

**The Burning Question: What Wildfire Adaptation Planning Lessons Can
British Columbia, Canada Learn from Other Jurisdictions?**

Christopher James Hampson-Curtis

Master of City Planning Capstone Report
Department of City Planning
Faculty of Architecture
University of Manitoba

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Acknowledgements

Thank you to David van Vliet of the University of Manitoba Department of City Planning for his guidance, support and feedback throughout the writing process.

Thank you to Hank Venema, Chief Executive Officer and Senior Engineer at Strategic Systems Engineering Inc. for his review and input as secondary reader.

Thank you to Rae Bridgman of the University of Manitoba Department of City Planning for her dedication to and organization of the Master of City Planning Capstone course, her tireless efforts to facilitate online course instruction and events, and her continual encouragement and kindness.

A special thank you to the Master of City Planning Class of 2022. All of them got me through the writing and editing process and so much more.

In memory of Jakub Jules Marshall. A thinker, a dreamer and a good friend.

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Preface

I lived at the south end of Winnipeg in 2021, my first year living in the city while studying at the University of Manitoba for my Master of City Planning degree. My roommate and I were renting a condo unit on Pembina Highway, one of the city's multilane arterial boulevards, and when we turned out of the condo complex facing north, we could see for kilometres down the straight wide street. That was a fun quirk of moving to the prairies for two chaps from southern Ontario. It all changed during our first summer in the city when the smoke came. It reminded me of my visit to San Francisco in the fall of 2018. A thick haze hanging in the air, obscuring visibility and filling the nostrils and lungs with the pungent, sticky aroma of charred vegetation. California was dealing with an intense wildfire season that year, and the restrictive nature of the smoke choking the city of San Francisco and the rest of the Bay Area adversely affected the pleasure trip I was taking. I could only imagine how it was affecting the lives of people living in the area – until the summer of 2021. For the first time, I was living in a city for which the weather forecast included warnings for smoke. I remember going outside the first day there was a noticeable amount of it in the air. Things looked a little off. Colours were less vibrant and there was less light permeating the landscape than usual. It looked like a cloud of fog, but the air was hot and dry. The smell was the most intense indicator of what was happening. It smelled like everyone in the city was having a bonfire. When I got out on my bike onto Pembina Highway and took a look north, the usual view of the long boulevard and the new university residence building in the distance was nowhere to be found. In its place was a haze of grey engulfing anything more than 50 metres away. A few minutes of riding was enough for my body to notice the smoke as well. A bit of breathing trouble and coughing accompanied me on my bike ride that day, and I began to realize this smoke was going to restrict more than just my visibility.

1. Introduction

1.1. Background

With relevant literature and precedents informing it, this report examines the response to wildfire risks in BC through an adaptation planning lens. Specific attention is given to how different levels of government and non-governmental entities collaborate to address current and forecast issues, as the literature reveals unequivocally that intergovernmental and stakeholder stewardship is essential to successful adaptation planning. The Metro Vancouver Region is examined as the regional context for the report, as it has two recent regional growth strategy plans, *Metro 2040* and its updated counterpart, *Metro 2050*. A significant objective of this report is to ascertain whether these plans – specifically the more recent *Metro 2050* – indicate acknowledgement of and strategies to address wildfire risks. Attention is given to whether these plans contain strategies congruent to the literature and successes of the precedent areas studied herein. The report provides insight as to how municipalities, the Metro Region, the Province and the Federal government can learn from and apply the findings in the literature and precedents. It asks questions to probe the information and decision making within the regional plans, or lack thereof, and to advance the discourse on the extremely pertinent and evolving issue of wildfires.

While destructive, unsightly and otherwise repugnant in nature, those smoky summer days in Winnipeg served as the initial inspiration for this research project on wildfires. Evidently, cities full of smoke are not conducive to healthy residents and good quality of life. Some exposure to the adverse effects of wildfires, even at a minimal scale, provided a degree of lived experience to help put the situation into perspective. The wildfires choking the City of Winnipeg with smoke in early July were burning hundreds of kilometres away in Berens River and Red Lake, Ontario (CBC, 2021). If fires burning that far from a city can fill its streets with smoke, fires burning much closer could have immeasurably worse impacts on human health and daily life in a given community.

Smoke is only part of the equation when it comes to the dangers wildfires pose. Wildfires are threatening countries all over the world in a variety of ways like never before (Weston, 2022). In Canada, many provinces have been facing alarming and catastrophic wildfire events in recent years. British Columbia was among the hardest hit provinces in the summer of 2021,

enduring its third worst fire season on record with 8,700 square kilometres of land scorched and many communities evacuated (Kulkarni, 2021). The town of Lytton completely burned to the ground, and some fear the town is lost permanently as it will not be rebuilt before residents, currently homeless, find new homes elsewhere (Brunoro, 2022). BC experienced unprecedented heat waves in 2021 as well, which included the three hottest temperatures ever recorded in Canada at 46.6, 47.9 and 49.6 degrees Celsius. These temperatures occurred sequentially over the course of just three days, coincidentally also in the town of Lytton just days before it was consumed by fire (Lindsay, 2021). Extreme heat and drought spawned a perfect storm of conditions conducive to wildfires in the province, and since BC is already prone to drought, the risk of wildfire is further increased (Boothby, 2021).

1.2. Methods

The methodology for the research includes a literature review and a precedent study. The literature review examines selections from a vast literature pool, focusing on identifying risks of wildfires as they pertain to a global and Canadian context, as well as the contexts of the precedents. Also selected for the literature review are texts that examine needs and strategies for adaptation planning and wildfire risk mitigation. The literature review does not represent a comprehensive account of all data pertinent to the topic of wildfires or adaptation planning; rather, it helps frame the Metro Vancouver Region's adaptation planning needs and opportunities in the face of increasing wildfire risks.

The precedent study features two regions with heavy wildfire exposure and measures in place or in development to address the risks. These regions are the State of New South Wales, Australia and the State of California, USA. A more localized regional context within each of these regions is also examined to gauge conformity and collaboration across levels of government. Though many of the initiatives adopted by the precedent regions are recent and in preliminary stages at the time of writing this report, they are outside the realm of what BC has adopted and are relevant to its context as is explored herein.

1.3. Findings

The evidence gathered from the literature review and precedent study reveal overwhelmingly that adaptation planning tailored to specific regional needs and intergovernmental collaboration including non-governmental stakeholders are needed. The findings indicate that current practices attempting to avoid obtrusive and disruptive changes are ineffective or only partially address the issue. It is not an appropriate response to the threat of increasingly catastrophic wildfires to cast a future goal of reducing climate change while maintaining “business as usual” presently. Wildfire seasons are becoming longer and more severe, exacerbating all negative affects to human health, ecosystems and built environments. Strategic adaptation is needed immediately because the dangers of wildfires are present now.

1.4. Constraints and Limitations

The entire process for creating the report was completed in approximately seven months. As such, a comprehensive literature review and exhaustive precedent study were not plausible, nor were they intended to be carried out. The time constraint instead afforded a focused, selective process for the research components of the report. The literature review is a snapshot of recent and current understandings of climate change risks and needs. The precedent study is similar and observes the wildfire challenges facing two regions outside Canada and how they are tackling those challenges. As climate change and its effects on global and domestic wildfire situations is an evolving issue, this report is intended to modestly advance an elaborate and expanding discourse. Many issues are emerging, and many responses are being suggested and administered at the time of writing this report, so it is not plausible nor intended for the report to encompass all knowledge of any topics broached in its examinations and discussions.

1.5. Research Questions

Three research questions were devised to guide the research process and maintain the report’s focus. They are as follow.

- a) How are regions outside Canada – particularly in other developed nations such as the United States and Australia – already tackling the issue of living with elevated wildfire risk?

- b) How effectively do existing planning policies applicable to the Metro Vancouver region's *Metro 2040* plan and Draft *Metro 2050* plan currently address wildfire risk?
- c) Given that the risks of climate change are present and worsening, how does planning policy need to evolve and change to maintain quality of life in BC and the Metro Vancouver Region?

While these questions orient the research and precedent analysis and receive answers throughout the report, these answers are not comprehensive. The discourse surrounding The Metro Vancouver Region's, Province of BC's and Canada's responses to climate change and climate change's effects on wildfires can and will expand to encompass new research and address new challenges. As the research reveals, ignorance, stagnation and malpractice must be eliminated if successful adaptation to wildfire risks is to be achieved and maintained.

Chapter 2 contains the literature review, which provides an overview of the theory and strategies observed in the precedent research to follow. As previously indicated, the literature covering the topic of wildfires and adaptation planning is extensive and many topics branch into their own specific discourses. To maintain its focus on adaptation strategies and needs relevant to the Province of BC and the Metro Vancouver Region, the literature reviewed in Chapter 2 was prioritized for its importance to the report's research questions, particularly questions B and C.

2. Literature Review: Adaptation Planning and Wildfires

The literature review is designed to provide an overview of the current discourse on adaptation planning as it pertains to wildfires, with a focus on needs and strategies relevant to the Province of BC and the Metro Vancouver Region. Major themes extracted here are also examined in the precedent research in Chapter 3. The two sections were drafted in tandem, with the purpose of ensuring the literature review retained its relevance to the precedent research and recommendations for the Province of BC and Metro Vancouver Region.

2.1. Risks of Continued Climate Change and Ineffective Approaches

This section is intended to provide an overview of how climate change is affecting and is projected to affect regions globally. Research here also aims to identify why adaptation to climate change effects is needed above alternative solutions.

2.1.1. Risks of Current and Worsening Climate Change Conditions

In observing the risks of climate change at a global scale, the need for adaptation planning to protect against severe damage and losses to human life, ecosystems and built environments is alarmingly apparent. Not only is it critical to ascertain and understand the current state of climate change as it applies to a global context, but also to acknowledge forecasts of how climate change will progress and what implications such progression will have.

The World Meteorological Organization (WMO) report a 40% chance of the average yearly temperature globally reaching 1.5 degrees Celsius above the pre-industrial era average temperature within the proceeding five years of the publication date of their article “New Climate Predictions Increase Likelihood of Temporarily Reaching 1.5 °C in Next 5 Years (WMO, 2021).” The Organization also report a 90% chance of any year between 2021 and 2025 becoming the hottest year on record, replacing 2016 as current hottest. 2021 ranked as the sixth hottest recorded year (NOAA, 2022; WMO, 2021).

Increased average global temperatures mean more extreme weather events, the most notable for wildfire influence being more heat waves and drought (WMO, 2021). The Secretary-General of the WMO, Petteri Taalas warns this new information means the world is very close to

reaching the lower global warming limit established at the Paris Climate Change Agreement, which is 1.5 degrees Celsius above pre-industrial levels (WMO, 2021). The higher limit is two degrees Celsius. (UNFCCC, 2022). The Paris Agreement limit represents the point after which effects of climate change will be disastrous on a global scale.

David Kramer's article "What Caused Australia's Disastrous Wildfires? It's Complicated" echoes the warnings of the WMO in its discussion of the season of extreme wildfires Australia experienced in 2019 and 2020. As one of the precedent regions for adaptation planning explored in this report is in Australia, literature surrounding the country's experience with climate change and wildfires is pertinent to the research for the report.

The hottest and driest year on record, 2019 was 1.5 degrees Celsius above the 30-year average for Australia of 21.8 degrees, which was set between 1961 and 1990 (Kramer, 2020). The previous record for hottest year had been 1.33 degrees above average, which was set in 2013. Two records set within a decade of each other highlight the trend of increasing favourable wildfire conditions in the country (Kramer, 2020).

Kramer makes note of the fact that 1.5 degrees Celsius above the pre-industrial era average was the global warming limit set at the 2015 Paris Climate Summit, as is also highlighted by the WMO's article (Kramer, 2020). A summer at 1.5 degrees above the average in Australia was indeed disastrous in terms of wildfires. Australia also experienced multiple days of record-breaking heat and record rainfall lows in 2019 (Kramer, 2020).

As the title suggests, the article examines factors at work other than climate change, such as positive surface water temperatures as part of the Indian Ocean Dipole (IOD) and the Southern Annular Mode (SAM) – a wind from Antarctica travelling south. Although there is evidence to suggest that climate change can exacerbate the effects of these natural phenomena, the article serves to demonstrate they occur independent of climate change as well, and when combined with other aspects of climate change create worse conditions for affected regions (Kramer, 2020).

It is important to take this type of uncontrollable influence into account when considering regional adaptation strategies, as adaptation will need to be effective despite external influences exacerbating stresses. Elaboration on adaptation despite external influences can be found in Chapter 3.

While destruction and losses to ecosystems and built environments can be catastrophic, the most concerning implication of the extreme conditions of climate change for humans is likely to be adverse human health impacts. Vardoulakis et al also cite Australia's 2019-2020 bushfire season as evidence of the need for the nation to adopt a universal strategy for health protection during periods of wildfire prevalence. Hospitalization rates, emergency department usage, ambulance deployment and visits to medical general practitioners have all been shown to increase when harmful particulate matter in the air is greatly intensified due to bushfire smoke (Vardoulakis et al, 2020). Effects can be further exacerbated when combined with very hot weather conditions, or when certain demographics are exposed to the smoke, i.e.: young children, seniors or those with pre-existing adverse health conditions (Vardoulakis et al, 2020).

2.1.2. Risks of Ineffective Approaches

What are some less apparent risks of a changing climate, and how do they relate to adaptation planning? One risk that falls outside the realm of direct impacts from climate stresses is a failure to adopt appropriate strategies to target them. This is an example of malpractice, or maladaptation – a practice that indirectly exacerbates negative effects for some entities while attempting to provide adaptive measures for others (Glavovic and Smith, 2014). Identification and study of maladaptation is especially relevant to this report, which focuses on adaptation planning and intergovernmental collaboration. While maladaptation can take many forms and carry many influences, efforts to identify and correct it are vital to successful campaigns against losses and damage due to climate change (Glavovic and Smith, 2014).

