# Clean air. Less cancer.

## Response to the discussion paper:
## *Working towards a National Clean Air Agreement*

*Collaborating with*

LUNG FOUNDATION AUSTRALIA

*"When you can't breathe... nothing else matters"®*

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# 1. Statement of purpose

## Peter MacCallum Cancer Centre aims to be a world leader in a new era of cancer control.

As leaders in cancer research, care and education – and together with our collaborating partners – we welcome the opportunity to contribute to the development of the National Air Pollution framework.

The insights and recommendations in this submission reflect our long term commitment to:

- Significantly reduce the risk to, and impact of cancer on individuals and their families.
- Improve the effectiveness of our health system and ensure its sustainability.
- Recommend initiatives and interventions that support improvements in the overall health and well-being of our communities.

In developing this submission, we have sought expert opinion from equally committed individuals and institutions.

We welcome the opportunity to discuss our submission in more detail.

# 2. Introduction

Air pollution causes cancer. Over the past 50 years studies have consistently shown an association between air pollution and increased risk of developing lung cancer.[1] A number of large scale studies conducted over the past two decades have contributed to and strengthened this body of evidence, leading to the International Agency for Research on Cancer (IARC) classifying outdoor air pollution as carcinogenic to humans.[2]

In 2012, the World Health Organisation (WHO) attributed 3.7 million deaths to ambient air pollution. In Australia, the most recent analysis dates back to 2003, where 3,000 deaths per year were attributed to air pollution.[3] The projected demographics for population growth, urbanisation and increasing demands for transportation and energy consumption, serve to highlight the importance that a National Clean Air Agreement (the Agreement) be undertaken with a focus on health promotion and prevention of disease.

One in three Australians get cancer of which lung cancer is the leading cause of cancer related death. Reductions in cigarette smoking have led to a reduced incidence of squamous-cell lung cancer; however another type of lung cancer (adenocarcinoma) is increasing.[4] Adenocarcinoma affects a significant non-smoking population. The five year survival rate of lung cancer in Australia is less than 15 per cent, with only minor improvements in survival over the last 20 years.

The most effective way to reduce lung cancer mortality is to prevent it.

Lung cancer comprises 21 per cent of the health burden attributable to urban air pollution,[3] and there is evidence that the DNA damage and mutations caused by diesel pollution also occurs in sperm cells[5] thereby extending the harmful effects of ambient air pollution onto future generations of Australians.

The current air quality standards and legislative framework is not focused around protecting public health.[6] In addition to a legislated threshold for fine particulate matter (PM2.5) and an exposure reduction framework for key pollutants; we would like to see the Agreement lead towards the development of a robust national legislative framework that protects the health of all Australians.

As Australia's leading comprehensive cancer centre cancer prevention, and the reduction of cancer distress and burden at the individual, community and national levels, is core to the Peter MacCallum Cancer Centre's strategic imperatives. Our mission is to reduce the future number of patients diagnosed with cancer, as such the Peter MacCallum Cancer Centre welcomes the opportunity to comment on and inform The National Clean Air Agreement.

While lung cancer is the main focus of this submission, it also is important to note that poor air quality has significant impact on respiratory health generally. Airborne contaminants may be the primary cause of respiratory disease or can exacerbate pre-existing conditions, such as asthma and Chronic Obstructive Pulmonary Disease (COPD).

It is estimated that occupational dust exposure is responsible for 20-30 per cent of Chronic Obstructive Pulmonary Disease in Australia.[7] It has also been estimated that work exposures worsen asthma control in 21 per cent of adults with asthma.[8] The defence mechanisms of the respiratory tract are impaired in the presence of chronic respiratory diseases such as COPD, bronchiectasis and pulmonary fibrosis. This may increase the susceptibility to the effects of airborne contaminants.

In Australia, the most recent analysis dates back to 2003, where 3,000 deaths per year were attributed to air pollution.[3]

# 3. Do you agree with the proposed goal, purpose, principles and scope as a basis for the National Clean Air Agreement? If not, please explain and provide alternatives if appropriate.

Peter MacCallum Cancer Centre acknowledges and supports steps being taken to action change to protect the health of all Australians.

We advocate that the overruling principle of this agreement should be protecting the public's health rather than 'reducing regulatory burden' or 'minimising disruptions that may result from policy changes'. With the substantial economic cost associated with the health impacts of air pollution, prioritising health will provide significant economic gain along with social and environmental benefits.

Peter MacCallum Cancer Centre encourages this agreement to proceed with a focus on health.

## 3.1 Approach

As States and Territories implement their legislation and policies with regard to air pollution, the original intent of the National Environment Protection Measures (NEPM) has been diluted and is no longer fit for purpose.

The current situation of 'a tailored response from governments across sectors' results in piecemeal implementation of essential components of the NEPM.

Collaboration across jurisdictions will drive a coordinated effort to achieve better health outcomes for all Australians.

