

Submission to the Inquiry into the Health Impacts of Air Pollution in Victoria

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Healthy planet, healthy people

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Inquiry into Health Impacts of Air Pollution in Victoria
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Doctors for the Environment Australia (DEA) is an independent, self-funded, non-government organisation of medical doctors and students in all Australian States and Territories. Our members work across all specialties in communities, hospitals and private practices. We work to prevent and address the health risks - local, national and global - caused by damage to our natural environment. We are a public health voice in the sphere of environmental health with a primary focus on the health harms from pollution, environmental degradation, and climate change.

Over the past decade, DEA has advocated for improvements in air quality and air quality standards to protect health.^{1,2,3, 4,5,6,7} We welcome the opportunity to contribute to this Victorian Government Inquiry into the health impacts of air pollution in Victoria.

In this submission, we focus on the terms of reference for the inquiry that align most closely with Doctors for the Environment policy and expertise, these being:

- (a) state-wide, practical, real-time, cost-effective mitigation strategies;*
- (b) ensuring that Victorian air quality continues to track towards meeting or exceeding current international best practice standards, and;*
- (e) any other related matters.*

¹ DEA submission to proposed variation to standards for ozone, NO₂ and SO₂ July 2019
<https://www.dea.org.au/expert-position-statement-on-health-based-standards-for-australian-regulated-thresholds-of-nitrogen-dioxide-sulfur-dioxide-and-ozone-in-ambient-air-august-2019/>

² DEA submission to the review of the National Pollution Inventory August 2018.
<https://www.dea.org.au/submission-to-the-review-of-the-national-pollution-inventory-npi/>

³ DEA submission on Better fuel for cleaner air draft regulation impact statement. March 2018
<https://www.dea.org.au/better-fuel-for-cleaner-air-draft-regulation-impact-statement/>

⁴ DEA submission to Clean Air for all Victorians. June 2018 <https://www.dea.org.au/submission-to-the-clean-air-for-all-victorians-victorias-air-quality-statement/>

⁵ DEA submission to Victorian CFPS licence reviews. Feb 2018 <https://www.dea.org.au/victorian-brown-coal-fired-power-stations-licence-reviews-submission/>

⁶ DEA submission to the Senate Committee on the impacts on health of air quality in Australia 2013.
<https://www.dea.org.au/submission-to-the-senate-committee-on-the-impacts-on-health-of-air-quality-in-australia-2013-healthy-planet-healthy-people-dea/>

⁷ DEA expert position statement on health- based standards for Australian regulated thresholds of NO₂, SO₂ and ozone. August 2019 <https://www.dea.org.au/expert-position-statement-on-health-based-standards-for-australian-regulated-thresholds-of-nitrogen-dioxide-sulfur-dioxide-and-ozone-in-ambient-air-august-2019/>

Preamble

The majority of ambient air pollution in Australia is generated from:

- electricity generation from fossil fuels,
- motor vehicle emissions,
- industrial processes, particularly from the chemical and mining industries,
- bushfires and
- domestic wood-fires.

These sources release a range of harmful air pollutants including carbon monoxide, nitrogen dioxide, ground level ozone, particulate matter (PM_{2.5} and PM₁₀), sulphur dioxide, and lead. The extensive evidence relating these individual pollutants to adverse health outcomes is summarised in Appendix 1 of this submission (pages 17-20).

Air pollution in Australia contributes to more than 3000 premature and preventable deaths per year and generates health costs of \$11-24 billion annually.^{8,9} It is a major risk factor for a range of chronic diseases including asthma, lung disease, heart disease, cancer, and diabetes. In children, air pollution has been associated with asthma and poor lung development. It also increases risk of pre-term birth and low birth weight, which has lifelong adverse health consequences. Air pollution appears to be an important although not yet quantified risk factor for neurodevelopmental disorders in children and neurodegenerative diseases in adults.^{10,11}

Importantly, for many pollutants, there is no lower threshold of exposure below which there is no effect.¹² The lack of a threshold means the language of a 'safe level' is no longer appropriate and that any lowering of pollution exposures will have health benefits.

Air pollution can be mitigated, and clean air should be a priority to improve and maintain the health and save the lives of Victorians.

⁸ Begg S, et al. The burden of disease and injury in Australia 2003. Australian Institute of Health and Welfare, Canberra, 2007. <https://www.aihw.gov.au/getmedia/f81b92b3-18a2-4669-aad3-653aa3a9f0f2/bodaiia03.pdf.aspx>

⁹ State of the Environment Australia. Health impacts of air pollution. 2016

<https://soe.environment.gov.au/theme/ambient-air-quality/topic/2016/health-impacts-air-pollution>

¹⁰ Grandjean P, Landrigan PJ. Neurobehavioural effects of developmental toxicity. *Lancet Neurol* 2014; 13: 330–38 <https://pubmed.ncbi.nlm.nih.gov/24556010/>

¹¹ Kioumourtzoglou MA, Schwartz JD, Weiskopf MG, et al. Long-term PM_{2.5} exposure and neurological hospital admissions in the northeastern United States. *Environ Health Perspect* 2015; 124: 23–29. <https://ehp.niehs.nih.gov/doi/10.1289/ehp.1408973>

¹² Barnett AG. It's safe to say there is no safe level of air pollution. *Aust N Z J Public Health*. 2014;38(5):407-8. <https://onlinelibrary.wiley.com/doi/full/10.1111/1753-6405.12264>

Doctors for the Environment Recommendations

Coal-fired Power Stations:

- Introduce licence conditions that require the retrofit of modern pollution controls to existing coal fired power stations.
- Implement significant financial incentives for companies to switch to less polluting production techniques.
- Establish a clear plan for early closure of the three remaining Coal-fired Power Stations (CFPS) in the Latrobe Valley to protect health while ensuring the welfare of CFPS workers and communities.

Transport emissions:

- Increase taxes on diesel vehicles and reduce taxes on clean vehicles such as electric or hydrogen vehicles.
- Develop anti-idling regulations and regulations to address “smoky vehicles”.
- Support the introduction of increased emission standards for new light vehicles based on Euro 6 and for new heavy vehicles based on Euro VI.
- Support the uptake of electric vehicles through measures such as government fleet purchases, tax concessions and increased charging infrastructure, and delay road user charges until electric vehicles comprise at least 10 per cent of the fleet.

