




Building a better understanding of bushfire risk consultation

Extracts from bushfire
inquiries reports



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Building a better understanding of bushfire risk – a summary background paper to inform submissions

Introduction

This document summarises publicly available content relevant for this consultation *Building a better understanding of bushfire risk* and should be read with the understanding that it contains extracts from three reports relevant to the bushfire inquiries following the 2019-20 bushfire season.

The intent of this summary document is to support stakeholder submissions to the Department of Environment, Land, Water and Planning (DELWP) regarding the consultation. Extracts are taken from the reports listed below. If you feel you would like further information or that the summary does not meet your needs, you can find the full reports in the links provided.

There are many projects underway in DELWP and other Victorian government departments and agencies to deliver against the recommendations of the reports. This work will present additional opportunities to participate in the coming months.

Victorian Auditor-General's Office (VAGO): Reducing Bushfire Risks October 2020, Independent assurance report to Parliament 2020-21:4

https://www.audit.vic.gov.au/sites/default/files/2020-10/20201014-Reducing-Bushfire-report_0.pdf

Inspector General Emergency Management (IGEM)
Inquiry into the 2019-20 Victorian fire season – Phase 1 report

<https://files.igem.vic.gov.au/2021-03/Inquiry%20into%20the%202019%2020%20Victorian%20Fire%20Season.pdf>

Government Response to the Review of 10 years of reform of the emergency management sector and Inquiry into the 2019-20 Victorian fire season - Phase 1 report

<https://www.emv.vic.gov.au/publications/gov-response-igem-review-10years-reform-and-2019-20-inquiry-phase1>

IGEM recommended their report should be read in conjunction with an additional report, the Review of 10 years of reform of the emergency management sector, however no extracts are contained in this summary.

<https://files.igem.vic.gov.au/2021-03/Review%20of%2010%20years%20of%20reform%20in%20Victorias%20emergency%20management%20sector.pdf>

Guiding questions

In your submission we would like to understand your views around the following aspects:

1. How we can improve community understanding around bushfire risk and fuel management.
2. In developing a whole of sector bushfire strategy, what are the areas of bushfire management that should be considered and prioritised?
3. How should fire agencies be responding to, mitigating, and adapting to climate change?
4. What you consider to be a realistically achievable percentage for bushfire risk reduction through fuel management and your reasoning for it?

Victorian Auditor-General's Office: Reducing Bushfire Risks October 2020

Independent assurance report to Parliament 2020-21:4

Audit snapshot

Are responsible agencies effectively working together to reduce Victoria's bushfire risk?

Why is audit important?

As the devastating 2019–20 bushfire season showed, all Victorians are at risk from bushfires.

The consequences include the loss of lives, homes, businesses and community infrastructure.

Other adverse consequences can include the negative health impacts from smoke exposure, financial hardship and harm to mental health. Victoria's bushfires also damage the state's natural environment and can reduce its biodiversity.

Almost all scientists agree that climate change increases the likelihood of weather extremes, which will influence the frequency and severity of bushfires. It is important that our strategies to reduce and manage bushfire risks are well-designed, efficiently deployed and continuously monitored and improved.

Who we examined

- Department of Environment, Land, Water and Planning (DELWP)
- Parks Victoria
- Country Fire Authority (CFA)
- Emergency Management Victoria
- City of Whittlesea
- East Gippsland Shire Council
- Murrindindi Shire Council
- Energy Safe Victoria

What we examined

To answer our audit objective we examined:

- how DELWP informed the government's planned burn target and developed its risk-reduction strategies to protect human life, property and the environment
- how agencies deliver risk-reduction strategies
- how Victoria's land-use planning system supports risk reduction
- the Powerline Bushfire Safety Program.

We did not examine frontline bushfire response or emergency management.

What we concluded

The audited agencies, particularly DELWP and CFA, are collaborating to reduce the risks that bushfires pose to life, property and the environment, and do so with strong commitment.

However, there is insufficient information available to understand the effectiveness and impacts of their risk-reduction activities.

Current modelling limitations and lack of reporting on non-burn and private land-based risk-reduction activities:

- inhibits continuous improvement
- limits community understanding of performance in reducing risk
- constrains DELWP and government's ability to make better informed investment decisions to further reduce risk.

Reducing risk across the state also requires a stronger focus on, and allocation of resources to, treating private land, to complement that applied to public land.

What we found and recommend

We consulted with the audited agencies and considered their views when reaching our conclusions. The agencies' full responses are [available in the full report].

Victoria is one of the most bushfire-prone areas in the world. The state's extreme weather events are becoming more frequent and intense, which is leading to more severe bushfires that burn more land. The recent 2019–20 bushfire season had a devastating impact on human life, wildlife, flora and infrastructure, and adversely affected Victoria's economy.

It is not possible to eliminate the threat of bushfires. However, the government plays a key role in reducing the risks they pose to people, property and the environment.

Fuel management forms a major part of the DELWP's bushfire risk management strategy. Fuel management reduces the intensity of fires and makes them easier for firefighters to control. Fuel management treatments include planned burning, where agencies such as DELWP and the CFA set controlled fires at times of the year when bushfire risk is low; and non-burn treatments, such as grass slashing and using herbicides.

DELWP has also developed land-use planning controls to reduce bushfire risk. These controls restrict people from building in high-risk areas and set safety standards for buildings and properties.

Since 2011, the government has also aimed to reduce the risk of powerlines starting bushfires through its Powerline Bushfire Safety Program (PBSP). This program stemmed from the 2009 Victorian Bushfires Royal Commission's (Victorian Royal Commission) recommendations.

In 2015, the government released its Safer Together: A new approach to reducing the risk of bushfire in Victoria (Safer Together) policy in response to the Victorian Royal Commission and a 2015 Inspector-General for Emergency Management (IGEM) report. Safer Together aims to bring responsible agencies together to improve bushfire preparedness and reduce risks across private and public land.

On 1 July 2020, Fire Rescue Victoria (FRV) was established to bring career firefighters from the Metropolitan Fire Brigade and CFA together. FRV will play a key role in supporting CFA and DELWP to manage bushfire risk.

DELWP and other agencies involved in Safer Together aim to reduce the state's bushfire risk to or below 70 per cent of what it would be without risk-reduction treatments. They refer to this as the statewide residual risk target. DELWP also has a Budget Paper 3 (BP3) measure, 'to reduce statewide residual risk to 70 per cent or less'. DELWP calculates bushfire risk by modelling the number of houses that would be destroyed in extreme fire conditions and uses this also as a proxy for modelling the risk to human life.

Findings

Measuring DELWP's performance in reducing bushfire risk

Victoria's current residual risk level meets the government's target.

However, reporting against DELWP's BP3 measure to reduce statewide residual risk to 70 per cent or less does not give government agencies, government or the public a complete understanding of the impact of DELWP's fuel management activities on public land.

This is because:

- DELWP's non-burn treatments are excluded from this reporting
- the reported result reflects the combined impact of DELWP's planned burn activities together with fuel reduction caused by bushfires, which is not attributable to DELWP.
- The reported result is also generated from a computer modelling tool. This means that some limitations are present that may affect the result, such as the parameters used in the modelling and the currency of underlying datasets.

DELWP has only recently undertaken work to enable it to distinguish the effect of its planned burns from the effect of bushfire. DELWP agrees that its future reporting should include information about the differential contribution of its fuel management strategies, compared to bushfires, to achieving its BP3 target and other risk-reduction outcomes.

The government's Safer Together policy commits to holistically measuring the impact of burn and non-burn risk treatments across public and private land by the end of 2020. DELWP and its partner agencies are not on track to meet this commitment.

While DELWP has some projects underway to work towards this, it has now been five years since IGEM first recommended this approach. DELWP advised us that it will develop the capability to measure the impact of both burn and non-burn treatments by late 2021.

Limitations of Phoenix RapidFire and its inputs

DELWP used Phoenix RapidFire, which is the primary modelling tool used by all eastern Australian fire agencies, to advise government on the target for the statewide residual bushfire risk measure. DELWP also uses Phoenix RapidFire to calculate its performance against its BP3 target. While there is no perfect tool to model bushfire risk, Phoenix RapidFire has several limitations that impact the residual risk target and DELWP's performance reporting against it.

DELWP's use of Phoenix RapidFire has been reviewed and endorsed by independent experts. However, some of the datasets and models that inform the tool's simulations have limitations including examples where data should be more up-to-date, and where models would benefit from academic validation and peer review.

For example, DELWP completes limited fuel hazard assessments after planned burns and bushfires. This reduces its ability to validate how quickly fuel re-accumulates to hazardous levels and incorporate this information in its modelling. DELWP's modelling also relies on a range of assumptions that likely impact the results, including the application of a single extreme fire scenario.

Fuel hazard assessments determine how the structure of different vegetation types change after they are burned. These assessments can range from simple and rapid visual assessments to highly detailed measurements.

Extreme fire conditions are associated with the majority of historical fire-related deaths and modelling them is consistent with the 2012 Code of Practice for Bushfire Management on Public Land (the Code), which requires DELWP to give priority to human life. However, research shows that as fire intensity increases, the broad effects of planned burning decreases.

It is likely that planned burns contribute to risk reduction most in lower intensity fires and to a lesser degree in high-intensity fires. Additionally, DELWP has not systematically or comprehensively verified the effectiveness of Phoenix RapidFire's predictions against real fire events.

DELWP has publicly acknowledged the limitations of its risk modelling and has a range of projects underway to address many of these issues. It has also committed to exploring alternative modelling tools in the future. Given how central Phoenix RapidFire is to understanding bushfire risk and assessing DELWP's performance in addressing it, continuous improvement of the tool warrants significant investment of effort.

Determining the statewide residual risk target

DELWP modelled seven different scenarios in Phoenix RapidFire to inform its recommendation to government about adopting the 70 per cent residual risk target. It compared these scenarios against a hypothetical scenario where all vegetation across Victoria has grown to its maximum risk level, which represents a risk level of 100 per cent.

Some of the seven scenarios maximised the number of hectares treated, while others maximised risk reduction, which was measured by the number of houses that planned burning would save during the modelled bushfire. These scenarios also considered constraints such as DELWP's existing resourcing levels, as well as operational feasibility and different ecosystems' tolerance to fire.

Scenarios that prioritised risk reduction outperformed those that prioritised hectares burned. Four of the risk-based scenarios intersected at a point that indicated that DELWP could achieve a 30 per cent reduction in risk across the state by investing \$50 million per year, which was DELWP's 2015 funding level for planned burn activity. These scenarios also matched good operational feasibility scores, indicating that DELWP would need to treat between 200 000 to 275 000 hectares each year to achieve the modelled risk reduction.

DELWP used this modelling to recommend 70 per cent residual risk as the target to government. However, DELWP's advice to government could have been more complete. It did not communicate that the modelling showed that with further investment, greater risk reduction could be achieved. Its advice also did not explain the limitations of the modelling tool and what level of risk reduction could be achieved with only one year of funding, as the modelling tool shows cumulative results achieved over many years.

Regional risk targets

In 2016, DELWP set risk targets for its regions that, if achieved, contribute to meeting the 70 per cent statewide target.

DELWP bases its regional targets on:

- the level of bushfire risk within each region based on its modelling
- each region's ability to deliver planned burns (some areas have less land that can be burned).

