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**THE LEGISLATIVE ASSEMBLY FOR THE
AUSTRALIAN CAPITAL TERRITORY**

BUSHFIRE SMOKE AND AIR QUALITY STRATEGY 2021-2025

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Bushfire Smoke and Air Quality Strategy **2021-2025**



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Acknowledgment of Country

We acknowledge the Ngunnawal people as Canberra's first inhabitants and Traditional Custodians. We recognise the special relationship and connection that Ngunnawal people have with this Country. Prior to the dislocation of Ngunnawal people from their land, they were a thriving people whose life and culture was connected unequivocally to this land in a way that only they understand and know, and is core to their physical and spiritual being.

The segregation of the Ngunnawal people from Culture and Country has had long-lasting, profound and ongoing health and well-being effects on their life, cultural practices, families and continuation of their law/lore. We acknowledge the historic dispossession of the Ngunnawal people of Canberra and their surrounding regions. We recognise the significant contribution the Ngunnawal people have played in caring for Country. For time immemorial they have maintained a tangible and intangible cultural, social, environmental, spiritual and economic connection to these lands and water

Ministers Foreword

We are pleased to present the ACT Government's *Bushfire Smoke and Air Quality Strategy 2021-2025* (the Strategy), which outlines the Government's approach to better understanding and managing impacts on our air quality from bushfires and other smoke sources.

In a changing climate, we need to take action to protect people from poor air quality, including from bushfire smoke. Over the 2019-20 summer period, the ACT and surrounding areas were subject to extended periods of unprecedented, extreme smoke pollution resulting from the Black Summer bushfires. This crisis highlighted the wide ranging and compounding effects of poor air quality on many aspects of our lives.

The Strategy sets out a whole-of-government approach to effectively prevent, prepare for, respond to, and recover from significant bushfire smoke events in the future. The Strategy also recognises the impact on air quality that wood heaters can cause. Clean air is fundamental to our health and is foundational to ensuring our communities are liveable for all, and while the smoke pollution resulting from wood heaters does not come near the peak particulate pollution levels from Black Summer bushfires, it is important to continue making steps to reduce localised impacts.

The Strategy's vision is to support healthy communities by reducing the adverse effects of bushfire and woodfire smoke on human health. It sets out eight objectives to direct Government actions over the next four years across a wide range of policy areas including: protection of vulnerable people; regulation of environmental pollution; monitoring of air quality; building standards; public health advice, warnings and directions; work health and safety; emergency management; support for businesses; and public education. Action plans will be developed to capture the specific steps required against these objectives.

The Government recognises that poor air quality caused by smoke pollution is an important issue for Canberrans. This Strategy brings together our efforts across government to reduce the health effects of smoke pollution, particularly for the most vulnerable, and minimise the impact of smoke on our environment, the economy and our community. It represents an important step in the journey towards cleaner air for all in our changing city.

Rachel Stephen-Smith MLA
Minister for Health

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Minister for the Environment

Introduction

Over the 2019-20 summer period, the ACT and surrounding areas were subject to extended periods of unprecedented extreme smoke pollution resulting from bushfires in NSW and the ACT.

Smoke from the 2019-20 Black Summer bushfires had impacts on the physical and mental health of Canberrans, and the local economy suffered as many people sheltered in place (or other safe spaces) and reduced travel to the ACT region¹.

Early research estimates that smoke from the 2019-20 bushfire season resulted in 31 premature deaths, 82 cardiovascular hospital admissions, 147 respiratory hospital admissions and 89 emergency department attendances, including for asthma².

There is also a growing body of research on how bushfire smoke impacts mental health. Asthma Australia's *Bushfire Smoke Impact Survey 2019-20* found that the unprecedented levels and duration of exposure to bushfire smoke significantly impacted the mental health of participants.³ Survey participants reported new and increased symptoms of anxiety and depression as a direct result of exposure to smoke and concerns of the long-term effects of the smoke on their health. Participants were also indirectly impacted by the smoke because of their inability to exercise or spend time outdoors to manage mental health issues.⁴

The hazardous smoke that blanketed the ACT over the summer of 2019-20 forced many businesses to close and reduced tourism to the Canberra region. WorkSafe ACT also encouraged employers to stop strenuous and outdoor work to protect the health of workers. The significant impact of bushfire smoke on local businesses showed the influence that poor air quality can have on the economy.

There is growing evidence that climate change will lead to longer, hotter and drier summers resulting in more frequent severe bushfire and smoke events⁵. Not only will climate change increase the frequency of severe bushfire smoke events in the ACT, but bushfire smoke can also contribute to global warming through the release of pollutants.⁶

Each year the ACT Government publishes the ACT Air Quality Report from data collected through the ACT Health Directorate's air quality monitoring network. This report presents the results of ambient air quality monitoring in the ACT against the National Environment Protection (Ambient Air Quality) Measure. The air quality in the ACT is generally excellent compared with other Australian cities and is considered clean by world standards. There are, however, higher levels of air pollutants in the winter months, and this has been linked to use of wood heaters.

The primary air pollutants of concern for human health are particulate matter (PM). Particulate matter with a diameter of less than 2.5 micrometres (PM_{2.5}) are small enough to penetrate the lungs and enter the bloodstream and have the most significant health impacts in the ACT.⁷ The primary source of PM_{2.5} emissions in the ACT is smoke from bushfires and wood heaters.

To manage the known impacts of wood heater smoke, the ACT Government has a range of long-standing programs aimed at reducing air pollution from wood heaters. These programs include the 'Burn Right Tonight' campaign, the Wood Heater Replacement Program, prohibition of wood heater installation in select suburbs and regulation of firewood merchants.

Why has this strategy been developed?

The severe smoke event from the 2019-20 Black Summer bushfires showed that there is a complex relationship between the health, environment, social and economic impacts of poor air quality. There is also a significant link between climate change, bushfires and air quality that needs to be addressed. To manage these complex impacts, coordinated action between ACT Government directorates and agencies is required.

This Strategy represents a whole-of-government approach to effectively prevent, prepare for, respond to, and recover from significant bushfire smoke events in the future. It also outlines the coordinated actions that have been taken to manage smoke from wood heaters as well as future actions.

The Strategy will complement the broader work to address the impact of climate change on extreme bushfire smoke events and poor air quality, and will build upon existing strategic documents, such as the:

- ACT Climate Change Strategy 2019-2025
- Canberra's Living Infrastructure Plan: Cooling the City
- Air Environment Protection Policy
- ACT Emergency Plan
- Strategic Bushfire Management Plan
- Royal Commission into National Natural Disaster Arrangements
- National Environmental Protection (Ambient Air Quality) Measure (NEPM).

The Strategy also acknowledges that motor vehicles are the primary source of air pollution in the ACT and are a significant contributor to ozone emissions and phytochemical smog. As the levels of ozone in the ACT continue to increase, and extreme hot weather events become more frequent, it is likely that the ACT will exceed NEPM standards for ozone concentrations in the future. Although this Strategy does not address air pollution from motor vehicles, it complements the air pollution reduction objectives of the *2018-21 ACT Transition to Zero Emission Vehicles Action Plan*.

