

Submission to the Hazelwood Coal Mine Fire Inquiry

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Healthy planet, healthy people.

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Who is DEA?

Doctors for the Environment Australia (DEA) is an independent, self-funded, non-government organisation of medical doctors in all Australian States and Territories. Our members work across all specialties including within communities, hospitals, private practice and academia. 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 environmental damage, pollution and climate change.

DEA has an extensive history of advocating for the protection of health in relation to the coal industry nationally and in Victoria. Specifically relevant to the residents of Morwell and surrounding areas was DEA's opposition at the VCAT in 2010 to the EPA approved development of a new coal fuelled power plant to be built by Dual Gas Pty Ltd. This power plant would have been situated 1 km from the Morwell township boundary, and DEA was greatly concerned for the health of local residents from an additional local air pollution source and the health implications globally from commissioning a new coal fuelled power plant when renewable alternatives are available. http://dea.org.au/images/uploads/submissions/VCAT_DEA_closing_sub.pdf

DEA welcomes the opportunity to submit to this Inquiry and will be specifically addressing Terms of Reference 6 and 7

6. *Whether the Hazelwood Coal Mine Fire contributed to an increase in deaths, having regard to any relevant evidence for the period 2009 to 2014.*
7. *Short, medium and long-term measures to improve the health of the Latrobe Valley Community having regard to any health impacts identified by the Board as being associated with the Hazelwood Coal Mine Fire.*

Summary of Key Points

- Increased particulate emissions (PM₁₀ and PM_{2.5}) as a result of the fire are likely to have contributed to both short term and long term adverse health outcomes.
- Although there is ample scientific and medical evidence to link the pollutants produced by the 2014 Hazelwood Coal Mine Fire with increased mortality, a direct association for this population cannot be made at this time without further careful analysis of accurate mortality data.
- Severe air pollution from the Hazelwood Coal Mine Fire added to health disability already experienced by Latrobe Valley residents.
- More validated air pollution measuring stations should be established in residential areas of the Latrobe Valley with particular emphasis on long-term monitoring of fine PM_{2.5} particulate matter.
- Long-term health surveillance of all Latrobe Valley residents and fire-fighters is required.
- The health care requirements of the residents and fire-fighters of the Latrobe Valley need to be adequately met now and for future decades.
- Rehabilitation of the old Hazelwood mine and closure of the current mine should be planned immediately in order to protect the health of Latrobe Valley residents.

Term of Reference 6

Whether the Hazelwood Coal Mine Fire contributed to an increase in deaths having regard to any relevant evidence for the period 2009 to 2014

Coal Mine Fire and Death Rates

As DEA does not have access to official figures on mortality rates or causes of death in the Latrobe Valley (LV) at the time of, or following, the coal mine fire of 2014 we cannot accurately comment as to whether the coal mine fire contributed directly to any increases in mortality.

However if the type and number of pollutants which were emitted during the Hazelwood Coal Mine Fire (HCMF) are considered in conjunction with the scientific evidence linking air pollution and mortality, it is a very real possibility that the HCMF could result in an increase in deaths among local residents.

We note that an initial risk assessment commissioned at the time of the fire, indicated that after 3 months of exposure, deaths would be expected according to modelling of the impacts of particulate matter, <http://hazelwoodinquiry.vic.gov.au/wp-content/uploads/2014/08/DOH.0005.001.0002.pdf>. This however did not take into consideration the additional impacts of other combustion products and volatile organic compounds, as data were unavailable.

Of the various toxic pollutants released, there were excessive emissions of carbon monoxide for several days, as well as both coarse and fine particulate matter (PM₁₀ and PM_{2.5}, particles being equal to or less than 10 µm or 2 µm in diameter respectively), with PM_{2.5} levels exceeding the Victorian advisory standard for at least 21 days at a Morwell South monitoring station. <http://report.hazelwoodinquiry.vic.gov.au/part-four-health-wellbeing/environmental-effects-response/air-monitoring-hazelwood-mine-fire>

These air borne pollutants and toxins released from coal combustion and fires and their adverse effects on health and mortality rates have been extensively described in the first Hazelwood report <http://report.hazelwoodinquiry.vic.gov.au/part-four-health-wellbeing/health-wellbeing-background/smoke>, in DEA's submission to that inquiry <http://dea.org.au/resources/submissions/P10> and by Adj Prof Marion Carey (Public Health expert) <http://dea.org.au/news/article/coal-mine-fires-remind-us-of-coals-threat-to-ourenvironment-climate-and-he>.