Bruce Glavovic and Gavin Smith are editors of the book *Adapting to Climate Change: Lessons from Natural Hazards Planning*, which provides a detailed examination of what can be learned from natural disasters in terms of adapting to climate change, and the planning associated with such adaptation. As the Executive Director of the Mississippi Governor's Office of Recovery and Renewal, Smith was able to study first-hand the effects of natural disasters linked

to climate change on communities lacking the capacity to withstand such stresses and damages (Glavovic and Smith, 2014). Glavovic oversaw a study of Hurricane Katrina's impact on the City of New Orleans and what recovery processes entailed, leading to questions of how adaptation planning could influence future recoveries from climate-related disasters (Glavovic and Smith, 2014).

The book's first chapter, "Learning from Natural Hazards Experience to Adapt to Climate Change," is most relevant to this report, and is the focus for this section. As per the early work of the United Nations Framework Convention on Climate Change (UNFCCC) in setting up the beginnings of an international framework for climate change adaptation, Glavovic and Smith observe that much of the historical focus on climate change has been on reducing greenhouse gas emissions. This type of initiative became prominent in the early-to-mid 1990s (Glavovic and Smith, 2014). The issue with this approach, however, is that climate change has already taken place, so its effects are already present. Even if greenhouse gas emissions were immediately and drastically reduced, adaptation to the existing effects of climate change would still need to take place (Glavovic and Smith, 2014). AR5 indicates greenhouse gas emission reduction is helpful only in the sense that fewer emissions lead to less extreme adaptation needs in the future (IPCC, 2014). Despite this potential benefit, as Glavovic and Smith indicate, climate change threatens to damage ecosystems and human life presently (Glavovic and Smith, 2014; IPCC, 2014). Therefore, greenhouse gas emission reduction must be treated as a complementary measure to adaptation planning. Furthermore, efforts to drastically reduce greenhouse gases while attempting to maintain a "business as usual" or undistruptive approach for communities and regions have been the norm for several decades and have been largely unsuccessful (Glavovic and Smith, 2014). The desire for the "business as usual" scenario helps to demonstrate what are often the greatest barriers to successful and efficient adaptation: cultural and institutional traditions or practices (Glavovic and Smith, 2014). There is often a great deal of resistance to change these, preventing adaptation strategies from being able to embed themselves and become mainstream within government practice, planning and policymaking. Also challenging to overcome are the restraints of older or unchanging technologies within communities (Glavovic and Smith, 2014).

At the time of the book's publication, Glavovic and Smith observed that attention to adaptation from most observed entities concerned with climate change was minimal, and what little attention the principle had received was quite recent (Glavovic and Smith, 2014). In early study and implementation, adaptation often came in the form of singular approaches in which one specific strategy was selected and applied to a given situation rather than adopting any sort of hybrid approach (Glavovic and Smith, 2014). If a municipality or region decided it would protect against a climate-related stress, it would implement engineered approaches as barriers to the stress, allowing residents and industry to continue "business as usual" (Glavovic and Smith, 2014). If the chosen strategy was to accommodate for climate stresses, the municipality or region would make minor adjustments to infrastructure and practice in attempts to mitigate the effects of the stresses being experienced (Glavovic and Smith, 2014). In a scenario in which retreating from the area experiencing stresses was the selected approach, settlements would migrate in a certain direction or shrink in size (Glavovic and Smith, 2014). This approach is often not possible due to population growth, however. Finally, the strategy of avoiding the stresses altogether involves recognizing the stresses exist, knowing where they will create the most vulnerability and risk, and avoiding those areas altogether (Glavovic and Smith, 2014). These strategies each have benefits and constraints, and it has become increasingly clear that no individual practice is effective on its own. While some applications of these strategies can appear to garner the desired effect, they can lead to maladaptation in some cases if not planned and implemented strategically (Glavovic and Smith, 2014).

Vardoulakis et al describe a prime example of maladaptation in their analysis of Australia's air quality warnings and recommendations when heavy smoke is present in municipalities. In this case, Australian state and regional governments attempt to apply protective measures against the stress to maintain the "business as usual" situation as much as possible. As the current air quality monitoring systems and subsequent health advice from Australia's state and regional governments focus on daily and even hourly air conditions, the available information is best suited for short-term outdoor activity planning (Vardoulakis et al, 2020). While this can be useful in providing real-time updates on rapidly changing conditions, discrepancies in how information is collected and disseminated can cause uncertainty and confusion (Vardoulakis et al, 2020). Vardoulakis et al also discuss the fact that current advice for poor air quality protocols is only reasonable for short periods of time, but the smoke-filled air

from the 2019-2020 bushfires remained a threat for weeks and even months in some cases (Vardoulakis et al, 2020). Advice that involves remaining indoors and reducing activity becomes irrational if applied to extended periods of time. Denying people access to basic needs such as socialization and exercise can become hazardous to human health in both the physical and mental capacities (Vardoulakis et al, 2020).

Similarly, Bowman et al argue that Australia's current fire monitoring system is ineffective because it pieces together data from individual states and agencies within states rather than monitoring at a national level with one universal method for data collection. This is also a prime example of maladaptation in that an ineffective fire monitoring system is not only dangerous for the public but is also a waste of resources and may as well not exist. The article features a map of wildfires in the country during the 2019-20 season, created using satellite data, which demonstrates the ineffectiveness of the current fire monitoring method of piecing together various data collected using other methods such as field observation (Bowman et al, 2020). Differences in data collection methods create inconsistencies and gaps in the data, which could be avoided if fires were monitored at a national level using a consistent monitoring system (Bowman et al, 2020). Inaccurate data as a result of varying methods of data gathering also affect knowledge of fire outcomes, such as the toll on wildlife and the greenhouse gas emissions (Bowman et al, 2020). Despite Bowman et al's research indicating burned areas in the 2019-20 season were 24% smaller than what is shown in the data compiled by the government, these fires were still unprecedented in scale for the country since at least the mid Nineteenth Century (Bowman et al, 2020).

2.2. Needs, Strategies and Opportunities

In line with Section 2.1, this section begins by examining themes at a global scale to harness a scope of the current global understanding of how best to approach climate change and its associated risks. The research here is intended to identify what is required, what methods can be applied and opportunities to take action towards climate adaptation planning, with particular emphasis on Canada, the United States and Australia to maintain relevance to the focus of this report.

2.2.1. Adaptation Planning Integration

As the United Nations' agency for research on the science relating to climate change, the Intergovernmental Panel on Climate Change (IPCC) produce assessment reports containing the organization's most recent findings with intervals of several years between them – usually fewer than 10 (IPCC, 2022). The IPCC's Fifth Assessment Report (AR5) was released in its various components throughout 2014. It contains updated and new information relative to its predecessor, the Fourth Assessment, which was released in 2007. The Sixth Assessment is due in 2022, but during the writing and research for this report, was unavailable (IPCC, 2022).

AR5 contains four chapters dedicated to climate change adaptation. These are “Adaptation Needs and Options,” “Adaptation Planning and Implementation,” “Adaptation Opportunities, Constraints, and Limits,” and “Economics of Adaptation” (IPCC, 2014). Of these chapters, the former three contain the most relevant information to this report. Analysis of these three AR5 chapters provides an effective basis for the rest of the Needs, Strategies and Opportunities section, as it represents the United Nations' 193 member states' current understanding of the issue (UN, 2022).

Climate change adaptation has gained wider attention as the effects of climate change have become more present and more pronounced (IPCC, 2014). The “Adaptation and Needs” chapter of AR5 introduces the needs for adaptation as arising when risks stemming from climate change are experienced or anticipated (IPCC, 2014). These needs are defined as the difference between what would happen to humanity and ecosystems if human activity continued on its current trajectory unaltered, and what changes should be made to that trajectory to reach a point at which human beings can continue living comfortably without catastrophic damage to themselves or other life (IPCC, 2014).

Integrating adaptation measures into policymaking and existing structures of governance will make accounting for funding and social issues related to adaptation measures easier (IPCC, 2014). It has also become apparent that many areas at risk of experiencing more immediate and acute effects of climate change will need to integrate adaptation planning in a transformative capacity rather than taking an incremental approach (IPCC, 2014). As discussed by Glavovic and Smith in Section 2.1, the greater risks climate change poses on societies may not be avoidable by

evolving existing practices alone. As such, the process of implementing transformative adaptation may need to begin with adapting people's attitudes toward, and their understandings of climate change, so transformative action can be widely accepted (IPCC, 2014).

The Council of Canadian Academies (CCA) echoes the importance of integrating adaptation into government processes in their *Building a Resilient Canada* report. The CCA's report is very recent at the time of writing this report, indicating that, despite a gap of eight years, *Building a Resilient Canada* continues to recognise the recommendations of AR5 as vital to mitigating disastrous climate change effects.

Building a Resilient Canada stresses that Canada's current level of action against climate change hazards is not nearly what it should be. By November 2021, over 2,000 jurisdictions across 37 countries had declared emergencies related to climate, with approximately one quarter of these in Canada, including the House of Commons (CCA, 2022). In 2020, Public Safety Canada posed the research question, "What key opportunities exist to improve disaster resilience in Canada through better integration of disaster risk reduction and climate change adaptation research and practice?" to the CCA (CCA, 2022). The CCA convened a panel of experts, which met recurrently over the course of two years to develop the *Building a Resilient Canada* report in response to the question (CCA, 2022).

The Expert Panel describe a successful approach to adaptation and disaster risk reduction as involving recognition of limited resources, finding synergistic methods of accomplishing goals and the reduction of redundant practices such as duplicating efforts, which waste time and resources (CCA, 2022). The current approach from Canadian governments is often one of reaction, similar to what Glavovic and Smith discuss in Section 2.1 (CCA, 2022). Seldom is sufficient investment made to protect against climate change hazards, resulting in a much steeper cost being paid in the form of rehabilitation (CCA, 2022). Reactive approaches have been shown to cost over 10 times more than proactive ones, yet regions in Canada continue to react to climate stresses rather than plan ahead for effective adaptation to these stresses (CCA, 2022). Just as the IPCC do, the CCA recommend the integration of adaptation planning into policymaking and government operations.

What are some approaches to adaptation planning? According to Glavovic and Smith, climate change adaptation most frequently manifests itself according to three dichotomies: anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation (Glavovic and Smith, 2014). Anticipatory and reactive adaptation are self-explanatory, and represent planning for adaptation using research, precedents and estimation as opposed to adapting using prior experience with stresses and damages (Glavovic and Smith, 2014). Private and public adaptation represent an approach from commercial and other non-governmental stakeholders versus a government-based approach (Glavovic and Smith, 2014). Perhaps the only adaptation type with a negative connotation is autonomous planning, which represents reactionary planning out of necessity due to a failure to plan for climate stresses, as opposed to its counterpart, planned adaptation (Glavovic and Smith, 2014).

2.2.2. Intergovernmental Collaboration

Coordination between governments and private stakeholders is essential in making adaptation efforts successful (IPCC, 2014). Specifically, AR5 suggests local governments and private sector actors will be most important in facilitating this coordination (IPCC, 2014). Local governments will be able to provide detailed analyses and reports of the conditions and needs of their respective areas, while the private sector will report on the interests and most likely practices of businesses, industries and agriculture (IPCC, 2014). This will allow for a detailed bottom-up understanding that can help higher governments create policy for effective collaboration on adaptation strategy and implementation (IPCC, 2014). These top-down and bottom-up strategies of gathering and disseminating information can also lead to increased action. It is often the case that reports of general risks of climate change and the needs for adaptation lead to awareness but not action (IPCC, 2014). Specific needs from a local and private interest perspective can help to influence specific action (IPCC, 2014).

The IPCC emphasize the fact that shared efforts between national and subnational levels of government as well as non-governmental stakeholders can reduce the burden of collecting and disseminating complex information and data, as well as difficult decision making (IPCC, 2014). Federal governments are increasingly adopting roles of coordination through legal framework and necessary actions to tackle potential risks at a broad level (IPCC, 2014). From this point,

subnational and local governments can create strategic plans with consideration for the context of their area (IPCC, 2014).

The subnational and local stage of adaptation planning is extremely important for the coordination of specific and effective measures due to the diverse nature of impacts and stresses climate change has on different areas of the world (IPCC, 2014). AR5 demonstrates an increase in recent years of adaptation planning using local and traditional knowledge, which can increase the capacity for community-specific adaptive strategies (IPCC, 2014). This planning method often involves the consultation of Indigenous peoples who have their own strategies for dealing with environmental stresses and risks (IPCC, 2014).

The framing of adaptation within the political sphere can dictate its importance to key influencers at different levels of government (IPCC, 2014). For example, benefits to infrastructure and development in the short-term can help to make adaptation measures more attractive to political actors at any level of government (IPCC, 2014). It is also an effective strategy for policymakers and planners to align adaptation goals with existing planning goals to help ease these measures into regions and municipalities more seamlessly (IPCC, 2014).

Glavovic and Smith also discuss the importance of collaboration between various levels of government and non-government organizations (NGOs). Since indicators for exact needs based on unique conditions come from a community or municipal level, a bottom-up approach to adaptation planning in which the lowest levels of government inform the higher levels of what is needed can be effective (Glavovic and Smith, 2014). A distribution of power with clear principles, interactive approaches and stakeholder-driven decision making is essential for adaptation planning as no singular entity can successfully adapt to stresses or reduce risks independently (Glavovic and Smith, 2014).

