

Our Future Air. Our Future health.

Response to the discussion paper:

Examining the future task of the Victoria's Environmental Protection Authority

It is estimated over 3000 Australians die each year from the effects of air pollution.¹ The air we breathe is beyond the control of the individual and as such, the public put its faith in the EPA to fulfil their charter, protecting our health and keeping the air we breathe as clean as possible.

Grounds of this submission

In April 2014, Professor Louis Irving and I presented to the government appointed assessment committee regarding the potential health impacts of the proposed East West link. The project proposed a major freight route, increasing the number of diesel vehicles into the city and through a tunnel with two unfiltered vent stacks in dense urban areas.

The International Agency for Research on Cancer (IARC) categorised diesel as a class 1 carcinogen in 2012.² A large growing body of scientific evidence shows an association between diesel particulates and lung cancer,³ cardiac arrest,⁴ respiratory disease⁵ and adverse birth outcomes.⁶ Numerous large scale epidemiological studies undertaken in Europe and America have produced evidence so convincing against diesel that diesel vehicles have been banned in Paris from 2020, and London is likely to follow suit.⁷

At the time of the EW public hearing, 3 million dollars had been spent in the consultation phase of the project, which included a Comprehensive Impact Statement (CIS). No health risk assessment (HRA) was undertaken. The CIS and the subsequent public hearing had contributions from numerous experts, yet no one with health expertise had been consulted.

The internationally recognised health impacts of traffic related air pollution were disregarded. Instead, the EPA report focused purely on the design criterion and whether

the SEPP (AQM) standards were met. It is widely acknowledged and accepted that the SEPP (AQM) standards are not commensurate to protection of public health and are outdated by over a decade. Health impacts occur at levels below our current advisory threshold of fine particulate matter PM_{2.5}.⁸

By failing to account for particle characterisation and significantly underestimating background air pollution, the EPA report misrepresented the risks to the public. The EPA used an average background air pollution measurement of fine particulates (PM_{2.5}) of 6.8µg/m³ which was taken from the middle of a park 3km away from the project.⁹ Hourly levels measured over 3 months at a childcare centre in Collingwood (in close proximity to the eastern section of the tunnel) produced an average of 11.4µg/m³.¹⁰ A 5µg/m³ increase in PM_{2.5} equates with a 55% increase in lung adenocarcinoma risk over the course of a lifetime (HR 1.55 CI 1.05-2.29)¹¹ and in terms of risk is equivalent to smoking 3.6 cigarettes per day.¹²

It should not be up to a member of the public to be the only person engaging with a health expert and pointing out the omissions and inadequacies in the report for a major government project which neglected the issue of public health. This role should have been undertaken by the EPA.

The discussion paper mentions the phrase *“the confidence we have in the air we breathe”*. In 2014 my confidence evaporated. I have since learnt that the deficiencies in the EW project were not unique. When the EPA is placed in a position where it must weigh up the protection of the environment and public health against the approval of a project the government wishes to proceed, their position is compromised and they are unable to meet their core objective of protecting.

Most of the considerations for framing the future of the EPA which are listed in the discussion paper represent a welcome direction for the future. However, if there is to be any chance of success the EPA requires:

- 1. Proper resourcing**
- 2. The ability to work with transparency to the public and autonomy from other government departments**

Without these two factors, there is little chance of a future EPA that meets its core objectives.

Air quality and public health in Victoria

The rhetoric used in discussion surrounding air quality is concerning. The statement is often made “*In Australia we have good air quality*”. This sets the tone for complacency. We do not have an adequate monitoring network that allows this statement to be confidently made. The residents of many communities including; Morwell, Brooklyn and Yarraville could argue that their air quality is not good. Air quality in Australia may be good in comparison to other countries in the Pacific-Asian region; however comparing ourselves these countries sets a very low benchmark.

