**Submission No 44**

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

**Organisation:** Environmental Justice Australia

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Environmental Justice Australia

Submission

In response to the

# Inquiry into the health impacts of exposure to poor levels of air quality resulting from bushfires and drought

Prepared by

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**About Environmental Justice Australia**

Environmental Justice Australia is a not-for-profit public interest legal practice. We are independent of government and corporate funding. Our legal team combines technical expertise and a practical understanding of the legal system to protect our environment.

We act as advisers and legal representatives to community-based environment groups, regional and state environmental organisations, and larger environmental NGOs, representing them in court when needed. We also provide strategic and legal support to their campaigns to address climate change, protect nature and defend the rights of communities to a healthy environment.

We also pursue new and innovative solutions to fill the gaps and fix the failures in our legal system to clear a path for a more just and sustainable world.

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# Introduction

Environmental Justice Australia welcomes the opportunity to provide a submission to the Inquiry into the health impacts of exposure to poor levels of air quality resulting from bushfires and drought.

## Summary of recommendations:

While the Government's immediate focus must of course be on the current COVID crisis and response, progress can and should be made by the NSW EPA and Department of Planning, Industry and Environment on reducing air pollution in NSW to protect the community from further harm.

The NSW Government should:

1. Focus air pollution control strategies on the biggest sources of air pollution which have the biggest impact on human health.

2. Set strong stack emissions limits for coal-fired power stations in line with international standards, which will require operators to install continuous stack monitoring and best practice pollution controls. This will reduce toxic air pollution from power stations by over 90% and improve health outcomes for NSW citizens and communities throughout the state.

3. Finalise and implement a Clean Air Strategy for NSW, for implementation 365 days a year, which includes strong measures to reduce industrial pollution as close to zero as possible.

4. Expand the NSW air quality monitoring network to monitor in areas with particular risks to health from significant air pollution sources, such as at Lake Macquarie and Lithgow.

5. Set strong health-based air pollution standards now to protect health, with an exposure reduction framework in place for continual improvement of the standards.

6. Finalise the review of the Load-Based Licencing (LBL) Scheme, removing the exemption for pollution from coal mines and associated infrastructure that threatens human health.

7. Commit to further research and policy development with regards to air pollution and impact on health.

## The health impacts of exposure to poor levels of air quality

More than 4800 Australians die from exposure to air pollution each year – three times the national road toll.[1] The health cost of air pollution in Australia is estimated by the federal government at up to

[1] Institute for Health Metrics and Evaluation (IHME). Global Burden of Disease Study 2017. Seattle, WA: IHME, University of Washington, 2017. Available from: http://vizhub.healthdata.org/gbd-compare

$24 billion each year.[2] In 2005, the NSW government estimated that in the Greater Sydney Metropolitan Region (GMR) – which includes Sydney, Illawarra and the lower Hunter – particle air pollution causes 520 premature deaths, 6300 cumulative years of life lost, 1180 hospital admissions and $8.4 billion (up to $15.2 billion) in health costs.[3] This health burden is expected to increase significantly in NSW.[4]

This week, an important new study has come out in the Medical Journal of Australia which estimated that the smoke from this summer's bushfires was responsible for an incredible 219 deaths in NSW. This study is discussed further below.

A 2019 global review of evidence found that air pollution can damage every organ and every cell in the human body.[5] In 2018, the director general of the World Health Organisation declared air pollution a "public health emergency".[6]

The most dangerous form of air pollution are tiny particulates, no more than 2.5 micrometres in diameter (0.0025 mm), known as $PM_{2.5}$. By way of comparison, a human hair is about 100 micrometres. $PM_{2\,5}$ particles are so small they can get deep into the lungs and into the bloodstream. $PM_{2\,5}$ are usually found in smoke from coal-fired power stations, motor vehicles, and wood burning.

There is abundant evidence that exposure to $PM_{2.5}$ can cause adverse health effects and increase risk of death.[7] World Health Organisation guidelines say anything above 25 micrograms per cubic metre (25 $\mu g/m^3$) of $PM_{2.5}$ over 24 hours is unhealthy.[8] However, there is no safe threshold for short-term exposure to $PM_{2.5}$, so even days below World Health Organisation guidelines could still pose a threat

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[2] AIHW (Australian Institute of Health and Welfare) (2016). Australian burden of disease study: impact and causes of illness and death in Australia 2011, AIHW, Canberra; Begg, S. (2007). The burden of disease and injury in Australia 2003, cat. no. PHE 82, Australian Institute of Health and Welfare, Canberra; Access Economics (2008). The health of nations: the value of a statistical life, Australian Safety and Compensation Council, Australian Government Department of Education, Employment and Workplace Relations, Canberra.

[3] NSW Department of Environment and Conservation, Air Pollution Economics - Health Costs of Air Pollution in the Greater Sydney Metropolitan Region, 2005, p.44.

[4] National Environment Protection Council, July 2014, Draft Variation to the National Environment Protection (Ambient Air Quality) Measure: Impact Statement, p.xiii.

[5] Dean E. Schraufnagel, John R. Balmes, Clayton T. Cowl, Sara De Matteis, Soon-Hee Jung, Kevin Mortimer, Rogelio Perez-Padilla, Mary B. Rice, Horacio Riojas-Rodriguez, Akshay Sood, George D. Thurston, Teresa To, Anessa Vanker, Donald J. Wuebbles, Air Pollution and Noncommunicable Diseases: A Review by the Forum of International Respiratory Societies' Environmental Committee, Part 1: The Damaging Effects of Air Pollution, February 2019, Volume 155, Issue 2, Pages 409–416. https://doi.org/10.1016/j.chest.2018.10.042; Dean E. Schraufnagel, John R. Balmes, Clayton T. Cowl, Sara De Matteis, Soon-Hee Jung, Kevin Mortimer, Rogelio Perez-Padilla, Mary B. Rice, Horacio Riojas-Rodriguez, Akshay Sood, George D. Thurston, Teresa To, Anessa Vanker, Donald J. Wuebbles (2019) Air Pollution and Noncommunicable Diseases: A Review by the Forum of International Respiratory Societies' Environmental Committee, Part 2: Air Pollution and Organ Systems, *CHEST Journal,* February 2019, Volume 155, Issue 2, Pages 417–426. https://doi.org/10.1016/j.chest.2018.10.041

[6] Dr Tedros Adhanom Ghebreyesus, "Air pollution is the new tobacco. Time to tackle this epidemic" *The Guardian*, October 27 2018: https://www.theguardian.com/commentisfree/2018/oct/27/air-pollution-is-the-new-tobacco-time-to-tackle-this-epidemic

[7] Dockery, Douglas W., Pope, C. Arden, Xu, Xiping, Spengler, John D., Ware, James H., Fay, Martha E., Ferris, Benjamin G., Speizer, Frank E. (1993) An Association between Air Pollution and Mortality in Six U.S. Cities, *New England Journal of Medicine*, 329(24): 1753-1759. https://www.nejm.org/doi/full/10.1056/NEJM199312093292401; Krewski D1, Burnett RT, Goldberg M, Hoover K, Siemiatycki J, Abrahamowicz M, White W., (2005) Reanalysis of the Harvard Six Cities Study, part I: validation and replication. *Inhalation Toxicology* 2005 Jun-Jul;17(7-8):335-42. https://doi.org/10.1080/08958370590929402