Bushfires and hazard reduction burns:

- Develop public education campaigns regarding measures people can take to keep themselves safe from smoke during bushfires.
- Provide more detailed health advice based on location-specific air quality data and forecasts, allowing planning of daily activities including outdoor exercise.
- Make available to the public easily understandable and consistent information on air quality during bushfires and hazard reduction burning, including smoke alerts and real time air quality data (e.g., via a smartphone app).
- Increase the number of air quality monitoring stations, both portable and fixed, and low-cost sensors that can be rapidly deployed in a bushfire emergency.

Wood-fired heaters

- Educate the public on the harms of air pollutants from wood fired heaters.
- Develop a phase out program, with provision of financial incentives to encourage households to switch to healthier heating options.

Air quality monitoring data

- Make air quality monitoring data available in close to real time and historical data available for download, following the example of NSW and Queensland.

TOR (a) state-wide, practical, real-time, cost-effective mitigation strategies.

1. Coal fired power stations

Coal-fired power stations (CFPS) are the dominant source of fine particle pollution (PM_{2.5}), oxides of nitrogen (NO_x) and sulphur dioxide in Australia.¹³

Pollution from CFPS causes the premature or avoidable deaths of 785 Australians every year.¹⁴ It is also responsible for 14,434 instances of children experiencing asthma symptoms and 845 babies born with low birth weight.¹⁴ In 2009, the cost of burning coal on the health system in Australia was assessed to be over \$2 billion annually.¹⁵ The Hazelwood mine fire disaster would have increased this amount considerably.

As well as causing local pollution that impacts on nearby residents, modelling has shown that pollutants from CFPS can travel hundreds of kilometres under certain weather conditions. By so doing, they worsen air quality over large areas and form a substantial component of ambient air pollution in large cities.

Restricting emissions in the Latrobe Valley is not only fundamental for protecting local communities but also for ensuring clean air for the whole of Victoria.

Pollution control technologies

The three coal fired power stations in the Latrobe Valley lack the pollution controls found on power stations elsewhere in the country. All NSW and most Queensland power stations have fabric filters that are highly effective in capturing particle air pollution before it leaves the chimney. While Hazelwood was by far the most polluting of Australia's CFPS, the three remaining Victorian generators – Loy Yang A and B, and Yallourn - are dirtier from the perspective of particle pollution than all others in Australia except for Tarong in Queensland (see Figure 1).

¹³ Cullen L. 6 April 2020. Environmental Justice Australia media release. CFPS top biggest polluter list again, NPI. <https://www.envirojustice.org.au/coal-fired-power-stations-top-biggest-polluter-list-again-as-toxic-emissions-soar-national-pollution-inventory/>

¹⁴ Farrow, A., Anhäuser, A. and Myllyvirta, L. (2020). Lethal power: how burning coal is killing people in Australia. Retrieved from <https://www.greenpeace.org.au/research/lethal-power-how-coal-is-killing-people-in-australia/> on Mar 8th, 2021

¹⁵ Australian Academy of Technological Sciences and Engineering. 2009. The hidden costs of electricity. <https://www.scribd.com/document/36842518/ATSE-Hidden-Costs-Electricity-report>

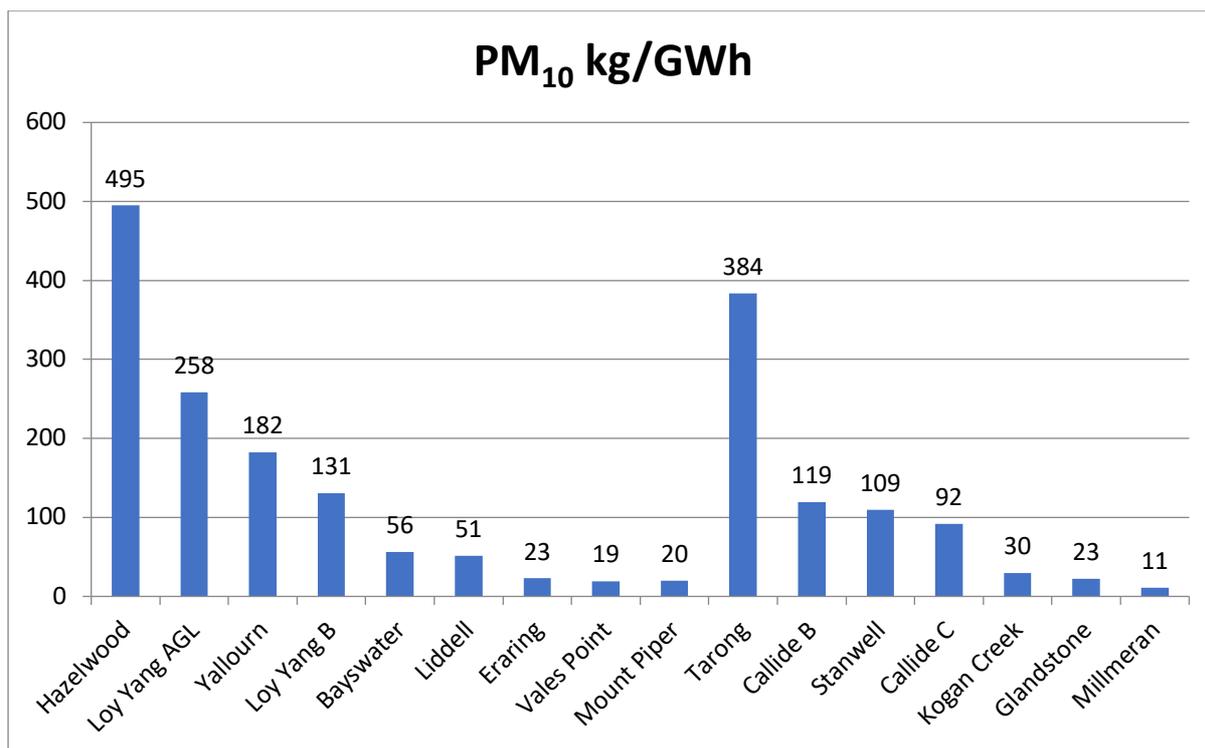


Figure 1: 2017 National Pollutant Inventory figures for PM₁₀ divided by the annual output of electricity, in units of Kg PM₁₀ /GWh of output www.npi.gov.au/npi-data

Overseas, many CFPS are also fitted with flue gas desulphurisation scrubbers that can reduce release of SO₂ emissions by over 90 per cent. However, there are currently no national or statewide limits on power station emissions of SO₂ in any Australian jurisdiction. Similarly, selective catalytic converters are used to control emissions of NO₂ in other countries, but there is a lack of regulatory mechanisms to enforce such pollution control measures in Australia.¹⁶

The range of options for pollution control technologies on power stations have been extensively covered in the People’s Clean Air Action Plan recently published by Environment Justice Australia.¹⁷

We note that the Victorian Environmental Protection Agency (EPA) has recently completed a review of the licences of the three brown CFPS in Victoria. An outcome of the review was that licence holders ‘have to continually assess the practicability of upgrading key air emission control technologies at their plants.’¹⁸ However, there is no *requirement* for the licence holders to install pollution control technologies, and little transparency around what might be considered practical. It is DEA’s view that this represents clear prioritisation of the economic interests of the licence holders over public health.