How has this strategy been developed?

The *Bushfire Smoke and Air Quality Strategy 2021-2025* has been developed in collaboration between ACT Health; Environment, Planning, Sustainable Development; Chief Minister, Treasury and Economic Development and Justice and Community Safety directorates.

The Strategy is built around an overarching vision

To support liveable communities and healthy environments by reducing the adverse effects of smoke pollution on human health driven by bushfire smoke and domestic woodfire smoke.

The Strategy sets out eight key objectives for the next four years. These objectives will guide actions that will be taken across government.

The specific initiatives and actions to be implemented will be set out in a series of Action Plans over the life of the Strategy. The first of these Action Plans was released alongside the Strategy and include initiatives and actions for the first two years of the Strategy.

The Strategy provides high level direction to guide the development of the Action Plans. The Action Plans will be flexible and dynamic, and their two-year time frame will allow timely responses to new experiences and learning across government and the community.

Each directorate will be responsible for the implementation, reporting and evaluation of actions in the Action Plans, but collaboration across government and with the community will guide the development of future Action Plans.

Vision

Our vision is to support healthy communities by reducing the adverse effects of bushfire and woodfire smoke on human health.

This vision means:

- reducing the occurrence of poor air quality events in the ACT
- reducing the health impacts from poor air quality
- vulnerable Canberrans are protected from air pollution
- there are supports for people and businesses impacted by poor air quality
- information on air quality is accurate and accessible.

Objectives

This strategy identifies eight objectives to direct ACT Government actions over the next four years.

Prevention

1. Support the implementation of the Strategic Bushfire Management Plan to manage and reduce bushfire risks and consequences in the ACT
2. Strengthen measures to address the air quality impacts of wood heaters

Preparedness

3. Enhance air quality monitoring and forecasting
4. Consider the impact of air quality associated with bushfire smoke through all phases of the emergency management continuum
5. Support the development of buildings that are resilient to air pollution

Response

6. Support the Health and Wellbeing of Canberrans affected by bushfire and woodfire smoke
7. Provide targeted support to vulnerable populations and workers during severe air pollution events

Recovery

8. Provide economic supports to businesses, communities and individuals affected by severe bushfire smoke

1- Support the implementation of the Strategic Bushfire Management Plan to manage and reduce bushfire risks and consequences in the ACT

Bushfires are a part of the ACT landscape. The ACT's predominantly natural environment, long hot summers, storm events and periodic droughts have regularly combined to produce bushfires of varying size and intensity.

The number of days per year that the ACT has severe, extreme, or catastrophic fire danger conditions is increasing in line with the Australia's changing climate. Research by the CSIRO and Bureau of Meteorology indicates that southeast Australia will see an increase in the number of high fire weather days and a longer bushfire season⁸. This change is a result of an expected decline in cool season rainfall and maximum and average temperatures associated with the ACT's changing climate, all of which pose particular challenges in addressing the bushfire risk in the Territory.

The 2003 Canberra Bushfires had a profound impact on the Territory and its residents and led to a fundamental shift in bushfire management. Key recommendations from inquiries into the 2003 Canberra Bushfires were used to develop the first Strategic Bushfire Management Plan (SBMP), which was released in January 2005. It introduced practices in urban planning, incident management, community education and fuel reduction through land management to minimise the likelihood of bushfires and their negative consequences.

The fourth version of the SBMP, the *Strategic Bushfire Management Plan 2019-2024* (SBMPv4), builds on 15 years of feedback on the effectiveness of previous SMPBs. It also reflects the significant improvements in bushfire prevention, bushfire fighting capability and community engagement that have occurred since 2005.

The traditional methods of sustainable land management practiced for thousands of years by the Ngunnawal Peoples, the traditional custodians of ACT land, have been combined with contemporary practices to achieve the best results for the environment and the community. These practices, as well as community involvement, adaptation to climate change and bushfire recovery have been surround the SBMPv4's central focus of community safety.

The Black Summer bushfires of 2019-20 caused unparalleled damage and destruction across Australia, during the hottest and driest year on record.⁹. In response to the bushfires the *Royal Commission into National Natural Disaster Arrangements* (RCNNDA) made several recommendations relating to forecasting, monitoring, and mitigating natural disasters. Many of the recommendations related to vegetation management, bushfire mitigation, hazard reduction and fuel loads continue to be addressed through the SBMP and Bushfire Operational Plans (BOP), which are informed by the Regional Fire Plan.

What we have done so far:

- Engaged with representatives from the community, such as the ACT Bushfire Council in their role of monitoring the SBMP's scope and effectiveness.
- Developed a framework by which the different agencies work together, particularly in large scale and protracted bushfire incidents.
- Taken a whole-of Government approach to completing BOP activities to reduce bushfire fuel loads by conducting large-area prescribed burns, asset protection activities, and providing an extensive fire trail access network.
- Signed an agreement with NSW for collaborative cross-border planning.

How we plan to meet this objective:

- Review air quality monitoring approaches during fuel reduction burns as part of the Strategic Bushfire Management Plan.
- The SBMP Governance Committee uses a range of existing data sets and performance indicators to measure the effectiveness of the SBMP.

2– Strengthen measures to address the air quality impacts of wood heaters

While Canberra’s general overall air quality compared to other cities is excellent, there are well known impacts of wood heaters in the ACT.

Wood heaters generate a complex mixture of particles and gasses, such as carbon dioxide, carbon monoxide, nitrogen oxides, organic compounds and organic matter¹⁰. These pollutants are both damaging to human health and the environment, but of these pollutants it is PM_{2.5} has the greatest health impacts in the ACT¹¹¹².

ACT meets the requirements set out by the NEPM more than 99% of the time, yearly averages for PM_{2.5} rarely exceed the NEPM standard (figure 1). During the colder months the rises in PM_{2.5} occur as reported in the ACT Air Quality Report, particularly at the Monash air quality station in the Tuggeranong Valley which is subject to cold weather inversions (figure 2).

The graphs below show data from the three ACT Health air quality monitoring stations against the NEPM standard for daily and annual PM_{2.5} averages. Peak from the 2019-20 bushfire smoke event has been removed for better resolution of seasonal and annual variation.