The IPCC indicate both top-down and horizontal approaches to planning and acting on plans present challenges in coordination, politics and sustaining momentum on long-term initiatives (IPCC, 2014). This is why strategic plans must have clear goals with timelines for completion and must have strategies to keep all actors on track, including all levels of government and non-governmental stakeholders (IPCC, 2014).

Glavovic and Smith warn that translating intentions and knowledge into action is still a barrier most governments face (Glavovic and Smith, 2014). When this happens, the coordinated strategies and resource allocation are not carried out, and lower levels of government are often forced to act autonomously rather than interactively as part of a planned approach (Glavovic and Smith, 2014). Therefore, lower levels of government must communicate what is needed, while higher levels of government must act upon this information by creating policy, allocating funding and initiating strategies to streamline adaptation throughout the lower levels of government (Glavovic and Smith, 2014). The long-term outcomes of climate change are still uncertain since there are many variables that can influence trajectories, but observation-based approaches and risk assessments can help governments implement the most up-to-date adaptation strategies (Glavovic and Smith, 2014).

The CCA add their support for collaboration across governments and private entities as vital to effective adaptation planning and climate risk reduction in *Building a Resilient Canada*. The CCA add that equally important to government collaboration is common documentation and sharing of knowledge (CCA, 2022). Disorganization and misaligned duty assignments lead to stagnant progress on initiatives, which can be avoided through communication and transparency from all involved parties (CCA, 2022). In Canada specifically, the sharing of knowledge includes that of Indigenous communities, which are often best at gauging and tackling risks in their own communities, as indicated by AR5 (CCA, 2022). Indigenous expertise and planning continue to be sidelined and seldom considered, which constitutes a huge missed opportunity for intergovernmental collaboration (CCA, 2022). Indigenous communities know best what their own communities need and how they will respond to environmental stresses, but also may be able to apply their expertise to western communities (CCA, 2022).

2.2.3. Determining and Applying Appropriate Strategies

AR5 defines adaptation planning as moving from a position of information and awareness to one of construction and implementation of strategies and legal framework, with the goal of preparing for and addressing the impacts of climate change (IPCC, 2014). In this regard, adaptation planning involves more action than discussion. Because of the wide range of issues and the complexity and diversity of the contexts in which governments need to work to resolve climate

change risks, there can be no single method of adaptation planning (IPCC, 2014). Climate change adaptation is a response to the existing risks of a changing climate, which come in many forms and are context specific (IPCC, 2014). This is why strategic planning, taking different forms and approaches depending on the conditions of the area in question is necessary (IPCC, 2014).

As examined in Section 2.1, many authors caution against the pitfalls of maladaptation, and the IPCC are no different. AR5 cites a risk of exacerbating the vulnerability of one region by implementing poorly planned adaptation measures in another as a prime example of the harm maladaptation can cause (IPCC, 2014). This harm can be mitigated by properly researching the outcomes associated with the intended measures and ensuring the entire process is well documented and understood, with stakeholders being informed as well (IPCC, 2014).

Another pitfall of maladaptation is the tendency to rely on approaches with benchmarks based on known potential impacts of climate change with limited consideration for stresses brought on by individual hazards (IPCC, 2014). This type of broad-reaching approach can be much less effective than a context-specific strategy (IPCC, 2014). Therefore, a given region should embrace a strategy targeting individual stresses and that plans to specifically protect against human vulnerability in the region (IPCC, 2014).

Vardoulakis et al examine maladaptation and a dependency on broad-reaching approaches. Specifically, the authors discuss the need for a universal strategy to protect against adverse health conditions due to wildfire smoke, as highlighted in Section 2.1. Recommend is a re-examination of advisory practices for extended periods of poor air quality to provide citizens with detailed, case-specific information (Vardoulakis et al, 2020).

For many living in older homes, remaining indoors for extended periods of time is not a reasonable solution to air quality issues given the tendency of older buildings to have porous structures causing particulate-ridden air to enter the home (Vardoulakis et al, 2020). It may be prudent for large public buildings with air conditioning and new construction to open as shelters during the day (Vardoulakis et al, 2020). For those for whom relocation is a challenge, it may be advisable to create a sealed area within the home for the worst parts of the day and open the home for air circulation when air quality improves (Vardoulakis et al, 2020). For example, the

City of Sydney's air quality was shown to be best around midnight, so this time of day could be used for air circulation throughout homes (Vardoulakis et al, 2020).

Information of a more general nature should be made readily available as well from the federal level. For example, more research is needed to determine the effectiveness of facemasks against particulate matter in the air (Vardoulakis et al, 2020). Some information is concrete, however, such as the fact that N95 masks are highly effective at filtration so long as proper secure fitment around the face is achievable (Vardoulakis et al, 2020). Information surrounding the benefits and constraints of facemasks should be widely circulated, especially for individuals that must be outdoors or cannot isolate themselves during times of poor air quality (Vardoulakis et al, 2020). Similarly, facts surrounding the adverse health affects of smoke should be circulated as well so people are aware of the dangers of bushfire smoke inhalation and can seek refuge, take precautions and make plans accordingly (Vardoulakis et al, 2020). Myths such as those that promote smoke derived from natural sources – wood, brush, etcetera – as healthy should be dispelled with clear and concise scientific information to promote informed decision making (Vardoulakis et al, 2020).

Information systems can also be instrumental in understanding and preventing against extreme wildfires in the first place. Bowman et al argue that information regarding the area and type of vegetation burned plays a role in determining more accurately how much of an area was burned and the environmental impact of a fire (Bowman et al, 2020). The information is relevant because reduced fuel resulting from dry conditions can drastically reduce the spread of a fire, while other conditions – such as type of vegetation can increase the spread and speed at which a fire burns (Bowman et al, 2020). Applying wildfire mitigation strategies using this information could be instrumental in maintaining better control of future wildfire situations. At the time Bowman et al's article was written, the Australian government had asked that a royal commission develop a national strategy for fire risk management (Bowman et al, 2020). Bowman et al. recommend that the commission establish a national fire monitoring agency gathering data on causes, frequency, extent, severity, biodiversity, vegetation coverage, greenhouse gas emissions, smoke and public health factors, and economic trade-offs for Australian wildfires (Bowman et al, 2020). These data, collected across the nation using

universal and replicable gathering methods, will allow policymakers to be properly informed and act accordingly, and will ensure accuracy in reports and analyses (Bowman et al, 2020).

Digital technology and information systems may also be able to play a more effective role in preparing people against the dangers of wildfire smoke if proper adjustments and improvements to infrastructure are made (Vardoulakis et al, 2020). Vardoulakis et al cite AirRater, a smartphone app, as a potentially useful tool in tracking air conditions locally with hourly updates but point out that many locations throughout Australia are still without air quality monitoring systems (Vardoulakis et al, 2020). Funding allocated to increased equipment, both fixed and portable, for regions and communities around the country to create an effective web of information gathering (Vardoulakis et al, 2020). At the time their article “New Climate Predictions Increase Likelihood of Temporarily Reaching 1.5 °C in Next 5 Years” was written, the WMO reported that approximately half of their member nations had systems in place to track and warn against extreme climate events (WMO, 2021). There is strong evidence to suggest monitoring technologies of various types are vital to increasing adaptive capacity and reducing loss of life and property (Vardoulakis et al, 2020; WMO, 2021).

The CCA examine opportunities for effective adaptation planning within the Canadian context. As the IPCC claim, governments and other entities concerned with adaptation and risk reduction planning often stumble over the pitfall of using historical data benchmarks to illustrate trends and indicate needs (IPCC, 2014). Canadian governments and stakeholders are no different (CCA, 2022). Given the continual changing of the climate and the vastly different conditions in regions across the country, continual updating of information is essential to creating accurate risk assessments (CCA, 2022). Without reliable, updated and detailed information it is difficult to plan for adaptation needs and distribute resources accordingly (CCA, 2022).

Equally important to gathering information is making information readily available, accessible and appropriate for those who need to access it, particularly governments (CCA, 2022). A lack of accessible data in Canada causes extreme limitations for creating up-to-date timelines, models and predictions (CCA, 2022). The Canadian Disaster Database, which provides information on a variety of large-scale events that have happened since 1900 (CDD,

2021), is currently not providing proper monitoring and evaluation data for climate-related events (CCA, 2022).

Despite the challenges indicated, the CCA highlight opportunities for improvement on climate change adaptation and risk reduction in Canada. As all entities involved must collaborate in order to be successful, initiatives must be taken by governments and private entities (CCA, 2022). Private sector entities can take a leadership role in curating and disseminating information as a means of preserving their continued operations and serving the interests of their investors (CCA, 2022). Insurance companies can provide information to customers regarding the risks of climate change and mitigation opportunities and can even mandate risk reduction strategies from users of their services (CCA, 2022).

In considering action from the public sector, the Expert Panel stress government mandates are needed to ensure continued progress, organization and accountability from all involved parties (CCA, 2022). Avoiding stagnation involves the creation of plans that use reliable evidence and financial information (CCA, 2022). Government processes should function using a bottom-up model, wherein communities communicate their specific needs in terms of resources, finances and information (CCA, 2022). Meanwhile, government mandates should use a top-down model, ensuring funding is readily available and dispersed according to need, and that organization and accountability are acknowledged and respected by all parties involved (CCA, 2022).

It is also important that Canada continue to work towards Indigenous self-governance so Indigenous communities can plan for their own adaptation and risk reduction, and so they have the agency to collaborate with other entities and stakeholders (CCA, 2022). No singular entity can take full responsibility for Canada's adaptation and risk reduction goals, so a collaborative, equitable approach is instrumental (CCA, 2022).

Appropriate strategies vary greatly and may appear and function quite differently depending on regional context. Therefore, the most effective adaptation planning strategies involve collaboration across governments and with stakeholders, as well as consideration of many factors inherent to the region in question.

2.2.4. Limitations, Constraints and Mitigation Methods

An adaptation limit exists when a risk that is considered intolerable occurs despite efforts to mitigate it or because mitigation efforts could not be carried out (IPCC, 2014). Limits can be observed and noted as precedents or anticipated in the form of research predictions, however, there is currently not sufficient information for most regions to effectively determine adaptation limits arising from any given degree of climate change (IPCC, 2014). This is due in part to developments in technology, economy, culture and other variables that can influence the indicators for predicting adaptation limits (IPCC, 2014).

Risk assessments and risk-based approaches are some of the ways in which decision makers can act under uncertain circumstances for adaptation planning (IPCC, 2014). In determining what risks exist and establishing a hierarchy of risks based on severity of consequence, plans can be drafted more effectively, resources can be distributed accordingly and actions can be taken in a prioritized fashion (IPCC, 2014). In risk assessment, some risks may have such severe consequences that they may be deemed intolerable, and every effort may be exerted to prevent such consequences from becoming reality (IPCC, 2014). This can be accomplished by removing most or all adaptive efforts against risks with such minor consequences that they are considered acceptable to absorb (IPCC, 2014). Despite these efforts, governmental and stakeholder capacity to act and to provide resources is always finite. Therefore, adaptation planning must include considerations for constraints and limitations (IPCC, 2014).

The capacity to effectively enact adaptation strategies is restricted by the uneven distribution of resources and challenges throughout areas in need of adaptive measures (IPCC, 2014). The ability to access and take advantage of tools, information, people and other resources to adapt to stresses can influence areas of any size – nations, regions, communities or even local areas within communities (IPCC, 2014). Various challenges inherent to specific areas can also influence those areas' abilities to embrace adaptation planning. These challenges can include lack of government organization and coordination (IPCC, 2014). As indicated by many of the works examined herein, regionally specific challenges and needs must be met in order to achieve successful adaptation to climate change stresses.

Finally, ethics also poses limitations and constraints to adaptation. The ethical issues surrounding adaptation planning come in the form of costs and benefits disproportionately affecting various stakeholders (IPCC, 2014). In some instances, ethics may become an adaptation limit if certain people and groups are being negatively impacted in a disproportionate manner (IPCC, 2014). To address this, AR5 emphasizes the importance of governments of all levels and non-governmental stakeholders recognizing this issue and working together to determine how to proceed with adaptation planning in an ethical way (IPCC, 2014).

Chapter 3 introduces two precedent regions for which current wildfire situations, policies and processes are studied. Themes identified in Chapter 2 are revisited within the context of the precedents to ensure the literature informs the precedent study. The regions chosen for the precedent study also exhibit similarities to Canada's wildfire situation, further exemplifying their relevance to the report.

3. Precedent Study: New South Wales and California

The precedent study provides a window into the operations of two regions in similar situations to Canada in terms of wildfire experience. These regions are the State of New South Wales, Australia and the State of California, USA. Specifically, the precedent study examines policy documents from these regions and determines how smaller regions within each precedent state practice correspondence with their respective regional plans. In observing strategies already in place, this research provides opportunities for the Province of BC and the Metro Vancouver Region to learn from the success and shortcomings of these precedents, and to adopt some of the policies and recommendations.

While there are similarities between New South Wales, California and BC, the nuances of which can be debated, the fact that all three have experienced catastrophic wildfires in recent years at the time of writing this report is indisputable. 11 of California's 20 largest wildfires burned within the five years preceding the writing of this report (Government of California, 2022). Similarly, New South Wales's worst wildfire season ever recorded – nicknamed “the Black Summer” – was the summer of 2019-2020 (AIDR, 2020).

The government structures of each region examined include local, regional and state/provincial government bodies, with varying degrees of accountability to the federal governments in terms of climate adaptation and risk management strategies.

Several documents are examined from various levels of government. These include policy documents and commissioned reports and recommendations. In some cases, reports or recommendations are commissioned by government and then adopted as policy. After analyzing the critical points of the documents, it has become clear that governments in these states are working towards a collaborative approach to wildfire protection. With the goals of increasing response and preventative measures, efforts to unify and streamline the processes are needed to improve efficiency, increase transparency, and consolidate plans. The precedent study examines the proposals and mandates of state documents, and how regions within these states respond and adapt through their official regional plans and other documents.