[8] World Health Organization. Regional Office for Europe. (2006). Air quality guidelines global update 2005: particulate matter, ozone, nitrogen dioxide and sulfur dioxide. Copenhagen: WHO Regional Office for Europe. https://apps.who.int/iris/handle/10665/107823

to health.[9] According to the World Health Organisation (WHO), all-cause mortality increases by up to two percent for each 10 µg/m$^3$ increase in the daily concentration of $PM_{2.5}$ above the WHO 24-hour guideline of 25 µg/m$^3$.[10]

New Australian research led by the University of Sydney and published by *The Lancet* has found up to a four percent increased risk of out-of-hospital cardiac arrest (OHCA) associated with every 10 µg/m$^3$ increase in $PM_{2.5}$.[11] OHCA is a major medical emergency, with less than one in 10 people worldwide surviving these events.[12]

In 2019, a research team at the Harvard Chan School of Public Health published an analysis of more than 95 million Medicare hospital insurance claims for adults aged 65 or older in the United States from 2000 to 2012.[13] The researchers found that each 1 µg/m$^3$ increase in $PM_{2.5}$ was associated with 2,050 extra hospital admissions, 12,216 days in hospital, and $31m USD in healthcare costs for diseases not previously associated with $PM_{2.5}$ including sepsis, kidney failure, and urinary tract and skin infections. These associations remained even at daily $PM_{2.5}$ concentrations below the WHO guideline. As such, the researchers concluded that substantial health and economic costs were linked to small increases in short term $PM_{2.5}$.

$PM_{2\,5}$ is not the only pollutant impacting the health of people in NSW. Even at low concentrations, nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$) and ozone ($O_3$) are impacting health. A number of Australian studies published in the last decade demonstrate statistically significant health impacts at pollutant concentrations well-below national standards for these pollutants.[14] Nitrogen dioxide is

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[9] Ibid.
[10] World Health Organization. As above.
[11] Bing Zhao, Fay H Johnston, Farhad Salimi, Masahiko Kurabayashi, Kazuaki Negishi. (2020) Short-term exposure to ambient fine particulate matter and out-of-hospital cardiac arrest: a nationwide case-crossover study in Japan. *The Lancet Planetary Health*, 4(1): 15-23. https://doi.org/10.1016/S2542-5196(19)30262-1
[12] University of Sydney. "Air pollution impacts can be heart-stopping: Biggest study of dangerously small particulate matter and cardiac arrest." *ScienceDaily*, 28 January 2020: https://www.sciencedaily.com/releases/2020/01/200128115421.htm
[13] Wei Yaguang, Wang Yan, Di Qian, Choirat Christine, Wang Yun, Koutrakis Petros et al. (2019) Short term exposure to fine particulate matter and hospital admission risks and costs in the Medicare population: time stratified, case crossover study *BMJ* 2019; 367:l6258. https://doi.org/10.1136/bmj.l6258
[14] Knibbs, Cortés de Waterman, Toelle, Guo, Denison, Jalaludin, Williams. (2018). The Australian Child Health and Air Pollution Study (ACHAPS): A national populationbased crosssectional study of long-term exposure to outdoor air pollution, asthma, and lung function. Environment International, 120, 394-403; Bowatte, G., Lodge, C., Knibbs, L., Erbas, B., Perret, J., Jalaludin, B., Dharmage, S. (2018). Traffic related air pollution and development and persistence of asthma and low lung function. Environment International, 113, 170-176; Pereira, Gavin, Cook, Angus, De Vos, Annemarie J.B.M., & Holman, C DEArcy J. (2010). A case-crossover analysis of traffic-related air pollution and emergency department presentations for asthma in Perth, Western Australia. (Clinical report). The Medical Journal of Australia, 193(9), 511-514; Pereira, Gavin, Cook, Angus, De Vos, Annemarie J.B.M., & Holman, C DEArcy J. (2010). A case-crossover analysis of traffic-related air pollution and emergency department presentations for asthma in Perth, Western Australia. (Clinical report). The Medical Journal of Australia, 193(9), 511-514; Jalaludin, B., Khalaj, B., Sheppeard, V., & Morgan, G. (2008). Air pollution and ED visits for asthma in Australian children: A case-crossover analysis. International Archives of Occupational and Environmental Health, 81(8), 967-974; Bowatte, Lodge, Knibbs, Lowe, Erbas, Dennekamp, . . . Dharmage. (2017). Trafficrelated air pollution exposure is associated with allergic sensitization, asthma, and poor lung function in middle age. The Journal of Allergy and Clinical Immunology,139(1), 122-129.e1; Gauderman WJ, Urman R, Avol E, et al. (2015). 'Association of improved air quality with lung development in children'. NEJM 2015;372;10:905-913; Chen, Guo, Abramson, Williams, & Li. (2018). Exposure to low concentrations of air pollutants and adverse birth outcomes in Brisbane, Australia, 2003–2013. Science of the Total Environment, 622-623, 721-726; Li, S., Guo, Y., & Williams, G. (2016). Acute Impact of Hourly Ambient Air Pollution onPreterm Birth. Environmental Health Perspectives, 124(10), 1623-1629; Pereira, G.; Cook, A. G.; Haggar, F.; Bower, C.; Nassar, N., Locally derived traffic-related air pollution and fetal growth restriction: a retrospective cohort study. Occupational and environmental medicine 2012, 69 (11), 815-822; Xu, Z. W.; Hu, W. B.; Williams, G.; Clements, A. C. A.; Kan, H. D.; Tong, S. L., Air pollution, temperature and pediatric influenza in Brisbane, Australia. Environment international 2013,

strongly associated with childhood asthma and impaired lung development, which can lead to lifelong adverse health effects and premature death.[15] Adverse neonatal outcomes, including preterm birth, low weight at birth and fetal growth restriction are associated with maternal exposures to nitrogen dioxide, sulfur dioxide, and ozone.[16] Laboratory confirmed paediatric influenza has also been associated with ozone.[17] Middle-aged Australians exposed to nitrogen dioxide can experience exacerbations of current asthma, the incidence of new asthma, and atopy.[18] Long term exposure to sulfur dioxide, even at low concentrations, has been associated with cardiorespiratory mortality.[19]

**Exposure to and health impacts of smoke from the recent bushfires.**

As mentioned above, this week the Medical Journal of Australia published a study which estimated that the smoke from this summer's bushfires was responsible for 417 deaths in NSW, Victoria, Queensland and the ACT.[20] Over half of these – 219 – were in NSW. NSW also had a total of 2548 hospital admissions and emergency attendances for cardiovascular and respiratory conditions and asthma as a result of the air pollution from the fires.[21] An extract from the article with these figures is below.

**Box 2 – Estimated health burden attributable to bushfire smoke, Queensland, New South Wales, the Australian Capital Territory and Victoria, 1 October 2019 – 10 February 2020**

| | Estimated number of cases (95% confidence intervals) | | | | |
|---|---|---|---|---|---|
| Outcome | Queensland | New South Wales | Australian Capital Territory | Victoria | Total |
| Excess deaths (any cause) | 47 (17–77) | 219 (81–357) | 31 (12–51) | 120 (44–195) | 417 (153–680) |
| Hospital admissions, cardiovascular | 135 (25–246) | 577 (108–1050) | 82 (15–149) | 331 (62–602) | 1124 (211–2047) |
| Hospital admissions, respiratory | 245 (0–513) | 1050 (0–2204) | 147 (0–308) | 585 (0–1227) | 2027 (0–4252) |
| Emergency department attendances, asthma | 113 (61–165) | 702 (379–1026) | 89 (48–131) | 401 (217–586) | 1305 (705–1908) |

59, 384-388; Wang, X., Hu, W., & Tong, S. (2009). Long-term exposure to gaseous air pollutants and cardio-respiratory mortality in Brisbane, Australia. Geospatial Health, 3(2), 257-263.

