Submission No 47

INQUIRY INTO HEALTH IMPACTS OF EXPOSURE TO POOR LEVELS OF AIR QUALITY RESULTING FROM BUSHFIRES AND DROUGHT

Organisation: NSW Government

Date Received: 27 April 2020

NSW Government Submission

Inquiry into the health impacts of exposure to poor air quality due to bushfires and drought

NSW GOVERNMENT

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The health impacts of exposure to poor air quality resulting from bushfires and drought

The NSW drought that began in mid-2017 and the 2019-20 bushfire season were exceptional events that created an unprecedented period of poor air quality across NSW. Particulate matter smaller than 2.5 micrometers in diameter (PM2.5) was the main contributor to this poor air quality.

The health effects of PM2.5 are well understood and informed by a substantial body of scientific evidence.[1,2,3] For most people, the effects of exposure to PM2.5 in bushfire smoke are mild symptoms like sore eyes and coughing. More serious effects are rare, but include worsening of asthma, hospital admission with respiratory and cardiovascular conditions and premature death. People with existing lung and heart conditions are at higher risk of serious effects because exposure to fine particles may worsen their illness. Young children, elderly people and pregnant women may also be more vulnerable.

Health impacts of exposure to poor levels of air quality

Quantification of the impacts of poor air quality requires sophisticated analysis of data from various sources, including data on ambulance call-outs, hospital admissions, pregnancy outcomes and deaths. These data will take several months to process before they are available for analysis. NSW Health is actively supporting researchers to access and analyse data to improve our understanding of the impact of this event. NSW Health has also supported the Medical Research Future Fund's 2020 Bushfire Impact Research Grant Opportunity to fund research into the health impacts of this event.

During the bushfire event, NSW Health used the NSW Public Health Rapid, Emergency, Disease and Syndromic Surveillance (PHREDSS) system to monitor the impacts of bushfires. The PHREDSS system provides daily monitoring of most unplanned presentations to NSW public hospital emergency departments and all emergency Triple Zero (000) calls to NSW Ambulance.

Over the 2019-20 summer period, there were sustained increases across NSW for presentations to emergency departments(ED) for asthma and breathing problems and ambulance calls for breathing problems, above expected year-on-year increases in activity. Presentations to ED for cardiovascular and chest problems were similar to the historical average.

During the period of most intense bushfire activity and statewide emergency response from 11 November 2019 to 9 February 2020:

- 11.4 per cent (29,685) of total ambulance emergency calls (260,942) were for breathing problems, nine per cent higher than the five year average for the same period of 10.4 per cent
- 2.1 per cent (14,140) of total unplanned presentations (675,228) to 67 NSW emergency departments, were for asthma and breathing problems, 10 per cent higher than the five year average for the same period of 1.9 per cent
- 8.3 per cent (55,769) of total unplanned presentations (675,228) to 67 NSW emergency departments were for cardiovascular problems or chest pain, similar to the five year average for the same period of 8.3 per cent.

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[1] US EPA (2019). Integrated science assessment for particulate matter. Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment- RTP Division.
[2] US EPA (2019). Wildfire smoke: A guide for public health officials. Research Triangle Park, NC: U.S. Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment- RTP Division.
[3] WHO (2013). Review of evidence on health aspects of air pollution – REVHIHAAP: final technical report. Copenhagen: World Health Organization Regional Office for Europe.

PHREDSS data is more useful for detecting changes in trends over time rather than the community burden of bushfire related smoke exposure. Not all ED presentations or ambulance calls relating to exposure to bushfire smoke will be captured by the PHREDSS system.

The effectiveness of measures to mitigate the health impacts of exposure

NSW Health provided the following information to assist people to make decisions about how to manage their health and reduce exposure:

- Follow medical advice about medicines and asthma management, and keep reliever medication close at hand.
- Monitor air quality and health messages available on the NSW Department of Planning, Industry and Environment website.
- Avoid vigorous outdoor activity when conditions are smoky.
- Spend more time indoors with doors and windows shut to keep out smoke. Open windows and doors when smoke clears to reduce smoke that may have entered the home.
- Spend time in air-conditioned venues such as cinemas, libraries and shopping centres.
- Avoid indoor sources of air pollution such as cigarettes, candles and incense sticks.
- P2 face masks can filter out PM2.5 from smoke when worn correctly. To be effective, a P2 face mask must maintain a good seal with the face.
- Air purifiers with a high efficiency particle (HEPA) filter can reduce PM2.5 indoors. For the air purifier to work well, the purifier must be appropriate for the size of the room and the room should be well sealed.