¹⁶ EJA NPI report sees toxic pollutants soar. <https://www.envirojustice.org.au/projects/npi-report-sees-toxic-pollutants-soar-again-and-highlights-need-for-pollution-controls-on-coal-fired-power-stations/>

¹⁷ EJA The People’s Clean Air Action Plan. <https://www.envirojustice.org.au/projects/clean-air-action/>

¹⁸ Victorian EPA. Brown coal-fired power stations licence review March 2021 <https://www.epa.vic.gov.au/about-epa/what-we-do/works-approvals-and-licences/improving-licensing/brown-coal-fired-power-stations-licence-review>

Financial incentives to reduce pollution

In order to achieve substantial reductions in air pollution from CFPS, DEA supports the use of incentives for companies to switch to less polluting production techniques such as a load-based licensing system based on a polluter pays model. Such a model requires the polluter to pay a significant fee per tonne of each pollutant released, creating a financial incentive to generate less pollution. It also adds weight to business cases for updating production methods and pollution control technology.

DEA believes fees imposed should reflect health externalities (i.e. the indirect health consequences of pollution) and be high enough to provide economic incentive to improve processes or to close a poorly performing plant. In addition to incentivising ongoing pollution reduction, a load-based licence fee scheme would serve to set clear minimum standards for environmental performance, give licencees flexibility to implement cost effective pollution abatement methods and increase regulatory transparency. A load-based licence fee scheme would primarily reduce pollution from industrial emitters creating economic equity between the various sectors of the economy. It would also concomitantly reduce their greenhouse emissions.

DEA has recommended the introduction of a load-based licencing system in multiple submissions related to air quality in Victoria previously^{19,20,21}, as have many others. It was therefore disappointing that the Victorian EPA failed to heed these recommendations in its recent CFPS licence review. It is our view that this represents a major missed opportunity.

CFPS closures

DEA notes that recent announcement that the Yallourn CFPS is to close four years ahead of schedule. However, the date set is still seven years away in 2028. Loy Yang A is not scheduled to close until 2046 and Loy Yang B, until 2048. Over the remaining period of operation of these CFPS, ongoing pollution will contribute substantially to negative health impacts in the Latrobe Valley and farther afield. DEA maintains that far earlier closure of these power stations is required in order to protect health.

It is crucial, however, that the closure of these CFPS is well planned to protect the welfare of communities currently dependent on coal industry jobs. It is also vital that legacy assets and infrastructure are fully rehabilitated to ensure environmental restoration and ongoing employment after closure.

¹⁹ DEA submission to Victoria's new environmental laws. February 2020 <https://www.dea.org.au/victorias-new-environmental-laws-submission-february-2020/>

²⁰ DEA submission to the Clean air for all Victorians: Air quality statement June 2018.

<https://www.dea.org.au/submission-to-the-clean-air-for-all-victorians-victorias-air-quality-statement/>

²¹ DEA submission to Victorian CFPS licence reviews. Feb 2018 <https://www.dea.org.au/victorian-brown-coal-fired-power-stations-licence-reviews-submission/>

Recommendations:

- **Introduction of licence conditions that require the retrofit of modern pollution controls to existing CFPS**
- **Implementation of significant financial incentives for companies to switch to less polluting production techniques**
- **The establishment of a clear plan for early closure of the three remaining CFPS in the Latrobe Valley to protect health while ensuring the welfare of CFPS workers and communities.**

2. Transport emissions

Pollutants produced by vehicle exhausts include nitrogen oxides (NO_x), particulate matter, carbon monoxide, sulphur dioxide, volatile organic compounds, and hydrocarbons.

Vehicle emissions are a major contributor to poor air quality in urban areas in Victoria. In the Melbourne metropolitan region, vehicle pollution can contribute up to 70 per cent of total urban air pollution.²²

In 2015, vehicle emissions were estimated to be responsible for more deaths in Australia than our national road toll (1715 vs. 1205).²³ In 2014, the health costs from PM₁₀ emissions from road transport were estimated to be \$2.7 billion.²⁴

Diesel-powered vehicles

Diesel exhaust is particularly toxic and is classified by the World Health Organisation and the International Agency for Research on Cancer (IARC) as a Class 1 carcinogen, increasing the risk of lung cancer.²⁵ Diesel-powered vehicles also emit higher amounts of fine particulates and NO_x than petrol engines. Much of Europe is now back-peddling away from diesel with bans or heavy fines placed on diesel vehicles driving through major cities such as Paris, London, and Munich. In

²² Vic EPA Vehicle emissions and air quality <https://www.epa.vic.gov.au/your-environment/air/vehicle-emissions-and-air-quality>

²³ Bureau of Infrastructure, Transport and Regional Economics (2017), 'Australian Road Deaths Database' (online database), https://bitre.gov.au/statistics/safety/fatal_road_crash_database.aspx

²⁴ Draft Variation to the National Environment Protection Measure. Impact statement, July 2014, Commonwealth of Australia. <http://www.environment.gov.au/protection/nepc/nepms/ambient-air-quality/variation-2014/impact-statement>

²⁵ Silverman D. Diesel exhaust and lung cancer. American Journal of Epidemiology Vol 187(6), June 2018 pp.1149-1152 <https://academic.oup.com/aje/article/187/6/1149/4924564>

contrast, Australian diesel vehicle ownership increased from 19.7% of the national fleet in 2015 to 26% in 2020.²⁶

DEA commends the Victorian government decision to allocate a budget to a 3-year trial of a zero-emissions bus fleet.²⁷

Idling and smoky vehicles

Children commuting to and from schools are exposed to high levels of vehicle-related air pollution especially when schools are located next to major roads.²⁸ This exposure is heightened due to idling of cars at school drop-off and pick-up points.²⁹ Many States in the US have anti-idling regulations, and these could be introduced in Victoria.³⁰ These should be applicable to all vehicle types in all city areas, although this is particularly important around schools. DEA supports increased public education around the harms of idling, along the lines of that provided by the “Idle Off” campaign. www.idleoff.com.au

