

Submission on Clean Air for All Victorians
from Dr Jo McCubbin

I commend the Victorian Government for this enquiry into Air Quality into the future. It is timely and necessary to take stock and plan for better air quality in the coming years.

I have been particularly passionate about this issue, since living across the road from a peat fire at Longford, (December 2010) when it became apparent that no one could fix the problem, and really there was no experience or protocol to guide response. My research at that time revealed that fine particles were the most concerning element of air pollution. Much that was already known about the health effects of air pollution, and I have watched with interest, the explosion of scientific knowledge that has occurred since. There is an abundance of scientific data coming out of places like China and Eastern Europe (brown coal like Victoria). Scientists can now drill down into the processes triggering inflammation and tissue damage, from inhaling polluted air.

Particular areas of concern for me are:

- **Environmental Stewardship**
- **Anti Idling Laws**
- **Wood-burning Household Heaters**
- **Planned Burns**
- **Health Effects**

ENVIRONMENTAL STEWARDSHIP

I believe that the future of environmental stewardship will be all about understanding the threats and possibilities for coping with man's influence on the biosphere. This is absolutely critical as we don't have anywhere else to go, if we allow this planet to become uninhabitable. A holistic approach to the environment is therefore essential, as each species occupies a very specific niche and each effects the myriad of those around it.

Its not just about humans either, since, for example, we depend on bees for pollination. Similarly, some predator species are necessary for pest control. It's all about a healthy balance and till recently man strode confident in his cleverness and failed to see the possible consequences of thoughtless pollution.

A whole of government approach, is a relatively new way of doing business, for all levels of government, their bureaucracies and statutory bodies. They now need a deeper level of understanding and holistic thinking to manage future threats (both known and unknown unknowns)!

Air quality is in some respects the Next Frontier: Over the last few centuries, since the invention of the microscope, mankind has developed the capability to recognise and manage microbes that are pathogenic for humans and have contaminated drinking water since the beginning. Sewerage systems, adopted in the Victorian Era, made a huge difference to the death toll among young children from water borne infectious diseases. However nobody worried too much about waste discharges to air (or oceans for that matter, since they absorb atmospheric pollutants such as CO₂), which were assumed to be huge enough to absorb them. With exponential population growth, the humans are outgrowing the ability of our atmosphere to cope.

DIESEL AND PETROL EXHAUST FUMES

Relatively little is known and understood by the community, about real life exposures to tiny airborne particles. These tiny particles are small enough to be airborne, so they are pervasive, and sometimes small enough to reach into the diffusion zones in lungs, allowing access to all organs via the blood stream. They pose a significant threat, which we are only just beginning to understand and take seriously. The black carbon or soot particles also adsorb chemicals such as benzene (known carcinogen) and act as carriers to deliver them deep into the body.

I think people are only just waking up to the fact that poor air quality affects health. We now understand that cigarette smoke is bad for health, but the logical next thought, that wood smoke or bush fire smoke, or car exhausts, might be similar, seems to be a leap too far. It is still common to see fitness-conscious, office workers, running along polluted streets in their lunch hours, in the CBD's of Australia's cities.

The photograph from a recent Guardian edition, illustrates this very point, but also addresses a potential way to help the public, to reframe it's thinking on air pollution.

From The Guardian:

UK's new air pollution strategy 'hugely disappointing', says Labour

Consultation proposes reducing pollutants, including particulates from wood burners and ammonia from farms - but does little to tackle diesel emissions



▲ A jogger passes air pollution warnings on the busy South Circular road in London. Photograph: Guy Bell/Alamy

The government said the new action would reduce the costs of air pollution to society by an estimated £1bn every year by 2020. The health costs of toxic air are currently estimated at **£20bn a year**, by the Royal College of Physicians and the Royal College of Paediatrics and Child Health.

Details of the government's new proposals were not available. But on domestic wood and coal burning it said it would legislate to ensure "only the cleanest domestic fuels" will be on sale. This may include wood bearing the "**Ready to Burn**" logo which indicates low moisture content. Wood and coal burning in homes contributes almost 40% of emissions of small particulate pollution, PM2.5, which is especially damaging to health.

ANTI-IDLING LEGISLATION:

The first step of any strategy to improve our health and air quality, is to engage in serious education campaigns to get the public thinking through the issues, and embracing more constructive ways of thinking and behaving. This will involve, both engaging with children that idling cars are not OK, and reminding adults that you can't leave the kids in the car (with the air con on and the engine running), and nip into the café for that much needed coffee. This one really annoys me, and I see examples of it throughout the warmer months. The other

common example, is adults leaving their engines running while they attend to their social media, or sip on a latte, sometimes for extended periods. This could so easily be done with the engine turned off, if they simply parked in the shade. Engagement with local councils, about increased planting of appropriate shade trees, would also make a difference. Councils could also help by implementing 15 minute shade spots, for people to park briefly to check their phones.