Yearly average PM2.5 concentration

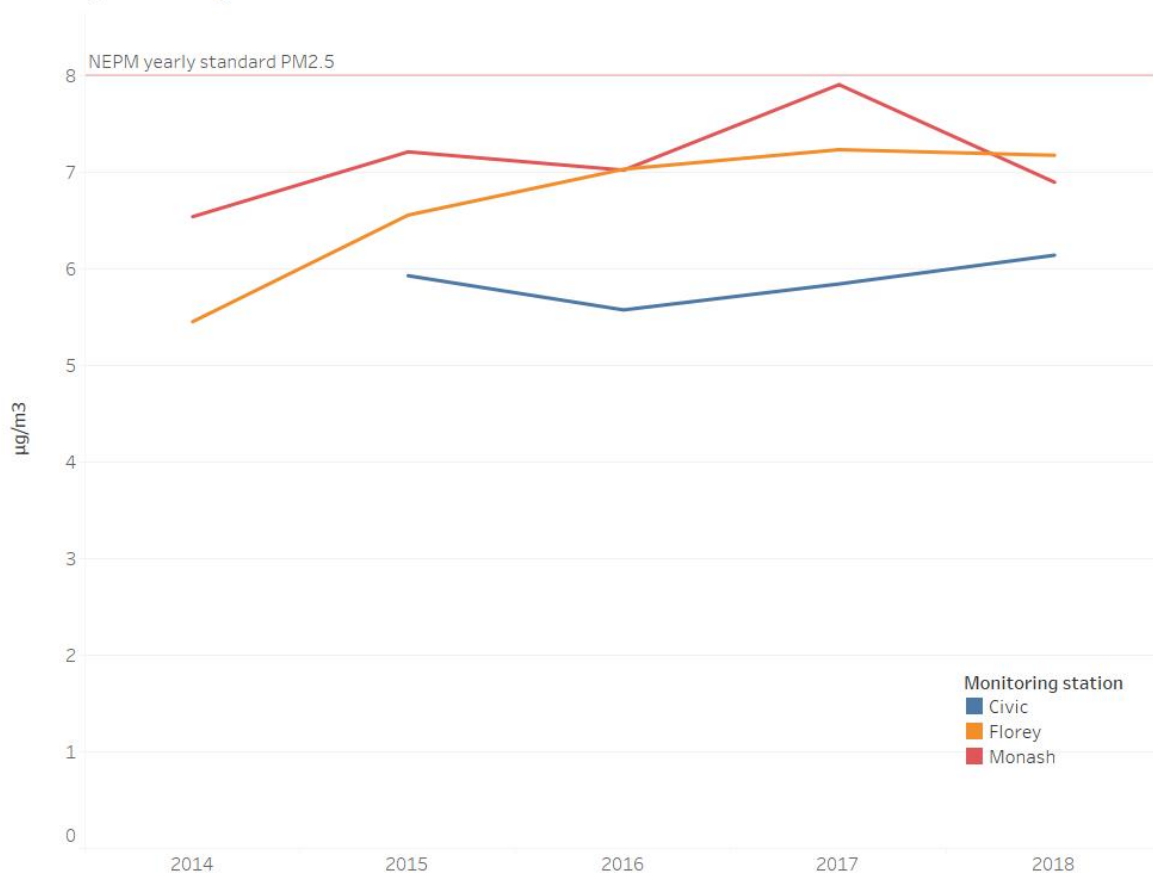
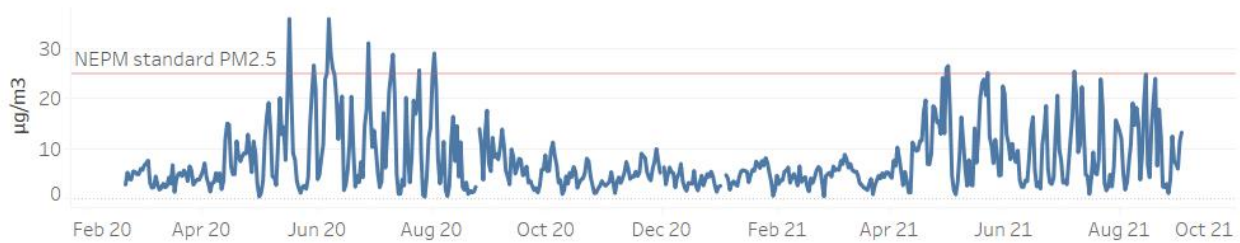


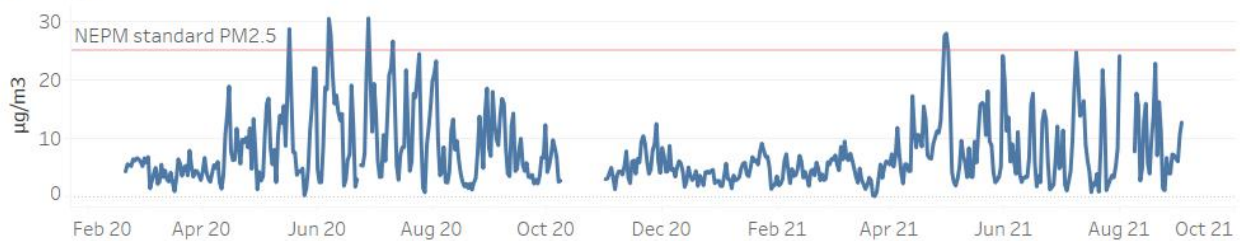
Figure 1. Average annual PM_{2.5} concentration (µg/m³) measured at Monash, Florey and Civic air quality station¹³

Daily average PM_{2.5} concentration

Monash



Florey



Civic

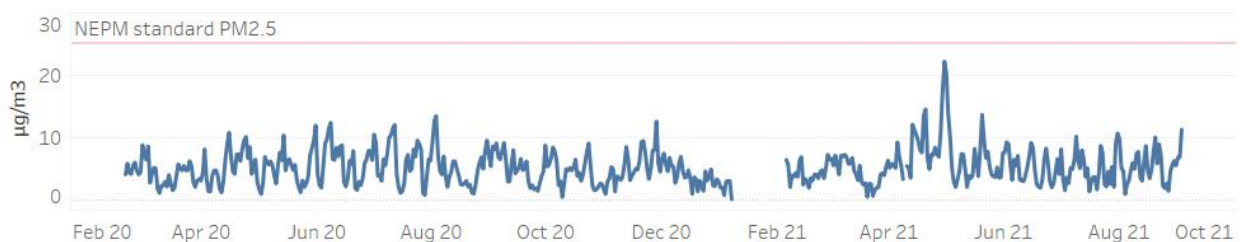


Figure 2. Average daily PM_{2.5} concentration (µg/m³) measured at Monash, Florey and Civic air quality station¹⁴¹⁵

Wood heater smoke has greater health impacts in cities and urban centres where population densities are higher, in areas that experience colder winters and heating demand, and in areas that form geographic basins such as Canberra. These impacts are worse in areas in areas such as the Tuggeranong valley, where regular temperature inversions and the shape of the valley hold pollutants closer to the ground.

Research by the CSIRO suggests that domestic wood heater emissions are largely underestimated in Australia. The way wood heaters are designed in compliance with Australian Standards does not reflect how they are often operated in homes. For example, they are often left overnight to smoulder, prompting inadequate burning, more emissions, and more significant climate impacts. 45

Although the number of Canberra households with wood heating is relatively small, these heating sources are largely responsible for increase PM_{2.5} pollution during the winter months. Figure 3 shows that there has been an increased uptake in electric home heating over the years, and transitions away from wood and electric heating are supported by ACT Government initiatives such as the Wood Heater Replacement Program and the Sustainable Household Scheme.