DEA also supports the introduction of specific regulations to address “smoky vehicles”. The current situation in which members of the public are encouraged to report smoky vehicles following which owners receive a letter advising that their vehicle may need repairs does little to address this problem.³¹ Regulations should be modelled on UK regulations whereby vehicles must pass an exhaust emissions check to be registered. Emissions may also be tested in the UK as part of a roadside check.³²

Emission standards

Globally, many countries have adopted stringent policies to protect the public from vehicle emissions. In contrast, Australia has amongst the worst vehicle emission standards in the

²⁶ Motor Vehicle Census, Australia 31 Jan 2020 Australian Bureau of Statistics <https://www.abs.gov.au/statistics/industry/tourism-and-transport/motor-vehicle-census-australia/latest-release>

²⁷ Press Release Victorian Premier Nov 2020 <https://www.premier.vic.gov.au/investing-buses-future>

²⁸ Breathe London Wearables Study October 2019 <https://www.london.gov.uk/WHAT-WE-DO/environment/environment-publications/breathe-london-wearables-study>

²⁹ Richmond-Bryant J, Bukiewicz L, Kalin R, Galarraga C, Mirer F. A multi-site analysis of the association between black carbon concentrations and vehicular idling, traffic, background pollution and meteorology during school dismissals. *Science of the Total Environment*. May 2011. Vol 409:11 pp2085-2093 <https://www.sciencedirect.com/science/article/abs/pii/S0048969711001732?via=percent3Dihub>

³⁰ US Department of Energy. Idling Reduction for Personal Vehicles https://afdc.energy.gov/files/u/publication/idling_personal_vehicles.pdf

³¹ Vic EPA Report smoky cars and vehicles <https://www.epa.vic.gov.au/report-pollution/smoky-cars>

³² UK government emissions testing for MOT <https://www.gov.uk/emissions-testing>

Organisation for Economic Co-operation and Development (OECD).^{33,34,35} The current minimum standard for new light vehicles in Australia is ADR/ 79/04, which is based on the Euro 5 standards.^{36,37} The current minimum standard for new heavy vehicles is ADR 80/03, which is based on the Euro V standards. By comparison, it has been a requirement in Europe since 2015 that all new light vehicles sold are Euro 6-compliant and heavy vehicles Euro VI-compliant. In the United States, even higher standards are applied.

This has created a situation where car manufacturers and importers can treat Australia as a dumping ground for dirty vehicles that don't meet international standards. The result is increased vehicle pollution, worse air quality and poorer health outcomes for Australians.

Electric vehicles

Electric vehicles emit no tailpipe pollutants, which means instantaneous improvements in urban air pollution. When renewable energy is used to power them, they are responsible for no air pollution at all.

A recently published study from the United States found that \$US17 billion in social and health costs could be saved if one in four cars transitioned to electric.³⁸ In more aggressive scenarios, where 75 per cent of cars were replaced with electric vehicles and renewable energy generation was increased, savings of as much as \$70 billion annually could be reached.³⁸

Similar to the situation with emission standards, Australia is lagging well behind other comparable countries in the transition to electric vehicles. Indeed, Australia has lower electric vehicle sales than all other OECD countries apart from Mexico, Chile, and Turkey.³⁹ In 2020, electric vehicles accounted for just 0.75% of total cars sold in Australia. By comparison, electric vehicle sales increased their market share between 2019 and 2020 from 3.8% to 10.2% in the EU, from 3.1% to 10.7% in the UK, from 7.6 % to 8.1% in California, and from 56% to 75% in Norway.⁴⁰

³³ OECD. The costs of air pollution: Health impacts of road transport <https://www.oecd.org/env/the-cost-of-air-pollution-9789264210448-en.htm>

³⁴ DEA submission on Better fuel for cleaner air draft regulation impact statement. March 2018 <https://www.dea.org.au/better-fuel-for-cleaner-air-draft-regulation-impact-statement/>

³⁵ DEA submission on Better fuel for cleaner air discussion paper March 2017 https://www.dea.org.au/wp-content/uploads/2017/03/Submission-on-Better-Fuel-for-Cleaner-Air_03-17.pdf

³⁶ Australia has adopted international standards for vehicle emissions which have been developed by the United Nations and are referred to as "Euro standards". The Euro standards regulate the emission standards of nitrogen oxides (NO_x), hydrocarbons, carbon monoxide, particulate numbers and particulate materials.

³⁷ Australian government. Vehicle Emission Standards

<https://www.infrastructure.gov.au/vehicles/environment/emission/index.aspx>

³⁸ Peters D, Schnell J, Kinney P, Naik V, Horton D. Public Health and Climate Benefits and Tradeoffs of U.S. Vehicle Electrification. *GeoHealth*, 13 August 2020 Vol 4:10 DOI: [10.1029/2020GH000275](https://doi.org/10.1029/2020GH000275)

³⁹ ABC FactCheck June 2019 <https://www.abc.net.au/news/2019-05-03/fact-check-electric-cars-australia-vs-oecd/11072962>

⁴⁰ Electric Vehicle Council submission 2020 <https://electricvehiclecouncil.com.au/wp-content/uploads/2021/03/2021-Submission-to-the-Senate-Standing-Committee-on-Economics-on-the-COAG-Reform-Fund-Amendment.pdf>

Policies to stimulate electric vehicle uptake in Australia are very much needed, not only to address air pollution but also vehicle-related CO₂ emissions. Yet despite this, Victoria is on the cusp of introducing a new tax on low-emission vehicles to compensate for their avoidance of fuel excise taxes. If the relevant legislation passes, Victoria will become the first state in Australia and indeed the first jurisdiction in the world to introduce a measure that will discourage electric vehicle uptake rather than incentives to encourage it.

DEA supports reform of road taxation system via road user charges at some time in the future. However, at this point, incentivising uptake of zero emissions vehicles must be the priority. A range of financial and non-financial incentive measures have been successfully utilised in the European Union and elsewhere.⁴¹

Active transport

DEA sees the goal of reducing urban air pollution as an opportunity to develop and pursue intersectoral policies that aim to reduce motor vehicle use and increase the use of public and active transport. Such policies have important health co-benefits in addition to lowering urban air pollution concentration.