DELWP's approach to setting the regional targets did not consider some of the key factors that determine a region's risk level, such as how often they experience high-risk weather conditions, common ignition types and their current fuel loads.

Additionally, these targets are static. While DELWP altered them in June 2019 to reflect administrative changes to regional boundaries, it has not reconsidered the targets based on changes to its regions' risk levels since 2016.

DELWP advised that the targets are intended to be long-term, noting that regional bushfire risk levels are relatively stable because many of the contributing factors, such as population, fuel type and general climate, change gradually. However, fuel loads can change more quickly, resulting in significant changes to the risk profile in a particular region, which may mean the risk target warrants periodic reconsideration.

Planning to address risk

DELWP and CFA document their planned fuel management activities in their three-year joint fuel management plan. This demonstrates an improvement in inter-agency engagement and planning, which is consistent with Safer Together's aim to manage bushfire risk across public and private land.

However, DELWP has far greater resources and sophistication in the tools available to it to assess risk on public land, compared to the tools and resources available to CFA and councils to assess risk on private land. In addition, DELWP also uses inconsistent approaches across its regions to identify potential areas for future treatment on private land.

The comparative lack of focus on risks present on private land is evident in the joint fuel management plan.

This is seen in the comparatively limited number of planned treatments on private land compared with public land. This creates a gap in understanding risk across the state, and may mean that risk-reduction efforts are not always directed to the areas of highest need.

Safer Together notes that 'no single strategy or action alone can manage bushfire risk. We must develop a multifaceted approach, using all the activities available to us'. However, DELWP's current statewide strategic planning focuses on planned burning and to a far lesser extent on non-burn treatments to reduce bushfire risk.

In the absence of a holistic approach, options may be missed that could reduce bushfire risk in areas, or at times, where planned burning is more difficult or not possible. As bushfire seasons extend and windows for planned burning reduce, there is a greater need to strategically plan alternate fuel-reduction methods.

DELWP and CFA also do not consider the cost-effectiveness of fuel management treatments and other risk-reduction activities in their strategic planning, largely due to a lack of data collection to enable this. By not using cost as an input in its decision-making, agencies may not be optimising their resources.

[The Audit Context chapter within the full VAGO report provides essential background information about how DELWP defines bushfire risk and fuel management approaches.]

Recommendations (relevant to this consultation)

DELWP in partnership with CFA and FRV develops, implements and publicly reports on a holistic suite of performance metrics to demonstrate:

- the impact that planned burning has on public and private land on bushfire risk
- the impact that non-burn fuel management activities have on public and private land on bushfire risk
- the impact that its activities at local and regional levels have on bushfire risk

Government response (In scope for this consultation)

DELWP will commission a comprehensive review of fuel management targets in response to Recommendation 9 of the Inspector General for Emergency Management's (IGEM) Inquiry into the 2019-20 Victorian Fire Season. This will occur in consultation with partner agencies and communities, including CFA and FRV.

This work will be closely aligned with work to expand DELWP's Monitoring, Evaluation and Reporting Framework to incorporate all public and private land, in response to Recommendation 8 of IGEM's report.

This will include:

- Development of a holistic suite of performance metrics and targets for fuel management on public and private land
- Publishing regional risk targets and exploring the application of smaller scale risk targets.

This work will provide information about bushfire risk at the appropriate regional and local level to support community-based risk understanding.

Inspector General Emergency Management (IGEM)

Inquiry into the 2019-20 Victorian fire season Phase – 1 report and the government response.

4.5 Fuel management in preparation for the 2019-20 fire season

Treatments to reduce fuel in the landscape can reduce bushfire risk for several years depending on the vegetation type, climate and topography of a region. As such, the Inquiry has considered several years of fuel management activities, with a focus on practices leading into the 2019–20 fire season. This period coincides with the implementation of several of the major changes in fuel management policy such as Safer Together.

4.5.1 Objectives of the 2019-20 fire season

Forest Fire Management Victoria (FFMVic) seasonal objectives

The DELWP Chief Fire Officer released the 2019 Autumn Directive as the first Joint Fuel Management Delivery Directive representing a shift towards a multi-agency approach to delivery of the fuel management program.

It identifies the following priorities for delivery:

- reducing risk to Victorian communities, priority assets and critical infrastructure, and ecosystem health and resilience
- deliver the fuel management program across the broader landscape to achieve 70 percent residual risk target key performance indicator
- delivery of 205,000 ha in 2018–19 (spring and autumn) in the area identified to deliver risk reduction outcomes.

The directive indicates that non-burn fuel treatments are an important component of the overall fuel management program and arrangements should be established to reallocate resources to non-burn treatments if conditions are unsuitable for burning, particularly where good risk reduction and/or community outcomes can be achieved.

The 2019–20 Spring Fuel Management Delivery Directive issued in October identified the following priorities for delivery:

- 225,000 ha of treated land to progress all program objectives including ecological resilience, Traditional Owner and landscape fuel reduction and contribute to maintaining a residual risk level at or below 70 percent
- address risks associated with a changing climate by adapting to all available burn windows across all seasons to reduce future bushfire intensity and risk, including large scale mosaic burns in late Autumn and Winter periods
- mechanical works on fuel breaks close to communities
- address challenges of burn control posed by spring and summer weather conditions by:
 - targeting small discrete areas (or discrete sections of burns) that can be undertaken in one or two days
 - achieving high coverage and removal of fuels to minimise unburnt patches within the burns or having good access and control lines
 - burns being made secure before fire danger spikes and
 - where these principles cannot be met, putting in place appropriate risk mitigation (increased resourcing, patrol, equipment, contingency arrangements) and testing assumptions around fuel conditions and availability.

The focus of the two directives reflect the different weather conditions in spring and autumn, with the autumn directive clearly focusing on hazard reduction burning and the spring directive more focused on being adaptable to the weather and climate to look for opportunities.

The fuel management directives demonstrate a shift over the last five years in seasonal priorities for fuel management. These include:

- changes in the language used from planned burning to fuel management reflecting the focus on nonburn fuel treatments as an important part of the program
- shifting from being mostly operationally focused to incorporating the strategic risk reduction objectives and directing fuel management to focus on achieving these objectives
- changing from being a DELWP/public land directive to a Joint Fuel Management Directive issued from both the DELWP and CFA Chief Fire Officers.

In Municipal Fire Management Plan (MFMP), many of the objectives associated with fuel management are associated with a reduction of risk or improvement in community safety. There is limited evidence to suggest that private land managers develop measurable fuel management objectives as part of the MFMPs or otherwise.

Finding 4.12

Land managers and fire agencies with fuel management roles do not develop consistent fuel management objectives for private and public land and progress towards achievement of the objectives cannot be objectively measured. The 70 per cent residual risk target is currently only applied to public land.

4.5.2 How risk is calculated and assessed?

The concept of risk is fundamental to Victoria's current fuel management program. The statewide residual risk target for fuel management requires land managers to reduce the risk of bushfires in the landscape. Currently the residual risk target in Victoria for public land is 70 per cent – meaning that land managers must observe that natural fire and deliberate fuel management strategies have reduced bushfire risk to people and property by 30 per cent.

The current residual risk target means that even with a successful program of fuel management, there will be 70 per cent bushfire risk remaining in the landscape. The remaining risk (the 'residual risk') must then be managed through strategies other than fuel management on public land.³¹⁵

The target is based on reducing risk compared to the maximum possible risk: that is the bushfire risk if interventions such as fuel management did not occur, and fuels in the landscape were set to their highest possible risk values.

While currently there is no target for residual risk on private land, efforts to increase joint, cross-tenure activities are occurring with land managers and fire agencies to a variable degree.

Victoria's Safer Together policy articulates a risk-based approach as a fundamental tenet of fuel management. It describes how fuel management activities are prioritised against risk reduction outcomes, which in turn promote more effective mechanisms for identifying and treating areas of highest risk. This process also quantifies the outcomes from fuel reduction activities (fuel management and bushfires), expressed as the 'residual risk' figure, which is reported and made available to the public.

[315] Department of Environment, Land, Water & Planning. Measuring Bushfire Risk in Victoria, Melbourne, 2015.

By measuring, quantifying, treating, evaluating and reporting risk, Safer Together aims to improve the effectiveness of fuel management treatments to reduce the risk from bushfires. Safer Together⁴²

The implementation of risk-based planning required a significant investment in specialist capabilities including modelling, engagement and monitoring, evaluation and reporting. It also requires models, tools, and some freedom to support innovation.

To address the risk-based approach, DELWP applies the Phoenix RapidFire system to integrate bushfire modelling and analysis to quantify bushfire risk. DELWP also uses Phoenix RapidFire to model the consequence of bushfire in relation to local government address points where it assumes premises are constructed. It combines several models and data inputs addressing fuel, weather, topography and climate to predict where fires will start and spread, and the effect on assets under different scenarios.

Phoenix RapidFire can also model the effect of fuel management strategies to predict the influence of hazard reduction burns in the landscape and how effective they will be in reducing the effect of fires on priority assets. DELWP is then able to model how risk has changed historically, how it is projected to change as a result of future burning on public land, and how it will change without fuel reduction through bushfire and hazard reduction burning.

The development of Phoenix RapidFire provides an advanced capability to model bushfire risk. However, there are some limitations that prevent its application across all tenures. The system cannot model the effects of small areas of fuel reduction including roadsides. Land managers of roadside reserves (for example DoT, councils and DELWP) cannot accurately measure risk in these areas to guide risk-based planning and monitor risk reduction.

Currently only hazard reduction burning is considered in the risk modelling and other fuel management strategies have not been included in the risk-based target.

Further, weather inputs are based on a 'worst case' scenario (catastrophic weather conditions and prolonged drought) and do not consider the risk reduction outcomes under less severe weather. The system can only model single day events. It cannot model the risk posed by multi-day bushfires (campaign fires) and these are explicitly excluded from the current analysis.

Phoenix RapidFire models consequence based on the effect to built assets as per the Victorian address points, which is seen as a proxy to loss of human life. It assesses the effects on built assets with ecological effects assessed through the planning process. However, the system does not consider the consequences of fire to a wider range of assets, industries and environments such as critical infrastructure and economic activities related to agriculture, farming, and forestry.

A criticism from some members of the community throughout the Inquiry is that DELWP does not engage enough to understand how assets in the landscape are used and how this should inform prioritisation. For example, the submission received from the Victorian Farmers Federation identifies that agricultural land should be considered in the same way as residential assets as this land sustains life. Fires can significantly reduce farmers' ability to earn an income through the loss of fodder, livestock and machinery. High intensity fires can destroy kilometres of fencing and impact the soil chemistry, and therefore the agricultural production. These impacts can have long-term impacts on productivity and are important considerations for calculating risk.

For some industries and communities, there is an appetite for greater access to the data and assumptions underpinning the model and for this to be communicated in peer-reviewed literature. There is a level of distrust in the process with some submissions referring to Phoenix RapidFire as a 'black box' and noting the need for validation by external expert bodies.

[42] Harrieville Community Forum Inc. Harrieville Community Emergency Management Plan, 2014.