An OECD report published in 2014, noted that of the 34 countries in the OECD, 20 saw their pollution related deaths decline from 2005-2010. Australia was in the minority of 14 countries that saw their death rates increase with a 68 per cent increase in air pollution related deaths reported for the period 2005–2010.¹³ The costs of this data to the country in relation to associated disability and death has not been reported.

Rather than lagging, Australia should be utilising the new available technologies and equipment and emerge as world leaders in air quality monitoring along with the implementation of innovative measures to keep our air as clean as possible.

Passive measures such as waiting for improved emission technology in cars to trickle into Australia is not enough to safeguard our future air. Our emissions standards are considerably more lax than the countries that are developing this improved emission technology and as such the benefits expected to flow down to Australia will be slow and unregulated. As an example, the current controversy over the VW emissions scandal cannot pertain to Australia. These doctored cars breach laws in America and Europe; however their emissions are still legal here. While future benefits from improved emissions provides some hope, they may be dwarfed in the face of our exploding populations transport and energy requirements and the future challenges presented by climate change.

The EPA must look to the successful initiatives implemented in the 20 OECD countries where rates of pollution-related deaths have decreased, to close the gap in health outcomes for Australians and then emerge as global leaders in Clean Air best practice standards.

Air quality monitoring should be linked with health surveillance

Accurate data to inform population health risk from exposure to pollutants is not available. Without these data, the community are uninformed and the industry, government and subsequent policy and regulations are not commensurate to protect public health.

Currently, the EPA estimate metropolitan Melbourne's PM2.5 levels from two stations which were positioned with the original intent of measuring 'background ambient levels'. They are placed as far away as possible from roads or other sources which could skew data collected. As such, the levels they record are not always reflective of what Melbournians are actually breathing. Exposure data which uses a citywide average introduces exposure measurement error and likely results in a downward bias in estimates.¹⁴ The paucity of reliable exposure measurements hinders health research.

Emerging technology has produced low cost mobile air quality monitoring devices with the capacity to link together and create a vast, accessible network of real time air quality data.

There is now enormous opportunity for the EPA for collaborative research ventures with the academic sector and utilisation of citizen science to aid them in implementing the following measures:

- Independent monitoring with transparent near real-time public reporting.
- Monitoring stations sited in appropriate locations (where humans dwell as opposed to the middle of parks).
- Stations present near any major industrial source of pollution whether in urban or regional Victoria.
- A coordinated streamlined link between monitoring and translating air quality information into timely and meaningful health alerts and emergency responses which protect public health.
- Health assessment studies in high risk areas, using personal exposure monitoring.

Reducing particulate matter emissions

Particulate matter generated from combusted carbon presents a particular risk to the health of the public. The main sources of this toxic particulate matter are: coal burning for power generation, mining, vehicle emissions, wood burning, bush fires and industrial activity.

There is currently no legislated threshold in Australia for PM2.5, despite ongoing discussions over the past 16 years. During this time America has updated its own legislation three times. It is apparent the only way this issue will be resolved is for the Commonwealth to pass legislation that is overarching and binding to all states and territories. It is vital the EPA meets this challenge swiftly and decisively drives the necessary agreements and policies to

create a legislated threshold for PM2.5s ensuring the lowest threshold possible accompanied with an exposure reduction framework.

“Particulate air pollution is like lead pollution: there is no evidence of a safe threshold even at levels far below current standards, including in the rural areas we investigated. We need to focus on strategies that lower exposure everywhere and all the time, and not just in locations or on days with high particulate levels.”¹⁵

Prof Joel Schwartz. Environmental epidemiologist.
Harvard University

Coal burning for power generation

Evidence from international studies indicate that communities in surrounding areas to coal mines are subjected to serious health and social harms including an increased risk of death from lung, laryngeal and bladder cancer.¹⁶ Data recently released by the National Pollutant Inventory shows: PM10 emissions from coal mining make up 47 per cent of the national total, making it the leading source of particle pollution with emissions increasing. Over the past 5 years, PM10 output has doubled and PM2.5 has increased by 52%.¹⁷