Carbon monoxide (CO) levels, from both indicative and validated monitoring stations as described in the 2014 report, were elevated during the fire <http://report.hazelwoodinquiry.vic.gov.au/part-four-health-wellbeing/health-wellbeing-background/smoke>. Exposure to CO may well have caused symptoms but is unlikely to have increased mortality, even though collection of CO measurements was considered inadequate during the early fire stages.

Increased particulate emissions (PM₁₀ and PM_{2.5}) as a result of the fire are likely to have contributed to both short term and long term adverse health outcomes.

In recent years, a large body of scientific evidence has emerged that has strengthened the link between short and long term ambient PM exposure and health effects, particularly in relation to PM_{2.5} particles, which are strongly associated with mortality and other adverse outcomes such as hospitalisation for cardio-pulmonary disease, increased respiratory symptoms, decreased lung function, worsening of asthma, irregular heartbeat and premature death in people particularly with pre-existing heart or lung disease. <http://www.epa.gov/pm/health.html>

According to the American Heart Association, "Exposure to PM_{2.5} over a few hours to weeks can trigger cardiovascular disease-related mortality and nonfatal events; longer-term exposure (e.g. a few years) increases the risk for cardiovascular mortality to an even greater extent than exposures over a few days and reduces life expectancy within more highly exposed segments of the population by several months to a few years."

<http://circ.ahajournals.org/content/121/21/2331.abstract>. A 10 µg/m³ increase in mean 24-hour PM_{2.5} concentration increases the relative risk for daily cardiovascular mortality by approximately 0.4% to 1.0%

<http://circ.ahajournals.org/content/121/21/2331.abstract>. A review of a number of air pollution studies has estimated that there is an average increase in mortality for longer term exposure for a population of 6% for every increase of 10 µg/m³ in fine particle levels per year in ambient air, and risk increases exponentially with increasing exposure. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2687917/>

A recently published Victorian study showed increased PM_{2.5} exposure was associated with an increased risk of out-of-hospital cardiac arrest and ischaemic heart disease during the Victorian bush fires of 2006-2007.

<http://jaha.ahajournals.org/content/4/7/e001653.full.pdf+html?sid=55ffbf03-c265-4244-944f-87e86e2bba16>

There is also emerging evidence that there is no known safe level of particulate pollution (PM₁₀ or PM_{2.5}); hence any increase in levels can be expected to lead to health impacts within a population.

Relevant evidence for the period 2009-2014

Of particular significance to Morwell residents is the existing high rate of chronic respiratory and cardiovascular risk factors and disease in the community. The risk of mortality due to air pollutant exposure is much higher for these vulnerable groups. Studies in 1996, described in the 2014 HCMF Report in the section "Health of the Latrobe Valley" revealed that the burden of chronic disease is particularly high in the Latrobe Valley; both males and females in the Latrobe Valley lost more healthy years to disease than for Victoria overall and compared with other regions in Gippsland, the leading causes for both groups were cancer and cardiovascular disease. A further study, also described in the previous HCMF Report, demonstrated relatively high rates of lung cancer mortality and cardiovascular disease during the period of 2003-2007.

Other relevant pre-conditions for residents in the Morwell area were:

- asbestos related disease has been the highest in Victoria and overall life-expectancy is 3-4 years less than the Victorian average.
- a greater percentage of residents aged over 50 years; and in the region closest to the fire, a higher proportion of those over 65 years than in regional Victoria and Victoria overall.
- children were below the state average in key areas of health, and therefore were more vulnerable due to both their age and pre-existing health.

As described in the previous HCMF report (Health effects-Vulnerable groups), the above factors increased the impact of fire smoke and its toxic constituents, resulting in intensification of pre-existing symptoms, particularly in the elderly and young. Additionally, long-term exposure to pollution from the coal-fired power stations in the Latrobe Valley would most certainly be a contributing factor to the elevated morbidity and mortality that is observed in this population (Castleden et al M J Aust 2011; 195(6): 333-335).

Considering that there have been no interventions to ameliorate exposure to air pollution since the 2003-2007 study period, the results are likely to continue to be applicable;

indeed, exposure to smoke from the Black Saturday bush fires in 2009 is likely to have compounded cardio-respiratory diseases further since then (Respirology. 2011 Feb;16 (2):198-209).

Term of Reference 7

Short, medium and long-term measures to improve the health of the Latrobe Valley community having regard to the health impacts identified by the Board as being associated with the Hazelwood Coal Mine Fire.