[15] Knibbs et al. (2018). As above; Bowatte et al (2017). As above; Gauderman et al. (2015). As above.

[16] Chen, Guo, Abramson, Williams, & Li. (2018). Exposure to low concentrations of air pollutants and adverse birth outcomes in Brisbane, Australia, 2003–2013. Science of the Total Environment, 622-623, 721-726; Li, S., Guo, Y., & Williams, G. (2016). Acute Impact of Hourly Ambient Air Pollution on Preterm Birth. Environmental Health Perspectives, 124(10), 1623-1629; Pereira, G.; Cook, A. G.; Haggar, F.; Bower, C.; Nassar, N., Locally derived traffic-related air pollution and fetal growth restriction: a retrospective cohort study. Occupational and environmental medicine 2012, 69 (11), 815-822.

[17] Xu, Z. W.; Hu, W. B.; Williams, G.; Clements, A. C. A.; Kan, H. D.; Tong, S. L., Air pollution, temperature and pediatric influenza in Brisbane, Australia. Environment international 2013, 59, 384-388.

[18] Bowatte, G., Lodge, C., Knibbs, L., Erbas, B., Perret, J., Jalaludin, B., Dharmage, S. (2018). Traffic related air pollution and development and persistence of asthma and low lung function. Environment International, 113, 170-176; Bowatte, Lodge, Knibbs, Lowe, Erbas, Dennekamp, . . . Dharmage. (2017). Trafficrelated air pollution exposure is associated with allergic sensitization, asthma, and poor lung function in middle age. The Journal of Allergy and Clinical Immunology,139(1), 122-129.e1.

[19] Wang, X., Hu, W., & Tong, S. (2009). Long-term exposure to gaseous air pollutants and cardio-respiratory mortality in Brisbane, Australia. Geospatial Health, 3(2), 257-263.

[20]Nicolas Borchers Arriagada, Andrew J Palmer, David MJS Bowman, Geoffrey G Morgan, Bin B Jalaludin and Fay H Johnston Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia Med J Aust || doi: 10.5694/mja2.50545, Published online: 23 March 2020

[21] Nicolas Borchers Arriagada, Andrew J Palmer, David MJS Bowman, Geoffrey G Morgan, Bin B Jalaludin and Fay H Johnston Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia Med J Aust || doi: 10.5694/mja2.50545, Published online: 23 March 2020

Sydneysiders experienced 81 days of unsafe air pollution in 2019, more than the combined total for the previous 10 years.[22] As of January 24, there were already 14 such days in 2020.[23] According to 30 of Australia's peak health and medical groups, this represents a public health emergency,[24] with Australian Medical Association President Dr Tony Bartone warning that exposure the toxic smoke would have a negative effect on the health of many Australians: "The length and density of smoke exposure is a new and possibly fatal health risk that many people within our community have not previously had to face. With denser smoke haze and longer periods that people endure smoke inhalation, there is a much higher risk that previously healthy people will face developing serious illness."[25]

From November to January, Sydney and other cities in NSW experienced some of the worst air in the world.[26] According to air pollution monitoring stations in Sydney, the average concentration of 24-hour $PM_{2.5}$ for November and December was 27 $\mu g/m^3$, more than four times the usual everyday level. According to analyst John Quiggin, this equates to somewhere between 160 and 300 additional premature deaths during this period in Sydney alone.[27]

During this period, state health services experienced immediate and significant increases in demand. NSW Heath reported that on December 10, there was almost twice the average number of presentations to emergency departments for asthma or breathing problems.[28] Admissions to hospital from the emergency department for asthma and breathing problems were 556, greater than the 5 year average of 435.[29] From 5 to 11 December 2019, emergency department presentations for asthma or breathing problems were higher than usual across NSW with 1,357 presentations, a 25% increase compared to the 5 year average of 916.[30] Ambulance calls for breathing problems were also higher than usual with 2,448 ambulance calls received, a 30% increase compared to the 5 year average of 1742.[31]

In December 2019, a Flutracking survey found more than 65 per cent Hunter Valley respondents reported having at least one adverse health symptom they attributed to bushfire smoke.[32] Comparing survey responses to available health data, Flutracking determined that for every one person that

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[22] Pallavi Singhal, "'New situation': Record 81 days of bad air quality in Sydney" *The Sydney Morning Herald*, January 24, 2020: https://www.smh.com.au/national/new-situation-record-81-days-of-bad-air-quality-in-sydney-20200123-p53u1e.html

[23] Ibid.

[24] Climate and Health Alliance, "The air pollution in NSW is a public health emergency." December 16, 2019: https://www.caha.org.au/air-pollution

[25] Australian Medical Association, "AMA warns of new health threats from ongoing bushfire crisis", January 3 2020: https://ama.com.au/media/new-health-threats-escalating-bushfire-crisis

[26] Pippa Neill, "The horror of the Australian bushfires and air pollution" *Air Quality News*, January 6 2020: https://airqualitynews.com/2020/01/06/the-horror-of-the-australian-bush-fires-and-air-pollution/

[27] John Quiggin, "Slow burn" *Inside Story*, 1 January 2020: https://insidestory.org.au/slow-burn/

[28] NSW Health, "Take care: bushfire smoke still about", December 13 2019: https://www.health.nsw.gov.au/news/Pages/20191213_01.aspx

[29] Ibid.

[30] NSW Health, As above.

[31] Ibid.

[32] Anita Beaumont, "Health impacts of bushfire smoke on Hunter residents widespread, Flutracking survey finds" *Newcastle Herald*, January 9 2020: https://www.newcastleherald.com.au/story/6573262/smoked-hunter-study-shows-wide-health-impacts-of-bushfires/

presented to a health provider, there are another 10 in the community with symptoms who didn't. These results suggest that the numbers for presentations to emergency departments and healthcare providers is just the tip of the iceberg in terms of the health, social and economic impacts of bushfire smoke air pollution events.

In January 2020, a national survey conducted by The Australia Institute found a quarter of Australians (26%) reported illness or health effects as a result of the bushfire smoke haze.[33] With 9% of survey respondents saying they had missed work because of the fires or smoke, The Australia Institute estimated that at least 1.8 million work days were lost as a result.[34] This disruption to the workforce is conservatively estimated to have cost more than $1.3bn in lost economic production.[35]

**Health impacts from previous bushfire and major smoke events**

A 2014 Australian study into emergency department attendances during periods of bushfire smoke in Sydney found smoke events were associated with an immediate increase in presentations for respiratory conditions and a lagged increase in attendances for heart disease and heart failure.[36]

A similar Australian study looking at the association between bushfire smoke and premature death found there was a 5% increase in mortality during bushfire smoke events in Sydney between 1994 and 2007.[37]

Another Australian study found a link between out-of-hospital cardiac arrests in Melbourne and bushfire smoke.[38] These cardiac arrests occurred several hundred kilometres away from where bushfires were burning in the Victorian Alps.

Also relevant is a series of studies into the health impacts from exposure to smoke pollution caused by the 2014 Hazelwood coalmine fire.[39] Residents in the town of Morwell endured 45 days of toxic smoke at concentrations similar to those experienced in eastern Australian cities in 2019/20 during

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[33] Sarah Martin, "Bushfire crisis: more than half of all Australians found to have been directly affected", *The Guardian Australia*, January 23 2020: https://www.theguardian.com/australia-news/2020/jan/23/bushfire-crisis-more-than-half-of-all-australians-found-to-have-been-directly-affected

[34] The Australia Institute, "Survey Reveals: Bushfires Cost 1.8 million Work Days, Leave 5 Million Sick from Smoke", 23 January 2020: https://www.tai.org.au/content/survey-reveals-bushfires-cost-18-million-work-days-leave-5-million-sick-smoke

[35] Sarah Martin, "Bushfire crisis: more than half of all Australians found to have been directly affected", *The Guardian Australia*, January 23 2020.