The full details of residual risk modelling and assumptions [should] be released to the public. It is also recommended that a truly independent panel of bushfire research scientists, with strong practical and theoretical understanding of bushfire behaviour and fire ecology, be appointed to review the validity of the outputs from the Bushfire Residual Risk model. South East Timber Association Submission

The 'residual risk' concept is also controversial because it has never been fully explained in a published research paper outlining the assumptions and thinking that underpins it ... The 'residual risk' rating also does not consider risks to other values such as economic assets in forestry and agriculture, social and critical infrastructure, or cultural and biodiversity values. The Institute of Foresters of Australia and Australian Forest Growers' Submission

In 2014 DELWP reconvened the Expert Panel from the Royal Commission, a group of scientists and practitioners that gave evidence at the 2009 VBRC about fire behaviour, forest fires and ecology.³¹⁶ The reconvened Expert Panel verified the current risk-based approach and the use of Phoenix RapidFire. DELWP acknowledge there is opportunity to establish a regular, systematic external review process by appropriate expert bodies.

In 2019 DELWP began the Risk 2.0 project to improve the data and models that underpin risk modelling and the calculations of bushfire risk. Part of this work includes research to quantify the effects on nonburn fuel treatments. This recognises that mechanical treatments cannot currently be included in the risk reduction calculations but are one way to increase the window of opportunity for fuel management. Without their inclusion, the reported residual risk is not accurate and the effectiveness of the investment in non-burn fuel treatment cannot be quantified.

Observation 4.2

Research and trials have commenced to strengthen the modelling capabilities of Phoenix RapidFire to include a number of variables that currently limit its application to all types of fuel management and accuracy in modelling overall risk reduction. This is valuable work that will strengthen land managers' and fire agencies' ability to accurately predict the effect of fuel management treatment on bushfire risk. The resultant product and methods for the calculation of risk should be continuously monitored and evaluated to ensure greater uptake across the sector and greater transparency in the process.

Finding 4.13

The calculation of residual risk is currently limited as the model used to calculate risk and risk reduction does not consider areas treated by mechanical means, roadsides and small parcels of land and is based on assumptions that consider housing assets only, the worst case weather scenario and excludes multi-day events.

[316] Teague, B., McLeod, R. & Pascoe, S. 2009 Victorian Bushfires Royal Commission Final Report Volume 2: Chapter 1 - Victoria's Bushfire Safety Policy, Parliament of Victoria. Melbourne, Australia, 2010.

4.5.3 Fuel management in preparation for the 2019-20 fire season

In order to ignite hazard reduction burns (and other planned burns), a significant amount of planning and risk assessment is conducted to ensure personnel and community safety during and after the treatment. FFMVic, CFA and other organisations each adhere to their own strategic planning and operational risk assessment processes for hazard reduction burns.

Within FFMVic there is a consistency in the approach to planning, risk assessment, reporting and monitoring for its public land activities. Other land managers use a variety of tools and processes to assess risk, such as assessments made in Municipal Fire Management Plans (MFMPs) that guide the process for councils.

IGEM analysed a range of data sources to assess fuel management activities across the state, much of it publicly available in DELWP's annual reports, and annual fuel management reports. IGEM also sought data from CFA, government departments and authorities with fuel management responsibilities, and selected councils.

Forest Fire Management Victoria (FFMVic)

FFMVic's planning for fuel management assesses community and land values with strategies in place to minimise or mitigate the effects of hazard reduction burns on air quality, ecological values, cultural values, and the aesthetics of the landscape. This is part of the Joint Fuel Management Plan (JFMP) process which is reconsidered locally and closer to the planned treatment time for specific fuel treatment plans. The community is invited to participate in the planning processes.

The JFMP maps and schedules set out where fuel management activities are planned to occur within the three-year period, assuming weather and other conditions are appropriate to conduct the burns. If a burn is not conducted within the identified period, it is rolled over into the subsequent year(s). Likewise, if a burn is only partially achieved – as measured against the objectives of the burn – only the successfully treated area is recorded and reported, and the burn will roll-over into the subsequent year(s) until its full objectives are met.

FFMVic is required to undertake rigorous checks when planning works to ensure fuel management is not having a detrimental effect on the protected values described in the Fuel Management Manual. These assessments are a critical part of the planning process and FFMVic has a structured approach not consistently adopted by other land managers and fire agencies. Specialists in biodiversity and cultural heritage typically review nominations proposed for the JFMP, to assess any effects of operational fuel management activity on biodiversity or cultural values. The specialists will propose standard mitigation options to reduce the impact of fuel management operations.

DELWP has the option to engage external specialists to address such issues. It recently used funding from the Reducing Bushfire Risk initiative to support Registered Aboriginal Parties to conduct more extensive Indigenous cultural heritage values assessments on works being delivered under this program. There is potential to engage Traditional Owner Groups to a greater extent to conduct value checks and cultural heritage assessments. This approach would support self-determination of Traditional Owners but requires appropriate government resourcing.

Using a specialist that sits outside the operational planning team provides a level of independence to the values assessments. However, resourcing these values assessments compromises business-as-usual requirements and can cause delays in the planning process, or limit fuel management activities. Likewise, values assessors have their own work demands to meet other legislative requirements and government commitments and must balance multiple land values that may involve conflicting priorities.

Finding 4.14

Forest Fire Management Victoria performs structured values assessments to ensure fuel management does not have a detrimental effect on protected values.

Ahead of conducting hazard reduction burns, FFMVic personnel work to prepare a site for burning. Data for the previous five seasons demonstrates that FFMVic prepared an area exceeding what it was then able to treat. This gives FFMVic alternative sites to ignite, if conditions at one site are more favourable than at another.

All planning documentation is very clear that burns should not proceed if conditions fall outside of the planned parameters. The burn plan may include contingency arrangements should conditions differ slightly to what was planned. If conditions are not favourable for the burn itself or the dispersion of smoke, the burn controller may decide to cancel the burn. Depending on weather and the forecast, this may occur in the week leading up to the burn, or on the day itself.

Immediately ahead of a hazard reduction burn ignition, a series of rigorous risk assessments are performed to ensure the weather, moisture and fuel conditions fall within the planned parameters. The risk assessment is conducted at the operational level using the Planned Burn Risk Assessment Tool, in place since 2016. This tool identifies a range of risks at the operational and tactical levels, and the mitigation measures required to address these risks. This process has multiple layers of approval depending on the level of risk.

The planning process is extensive and to date has required a minimum of two years to complete all the steps. Community and relevant land management stakeholders commented that they are not suitably engaged enough in DELWP's planning process.

Interviews with DELWP staff confirm difficulty in meaningfully engaging with all parties due to time and resourcing constraints. There is also a highly variable level of interest among community and stakeholders to participate in planning discussions in a timely and structured manner. However, DELWP and Parks Victoria believe that involvement of community and stakeholders is key to the planning process, and have ongoing projects to reach a broader range of community views.

To compensate for the difficulty and time required to successfully implement its hazard reduction burn program, FFMVic also worked on other strategies including ecological fuel management strategies and suppression strategies. The modelling system developed for the strategic suppression work is being used by DELWP to model the optimal distribution of work centres and pre-positioning of resources across the state.

FFMVic undertook a range of fuel management activities in the lead up to the 2019–20 Victorian fire season including planned burning and mechanical fuel management treatments.

Hazard reduction burning was the most widespread treatment. Over the four years leading into the 2019–20 fire season, approximately 68 to 82 per cent of burns conducted were for hazard reduction objectives.

FFMVic has met the fuel management program target of keeping residual risk below 70 per cent for the past three years. This is calculated based on Phoenix RapidFire assessments of the bushfire risk in a worst-case scenario for public land, and the change caused by hazard reduction burns on public land.

DELWP implemented a burn costing tool in 2019–20. When it applied this same calculation methodology retrospectively, FFMVic has increased its level of expenditure for fuel management on public land by approximately 12 per cent since 2015–16.

Mechanical treatments applied by FFMVic and fuel management done on private land are not included in the assessment of residual risk. The proportion of mechanical treatments in relation to hazard reduction burns is low.

Since 2016–17 and the introduction of the risk-based approach for fuel management, there has been a reduction in the amount of the fuel management program completed (planned area treated). The actual area of treated land compared to the area planned has decreased. Adverse weather conditions and longer fire seasons were significant factors that affected this outcome. However, FFMVic successfully conducted hazard reduction burns in areas that achieved greater amounts of bushfire risk reduction.

Land managers no longer apply hectare-based performance targets following the adoption of the 70 per cent residual risk target. However, prior to the introduction of the risk-based approach for fuel management, FFMVic did not consistently treat the planned number of hectares, with the five-year treatment average being 85 per cent of what was planned. DELWP and its partner agencies only exceeded their target in the 2012–13 financial year.

Despite the achievement of the residual risk target, the reduction in hectares treated compared to the amount of hectares included in fuel management plans, may explain some of the community frustration: regardless of the achievement of the risk reduction, the community in many areas would have expected to see larger areas of land treated by planned burns.

Finding 4.15

Forest Fire Management Victoria has achieved its residual risk target of 70 per cent for three consecutive years resulting in bushfire risk reduction on public land that aligns with the objectives set in the statewide fuel management program.

Country Fire Authority

The implementation of Safer Together has increased CFA's ability to obtain funding for the preparation and delivery of hazard reduction burns, and consequently has increased the number of hazard reduction burns prepared by Vegetation Management Teams composed of 13 Vegetation Management Officers (VMO).

The VMOs are currently located across the state and lead the strategic and tactical planning of CFA burns. They are supported by a statewide team of five technical specialists who conduct the risk assessment and values checking processes for heritage and biodiversity.³¹⁷

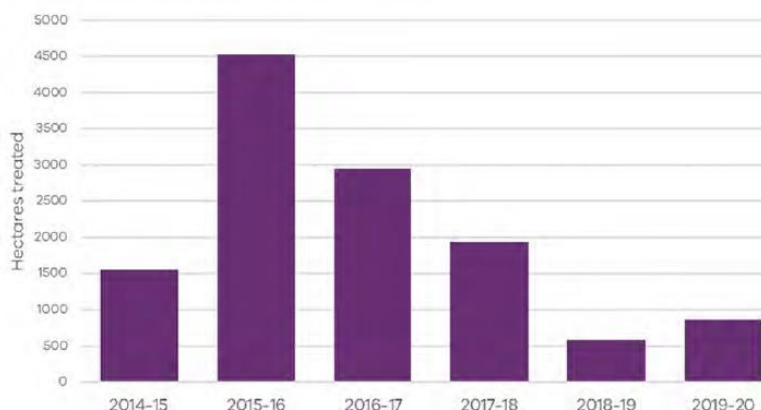
In the lead up to the 2019–20 fire season CFA included several of its planned fuel management treatments on private land in the JFMP. However, CFA did not fully implement planned treatments and applied them inconsistently. Its processes are not yet fully aligned with the strategic planning encouraged through the JMFP and broader Safer Together program. CFA has acknowledged it can significantly improve its ability to undertake risk-based planning for fuel management activities through better alignment of operational activities with strategic plans.

CFA uses the Burn Risk Complexity rating, which assesses burns according to a level of complexity and assigns a numerical value. Type 1 burns are lowest risk and type 3 the highest. Risk mitigation measures are planned commensurate with the complexity rating. Additionally, the level of approval is determined according to the rating.