Physical activity - walking and cycling - helps prevent heart disease, some cancers, type-2 diabetes, and other obesity-related health risks.⁴² Transport systems that prioritise safe and accessible active transport and rapid transit systems improve urban land use and enhance health equity by improving access for vulnerable groups, including children, the elderly, people with disabilities, and lower wage earners.

The World Resources Institute states that private cars account for less than one-third of trips in cities worldwide but are responsible for 73 per cent of urban air pollution and generate three times more greenhouse gas than public transport. They suggest a '3C' model of urban growth: Connected, Compact, and Coordinated, where transit-oriented development strategies focus on adapting urban spaces to the needs of pedestrians and cyclists.⁴³

⁴¹ <https://electricvehiclecouncil.com.au/wp-content/uploads/2021/03/2021-Submission-to-the-Senate-Standing-Committee-on-Economics-on-the-COAG-Reform-Fund-Amendment.pdf>

⁴² World Health Organisation. Health and co-benefits of climate change mitigation – transport sector. 2011 http://extranet.who.int/iris/restricted/bitstream/handle/10665/70913/9789241502917_eng.pdf;jsessionid=4E57D4241B385E62CA862419A7DA8EA3?sequence=1

⁴³ World Resources Institute. Transport Plays a Key Role in Urban Air Quality by Toni Lindau - February 03, 2015 <https://www.wri.org/print/42553>

Recommendations:

- **Increase taxes on diesel vehicles and reduce taxes on clean vehicles such as electric or hydrogen vehicles.**
- **Develop anti-idling regulations and regulations to address “smoky vehicles”.**
- **Support the introduction of increased emission standards for new light vehicles based on Euro 6 and for new heavy vehicles based on Euro VI.**
- **Support the uptake of electric vehicles through measures such as government fleet purchases, tax concessions and increased charging infrastructure, and delay road user charging until electric vehicles comprise at least 10 per cent of the fleet.**

Bushfires and hazard reduction burns

Bushfire smoke is a complex mixture of particulate matter, toxic gases and chemicals including carbon monoxide, sulphur dioxide, nitrogen dioxide, benzene, formaldehyde, cyanide gas, and polycyclic aromatic hydrocarbons. In Victoria, smoke from bushfires and hazard reduction burning is a significant source of air pollution.

There is overwhelming evidence of many negative health impacts of bushfire smoke.⁴⁴ Specifically, studies have shown:

- an increase in all-cause mortality rates during bushfires
- an increase in ambulance callouts
- an increase in emergency department presentations and hospital admission rates
- an increase in out of hospital cardiac arrests
- a direct association between bushfire smoke exposure and exacerbations of asthma and chronic obstructive pulmonary disease.

The disastrous impact that bushfires can have on air quality was demonstrated during Australia’s 2019-20 ‘Black Summer’. Around 80 per cent of the Australian population was exposed to very high levels of smoke pollution during the fire period, in some cases for weeks. An early study of the smoke-related health burden in Eastern Australia demonstrated over 400 excess deaths and over

⁴⁴ DEA submission Lessons to be Learnt in relation to the Australian bushfire season 2019-20. May 2020 <https://www.dea.org.au/lessons-to-be-learnt-in-relation-to-the-australian-bushfire-season-2019-20/>

5000 hospitalisations for heart and lung problems.^{45,46} Australians will suffer longer and more severe bushfire seasons in the future due to climate change.⁴⁷

There is a profound lack of community awareness of protective behaviours during a smoke emergency. People with smoke sensitive conditions like asthma, chronic obstructive pulmonary disease or heart disease should limit smoke exposure by staying indoors, closing windows, wearing appropriate masks, filtering indoor air, or sheltering at refuges such as suitable public buildings where there is clean air. A public education campaign with the working title of “Air Smart” has been proposed by Asthma Australia and DEA supports its implementation.

Recommendations:

- **Develop public education campaigns regarding measures people can take to keep themselves safe from smoke during bushfires.**
- **Provide more detailed health advice based on location-specific air quality data and forecasts, allowing planning of daily activities including outdoor exercise**
- **Make available to the public easily understandable and consistent information on air quality during bushfires and hazard reduction burning, including smoke alerts and real time air quality data (e.g. via a smartphone app)**
- **Increase the number of air quality monitoring stations, both portable and fixed, and low-cost sensors that can be rapidly deployed in a bushfire emergency**

Wood smoke from wood-fired heaters

Over the 2020 winter, the Victorian EPA identified smoke emissions from wood heaters and cookers as responsible for 27 per cent of Melbourne’s PM_{2.5} emissions.⁴⁸ The impacts in rural communities with high numbers of wood heaters are likely to be even greater. EPA Victoria has conducted only

⁴⁵ Vardoulakis S, Jalaludin B, Morgan G, Hanigan I and Johnston F. Bushfire smoke: urgent need for a national health protection strategy *Med J Aust* 2020; 212 (8): 349-353.

<https://www.mja.com.au/journal/2020/212/8/bushfire-smoke-urgent-need-national-health-protection-strategy>

⁴⁶ Borchers Arriagada, N. et al. Unprecedented smoke-related health burden associated with the 2019–20 bushfires in eastern Australia. *Med J Aust*. doi: 10.5694/mja2.50545.

<https://www.mja.com.au/journal/2020/213/6/unprecedented-smoke-related-health-burden-associated-2019-20-bushfires-eastern>

⁴⁷ Yu p, Zu r, Abramson M, Li S, Guo Y. Bushfires in Australia: a serious health emergency under climate change *Jan 2020 Comment Vol 4(1); Pe7-e8* [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(19\)30267-0/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(19)30267-0/fulltext)

⁴⁸ Vic EPA Wood smoke and air quality <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/wood-smoke-air-quality>

limited air quality monitoring in many rural towns but has found that domestic wood heaters are responsible for most exceedances in air quality standards.

The health costs of domestic wood heaters in Australia are estimated to be \$3.4 billion annually: \$4000 to \$5600 per wood heater per year.⁴⁹ About 10 per cent of Australian households use wood heaters as their primary source of heating. In addition, 40,000-50,000 new wood heaters are sold every year.

Critically, modern wood heater standards do not adequately reduce air pollution. A heater that meets the AS/NZS 4103:2014 standard, installed in 2018, when burning 5kg of firewood per hour still pollutes as much per hour as 73 modern Euro 5 rated diesel cars. When wood heaters in actual use have been studied, the particle pollution is often many times higher than that measured under laboratory test conditions.