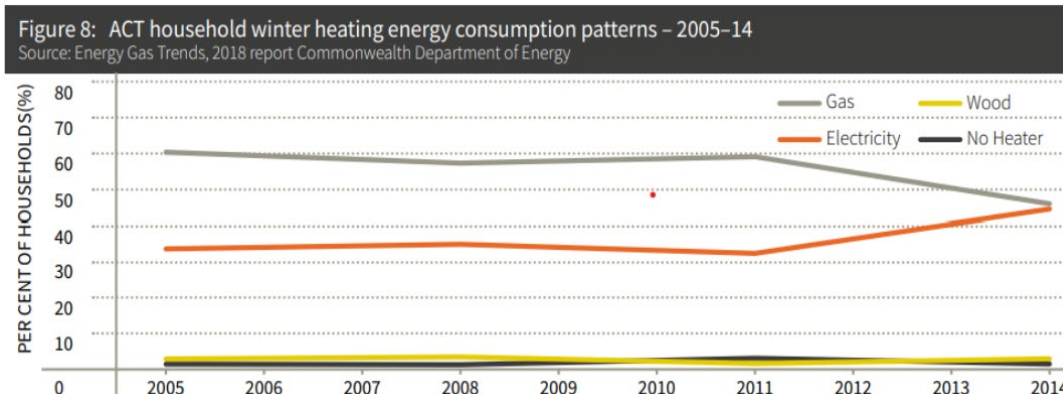


Figure 3: ACT household winter heating consumption patterns 2005-14¹⁶

What we have done so far:

The ACT Government supports programs and campaigns aimed at minimising the impacts of wood heaters on air quality, including targeted education for households. The ACT Government has several initiatives in place to minimise pollution from wood smoke including:

- the ‘Burn Right Tonight’ campaign, which is a public education tool that has run every winter since 2011 to remind ACT residents on the correct use of wood heaters to reduce emissions
- implementation of stricter national emissions and efficiency standards for wood heaters in 2019 through amendments to the Environment Protection Regulation 2005
- bans on the installation of wood heaters in new suburbs in the Molonglo Valley (except Wright), Dunlop and East O’Malley where cold weather inversions increase the impact of smoke pollution
- regulation of firewood merchants and audits of wood heater retailers by the EPA
- compliance and enforcement of wood heaters emissions by the EPA
- the Wood Heater Replacement Program, which commenced in 2004 to provide financial incentives to encourage the removal of wood heaters from Canberra homes. This program is complemented by the 2021 Sustainable Household Scheme, which provides zero-interest loans of between \$2,000 to \$15,000 to support eligible ACT households to reduce emissions and their energy costs.

How we plan to meet this objective:

- Air quality data will inform current and future actions and initiatives on wood heaters
- Current programs, policies and regulations will be reviewed to ensure they support better air quality.

3 – Enhance air quality monitoring and forecasting

ACT Health reports on air quality using up-to-date, accurate data on levels of pollutants in the air. There are three monitoring stations located at Civic, Florey and Monash. These monitoring stations measure a variety of air pollutants including PM_{2.5}, which is the air pollutant of highest concern in the ACT.

Through cross-directorate collaboration air quality data is used by Environment, Planning and Sustainable Development Directorate for policy, legislation, program and public education development, and the Environment Protection Authority for the delivery of the annual ACT Air Quality Report.

The ACT Air Quality Report 2020 showed that the Black Summer bushfires had significant impacts on air quality in the ACT, and that there is a yearly trend of increased air pollution in the winter months linked to smoke from wood heaters (figure 2).

Prescribed burning, also known as hazard reduction burning, is another contributor to air pollution. Research suggests the cumulative impact of moderate exposure to particulate matter, such as multiple days of minor smoke exposure from a hazard reduction burn, could be equally as damaging as severe short-term exposure¹⁷. Proactively managing and minimising the impacts of smoke from all-hazard reduction activities can yield substantial public health benefits¹⁸.

Following the 2019-20 Black Summer bushfires the RCNNDa made several recommendations to improve air quality monitoring, forecasting and communication. These recommendations called on governments to develop:

- close to real-time, nationally consistent air quality information, including consistent categorisation and public health advice
- greater community education and guidance
- targeted health advice to vulnerable groups
- national air quality forecasting capabilities, which include broad coverage of population centres and apply to smoke and other airborne pollutants, such as dust and pollen, to predict plume behaviour.

The ACT Government has acted on most of the recommendations made by with RCNNDa, but the existing air quality monitoring stations are unlikely to provide the detailed coverage of the region needed for air quality forecasting.

Recommendations from the RCNNDa that are relevant to this strategy are included in Appendix B.

What we have done so far:

- From December 2020, ACT Health implemented air quality categories for PM_{2.5} that correspond to nationally agreed health and activity advice.
- Clear processes have been developed and documented for the provision of public health advice during episodes of poor air quality.

- ACT Health has completed changes to its online public information about air quality to reflect the recently adopted national categories and public health messaging for 1-hour and 24-hour $PM_{2.5}$ exposure.
- Forecasting capability for the ACT is currently being explored in consultation with NSW Government. A preliminary investigation of market options to enable the expansion of the ACT air quality network has occurred.

How we plan to meet this objective:

- Emerging air quality forecasting capabilities are harnessed to support better health outcomes.
- The use of low-cost air quality sensors is investigated to determine its utility and reliability.

4 – Consider the impact of air quality associated with bushfire smoke through all phases of the emergency management continuum

On the 1 January 2020, fires burning in south-east Australia created smoke that led to Canberra's air quality being rated the worst in the world. The following day, a State of Alert was declared for the ACT and an Emergency Controller was appointed for the first time since the devastating 2003 Canberra bushfires¹⁹.

The ACT's prevention, preparedness, response and recovery to emergencies and natural disasters is legislated by the *Emergencies Act 2004*. As well as allowing the appointment of an Emergency Controller, this Act requires the development of the ACT Emergency Plan.

The ACT Emergency Plan outlines the principles for emergency management in the ACT and identifies the roles and responsibilities related to identified hazards and associated emergencies. The governance arrangements in the Plan identifies the forums for communication, liaison and coordination between the ACT Government, its Agencies and national emergency management bodies.

Under the ACT Emergency Plan are hazard specific sub plans, which are supported by support sub plans. The purpose of the sub plans is to coordinate arrangements relevant to a particular hazard. The support sub plans outline operational arrangements and functions as part of a response to a range of hazards.

The Extreme Fire Danger Sub Plan is the sub plan most relevant to hazards from bushfire smoke. This sub plan can be enacted when there are immediate threats of bushfire to the ACT but is of little relevance when the ACT is impacted by smoke from bushfire well outside the ACT.

Because of the broad and all-hazard nature of the support sub plans, prolonged and severe smoke events can also be managed by sub plans such as the Community Communication and Information Sub Plan and the Recover Sub Plan.