[317] Country Fire Authority. CFA Board discussion paper - planned burning in Victoria, Melbourne, 2019.

Across Victoria CFA undertook a combination of hazard reduction burning, spraying and mechanical mulching and slashing activities in the lead up to the 2019–20 Victorian fire season. Figure 18 (p 168) provides a summary of the activities, noting a decrease in the level of activity in the lead up to the 2019–20 fire season.

Figure 18: Area treated by all fuel management activities by CFA.



Although CFA has linked operational plans to strategic outcomes via the JFMP process, the allocation of its fuel management activities in the JFMP are not based on a consistently applied risk-based approach. The final decisions and applications of fuel management treatments are often based on the availability of the brigade to conduct the burn; its ability to conduct the burn; and whether the brigade believes there is value in performing requested burns.

On many occasions these decisions were occurring in a decentralised manner and without the timely involvement of CFA's VMOs which limits the implementation of a strategic risk-based approach across its regions.

CFA does not require individual brigades to report in a way that allows the proportion of each fuel management treatment type to be determined. A submission to the Inquiry highlighted that the reporting mechanisms are not compulsory or prescriptive in the information reported. This position is supported by the comments that:

[CFA] burn plans do contain a page which is a report of sorts, although in 11 years I've only ever had one completed and returned to me. It is left up to the Vegetation Management Officer to go out to the burn, if they're notified, and collect any information on what was achieved. On-going monitoring usually doesn't happen as we simply do not have time. Stakeholder

Department of Transport (DoT)

DoT's Regional Roads Victoria align operational plans with strategic goals via the VicRoads Roadside Management Strategy, the Roadside Bushfire Risk Assessment Guideline, and Risk Mapping Methodology. Regional Roads Victoria developed these in response to the VBRC recommendation for a statewide program of bushfire risk assessment for all its roads to ensure conformity with obligations under the CFA Act.

In line with this strategy, Regional Roads Victoria identifies the management of fire risk as one of four key objectives. In some cases, the management of roadside vegetation plays a role in Victoria's Integrated Fire Management Planning process. The guidelines are used to map and assess the likelihood of ignitions in the road corridor and fire spread beyond the road reserve. It is also used to assess the consequence of fire on the road reserve, and the consequence of fire spread beyond the road reserve.

Regional Roads Victoria undertakes annual fuel management activities that sit within a governance framework supported by strategy and guidelines. Its processes are governed by MFMCs that seek to apply an integrated and risk-based approach to fire management planning and the overall fuel management program.

There is an inconsistent application of planning and treatment across and within the regions, and no common processes for monitoring, evaluating and reporting. There is limited evidence demonstrating that Regional Roads Victoria is strongly engaged with the Safer Together policy and the state's strategic bushfire management planning process.

Regional Roads Victoria provided the Inquiry with a range of planning documents that set out its program for the preceding years across its regions. This included:

- slashing - full width for defined strategic firebreak roads
- slashing – three metres from roadside edge
- hazard reduction burning – undertaken on its behalf by CFA
- overhanging tree maintenance
- targeted weed spraying
- dangerous tree removal
- ploughing.

Under a newly formed DoT, Regional Roads Victoria has identified several opportunities to improve the fuel management approach taken in relation to planning and reporting. Fuel management was discussed in the department's regional after-action reviews of the season with a need for a more targeted and strategic mowing program identified in one region.

VicTrack

VicTrack is a state-owned organisation that owns the state's transport assets including rail buildings, signalling infrastructure, track and telecommunications network. It also undertakes an annual fuel management works program that largely includes 'on-track' herbicide spraying. VicTrack is not engaged with the Safer Together policy and the strategic bushfire management planning process.

VicTrack's operational work program references the Integrated Fire Management Planning process, however, the Inquiry was unable to ascertain if VicTrack actively participated in this process and if so, how this directed operational works.

VicTrack undertakes additional works in adjacent rail reserve zones subject to environmental and physical restrictions. These include:

- slashing
- rubbish/fuel hazard removal
- herbicide treatment
- controlled burns.

In the evidence provided it was not possible to determine the level of activity that took place in the lead up to the 2019–20 fire season.

Councils

The Inquiry focused on councils affected by the 2019–20 fires appreciating the range of fuel management needs across all 79 municipalities. Councils predominantly employ roadside slashing as the means to manage fuel. However, they also issue fire prevention notices to private landowners as part of their annual works programs, generally resulting in the reduction of fuel. At least one council in the season's fire-affected areas issued roadsides grazing permits to assist with fuel reduction.

Under the CFA Act, councils seek to use the services of CFA brigades to conduct hazard reduction burns within the municipality. Likewise, many councils engage contractors to complete mechanical treatments, and simply contract the amount and location of hectares requiring treatment.

Councils prepare fire management plans within the governance of Regional and Municipal Fire Management Planning Committees. There is a move to adopt risk-based fire management planning in council, as evidenced in the following MFMP:

The purpose of this Integrated Fire Management Plan is to chart the planned and coordinated implementation of measures designed to minimize the occurrence and mitigate the effect of bushfire (and grassfire), structural fires, and chemical fires in the community. This East Gippsland Fire Management Plan (FMP) is risk based and has been developed using the principles outlined in the Integrated Fire Management Planning (IFMP) Framework and Guide.

East Gippsland Shire Council Fire Management Plan 2017–20

The link between operational plans with strategic goals is created in the Bushfire Fuel Management Guide for the Protection of Townships and Settlements. One council in the fire-affected area described several examples where it had used the guide to shape part of the work of MFMCs, Regional Strategic Fire Management Planning Committees and sub-committees. This resulted in a planned, systematic and collaborative approach that achieved practical fire prevention outcomes. Further, the same council highlighted that use of these planning structures and committees are integral to successful integrated fire management planning, including fuel management. As discussed previously, there is limited evidence to demonstrate that councils are collectively engaged with the Safer Together program and the strategic bushfire management planning process. Several councils received project funding through Safer Together, and most of these projects relate to community-based planning. Some councils rely on their community feeding into the process through their local CFA brigade who in turn may raise the issue with the MFMC.

Councils generally indicated they complete their program of slashing but do not undertake any process to confirm hectares treated, and do not formally report this. In a 2019 assessment of target maturity, 43 per cent of councils with road authority indicated they were below target in maintaining a safe and efficient network of roads (including roadside vegetation management), with the remainder meeting or exceeding their targets. Councils reported that any issues with planning or treatment are raised with the MEMPC. This committee can escalate critical fuel management issues to the Regional Emergency Management Planning Committee, but there was no evidence of this occurring for the fire-affected areas.

Bushfire and forestry

In November 2019 the government announced an immediate end to logging in old growth native forests and the phased cessation of native forest logging by 2030.

There is a long-established philosophical divide within the Victorian community over timber harvesting in native forests, driven in part by ideology but also history. The tension lies between the view that the forests, their timber and other attributes are resources to be managed, harvested and sold, and an alternative vision that the public estate should be conserved, protected and managed to preserve habitat and biodiversity for use in more passive ways, such as tourism. The two approaches – while arguably not mutually exclusive – have been played out in political, policy, economic and community forums for decades. The struggle for primacy between managed forestry and conservation has played out both within the bureaucracy and across the wider community ever since. Meanwhile, an increasingly efficient industry has developed around timber harvesting which is economically important to several Victorian communities.

The Inquiry heard from community members and stakeholders who believe bushfire management and forest management is inherently linked, and that VicForests personnel and forestry contractors play a crucial role in bushfire preparedness, response and recovery activities. One view is that modernised RFAs support DELWP

to develop new Forest Management Plans that integrate forest and bushfire management through active management strategies. Fuel management is intended to be a core component of these plans.

The forestry industry and its role in Victoria has been widely debated in public forums and it is not the role of the Inquiry to engage this debate. The industry does, however, provide support to fire agencies and fuel management before, but especially during and after bushfires.

DELWP noted that VicForests provides a core workforce and specialist equipment that it has come to rely upon for fuel management, road and track maintenance, and during clean-up after major bushfires. This has also made forests safer and easier to access for all Victorians – themes identified from the RFA engagement process. Much of FFMVic's road and track maintenance funding comes from haulage fees from VicForests, which will be lost as native timber harvesting ceases.

Submissions from stakeholders and community members suggested that the knowledge and skills developed by forest industry workers provides them with a unique and local perspective on how to actively and sustainably manage forests, promote ecological sustainability and reduce the risk of bushfires. Several stakeholders noted that there is a risk of a decline in forest science knowledge, skills and applied practice, which will have a significant effect on the future management of forests, fuel and bushfires.

Loggers and foresters, we are passionate people born and bred in the bush, we are brought to tears when wildlife and regeneration gets burned.

Community member

Some stakeholders raised concerns that the progressive reduction in native timber harvesting will lead to:

- a loss of experienced people who are able to operate machinery in steep, rough country which is critical to fire suppression tactics
- a loss of specialised heavy equipment as the demand will be reduced and many smaller operators will not be able to afford to maintain their equipment to the high standard required for firefighting and fuel management operations
- a loss of local knowledge as many small communities are sustained by the timber industry but people will potentially need to move to larger towns to find work.

There are calls from some in the community to enact the new major events clause in the RFAs and bring native timber harvesting to an end sooner than the planned 2030 deadline due to the devastation caused by the bushfires. However, DELWP recognises the role of VicForests in fuel management and response and is currently undertaking work to understand the capacity that will be lost through the cessation of native timber harvesting and assessing strategies to ensure the capability and capacity (including fit for purpose equipment) is not lost.

Observation 4.3

The timber industry provides an important support capacity to fire management in Victorian forests with a skill set, knowledge base and operational experience in forest landscapes. The cessation of native forest harvesting by 2030 poses challenges for the fuel management program and bushfire response capacity across the state. Planning currently being undertaken by the Department of Environment, Land, Water and Planning should be supported and continued to ensure the skills, knowledge and equipment of the industry remain accessible to land managers and fire agencies.

4.5.4 Barriers to fuel management in the lead up to the 2019-20 fire season

Land managers and fire agencies must contend with multiple barriers and considerations that extend the planning process of fuel management treatments and can delay planned fuel treatments with a limited opportunity to reschedule or adopt planned contingencies.

Hazard reduction burning is a dangerous activity, and the safety requirements that are inherent steps in the planning and conduct of burns can result in delays where conditions are not conducive to a safe burn.

Safety concerns are typically a product of the weather, terrain, vegetation and climate and while every effort is made to mitigate safety risks, the weather on the day of the burn may make it untenable at the last minute.

In order to improve the safety of personnel conducting a hazard reduction burn, vegetation or dangerous trees may be removed as part of the preparation activities ahead of ignition. There was negative community feedback around the removal of dangerous trees as they have an important role in the habitat and ecology.

While guidance is in place to minimise delays and to reduce the unnecessary removal of trees, personnel safety is an overriding requirement for hazard reduction burns to occur. Values checks and planning considerations occur to ensure the removal of trees and impacts to other vegetation are minimised and mitigated as much as possible.

For hazard reduction burns, weather is a key barrier that can cause last minute delays and cancellations of a burn. The weather can influence the fire behaviour, fuel moisture content and smoke dispersion – all of which need to be considered ahead of ignition.