Our health, environment and future survival depend on coal remaining in the ground. The phasing out of Hazelwood must be a priority for the EPA. Evidence suggests this could be achieved with a much greater emphasis on renewable sources of energy. We are moving much too slowly on this issue. Hazelwood has gained notoriety for being one of the dirtiest electricity producers in the world. It is a source of shame for the EPA that Hazelwood continues to function without the use of the filtration equipment commonly used in other countries (which includes China). The issue of coal in Australia is a difficult one. There are economic realities associated with the coal industry and as such it is highly political. Short term economic gain tends to dominate over long term protection of environment and

health. The EPA must find some way to navigate this difficult issue and speak loudly and strongly with their focus purely on protecting environment and health.

Diesel Emissions

Diesel emissions are a particularly dangerous subset of combusted carbon products and are listed by the International Agency for Research on Cancer (IARC) as a class 1 carcinogen in their own right.¹⁸ By 2030, 74 per cent of Australians will live in a major urban city. Road and rail freight are projected to grow by 80 and 90 per cent respectively, whereas public transport is projected to grow by only 30 per cent.¹⁹ Therefore, we are likely to see an increase in the population health risk from increased exposure to diesel emissions.

Particulate matter derived from diesel combustion has a very low ratio of organic carbon to elemental carbon (0.4), and up to 45–60 per cent of diesel engine emissions are elemental carbon (soot).²⁰ Diesel emissions are carcinogenic due to their size, shape, large surface area and ability to form bonds with volatile organic compounds (VOCs), including polycyclic aromatic hydrocarbons (PAH) and nitroarenes.¹⁸ A meta-analysis undertaken by the European Study of Cohorts for Air Pollution Effects (ESCAPE) reported a significant association between the risk of lung cancer (adenocarcinoma) and living within 100m of a major road.¹¹ Currently in Australia, measures of road side emissions are generally done using the heavier coarse fraction of particulate matter (PM10).²¹ Traffic emissions are much smaller and lighter (85 per cent of diesel emissions are less than one micron PM1.0).²² This results in under-reporting of road side emission levels and the geographical range over which pollutants decrease from road side measures.

Diesel is a class 1 carcinogen, in the same category as asbestos and tobacco.
IARC. 2012

The Truck Industry Council estimates approximately 50 per cent of trucks used to make short haul trips within the major cities pre-date 1995. One pre-1995 truck emits the same particulate matter as 60 post 2007 trucks. The City of Maribyrnong in Melbourne's Inner west records 21,000 trucks a day, the majority of which travel on residential streets. Schools are also hot spots for idling diesel vehicles concentrated around the school gates.

Metropolitan school children are exposed to a particularly high amount of particles during their commute to school and outdoor school activities.²³

As traffic networks across the cities increase, long road tunnels are likely to become increasingly utilised. Such tunnels have the capacity to significantly increase the concentration and hence the pollution exposure of tunnel users. There are proven examples of successful use of filters to reduce health impacts from pollution created and retained in long road tunnels internationally, (for example, the Calle 5 tunnel in Madrid); however with the exception of the M5 East tunnel in Sydney, tunnels in Australia are not fitted with filtration systems, and filtration is not currently considered in the planning for future road tunnels.

There are no emission standards for off-road diesel engines in Australia. A 2010 report from NSW Department of Environment, Climate Change and Water, found nearly a quarter of off-road diesel engines sold in NSW in 2008 were non-compliant with EU and US off-road standards.²⁴ Diesel engines have a wide range of industrial off-road applications in mining, rail, construction, shipping and agriculture – occupations of significance in Australia. The use of off-road diesel engines in coal mines has been shown to contribute heavily to the particulate matter levels in nearby townships.²⁵ Unlike Europe and North America, Australia has no national workplace exposure standard for diesel particulates. Evidence from the US Miners Study demonstrated that diesel exhaust increases the risk of mortality for both underground and surface only workers. Heavily exposed workers had an approximate threefold increase in the risk of developing cancer (OR 3.20, 95 per cent CI = 1.33 – 7.69).²⁶ Truck drivers also have an elevated risk of lung cancer, attributed to their occupational exposure to diesel exhaust.²⁷