[36] Johnston FH, Purdie S, Jalaludin B, et al. (2014) Air pollution events from forest fires and emergency department attendances in Sydney, Australia 1996-2007: a case-crossover analysis. *Environmental Health*. 2014;13:105. https://doi.org/10.1186/1476-069X-13-105

[37] Fay Johnston, Ivan Hanigan, Sarah Henderson, Geoffrey Morgan, David Bowman, (2011) Extreme air pollution events from bushfires and dust storms and their association with mortality in Sydney, Australia 1994–2007, *Environmental Research*, 111(6): 811-816. https://doi.org/10.1016/j.envres.2011.05.007

[38] Dennekamp M, Straney LD, Erbas B, Abramson MJ, Keywood M, Smith K, Sim MR, Glass DC, Del Monaco A, Haikerwal A, Tonkin AM. (2015). Forest Fire Smoke Exposures and Out-of-Hospital Cardiac Arrests in Melbourne, Australia: A Case-Crossover Study. *Environmental health perspectives*, *123*(10), 959–964. https://doi.org/10.1289/ehp.1408436

[39] Victorian Department of Health and Human Services, (2019) Hazelwood Health Study Annual Report 5, *Hazelwood Health Study*, November 15 2019. https://hazelwoodhealthstudy.org.au/__data/assets/pdf_file/0009/2052828/HHS-5th-Annual-Report-v-1.0-with-Appendices.pdf

the bushfire smoke haze, after a bushfire ignited the Hazelwood mine. The Hazelwood mine inquiry concluded that the fire contributed to an increase in deaths in Latrobe Valley.[40]

The Hazelwood mine fire has been linked to a spike in doctor visits by Latrobe Valley residents, as well as a jump in rates of prescription medicine being dispensed.[41] For every 10 µg/m$^3$ increase in $PM_{2.5}$, there was a 17% increase in health service visitors, including 29% cardiovascular services and 27% respiratory services. The study found there were an extra 5,137 visits to GPs in the Latrobe Valley in a month when the coal mine fire was alight.

The study also estimated there was an extra 1,429 mental health-related medications being dispensed during the period examined, along with an additional 2,501 cardiovascular prescription medications and 574 respiratory medications.[42]

Pregnant women exposed to the Hazelwood mine fire smoke were more likely to contract gestational diabetes, a condition that affects the mother's blood sugar level.[43] Their babies stored the extra sugar as fat and grew larger than normal. Children who were exposed to the Hazelwood mine fire smoke while in the womb or in their first two years of life had more respiratory infections.[44] They also found a link between elevated $PM_{2.5}$ exposure from the mine fire and long-term reduced lung function in children.[45]

A study of infant rhesus macaque monkeys living near the 2008 California wildfires found something similar: those who were exposed to the bushfire smoke had significantly worse lung and immune health at 3 years of age than those who weren't exposed.[46]

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[40] Bernard Teague, John Catford, Anita Roper, (2015) *Hazelwood Mine Fire Inquiry Report 2015/2016 VOLUME II – Investigations into 2009–2014 deaths*. Victorian Government Printer, 2015, No 81, Session 2014–2015. https://www.parliament.vic.gov.au/file_uploads/10826_HAZ_Hazelwood_Mine_Fire_Inquiry_Report_2015_16_Volume_II_____Term_of_Reference_6_LoRes_58CA_4NfZvjW2.pdf

[41] Johnson, A., Dipnall, J., Dennekamp, M., Williamson, G., Gao, C., Carroll, M., Dimitriadis, C., Ikin, J., Johnston, F., McFarlane, A., Sim, M., Stub, D., Abramson, M., & Guo, Y. (2019). Fine particulate matter exposure and medication dispensing during and after a coal mine fire: A time series analysis from the Hazelwood Health Study. *Environmental Pollution*, *246,* 1027-1035. https://doi.org/10.1016/j.envpol.2018.12.085

[42] Ibid.

[43]Victorian Department of Health and Human Services, Gestational diabetes increased in women exposed to mine fire smoke, *Hazelwood Health Study*, May 20 2019: https://hazelwoodhealthstudy.org.au/articles/gestational-diabetes-increased-in-women-exposed-to-mine-fire-smoke, https://hazelwoodhealthstudy.org.au/__data/assets/pdf_file/0006/1795830/Research-Summary-ELF-Exposure-to-mine-fire-smoke-and-the-risk-of-pregnancy-related-health-problems.pdf

[44] G, Willis; K, Chappell; S, Williams; S, Melody; A, Wheeler; M, Dalton; S, Dharmage; G, Zosky; F, Johnston (2019) The impact of exposure to coal mine fire smoke in utero and in early childhood on parent-reported indicators of childhood atopic and respiratory illness. *Environmental Epidemiology*: October 2019, Volume 3, p.441. https://doi.org/10.1097/01.EE9.0000610972.18990.08

[45] Jingyi Shao, Graeme R. Zosky, Graham L. Hall, Amanda J. Wheeler, Shyamali Dharmage, Shannon Melody, Marita Dalton, Rachel E. Foong, Tierney O'Sullivan, Grant J. Williamson, Katherine Chappell, Michael J. Abramson, Fay H. Johnston (2019) Early life exposure to coal mine fire smoke emissions and altered lung function in young children, *Respirology*, 25(2): 198-205. https://doi.org/10.1111/resp.13617

[46] Black C, Gerriets JE, Fontaine JH, Harper RW, Kenyon NJ, Tablin F, Schelegle ES, Miller LA. (2017). Early Life Wildfire Smoke Exposure Is Associated with Immune Dysregulation and Lung Function Decrements in Adolescence. *American journal of respiratory cell and molecular biology*, 56(5), 657–666. https://doi.org/10.1165/rcmb.2016-0380OC

These findings suggest that even short-term exposure to $PM_{2.5}$ may cause long-term impact on the lung growth of children and young animals.

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

### Minimising the overall impacts of air pollution on public health

Regulation is particularly important in controlling air pollution. Individuals cannot readily control the extent to which they are exposed to harmful air pollution. People rely on the government to implement and enforce good regulation to protect their health. Polluters will pollute to the maximum amount allowed by law (and often more when enforcement is lax as it is with air pollution).