The annual FFMVic Fuel Management Reports provide some general insights into the weather conditions in the past years that have hindered efforts to complete the hazard reduction burning program. Table 14 summarises the weather characteristics of the years leading into the 2019–20 fire season.

Table 14. Summary of weather limitations and fuel treatment conducted by FFMVic.

| YEAR | WEATHER LIMITATIONS SUMMARY | BURNS CONDUCTED / RESIDUAL RISK ACHIEVED |
|---------|---|--|
| 2015–16 | Early start to fire season Very dry summer, extended into autumn Wet April Favourable May in Western Vic | |
| 2016–17 | Overall, less than normal suitable fuel moisture and weather Wet spring Late dry fire season | Achieved 70 per cent residual risk target 23 (late Feb-March) 240 (late March - mid April) 50 (may) |
| 2017–18 | Very dry autumn Late fire danger The season characterised as challenging, limited, and interspersed with high fire risk periods | Achieved 70 per cent residual risk target |
| 2018–19 | Very dry autumn Late fire danger and fire activity Extended planned burning season | Achieved 70 per cent residual risk target |

CFA evidence also suggests that the very dry conditions in Gippsland throughout 2019 made the implementation of the fuel management program very challenging. Likewise, Regional Roads Victoria and East Gippsland Shire Council described the challenges associated with the dry conditions in Gippsland in 2019 in completing the roadside slashing program. Evidence provided highlighted how the early onset of bushfires meant that public land managers were unable to complete the program.

Observation 4.4

Land managers and fire agencies have been inhibited in their delivery of the planned burning element of their fuel management programs due to unfavourable weather over recent years. Despite achieving the residual risk target, there is a marked reduction in planned hectares treated since its implementation.

Several land and fire management organisations discussed the issues associated with resources and how that affected their delivery of the fuel management program.

The Inquiry received evidence and commentary demonstrating the resourcing constraints faced by FFMVic and CFA. The Councils and Emergencies Capacity and Capability Evaluation Report by Local Government Victoria identifies that councils face similar capacity issues when resourcing fuel management across their municipality. Regional Roads Victoria also indicated a resourcing pressure due to the number of priorities it has as a land manager and provider of road infrastructure across Victoria.

FFMVic has a strong reliance on project firefighters who provide additional capacity during the peak fire season but are often ending their tenure when autumn burning season is peaking. FFMVic can extend the contracts if required but it is not the same as having a year-round workforce that it can deploy to preparation works during periods unsuitable for conducting burns or undertaking non-burning methods of fuel reduction such as slashing and mulching throughout the year.

Several submissions received throughout the Inquiry expressed concerns that FFMVic had not recruited a sufficient number of seasonal firefighters ahead of the fire season and that this had reduced its ability to conduct spring fuel management activities. The evidence demonstrates that project firefighter numbers were comparable to previous years. Further, the majority of hazard reduction burning is conducted in autumn making the contract start date of project firefighters less important than the contract end – at least for fuel management.

Currently CFA has an insufficient capacity and capability for fuel management planning, conduct and monitoring. Ahead of the 2019–20 fire season CFA introduced the Planned Burn Taskforce to increase its resources and appropriately skilled volunteers with experience to assist in operational delivery of hazard reduction burns. CFA indicated that the taskforce was a positive step towards increasing its capacity and capability.

Within the CFA, there is a limited number of VMOs with a support structure in place to guide strategic planning across districts and regions. Since the inception of this position following the VBRC, the value of these officers has been recognised in previous inquiries and reviews. However, these personnel felt a sense of isolation within the organisation as their core work focused on fuel management for risk mitigation purposes, where CFA is legislatively required to maintain a focus on fire response and prevention.

It is still extremely difficult to process the [fuel management] nominations we receive from our brigades. It is a very large area. This means there is a lot of interface—where private meets public.... Our brigades are aware of the risks, the fire history, human behaviour and the amount of fuel reduction that doesn't get done by FFMV each year. They send us requests constantly to do something on private land and roadsides. We do what we can with the staff and funding we have available. It isn't enough.

CFA stakeholder

There is no requirement for CFA volunteers to participate in hazard reduction burns and there is a variable response to fuel management requests from brigade members across the state. Feedback from volunteer organisations suggested that the 'workload of the volunteer' has increased considerably over the years due

to a decline in volunteer numbers and an increase in training and administration tasks, not to mention ongoing roles in fire and other emergency response efforts. As such, they may be unable to attend hazard reduction burns in a volunteer capacity.

Some also discussed the reluctance of some brigade members to undertake land management activities, such as hazard reduction burning as it is not seen as core CFA business. This highlights the tension that competing priorities can create, and it is not unreasonable to withhold personnel from attending a hazard reduction burn so as not to deplete volunteer resources required to respond to other emergencies such as a house fire or car accident.

4.5.5 Community perceptions of the fuel management program

Inquiry feedback from Victorians discussed fuel management from both current and past experiences – demonstrating that fuel and land management concerns are long-standing and widespread issues across Victorian landscapes.

Victorian land and fire management organisations face a wicked problem: what one person believes is the only way to achieve a better outcome, is the antithesis of the next person's view.

Much of the commentary received through the Inquiry reflects that current practices were inadequate and/or that government needed to do more. However, there was also an equally strong call for less intense burning practices to protect wildlife and the environment. This was strongly supported by the Inquiry's survey where 60 per cent reported some level of dissatisfaction with the way fuel is managed to reduce bushfire risk in the community, while one quarter were satisfied.

Fuel management was the second most discussed topic in IGEM's community meetings and 70 per cent of the commentary expressed dissatisfaction with the current approach.

Through all forms of feedback to the Inquiry, there was a strong perception that overall fuel management was declining across the state. Community members provided examples of fuel management practices and there were multiple reports describing instances where public land managers had not conducted fuel management in alignment with published plans, or where community members had specifically requested to treat public land. There was a clear sense of frustration and unfairness, particularly in cases where community members felt they had engaged in a high level of fuel management on their own property.

There was also an acknowledgment from some community members that they were not aware of broader fuel management plans and other activities that may have been conducted elsewhere in the area, but in their experience, there was no clear communication of 'where and why'.

All I can see is the country around me, so I understand that other burning will be going on. But I was expecting to see burns in my area and when that did not occur, it was difficult to find out why and where else they decided to burn in the district'.

Community member

A strong theme emerging from community relates to the lack of adequate assessment and monitoring processes to ensure public land and fire managers protect environmental values. There was concern about loss of habitat and the effects of salvage logging on biodiversity. On the same note, there was a conflicting view that public land managers were driven in their decision-making process by environmental and native vegetation values, to a degree that compromised bushfire safety priorities.

The amount and timing of burning was a prominent theme in the survey, meetings and submissions. Community members reflected a need to do more burning (more frequently and larger areas) and follow through with plans developed with the community. There was a strong theme that community feedback and local knowledge was not considered in final decisions.

Some community members advocated for significant increases to the burning targets and advocated for a return to hectare-based targets to prevent fires from 'getting a run' in remote country and developing in severity and expanse, making fires difficult to contain when they approached towns. The conflicting view was that many burns were conducted in a manner that led to very hot burns that dried out the landscape and ultimately resulted in a higher-risk environment in the long-term.

There was also commentary that the fires of this season were so severe that no amount of planned burning would have contained the spread of fire. Many people who had witnessed the fires or their impacts noted the severity – *'there was no stopping it'*.

A small number of submissions (compared to those commenting on burn area) noted the importance of asset and township protection and advocated for more strategic burning and the maintenance of tracks and fire breaks.

The Inquiry received significant commentary on the effectiveness of both Parks Victoria and DELWP. The more common opinion was that community members felt these organisations were not effective fuel managers. However, some balanced this view by acknowledging the lack of resources for these organisations to effectively manage fuel across the landscape and advocated for a greater number of seasonal firefighters to support hazard reduction burning in autumn and spring.

It seemed that public land managers were mostly held accountable for the perceived failings of fuel management overall, but there was also a perception that CFA and councils inhibited fuel management on private land due to a lack of support or excessive regulatory 'red tape'.

One theme that emerged was the importance of public land managers having local knowledge and forestry knowledge, but this was not solely in relation to fuel management. Some flagged concerns about the imminent closure of the forestry industry and the implications this has for personnel and equipment to conduct fuel management and maintain fuel breaks and tracks.

Conversely, IGEM also received a large number of submissions advocating for the cessation of logging and noting the long-term changes logging has had on local ecosystems and the increased level of bushfire risk this creates. A small number of submissions also reflected that local knowledge was being lost through the centralisation of Parks Victoria and DELWP services.

Throughout the Inquiry, community members provided examples of the effectiveness of hazard reduction burns and reported cases where burning had (or had not) been conducted and resulted in positive or negative outcomes. These examples were typically highly localised and did not provide sufficient information to verify land ownership, location or timing. However, there were a few submissions that provided specific examples detailing what they perceived were the negative outcomes.

The Inquiry notes that there was a lack of commentary in submissions generally about how private landowners managed fuel on their own property and what the barriers and enablers were to private land management. There was, however, negative sentiment surrounding the private owner burning permit regulations. This related to the cumbersome process of obtaining permits for burning on private land.

There was considerable commentary on the land management practices historically conducted by Traditional Owners and a small number of submissions mentioned the positive outcomes associated with current collaborative arrangement between government and Traditional Owner Groups. The Inquiry understands that community members would be very supportive of a greater consideration and adoption of traditional land management practices.

Submissions also advocated for the use of alternative fuel management strategies, including slashing and grazing. While most commentary focused on planned burning, those that discussed alternative methods were supportive of their use.

Finding 4.16

A significant percentage of community representations to this Inquiry were not satisfied with current fuel management practices on public land. The rationale for this dissatisfaction and proposed alternative approaches are not easily reconciled due to fundamental differences in the values and experiences underpinning these beliefs.

Recommendation 5

The Inspector-General for Emergency Management recommends that the Department of Environment, Land, Water and Planning (or the single entity referenced in Recommendation 4) – with support from all legislated fuel management organisations for public and private land – lead a community engagement process to improve the Victorian community's understanding of:

- a) the purpose of Victoria's fuel management program and the concept of residual risk
- b) the conditions under which fuel management effectiveness is limited
- c) how fuel management is planned, conducted, evaluated and reported.

Recommendation 5 government response

The Victorian Government **accepts** IGEM's recommendation.

Actions

Current actions under way:

DELWP and CFA will release updated regional Bushfire Management Strategies by December 2020, with information to help communities understand bushfire risk at a landscape level.

Immediate actions:

By June 2021, DELWP will update and simplify:

- information provided about Victoria's fuel management program,
- the concept of residual risk and how fuel management effectiveness is evaluated, and
- what bushfire risk means at state, regional and community levels.

Longer-term actions:

As part of the review of the risk target committed at Recommendation 9, DELWP, in collaboration with EMV and land and fire agencies, will develop a community engagement process that:

- builds understanding of the fuel management program and its limitations
- makes targets more meaningful and understandable to the community, and
- supports transparency and shared responsibility.

By December 2021, DELWP will develop shared guidance and principles for engaging with communities and with other agencies involved in bushfire risk management. The shared guidance and principles will clarify accountabilities and ensure a community centred and consistent approach.