Shipping is a major part of the Australian economy and generates substantial emissions in coastal waters which are carried into the air-sheds of major urban population centres including the capital cities of Perth, Melbourne, Sydney and Brisbane.²⁸ Ships generally use residue oil (RO) as fuel. The higher the sulphur content used in RO, the bigger the health impact. Ships in the Baltic Sea, North Sea, EU ports and Californian coast burn a lower sulphur content RO due to restrictions. Australia does not have these same restrictions. Ships often carry more than one type of fuel, and use the substantially cheaper high sulphur

content fuel whilst in Australian waters generating a toxic mix of particles, NOx and SOx that can be advected over coastal population centres.²⁸

Diesel engine exhaust is estimated to be the 3rd leading cause of occupational cancer deaths (behind asbestos and silica).²⁹ In Australia 14% of our workforce are estimated to be occupationally exposed to diesel exhaust.³⁰

It is standard practice for Drs to record personal and occupational history of exposure to carcinogens when dealing with patients with cancer. Diesel is now included alongside other carcinogens such as tobacco and asbestos.

The following initiatives would deliver improved health outcomes:

- Targeted, multi-sector public health education program used to raise public awareness.
- Implementation and enforcement of exposure standards in occupations and industries with an elevated potential for heavy exposure.
- Anti-idling laws such as those instigated by 37 states in the US.
- Curfews for trucks using routes in high density / urban areas.
- National emission standards for non-road diesel engines and equipment, such as those in place in the US and EU.
- Strategies to reducing diesel emissions in urban areas. We could look towards examples set by Paris and London.
- Greater incentives for the use of more sustainable vehicle options including hybrid vehicles.
- Further encouragement for increased expenditure and development of rail public transport and freight routes
- Effective filtration of all large point sources of emissions (both industrial and transport related)
- Reducing and phasing out of older truck fleets.

Wood Burning

Over the winter months, wood heaters are responsible for over a third of all PM2.5 emissions in many parts of Australia.³¹ Domestic wood heaters are listed by the Australian National Pollutant Inventory lists as the largest single source of polycyclic aromatic hydrocarbon (PAH) emissions. The problem can be exacerbated by meteorological inversions that occur in autumn and winter, preventing smoke from rising and dispersing. In Launceston a woodsmoke reduction program launched in 2003, was shown to be very effective in reducing particulate matter: The mean daily PM10 reduced from 44µg/m³ (between 1994–2000) to 27µg/m³ (between 2001–2007).³² The decrease in wood smoke was associated with a significant reduction in annual all-cause mortality rates for men (11.4%) and reductions in cardiovascular (17.9%) and respiratory mortality (22.8%) over the winter months.³² Given the lag time to developing lung cancer, the Launceston study was unable to account for any reduction in cancer, however it is pertinent to note that along with generating PM2.5, woodsmoke contains a number of other carcinogens including benzene, benzo(a)pyrene (BaP) and formaldehyde.

Health and environmental benefits may arise if the EPA implemented some of the following measures:

- **Work towards a ban on heater sales**
- **Removal of wood heaters when homes are sold**
- **Cash incentive phase out**
- **Increased tax on wood fuel**

Bush fires

The threat of uncontrolled bush fires is ever present in Australia. Prescribed burns are used to reduce the potential fuel available in an uncontrolled fire. After the 2009 wildfires in Victoria, the Royal Commission inquiry recommended expanding the prescribed burning

program target area from 130,000 hectares to 385,000 hectares. Whilst prescribed burning may be a useful strategy to protect human and animal lives and properties, it is also important to be mindful that bush fires release a range of potentially toxic components in the air. These toxins include formaldehyde, acrolein, xylenes, toluene, benzene, terpene and a number of other VOCs, compounds capable of causing a range of negative health impacts, including cancer and cardiac arrests.