These measures are generally low cost and likely to reduce exposure. In December 2019, NSW Health convened a panel of public health and air pollution experts to review and provide advice on these messages.

Impact on people who are exposed to poor outdoor air quality in the workplace

Each year, SafeWork NSW receives more than 200,000 calls and 10,000 emails from customers about a wide range of workplace health and safety issues. The following requests about the health impacts from exposure to poor air quality were received for the:

- ongoing **drought**: no requests for service were received reporting health concerns about the ongoing drought (1 January 2017 – 6 March 2020)
- 2019-20 **bushfire** season: 38 requests for service were received relating to bushfire smoke (1 August 2019 – 6 March 2020).

In response to the bushfire event, SafeWork NSW prepared the following resources:

- An inspector guide, *Managing the effect of bushfire smoke in the workplace* through the Bushfire smoke webpage. This information provided advice to businesses and other persons conducting a business or undertaking (PCBUs) who were not directly involved in firefighting, but might have had staff affected by the smoke caused by the bushfire emergencies
- Matters arising in relation to first responders were dealt with through SafeWork NSW's ongoing relationship with the relevant agencies.

The effectiveness of the NSW Government to plan for and improve air quality

NSW has strong policy and regulatory systems to improve air quality and protect the health of NSW communities from air pollution events. NSW targets its air quality improvement actions to achieve the greatest benefits for the health of the NSW population. These actions are developed from a sophisticated understanding of the evidence relating to air pollution sources, air quality and health impacts and best practice approaches.

Nationally consistent air quality standards under the National Environment (Ambient Air Quality) Protection Measure guide jurisdictional policy on air pollution. In 2015, Australia adopted standards for fine particles that are still among the strongest in the world, following a review led by NSW. NSW has been working with other jurisdictions to review the national air quality standards for sulfur dioxide, nitrogen dioxide and ozone. The review is expected to be complete by end of 2020.

The NSW Environment Protection Authority (EPA) has a comprehensive and robust air quality framework to regulate industry in NSW. This framework includes a contemporary range of compliance and enforcement tools, complemented by strong penalties and the ability to seek court orders to redress environmental impacts and recover any monetary benefits from non-compliance.

The NSW Department of Planning, Industry and Environment (DPIE) runs a comprehensive air quality network and program to monitor, map and forecast air pollution, characterise the impacts of air pollution and develop an evidence base for improving air quality.

Measurement and reporting

As part of the NSW Government's long-standing commitment to providing reliable, timely air quality information, DPIE operates the largest and longest running air quality monitoring network in Australia. NSW has led air quality monitoring and reporting in Australia with the most comprehensive air quality calibration laboratory. This is the first near real-time air pollution alert system and open access to air quality data.

In recent years, the NSW Government made major new commitments to air quality. This includes the establishment of new monitoring stations in the 'Three Cities' CBDs (Sydney, Parramatta and Penrith), the expansion and upgrade of the Rural Air Quality Monitoring Network, the establishment of baseline air quality monitoring in rural NSW, the enhancement of the NSW Government air quality website, data and information delivery system and the provision of statewide air quality forecasting and alerts.

Emergency monitoring was established in NSW in response to the Victorian Hazelwood mine fire. This capability was commissioned in March 2014 while the Hazelwood fire was still burning and provides emergency response monitoring anywhere in NSW. The NSW emergency monitoring capability was fully employed during the 2019-20 bushfire season.

NSW Air Quality Observation Network during 2019-20 event

Over the 2019-20 bushfire season, nine temporary monitoring stations were deployed at Batemans Bay, Coffs Harbour, Cooma, Grafton, Lismore, Merimbula, Port Macquarie, Taree, and Ulladulla to provide critical information during the emergency. These stations are established at short notice, to provide the community with near-real-time information about local or transported smoke impacts via the NSW Government air quality website. Further information on the emergency monitoring for the bushfire season can be found at: www.environment.nsw.gov.au/research-and-publications/publications-search/emergency-air-quality-monitoring-in-response-to-bushfires

The air quality and emergency monitoring capabilities and the ongoing upgrades to the Rural Air Quality Monitoring Network enabled DPIE to respond quickly and have resources to deploy and redeploy when they became available.