The whole of sector strategy for bushfire management will draw on behavioural change work being carried out under Safer Together to support people to take action to address bushfire risk in their local area and on their own land.

Response background

The community is entitled to understand what land and fire agencies are doing to reduce bushfire risk, why they are doing it, and whether it is working. This is an important step in building a shared responsibility for bushfire preparedness.

Victoria has good reporting and assurance processes and works hard to genuinely engage Victorians on matters that interest and affect them. But this inquiry has identified opportunities for this to be improved. DELWP will work with fuel management agencies to design an engagement process in line with IGEM's recommendations to support community-centred engagement approaches.

A community-centred engagement approach will see a range of opportunities offered, including at-place engagement with local communities across metro, rural and regional Victoria. This engagement will link to the review described in Recommendation 9.

Land and fire agencies will also continue to implement engagement and education programs intended to help communities understand and manage their local bushfire risk and the trade-offs associated with mitigation activities, as well as the steps they can take to reduce bushfire risk on their land.

This action is connected to Recommendation 3 – Safer Together

Longer-term actions:

DELWP, in collaboration with EMV and other land and fire managers, will lead the development of a whole of sector strategy to guide land and fire management in the context of a changing climate, growing population and changing demographics by November 2021. In addition to public land, the whole of sector strategy will consider how to effectively support road managers and local governments to mitigate bushfire risks on roadsides and in high bushfire risk local government areas.

Response background

The Safer Together program will be expanded to include road and rail managers to achieve enhanced integration in planning and delivery. Additional focus will be given to building local government participation and capability.

The Victorian Government will develop a whole of sector strategy that will refresh and expand on the current Safer Together program.

Inspector General Emergency Management (IGEM)

Inquiry into the 2019-20 Victorian fire season Phase – 1 report and the government response.

4.6.4 Appropriateness of the current residual risk target

While the residual risk target for public land has been achieved consistently over the last three years, there is still a considerable amount of frustration and dissatisfaction in the community regarding the way in which fuel management is conducted. This is despite ongoing community engagement efforts by FFMVic to communicate the target and involve communities in fuel management planning.

Regardless, achieving the residual risk target still means that there is still approximately 70 per cent risk remaining in the landscape. In alignment with the current fuel management program, the target is applied across the state and regions on public land and some private land where it has been included in the JFMP.

The residual risk target is the first outcomes-based target used for fuel management in Victoria, but it only applies to public land. If it applied to both public and private land it would provide a consistent outcome metric for all land and fire agencies to work towards. Residual risk recognises that humans can never eliminate the risk of bushfires completely through fuel management, only reduce it and that other strategies such as suppression and community education are also required.

The 2015 IGEM Review of performance targets for bushfire fuel management on public land recommended the performance target, and delivery against it, should be effectively communicated to ensure public confidence in the program. A residual risk performance target is a concept that can be difficult for communities and individuals to understand. The review recommended that DELWP report clear information on bushfire risk and ecosystem resilience to assist this clarity.

The determination of the current target is also unclear to many land managers and fire agency personnel. As discussed in Section 4.5.2 (p 161) there are known limitations and assumptions in the calculation of the residual risk value, and using this method as the sole measure of risk reduction may not provide a complete and accurate account of risk reduction. Current work being conducted under Risk 2.0 will allow the calculation of risk reduction to consider small parcels of land and mechanical fuel treatment. However, other measures should be reported to provide a comprehensive measure of risk reduction achieved through fuel management and other bushfire preparedness initiatives.

The Inquiry recognises that the current residual risk target provides an important first step towards an effectiveness measure for fuel management and FFMVic has systems and tools in place to enable reporting against the target. With the progress made under Safer Together, there are opportunities for the target to be reviewed considering what can be achieved through a cross-tenure fuel management program so that private land managers have clear and reportable targets and appropriate systems and tools to report progress.

Community members may or may not understand the concept of residual risk. Regardless of their understanding, the area in which they live or work may have significantly higher or lower risk than the 70 per cent residual risk target. As the calculated residual risk is averaged across the state or region, specific local areas may vary in actual residual risk. In any given year, an individual may not see local fuel management activities depending on where public land managers have planned to treat fuel, and recent fire activity in the region. The local view of an individual that is based on observations and experience is likely to be different to the state or region-wide calculation of residual risk.

The Safer Together program does not specify any timeframe, or circumstances under which the residual risk target should be reviewed. However, in light of community feedback, several years of implementation and improvements in the calculation of residual risk, there is scope to reconsider the appropriateness of the target. The review would need to consider community feedback and other land and cultural values.

Observation 4.5

Despite the achievement of the residual risk target on public land for three years, there is a high level of dissatisfaction in some parts of the emergency management sector and the community in relation to fuel management. The establishment of a schedule to regularly review the residual risk target and the land to which it applies would support greater understanding of fuel management and the effect it has on bushfire risk across the state.

Recommendation 9

The Inspector-General for Emergency Management recommends that the Department of Environment, Land, Water and Planning (or the single entity referenced in Recommendation 4) – in collaboration with the Country Fire Authority and local government – undertake a review of the current residual risk target to ensure that it remains contemporary in terms of its designated percentage value. The review should:

- a) involve engagement with land and fire management agencies; public authorities; private organisations; individuals and any other stakeholders with a role in fuel management
- b) define a pathway to expanding the residual risk target to apply to all methods of fuel management, with the expansion of the target to apply across all organisations with a legislated responsibility for fuel management
- c) become part of a program of review of the State's land and fuel management policy occurring on a regular basis and not exceeding a five-year cycle.

4.6.5 Summary

Members of the Victorian community that engaged with this Inquiry, generally believe more can be done to reduce bushfire risk. The rationale underpinning the community dissatisfaction varies greatly and individuals advocate for a range of different – and at times conflicting – land values. However, the evidence demonstrates that FFMVic is meeting the current residual risk target, reporting publicly and adopting a continuous improvement approach to fuel management.

Much of the frustration from community, land managers and fire agencies is based on fuel management concerns on private land and cross-tenure issues. Land tenure legislation and policy is extremely complex and many different land values need to be considered when planning and conducting fuel management.

While public land is managed by a government entity – FFMVic – a large amount of private land is also managed by government entities (FFMVic, DoT, councils) or requires fire agencies (CFA, FFMVic) to manage the fuel. A lack of clarity as to 'who does what and where' makes it difficult for community to meaningfully engage with the land managers to express their views and preferences for land and fuel management.

Across the state, there is a large amount of variability in how land managers and fire agencies report on fuel management practices and assess the effectiveness of these practices against clearly defined outcomes. While FFMVic has a clear and extensive range of objectives, tools, reporting requirements and evaluation

practices, other land managers do not currently plan or conduct fuel management in a manner that allows a similar level of transparency. This is due – in part – to the residual risk target currently only being applicable to public land.

There is an opportunity to consider how fuel management across all land tenures could be improved to ensure a greater amount of clarity in relation to what fuel management is conducted and how effective it is in achieving a reduction in bushfire risk. This will require greater consistency in the setting of fuel management objectives, reporting requirements and evaluation.

There will always be an argument that greater resourcing, more personnel and more equipment will support bushfire risk reduction, regardless of this FFMVic has achieved the residual risk target since it was implemented. This leads to the question of whether the current residual risk target reflects the expectations of the sector, government and community. Submissions to the Inquiry suggest that many in the community do not understand the target or do not feel the current approach to fuel management is appropriate. There is some commentary from the sector that indicates a willingness to reconsider the target and the resourcing required to achieve this target.

This tension between community and government appetite for bushfire risk, and the resourcing required to reduce risk through fuel management treatments to an acceptable level is part of a much broader narrative identified throughout this Inquiry. See Chapter 8 (p 343 of the full report) for a full discussion of this issue.

8.1 Climate change and bushfire

Scientific evidence for human-induced climate change is unequivocal. Australia has experienced an average increase of 1 °C since 1910, with most of this occurring since the 1970s. There has also been an increased frequency of large-scale heatwaves and record high temperatures.³⁷⁷

In southern parts of Australia there has been a 10-20 per cent decline in cool season rainfall.³⁷⁷ In Victoria, in Spring, there has been an average increase of 1.4 °C in maximum temperature and a decrease in rainfall of 15 mm.³⁷⁸ This has implications for the severity of a fire season. Climate change has increased the frequency, severity and timing of dangerous bushfire weather conditions in Australia, especially in southern and eastern Australia during spring and summer.³⁷⁸⁻³⁸¹ This means fire seasons are starting earlier resulting in a longer fire season with more extreme fire weather.

In 1992 CSIRO published the first climate model projections. More than 25 years later, in 2018 it compared these projections to the actual climate. It reported that the linear trend that was observed was within the predicted range, indicating that the climate models 'represent the key processes responsible for the warming trend and therefore these projections were a useful resource for future planning when they were released.'

They also noted that 'factors such as unforeseeable changes to the atmospheric composition and variability from influences such as specific El Niño and La Niña events mean that we can never make a forecast of the exact time series of Australian temperature, and that the projections will differ from observations over short to medium periods'.

Not only does the 2018 report identify that climate change models can provide a reasonable forecast of future climate, the modelling demonstrates that the climatic conditions observed before and during the 2019–20 fire season were foreseeable (see Figure 43). The fire season of 2019–20 was at least 30 per cent more likely than a century ago due to climate change and the likelihood of similar extreme conditions will rise four-fold if global temperatures exceed a 2 °C increase.³⁸²

[377] Bureau of Meteorology & Commonwealth Scientific and Industrial Research Organisation. State of the Climate 2018, Canberra, 2019.

[378] Harris, S., Mills, G., Brown, T. & Ackland, A. Victorian fire weather trends and variability, P, Published by the Montana, USA, 2019.

[379] Harris, S. & Lucas, C. Understanding the variability of Australian fire weather between 1973 and 2017, *PLoS ONE*, (14), e0222328, 2019.

[380] Dowdy, A.J. Climatological variability of fire weather in Australia, *J Appl Meteorol Climatol*, (57), 2018.

[381] Harris, S., Nicholls, N., Tapper, N. & Mills, G. The sensitivity of fire activity to inter-annual climate variability in Victoria, Australia. (*Journal of Southern Hemisphere Earth System Science*, (Online First), 2019.