There is a need for public education on the harms associated with wood fire smoke, with discussions resembling those around tobacco smoking. DEA supports an evidence-based phase out program for wood heaters, as implemented for incinerators and open-flued gas heaters because of public health concerns.⁵⁰

In some cities, successful incentive schemes have been employed to encourage people to remove wood heaters and improve insulation to reduce heating bills. In Launceston, an intervention of this type led to reductions in winter PM₁₀ levels from 44mcg/m³ to 27mcg/m³.⁵¹ In turn, winter mortality fell by 20% from cardiovascular disease and by 28% from respiratory disease, with these reductions nearly reaching statistical significance.

Recommendations

- **Education the public on the harms of air pollutants from wood fired heaters.**
- **Develop a phase out program, with provision of financial incentives to encourage households to switch to healthier heating options**

⁴⁹ Robinson D L. Woodsmoke: Regulatory failure is damaging public health. Environmental Justice Australia 2014 https://envirojustice.org.au/sites/default/files/files/Air_percent20Summit_percent202015/Robinson_2014_AQCC_Woodsmoke_Health_Regulation.pdf

⁵⁰ <https://www.theage.com.au/national/victoria/ama-fires-up-over-wood-heater-buy-back-scheme-20200611-p5528k.html>

⁵¹ Johnston F, Hanigan I, Henderson S, Morgan G. Eval Evaluation of interventions to reduce air pollution from biomass smoke on mortality in Launceston, Australia: Retrospective analysis of daily mortality, 1994-2007 British Medical Journal 2013; 346. <https://www.bmj.com/content/346/bmj.e8446>

TOR (b) ensuring that Victorian air quality continues to track towards meeting or exceeding current international best practice standards and is enforced

Victoria's recent review of brown coal power station licences

As noted above, the Victorian EPA recently completed a three-and-a-half-year review of Victoria's CFPS licences. This failed on multiple other fronts to take measures to bring emissions from Victoria's CFPS in line with international standards.

Specifically, the review:

- failed to impose requirements for CFPS to install the sorts of basic pollution controls that are required in most other world regions (see pages 4-6 above under **Pollution control technologies**)
- modestly tightened limits on pollutants such as sulphur dioxide and PM_{2.5}, but set these limits above what the plants currently produce, resulting in minimal impact to air quality
- for the first time set limits on mercury emissions, but again, set the limits so high that they are unlikely to reduce mercury pollution
- while acknowledging the health impacts of 'class three' substances like dioxins and furans, cadmium, and benzene, and adding monitoring conditions of these to each licence, took no steps to ensure the levels of these pollutants are actually reduced
- failed to take any action to reduce greenhouse gas emissions.

One positive outcome from the review was that it made continuous air monitoring requirements uniform for all power stations. However, this will not in itself reduce pollution without a requirement for pollution reduction measures and stricter air pollution standards. It also stipulated that air monitoring data be made available to the public. However again, while the notion of greater transparency is commendable, on its own this will do little to protect the health of communities.

Overall, it is DEA's view that the Victorian EPA missed a major opportunity through this review to improve air quality in the Latrobe Valley and surrounds. The flow on will be worse health outcomes for Victorians.

Air quality standards

Air quality standards for Australia are set by agreement between the various state and territory environment ministers, in a process known as the National Environment Protection Measure, or NEPM. While the NEPM standards are advisory and not enforceable under law, individual states and territories use them as a guide to form their own enforceable standards.

The NEPM values for nitrogen dioxide, sulphur dioxide and ozone were recently revised after 21 years.⁵² Whilst the new standards for these pollutants are considerably improved compared with the previous standards, the levels set are still well-above the level at which harm to health occurs and they do not align with international best practice.⁵³

In 2019, peak medical bodies including DEA published an expert consensus paper that made a range of recommendations regarding new thresholds for nitrogen dioxide, sulphur dioxide, and ozone to bring them in line with international standards.⁵⁴ Recommendations were also made regarding improved air pollution monitoring and reporting metrics, improved compliance obligations and enforcement mechanisms and regular updating of the standards to ensure they reflect current scientific evidence and international standards.

We refer the Environment and Planning Committee to this paper⁵⁴, as its recommendations are relevant to this Inquiry. A summary of recommendations is here:

1. Regularly revise and lower the thresholds of air pollutants e.g., PM_{2.5}, nitrogen dioxide, sulphur dioxide, and ozone, based on emerging scientific evidence.
2. The network of NEPM compliance monitors should be expanded to reflect risks from widespread source emissions and hotspots, such as traffic on major roadways. Air quality standards should protect people wherever they live, including those close to coal-fired power stations and major roadways.
3. Air quality monitoring data should be made publicly available through a coordinated national website, allowing access to real-time and historical data.
4. Air quality standards should include compliance obligations and enforcement mechanisms. A strong and proactive approach to air pollution prevention requires robust and well-resourced institutional arrangements capable of decisive policy intervention. This includes incentives and penalties that create a sufficient deterrent to prevent non-compliance.
5. Strong health-based standards should be set now to protect health, with an exposure reduction framework in place for continual improvement of the standards, to “minimise the risk of adverse health impacts from exposure to air pollution for all people, wherever they may live.”

⁵² National Environment Protection Council April 2021 Variation to Ambient Air Quality NEPM – ozone, nitrogen dioxide and sulphur dioxide. <http://www.nepc.gov.au/nepms/ambient-air-quality/variation-ambient-air-quality-nepm-ozone-nitrogen-dioxide-and-sulfur>

⁵³ Zosky G, Hoorn S, et al. Principles for setting air quality guidelines to protect human health in Australia. March 2021. The Medical Journal of Australia. 214(6) <https://onlinelibrary.wiley.com/doi/full/10.5694/mja2.50964>

⁵⁴ DEA expert position statement on health-based standards for Australian regulated thresholds of NO₂, SO₂ and ozone. August 2019 <https://www.dea.org.au/expert-position-statement-on-health-based-standards-for-australian-regulated-thresholds-of-nitrogen-dioxide-sulfur-dioxide-and-ozone-in-ambient-air-august-2019/>

TOR (e) any other related matters.

Public availability of air quality data

The Victorian EPA publishes online only the latest 48 hours of air quality data. DataVic makes available results of all sites and all parameters in a single file once a year, but with more than 12 months delay. As of February 2021, the 2019 file is the most recent. The single large (35 Mb) file is a barrier to access by people without data management expertise, who will mostly be looking for a small number of parameters at a single site and interested in multi-year trends. A much more user-friendly solution has been implemented in both NSW and Queensland, where a web interface allows download of user specified parameters in either a graphic or table format. This allows researchers, students, and community members to study and develop their own interpretation of local air issues and is an important contribution to increasing community engagement with air quality issues. We encourage our state to develop a similar interface.