Emergency management in the ACT is continuously reviewed. Following the 2019-20 Black Summer bushfires the ACT Government led and responded to a number of reviews including the RCNDA, the Review of ACT Government coordination and response during the 2019-20 Bushfire Season, the ACT Emergency Services Agency Operational Review of the Bushfire Season 2019-20 and the ACT Legislative Assembly's Standing Committee on Justice and Community Safety's Review of the ACT Emergency Services Responses to the 2019-20 Bushfire Season. The Minister for Policing and Emergency Services is also advised by the ACT Bushfire Council that contain members with specialist knowledge in matters related to bushfire preparedness, response and recovery.

While most of the emergency management recommendations in the RCNDA had a greater focus on bushfire management than air quality, the benefits of a shift to an all-hazards approach were frequently noted and recommended.

What we have done so far:

- Findings from the review included building resilience into the objects of the *Emergencies Act 2004* and increasing clarity about state of alert and state of emergency. Both these elements are critical when

dealing with severe or prolonged smoke events and will need to be incorporated into any future smoke and air quality sub plans.

- ACT ESA provides a single source of truth for bushfire preparedness information, including communication on smoke management.

How we plan to meet this objective:

- Provide a single source of truth for bushfire preparedness information, including communication on smoke management.
- Deliver on the ACT Government's agreed commitments in response to the RCNDA (Appendix B) and other reports following the 2019-20 Black Summer bushfires.

5 – Support the development of buildings that are resilient to smoke pollution

The unprecedented bushfire smoke of 2019-20 was both severe and long lasting. For many people it was impossible to keep smoke out of their homes. The University of Canberra Living Well in the ACT Region 2020 survey found that 67% of survey respondents had a lot of smoke in their homes, and 36% also experience a lot of smoke in the workplace²⁰. Furthermore, places that normally act as respite to bushfire smoke, such as shopping centres and libraries, were also inundated with hazardous levels of smoke.

The technical design and construction of buildings is primarily set by the National Construction Code (NCC). The NCC sets the minimum standard for safety, health, amenity, accessibility, and sustainability of certain buildings and is updated every three years by the Australian Buildings Codes Board.

Currently, the code does not include specific references to climate change adaptation, such as ventilation and seals required to prevent smoke entry²¹. The next version of the NCC, which is produced on behalf of the Commonwealth, state and territory governments by the Australian Building Codes Board (ABCB), will be released in 2022.

The ACT Government has committed to improving the sustainability standards of buildings and commencing a 10-year pathway to shift to world's best practice on climate-ready and environmentally sustainable buildings, including expanding the ACT Appendix to the Building Code of Australia. The ACT Climate Change Strategy 2019-2025 also outlines actions to increase the sustainability of buildings through the development of climate-wise buildings that are resilient to the impacts of climate change.

Canberra's public spaces and buildings are also not designed to keep out smoke during severe and prolonged smoke events. Internationally, there is an increase in the development of clean air shelters, which are public places that people can access for respite from wildfire smoke²². In these countries, existing public buildings are converted to clean-air shelters by making changes to the ventilation system, positive pressure and seals²³.

In the Royal Commission into National Natural Disasters – Health Arrangements in Natural Disasters, the ACT Government recommended that HEPA-filtered smoke respite areas should be created in major town centres. This recommendation is supported by the ACT Government commitment to support clubs to become heat and smoke refuges and the Community Clubs Building Energy Efficiency Program. This program will require participating clubs to submit extreme weather plan that outlines actions a club could take in an official extreme weather event. These extreme weather plans will then assist the ACT Government to develop guidelines for official extreme weather refuge sites.

What we have done so far:

- Commenced a 10-year pathway to shift to world's best practice on climate-ready and environmentally sustainable buildings, including expanding the ACT Appendix to the ACT Building Code of Australia.
- Environment, Planning and Sustainable Development Directorate is currently participating at a national level on potential changes for the 2022 National Construction Code and will consider whether any ACT based variations are required when this work is more advanced.

- The Minister for Gaming will provide an update to the Legislative Assembly on the progress of implementing gaming related commitments under the Parliamentary and Governing Agreement of the 10th Legislative Assembly of the ACT (PAGA) including supporting clubs to be smoke and heat refuges.
- The Community Club Building Energy Efficiency Fund has recently been established to provide rebates to clubs for equipment energy upgrades, building envelope improvements and installation of rooftop solar and batteries to reduce electricity and gas bills. The rebates are capped at \$75,000 per club over four years from 2021-22 to 2024-25 and complements the development of clubs as smoke and heat refuges.

How we plan to meet this objective:

- Deliver on the ACT Climate Change Strategy 2019-2025
- Deliver on the ACT Living Infrastructure Plan
- Support the establishment of heat and smoke refuges for local communities

6 – Support the Health and Wellbeing of Canberrans affected by bushfire and wood smoke

Smoke generated from bushfires, prescribed burning, and wood heaters contain complex mixtures of gases and particles and are a major cause of health problems in the ACT.

Air pollution includes a mixture of major pollutants such as particulate matter (PM), carbon monoxide, carbon dioxide, nitrogen oxides and a range of other organic compounds including formaldehyde, benzene and polycyclic aromatic hydrocarbons²⁴. However, most evidence suggests that particulate matter is of the greatest concern to health²⁵.

Particulate matter (PM) refers to a mixture of solid and liquid particles suspended in the air. This includes primary particles that are emitted directly from sources, and secondary particles, which are produced by chemical reactions in the atmosphere²⁶. PM is a major public health risk as it can be suspended in the air and travel long distances in the wind²⁷. Particles less than 10 micrometres in diameter, PM₁₀, can enter the lungs through the nose and throat, and fine particles less than 2.5 micrometres in diameter, PM_{2.5}, are small enough to penetrate the lungs and enter the bloodstream²⁸.

Factors such as a person's age and pre-existing health conditions affect the severity of the health impacts experienced from PM_{2.5}, though there is currently no evidence of a "safe" threshold below which exposure to PM causes no health impacts²⁹³⁰. A study conducted in Australia found that PM_{2.5} was estimated to have accounted for approximately 1590 deaths annually³¹.

Health may also be impacted by short and long-term exposure to PM_{2.5}. Short-term exposure can cause health problems such as nose and throat irritation, lung diseases and heart attacks, whilst long-term exposure can lead to reduced lung function and the development of cardiovascular and respiratory diseases, which may reduce life expectancy³².

Preliminary evaluations of the health effects caused by the Black Summer bushfires have identified a smoke-related health burden. One study estimated that in the ACT bushfire smoke caused:

- 31 excess deaths
- 82 cardiovascular hospital admissions
- 147 respiratory hospital admissions
- 89 'smoke-related' emergency department presentations, including for asthma³³³⁴

Other health impacts of the Black Summer bushfire smoke event in the ACT included worsening of physical health problems, difficulty sleeping and reductions in outdoor exercise.

A report conducted by Asthma Australia, Bushfire Smoke Impact Survey 2019-2020 found that the unprecedented levels and duration of exposure to bushfire smoke in Canberra had significant impacts on mental health, including new and increased symptoms of anxiety and depression³⁵.