During the bushfires, the NSW Government air quality website received up to 500,000 unique users each week. This placed pressure on the existing systems, which were gradually upgraded over the bushfire event to ensure information was always delivered.

DPIE responded to public feedback over this busy period by introducing a number of improvements to the website. This included a centralised location for information on air quality, prominent and clear health advice, and provision of hourly average particulate matter air pollution data, mobile friendly and regional air quality at-a-glance design and ease of registering for SMS alerts.

From October 2019 to January 2020, more than 9,000 new subscriptions for the daily air quality ratings and forecasts were added.

NSW Air Quality Forecasting Framework

DPIE is responsible for delivering air quality forecasts through the NSW Air Quality Forecasting Framework. The framework uses a number of modelling systems to forecast air pollution in Sydney and the Greater Metropolitan Region up to 72 hours ahead. The framework includes a comprehensive airshed modelling system (CCAM-CTM), trajectory and plume modelling (HYSPLIT-NSW), a combination of machine learning based statistical models and domain expert knowledge, and comprehensive emissions and emissions modelling system which includes bushfire, dust and power station emissions modules.

The framework provides additional modelling and forecasting capability as part of the DPIE air pollution emergency/incident response function, for example with trajectory and plume modelling.

All models are coupled with the Bureau of Meteorology's (BOM) ACCESS meteorological forecast which is used as the primary meteorological input to the framework. This allows DPIE scientists and forecasters to focus on the emission uncertainties rather than the meteorological uncertainties.

The framework's smoke modelling capability is used in parallel to the NSW RFS's smoke modelling to assist in understanding the impacts of planned hazard reduction burns, particularly on large population centres. The DPIE forecasting accounts for cumulative air pollution arising from bushfires emissions and other natural and human source emissions.

NSW Smoke Modelling Framework

The NSW RFS has smoke modelling capabilities. Its primary system uses an interface that combines a weather forecast model (CCAM) with a smoke/pollution modelling software (TAPM) and a mapping module to animate the outputs. This software was principally designed to support hazard reduction burning. Whilst it has a number of limitations, where appropriate, it can be useful for bushfires particularly in their initial stages.

This smoke modelling capability is routinely used to underpin risk assessment or decisions relating to firefighting operations or public information. This could include staging hazard reductions, changing lighting patterns or the size of the burn.

In 2018, the NSW Government started a pilot, chaired by DPIE, of an interagency Hazard Reduction Burn Smoke Management Protocol. This pilot has been ongoing and has resulted in the NSW RFS modelling hazard reduction burn smoke using the CCAM/TAPM software on a routine basis to fulfil the obligations of the protocol. Via this protocol, the NSW RFS provides smoke modelling to DPIE for consideration in air quality forecasting. This information is sometimes published on the NSW RFS website. Under the protocol, if DPIE forecasts 'poor' or 'worse' air quality, duty air quality forecasters provide feedback to the RFS, consults with NSW Health and

notifies the EPA (Chief Environmental Regulator) who in turn may seek further consultations and information.

While the protocol primarily relates to hazard reduction burning, elements of the protocol are applicable to bushfires and before the 2019-20 Fire Season. The Hazard Reduction Smoke Steering Committee discussed extending the protocol to bushfires. Linkages established via the protocol assisted with coordination over the season.

It should also be noted that over the 2019-20 fire season, the NSW RFS was trialing the BOM's national Air Quality Forecast System (AQFx).

There are many challenges associated with smoke management including:

- The geographies of many of our major population centres are not conducive to smoke dispersion. As an example, the Sydney Basin is fringed by ranges that effectively create a bowl and when combined with low level inversions, traps smoke from bushfires or hazard reduction burns during periods of stable weather. Its proximity to the coast mean that prevailing weather conditions during favourable hazard reduction burning periods can often concentrate smoke.
- Hazard reduction burning is an effective bushfire mitigation tool, however, hazard reduction burning can have smoke-associated health risks.
- Bushfires are difficult to characterise and develop model inputs. There will be degrees of uncertainty in modelling smoke from bushfires as there will be an undetermined level of accuracy to predict how much area will burn (and consequently generate smoke) for a given period.
- Smoke also has the potential to travel large distances. Smoke from the 2019-20 bushfires crossed international borders and reached the stratosphere.