Shade trees are good in several ways: they clean the air, and help cool our towns in the face of climate change as well as being aesthetically pleasing.

After education, there needs to be a community debate followed by proposed legislation. Done really well, if this brings about behaviour change, legislation and enforcement may not even be necessary, but should be a fall back position.

HOME HEATERS:

The current high energy costs make wood burning attractive, and we all enjoy sitting by a fire, but we have to wean ourselves off this!! Fireside relaxation is fine outside of urban areas and could become a selling point for rural properties and a tourism draw card.

Householders, who depend on wood for winter heating, will need to be made to think about the effect this might be having on their neighbours. A campaign could explain what poor air quality might be doing to their kids who are getting asthma while playing sport, or adults who labour outdoors. At the same time, in a time-poor society, it is more convenient not to have to chop wood and light the fire.

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Just as we have done with water, we understand that water is a dwindling resource and we have learnt better ways of minimising its usage. It is now rare to see cars being hosed clean in the street, or kids playing under the hose, in ways that were once commonplace. Similarly more efficient heating is the way of the future and people will get used to the convenience of flicking a switch to get warmth.

Along the way, tightening of standards for solid fuel heaters and stronger controls on wood that is burned, to ensure that it is well dried and will burn cleanly, will help focus minds. New homes should have strong pollution controls on their heating, and renovations or heater upgrades, will need to be to a better, more efficient version.

Above all, monitoring in polluted towns should be undertaken, to show people just how bad their air is. On still winter mornings, there is a visible brown smudge of smog that hangs over Sale and is visible from surrounding high points. Sale has no air quality monitoring, but it should now be possible to use temporary monitoring to help bring about behaviour change. (this would be

timely if it overlaps the Hazelwood Health Study monitoring of the health of Sale citizens who are supposed not to have been so badly affected by the Morwell Mine Fire)

My sense is that folk will mistrust satellite data usage, over actual monitoring. This last autumn was unusual in that air quality in Sale, was surprisingly good, with minimal planned burning, bringing smoke into Gippslanders' lives. In other years when the air has been putrid for days on end, the lack of monitoring, and readily accessible data has left people guessing and believing in conspiracy theories. Should school cross country for primary school children be conducted in these conditions??



Above is an example of a still winter's night in Sale, when all the neighbours light their heaters. The measurements taken with a hand held AirBeam monitor. Given the recommendation to move towards a recommended 7 ppm for healthy air...there is clearly an issue, even if this sort of thing is only indicative of what is happening. Precision monitoring should be undertaken to confirm or deny this kind of finding.

PLANNED BURNING: Now that incident monitoring can be put in within 24 hours of the start of a fire (as was recently demonstrated by the response to peat fires near Colac), the expectation is that our communities will also benefit from the portable monitoring stations. This will allow residents to base decisions on activities for the coming days or evacuation to safer air, if they have pre-existing health problems or are pregnant

It has long been accepted practice to burn forest to limit the flammability on high fire danger days. It seems that even that is becoming more debateable.

With climate change increasing the risks, and reducing the window of opportunity for controlling burns, it may be time to review the whole scientific basis for the time-honoured practice. In the mean time, burning smaller plots, and completing the process before lighting more fires, may limit the smoke burden for nearby communities. It is a wicked problem because the best weather conditions for burns, occurs when it is still and that means that the smoke hangs around.

We do seem somewhat obsessed with burning as a pastime, but there needs to be more thought as to other methods of risk management that don't require fire as the only option. It does seem as if more care and coordination is already happening, with less severe problems in recent years.

AIR POLLUTION AND HEALTH

There is abundant evidence of the potential harms of poor air quality and the costs are substantial. In Australia upto 3000 extra people die each year because of poor air quality. Worldwide, half a million children die of pneumonia, each year, secondary to toxic air.

From The Senate Enquiry:

6.14 Evidence from Tasmania shows that reducing the pollution from wood heaters results in tangible health benefits. Following Launceston's \$2 million wood smoke reduction program it was reported that between 2001 and 2004 the number of households that used wood-burning stoves fell from 66 to 30 per cent, and wintertime particulate pollution reduced by 40 per cent. This appears to have correlated with a reduction in all-cause mortality and associated costs.[\[22\]](#)

and....

.....particularly into relation to PM 2.5 and PM 10. So far no limit of exposure where there is no impact has been identified.[\[27\]](#)

It is also recognised that poor air quality has significant effects on unborn children, causing reduced birth weight, which may in adulthood, lead to hypertension, diabetes and markedly increased cardiovascular risk. The concomitant health expenses before a premature death are costly to the economy.

The less obvious effects which are also emerging, are brain effects, such as potential links to neurodegenerative disorders, and in childhood, effects on learning and behaviour as well a autism which appears to be more likely for young children of women living closest to major transport routes.

CONCLUSIONS:

There is abundant evidence that we do need to clean up our air.