Recommendations

- **Make air quality monitoring data available in close to real time and historical data be available for download, following the example of NSW and Queensland.**

Appendix 1 - Air Pollutants, their sources and health impacts

Criteria air pollutants

Criteria air pollutants are those that are legislated internationally as measures of air quality and include particulate matter (PM_{2.5} and PM₁₀), nitrogen dioxide (NO₂), carbon monoxide (CO), ozone, sulphur dioxide (SO₂) and lead.⁵⁵

Particulate matter

Particulate matter (PM) is comprised of extremely small solid particles and liquid droplets suspended in air. Particles are defined by their diameter for air quality regulatory purposes. PM₁₀ are particles with diameters of ≤10 micrometres that can be inhaled and enter the lungs. PM_{2.5} are particles ≤2.5 micrometres in diameter that can pass deep into the lungs and enter the bloodstream, affecting distant body organs.⁵⁶

PM₁₀ and PM_{2.5} are emitted during the combustion of solid and liquid fuels, such as occurs during power generation, within vehicle engines, from wood heaters and from industrial processes. In addition to these direct emissions, PM can also be formed from the chemical reactions of gases such as sulphur dioxide and nitrogen oxides (NO_x: nitric oxide plus nitrogen dioxide). Measures to reduce the emissions of these precursor gases are therefore often beneficial in reducing overall levels of particulate matter.

Short-term exposure to PM₁₀ has been associated with worsening of respiratory diseases including asthma and chronic obstructive pulmonary disease, leading to hospitalisations and emergency department visits. Longer term exposure has been linked to chronic cardiorespiratory conditions and metabolic disorders. No safe threshold for PM₁₀ exposure has been identified.⁵⁵

PM_{2.5} exposure is recognised as one of the leading causes of global mortality and morbidity. Short-term exposure has been associated with respiratory symptoms, acute and chronic bronchitis, asthma attacks, emergency room visits, increased hospital admissions due to cardiorespiratory conditions and premature mortality. Longer term exposure has been linked to chronic cardiac and

⁵⁵ Zosky G, Hoorn S, et al. Principles for setting air quality guidelines to protect human health in Australia. March 2021. The Medical Journal of Australia. 214(6) <https://onlinelibrary.wiley.com/doi/full/10.5694/mja2.50964>

⁵⁶ California Air Resources Board. Inhalable Particulate matter and health <https://ww2.arb.ca.gov/resources/inhalable-particulate-matter-and-health>

respiratory disease, neurological disorders^{57,58}, kidney diseases, diabetes⁵⁹, infertility⁶⁰, increased risk of miscarriage⁶¹ and pre-term birth, low-birth weight and reduced lung function in children.

62,63,64,65,66,67,68,69

Similar to PM₁₀, there is no evidence for a safe threshold for PM_{2.5} exposure.

Nitrogen dioxide

Nitrogen dioxide (NO₂) forms when fossil fuels such as coal, oil, gas or diesel are burned at high temperatures. The dominant sources of NO₂ pollution are motor vehicles, off-road vehicles including rail locomotives, coal fired power stations and industrial processes. NO₂ is also released when wood is burnt and thus is a component of smoke pollution.

NO₂ acts a respiratory irritant, causing cough, shortness of breath, wheeze and asthma. In one Australian study, a 4ppb increase in ambient NO₂ concentrations was associated with a 24% (95% CI:

⁵⁷ Kioumourtoglou MA, Schwartz JD, Weisskopf MG, et al. Long-term PM_{2.5} exposure and neurological hospital admissions in the northeastern United States. *Environ Health Perspect* 2015; 124: 23–29.

<https://ehp.niehs.nih.gov/doi/10.1289/ehp.1408973>

⁵⁸ Shi L, Wu X, Yazdi M, et al. Long-term effects of PM_{2.5} on neurological disorders in the American Medicare population: a longitudinal cohort study 19 Oct 2020. *The Lancet* Vol 4(12); E557-E565

[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30227-8/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30227-8/fulltext)

⁵⁹ Bowe B, et al. Diabetes minimally mediated the association between PM_{2.5} air pollution and kidney outcomes. *Nature scientific reports*. 12 March 2020 <https://www.nature.com/articles/s41598-020-61115-x>

⁶⁰ Carre J, Gatimel N, Moreau J, Parinaud J, Lenadri R. Does air pollution play a role in infertility? a systematic review. *Environmental Health* 28 July 2017. 16(18).

<https://ehjournal.biomedcentral.com/articles/10.1186/s12940-017-0291-8>

⁶¹ Xue T, Zhu T, Geng G, Zhang Q. Association between pregnancy loss and ambient PM_{2.5} using survey data in Africa: a longitudinal case-control study, 1998-2016. May 2019. *The Lancet Planetary Health* Vol 3(5), E219-E225. [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(19\)30047-6/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(19)30047-6/fulltext)

⁶² Dennekamp M, Carey M. Air quality and chronic disease: why action on climate change is also good for health. *NSW Public Health Bulletin* 2010; 21(6):115-121. <http://www.publish.csiro.au/paper/NB10026.htm>

⁶³ Kjellstrom T, Neller A, Simpson R. Air pollution and its health impacts: the changing panorama. *Med J Aust* 2002; 177: 604-608. <https://www.mja.com.au/journal/2002/177/11/air-pollution-and-its-health-impacts-changing-panorama>

⁶⁴ Raaschou-Neilsen O, et al. Air pollution and lung cancer incidence in 17 European cohorts (ESCAPE) *The Lancet Oncology*. August 2013 14:9 pp 813-822 [https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045\(13\)70279-1/fulltext](https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(13)70279-1/fulltext)

⁶⁵ Hanigan I, et al Avoidable mortality attributable to anthropogenic fine particulate matter in Australia. *Int. J. Environ. Res. Public Health* Dec 2020, 18, 254. <https://doi.org/10.3390/ijerph18010254>

⁶⁶ Knibbs L, Waterman A, Toelle B, et al. The Australian child health and air pollution study (ACHAPS): a national population-based cross-sectional study of long-term exposure to outdoor air pollution, asthma and lung function. *Environment International*. Nov 2018. Vol 120,pp 394-403

<https://www.sciencedirect.com/science/article/pii/S0160412018309838>

⁶⁷ Bekker B, Pacheco S, Basu R, DeNicola N. Association of air pollution and heat exposure with preterm birth, low birth weight and stillbirth in the US – a systematic review. *JAMA Netw Open* 2020 June1:3(6)

<https://pubmed.ncbi.nlm.nih.gov/32556259/>

⁶⁸ Kioumourtoglou MA, Schwartz JD, Weisskopf MG, et al. Long-term PM_{2.5} exposure and neurological hospital admissions in the northeastern United States. *Environ Health Perspect* 2015; 124: 23–29.