Communities in Victoria have been exposed to PM2.5 levels of up to 377 $\mu\text{g}/\text{m}^3$ during controlled burns.³³ Such dangerous levels of pollutants require extensive prior warning to the affected communities along with medical advice and assisted evacuation of vulnerable community members.

The bushfire risk will increase with climate change. During the Russian drought and heat wave of 2010, an estimated 50,000 people were killed by the combination of heat and forest fire smoke in just over 1 month.³⁴

If a controlled burn is to occur, a timely warning must be given to the affected community(s) along with appropriate health advice and evacuations of vulnerable members.

Climate Change & Health

Climate change is the single biggest health threat to humans this century.³⁵ In terms of air quality, in addition to increased particulates from forest fires, ground level ozone is also likely to increase. Higher temperatures and UV radiation will catalyse reactions between NO_x and VOCs (both present in vehicle emissions and fossil fuel-burning power plants) to produce ground level ozone.

This submission has focused on the health effects of fine particulate matter, however it is worth noting that exposure to ground level ozone will also cause serious health impacts including reduced lung function and increased hospitalisations for asthma.³⁴

Numerous studies have shown increased hospital admissions and mortality during heatwaves. During the 2006 heatwave in Portugal, each 1^oC increase in mean temperature was associated with an increase of 2.8% all-cause mortality and 5.4% COPD mortality.³⁶

The interactions of air pollutants at higher temperatures mean that even if air pollution levels do not rise and levels of ozone, particulates and other pollutants remain constant, higher mean temperatures may cause more admissions and deaths than would otherwise be expected from ambient air pollution.³⁴

The 2015 Lancet Commission on Health and Climate Change is an extensive review on the health impacts of Climate Change.³⁵ The review is something the EPA should be intimately familiar with by now, and gearing themselves to work towards the recommendations made in the review.

The Lancet Commission recommends that governments:

- 1) Invest in climate change and public health research, monitoring, and surveillance**
- 2) Scale-up financing for climate resilient health systems world-wide**
- 3) Protect cardiovascular and respiratory health by ensuring a rapid phase out of coal from the global energy mix**
- 4) Encourage a transition to cities that support and promote lifestyles that are healthy for the individual and for the planet**
- 5) Establish the framework for a strong, predictable, and international carbon pricing mechanism.**
- 6) Rapidly expand access to renewable energy in low-income and middle-income countries**
- 7) Support accurate quantification of the avoided burden of disease, reduced health-care costs, and enhanced economic productivity associated with a low-carbon economy**
- 8) Facilitate collaboration between Ministries of Health and other government departments, empowering health professionals and ensuring that health and climate considerations are thoroughly integrated in government-wide strategies**
- 9) Agree and implement an international agreement that supports countries in transitioning to a low-carbon economy**

Environmental Levies & Penalties

It appears that air quality is currently an unconsidered area in terms of environmental levies. An air quality levy on industries and businesses that pollute the air, along with smaller levies on owners of cars would go some way to encouraging less pollution in the future. Additionally Victoria requires a robust consistent system of penalties issued to polluters that are large enough to deter continuation of polluting behaviour and serve as a warning to other potential polluters. The revenues generated from the levies and fines could then be put towards improving health outcomes in the areas most affected.

Economics

The key area of “*Combining environmental protection with economic viability*” gives rise to concern. At times economic viability and protection of the environment may complement each other; however it is certain that often the two objectives will be at odds. When such occasions arise it creates a conflict of interest for the EPA.

A substantial portion of the government considers economics, yet the EPA is the only government department whose title includes the words environment and protection. In order to honour those words, and live up to its title, the EPA should be autonomous from considerations such as economic viability.

Instead, the EPA should focus on health economics. For example, the cost of implementing some of the measures suggested in this submission would be more than offset in terms of the health expenditure they would save the government. Health risk analyses for large projects should contain estimated health costs in relation to any deterioration or improvement of air quality.