3.1. State of New South Wales, Australia

Many states in Australia regularly experience wildfires, however, New South Wales has experienced some of the worst fires in the country in recent years, including the “Black Summer” in 2019 and 2020 (AIDR, 2020).

3.1.1. *New South Wales Rural Fires Act 1997*

The State of New South Wales in Australia has legislated an official *Rural Fires Act* to guide efforts involving wildfire through the New South Wales (NSW) Rural Fire Service. The Act replaces the *Bush Fires Act* of 1949 and was last updated on September 10, 2021. The NSW Rural Fire Service comprises a commissioner, staff and volunteer firefighters. The Act contains policy for fire prevention and mitigation efforts, firefighting, protection of people and property, and environmental preservation.

The Act grants emergency powers to the NSW Rural Fire Service under the instruction and guidance of the State Emergency Operations Controller, allowing the Service to act in emergency situations in which other agencies are not lawfully permitted to act. The Act designates the six-month period of October 1 to March 31 as the bush fire danger period, unless otherwise stated by the commissioner. During the danger period, the safety and preventative mandates outlined in the Act come into effect and are enforceable by law if they pertain to civic responsibilities, such as recreational fire bans or increased penalties for negligent behaviour increasing the risk of wildfire.

Australia uses a punitive system involving an accumulation of units called “penalty units.” As outlined in the *Crimes Act* of 1914, each penalty unit indicates an amount owing as a fee for unlawful activity, which increases for inflation according to a formula outlined in the Act. As of July 1, 2020, the current value of one penalty unit is 220 Australian dollars (Government of NSW, 2020). The *Rural Fires Act* outlines many scenarios in which penalty units may be administered for both individuals and corporations in the pursuit of fire prevention and mitigation. Offenses committed by corporations often receive more penalty units.

A significant power the *Act* grants to hazard management officers is the power to issue bush fire hazard reduction notices. A hazard reduction notice is an official written delivery of information and warning to a property owner in recognition of hazards on a property that may increase the risk of bush fire. The notice requires the property owner to carry out work on the property to eliminate or reduce the hazards to a reasonable extent lest he or she incur the administration of penalty units, prison time or both. The designated number of penalty units for individuals in non-compliance of hazard reduction notices is 50 penalty units. Corporations receive 100 penalty units.

3.1.2. Planning for Bush Fire Protection 2019

The Government of New South Wales, Australia has created a guide containing policy, research and information on industry standards to inform planning and development on land prone to bush fires in the state. The guide was drafted by the NSW Rural Fire Service by commission of the government. The document provides a substantial update to the 2001 document of the same name to reflect current bush fire conditions in the area and industry best practice in fire protection. It is intended to serve as a resource for various levels of planning, as well as a guide to the legal requirements of development in terms of fire protection.

The document outlines a set of objectives and principles for defensive planning to protect against the effects of bush fires on rural and urban land in NSW. The objectives include protecting human life, wildlife and property, and the principles outline the initiatives and assets involved in achieving this protection. These are referred to as bush fire protection measures (BPMs). It is important to recognize that the *Planning for Bush Fire Protection* (PBP) document refers to policy and research acknowledging that bush fires will continue to occur in NSW, and that planning and development in the state must include adaptation strategies to provide the best protection against them.

The substance of PBP comes from the BPMs. These are the key measures for successful adaptation to the effects of bush fires in the state.

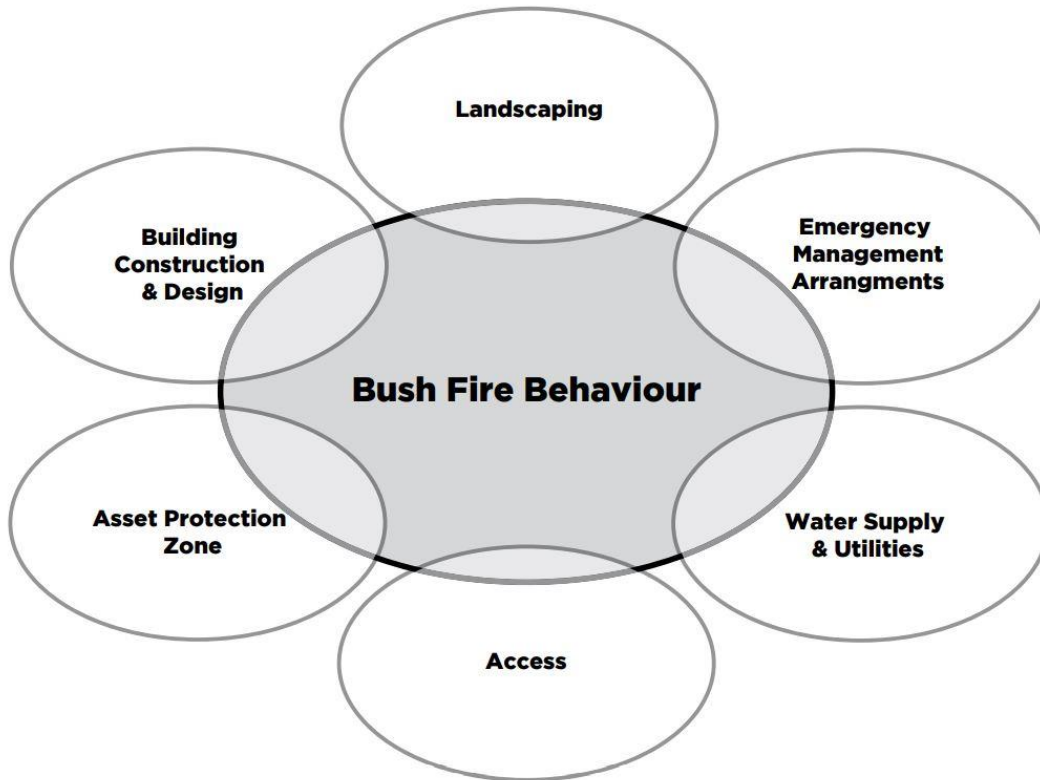


Figure 1 – Bush Fire Protection Measures (Government of NSW, 2019)

Figure 1 provides examples of BPMs illustrating how they can be considered functioning together to address a bush fire’s behaviour. It is important for different types of development projects to consider which BPMs will take priority based on their relevance to the type of development, the land use, the conditions of the land, the types of vegetation present and how bush fires are likely to behave in the area. Each BPM is intended to address one or more variables affecting fire behaviour and, combined appropriately with other BPMs, is designed to provide the best possible protection from bush fires.

While the document refers to existing policy, and some phases of planning in NSW now require compliance with PBP’s recommendations, not all content within the document is official policy. For some users, the document is only a guide to industry best practices. As such, the

content often reads as a set of recommendations rather than requirements. Section 1.4: “How to Use This Document” begins with, “applications for development on [bush fire prone land] should include a bush fire assessment report” (Government of NSW, 2019). Using “should” rather than “must” indicates that much, if not all the document content must be officially legislated by government in order to be enforced. However, the document is easy to understand and use for a variety of officials and the public as it contains plain language and provides a substantial compilation of information for anyone involved in bush fire protection. Considering the Government of NSW commissioned the Rural Fire Service to produce the document, it may have plans to incorporate the recommendations of the document wherever possible in the creation of bush fire protection policy.

Despite not always serving as official policy, the document contains information on the legal context of bush fire protection. Section 2.1: “Legal Framework” states that the *Environmental Planning and Assessment Act 1979* and *Rural Fires Act 1997* received amendments in 2002 to bolster bush fire protection policy in the development process. The *Environmental Planning and Assessment Act* now requires consideration of bush fire hazards in the strategic planning phase – one of two phases in the NSW land use planning framework, and the PBP document recommends that its guidelines be applied in carrying out this consideration. During development assessment, the second phase of land use planning in NSW, the recommendations of PBP must be consulted if the land is considered prone to bush fires. During processes such as development assessment planning, in which compliance with PBP is mandated, use of the word “should” rather than “must” becomes irrelevant.

The official designation of bush fire prone land is required under the *Environmental Planning and Assessment Act*, and the commissioner of the Rural Fire Service is responsible for the determination of what constitutes bush fire prone land, and how it will be mapped. Councils prepare maps based on these determinations, and the commissioner reviews and certifies them. This process must be carried out at least once every five years. The designation of land as bush fire prone triggers the required compliance with PBP. In this regard, the document does become policy.

Check if you're in bush fire prone land




You can check here if your land is in a bush fire prone area.

- › Enter your address including house number, street and suburb or town. Select your address from the drop down options provided.
- › Check the map has correctly located your property. If not drag and drop the red marker on to your property.
- › Click the 'Get Results' button to see if you're in a designated bush fire prone area.
- › You should consider seeking expert advice before commencing any development.

Your Property

Please enter your home address here.



The image shows a screenshot of a web-based interactive map. At the top, there is a text input field with the placeholder text 'Please enter your home address here.' and a 'Get Results' button to its right. Below the input field is a map of New South Wales, Australia. The map is titled 'NEW SOUTH WALES' and shows various geographical features, including roads, rivers, and green shaded areas representing bush fire prone land. Major cities like Dubbo, Newcastle, Port Macquarie, and Coffs Harbour are labeled. In the top left corner of the map, there are two buttons: 'Map' and 'Satellite'. In the top right corner, there is a small window with a red location pin and a search icon.

Figure 2 – Bush Fire Prone Land Interactive Map (Government of NSW, n.d.)

Figure 2 illustrates the NSW Rural Fire Service's mapping tool for determining whether land is considered bush fire prone land. This service is available on the Rural Fire Service's website.

The strategic planning stage is preliminary and broad in nature, involving state, regional and local government cooperation to be incorporated successfully. Strategic planning avoids the specifics of development and instead focuses on long-term land use strategies and infrastructure at a macro scale. This includes PBP measures, such as the incorporation of BPMs. At this stage of the planning process, development can avoid high risk areas as much as possible, and proper emergency provisions can be designated to areas where development does take place in higher risk areas. Carrying out assessments on level of fire risk, and whether development is acceptable on the land given the level of risk is instrumental in ensuring future developments can comply with PBP, as is required during the development assessment phase.

Figure 3 illustrates an exercise in strategic planning refined to its most relevant considerations. The first table entry highlights the determination of how the land is likely to be affected by bush fire, and the second highlights the determination of how the land should be used to best reduce the risk of fire exposure and effects.

Bush Fire Strategic Study

ISSUE	DETAIL	ASSESSMENT CONSIDERATIONS
Bush fire landscape assessment	A bush fire landscape assessment considers the likelihood of a bush fire, its potential severity and intensity and the potential impact on life and property in the context of the broader surrounding landscape.	<ul style="list-style-type: none"> ➤ The bush fire hazard in the surrounding area, including: <ul style="list-style-type: none"> ➤ Vegetation ➤ Topography ➤ Weather ➤ The potential fire behaviour that might be generated based on the above; ➤ Any history of bush fire in the area; ➤ Potential fire runs into the site and the intensity of such fire runs; and ➤ The difficulty in accessing and suppressing a fire, the continuity of bush fire hazards or the fragmentation of landscape fuels and the complexity of the associated terrain.
Land use assessment	The land use assessment will identify the most appropriate locations within the masterplan area or site layout for the proposed land uses.	<ul style="list-style-type: none"> ➤ The risk profile of different areas of the development layout based on the above landscape study; ➤ The proposed land use zones and permitted uses; ➤ The most appropriate siting of different land uses based on risk profiles within the site (i.e. not locating development on ridge tops, SFPP development to be located in lower risk areas of the site); and ➤ The impact of the siting of these uses on APZ provision.

Figure 3 – Bush Fire Strategic Study (Government of NSW, 2019)

Regional and local governments each play a key role in the strategic planning process, and the NSW State Government has implemented measures to ensure different levels of government cooperate in bush fire adaptation. The creation of the NSW Rural Fire Service is one such measure, as the Service has become a key stakeholder in the creation of regional and local plans and must be consulted in this regard.

When a local government is drafting a planning proposal or a local environmental plan for land that is considered bush fire prone or within close proximity to such land, the planning authority must consult with the Rural Fire Service Commissioner. The commissioner's feedback must be heeded in the creation of the planning strategy.

3.1.3. Regional Correspondence: *Illawarra Shoalhaven Regional Plan 2041*

The Illawarra Shoalhaven region recently experienced a series of devastating bushfires, as the 2019-20 season was the worst the State of New South Wales has ever experienced (Government of New South Wales, 2021). *Plan 2041* is the region's 20-year land use plan, which was first released in 2015 as Plan 2036. It informs the four major local government areas of Wollongong, Shellharbour, Kiama and Shoalhaven, the latter of which had 80% of its land affected by the 2019-20 fire season. This impact is acknowledged in the plan's introductory section, highlighting the long-lasting effects the 2019-20 fires continue to have on the region.

Is the Regional Plan concerned about bushfires? The word "bushfire appears in the document 19 times.

Plan 2041 is considering adaptation planning strategies as a direct result of the devastating impacts of the 2019-20 fire season. The "Reviewing the Regional Plan" section indicates one of the major updated items from Plan 2036 is bushfire adaptation strategies. "Objective 12" is to "Build Resilient Places and Communities." This section includes strategies to reduce human exposure to bushfires by paying close attention to the proximity of new development to areas that are considered high-risk bushfire areas. This is in alignment with Planning for Bushfire Protection 2019's goal of creating risk profiles based on landscape assessments. Despite the apparent shared goal, however, this section of the Plan would function collaboratively with PBP more effectively if it clearly identified and acknowledged the state guide as producing the same recommendations. *Plan 2041* does directly reference PBP in its "Reduce Exposure to Natural Hazards" section, however, by recommending its consultation to the region's member municipal councils and stating that the region has been and will be consulting the guide for its wildfire protection planning. This direct reference to the state's planning guide works to solidify the collaborative approach the state is taking across its levels of government.