A 2020 survey by the ACT Commissioner for Sustainability and Environment found that 71% of respondents reported a change in their mental health, while 53% of respondents with a history of mental illness experienced a worsening of symptoms due to the bushfires³⁶. For 26% of respondents in the Living Well in the ACT Region survey, the smoke event triggered traumatic memories or events, particularly those in Tuggeranong and Weston Creek, which were the most impacted by the 2003 Canberra Bushfires³⁷

More broadly, the RCNNDA identified that there is compelling evidence of the impacts of natural disasters on mental health including increased rates of stress, depression, anxiety, post-traumatic stress disorder (PTSD), alcohol and substance abuse, aggression and violence, suicide, and exacerbation of other underlying mental health problems. These effects can also endure over an extended period and take time for symptoms to present.

The RCNNDA also found that there is often a significant surge in pressure on acute health services, such as hospitals, during a natural disaster and that primary care providers play a role in alleviating this pressure: preventing unnecessary presentations to hospital emergency departments and freeing up resources for critical needs.

The RCNNDA identified the importance of effective integration of mental health response is disaster planning to ensure a proactive response to the short, medium and long-term mental health effects following natural disasters. Beyond the available research, the ACT has identified that there are gaps in knowledge about indoor and outdoor air quality and its effect on physical and mental health, particularly in respiratory presentations at Emergency Departments, and resilience to cope with compounding effect of repeated disaster events. In addition, the ACT will also need to consider the effects that smoke cover, like what affected Canberra in 2020, and particularly the smell of fire and smoke can have on retraumatising members of the community, even in the absence of any direct fire danger.

During the Black Summer bushfire smoke event ACT Health provided public health messaging on pollutant levels, the air quality index, advice on when to stay indoors and advice on the use of face masks. Two-thirds of respondents to the Living Well in the ACT Region survey found it easy to obtain information on air quality, however, more than half did not know how to use this information to assess the risk of going outside on high air pollution days. Others felt helpless on how to use the public health messaging to reduce the potential impacts of smoke pollution on their own health³⁸.

The community's difficulty in understanding public health messaging about air quality was reflected in RCNNDA recommendations for governments.

What we have done so far:

- The RCNNDA called for the inclusion of primary care in disaster management; prioritising mental health during and after natural disasters; and enhancing health and mental health datasets.
- The ACT's emergency management arrangements provide effective mechanisms for the participation of primary healthcare providers in disaster planning (including cross-border) and their activation to support responses to natural disasters.
- The ACT's recovery arrangements also provide disaster-ready arrangements to support the delivery of appropriate mental health services following a natural disaster. These arrangements have been extensively exercised during the COVID-19 pandemic.
- The ACT Government supports the ongoing strengthening of health and mental health datasets to better measure mental health impacts related to natural disasters and to ensure the appropriate sharing of health and mental health datasets.
- In its Submission to the RCNNDA, the ACT also noted access to training and information for primary care providers on mental health impacts would be highly beneficial.

- The Living Well in the ACT region survey first collected data in the period immediately before the bushfires during the summer of 2019-20. The timing of the survey data collection provides a unique snapshot of wellbeing 'before' and 'after' the experience of bushfire, hailstorm and COVID-19.

How we plan to meet this objective:

- Better health outcomes are achieved during poor air quality events through clear and effective communications strategies
- Health and wellbeing initiatives are informed by local and national sources of evidence.

7 – Provide targeted support to vulnerable populations and workers during severe air pollution events

Studies show that vulnerable populations, such as the elderly, infants, Aboriginal and Torres Strait Islander people and people with underlying cardiovascular and respiratory disorders are more susceptible to the short-term and long-term impacts of exposure to particulate matter³⁹⁴⁰.

People with socioeconomic difficulties are also at risk, as they are less likely to have access to air conditioning, good insulation and air purifiers, and are more likely to have 'leaky' houses that provide little protection from smoke.

Pregnant women are also considered a vulnerable population, and research following the 2019-20 Black Summer bushfires suggests that there may be a link between PM_{2.5} exposure, maternal stress and adverse infant outcomes⁴¹, and that exposure to air pollution is linked to lower birth weights and premature deliveries. A 2020 Survey by the ACT Commissioner for Sustainability and Environment found that pregnant women and new mothers experienced increased stress from the 2019/20 bushfires and smoke event because they were concerned for the wellbeing of their infants⁴².

The RCNDA recommended that Australian, state and territory governments develop close to real-time, nationally consistent air quality information, including consistent categorisation and public health advice and targeted health advice to vulnerable groups. The early notification of worsening air quality enables the community, including vulnerable groups, to take preventative action, such as seeking cleaner air spaces, sealing an indoor environment, or taking preventative medication.

Submissions to the RCNDA expressed concern that evacuation centres were not always appropriately equipped for vulnerable people, such as those with disabilities, mobility issues or chronic health concern, or for pregnant women, infants and young children.

A recommendation made by the RCNDA was that state and territory governments should ensure those responsible for evacuation planning periodically review these plans, and update them where appropriate, to account for the existence and standard of any evacuation centres and safer places in the community, including the suitability of facilities to cater for diverse groups, including vulnerable people, and those evacuating with animals.

During the smoke event of the 2019-20 Black Summer bushfires it became evident that other groups within the population were vulnerable to the effects of smoke exposure in outdoor areas. These groups included outdoor workers and people attending outdoor events, where there was no or limited access to respite. In response to the hazardous air quality conditions Worksafe encouraged employers across Canberra to look at mitigation strategies to manage heat and smoke conditions, particularly by stopping strenuous or outdoor work wherever possible.

Employers and businesses will have work health and safety (WHS) duties under the Work Health and Safety 2011 to manage heat and smoke conditions to protect, as far as reasonably practicable, their workers' health and safety at the workplace. These duties require persons conducting a business or undertaking (PCBU) to assess the risks to health and safety that smoke generated by bushfires pose to all workers, whether working outdoors or indoors. In doing so, employers are then to implement control measures as needed to eliminate, and if not possible, minimise the risks to workers.

It is noted that external factors may also affect workplace risks, such as where air quality in the home environment may be the same or worse than in the workplace affecting working from home arrangements, indoor air quality may also vary in the workplace, air quality may change over the course of a day requiring ongoing monitoring and consultation with workers and individual factors that may make some workers more vulnerable or at risk than others. Other risk factors such as the current COVID-19 emergency and related restrictions would also be a factor in implementing control measures to respond to workplace risks associated with air quality.

Advice from the ACT Work Health and Safety Council has been that during the 2019-20 bushfire event there was a need for clearer more nuanced information to assist businesses in meeting their work health and safety obligations associated with workplace air quality risks.

The hazardous air quality and prolonged duration of the 2019-20 smoke event resulted in ACT providing public information on the proper use of P2 and N95 face masks (face masks). There were significant shortages of face masks in the ACT, and on the 6 January 2020, it was announced that face masks would be delivered to pharmacies and Winnunga Nimmityjah Aboriginal Health Service for people who were most at risk of the health impacts of exposure to the smoke. A small supply of face masks was also provided to the ACT by the Commonwealth Government.