Health impacts of the fire

The health impacts of the fire were described by the Board of the first Inquiry as a list of 25 symptoms which were reported to occur at the onset of the fire. There is no doubt that many of these symptoms were related to the irritant effects of particulate and chemical substances from the coal-mine fire, including some symptoms due to carbon monoxide. Acute severe exposure to coal fire smoke constituents as mentioned can also exacerbate cardiovascular conditions leading to increased risk of heart attack and stroke <http://circ.ahajournals.org/content/121/21/2331.abstract> as well as acute respiratory symptoms.

For longer term exposure, as also mentioned, much is also known about the adverse health effects from air pollution. However, little scientific evidence has been published about the specific long term health effects of variable exposure to increased levels of coal fire smoke over 45 days as was the case with the HCMF. Hence there is no medical evidence at present to predict, if the risk of lung cancer is increased by significantly high levels of exposure to coal fire constituents for an intermediate time frame (weeks to months).

We can draw some conclusions from general medical knowledge in that the duration of exposure to coal fire smoke may well have led to exacerbation of airways disease over a longer term. Prevention of future coal fires and subsequent health risks necessitate thorough rehabilitation of the disused mine (subject of another Term of Reference). In addition, due to on-going pollution and the increasing bush-fire activity in South-east Australia as a result of climate-change, a transition plan for closure of the remaining Hazelwood mine is urgently required. <http://www.bom.gov.au/climate/current/annual/aus/>

Measures to improve health

“Short-term” measures would reasonably be considered to be for the duration of the fire and perhaps for several weeks after. In hindsight, knowing the intensity of the fire and the difficulties faced by the fire-fighters, more effective and coordinated communications would have helped residents take more appropriate steps to reduce their exposure to smoke and pollutants and thus reduce their health risks.

“Medium” term measures would be those which are taken for perhaps up to 2-3 years after the fire. There are several aspects to consider here.

- Whether measures to reduce local population exposure to on-going pollution from the mine site are needed. http://dea.org.au/images/uploads/submissions/AAQ_-_NEPM_Submission_10-14.pdf

- The prevention of future coal fires and subsequent health risks necessitate thorough rehabilitation of the disused mine. Though in the event of another fire in the near future, the facility for rapid air quality measurement (either indicative or validated) at appropriate locations for PM_{2.5}, PM₁₀, CO and ozone is required.
- Health risks from on-going pollution and the predicted increasing bush-fire activity in South-East Australia necessitates an urgent transition plan to facilitate an orderly closure of the remaining Hazelwood coal mine.
<http://www.bom.gov.au/climate/current/annual/aus/>
- Consideration should be given as to whether any diagnostic or therapeutic measures can be taken at this stage to improve the health of those already affected by smoke and pollution from the HCMF. Without access to medical records, we cannot give specific suggestions. However, we would recommend ensuring sufficient resources and expertise to deal with on-going associated medical conditions; both physical and psychological are readily available.
- As information comes to light as result of the Monash University health study, these issues may require further review

“Long term” measures (over subsequent years to decades) to improve health of the local population are possibly the most important and generally the most amenable to implementation.

Each step in the production of energy from coal - mining, transport, combustion and waste deposition - has the potential to affect health. It is not only coal mine fires that emit substances with adverse health effects, but constituents released from coal combustion (PMs, SO₂, oxides of nitrogen) which contribute to acute and chronic diseases and premature mortality (heart disease, cancer, stroke, respiratory disease).

Toxic trace elements are also released with coal combustion, perhaps the most important of which is mercury. Once in the environment it takes a form which accumulates in the food chain (particularly in fish) with the potential to affect the human nervous system. Mercury exposure during pregnancy is a risk to the development of the unborn child’s brain and one reason why pregnant women receive advice concerning their intake of fish.

As mentioned a review of a number of air pollution studies has estimated that there is an increase in mortality for longer term exposure for a population of 6% for every increase of 10 µg/m³ in fine particle levels (annual mean) in ambient air, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2687917/>. Shi et al (2015) found an association between relatively low increases of PM_{2.5} and increased mortality for both short and long-term exposure in residents aged 65 years and over in Nth America. <http://dx.doi.org/10.1289/ehp.1409111>. In addition, these particulate pollutants have been associated with cancer of the lung (Walter C et al Submission to NEPM AAQ variation 2014).