3.2. State of California, United States

Like New South Wales, the State of California has also been experiencing devastating wildfires in recent years and has introduced many initiatives in response to those fires.

3.2.1. Agreement for Shared Stewardship of California's Forest and Rangelands 2020

The *Shared Stewardship Agreement* brings together the State of California and the United States Department of Agriculture (USDA)'s Forest Service in sharing the responsibilities and tools for forest maintenance, restoration and protection in California. The initiatives of this agreement, outlined in the Memorandum of Understanding (MOU) signed by five authorized representatives of the two parties, are intended to reduce safety risks to the public, to natural habitats, and to protect natural and built environments from wildfires in the state.

The MOU describes a forestry situation within the state that owes its troublesome trajectory to a history of clearcutting dating back to the Gold Rush era, and a long-lasting fire suppression policy to follow. These influences helped promote the current forestry conditions conducive to large, fast-spreading wildfires, along with other factors that have emerged or worsened in recent decades. The current ailing conditions of forests, new and worsening impacts on fire risks and Statewide division of land ownership and management have led to the urgency for collaborative action from different levels of government agencies and private entities. The Shared Stewardship Agreement is both reactive and proactive as it serves as a response to the need for immediate action, but also commits its member agencies to preventative measures for the future of California's forests.

The Shared Stewardship Agreement comes at the heels of the USDA's strategy to bring entities together for effective forestry management, which it put forth in 2018. The strategy outlined three primary goals. The first was to "manage together," meaning working efficiently to join forces so that shared goals are not thwarted by jurisdictional boundaries. The second goal was to "do the right work in the right places at the right scale," involving prioritizing initiatives and determining logistics to maximize protection for communities and natural areas. The third goal was "use all available tools for better stewardship," involving monitoring tools, programs

and efforts related to protection of natural and built environments to ensure they are being applied effectively and efficiently.

“Principles”

In the “Principles” section, the MOU highlights the importance of using science to inform decisions made by the coalition of agencies. Stewardship initiatives should include the support of long-term research projects to enhance forest management understanding. The sharing of maps and data between agencies is also prioritized to eliminate gaps and overlap in information. Another principle of the Agreement is to “collaborate and innovate with all stakeholders.” These stakeholders include organizations outside of government, academic institutions, private landowners, Indigenous governments and municipal governments. The collaboration goals involve increased frequency and clarity of communication for the creation of more effective policy, improved public understanding of goals and efforts, and effective public engagement and transparency in decision-making.

“Actions”

The involved parties commit to several actions in the MOU, including a combined effort of 1,000,000 acres of forest treatment per year by 2025. This means each party is responsible for increasing its treatment of forested land to 500,000 acres within five years of the Agreement being signed. The parties also commit to collaborate on the creation of a 20-year project plan based on landscape analysis and risk assessment, which was to be drafted by 2021 and updated every five years. At the time of writing this report, the 20-year plan has been drafted and is examined in the subsequent section of the Precedent Study. It has been titled *California’s Wildfire and Forest Resilience Action Plan* and will need to be updated by 2026 as per the MOU. Progress on forest management is to be displayed on a publicly-available map that includes completed, ongoing and future projects. The involved parties are also required to consult with non-government organizations, including Indigenous governments, municipal governments and other stakeholders.

Two methods for wildfire mitigation are emphasized in the MOU. These are prescribed fire and forest thinning. In efforts to increase the use of prescribed fire, the involved parties are to bolster public awareness of the effectiveness and intentions to expand prescribed fire efforts. They are also expected to develop the toolkits necessary to support continued and expanding prescribed fire efforts. Sustainable timber harvest is a vital component of forest thinning, and the Shared Stewardship Agreement seeks to increase timber harvest within the state in a sustainable manner. Given that approximately seven billion board feet of lumber is purchased annually in California, but only two billion of those board feet come from the state, there is ample room for growth in California’s timber harvesting industry. As part of the forest thinning initiative, it is important for private landowners to be able to harvest timber effectively and efficiently on their land to sell. As such, the Agreement prioritizes streamlining permitting processes and supporting public-to-private harvesting partnerships.

Another prescribed action of the Agreement is to address communities in need of wildfire adaptation. Communities vulnerable to the impacts of wildfire must be identified and addressed based on assessed risk level. There are many variables indicating risk level, including likelihood of fire or smoke exposure, egress routes, car ownership rates and average age. The involved parties are to prioritize fire prevention and fire suppression capabilities in these communities.

3.2.2. California’s Wildfire and Forest Resilience Action Plan

The *Wildfire and Forest Resilience Action Plan* – hereafter cited as “the Plan” – was drafted by Gavin Newsom, the current governor of California at the time this report is being written and one of the signatories of the Shared Stewardship Agreement, and the government-commissioned Forest Management Task Force. The Action Plan was created in response to the *Agreement for Shared Stewardship of California’s Forest and Rangelands* and serves as the first draft of the 20-year project plan mandated by the Agreement, with an update due in 2026. The Plan acknowledges that wildfires are a great risk in the State of California, calling attention to the extreme fire season of 2020, which set a record for largest amount of area burned in a fire season, and subjected California to its first single fire to burn over one million acres (Cal Fire, 2022). This fire season led to large-scale evacuations, mass destruction of natural and build environments, and human exposure to smoke and other toxins. The Plan calls for bolder and

swifter action, acknowledging that measures must be taken to reduce the harm wildfires cause rather than to mitigate their existence altogether through reduction of carbon emissions and forest treatment measures, which alone are not enough to extinguish the heightened threat.

“Call to Action”

The Shared Stewardship Agreement exists to propagate the need for collaboration and communication between agencies tackling wildfire protection in California. That being the case, it is important to recognize the *Wildfire and Forest Resilience Action Plan*'s acknowledgement of and adherence to the Shared Stewardship Agreement, which can be found throughout the Plan document. In the “Call to Action” section, the Plan acknowledges the Shared Stewardship Agreement, highlighting the importance of its call for joint initiatives through federal, state, local and Indigenous governments as well as other stakeholders. The Plan prioritizes regional involvement with wildfire adaptation programs, as California's landscape varies significantly and universal policy with singular mandates from higher levels of government will not be effective in all areas of the state. While the Task Force has forest treatment goals in place, regional and local governments are expected to engage in community wildfire preparation, meaning adaptation measures take place at scales as small as individual homes and neighbourhoods. This further fosters the principle of correspondence and shared initiative, which is integral to reducing threats from wildfires, as described in the Shared Stewardship Agreement.

“Goal 1”

The Plan is divided into four main sections, each of which outlines a major goal and contains subsections with details on these goals. “Goal 1” is to “Increase the Pace and Scale of Forest Health Projects.” This section again refers to the Shared Stewardship Agreement and the State Forest Carbon Plan 2018, both of which indicate that state and federal agencies should each be treating 500,000 acres of forested area per year.

A significant challenge California faces in its forestry management is the result of its historical fire suppression initiatives, which have contributed to large-scale buildup of undergrowth and dry material serving as fuel for intense wildfires. This buildup can also provide

a ladder for fire to climb, resulting in tree canopy fires that typically kill even large trees, whereas ground fires would only scorch the trunks (US Forest Service, n.d.).

Forest management projects also require collaboration across levels of government and other stakeholder entities due to the division of land ownership.

Forest Lands Ownership in California

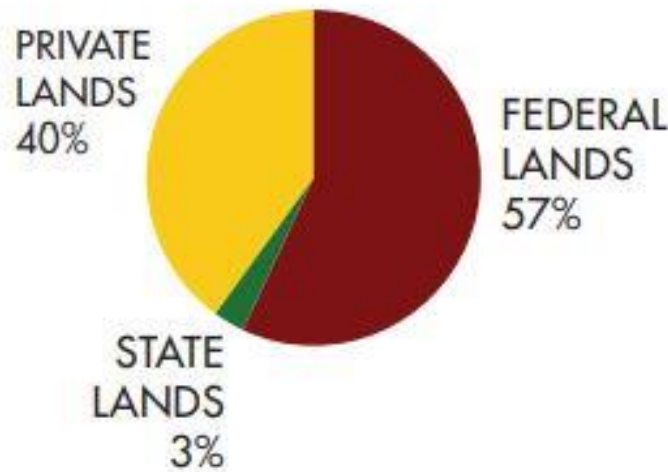


Figure 4 – Forest Lands Ownership in California (Government of California, 2021)

Figure 4 illustrates how little forested land in the state is owned by the State of California. With 97% of forested land being owned either federally or privately, the state’s primary objective in planning for forest resilience is commissioning action from those entities. The Plan acknowledges a significant increase in action from federal agencies, specifically in terms of fuel reduction and prescribed burning. This action is in alignment with the federal government’s commitment in the Shared Stewardship Agreement. Efforts are a combination of state and private operations on private land, and the state is committed to upholding its agreement to scale up its annual forested area management to 500,000 acres. The state will also increase incentives for private timber harvesting in an environmentally sustainable manner on private land to increase fuel reduction, as mandated by the Shared Stewardship Agreement. The California Forest Improvement Program (CFIP) is one initiative designed to help small private landowners access government funding to begin sustainable timber harvesting on their lands. The state is

limited in its funding for this type of incentive program, however, and intends to partner with other organizations in an effort to increase funding so this type of shared stewardship can prosper. The US Fire Service also seeks to create more agreements to facilitate shared stewardship of forest management with other stakeholder entities, such as local and Indigenous governments.

A regional approach to forest health and management projects is recommended by the Forest Carbon Plan. Regional collaborative efforts already exist in some areas, and the Plan provides guidelines for successful regional efforts. One of these guidelines, remaining faithful to collaboration goals, is to maintain alignment with state and federal goals while carrying out the needs of the region. It is also important for the state and federal governments to recognize and focus resources on unique requirements arising from region-specific risks.

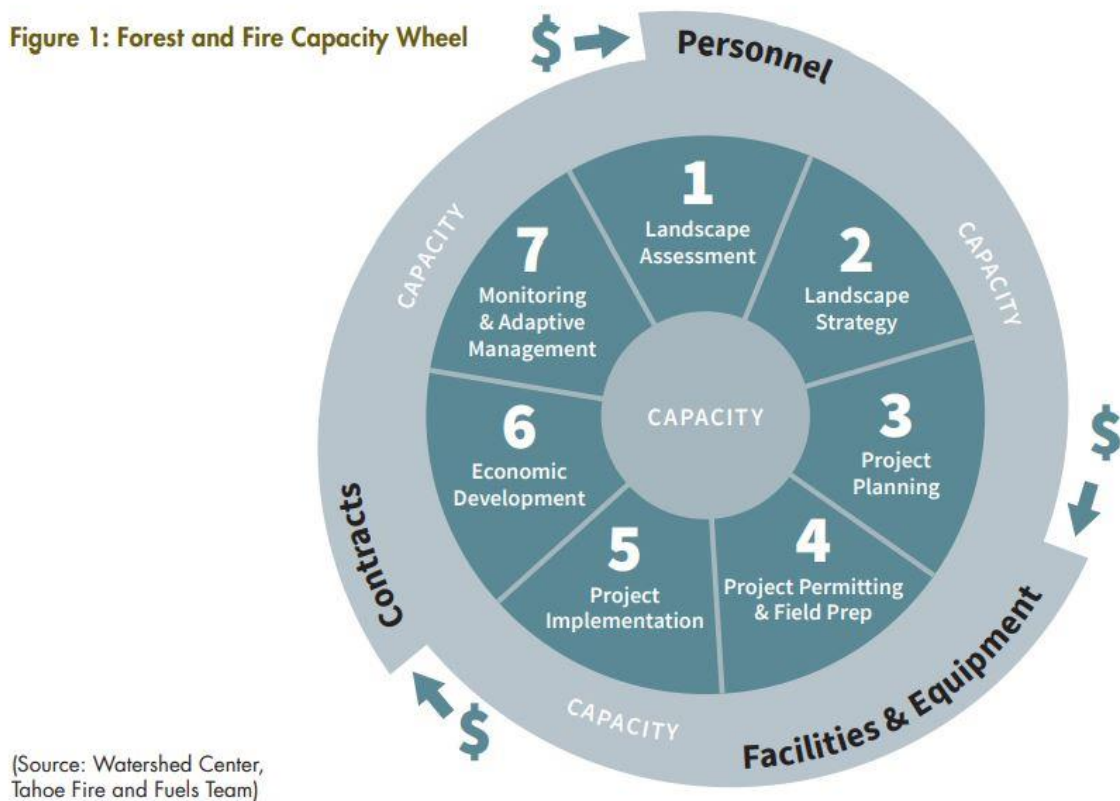


Figure 5 – Funding for Capacity in Fire Protection Efforts (Government of California, 2021)

Figure 5 illustrates the three points at which federal and state governments should inject funding in order to build capacity for the seven forestry and fire protection efforts within the wheel.

“Goal 2”

“Goal 2” is to “Strengthen Protection of Communities.” This section calls attention to the need to protect human life and property in communities using methodology other than forest management efforts, which may not be effective in all communities. This is especially true for communities not near forested areas that are subject to other types of wildfires.

One of the most important initiatives for “Goal 2” is adaptation planning. Adapting communities involves the state partnering with local organizations to carry out risk and vulnerability assessments, development of a best practices guide for communities creating local wildfire protection plans and development of specific criteria for space defence and home protection against wildfires to ensure efforts are consistent with state standards. Defensible space expansion is earmarked as an initiative for 2021 and is to involve Cal Fire and the Board of Forestry and Fire Protection collaborating on updating requirements for ember-resistant space around homes. Other initiatives for homes and private property as well as enforcement for new regulations for communities are meant to increase community protection and preparedness through a multi-level, multi-step process.