There is mixed evidence about whether using face masks effectively minimises the impact of poor air quality on physical health. The RCNDA received feedback that the evidentiary basis for their use is relatively poor. It identified that a better understanding of the effectiveness of face masks, as well as filters and air quality shelters, is needed. The RCNDA also found that advice relating to the use of face masks can be confusing and inconsistent.

Other studies, including a report from the British Columbia Centre for Disease Control in 2014⁴³ and a study of the health effects of wildfire smoke in children in 2020⁴⁴, suggest that the use of face masks effectively protects against particulate matter (PM), or is likely to decrease exposure to the particulate matter found in wildfire smoke.

During the 2019-2020 Black Summer bushfires, the Australian Government announced that approximately \$3 million from the Medical Research Future Fund will be provided for research into the physiological impacts of prolonged bushfire smoke exposure, including projects on the respiratory impacts of bushfire smoke on vulnerable groups and the efficacy of face masks in filtering bushfire smoke.

Asthma Australia released a report following the Black Summer bushfires recommending the Commonwealth Department of Health develop a strategy on access by people with asthma during air pollution events, covering:

- maintaining a stockpile of appropriate face masks and developing a strategy to distribute them to people in all areas affected by poor air quality, particularly people in high-risk groups and
- providing clear guidance on the optimal way to use face masks, including risks and limitations.

What we have done so far:

- The ACT Government emergency management governance arrangements already provide mechanisms for the periodic review of evacuation plans and arrangements to factor in the diversity of communities and the resilience of the evacuation centre.
- In response to the 2019-20 hazardous smoke event, the ACT Government carried out upgrades of air conditioning and filtration.
- The ACT Government has also completed changes to its online public information about air quality.

How we plan to meet this objective:

- Continue to progress strategies to better manage air quality for vulnerable groups including increased filter replacement at the Canberra Hospital and closing doorways which would usually be left open to stop the spread of smoke; and
- Strong and effective engagement strategies targeting vulnerable populations and workers
- Continue design work on new schools and continued energy efficiency upgrades to older schools to improve resilience to extreme smoke events through insulation, air locks, automatic doors and draught-proofing.
- Undertake a detailed review to ensure that information regarding vulnerable people can be appropriately accessed, provided, and used during an emergency event.

8 – Provide economic supports to businesses, communities and individuals affected by severe bushfire smoke

The unprecedented bushfires that occurred in and around the ACT during December 2019 and January 2020 revealed a need to ensure targeted, accessible financial support for businesses affected by poor air quality.

Extensive smoke from bushfires in NSW affected the ACT particularly in early January. Businesses across the ACT were significantly impacted by sustained periods of extreme and hazardous smoke conditions, including larger shopping centres and supermarkets which would typically provide some relief from bushfire smoke.

Outdoor business operations were particularly impacted by the extreme and hazardous smoke conditions. Tourism business in Canberra reported a 20% cancellation rate, and Australia Post was unable to complete deliveries due to safety concerns for their workers⁴⁵. Long after the smoke from the Black Summer bushfires cleared, winemakers in the Canberra district had to abandon their smoke-tainted 2020 vintage which is estimated to have cost the industry millions of dollars.

The initial location of the fires being in NSW, and the fact that the loss of revenue was not directly caused by fire damage added additional complexities for businesses seeking to claim financial compensation.

In response to the 2019-20 bushfires ACT Government established a registration platform through Access Canberra for businesses that had been significantly impacted by the hazardous smoke conditions. Economic Development case managed approximately 120 businesses that registered through Access Canberra.

Disaster recovery assistance was also activated in response to the 2019-20 bushfires, including concessional interest rate loans for farmers and small businesses and to help with residential clean-up. Two outdoor recreation businesses and one retail business that all experienced significant and ongoing revenue loss accessed concessional loans.

As climate-driven extreme weather events such as bushfires become more frequent and intense, disaster funding needs to be evaluated to ensure that people can access targeted and timely financial assistance. The ACT Government recognises the benefit of developing and maintaining pre-agreed recovery programs to support the timely and effective deployment of these programs.

The ACT Government is also supportive of developing greater consistency in the provision of financial support under the Disaster Recovery Funding Arrangements, where existing state and territory programs allow.

What we have done so far:

- The ACT, as part of a national effort of the Australian, state and territory governments has progressed several reforms to the Disaster Recovery Funding Arrangements ahead of the 2020-21 summer season.
- The Canberra Business Advice and Support Service (CBASS) was initiated to support Canberra businesses that had been impacted by extreme events including the 2019-20 bushfires and January 2020 hailstorm.

- CBASS is available for ACT businesses to receive free personalised business advice including addressing the impact of these events. The service has been extended to provide business support and advice broadly but also to businesses being impacted by the COVID-19 emergency.
- Smoke Taint Grants were activated in the ACT to support eligible wine grape producers impacted by smoke taint damage from the bushfires. These grants of \$10,000 were provided to four local producers.

How we plan to meet this objective:

- Engage with the Commonwealth led review of existing Disaster Recovery Funding Arrangement, including application processes, eligibility, and focus.
- Coordinate with Australian, state and territory governments to broaden of the Disaster Recovery Funding Arrangements to encompass funding for recovery measures that are focused on resilience, including in circumstances which are not 'exceptional'.
- In consultation with Australian, state and territory governments, evaluate the effectiveness of existing financial assistance measures to inform the development recovery supports.

Implementation and Reporting

Following the development of each Action Plan, relevant ACT government directorates will be responsible for the implementation, reporting and evaluation of each action, subject to availability of funding.

At the end of each Action Plan, whole of government reporting will update on the progress of each action.

The first Action Plan for the Bushfire Smoke and Air Quality Strategy 2021-2025 includes the actions for the first two years of the strategy and is attached at Appendix A of this Strategy.

Appendix A – First Action Plan of the Bushfire Smoke and Air Quality Strategy 2021-2025

Objective	Action	Responsible Directorate
1 - Support the implementation of the Strategic Bushfire Management Plan to manage and reduce bushfire risks and consequences in the ACT	Review air quality monitoring approaches during fuel reduction burns as part of the Strategic Bushfire Management Plan.	JACS (Emergency Services Agency)
2 - Strengthen measures to address the air quality impacts of wood heaters	Investigate the utility and reliability of suburban air quality monitoring to collect data on the prevalence of wood smoke in suburban areas across Canberra.	ACT Health
	Review and strengthen wood heater emissions standards (to 1 gram particulate matter/kg of fire wood burnt from 1.5) via building regulations, including investigating and implementing measures to phase out wood heaters that don't meet standards.	EPSDD
	Evaluate the Burn Right to Tonight campaign; the Wood Heater Replacement Program; and the efficacy of measures to ensure that firewood sold is seasoned, sustainably sourced, and meets compliance with Government recommended wood burning practices.	EPSDD
3 - Enhance air quality monitoring and forecasting	Investigate and implement air quality forecasting systems.	ACT Health
	Investigate the feasibility, utility, reliability and potential ongoing costs of a low-cost air quality sensors network.	ACT Health
4 - Consider the impact of air quality associated with bushfire smoke through all phases of the emergency management continuum	Provide a single point of truth for bushfire preparedness information including communication on smoke management.	JACS (Emergency Services Agency)