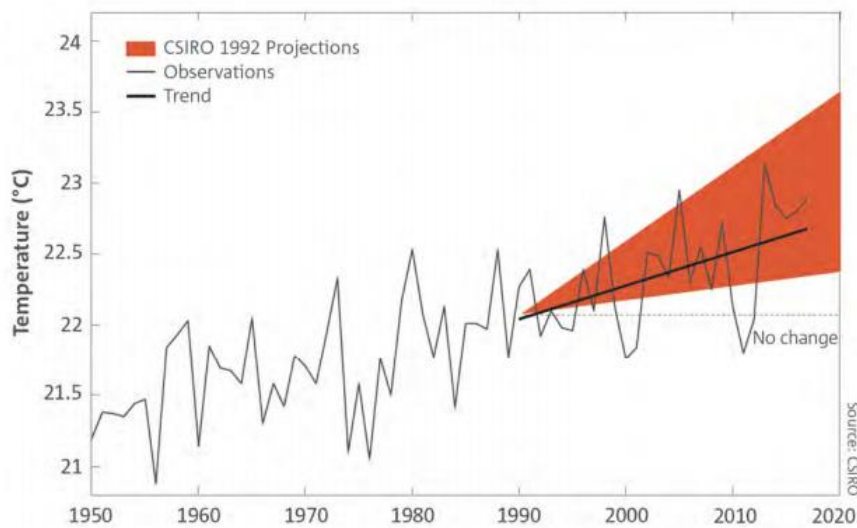


Figure 43: Comparison of observations of the actual climate against the CSIRO (1992) produced projections of Australian temperature from 1990 to 2030 including the linear trend in observed temperature.³⁷⁷

Projections of bushfire weather risk are typically derived from global climate model simulations. Most climate models are run within the framework of the World Climate Research Program's Coupled Model Inter-comparison Project. Simulations have been designed to explore a range of possible futures, from a low-emission scenario (RCP2.6) where CO₂ emissions decrease through the twenty-first century, to a high emission scenario (RCP8.5) where CO₂ emissions continue to grow unchecked through the twenty-first century.

Under climate change projections, observed temperature, rainfall and weather trends are likely to continue with an increase in severity for south and east Australia, driven by hotter, drier conditions.^{383, 384}

Climate change mitigation is a crucial step towards reducing bushfire risk in the long-term. The sector's climate change mitigation actions are part of a broader whole-of-government commitment to reduced emissions under the Climate Change Act 2017. Just as the government recognises climate change mitigation is a whole-of-government responsibility, it must also adopt this approach for disaster risk reduction planning. As such, all elements of responding to climate change need to be embedded in government decision-making.

The 2009 Victorian Bushfire Royal Commission (VBRC) emphasised that the sector needed to consider the influence of climate change on future bushfire risk in its planning. Now, a decade later, the need for that is even more apparent and urgent. The government has embedded adaptation into the Climate Change Act and is in the process of developing adaptation action plans for key systems that are either vulnerable to the inevitable impacts of climate change or are essential to ensure Victoria is prepared. All adaptation action plans will be developed in the year following the release of the five-yearly Climate Change Strategy. This work presents an opportunity to more effectively embed disaster risk reduction considerations across government.

Climate Change Policy at DELWP in conjunction with CSIRO's Climate Science Centre has developed local-scale climate projections data for Victoria at a 5 km by 5 km scale. This covers average and extreme temperature and rainfall, relative humidity and evaporation out to 2090 for moderate and high greenhouse gas emissions scenarios. This is part of a suite of work being conducted to understand the implications of climate change for the local environment.

[382] Oldenborgh, G.J., van Krieken, F., Lewis, S., Leach, N., Lehner, F., Saunders, K., . . . Otto, F.E. Attribution of the Australian bushfire risk to anthropogenic

[383] Clarke, H. & Evans, J. Exploring the future change space for fire weather in southeast Australia, *Theoretical and Applied Climatology*, (136), 513-527, 2018.

[384] CSIRO & Bureau of Meteorology. Projections for Australia's natural resource management regions, *Climate change in Australia: Technical report*, Australia, 2015.

Climate change is influencing the patterns of natural hazards globally. In Australia, increases in temperature and changes in rainfall patterns are contributing to an increase in extreme fire weather across much of the country. This is especially true in south-east Australia where there have been long-term decreases in rainfall and the bushfire season is lengthening.

The 2018 CSIRO report³⁷⁷ predicted changes that Australia will experience over the coming decades with implications for bushfire including:

- further increase in temperatures, with more extremely hot days and fewer extremely cool days
- a decrease in cool-season rainfall across many regions of southern Australia, with more time spent in drought
- an increase in the number of high fire weather danger days and a longer fire season for southern and eastern Australia.

There is also likely to be an increase in dangerous fire conditions for communities and fire fighters with studies indicating climate change could amplify the conditions associated with pyrocumulonimbus development.³⁸⁵ Climate change may also result in more ignitions as there is a link between increased lightning-ignited fire occurrence and climate change, with this trend likely to continue.³⁸⁶

The likelihood of bushfires occurring and their potential severity when they occur are influenced by seasonal and daily weather. Bushfire danger is greater when there are high temperatures, low rainfall, low humidity and high wind speeds. These variables are used to calculate the FFDI, which provides daily estimates of bushfire danger that inform the sector's bushfire preparedness planning. In Victoria, the number of days with very high FFDI (high bushfire danger) has tended to increase in spring over recent decades (see Figure 44). The number of days with a FFDI >25 on average for parts Victoria has increased from 66 to 94 over the last 45 years (see Figure 45).³⁸¹ This has contributed to the lengthening fire season. The occurrences of earlier starts to the season has doubled in the last 45 years (from 5 occurrences through to 2002 with FFDI>25 before September, to 10 occurrences).³⁸¹ These changes are expected to be further exacerbated under climate change.

Increases in bushfire weather risk have been projected under all global warming scenarios, primarily due to climate models projecting hotter and drier conditions. A 2007 study projected that by 2020 the number of extreme fire days in parts of south-east Australia would increase by 5–25 per cent under low emission scenarios and by up to 65 per cent for high emission scenarios.³⁸⁷ Research has estimated that global warming has increased the probability of extreme fire seasons by 30 per cent.³⁸²

[385] Di Virgilio, G., Evans, J.P., Blake, S.A.P., Armstrong, M., Dowdy, A.J., Sharples, J. & McRae, R. Climate change increases the potential for extreme wildfires, *Geophysical Research Letters*, (46), 2019.

[386] Mariani, M., Holz, A., Veblen, T.T., Williamson, G., Fletcher, M.-S. & Bowman, D.M.J.S. Climate Change Amplifications of Climate-Fire Teleconnections in the Southern Hemisphere, *Geophysical Research Letters*, (45), 5071-5081, 2018.

[387] Lucas, C. Bushfire Weather in Southeast Australia: Recent Trends and Projected Climate Change Impacts, 2007.



Figure 44: Area-averaged daily FFDI values from 1 September to 30 November 2019 and accumulated FFDI values for spring each year from 1950 to 2019. (Source: Bureau of Meteorology388)

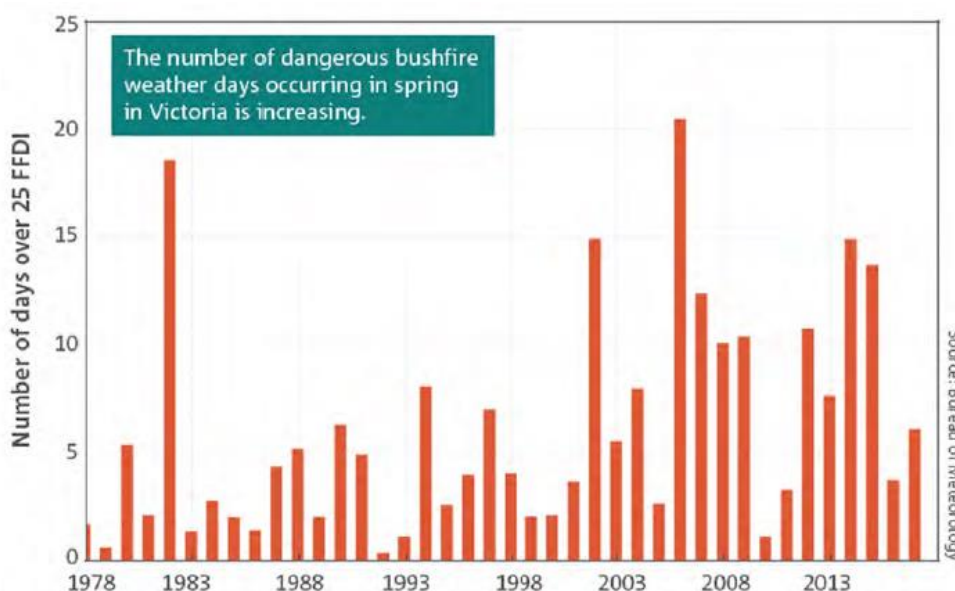


Figure 45: Area average of the number of days with FFDI greater than 25 in Victoria in Spring for the years starting in July (1978-2017). 377

Climate change contributed to Australia’s extraordinary 2019–20 fire season through cumulative long-term changes in climate. The severity of the fires was related to the weather during and leading up to that spring and summer. The 2019–20 summer was the second warmest on record in Australia and 2019 was the driest year on record with rainfall 40 percent below average. The FFDI was very high in eastern Australia during spring, and in December the FFDI reached the highest values on record in parts of south-eastern Australia. The combination of high temperatures and dry forests in south-east Australia contributed to the widespread and severe bushfires.

For the 2019–20 fire season, across the districts 24.3 per cent of FDRs issued were Very High to Code Red. FDRs are based on both the FFDI and Grass Fire Danger Index for a district. Table 29 shows the proportion of each rating issued across districts from 1 November 2019 to 29 February 2020.

| | LOW-MEDIUM | HIGH | VERY HIGH | SEVERE | EXTREME | CODE RED |
|--------------------------|------------|-------|-----------|--------|---------|----------|
| Mallee | 10.7% | 43.0% | 33.9% | 9.1% | 2.5% | 0.8% |
| Wimmera | 19.0% | 50.4% | 24.8% | 4.1% | 1.7% | 0.0% |
| Northern Country | 12.4% | 47.1% | 31.4% | 7.4% | 0.8% | 0.8% |
| North Central | 25.6% | 52.9% | 17.4% | 3.3% | 0.8% | 0.0% |
| North East | 20.7% | 44.6% | 31.4% | 1.7% | 1.7% | 0.0% |
| South West | 52.1% | 36.4% | 8.3% | 1.7% | 1.7% | 0.0% |
| Central | 55.4% | 33.9% | 7.4% | 2.5% | 0.8% | 0.0% |
| West and South Gippsland | 63.6% | 26.4% | 9.1% | 0.0% | 0.8% | 0.0% |
| East Gippsland | 43.0% | 43.8% | 11.6% | 1.7% | 0.0% | 0.0% |
| Total across regions | 33.6% | 42.1% | 19.5% | 3.5% | 1.2% | 0.2% |

Table 29. Proportion of fire rating days across districts from 1 November 2019 to 29 February 2020. (Source: State Control Centre)

Climate change has other indirect implications for bushfire risk management. Rising temperatures, increased fuel availability, increasing awareness of smoke and greenhouse gas emissions and less predictable wind conditions will reduce opportunities to safely undertake planned burning.³⁸⁹ More frequent extreme weather conditions and longer fire seasons may reduce opportunities to implement mitigation and emergency management reform activities, and result in emergency management personnel fatigue,^{389, 390} and increase the frequency of work, health and safety incidents.³⁹¹ This fatigue and high workload has implications for the mental health of emergency management personnel.³⁸⁹⁻³⁹¹ Further, the high workload and severity of the seasons is likely to strain the recruitment and retention of paid and volunteer staff.³⁹⁰

Bushfire severity is influenced by weather conditions and the amount of fuel available to burn. The sector strives to reduce bushfire risk through land and fuel management practices, which are examined in Chapter 4 (p 119) of this report. In contrast, the sector has no control over fire weather conditions and the progression of climate change.