To protect against human health impacts from exposure to smoke, a coalition of local, state and federal agencies have created an information campaign called “Smoke Ready California.” The Plan earmarked its creation for 2021, ahead of wildfire season. The campaign is intended to inform Californians so they can be prepared for and protect themselves from smoke exposure.

“Goal 3”

Goal 3 is to “Manage Forests to Achieve the State’s Economic and Environmental Goals.” Recognition of and intention of meeting the goals of the state are apparent even in the section’s subheading. This further bolsters the credibility and seriousness of the government’s intentions to collaborate on efforts across governments and other agencies.

This section of the Plan describes the state’s intentions for tackling climate change. It deals little with adaptation for wildfire protection, but it is significant in that it further demonstrates an organized and collaborative approach to the tasks involved with forestry and wildfire management.

Governor Newsom signed an Executive Order in 2020 mandating the acceleration of climate change reduction measures across state agencies. The order establishes a deadline of February 1, 2022 for involved agencies to present strategies to the Governor as to how they can effectively reduce carbon emissions, which arrived late into the writing of this report. As a result of the order, the California Natural Resources Agency launched the California Biodiversity Collaborative as an initiative to protect the diversity of land and wildlife native to the state. The legislature has also been active in passing many bills pertaining to climate change and its effects on natural lands. These actions initiated by the Governor and adopted by state agencies are exemplary of the government’s commitment to a collaborative approach to all aspects of wildfire protection.

“Goal 4”

As it is with contemporary approaches to community planning, monitoring and evaluation is the last of four stages in the Wildfire and Forest Resilience Action Plan (Government of Canada, 2021). This goal incorporates keeping track of progress on the initiatives prescribed within the Plan, expanding research and reporting back on current situations to maintain transparency and accountability in this multi-agency collaboration.

Actions involved in this section include keeping tallies of total costs of uncontrolled wildfires as part of the research and data-gathering expansion, expanding grant programs as per priority needs and completing applied research plans. Also important to this section are prioritization and scenario planning tools, which are being developed and expanded by several of the state’s agencies. These tools will help with monitoring current conditions as well as forecasting the future of wildfires in the state.

At the time the Plan was released, local, state and federal governments, as well as private agencies were operating using their own data gathering and analysis techniques. The Plan emphasizes the importance of aligning these techniques into one uniform system to maintain coherence and consistent indicators and measurement tools, as well as to organize all data into one database.

3.2.3. Regional Correspondence: *Plumas County General Plan 2035*

Plumas County is approximately 65% public land maintained by the United States Forest Service. During the 2020 California wildfire season, the North Complex fire burned 318,935 acres of Plumas National Forest, much of which in Plumas County (National Wildfire Coordination Group, 2021). *General Plan 2035* is Plumas County’s current regional growth and development plan, with an update provided on a yearly basis via the Annual Report (Plumas County, n.d.).

Is the County General Plan concerned with wildfires? The word “wildfire” appears in the document 31 times.

Element 6 of the Plan is the “Public Health and Safety Element.” The risks of wildfire in the county are introduced at the forefront of the section before the initiatives responding to these risks are introduced. The heightened potential for intense and uncontrollable wildfires in the area is due to previous fire suppression efforts, terrain that is difficult to navigate, high winds and hot-burning vegetation. Landslides are another identified risk linked to wildfires, as the removal of vegetation greatly reduces the stability of the soil (Di Napoli et al, 2020). The Plan considers fire threat assessment data provided by the California Forestry and Fire Protection Agency, and acknowledges the county needs to plan for moderate-to-high wildfire risk.

Section 6.3 contains the county’s policies for wildfire protection. These policies align with many of the goals and actions of the *Wildfire and Forest Resilience Action Plan* and present strategies with strong statements committing to action in many cases. A good example of this is in Section 6.3.2.: “the county shall consult the current Fire Hazard Severity Zone Maps during review of all projects so that standards and mitigation measures appropriate to each hazard classification can be applied (General Plan 2035, 152). The statement begins with “the county

shall,” providing direct accountability and eliminating the conditional or uncertainty of terms such as “should” or “may.” It also indicates the exact resource the county will consult – the current Fire Hazard Severity Zone Maps – and that it will consult these maps for all project reviews, committing the county to uphold the standard each time. Some statements in the section are weaker, in that they include less deliberate language and descriptions, and referrals that are vaguer than the one outlined above. While a revision of these statements would be a strengthening exercise for the Plan, these statements still indicate a call to action and represent the county’s overall policy to protect its communities against wildfires it knows are likely using the specific strategies outlined in this section.

Element 1 of the Plan is the “Land Use Element,” which also defines measures for wildfire protection. This section refers to the county’s *Community Wildfire Safety Plan* as a guiding document for General Plan 2035.

As per Section 1.1.4, “Land Divisions,” developments outside of planning areas must feature structural fire protection. It would be more effective for this section to specify what structural fire protection entails; however, the Plumas County Fire Protection Plan discusses structural fire protection in greater detail under the “Mitigation Measures by Focus Area” section. Specifically, the Mitigation Measures section highlights roofing and defensible area surrounding the structure as the key elements of structural protection, and emphasizes the importance of education efforts targeted towards residents, realtors and people moving to the county. This is in line with Goal 2 of the *Wildfire and Forest Resilience Action Plan*, which calls for Cal Fire and the Board of Forestry to expand initiatives for defensible space around homes and other structural defensive measures in 2021. This is a prime example of three planning documents at both the state and regional levels working in tandem to create comprehensive, coherent wildfire protection strategies. It would be more effective for each document to clearly acknowledge the information in the other relevant documents, but ultimately it can be seen that *General Plan 2035* is in line with the *Plumas County Fire Protection Plan*, which is in line with the *Wildfire and Forest Resilience Action Plan*. Together, these plans present a collaborative strategy as is mandated by the Shared Stewardship Agreement.

Much of the work the precedent regions have completed, are completing or proposing is recent at the time of writing this report. This indicates understanding and acknowledgement of an urgent wildfire situation being experienced in these regions. As is discussed in Chapters 4 and 5, regions in Canada can learn from these precedents that governments need not wait until climate risks such as extreme wildfires reach a high level of urgency to take action to protect against them.

4. Findings and Analysis

Chapter 4 presents a synthesis of the information gathered in the literature review and precedent study. It is broken down into the major themes common between all components of the research and provides meaning and analysis on the data collected.

4.1. Immediate Action is Needed

As discussed by Glavovic and Smith, consensus is growing on the matter that simply continuing and even bolstering efforts to reduce greenhouse gas emissions in attempts to mitigate the effects of climate change is not the all-encompassing solution to the dangers and stresses it was once considered to be (Glavovic; Smith, 2014). Nearly 200 countries agreed to commit to achieving the goal of maintaining a global average temperature of no more than two degrees Celsius above levels of the pre-industrial era, with a preferred limit of 1.5 degree Celsius (UNFCCC, 2022). This agreement was made in 2015, but already individual countries are reaching the lower end of the temperature limit threshold. Australia experienced a record-breaking year in 2019, with temperatures 1.5 degrees above their 30-year average set between 1960 and 1990, which itself is already well into the industrial era (Kramer, 2020). The WMO are warning the world is on track to reach 1.5 degrees Celsius above pre-industrial levels and predict a 40% likelihood of it happening within the next five years (WMO, 2021). As Glavovic and Smith point out, significant climate change has already taken place, and its effects are cemented into weather patterns and extreme temperatures around the world. Continuing efforts to reduce the causes of climate change is only part of the battle. The other part is protecting human life, ecosystems and built environments from the stresses already present (Glavovic; Smith, 2014). The IPCC are also in agreement here, stating in the AR5 chapter “Adaptation Opportunities, Constraints and Limits” that greenhouse gas reduction should be complementary to adaptation strategies (IPCC, 2014). Clearly, action must come immediately with strong intent and deliberation to protect against the growing threats of climate change. This action should also adjust course to target adaptation rather than greenhouse gas emission reduction alone.

The IPCC is warning that many regions and communities around the world will need to adopt transformative measures to adapt to changing climate conditions rather than incremental ones (IPCC, 2014). This is indicative of the fact that many areas have not been able to or have

not made efforts to keep up with climate change and are now faced with stresses that cannot be ignored and are forcing them to accelerate and innovate with their responses. Glavovic and Smith allude to resistance to change in the form of institutional or cultural barriers. These represent the desire to cling to a “business as usual” or familiar and comfortable scenario (Glavovic; Smith, 2014). While people, and by extension governments and other institutions, may be resistant to change, climate change stresses and dangers are forcing change, and it is far more agreeable from a financial and loss perspective to adopt a proactive approach rather than a reactive one (CCA, 2022). This is especially true of the increasingly devastating wildfire situation experienced in several countries, including Canada.

The State of New South Wales, Australia has taken proactive measure to adapt to wildfires with its *New South Wales Rural Fires Act 1997*, but more prominently with its *Planning for Bush Fire Protection 2019* guidebook and policy document. PBP does not shy away from bringing the severity of NSW’s bush fire situation to light and highlighting the fact that severe wildfires are impacting the state now and so adaptation action is needed now (Government of NSW, 2019). The Illawarra Shoalhaven region also acknowledges the need for immediate action with its *Illawarra Shoalhaven Regional Plan 2041*. The action is reactive in nature, as the plan cites the devastating 2019-20 bush fire season as a primary indicator of the need for action, but the acknowledgement of the need and the immediacy is present (Government of Illawarra Shoalhaven, 2021).

The State of California, U.S.A.’s *Agreement for Shared Stewardship of California’s Forest and Rangelands 2020* is most certainly a call for immediate action. Since it is a joint venture between two parties, it serves as a manifestation of both the State of California and the United States federal government’s agreement that immediate action is necessary, and their commitments to carry out their respective roles in that action. The *Shared Stewardship Agreement* bolsters its argument for the need for immediate action with discussions of malpractices of the State’s past in terms of forestry maintenance and policy, which have contributed to the dire wildfire situations (Government of California, 2020). One element of the *Agreement* that holds member parties accountable for carrying out their respective duties in a timely manner is the establishment of timelines, such as the commitment to collectively manage 1,000,000 acres of forest by 2025.

In tandem with the *Shared Stewardship Agreement, California's Wildfire and Forest Resilience Action Plan* also acknowledges the need for and makes a strong commitment to immediate action. As it was created in response to the *Shared Stewardship Agreement*, the Plan exists largely to pledge adherence to the actions agreed upon, and further highlights the increasingly vast and destructive nature of wildfires in the State. Further correspondence comes from the *Plumas County General Plan 2035*, which again brings current and recent past wildfire events to light and cites them as evidence to the fact that immediate action is needed to protect against them.

In disseminating the literature and the precedents informing this report, a clear and concise conclusion can be formulated that immediate action is indeed needed to protect against the dangers to human life, ecosystems and built environments brought about by wildfires. This protection will come most effectively from adaptation strategies, which should be prioritized above greenhouse gas emission reduction strategies. Climate change is present and is affecting regions and communities in nations around the world. The time to face these effects is now.

4.2. Governments Need to Increase and Intensify Initiatives

Bowman et al's article on monitoring wildfires at a national level makes a clear case for governments needing to put in substantially more effort in creating coherent, efficient and successful responses to wildfires. The authors argue primarily for a more robust and coherent federal response to wildfires and the creation of a monitoring system at a national level, but the argument speaks to a wider spread issue of incomplete, incoherent and redundant data collected and stored by governments (Bowman et al, 2020). The IPCC indicate a degree of lethargy spawned from generalized data in their "Adaptation Needs and Options" chapter. When data on general risks of climate change with no specific prescribed actions is gathered and circulated, the overwhelming response is frequently knowledge, but not action (IPCC, 2014). This indicates the need for governments to curate strong, clear and deliberate data and action plans based on said data. Ensuring data is always up-to-date will ensure governments are not setting their climate benchmarks based on historical data, as is discussed in the CCA's *Building a Resilient Canada report* (CCA, 2022). Collaborative efforts from multiple levels of government and private entities is also vital to the success of strong responses to climate change stresses, which is discussed in detail in the next section.

In the AR5 chapter “Adaptation Opportunities, Constraints and Limits,” the IPCC cite disorganization in resource distribution as a major source of inefficiency and inability to adapt to climate stresses such as wildfires (IPCC, 2014). It is up to governments to prioritize the distribution of finite resources based on need and desired outcomes in order to limit the stagnation of adaptation efforts.

It is becoming clear that government mandates are needed to maintain accountability and ensure continued and progressive action is taking place, as per the CCA’s report (CCA, 2022). Mandates are plentiful in both the New South Wales and California contexts. The *New South Wales Rural Fires Act 1997* is full of prescribed actions and prohibitions that are legally enforceable in the name of protecting against the dangers of bush fires. Under the Act, designated hazard management officers can issue hazard reduction notices, requiring landowners to remove or reduce bush fire hazards. Noncompliance results in financially costly “penalty units” (Government of NSW, 1997). This type of mandate presents a very clear message and a very clear indication of what can be expected if applicable parties are not cooperative. California Governor Gavin Newsom’s mandates take a different approach and present regions throughout the State with the task of defining their respective climate responses by February 2022 (Government of California, 2021). While these mandates do not target private stakeholders, the government does have plans to facilitate forest thinning measures carried out by private entities for profit, as per the *Wildfire and Forest Resilience Action Plan* (Government of California, 2021).

The literature and precedents examined here present numerous opportunities for governments to do more, including Canada’s governments. The next section discusses an important strategy for developing comprehensive plans for adaptation, which will help governments carry out these proposed measures.