A team of Australia's eminent experts in air pollution, bushfire smoke and respiratory health recently recommended that the NSW government respond to the bushfire smoke air pollution crisis by:[47]

- Presenting actual hourly $PM_{2.5}$ data rather than an index.
- Investing in improving and expanding the state's air quality monitoring network, forecasting and research on public health messaging, and exposure reduction measures to protect Australians from bushfire smoke.
- Developing consistency of air quality information and related public health advice with other jurisdictions

While Australians are more familiar with $PM_{2.5}$ as a result of the recent bushfire crisis, the toxic pollutant is primarily generated by fossil-fuel combustion. The two biggest sources of air pollution are coal-fired power stations and motor vehicles. The NSW Air Emissions Inventory[48] estimates that coal-fired power stations contribute 87% of $SO_2$ emissions and 52% of $NO_2$ emissions, as well as 9% of direct $PM_{2.5}$ emissions in the Greater Metropolitan Region (GMR).[49] Power stations also contribute to secondary sulfate particulate levels across the GMR. For example, power station $SO_2$ produces close to 20% of $PM_{2\,5}$ at Richmond in Sydney's north-west on an annual basis.[50]

Pollution control technologies to reduce toxic air pollution emissions from coal-fired power stations by up to 99% are standard practice, and in fact mandatory in most other countries. In the United States, where pollution control has been deployed across industries, the Clean Air Act is estimated to have saved $2 trillion USD in the 25 years after it became law, 32 times more than the associated costs of pollution control.[51] In Europe, studies identify a benefit of at least €14 and as much as €50

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[47] Sotiris Vardoulakis, Bin Jalaludin, Geoffrey Morgan, Ivan Hanigan and Fay Johnston (2020) Bushfire smoke: urgent need for a national health protection strategy, *Medical Journal of Australia*, 23 February 2020. https://doi.org/10.5694/mja2.50511
[48] https://www.epa.nsw.gov.au/your-environment/air/air-emissions-inventory
[49] State of New South Wales Department of Planning, Industry and Environment (2019). NSW Electricity Strategy. November 2019: https://energy.nsw.gov.au/media/1921/download
[50] Ibid.
[51] Giannadaki, D., Lelieveld, J. & Pozzer, A. (2016) Implementing the US air quality standard for $PM_{2.5}$ worldwide can prevent millions of premature deaths per year. *Environmental Health* 15:88. https://doi.org/10.1186/s12940-016-0170-8

per €1 spent on pollution abatement.[52] Furthermore, analysis of the US Clean Air Act found the health benefits from reduced secondary particles accounted for 99% of the monetised benefits of pollution controls for sulfur and nitrogen reduction dioxides.[53] So controlling other forms of pollution can also contribute significantly to $PM_{2.5}$ reduction.

While Sydney's usual annual average of 6 µg/m$^3$ is within World Health Organisation annual guideline of 8 µg/m$^3$, a study led by NSW Health Director of Environmental Health, Dr Richard Broome, estimated that everyday $PM_{2.5}$ in Sydney already causes 430 premature deaths (2% of all deaths) and 630 respiratory and cardiovascular hospital admissions annually.[54] Ozone pollution accounted for a further 1% of all deaths.[55] As such, reducing everyday air pollution levels by even a small amount will yield a range of substantial health benefits. The study concluded that reducing $PM_{2.5}$ exposure in Sydney by as little as 10% would result in about 650 fewer premature deaths, a gain of 3500 life-years and about 700 fewer respiratory and cardiovascular hospital visits.[56]

Just this week, a further study released by Dr Richard Broome on the contribution to deaths from various sources of pollution in Sydney found that woodheaters, road emissions and coal-fired power stations all contribute to air pollution deaths in NSW. Using Dr Broome's figures (which he himself describes as a conservative estimate of the health damage from power stations) the health costs of power station pollution are (conservatively) $240,234/MW or $43/MWh. Coal sells for around $55/MWh, meaning the health cost of air pollution is basically equivalent to the wholesale price of electricity in NSW. In other words, the health cost from burning coal is extraordinary. [57]

In November 2018, Dr Ben Ewald published an independent assessment of the health impacts of $PM_{2.5}$ pollution from coal-fired power stations in NSW.[58] Dr Ewald's study estimated that 279 people die prematurely each year in NSW as a result of toxic air pollution from the state's five coal-fired power stations. The health impacts also include 233 babies born with reduced birthweight, 361 people developing type 2 diabetes and 2,614 years of life lost each year. This study suggests that controlling the pollution from coal-fired power stations could also deliver significant health benefits. Indeed, in the United States, an estimated 26,610 lives were saved by the shift away from coal between 2005 and 2016.[59]

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[52] Carnell E., Vieno M., Vardoulakis S., Beck R., Heaviside C., Tomlinson S., Dragosits U., Heal M., Reis S., (2019). Modelling public health improvements as a result of air pollution control policies in the UK over four decades – 1970 to 2010. *Environmental Research Letters* 14, 074001.
[53] Giannadaki, D., Lelieveld, J. & Pozzer, A. As above.
[54] Broome RA, Fann N, Cristina TJ, Fulcher C, Duc H, Morgan GG. (2015) The health benefits of reducing air pollution in Sydney, Australia. *Environmental Research*, 143(Part A): 19-25. https://doi.org/10.1016/j.envres.2015.09.007
[55] Ibid.
[56] Ibid.
[57] Richard A.Broome, JenniferPowell, Martin E.Cope, Geoffrey G.Morgan, The mortality effect of $PM_{2.5}$ sources in the Greater Metropolitan Region of Sydney, Australia, Environment International Volume 137, April 2020, https://doi.org/10.1016/j.envint.2019.105429
[58] https://www.dea.org.au/new-report-from-eja-the-health-burden-of-fine-particle-pollution-from-electricity-generation-in-nsw-/
[59] Burney, J.A. (2020) The downstream air pollution impacts of the transition from coal to natural gas in the United States. *Nature Sustainability*. https://doi.org/10.1038/s41893-019-0453-5

In response to Dr Ben Ewald's report, the Australian Energy Council commissioned consultants EnRiskS to conduct an "independent peer review".[60] While the EnRiskS report is critical of Dr Ewald's work, the industry-commissioned report nonetheless concedes that air pollution from coal-fired power stations is responsible for at least 98 deaths in NSW each year. Significantly, this is the first time the industry has admitted to a quantifiable health impact of the pollution from coal-fired power stations. The EnRiskS Report also notes that a number of other key health endpoints, such as cardiovascular and respiratory mortality and morbidity, were not studied and quantified in Dr Ewald's report. Quantifying this health burden would likely result in significantly increased numbers.

Air pollution and respiratory medicine experts say that bushfire smoke mixes with existing sources of pollution, such as from coal-fired power stations, to create more $PM_{2.5}$ and this amplifies the public health impact of the pollution.[61] This means the health impacts of bushfire smoke are exacerbated because the everyday air quality is not clean. So by reducing the baseline or background pollution levels, we'd see lower pollution levels during bushfire smoke events. One of the things governments can do to reduce the health impacts is to reduce the amount of compounding pollutants in the air and ensure we have the cleanest possible everyday air quality. Experts have suggested governments consider issuing temporary curbs on polluting industries during periods of poor air quality, such as encouraging load-shedding, which is common practice in the US and Europe.[62]

A 2019 review of international evidence by experts from the Forum of International Respiratory Societies found that cutting air pollution can prevent deaths within weeks.[63] Researchers discovered that the health benefits of clean air are "almost immediate and substantial" and stretch into the long term, saving billions of dollars.[64] The review examined the evidence for the reduction of illness after levels of toxic air were reduced. It showed dramatic reductions in asthma and children missing school, heart attacks and the number of small and premature babies.[65]

These findings highlight the critical need for government adopt and enforce stricter standards for air pollution immediately. NSW will experience substantial health benefits from cutting pollution, even when concentrations are already below WHO guidelines. At present, the NSW EPA regulates air pollution levels "up to the limit". The National Environmental Protection Measures Ambient Air

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[60] Jackie Wright (2019) Environmental Risk Sciences Pty Ltd Peer Review: Dr Ewald Report, Australian Energy Council: https://www.energycouncil.com.au/media/16734/enrisks-report-final.pdf