In the community, the greater frequency and severity of natural hazards will lead to changes in insurability of assets, which increases the financial vulnerability of households and businesses.³⁸⁹ Increasing extreme temperatures will increase work, health and safety risks associated with heat stress.³⁸⁹ There are also likely to be more frequent disruptions to critical infrastructure and essential/vital services as a result of more extreme weather and the impacts of natural hazards.^{389, 390}

To cope with fire seasons of greater severity and length, fire services will need greater workforce capacity and resourcing for firefighting equipment and infrastructure. Research conducted to assess changes in expenditure per year of fire services in various climate change scenarios shows the need for a marked increase on current expenditure. Modelling provided by Risk Frontiers indicates that expenditure for fire services will increase based on the projected increase in cumulative FFDI. With current expenditure estimated at around \$1.5 billion, by 2025 it is estimated this will be around \$2 billion. By 2055, modelling indicates it might be almost at \$5 billion.

Research shows that the ability of planned burns to slow or halt fire behaviour is significantly reduced on days where the FFDI exceeds 50 (Severe, Extreme FDR). This does not mean that planned burns become ineffective - the timing and location of the burn becomes more important. With a projected increase in the number of Severe and Extreme FDR days, land managers will need to significantly reconsider land and fuel

[389] Australasian Fire and Emergency Service Authorities Council. Discussion paper on Climate Change and the Emergency Management Sector, Melbourne, Australia, 2018.

[390] Thompson, M. Climate change challenges for Queensland's emergency management sector [online], *Australian Journal of Emergency Management*, (34), 2019.

[391] Withen, P. Climate change and wildland firefighter health and safety, *New solutions: a journal of environmental and occupational health policy*, (24), 577-84, 2015.

management strategies to ensure effective approaches continue to be employed as part of a more comprehensive approach to bushfire risk management.

The lengthening of fire seasons is reducing opportunities for cross-jurisdictional resource sharing. As observed in the 2019–20 fire season, bushfires in Victoria are increasingly coinciding with fires and other emergency events elsewhere in Australia and overseas. This limits personnel and firefighting equipment (such as specialised aircraft) available for deployment to Victoria when needed and has implications for Victoria's ability to provide support to other jurisdictions.

The Inquiry heard concern within the Victorian community about the effects of climate change on bushfire risk. A common theme in the community submissions received by IGEM was that the government's efforts to reduce greenhouse gas emissions have been insufficient – with submissions largely referring to policy and decisions that fall under the remit of Federal Government. Groups drawing on expert knowledge such as the Climate Council and Emergency Leaders for Climate Action are similarly campaigning for greater and more rapid action towards climate change mitigation through reducing greenhouse gas emissions.

Fire weather conditions will vary annually in the future, and there will continue to be years with extreme fire weather conditions similar to those of the 2019–20 season. In the long-term, the severity of fire seasons in Victoria is projected to worsen based on modelled FFDI values for potential future carbon emission scenarios. The sector must prepare for levels of bushfire risk in future that exceed what was typical in the past.

8.2 Future proofing the sector

Importantly, bushfires are not the only natural hazard affected by climate change. Climate change is influencing the occurrence of other natural hazards such as drought, heatwaves, storms and floods. There will likely be greater frequency of compound events in the future. Compound events are when two or more hazards occur at the same time – for example bushfires and a heatwave occurring during a drought. Organisational planning needs to be coupled with strategic sector planning that is integrated across all hazards to ensure that the sector has the capacity and capability to cope with compound events.

The sector also needs to consider strategic planning requirements to prepare for cascading and compounding emergencies. While there are some good examples of exercises considering the likelihood of concurrent emergencies, there is an opportunity to ensure capacity and capability initiatives model this likely situation and strategies are flexible to complex and concurrent emergencies.

The current emergency risk assessment identifies Victoria's highest emergency risks and can guide prioritisation of resource allocation. As discussed in Section 3.1.4 (p 73) the current risk assessment was completed in 2014 and was due to be updated at least every three years meaning an update is now overdue. Neither compounding nor cascading emergencies are considered in the current risk assessment, which largely address hazard risks in isolation. In addition, it does not consider current vulnerabilities facing the sector and how these interact with hazard risk (for example declining rates of volunteerism considering increased frequency of major emergencies).

Progress on the sector workforce strategy and capability needs assessment has been delayed and neither initiative is completed. As such, the sector currently lacks insight into its current baseline capacity, which hinders action towards optimising capability for the future. This represents a shortcoming in the sector's preparedness in general, but especially in its ability to plan and prepare for a future with a changing risk profile due to climate change.

Shared responsibility becomes critical in the context of climate change. The sector and government will not be able to adequately resource risk reduction or emergency response and individuals, communities, business and industry all have a role to play in developing community resilience. This will require communication and leadership from the sector and government to ensure everyone has a clear

understanding of the risk they face and the steps they can take to increase their own resilience and that of the broader community.

Crucial to success in managing responses to future bushfires is the ability for early detection to inform first attack. Satellite technology is already used to detect the incidence of lightning strikes and this provides a good indication of the likelihood of fire starts across the landscape.

In 2018–19 a trial of remote sensing technology undertaken by CSIRO³⁹² assessed three systems, all based on image analysis from sensors mounted on fixed towers. It tested the ability of the systems to detect and locate fires, to provide information about fires for developing situational awareness, and potential for integration with agency operations. The capacity of the systems to detect and locate fires was compared with a trained human observer using a series of planned fires. It concluded that it was not possible to rely on cameras as a sole primary detection method or a replacement for trained fire tower observers. However, they could be used to supplement other detection methods, particularly at night or in remote locations.

A current research stream of the BNHCRC is examining the prospect of near continuous fire surveillance from space using data from the Japanese geostationary Himawari-8 satellite, which generates observations every 10 minutes, and new algorithms to determine potential fire starts. Still in a development and testing phase, it is anticipated that this work will eventually lead to earlier detection of fires, along with mapping and ongoing observations.³⁹²

Other areas outside the responsibility of responder agencies are also integral to building Victoria's ability to prepare for and respond to bushfires. These include critical infrastructure and essential services and a requirement to consider how these might be adapted to better withstand the impacts of climate change.

Stakeholders highlighted the importance and reliance on communications to understand impacts on the ground and manage response activities accordingly. Adequate water supplies to respond to fires remains critical. In areas impacted by the 2019–20 fire season not all communities had town water to draw on and where it was available the system was not designed to provide water for such events. DELWP noted that some towns were going through water supplies that would normally last two weeks, in three days.

There is already significant interest from business and science and technology industry bodies to contribute to the emergency management sector. A recent forum (hosted by Risk Frontiers) focused on identifying the next generation of bushfire capability and priority areas for research and innovation. The forum involved industry participants with expertise in construction, technology, aviation, insurance, risk management, firefighting and information technology.³⁹³ It was agreed that, in the short-term, there are many existing technologies and systems that could be used to enhance firefighting capabilities and support emergency management with very little innovation or modification required.

Given the predicted impacts of climate change highlighted above, preparedness for fires needs to consider resources – such as personnel and assets – but also infrastructure across Victoria, shared responsibility with communities, critical infrastructure, land planning, fuel and land management practices and supply chains required during bushfire emergencies. These considerations need to be given considering the increased frequency and severity of bushfire emergencies, and the greater likelihood of cascading and compounding emergencies associated with bushfires.

There should be no expectation that risk will be completely addressed through climate change risk mitigation activities alone – there will be a level of residual risk that needs to be clearly communicated and understood across the sector, government and community. Once there is a clearer understanding of the risks facing Victoria, more constructive conversations related to shared responsibility can be held. The answer is not to simply increase government resources to improve response, but to consider:

- how to better prepare for the season both as a government and as a community
- what are the required capacities, skills and assets required to manage the level of risk agreed, and who is responsible
- what preparation activities need to occur to support these changes and who is required to ensure that these activities occur, including:
 - changes in legislation (housing, insurance, essential services)
 - community planning
 - critical infrastructure
 - land and fuel management
 - what systems are needed to maintain operations, at what scale and for what duration
- how to use and build skills and resources within the community (community members, private organisations, etc)
- how to adapt the workforce model to be prepared for a longer season
- how to increase relevant skills in surge capacity and support personnel of government response agencies
- what adaptations are required to the infrastructure and services Victorians expect and rely on.

Observation 8.1

Victoria needs to determine the level of preparedness it wants in place to reduce future risks. In doing so, consideration needs to be given to the predicted outcomes of climate change on weather patterns, increasing severity of events and the increasing likelihood of concurrent events occurring within Victoria, as well as nationally and internationally.

Recommendation 9 government response

The Victorian Government **accepts** IGEM's recommendation.

Actions

Current actions under way:

- DELWP and CFA are undertaking work to improve bushfire risk data and modelling. This work will provide the basis of building the technical capability for agencies to work with stakeholders and the community to review the current residual risk target.
- DELWP and CFA are currently updating approaches to modelling risk, centred on a metric of house loss. This work will broaden the range of values considered in bushfire risk modelling, to include water yield and quality, critical infrastructure, fire size and agricultural values.
- DELWP is currently undertaking work to improve modelling of the impact of fuel management on environmental values, including threatened species. These modelling improvements will drive improvements in evaluation and reporting, and strategic bushfire management planning.

Immediate actions:

DELWP will deliver a new spatial dataset (to underpin bushfire risk modelling) that provides enhanced understanding of asset location by June 2021.

Longer-term actions:

DELWP will commission a comprehensive review of fuel management targets and provide advice to Victorian Government. New targets will be developed in consultation with stakeholders and the community and be communicated as part of the sector's new strategy for land and fire management, by December 2021. This will link to engagement on bushfire fuel management agreed in response to Recommendation 5.

Response background

The Victorian Government is continuing to invest in improved bushfire risk modelling. This will allow land and fire managers to better measure the effectiveness of planned burning and mechanical fuel treatment works, increase the precision of modelling and allow us to better protect our precious flora and fauna from the impacts of planned and unplanned fire.

Victoria's risk-based approach to bushfire management is world leading. Through Safer Together, the Victorian Government committed to maintaining the residual risk of bushfires to communities at or below 70 per cent. This target has guided Victoria's fuel management program and has been consistently achieved. The target has now been in place for five years, and the Victorian Government agrees it is timely for a comprehensive review of the residual risk target to be undertaken.

DELWP will commission a review that will make recommendations to Victorian Government. The review will include close engagement with the CFA, partner agencies and communities.

The output of this review will be a suite of targets applicable to all land tenures and organisations with a legislated basis for fuel management, and provide a basis for:

- Directing a fuel management program driven by the dual objectives of:
 - reducing the impact of major bushfires on life, property, the environment, communities and industry; and
 - maintaining or enhancing the resilience of natural ecosystems.

Prioritising fuel management investment and activity, including both planned burning and mechanical treatment.

Measuring and reporting on the activities and effectiveness of the state-wide, cross-tenure fuel management program.

Enhancing community understanding of bushfire risk and agency performance, and the trade-offs inherent in reducing bushfire risk.

The review will engage with local communities and stakeholders and seek to build community understanding of residual risk as described in Recommendation 5. It will retain and build on Victoria's current approach of integrated land and fire management to ensure that fuel management is delivered against a full suite of objectives – bushfire risk management, biodiversity, environmental and social values, cultural heritage, and ecosystem services.