4.3. All Involved Entities Need to Work Collaboratively and Transparently

Perhaps the most important element to be derived from the literature and precedents is the fact that adaptation involves the collaboration of all stakeholders. This includes each level of government, private stakeholders and Indigenous governments. There is almost unanimous agreement on this point, as will be reiterated herein. Nearly every piece of literature examined stresses the importance of collaborative approaches to adaptation, to the point at which the

precedent study is somewhat repetitive. This only serves to bolster the point, however, that each entity involved in climate change adaptation planning has a key role in the combined efforts of the nation.

IPCC's AR5 indicates different levels of governments need to recognize their unique and vital roles in a successful climate change adaptation strategy. Higher levels will need to initiate strategies to align intergovernmental work and focus on the distribution of funds and resources based on prioritization of timeliness and quantities needed (IPCC, 2014). The most successful method with which to approach intergovernmental cooperation is a bottom-up and top-down approach. This methodology is discussed by much of the literature but described effectively and concisely by the CCA's report. Lower levels of government are experts on their own unique situations and should provide detailed information about their needs, while regional and federal governments can create plans to distribute funding and resources and can also use information gathered by lower levels as well as their own to create effective and just legislation (CCA, 2022).

As per Bowman et al, another benefit of intergovernmental collaboration is a coherent and efficient data gathering system. The article highlights the inefficiency of Australia's current bush fire monitoring system stemming from a disjointed conglomeration of fragmented data gathered using different methods around the country (Bowman et al, 2020). A single data collection and analysis method prescribed by the federal government and recognition and agreement to abide from lower levels would facilitate a smooth data gathering process, free of confusion and redundancy.

Private stakeholders also play a role in determining needs and carrying out their share of adaptation strategies. As discussed by the CCA report, businesses providing services relating to climate change risks can serve their own interests as well as those of the public by informing their customers and even requiring certain precautions be taken by their customers in the name of adaptation to those risks.

The *New South Wales Rural Fires Act* mandates the collaboration of different levels of government and private stakeholders in many instances, including the requirements of landowners to participate in the prevention of and protection against bush fires and the facilitation of local governments to enforce bush fire prevention laws (Government of NSW, 1997). The State also requires the recommendations of *Planning for Bush Fire Protection* be

considered in certain aspects of planning and development where bush fires are a heightened threat (Government of NSW, 2019).

California's *Shared Stewardship Act* is likely the most prominent piece of government recognition of the need for collaborative efforts in the face of increasing wildfire risks, as it is a direct call to action from both the federal and state governments. As a manifestation of the detailed commitments in which each entity agrees to participate, it highlights California's strong and clear goal of tackling the stresses and dangers of wildfires with an organized, coherent approach with clear responsibilities assigned to each member entity. To follow up on the Act, the *Wildfire and Forest Resilience Action Plan* presents further calls for collaborative action across various level of government and stakeholders. The document itself is the result of a collaborative effort between Governor Newsom and the commissioned Forest Management Task Force. As a series of recommendations and guiding principles for governments follow, it highlights the importance of initiatives such as allowing for private stakeholders to carry out adaptation methods such as thinning timber in forests to reduce wildfire fuel.

The literature stresses the need for intergovernmental collaboration frequently, and throughout the precedents taking place in NSW and California, it can be seen that regions around the world are making collaborative efforts to adapt to climate change stresses, such as increasing wildfires. The next section applies these lessons to the Canadian context of the Metro Vancouver Region.

4.4. In Summary

The three key findings derived from the research are that immediate action to adapt to wildfire risks is needed, governments need to adopt a more involved role in leading initiatives and all stakeholders, governmental and non-governmental need to work collaboratively and transparently. Increasing damages and losses linked to climate stresses, including extreme wildfires, are being experienced and are projected to worsen in the near future. The precedent regions examined in Chapter 3 have been scrambling to introduce adaptive measures in response to rapidly increasing wildfire stresses, and the literature reflects the need for all regions affected by wildfires to take immediate action towards adaptation. Governments should take a leadership position on adaptation planning to promote clarity and intentions on needs and opportunities, but governments must not act alone. Intergovernmental collaboration and non-governmental

stakeholder involvement must take place in order to achieve successful and efficient adaptation that encompasses all opportunities and fulfills all needs. Part of the process of adaptation involves determining acceptable damages and losses when resources do not meet needs. This step should only come after needs have been identified and deficiencies in adaptation measures have been depleted. There need not be wildfire damages and losses due to inefficient processes, avoidable delays and inappropriate prioritization of resources and initiatives.

5. Conclusion: What Does Planning for Wildfire Adaptation Look Like in British Columbia and the Metro Vancouver Region?

The Province of British Columbia has taken some similar steps to the States of California and New South Wales in protecting against losses and damages due to wildfires. The province regulates activity and policy related to wildfires in the *Wildfire Act 2004* – most recently updated in 2022 – which incorporates some regulations that run parallel to NSW’s *Rural Fires Act 1997*. BC also provides regular updates on fire conditions in real time visually on the BC Wildfire Dashboard (see *Figure 6*), as well as wildfire season summaries on the “Wildfire Service” section of the Government of British Columbia website. In examining the steps taken in BC at the provincial level, correspondence from regions and municipalities, and the Province’s legislation, it is apparent that the Province stands to benefit from increasing and enhancing its wildfire protection and adaptation strategies. This section provides three key opportunities for improvement in BC’s current approach to wildfire protection and adaptation planning. These include creating an official provincial wildfire protection plan, seeking to strengthen intergovernmental collaboration and bolstering its current wildfire legislation.

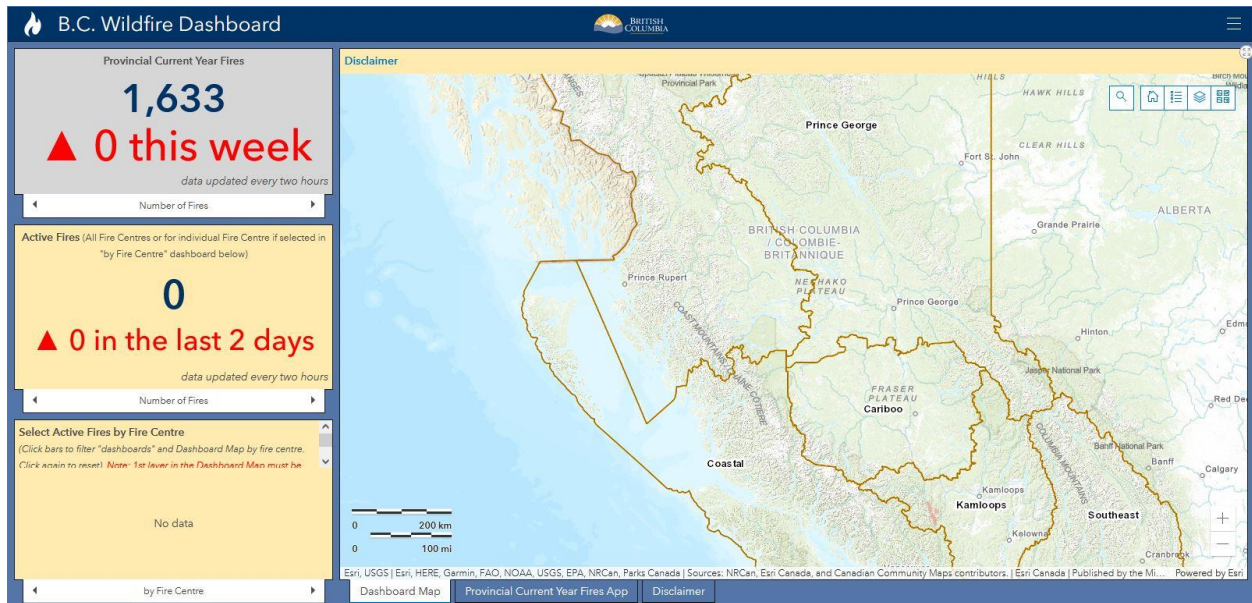


Figure 6 – BC Wildfire Dashboard Interface (Government of BC, 2022)

5.1. BC Should Create an Official Provincial Wildfire Protection Plan

Each of the examined precedent states has created a wildfire protection and adaptation plan. For New South Wales this is *Planning for Bush Fire Protection 2019*, and for California, the *Wildfire and Forest Resilience Action Plan*. Each of these documents is recent – although *PBP 2019* is an updated version of the 2001 document (Government of NSW, 2019) – and cites recent devastating wildfire events in its respective state as a contributing influence in its creation. Although these two documents are somewhat reactionary in nature, a provincial adaptation plan does not need to be so. Such a plan will likely take heed of recent events, however, as BC has experienced severe wildfire conditions in recent years, with an extremely difficult fire season having just taken place in 2021 (Government of BC, 2022).

Regardless of the influences for its creation and the tardiness of its arrival relative to the state of wildfire activity in the area, a provincial wildfire protection and adaptation plan will provide a clear and concise summary of the province’s goals to tackle wildfire risks. If drafted in a similar fashion to the precedent plans, the provincial plan will compile information that may currently be difficult to access, refer to law and industry best practices supported by research, and inform its readers using plain language, detailed explanations and visual aids so as to be accessible to a wide range of readers. In examining the “Ministerial Foreword” section of NSW’s *PBP 2019*, it is clear the planning document is intended to build upon lessons learned from previous fire events as well as research and industry best practices to inform members of the public and those involved with planning and building communities. *PBP* was created by the NSW Rural Fire Service – a government entity – and is intended to guide councils, planners, fire authorities and developers (Government of NSW, 2019). By the same token, *California’s Wildfire and Forest Resilience Action Plan* is also created by a government entity. In its “Executive Summary” section, the Plan clearly communicates the Forest Management Task Force’s objectives to restore the health of natural areas and improve community fire safety, and how they will be achieved. The Plan clearly states its purpose through the needs it will fulfill and the goals of the State it recognizes and is working toward realizing.

Both wildfire protection and adaptation plans represent their respective state’s intentions and compile these intentions in a clear, concise, plain-language document. Although the BC government provides ample information and recommendations on top of existing legislation

when it comes to wildfire risk mitigation, a comprehensive provincial plan with goals and methods clearly indicated would help to inform the public, private stakeholders, different levels of government and planners of the province's intentions.

An example of a potentially effective application of a provincial plan comes with the examination of the Government of BC website, which provides an information page on "FireSmart." FireSmart is an organization dedicated to providing information to reduce loss of life and property damage during wildfire events. The organization was acquired by the Canadian Interagency Forest Fire Centre in 2021, though the national FireSmart program was first proposed in 2008 (FireSmart Canada, 2022). Upon navigating to the webpage, the user is greeted with a general description of what FireSmart hopes to achieve, and two videos, one of which features a local fire chief performing a home inspection to determine its level of wildfire safety according to FireSmart criteria (Government of BC, 2022). Questions that arise when viewing this information are: how is information distributed to homeowners and other stakeholders regarding this type of building protection and inspection procedure? Who is in charge of facilitating home fire protection projects? When does the government expect homes to be "FireSmart?" A provincial plan could address these questions by indicating the province's relationship with and commitment to the national FireSmart organization, how it plans to inform, facilitate and regulate home improvement projects and at what point it expects homes in different regions to be in accordance with the FireSmart criteria. Communities and other levels of government would be able to access this information via the plan and use it to inform their own accountability. This type of information can be found under the "Goal 2: Strengthen Protection of Communities" section of *California's Wildfire and Forest Resilience Action Plan*. Here the plan indicates the State's intentions to partner with local entities to carry out risk assessments on homes and to develop a guide for best practices (Government of California, 2021). BC has the best practices guide in the form of the FireSmart criteria, and with a provincial plan for wildfire protection and adaptation, the Province could indicate local government or other entities' roles in disseminating the information and preparing homes to be more resilient to wildfire risks. The significance of this type of collaboration is further examined in the next section.

5.2. BC Should Seek to Strengthen Intergovernmental Collaboration

The precedents examined for this report (see Chapter 3) frequently refer to the importance of increasing collaborative efforts, as does the literature. The *Agreement for Shared Stewardship of California's Forest and Rangelands 2020* is a prime example of a call for the collaboration of multiple levels of government and provides rationales for why it is needed. The three primary objectives of the Shared Stewardship Agreement are to dismantle jurisdictional barriers to streamline projects, determine prioritization of projects and resource deployment and to ensure all available tools are being used (Government of California, 2020).

These objectives are universally beneficial and can be applied to BC's situation as well. As BC is already a member of the not-for-profit Canadian Interagency Forest Fire Centre and trains its own provincial Wildfire Service firefighters to the Centre's standards (Government of BC, n.d.), it may be beneficial for the Province to turn its attention to its relationships with local governments, both Indigenous and non-Indigenous. As expressed in the CCA's *Building a Resilient Canada* report, Indigenous communities are resourceful and knowledgeable in wildfire adaptation, especially when it comes to their own communities (CCA, 2022). A report on a devastating wildfire that burned in 2017 was drafted by the Secwepemcul'ecw Restoration and Stewardship Society, an Indigenous organization for land protection and regeneration. The report indicates that the Elephant Hill wildfire, which impacted several First Nations, could have been managed much more effectively if the provincial government had collaborated with Indigenous communities in their response (CBC, 2021). The *Shared Stewardship Agreement* objectives of dismantling jurisdictional barriers and ensuring the use of all disposable resources apply directly to this case. It would likely be beneficial for the Province of BC to examine its relationship with local communities, especially First Nations, and create agreements for shared stewardship with those communities in a proactive effort to ensure its wildfire adaptation efforts are considering all options and encompassing all knowledge and resources.