[61] Peter Hannam, "Worse than Beijing: Call for air pollution curbs as Sydney climbs global rankings", *Brisbane Times,* November 1 2019: https://www.brisbanetimes.com.au/environment/weather/call-for-air-pollution-curbs-as-sydney-climbs-global-rankings-20191101-p536fz.html?ref=rss&utm_medium=rss&utm_source=rss_feed
; Christine McGinn "Bushfire smoke plays havoc with Vic health", *The Daily Telegraph*, January 14, 2020: https://www.dailytelegraph.com.au/news/breaking-news/vic-blaze-flares-amid-fire-recovery-effort/news-story/53b298392d0591d5f03ba1d4383f821b

[62] Peter Hannam, "Worse than Beijing: Call for air pollution curbs as Sydney climbs global rankings", *Brisbane Times,* November 1 2019: https://www.brisbanetimes.com.au/environment/weather/call-for-air-pollution-curbs-as-sydney-climbs-global-rankings-20191101-p536fz.html?ref=rss&utm_medium=rss&utm_source=rss_feed

[63] Dean E. Schraufnagel, John R. Balmes, Sara De Matteis, Barbara Hoffman, Woo Jin Kim, Rogelio Perez-Padilla, Mary Rice, Akshay Sood, Aneesa Vanker, and Donald J. Wuebbles; on behalf of the Forum of International Respiratory Societies Environmental Committee, (2019) Health Benefits of Air Pollution Reduction, *Annals of the American Thoracic Society*, 16(12):1478–1487, Dec 2019. https://doi.org/10.1513/AnnalsATS.201907-538CME

[64] Ibid.

[65] Dean E. Schraufnagel, John R. Balmes, Sara De Matteis, Barbara Hoffman, Woo Jin Kim, Rogelio Perez-Padilla, Mary Rice, Akshay Sood, Aneesa Vanker, and Donald J. Wuebbles. As above.

Quality (NEPM AAQ) standards are inappropriately used as a target rather than a 'worst case scenario' measure to avoid. There is a prevailing attitude that so long as the NEPM AAQ is not breached, there is no requirement (and in fact no legal ability) to reduce point-source air pollution. This actively prevents further reductions in air pollution that are achievable, and that would have significant health benefits.

**What can the government do to control air pollution and protect public health?**

There are 6 key actions the government can take to respond to the air pollution crisis and protect the health of citizens and communities in NSW:

1. Set strong stack emissions limits for coal-fired power stations in line with international standards, which will require operators to install continuous stack monitoring and best practice pollution controls. This will reduce toxic air pollution from power stations by over 90% and improve health outcomes for NSW citizens and communities throughout the state.

2. Finalise and implement a Clean Air Strategy for NSW, for implementation 365 days a year, which includes strong measures to reduce industrial pollution as close to zero as possible.

3. Expand the NSW air quality monitoring network to monitor in areas with particular risks to health from significant air pollution sources, such as at Lake Macquarie and Lithgow.

4. Set strong health-based air pollution standards now to protect health, with an exposure reduction framework in place for continual improvement of the standards.

5. Finalise the review of the Load-Based Licencing (LBL) Scheme, removing the exemption for pollution from coal mines and associated infrastructure that threatens human health.

6. Commit to further research and policy development with regards to air pollution and impact on health.

Each of these are discussed below.

**Set strong stack emissions limits for coal-fired power stations in line with international standards, which will require operators to install continuous stack monitoring and best practice pollution controls.**

The health burden of coal-fired power stations on our communities is shocking and preventable through the installation of readily available pollution controls. The companies that own coal-fired power stations in NSW have the technology to reduce toxic pollutants from coal-fired power stations by more than 95%, but they won't install these measures unless required by the government.

Stack emission limits for coal-fired power stations are currently not being used to control pollution, but they could set strong benchmarks that improve community health outcomes. The following table compares the stack emissions limits of NSW coal-fired power stations with that of power stations in the United States, Europe and China:

| Power station/Jurisdiction | Sulfur dioxide | Nitrogen dioxide | Mercury | Fine particles |
|---|---|---|---|---|
| EJA recommends | 200 milligrams per cubic metre ($mg/m^3$) | 200 milligrams per cubic metre ($mg/m^3$) | 1.5 micrograms per cubic metre ($\mu g/m^3$) | 20 milligrams per cubic metre ($mg/m^3$) |
| European Union | 130 $mg/m^3$ | 175 $mg/m^3$ | 7 $\mu g/m^3$ | 8 $mg/m^3$ |
| China | 200 $mg/m^3$ | 200 $mg/m^3$ | 30 $\mu g/m^3$ | 30 $mg/m^3$ |
| United States | 1517 $mg/m^3$ | 875 $mg/m^3$ | 1.5 $\mu g/m^3$ | 125 $mg/m^3$ |
| Vales Point | 1716 $mg/m^3$ | 1500 $mg/m^3$ | 1000 $ug/m^3$ | 100 $mg/m^3$ |
| Eraring | 1716 $mg/m^3$ | 1100 $mg/m^3$ | 200 $ug/m^3$ | 50 $mg/m^3$ |
| Mt Piper | 1716 $mg/m^3$ | 1500 $mg/m^3$ | 200 $ug/m^3$ | 50 $mg/m^3$ |
| Bayswater | 1716 $mg/m^3$ | 1500 $mg/m^3$ | 1000 $ug/m^3$ | 100 $mg/m^3$ |
| Liddell | 1716 $mg/m^3$ | 1500 $mg/m^3$ | 1000 $ug/m^3$ | 100 $mg/m^3$ |

As the table shows, power stations in NSW are licenced to emit up to 13 times the concentration of toxic sulfur dioxide, eight and a half times the concentration of nitrogen dioxide, 143 times the concentration of mercury, and 12.5 times the concentration of $PM_{2.5}$, as equivalent power stations in Europe.

To comply with stricter licence limits, coal-fired power station operators in Europe, the United States, and China have installed pollution controls including Flue Gas Desulfurisation (FGD) which reduces sulfur dioxide ($SO_2$) emissions by as much as 99%, Selective Catalytic Reduction (SCR) which reduces nitrogen dioxide ($NO_2$) emissions by 95%, and Activated Carbon Injection (ACI) to reduce emissions of mercury by about 90%. These measures have become standard practice internationally. Indeed, a Pollution Reduction Program (PRP) report prepared for Vales Point identified that as early as 2012, more than 90% of the power stations in Asia had fitted SCR.[66] In 2012, controlling $NO_2$ emissions from coal-fired power stations was also identified as a priority policy action for the NSW government to improve air quality in the GMR.[67] None of the power stations in NSW are required to fit or operate these emissions controls.

Community members have the right to know what they're breathing, and the right to trust that pollution monitoring and reporting is accurate and reliable. But pollution monitoring and reporting arrangements in NSW fall well short of this ideal. There are two mechanisms for community members to access information about air pollution from power stations: (1) annual estimates of toxic emissions as reported to the National Pollutant Inventory and (2) data from the self-reporting that is required as a condition of the power stations' Environment Protection Licences. Neither of these arrangements meet community expectations, nor do they provide an accurate or useful picture of actual emissions. This is highlighted by the fact that when the Stanwell power station in Queensland installed continuous emissions monitoring, operators learned that they had been under-estimating their toxic emissions by 50%.[68]

Continuous monitoring of stack emissions from coal-fired power stations enables operators to respond to variations in emissions, and report actual (rather than estimated) toxic emissions. The EPA should amend licences for all NSW power stations to require continuous automatic emissions

[66] Jacobs Group (Australia) Pty Limited (2017) Vales Point Power Station Delta Electricity $NO_X$ Pollution Reduction Study (PRS), 29 June 2017, p.42.
[67] Davies, M. & Kearney, B. & Morison, A.. (2012). Air pollution reduction measures in the Sydney GMR using marginal abatement cost curves. *WIT Transactions on Ecology and the Environment*. 157, 423-433, 10.2495/AIR12037.
[68] See: http://www.npi.gov.au/npi-data/latest-data

monitoring from all stacks for $NO_2$, $SO_2$, $PM_{2.5}$ and mercury (as recommended by the World Bank[69]) with a requirement that the data be released publicly in real time.