## 3.2 Engagement

The National Clean Air Agreement discussion paper invites cross sector engagement: "serves as a basis for engagement with business, industry and community representatives to inform the development of this agreement." There is a growing body of evidence demonstrating impact of ambient air pollution on the health outcomes of children and adults, with specific reference to cardio-pulmonary diseases and cancer.

Peter MacCallum Cancer Centre recommends that expert stakeholders from paediatrics, cardio-pulmonary and cancer groups are engaged from the outset and throughout this process of consultation, and referenced in the list of contributors to this engagement.

## 3.3 International efforts

An OECD report published in 2014, noted that of the 34 countries in the OECD, 20 saw their pollution-related deaths decline between 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.[9] The costs of this data to the country in relation to associated disability and death has not been reported.

Australia should 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 to emerge as global leaders in Clean Air best practice standards.

# 4. What, in your view, do you consider as a high priority air quality issue(s) that could be considered under the National Clean Air Agreement? Please provide evidence.

Of particular importance for consideration under the National Clean Air Agreement is particulate matter, the air pollutant with the most impact on health outcomes, including cancer. An increase of 10µg/$m^3$ in PM2.5 correlates to a 40 per cent increase in the life time risk of developing lung cancer.[1] Main sources of particulate matter in Australia are: coal burning for power generation, mining, vehicle emissions, wood burning, bush fires and industrial activity.

Peter MacCallum Cancer Centre welcomes the opportunity to advocate for reduction in emissions of particulate matter as a critical opportunity for advancement of public health across Australia.

## 4.1 Reducing diesel emissions

### On road emissions

Combusted carbon products present particular risk to the health of the public.[10] 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.[11]

In France, the decision has been made to ban diesel cars in Paris from 2020.[12]

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. 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).[13] 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.[11] 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.[14]

Currently in Australia, measures of road side emissions are generally done using the heavier coarse fraction of particulate matter (PM10).[15] Traffic emissions are much smaller and lighter (85 per cent of diesel emissions are less than one micron PM1.0).[16] This results in under-reporting of road side emission levels and the geographical range over which pollutants decrease from road side measures.

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.

Another relevant example is the City of Maribyrnong in Melbourne's Inner west which 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.[17]

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.

## Off road emissions

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.[18]

In 2012, the WHO reclassified diesel engine exhaust as a Group 1 carcinogen. 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.[19]

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).[20] Truck drivers also have an elevated risk of lung cancer, attributed to their occupational exposure to diesel exhaust.[21]

Shipping is a major part of the Australian economy and generates substantial emissions in coastal waters which are carried into the airsheds of major urban population centres including the capital cities of Perth, Melbourne, Sydney and Brisbane.[22] 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.[22]

At Peter MacCallum Cancer Centre it has become standard practice to record personal and occupational history of exposure to carcinogens. Diesel is included alongside other carcinogens such as tobacco and asbestos.

Peter MacCallum Cancer Centre notes the adverse health impacts of high levels of diesel emissions in Australia and notes the following initiatives used internationally to 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 the EPA, New England (USA).
- 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. A total ban of diesel vehicles in Paris by 2020 is now in place.[12]
- A push towards the use of more sustainable vehicle options including hybrid vehicles.
- The use of filters/scrubbers on large point sources of emissions (this includes vent stacks of road tunnels, but would also apply to large industrial point sources). We note this area is likely to require additional research, with lessons to be learnt from successful and effective implementation in other countries.
- Reducing and phasing out of older truck fleets.

## 4.2 Wood heaters or fireplaces

Over the winter months, wood heaters are responsible for over a third of all PM2.5 emissions in many parts of Australia. Despite only 4.3 per cent of households using wood heaters as their main source of heating, they contribute to over 40 per cent of the total PM2.5 in GMR Sydney during July.[23,24] 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 winter, preventing smoke from rising and dispersing.

In Launceston, for example a woodsmoke reduction program launched in 2003, was shown to be very effective in reducing particulate matter: The mean daily PM10 reduced from 44µg/$m^3$ (between 1994–2000) to 27µg/$m^3$ (between 2001–2007). The decrease in wood smoke was associated with a significant reduction in annual all-cause mortality rates for men (11.4 per cent) and reductions in cardiovascular (17.9 per cent) and respiratory mortality (22.8 per cent) over the winter months.[25] 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.

There are an estimated 372,000 wood heaters in NSW. The average new wood heater (that meets the industry standards) can emit between 19.6 – 32.2 kg of PM2.5 per year.[24]

A report commissioned by the NSW Office of Environment and Heritage in 2011 provided an economic appraisal of wood smoke control measures, concluded that a range of potential control options such as ban on heater sales, tax on wood fuel and cash incentive phase out can, for relatively modest costs of implementation, produce substantial health benefit.[26]

Peter MacCallum Cancer Centre notes the adverse health outcomes from the impact of wood fuel.