<https://ehp.niehs.nih.gov/doi/10.1289/ehp.1408973>

⁶⁹ Kloog I, et al. Effects of airborne fine particles (PM_{2.5}) on deep vein thrombosis admissions in the northeastern United States. *J Thromb Haemost*. May 2015 13(5): pp768-774

<https://pubmed.ncbi.nlm.nih.gov/25678264/>

8% to 43%) or 54% (95% CI: 26% to 87%) increase in the prevalence of asthma in children, depending on the method for assessing NO₂ exposure.⁷⁰ Conversely, health impact assessments have demonstrated substantial expected reductions in asthma incidence with hypothetical interventions to reduce NO₂ exposure. Other health impacts of NO₂ exposure include atopy, reduced lung function, lower birth weight in newborns and increased risk of premature death.^{71,72}

Existing data suggest that there is an effect threshold for the adverse effects on NO₂ on health. However, it is three to five times lower than the current NO₂ standard.⁷²

Sulphur dioxide

Sulfur dioxide (SO₂) is primarily emitted from coal combustion at CFPS. Even short-term exposure to high levels of SO₂ can adversely impact breathing, particular for those with underlying respiratory diseases such as asthma. Long term exposure to SO₂ has been associated with cardiorespiratory mortality^{73,74}, with this relationship persisting at low concentrations. SO₂ also reacts with other chemicals in the air to form fine particle pollution.

Ozone

Ground level ozone is a "secondary" pollutant because it is produced when two primary pollutants (nitrogen oxides or NO_x, and volatile organic compounds or VOCs) react in sunlight. Motor vehicle exhaust fumes produce as much as 70% of the oxides of nitrogen and 50% of the VOCs that form ozone.⁷⁵ Coal fired power stations, industrial facilities, wood heaters and bushfires are also sources of NO_x and VOCs.

Exposure to ozone can increase susceptibility to lung infections and aggravate lung diseases such as asthma, chronic obstructive pulmonary disease and chronic bronchitis.⁷⁶ It has also been linked to increased hospital admissions and premature mortality from respiratory causes.⁷⁷

⁷⁰ Knibbs L, Waterman A, Toelle B, et al. The Australian child health and air pollution study (ACHAPS): a national population-based cross-sectional study of long-term exposure to outdoor air pollution, asthma and lung function. *Environment International*. Nov 2018. Vol 120, pp 394-403

<https://www.sciencedirect.com/science/article/pii/S0160412018309838>

⁷¹ American Lung Association. 12 Feb 2020. <https://www.lung.org/clean-air/outdoors/what-makes-air-unhealthy/nitrogen-dioxide>

⁷² DEA expert position statement on health-based standards for Australian regulated thresholds of NO₂, SO₂ and ozone. August 2019 <https://www.dea.org.au/expert-position-statement-on-health-based-standards-for-australian-regulated-thresholds-of-nitrogen-dioxide-sulfur-dioxide-and-ozone-in-ambient-air-august-2019/>

⁷³ Kan H, Wong CM, Vichit-Vadakan N, et al. Short-term association between sulfur dioxide and daily mortality: the Public Health and Air Pollution in Asia (PAPA) study. *Environ Res* 2010; 110: 258–264

<https://www.sciencedirect.com/science/article/abs/pii/S0013935110000186>

⁷⁴ 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. <https://pubmed.ncbi.nlm.nih.gov/19440967/>

⁷⁵ Vic EPA Vehicle emissions and air quality. <https://www.epa.vic.gov.au/for-community/environmental-information/air-quality/vehicle-emissions-air-quality>

⁷⁶ <https://www.dea.org.au/wp-content/uploads/2021/01/Expert-Position-Statement-PDF-7.pdf>

⁷⁷ US EPA Health effects of ozone pollution <https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution>

Carbon monoxide

Carbon monoxide (CO) is a gas which forms when the carbon in fuels doesn't completely burn. It is usually generated by motor vehicles and industry but can also be formed during bushfires.⁷⁸ While carbon monoxide exposure is responsible for a wide range of adverse physiological effects, the co-existence of carbon monoxide with other criteria air pollutants makes it difficult to disentangle the contribution of this pollutant to the health effects of air pollution in general.⁷⁹

Lead

The severe adverse effects of lead on the health of children, unborn babies and adults are well established.⁸⁰ There is no safe level of lead exposure. However, the amount of lead in Australia's air has decreased significantly since the introduction of unleaded petrol in 1986. Exceedances of the national air quality standard for lead are now rare, although do still occur in some Australian communities with large industrial point sources such as lead smelters.

Air toxics

Air toxics are chemicals that are known or suspected to pose a hazard to human health.⁸¹ Air toxics are formed as products of combustion from various industrial processes, and as volatile emissions from paints and adhesives. Knowledge of the health effects of air toxics is incomplete, but studies from Europe and North America show that even very small amounts of some air toxics may have severe adverse health consequences.⁸²

Currently, no standards exist for air toxics in Australia. National standards for five air toxics (benzene, benzo(a)pyrene, formaldehyde, toluene, and xylene) were due to be set in 2012, but as of 2021, this is still awaited.

⁷⁸ NSW Health. Carbon Monoxide <https://www.health.nsw.gov.au/environment/air/Pages/carbon-monoxide.aspx>

⁷⁹ Zosky G, Hoorn S, et al. Principles for setting air quality guidelines to protect human health in Australia. March 2021. The Medical Journal of Australia. 214(6) <https://onlinelibrary.wiley.com/doi/full/10.5694/mja2.50964>

⁸⁰ Australian government. What is Lead? <https://www.environment.gov.au/protection/chemicals-management/lead>

⁸¹ Australia: State of the Environment 2016. Air Toxics. <https://soe.environment.gov.au/theme/ambient-air-quality/topic/2016/air-toxics>

⁸² Grandjean, P and Landrigan, PJ. Neurobehavioural effects of developmental toxicity. Lancet Neurol. 2014; 13: 330–338 <https://pubmed.ncbi.nlm.nih.gov/24556010/>