The NSW Electricity Strategy, released late last year, acknowledges that coal-fired power stations release air pollutants that are harmful to human health.[70] The strategy states that the NSW Government is committed to reducing the emission of substances that are harmful to human health and improving the air quality of the state more generally.[71] Through this strategy, the government will support clean air in NSW and contribute to improved health outcomes.[72] The strategy also commits to minimum environmental standards for air pollution, such as $NO_2$, $SO_2$ and $PM_{2.5}$ standards.[73]

However, the strategy does not offer any details as to what these minimum environmental standards will be or how they will be implemented. It is critical the state's minimum environmental standards for air pollution under this new strategy are set at levels that require the installation of best practice pollution control technologies by coal-fired power stations if it is to reduce the emissions and health burden of air pollution and improve the air quality of the state. It is also essential that community and non-government groups are actively engaged to contribute to the development and implementation of these standards.

**Finalise and implement a Clean Air Strategy for NSW, which includes strong measures to reduce industrial pollution as close to zero as possible.**

The 'Clean Air for NSW Options Paper' was released late 2016 and generated several hundred submissions that advocated for air pollution control. There has been no evident progress toward completing and implementing the Clean Air for NSW strategy in the more than three years since this release.

In the wake of the bushfire smoke air pollution crisis, citizens expect our government to ensure Clean Air for NSW is progressed. While the Government's immediate focus must of course be on the current COVID crisis and response, the Clean Air Strategy for NSW should also be progressed in 2020, with clear opportunities for public and non-government to contribute to its development and implementation.

The priorities for pollution control strategies should reflect the relative contribution of various pollution sources, and the health impacts of those sources. Government must prioritise controlling those pollution sources which are the greatest contributor to pollution levels and have the biggest impact on human health. As is clear from the significant health costs associated with air pollution, prioritising human health will also have significant economic (and environmental) benefits.

The Clean Air Strategy should also be driven by environmental justice principles, whereby pollution sources that create disproportionate impacts on certain communities, resulting in those communities

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[69] World Bank Group/International Finance Corporation, Environmental, Health and Safety Guidelines Thermal Power Plants, Draft for Second Public Consultation (May/June 2017) http://www.ifc.org/wps/wcm/connect/9a362534-bd1b-4f3a-9b42-a870e9b208a8/Thermal+Power+Guideline+2017+clean.pdf?MOD=AJPERES at 36.
[70] State of New South Wales Department of Planning, Industry and Environment (2019). NSW Electricity Strategy. November 2019, pp5-6: https://energy.nsw.gov.au/media/1921/download
[71] Ibid, p.24.
[72] State of New South Wales Department of Planning, Industry and Environment (2019). As above, p.24.
[73] Ibid, p.29.

bearing an unfair burden from pollution, should have targeted action, regardless of whether the number of people affected is at a smaller scale. Although it is important to prioritise measures that will create health benefits for the greatest number of people, it is also important to target the disproportionate health impacts placed on some communities and address this environmental injustice. In recognition of the serious and costly health impacts on communities in these regions, regulation should also adopt a cumulative approach to preventing further development that will increase the pollution levels in those airsheds. This would require special measures in places like the Upper Hunter, where national standards for course particulate matter are routinely breached.

A Clean Air Strategy for NSW should include:

- increased air quality monitoring,
- research and information sharing with the public, so that the public can exercise their right to know what they are breathing and take measures to protect themselves
- increased bushfire hazard reduction and emergency planning
- pollution control for industrial and vehicle sources of pollution to reduce those sources as much as possible, including a requirement for adoption of best available technologies.

To implement and enforce an effective Clean Air Strategy, the EPA must be adequately resourced and empowered to fulfil its functions for air quality monitoring and regulation. A strong and proactive approach to air pollution prevention requires robust and well-resourced institutional arrangements capable of decisive policy intervention.

**The NSW air quality monitoring network should be expanded to monitor in areas with particular risks to health from significant air pollution sources, such as at Lake Macquarie and Lithgow.**

Ambient air pollution monitoring and regulation must protect people wherever they live. This is especially so for people who live closest to heavily-polluting facilities such as coal-fired power stations and major roads. To accurately reflect population exposure, the NSW network of air quality monitors should be expanded to more effectively evaluate the exposure of communities vulnerable to frequent air pollution exposure. People have a right to know what they are breathing. All air pollution monitoring data must be made publicly available to community members via the web, allowing access to real-time and historical data.

This expansion requires making monitoring requirements in high-risk areas mandatory rather than discretionary. In order to improve air quality and minimise the risk of adverse health impacts from exposure to air pollution, we must first understand what people are exposed to. This cannot be achieved if air pollution monitors are not installed in the areas where people are exposed to regular and high levels of air pollution.

In May 2019 a temporary air quality monitoring system was installed in Katoomba and three smaller 'KOALA' (Knowing Our Ambient Local Air) air quality sensors were installed in Lithgow, near the Mt Piper coal-fired power station, for a year-long study. However, this program is not permanent. Many

members of the community would like to see permanent 24/7 air monitoring in the Lithgow region once the 12-month program comes to an end.

The Eraring and Vales Point power stations operate in a region with a rapidly growing population, yet there is currently no air pollution monitoring within 20 kilometres of these two coal-fired power stations. By contrast, the government operates more than a dozen monitors in the Hunter Valley. Data from these monitoring stations is immediately available to community members online and via air pollution alerts are issued when national standards are exceeded.

Industry operate ambient air monitoring stations in these regions, but they are not required to publish that data or provide it on request to the community. Nor are these monitors calibrated to meet EPA or NEPM monitoring standards. They are not trusted by the community.

The Environment and Health Ministers should provide clear direction to the EPA on the matter of where to monitor rather than leaving this to the discretion of state regulators. The government must actively involve community, health and environment groups in the development and improvement of the NSW monitoring program. An exposure reduction and continuous improvement model is recommended for all exposed populations.

The Upper Hunter Valley needs to be included in NSW's NEPM monitoring network. In this region, the NEPM standards for $PM_{10}$ are regularly breached, often within the same day. In 2019, residents in the Upper Hunter Valley received more than 1000 air pollution alerts when national air quality standards for coarse particles were exceeded. Already there have been more than 200 alerts issued in 2020. Every exceedance of the standards represents a dangerous threat to human health. Local GP Bob Vickers, using the World Health Organization figures, estimates that over the last five years pollution from $PM_{10}$ has caused at least 160 more deaths in the Upper Hunter.[74] In short, the government is failing to protect the health of Upper Hunter residents from hazardous air pollution. But because the Upper Hunter is excluded from NSW's NEPM reporting requirements, NSW is able to report that it is largely compliant with the NEPM standards.

Section 3 of the NEPM AAQ requires New South Wales to monitor, assess and report a range of air pollution indicators. The population of The Upper Hunter Valley region (which in the 2016 Urban Centre and Locality statistical level totalled 30,658) significantly exceeds the 25,000 population threshold to trigger the mandatory monitoring, assessment and reporting of air pollution under the NEPM AAQ. The NSW government must commence monitoring, assessment and reporting of Hunter air pollution under the NEPM.