Public information

The NSW Government air quality website provides daily forecasts for Sydney and near real-time information for other regions where air quality is monitored. The public can sign up to receive a daily SMS or email, with air quality ratings and forecasts.

Air quality information is provided in a colour-coded Air Quality Index (AQI) that displays levels of observed air pollution against national standards. An AQI of 100 or more (POOR) indicates that air pollution has exceeded national standards and triggers air quality alerts. When values exceed 200, air quality is reported as HAZARDOUS. The other main categories are VERY GOOD (0-33), GOOD (34-66) and FAIR (67-99).

During the bushfire event, health information and guidance was added to the air quality website to make it simpler to access this information. A change was also made to allow the reporting of hourly-average PM2.5 concentrations.

Following the bushfires, the NSW Government is continuing work to further enhance the air quality website and ensure national consistency in the communication of air quality information.

The NSW RFS is the lead agency for providing information relating to bushfire, bushfire warnings and hazard reduction activities. The NSW RFS is supported by DPIE and NSW Health in the communication of information about smoke.

Where there is, or is likely to be, a significant amount of smoke, the NSW RFS may produce a Smoke Advisory on its website. This provides information about the source of the smoke and directs users to health and environmental information provided by other agencies. The NSW RFS works closely with NSW Health and other bodies including the Asthma Foundation in the event of predictions of poor air quality, normally due to hazard reduction burning. The NSW RFS also includes references to possible smoke issues in its communications activities and warnings.

Whilst smoke from bushfires and hazard reduction burning is a whole of government responsibility, as the lead agency for bushfires, the NSW RFS leads public information on bush and grass fires as

well as hazard reduction burning. Often this is irrespective of the tenure or lead agency undertaking the response or hazard reduction activity. The Hazard Reduction Smoke Communications Protocol coordinates responsibility for communication, triggers and messages appropriate for the level of activation. It has led to improved public messaging for hazard reduction smoke events.

During the 2019-20 bushfire event, NSW Health used general and social media channels to provide information messages and videos. These messages focused on the groups at higher risk from exposure to air pollution and the steps people could take to reduce exposure to bushfire smoke. Much of this communication was done locally by the Local Health Districts that were most impacted by bushfires.

NSW Health also provided specific information about air pollution and health to general practitioners, pharmacists and local health districts. NSW Health liaised with the NSW Department of Education on information provided to schools and sent information about reducing the health risk of smoke to more than 4,000 child care centres across NSW.

Provision of protective materials

NSW Health distributed more than 700,000 P2 face masks from the Commonwealth to Multipurpose Services (integrated health and aged care services in small rural locations in Southern, Illawarra Shoalhaven and Murrumbidgee Local Health Districts), evacuation and recovery centres, Aboriginal Medical Services, general practices and community pharmacies in bushfire affected regions to assist in reducing exposure to bushfire smoke.

Drought

The DPIE air quality monitoring network includes 35 Rural Air Quality Monitoring Network sites. Six of these sites are located outside New South Wales but are still run by DPIE in partnership with catchment management authorities and land services. These sites will act as early warning stations for potential air pollution events moving in from other jurisdictions.

Over many years, the EPA has carried out a range of initiatives to ensure the minimisation of air-borne dust from major regulated sources, such as coal mines, which are required to use best practice dust management .

During spring 2019, the EPA undertook Operation Bust the Dust, targeting Hunter Valley coal mines to tackle excessive dust levels. Operation Bust the Dust involved frequent inspections of mines on hot, dry and windy days, to check that extra controls were in place at the mines to minimise dust. Coal mines are required to implement procedures to reduce dust from their operations, such as by watering unsealed roads, avoiding dust-generating activities during windy weather and minimising the impact of drilling operations. Officers continue to use the latest technology, including drones, to see the source of any dust and to check that the appropriate controls are in place.

The EPA, in consultation with the mining industry and DPIE, publishes the *Dust Assessment Handbook* to assist mine operators in the Hunter Valley to improve air quality. This document was most recently updated in late 2019.

The Rural Air Quality Monitoring Program, run by DPIE, is a citizen-science program that gathers data about dust storms to monitor wind erosion. Details can be found at: www.environment.nsw.gov.au/topics/land-and-soil/soil-degradation/wind-erosion/community-dustwatch.