5.3. BC Has the Opportunity to Expand and Strengthen Its Wildfire Legislation

As the governing legislation over wildfire protection and adaptation issues in BC, the *Wildfire Act 2004* contains effective mandates, but could be strengthened using similar legislation from the *New South Wales Rural Fires Act 1997*.

The *Wildfire Act 2004* permits the minister responsible for the administration of the Act to take special actions in response to wildfires. These actions include establishing policies for use of resources, entry onto private property, restrictions on actions, requirements to vacate premises and assign temporary employees to act on behalf of the government in response to fire risks (Government of BC, 2022). Certain specifications may make operations run more smoothly, however, such as the inclusion of a wildfire danger period. NSW's *Rural Fires Act* designates a period of six months from October 1 to March 31 as the bush fire danger period, which informs the time period under which authorities are granted emergency powers (Government of NSW, 1997). Adopting a similar danger period into legislation may help to streamline the process of wildfire response, as actors may not need to receive permission to take emergency measures.

Secondly, the *Rural Fires Act* names the NSW Rural Fire Service and its commissioner, staff and volunteer firefighters as the official actors responsible in carrying out many of the measures described in the Act and identifies the State Emergency Operations Controller as the overseeing authority of this action (Government of NSW, 1997). In BC's *Wildfire Act*, work that may or will be carried out is mostly attributed to actors appointed by the minister, which of course must first be identified and appointed. After actors are appointed, the parameters of their duties and compensation must be determined, as per the Act (Government of BC, 2022). Specifically identifying a body of actors to carry out tasks when they are required may remove some of the extra steps involved with tailoring a response to wildfire risks and help streamline the process.

Finally, the *Rural Fires Act* is more specific than BC's *Wildfire Act* when it comes to the duties that may befall private entities during the bush fire danger period. The issuance of bush fire hazard reduction notices and subsequent requirements to carry out hazard reduction tasks is one such specific duty outlined in the *Rural Fires Act* (Government of NSW, 1997). The *Wildfire Act* indicates the minister may require private entities to perform tasks, but there is not significant specifics on what may be required of private actors (Government of BC, 2022). Punitive measures for violation of government requirements are also more specific in the NSW context. The *Rural Fires Act* specifies its system of penalty units, which carry a monetary value determined by inflation of currency, and are administered based on the type of private entity committing the offense – individual or corporation (Government of NSW, 1997). Conversely,

BC's *Wildfire Act* attributes fixed dollar values to offenses based on which sections of the Act they contravene (Government of BC, 2022). This means the monetary punitive measures outlined in the legislation are not flexible, and the Act would need to be amended each time they are to be adjusted.

More specific clauses and identification of actors and actions within *BC's Wildfire Act 2004* may help to reduce redundant procedures and streamline processes related to wildfire response and adaptation.

5.4. Regional Correspondence: Examining the Metro Vancouver Region's *Plan2040* and *Draft Plan2050*

Part of intergovernmental cooperation comes in the form of accountability from lower levels of government. Two regional plans were reviewed in the precedent study, each of which acknowledges the risks wildfires pose to their respective lands, and recent extreme wildfire events that warrant recognition and inform each document. It merits taking into account a tally of the words "wildfire" or "bush fire" within the documents as well as a point of reference for how often each document is concerning itself with the subject, and each of the *Illawarra Shoalhaven Regional Plan 2041* and *Plumas County General Plan 2035* provide numerous uses of the words.

Most importantly, given the general consensus within the literature and precedents that intergovernmental cooperation is of vital importance to wildfire and adaptation planning in general, is how regional plans acknowledge and correspond to goals of higher governance. Specifically, it is of interest for the regional plan to make mention of state or provincial goals, and communicate how the region will address these goals with detail and regional context. For the precedent cases in both New South Wales and California, the regional plans present information that is in direct alignment with the goals of the state plans for wildfire adaptation and protection. The *Illawarra Shoalhaven Regional Plan 2041*'s "Reduce Exposure to Natural Hazards" section specifically references New South Wales's *Planning for Bush Fire Protection 2019* document and explains where and how the Illawarra Shoalhaven Region will be using its guidance in the planning process (Government of NSW, 2021). While the *Plumas County General Plan 2035* does not make specific reference to *California's Wildfire and Forest Resilience Action Plan*, it does provide its own goals that are directly in line with the *Action*

Plan, which can be seen when the documents are cross referenced (Government of California, 2021). This is the kind of correspondence from a lower level of government not only helps construct the bottom-up collection and transference of information recommended by the IPCC (IPCC, 2014), but it also helps accomplish some of the goals outlined in the *Building a Resilient Canada* report, such as using synergistic strategies and reducing redundancy and overlap in adaptation efforts (CCA, 2022).

Encompassing 21 municipalities, one electoral area and a First Nation, the Metro Vancouver Region is home to approximately 2.7 million of British Columbia's 5.2 million people and is the largest regional district in the province by population (Government of BC, n.d.) (Government of BC, 2022). The Region is also home to 24 regional parks and four greenways, comprising roughly 14,500 hectares of natural landscape (Government of BC, 2022). The region is in need of strong planning initiatives to protect its people and ecosystems from the risks of wildfire, including the immediate danger of fire itself – especially in forested park areas – and dangers from poor air quality due to wildfire smoke.

The Regional Parks division outlines steps to prevent wildfire and mitigate its risks on the “Wildfire Preparedness and Response” page of the Metro Vancouver website. Steps involve monitoring conditions, increasing patrols and implementing restrictions when conditions are favourable for fires, and other measures (Government of BC, 2022). While these measures may prove effective against the risks of wildfire in the short term, comprehensive adaptation planning involves strong proactive measures, as described in the *Building a Resilient Canada Report* (CCA, 2022). This being the case, the Region should publish its goals for adaptation to the risks of wildfire in its regional plan.

Two regional plans for the Metro Vancouver Region are examined for this report. The Region adopted *Metro2040* in 2011, and released *Metro2050* in draft form in 2021 for public consultation. As such, *Metro2050* was not yet adopted at the time this report was written, and so is only examined in draft form. *Metro2040* is used alongside *Metro2050* for the purposes of comparing and contrasting the two documents to gauge progress.

A search for the word “wildfire” in *Metro2040* returns no matches. The word “interface fire” does appear three times within the document, of which all three instances can be found in the “Goal 3: Protect the Environment and Respond to Climate Change Impacts” section

(Government of BC, 2011). This section details the region’s valuable natural environment, how it must be protected, and natural hazards that threaten its integrity and ecosystems, such as floods, earthquakes and interface fires (Government of BC, 2011). In section 3.4, the plan indicates it will work with the federal, provincial and local governments to consider impacts from climate change, including interface fires, when planning developments and encourage regional context statements that include policy and strategy to minimize natural hazard risks. The section also mentions efforts to consider best practices when it comes to climate change adaptation in land use planning (Government of BC, 2011).

A search for the word “wildfire” in *Metro2050* reveals four results, and a further result for “fire,” which is again in the context of “interface fire.” The first two instances of “wildfire” are in the “Introduction to the Region” section and serve as the part of the plan’s acknowledgement of Metro Vancouver’s wildfire risk, as the region contains many forested areas. The plan also acknowledges that the vulnerability is augmented by the stresses brought about by climate change, namely warmer temperatures and extended drought periods (Government of BC, 2021). Section 3.4 of this document largely mirrors that of *Metro2040* in addressing natural hazards and providing solutions to mitigate the associated risks. While this version of the regional plan has more on the subject of climate change and the importance of adaptation, the document is still plagued by a degree of vagueness. For example, the document states, “Metro Vancouver will... support the integration of emergency management, utility planning, and climate change adaptation principles in land use plans, transportation plans, and growth management policies” (Government of BC, 2021. 65). What are these principles and how does the region intend to support their integration? What does the region consider to be climate change adaptation principles? *Illawarra Shoalhaven Regional Plan 2041* describes the specific goal of reducing dangers to humans as a result of bush fires by considering proximities of new development areas to high-risk bush fire areas in the “Build Resilient Places and Communities” section (Government of NSW, 2021). This is an example of a specific adaptation method. Further, *Plan 2041* directs its reader to the state’s *Planning for Bush Fire Protection 2019* document as further evidence to its commitment to adaptation planning and the state’s larger goals.

Lastly, it is important for the Metro Vancouver region to consider poor air quality as a potential hazard to human health resulting from fires burning nearly anywhere in the province as well as within the region. An article published by the CBC highlights the opinions of two medical experts who believe wildfire season should be treated similarly to flu season, as flu season is characterized by a certain period of the year in which influenza is more likely to infect people and spread through populations (CBC, 2021). Wildfires are largely seasonal as well and can become difficult to contain when conditions are conducive to spreading (CBC, 2021). Therefore, planning and preparing for the dangers inherent to large wildfires, such as smoke-filled air is key to avoiding the worst shocks and stresses to personal health (CBC, 2021). The Metro Vancouver Region is concerned with air quality, as it is cited as one of one the primary variables regulated by regional efforts on the regional website (Government of BC, 2022). The site also features a dedicated page to air quality as it relates to wildfire smoke and how to prepare for times of poor air quality.

Air quality improvement and regulation goals in the *Metro 2050* plan focus largely on transportation and greenhouse gas emission reduction targets, however, Section 3 offers information on air quality in relation to climate change, most notably the Region's commitment to implement the *Metro Vancouver Clean Air Plan* (Government of BC, 2022). The *Clean Air Plan*, created in 2021, is the region's guide for air quality and greenhouse gas initiatives. The *Clean Air Plan's* initiatives include prioritizing the development of better ventilation and insulation in buildings to protect against smoke, creating shelters for vulnerable members of the public to seek refuge from smoke and the creation of more information to help guide the public during times of poor air quality due to wildfire smoke (Government of BC, 2021). While this resource provides pertinent information on important efforts, correspondence between the plans could be clearer, and efforts could include more specificity to inform readers as to how certain goals will be achieved. The *Clean Air Plan* cites the region's intentions to create "resources to help residents and businesses manage indoor air quality" beginning in 2022-2023 (Government of BC, 2021. 54). What will these resources entail? Do they need to be created from scratch or could they be derived from precedents? For example, Vardoulakis et al determine that occupying space in the centre of the home with access points sealed as much as possible during periods of intense wildfire smoke in the air is a viable solution, especially for people for whom relocation to a shelter is difficult. Determining when to open doors and windows to circulate air and to go

outside for physical activity demands research into what periods of the day the smoke is least prominent. For Sydney, Australia, Vardoulakis et al cite late evening around midnight as the best time to recirculate the air in homes. Information and resources have already been created on the subject of reasonable and accessible strategies for adapting to air quality issues due to wildfire smoke. Perhaps the Metro Vancouver Region needs to conduct more research into determining what is best given the specific conditions of the region. If this is the case, the Region's goals would be clearer and provide a better sense of collaboration if *Metro 2050* were to reference the *Clean Air Plan* more clearly and specifically, and if the *Clean Air Plan* were to provide more detail as to the Region's approaches to the goals outlined in the plan.

There are many ways the Metro Vancouver Region can bolster its collaboration with other governments, strengthen its research and goal setting, and increase transparency. Such efforts will involve better communication of specifics through the regional plan, and on a larger scale, adherence to and collaboration with other plans, including the *Clean Air Plan* and any provincial plans. The creation of a provincial wildfire protection and adaptation plan would be an effective top-down approach to creating and maintaining accountability and clearly communicating provincial and federal goals.

5.5. Moving Forward: Suggestions for Future Research

Naturally, a significant limitation of this report is the continual arrival of new information. The report was drafted in fall 2021 and winter 2022, preceding the release of the IPCC's AR6 and the Metro Vancouver Region's Plan 2050 in non-draft form by months. Information in these documents, especially the new IPCC report, could present findings affecting the relevance and accuracy of findings presented here. It is vital to the discourse of climate adaptation planning that reports of this nature continue to be produced, encompassing current data and understanding to inform best practices.

Continuing research into wildfire adaptation for metro regions could focus on the difference in needs between urban centres and peripheral areas. For example, structures in the City of Vancouver will not need to be prepared for defensibility against immediate encounters with wildfires as peripheral municipalities of the Metro Region such as North Vancouver or Coquitlam will need to. The City of Vancouver will, however, need to address the issue of poor air quality due to wildfire smoke and the inherent adverse effects on human health. Research on

the City of Vancouver's approach to adaptation to the presence of smoke could use the work of authors such as Vardoulakis et al as a starting point to determine needs and strategies. The research could then expand to determine behavioural patterns of smoke relative to wind and humidity conditions to inform a strategic plan that outlines when to remain indoors and when it is best to go outdoors and circulate air in structures. Future research could also determine where the best locations for air quality shelters are, and how zoning and development plans within municipalities could facilitate or be amended to facilitate these shelters.

Finally, a significant area of study for future research should be the issue of insurance in areas of increasing risk of loss due to wildfire. Will private or public insurance agencies be willing and able to insure property in a future in which extreme and record-breaking wildfires are a regular occurrence? How will the insurance industry need to change, or how will approaches to property ownership need to change to address elevated risks and frequency of losses due to wildfires?

5.6. Final Word and Continuing the Discourse

The literature and precedents examined in this report provide strong evidence that immediate action must be taken to protect against severe damage and losses to human life, ecosystems and built environments. Such action must come in the form of adaptation with a strong focus on specific regional and municipal needs and must involve government collaboration across all levels – not only between government entities but with non-governmental stakeholders as well.

This report encompasses a sample of the information, understanding and recommendations of experts and governments available at the time it is written, but the discourse must continue. Just as the needs of regions across Canada are various in nature and continually evolving, so is the knowledge and best practices surrounding climate change and its effects on catastrophic wildfires. Adaptation involves constant evaluation and re-evaluation, meaning the work of this report is never done.

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