## 4.3 Coal dust

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 form from lung, laryngeal and bladder cancer.[27]

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 per cent.[28]

Peter MacCallum Cancer Centre notes the effects of coal dust on various communities in Australia can be a health risk and recommends consideration of all possible mitigation measures. We also note that covering coal wagon fleets was among the recommendations of the 2013 Senate enquiry into the health impacts of air pollution.

## 4.4 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.

Peter MacCallum Cancer Centre acknowledges the value and importance of fire control in protecting human lives, those of animals, and homes and properties.

Peter MacCallum Cancer Centre seeks to note 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.

Peter MacCallum Cancer Centre supports community education, public warnings and appropriate health advice to protect health outcomes and acknowledges the significant work already undertaken including by the CFA such as the FireReady app.

## 4.5 Air Quality Monitoring should be linked with health surveillance

Whilst our general air quality may compare favourably to some other countries such as China, our monitoring and reporting systems are not sufficiently geared to provide an accurate account of the air quality experienced by the general Australian public.

Currently there are only two stations that measure levels of PM2.5 across Melbourne, extrapolating results across the city. Monitors at these stations are positioned to meet the original intent of measuring 'background ambient levels' and thus placed as far away as possible from roads or any other sources which would skew data collected. There is a deficiency in personal exposure data collected and made publicly available across Australia relevant to lung cancer research.

The Victorian EPA monitor in Alphington which is situated in a leafy park, 200m away from the nearest road, measured an annual average PM2.5 level of 6.8µg/m$^3$ in 2012.[30] This level is used to represent a large surrounding area of Melbourne including inner city suburbs several kilometres away. Hourly levels monitored independently over three months in 2014 by a childcare centre in one of these suburbs (3km away) showed an average PM2.5 level of 11.4µg/m$^3$,[31] significantly higher than that measured in Alphington the previous year.

Health impacts occur at levels below our current annual average advisory threshold of fine particulate matter PM2.5 (8 µg/m$^3$), and there is no minimum threshold under which impacts do not occur.[6]

Using one of the more conservative estimates of lung cancer risk (from the American Cancer Prevention II Study[32]), the long-term exposure to the current advisory level of PM2.5 equates to smoking 2.4 cigarettes daily.

Current air quality monitoring does not provide accurate, reliable or best practice 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.

Peter MacCallum Cancer Centre recommends consideration of the following measures which would improve the link between air quality monitoring, timely preventative measures and health surveillance.

- 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 Australia.
- A coordinated streamlined link between monitoring and translating the information into timely and meaningful health alerts and emergency responses which protect public health.[33]
- Health assessment studies in high risk areas, using personal exposure monitoring.

# 5. Can you provide any suggestions for cooperation/partnerships and/or knowledge, education and awareness for the purpose of assisting governments to manage air quality?

## 5.1 Raising public awareness through education

Raising public awareness through targeted, best practice public health education is the most important and achievable of the mitigation measures canvassed. A 2007 review of air quality education recommended a concerted and strategic approach be adopted to community education around air quality, including national leadership and coordination between various levels of government.[34]

Targeted messaging is particularly important for vulnerable sub-populations, including people working in occupations or industries where there is a high risk of exposure to air pollutants.[34]

Increased awareness will enable the public to take appropriate actions to reduce their personal exposure and lobby for changes in clean air policy and legislature.

Few Australians are aware of the risks posed to their health by the current levels of air pollution. Likewise, the public are generally unaware that there is no legislated threshold for PM2.5, the pollutant deemed to be responsible for the majority of air pollution related deaths.

Peter MacCallum Cancer Centre recommends consideration of the following measures:

- Develop and implement targeted, best practice, public health education.
- Draw on cross sector experts to work with government to deliver lectures to local government and communities; councils, hospital lectures (grand rounds), schools, maternal health mother's groups, large industry meetings, conferences, professional development group meetings.
- Roll out a national advertising campaign, similar to the anti-tobacco campaign.
- Research collaboration between air quality monitoring and health surveillance studies.

# 6. Summary

The quality of the air we breathe is beyond the control of the individual.

Health risks identified from large scale international epidemiological studies of air quality are alarming, yet likely to underestimate the burden of disease when considering demographic trends and populations exposed.

Australia has a unique combination of air pollution issues: Bush fires, coal mining, wood heaters, unregulated diesel fleets, toxic shipping emissions which combine to affect a wide range of the public.

Fine particulate matter (PM2.5) is a class 1 carcinogen and needs to be recognised and treated as such.

Emissions from combusted carbon sources need to be reduced by lower thresholds, which could be accompanied by an exposure reduction framework.

There are a number of mitigation measures to current situations that can be implemented in order to protect the public. Overseas experience shows that public health interventions to limit fine particulate air pollution emissions have led to major improvements in air quality along with demonstrable benefits to human health.[35,36,37]

There needs to be a greater emphasis and inclusion of health professionals as stakeholders and collaborators with the government in matters pertaining to air pollution.

Resources need to be put into developing an improved air quality monitoring network that can deliver meaningful and accurate information to the public and is linked with health surveillance.

Raising public awareness through education is vital to success.

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