Objective	Action	Responsible Directorate
5 - Support the development of buildings that are resilient to air pollution	Identify and support smoke refuges, including by supporting clubs to become heat and smoke refuges for local communities. This will include ensuring appropriate air filtration systems, and financial payments for venues designated as official extreme weather refuge sites.	JACS / CSD
	Deliver on the ACT Climate Change Strategy 2019-2025, including development of a Climate-wise building Code	EPSDD
	Deliver on Parliamentary and Governing Agreement to commence 10-year pathway to shift to worlds best practice on climate-ready and environmentally sustainable buildings and consider appropriate changes to building standards in the ACT including working with the ABCB to consider changes to the National Construction Code.	EPSDD
	Deliver on the ACT Living Infrastructure Plan	EPSDD
	Establish a five-year \$5 million Building Energy Efficiency Upgrade Fund, to be accessed by community clubs	EPSDD
6 - Support the Health and Wellbeing of Canberrans affected by bushfire and woodfire smoke	Consider available health data and information related to the impacts of natural disasters, including mental health.	ACT Health / Office of Mental Health
	Update public health messaging to provide clear and consistent information on managing anxiety and mental health and wellbeing during periods of severe bushfire smoke and hazardous air quality.	ACT Health
	Inform the community on ways to reduce the amount of smoke entering buildings.	ACT Health

Objective	Action	Responsible Directorate
7 - Provide targeted support to vulnerable populations and workers during severe air pollution events	Undertake a detailed review to ensure that information regarding vulnerable people can be appropriately accessed, provided and used during an emergency event.	ACT Health/JACS
	Develop specific guidance material to help employers and industry manage the risks of bushfire smoke in the workplace	CMTEDD/WorkSafe ACT
8 -Provide economic supports to businesses, communities and individuals affected by severe bushfire smoke	Engage with the Commonwealth-led review of the existing Disaster Recovery Funding Arrangements, including application processes, eligibility and focus (i.e. Category D).	JACS/CMTEDD
	Coordinate with Australian, state and territory governments to broaden of the Disaster Recovery Funding Arrangements to encompass funding for recovery measures that are focused on resilience, including in circumstances which are not 'exceptional'.	JACS/CMTEDD
	In consultation with Australian, state and territory governments, evaluate the effectiveness of existing financial assistance measures to inform the development of a suite of pre-effective pre-determined recovery supports.	JACS/CMTEDD
*CMTEDD – Chief Minister, Treasury and Economic Development Directorate, JACS – Justice and Community Safety Directorate, EPSDD – Environment, Planning and Sustainable Development Directorate		

Appendix B – Extract of recommendations from the Royal Commission into National Natural Disaster arrangements

Recommendations included in the following table have been taken from the RCNDA and are those that relate to objectives in this Strategy. Some of the recommendations listed are being actioned by the ACT Government, however, many of these actions are being led by the Commonwealth Government with assistance from state and territory governments.

Recommendation no.	Recommendation
12.4	<p>Sheltering terminology should be made nationally consistent</p> <p>State and territory governments should, as a priority, adopt nationally consistent terminology and functions for the different sheltering facilities, including evacuation centres, Neighbourhood Safer Places, places of last resort and natural disaster shelters.</p>
13.3	<p>The Australian Warning System</p> <p>State and territory governments should urgently deliver and implement the all-hazard Australian Warning System.</p>
13.4	<p>An education campaign on the Australian Warning System</p> <p>State and territory governments should ensure that the implementation of the Australian Warning System is accompanied by a carefully developed national education campaign that considers the needs of all Australians.</p>
13.6	<p>Exploring the development of a national, all-hazard warning app</p> <p>Australian, state and territory governments should continue to explore the feasibility of a national, all-hazard emergency warning app.</p>
14.1	<p>Nationally consistent air quality information, health advice and interventions</p> <p>Australian, state and territory governments should:</p> <ol style="list-style-type: none"> 1. develop close to real-time, nationally consistent air quality information, including consistent categorisation and public health advice 2. greater community education and guidance, and 3. targeted health advice to vulnerable groups.
14.2	<p>National Air Quality Forecasting Capability</p> <p>Australian, state and territory governments should develop national air quality forecasting capabilities, which include broad coverage of population centres and apply to smoke and other airborne pollutants, such as dust and pollen, to predict plume behaviour.</p>

Recommendation no.	Recommendation
18.2	<p>Indigenous land and fire management and public land management</p> <p>Australian, state, territory and local governments should explore further opportunities to leverage Indigenous land and fire management insights, in the development, planning and execution of public land management activities</p>
19.4	<p>National Construction Code</p> <p>The Australian Building Codes Board, working with other bodies as appropriate, should:</p> <ol style="list-style-type: none"> 1. assess the extent to which AS 3959:2018 Construction of buildings in bushfire-prone areas, and other relevant building standards, are effective in reducing risk from natural hazards to lives and property, and 2. conduct an evaluation as to whether the National Construction Code should be amended to specifically include, as an objective of the code, making buildings more resilient to natural hazards.
22.1	<p>Evaluation of financial assistance measures to support recovery</p> <p>Australian, state and territory and local governments should evaluate the effectiveness of existing financial assistance measures to inform the development of a suite of pre-effective pre-determined recovery supports.</p>
22.3	<p>Review the thresholds and activation process for the Disaster Recovery Funding Arrangements</p> <p>Commonwealth led - In reviewing the Disaster Recovery Funding Arrangements, Australian, state and territory governments should examine the small disaster criterion, and financial thresholds generally.</p>
22.4	<p>Nationally consistent Disaster Recovery Funding Arrangements assistance measures</p> <p>Commonwealth led - Australian, state and territory and local governments should develop greater consistency in the financial support provided to individuals, small businesses and primary producers under the Disaster Recovery Funding Arrangements.</p>
22.6	<p>Better incorporate ‘build back better’ within the Disaster Recovery Funding Arrangements</p> <p>Commonwealth led - Australian, state and territory governments should incorporate the principle of ‘build back better’ more broadly into the Disaster Recovery Funding Arrangements.</p>

Recommendation no.	Recommendation
22.7	<p>Disaster Recovery Funding Arrangements recovery measures to facilitate resilience</p> <p>Commonwealth led - Australian, state and territory governments should broaden Category D of the Disaster Recovery Funding Arrangements to encompass funding for recovery measures that are focused on resilience, including in circumstances which are not 'exceptional'.</p>
22.8	<p>Streamline the Disaster Recovery Funding Arrangements processes</p> <p>Commonwealth led - Australian, state and territory governments should create simpler Disaster Recovery Funding Arrangements application processes.</p>

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