**Set strong health-based air pollution standards now to protect health, with an exposure reduction framework in place for continual improvement of the standards.**

[74] See: World Health Organization. Regional Office for Europe. (2006). Air quality guidelines global update 2005: particulate matter, ozone, nitrogen dioxide and sulfur dioxide – Summary of risk assessment. Copenhagen: WHO Regional Office for Europe, p.12: https://apps.who.int/iris/bitstream/handle/10665/69477/WHO_SDE_PHE_OEH_06.02_eng.pdf?sequence=1

Later this year, the NSW Environment Minister will represent NSW at meetings of the National Environment Protection Council along with environment ministers for the Commonwealth and Australia's other states and territories, to agree on new national air pollution standards for nitrogen dioxide, sulfur dioxide and atmospheric ozone. These three pollutants are responsible for significant health impacts in Australian communities; causing asthma, reduced lung function, pre-term and low-weight birth, and cardiorespiratory mortality.

Health experts including the Thoracic Society, the Lung Foundation, the Royal Australasian College of Physicians and the Lung Health Research Centre recommend that Australian governments adopt much stricter national standards for ambient air pollution.[75] They also recommend air pollution monitoring in pollution hot spots, public access to real-time air pollution monitoring data through a nationally coordinated website, and mechanisms to ensure compliance and enforcement of the new standards.[76]

A regulatory impact statement was released in May 2019, proposing somewhat stricter ambient air pollution standards, but falling short of these recommendations. More than 18,000 community members and non-government organisations made submissions on the Impact Statement. The overwhelming majority of submissions endorsed standards consistent with international best practice.

The Australia Institute's (TAI) submission was particularly critical of the cost-benefit analysis prepared as part of the NEPM variation Impact Statement. TAI economist Rod Campbell identified major flaws in the methodology and conclusions which under-estimate the benefits of complying with stronger air pollution standards by up to 99% and significantly over-estimate the costs of readily-available pollution controls by more than seven times.

The initial timeline for the review was set to conclude in 2019, however, this has been pushed back so that the National Environment Protection Council can review the evidence provided in the 18,000 submissions and interrogate the accuracy of the cost-benefit analysis. It is not clear if or when a date has been set for the finalisation of this review.

The NSW Environment Minister should vote to set strong health-based national air pollution standards, as proposed by Australia's health community.

In the absence of strong health-based national standards, the government must recognise any national standards as a baseline requirement, and adopt higher NSW standards for permitted

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[75] Clare Walter, Maxwell Smith et al. (2019) *Health-based standards for Australian regulated thresholds of nitrogen dioxide, sulfur dioxide and ozone: Expert Position Statement 2019*: https://www.envirojustice.org.au/wp-content/uploads/2019/11/Expert-Position-Statement-PDF.pdf; Kotsirilos, Vicki "Health experts right in calling for stonger air pollution standards" *Australian Medicine*, November 4 2019: https://ama.com.au/ausmed/health-experts-right-calling-stronger-air-pollution-standards

[76] Clare Walter, Maxwell Smith et al. (2019) *Health-based standards for Australian regulated thresholds of nitrogen dioxide, sulfur dioxide and ozone: Expert Position Statement 2019*: https://www.envirojustice.org.au/wp-content/uploads/2019/11/Expert-Position-Statement-PDF.pdf; Kotsirilos, Vicki "Health experts right in calling for stonger air pollution standards" *Australian Medicine*, November 4 2019: https://ama.com.au/ausmed/health-experts-right-calling-stronger-air-pollution-standards

concentrations of major pollutants, based on independent established research, and which are the subject of expert and public consultation processes.

The Government has already announced interim hourly air quality standards for $PM_{2.5}$ and $PM_{10}$, of 62 µg/$m^3$ and 80 µg/$m^3$, respectively. The 24-hour standards are for concentrations of 25 µg/$m^3$ and 50 µg/$m^3$.

Air pollution experts and epidemiologists including Dr Ben Ewald, have expressed their concern about the lack of transparent scientific evidence for the selection of these standards.

The NSW hourly standards for $PM_{2\,5}$ and $PM_{10}$ should be set at levels that align with the science on health impacts of these pollutants.

**Finalise the review of the Load-Based Licencing Scheme, removing the exemption for pollution from coal mines and associated infrastructure that threatens human health.**

The 'polluter pays' principle dictates that those who generate pollution and waste should bear the cost of containment, avoidance or abatement.[77] Load-based licencing schemes require polluters to pay licences fees based on the amount of their pollution. It provides a financial incentive for polluters to reduce their toxic emissions further than what they are licenced to emit, and rewards those who are reducing their emissions for any reason. This is good way to ensure that polluters are bearing the cost of their pollution rather than pushing it on to local communities as health costs and allows polluters to determine the most cost effective way of doing so.

The NSW Load-Based Licencing scheme is the only significant incentive for industry operators to reduce air pollution, and it has been under review since late 2016. In redeveloping the Load Based Licencing Scheme, the EPA should ensure that the fees are set at a level that does in fact incentivise emission reduction and internalises the cost of the pollution. Although the NSW scheme is structurally sound, the fees are set too low and have not incentivised pollution reductions in the power stations (as evidenced by the fact that none of the NSW power stations have installed new pollution reduction technologies or reduced their emissions for many years). It has been estimated by Doctors for the Environment Australia that the NSW scheme would have to increase by a factor of 50 to properly internalise the health costs created by the NSW power stations.[78]

In the Upper Hunter, open cut coal mines are responsible for about 90% of coarse particle pollution. These emissions have increased dramatically over the last decade, and $PM_{10}$ concentrations regularly exceed the national standard. Local GP Bob Vickers, using the World Health Organization figures, estimates that over the last five years pollution from $PM_{10}$ has caused at least 160 more deaths in the

[77] *Protection of the Environment Administration Act 1991* (NSW) s. 6(2)d)(i).
[78] Doctors for the Environment Australia (2016) Submission to NSW EPA on the Review of the loadbased licensing scheme, December 2016, p.6: https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/licensing/lbl/lbl-issues-paper-doctors-for-the-environment.pdf?la=en&hash=6C115A77E8F9BB507FEC7C6CF8EA0AF20BFEC42F

Upper Hunter.[79] This unfair health burden is shouldered by the community, not the mining companies. The government must extend the Load-Based Licencing scheme to include a fee for the coarse and fine particle pollution emitted by coal mines and associated infrastructure (trucks, conveyors, load-out facilities and trains).

**The government must commit to further research and policy development with regards to air pollution and impact on health.**

It is clear further research is required to adequately quantify the health impacts of air pollution and the benefits accruing from controlling air pollution.

Additional research should include the utilisation of detailed atmospheric modelling to estimate ground level air pollution across all populated areas of NSW. It is also important to quantify other non-health indicators such as reduced labour productivity, the co-benefits of reducing other pollutants, and reduction in secondary particulate formation. The US EPA included an assessment of many of these factors in its assessment of the costs and benefits of the Clean Air Act.[80]

[79] See: World Health Organization. Regional Office for Europe. (2006). Air quality guidelines global update 2005: particulate matter, ozone, nitrogen dioxide and sulfur dioxide – Summary of risk assessment. Copenhagen: WHO Regional Office for Europe, p.12: https://apps.who.int/iris/bitstream/handle/10665/69477/WHO_SDE_PHE_OEH_06.02_eng.pdf?sequence=1

[80] United States Environment Protection Agency, *Benefits and costs of the Clean Air Act 1990-2020: the Second Prospective Study*, 15 September 2001, p. 493. Available at: http://www.epa.gov/clean-air-act-overview/benefits-and-costs-clean-air-act-1990-2020-second-prospective-study