The Rural Air Quality Monitoring Program and its predecessors have been running for decades and have considerable data on dust storm activities across eastern Australia. The program works with landholders, helping them improve land management practices by tracking land cover and erosion risk and providing information on improved management practices.

Asbestos

During the 2019-20 NSW bushfires, more than 2,400 homes and 10,000 buildings were damaged or destroyed. About 48 per cent of these contained asbestos that could negatively affect human health and the environment if not handled and disposed of appropriately.

Asbestos at fire damaged properties is being managed to minimise health risks. The air monitoring undertaken by Public Works Advisory has not detected airborne fibres above the guidelines after the bushfires. This suggests that the controls put in place to manage asbestos at damaged or destroyed buildings may be effective in managing exposure to airborne fibres after bushfires.

NSW RFS, Fire and Rescue NSW (FRNSW), Public Works Advisory and the EPA conduct assessments of fire-affected properties. This process identifies hazards that property owners need to be aware of, such as asbestos, so they can take the proper action to protect themselves. The EPA released a Building Impact Assessment factsheet to inform residents about the range of possible hazards that may be present and the actions they can take to protect themselves when returning home. If asbestos is suspected or identified and there is a risk of airborne fibres, FRNSW sprays the site with a non-toxic glue to provide a temporary seal to reduce the risk. If an assessment team identifies asbestos, it will leave a Hazard Identification Notice at the property and it is recommended that property owners do not enter the property.

Public Works Advisory completes asbestos air monitoring following bushfires. Asbestos air monitoring has been carried out in Southern NSW following bushfires at Cobargo, Mogo, Rosedale (North and South), Malua Bay, Surf Beach, Catalina, Conjola Park and Lake Conjola with no results above the guideline standards. Following the Tathra bushfire in 2018, continuous asbestos air monitoring was carried out for three months at four sites with no results above the guidelines. The EPA is working with Public Works, NSW Health and Safework NSW to develop a communications plan for the results of the asbestos air monitoring undertaken following the 2019-20 bushfires.

When asbestos is removed from a site during the government clean-up process, asbestos air monitoring will be carried out at the site as per SafeWork requirements.

The suitability of work health and safety Work Health Safety regulations

Under the Work Health Safety legislation, PCBUs have the primary duty of care to ensure the health and safety of workers and others in the workplace, so far as is reasonably practicable (s19, Work Health Safety Act 2011). Key pieces of the legislation relating to air quality and health monitoring are:

- PCBUs must ensure that the health of workers and the conditions at the workplace are monitored for the purpose of preventing illness or injury of workers arising from the conduct of the business or undertaking (s19(3)(f), Work Health Safety Act 2011)
- PCBUs must manage the risk of airborne contaminants (does not include bushfire smoke) by:
  - ensuring exposure standards for substances and mixtures are not exceeded (Clause 49, Work Health Safety Regulation 2017)
  - monitoring airborne contaminant levels to which an exposure standard applies (Clause 50, Work Health Safety Regulation 2017).

PCBUs must eliminate and then minimise exposure, so far as is reasonably practicable, to airborne asbestos in the workplace (Clause 420, Work Health Safety Regulation 2017).

When addressing environmental air quality issues that affect workplaces, SafeWork NSW takes a general risk management approach and defers to the NSW EPA and NSW Health for specialty advice.

Given the above legislated Work Health Safety requirements, SafeWork NSW is satisfied the current Work Health Safety legislation is suitable, as health of workers and the conditions of the workplace (monitoring) are expressly covered.

Road safety

Of potential interest to the inquiry is the increased danger to road users during bushfire and drought generated events. During dust storms this summer, several accidents and near misses were attributed to poor visibility.

Future focus

Following the unprecedented 2019-20 bushfire season, NSW Health had discussions with key stakeholders and highlighted several areas of focus to lessen the health impact of future bushfire smoke events.

1. Enhancing forecasting capabilities.
2. Updating the AQI to better address the public's need for near-real-time air quality information and to increase consistency between jurisdictions.
3. Turning the Hazard Reduction Burn Smoke Management Protocol into a more general protocol for use during bushfires, building on the strengths of the protocol to coordinate actions and messaging during extreme smoke events during bushfires.
4. Supporting research to improve understanding of the impacts of the 2019-20 bushfire event and the effectiveness of interventions to mitigate smoke exposure.