Environmental Justice and Equitable protection

In addition to parks and water, the principles of environmental justice must also extend to air quality. Too often the poorer and more vulnerable members of society are exposed to a

greater distribution of polluted air. The residents of Morwell can certainly attest to this. One of the lesser known examples is the exit ramps of the EW link proposal which would have wrapped around a housing estate in Flemington and flowed directly over the children's playground. Some of the residents would have the ramp 10 metres from their windows. The estate has no air conditioning and in warm days the residents would have had their windows open to receive the full blast of diesel particulates as cars and trucks sped past.

The people in this estate were in no way educated with regard to the associated health risks and even if they had of been made aware, they were in no position to do anything about it.

Moving was certainly not an easy option for them.

The discussion paper mentions "*how is environmental risk distributed*" and "*to what extent can the public participate in decisions about the environment*".

One suspects, had there been a similar project with exit ramps 10 metres away from residents of Toorak, the outcome of the public hearing would have been very different.

Despite a university education and fluency in English the process of participating in the decision re the EW link was difficult and time consuming. During the government hearing Prof Louis Irving was subjected to a cross examination from a QC paid for by the government. We were fortunate to have a barrister volunteer to appear on our behalf. Those who rely on the government for housing and funds are less likely to be able to agitate their concerns and participate in discussions relating to their equitable protection.

EPA Structure and Resourcing

The EPA is severely under resourced. The future holds enormous challenges for Victoria and in order to meet these, the EPA must be afforded a far greater portion of government expenditure.

Legislation and policies need altering in order to ensure the EPA can work autonomously and be free from any potential interference from other government departments.

The EPA is an agency for the protection of the environment and public and its responsibilities and endeavours must be transparent to the public and where appropriate, enable the public to engage and participate with ease.

One of the major road blocks for air quality is the lack of a consensus among the EPAs from each state and territory. National agreement is needed and the various EPA's need to find some way of working together cohesively and for the betterment of the environment and public health. An option may be the formation of a national EPA body with over-arching jurisdiction. This may also be a useful way of better utilising resources. For example, a national pool of health experts and epidemiologists could be created and used on occasion to undertake health risk assessments for various projects.

A greater emphasis on prevention is a more effective and economic strategy than current approaches. EPA structure and resourcing must be conducive to including health risk assessments as a routine procedure prior to major projects and include health professionals as major stake holders in future discussions.

Raising public awareness

The discussion surrounding the EPA's Environmental Citizenship strategy is very shrewd.

Despite the frequent publications of medical studies highlighting the detrimental impact air pollution has to health, the average Australian citizen is unaware of the effects of particulate matter, NOx and ozone. Most Australian's would be shocked to learn diesel is a class 1 carcinogen and that our country is globally lagging in legislation and emission thresholds.

Raising public awareness is vital to ensuring a future of reasonable air quality and is possibly the most important strategy for the EPA to investing time and resources into. Economically this strategy makes long-term sense. If people are aware of the implications of air pollution they are far more likely to engage with the EPA, comply with mitigation strategies, report polluters, utilise sustainable technologies and contribute to the EPA with citizen science. All

other aspects of air quality are likely to flow in a positive direction once the level of awareness has been raised in the general public.

Summary

The primary objective of the EPA is to enforce environmental standards in order to safeguard public health. Significant improvements are required if the EPA is to achieve this. Our legislation and strategies surrounding air quality are lagging internationally and are inadequate to protect public health. These deficits must be addressed as a priority and be followed by an effort to overtake other OECD countries and emerge as leaders in world's best practice. Particulate matter emissions generated from coal burning, transport, diesel engines and wood fires hold serious ramifications to public health and government health expenditure. A concerted effort is required to employ a range of strategies to reduce these emissions. An effective EPA of the future would consult and collaborate extensively with health experts. Improved resources, autonomy and transparency are key ingredients for an EPA that meets the expectations of Victorians and is capable of protecting the environment and our health.

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