Therefore long term measures need to include:

- Ensuring the health-care requirements of the people and fire-fighters of the Latrobe Valley are more than adequately met now and for future decades.
- Support for the establishment of the study being conducted by Monash University (Hazelwood Health Study) <http://hazelwoodhealthstudy.org.au/website-launched-for-hazelwood-health-study/> in tracking health outcomes of everyone who was in the vicinity of the HCMF 2014. Monitoring would need to continue for two decades at least, as recommended in the previous HCMF 2014 report, even if residents move to another location. Surveillance should be especially tightly conducted for the fire-fighters, some of whom are known to have been severely exposed to toxic smoke at the outset. It will be important to follow the outcome of the Fiskville Inquiry whose final report is due at the end of the year, to see if any specific

guidelines should be followed.

<http://www.parliament.vic.gov.au/about/news/2427-fiskville-inquiry-call-for-submissions>

- The importance of upgrading air monitoring systems by the EPA for the region to include permanent monitoring for PM_{2.5} fine particulate matter and that this be situated to accurately measure the exposures of the population nearest the mine and power plant rather than just reflecting average airshed concentrations. These air quality data should be publically available in a timely and accessible fashion so that citizens and health care workers can track air pollutant levels over time and in relation to health impacts.
- That to truly protect public health, the Hazelwood power plant and mine should be decommissioned as soon as possible with transition plans developed urgently.

As long as the polluting aging power plant and mine continue to operate, the health of residents will continue to be impacted, even in the absence of fire. Even the unions appreciate that coal mining and combustion for energy has a limited future and that it is paramount that decommissioning of coal industries are done in a fair manner where adequate transition plans are implemented to care for the health and wellbeing of local communities. <http://mobile.abc.net.au/news/2015-07-28/cfmeu-backs-labor-ret-on-condition-of-assistance-for-workers/6655142>

Given the vulnerable socio-economic status of the region and poorer health status, this population needs protection from the adverse impacts of increasing unemployment that the inevitable transition away from coal will bring.

Comprehensive transition plans for the area are required prior to decommissioning to ensure job retention and retraining, and economic growth. Earthworker Cooperative in Morwell is an example of engineers in the Latrobe Valley who have understood that the coal industry has a limited future and so have established an industry for the manufacture of non-polluting solar water heaters.

Coal contributes to global climate change, which also threatens the health of Australians. Over one third of Australia's greenhouse gas emissions are attributed to the coal industry. According to the World Health Organization (WHO), climate change is one of the greatest threats to public health and it will affect, in profoundly adverse ways, some of the most fundamental pre-requisites for good health: clean air and water, sufficient food, adequate shelter and freedom from disease.

Non-fossil fuel forms of energy generation that do not have associated adverse health effects already exist, particularly in the form of wind and solar energy. Renewable energy can provide cost effective power relative to coal when subsidies and externalities (such as health-care) are taken into account (Coady et al IMF Working Paper How Large Are Global Energy Subsidies? May 2015). Coal combustion as an energy source is an expensive option when the industry's burden on public health and the environment are considered. US studies estimate the true financial cost of coal is double (if not triple) when externalities are taken into account. In Australia when the health costs of only air pollution from coal combustion on the community are considered, there is an estimated cost to healthcare of \$2.6 billion per annum (Australian Academy of Technological Sciences and Engineering 2009) which is equivalent to an extra \$13 AUD per megawatt hour

<http://www.atse.org.au/Documents/Publications/Reports/Energy/ATSE%20Hidden%20Costs%20Electricity%202009.pdf>. For Hazelwood alone, externalities of health and social costs have been recently calculated to amount to \$900 million AUD per year <http://www.theage.com.au/victoria/the-hidden-cost-of-the-hazelwood-coal-power-plant-20150418-1mnmdf.html>.

Furthermore, solar- and wind-power will continue to become considerably cheaper with greater utilisation. It is also possible to manage base-load power without sole reliance on coal-fired power stations or other carbon-emitting power generation because of advances in battery and solar-thermal storage technologies.

Finally greenhouse gas emissions from the Latrobe Valley coal industry contribute to green-house gases world-wide. Hazelwood has the highest CO₂ emissions intensity of any coal-fired power station in Australia

http://www.sourcewatch.org/index.php/Hazelwood_Power_Station. In line with DEA's advocacy for Australia to contribute its share of action on mitigating global warming, we need to reduce CO₂ emissions drastically, by moving away from coal mining and burning. At least 80% of all known global coal reserves need to be kept in the ground if we are to have a chance of keeping global warming to an average of 2°C

www.nature.com/articles/nature14016.epdf?referrer_access_token=x. Thus, reducing green-house gas emissions is also ultimately needed to safeguard the health of the Latrobe Valley community as global warming of more than 2°C will seriously threaten many living species including mankind (IPCC Fifth Assessment Report 2015).