This will require:

- **Societal behaviour change.**
- **Community education hand in hand with monitoring**
- **Tightening regulation of heaters, and planned burns**
- **Anti-idling laws and enforcement**

There is so much more I could say, especially on the health effects.

I am a Paediatrician, have taught Environmental Medicine to medicals students and am a member of Doctors for the Environment and The Climate and Health Alliance. I live and work in Sale and am daily engaged with families from across Gippsland. I was a member of the EPA Co-design panel for Latrobe Valley AQ monitoring.

I would be keen to be involved in the planned Panel in August this year.

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What causes poor air quality?

Air pollutants originate from a range of sources, including:

- burning of fuels e.g. driving motor vehicles, running factories and/or other industries, generating electricity using coal or gas, burning wood for home heating, planned burning to reduce bushfire risk, and even operating home equipment like barbecues and lawn mowers (small garden equipment and outboard motors can contribute up to 10 per cent of urban air pollution at peak times of use)
- natural sources and events (e.g. bushfires, wind-blown dust and allergens)
- some mining, quarrying and agricultural activities.

To reduce bushfire risk in Australia, an accepted land management practice is deliberate burning to reduce fuel loads and, hence, the fire hazard.⁴ Such prescribed burning is usually limited to calm meteorological conditions when fires can be more easily contained, but smoke dispersal is often less effective. Lighting multiple fires under these conditions may cause severe pollution episodes, as experienced in Sydney in May 2016.⁴ In sum, smoke exposure from both uncontrolled and prescribed fires is a fact of life in Australia, so understanding the health consequences and mitigation strategies is essential for community members and their health providers alike. The evidence base for fire smoke pathophysiology, epidemiology and public health interventions has expanded considerably over the past decade, and the key points are summarised in this article.

Van Eeden et al. [24] showed that human alveolar macrophages produce TNF- α in a dose-dependent manner when exposed to atmospheric particles.

In vitro studies have shown that human alveolar macrophages exposed to PM₁₀ release numerous inflammatory cytokines, including IL-6 and TNF- α [6,7,24]

1. van Eeden SF, Tan WC, Suwa T, Mukae H, Terashima T, Fujii T, Qui D, Vincent R, Hogg JC. Cytokines involved in the systemic inflammatory response induced by exposure to particulate matter air pollutants (PM₁₀) Am J Respir Crit Care Med. 2001;164:826–830. [PubMed]

smoking and RA

Cigarette smoking acts on both cellular and humoral aspects of the immune system to cause a systemic proinflammatory state [4,29]. The effects of chronic cigarette smoking on innate and adaptive immune responses appear to trigger various morphological, physiological, biochemical and enzymatic changes that lead to impaired antibacterial defences, cellular regulatory activity and inflammatory responses [4,5,29]. In the lungs, alveolar macrophages and other monocytes of the innate system increase significantly in number, which, in turn, increase levels of lysosomal enzymes and secrete elastase responsible for parenchymal and connective tissue damage [4,30]. Elastase might cause such connective tissue damage and lung parenchymal cells, which could contribute to the pathogenesis of chronic obstructive pulmonary disease [30,31]. Bracke *et al.* reported that cigarette smoking increased the expression of matrix metalloproteinase (MMP)-12 (macrophage elastase), which is produced by both macrophages and dendritic cells in the lungs of mice [31]. MMP-12 has also been implicated in the pathogenesis of RA [32,33]. Liu *et al.* reported that RA synovial tissue contained higher levels of MMP-12 messenger RNA compared to osteoarthritis synovial tissue [32], and Wang *et al.* demonstrated that overexpression of MMP-12 in transgenic rabbits significantly enhanced arthritic lesions, resulting in severe synovial thickening, pannus formation, prominent macrophage infiltration at an early stage and a marked destruction of articular cartilage at a later stage [33]. Furthermore, smokers show higher levels of MMPs, particularly proMMP-2 and proMMP-9 [34], and it has been reported that MMP-9 derived from RA synovial fibroblasts may directly contribute to joint destruction in RA [35].

Natural killer (NK) cell activity against cultured melanomas and cancer cells was reported to be reduced significantly in smokers, as well as in animal models [36,37]. However, the role of NK cells in the pathogenesis of RA has not been fully elucidated, and recent reports suggest both protective and detrimental roles of NK cells [37].

Leukocytosis with decreased leukocyte function is commonly found in chronic smoke exposure [4,38,39], a



PROTECTING CHILDREN FROM THE ENVIRONMENT

Each year 1.7 million deaths of children under 5 are linked to the environment.

570,000 deaths



Respiratory infections,
including pneumonia

360,000 deaths



Diarrhoea

270,000 deaths



Neonatal conditions,
including prematurity

200,000 deaths



Unintentional injuries,
such as burns, drowning

200,000 deaths



Malaria

26%



World Health
Organization

Reducing environmental risks could
prevent a quarter of these deaths.