Submission on the proposed variation to the Ambient Air Quality NEPM

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Healthy planet, healthy people.

Doctors for the Environment Australia (DEA) is a national organisation of medical practitioners, health scientists, and medical students who are committed to improving health by protecting the environment. DEA sees environmental protection as the most fundamental preventive health strategy, so has a keen interest in air pollution.

DEA notes that the AAQ NEPM is not enforceable by the federal government, so even if it includes standards and goals that correctly reflect current scientific thinking on the health effects of air pollution it is not a strong mechanism for ensuring that the Australian population is protected from health impacts.

The option for direct federal legislation such as an Australian Clean Air Act is considered only briefly in the discussion paper and we believe it warrants further exploration. Just as road safety enforcement is not optional, and the Commonwealth will use funding powers to ensure states comply with national standards, a vigorous approach to enforcement of air quality standards would lead to better air.

Our comments on the standards and goals should be read in the context that we believe the NEPM is not a very effective mechanism, and stronger air quality legislation could lead to greater health gains.

While air quality in Australia improved during the last decades of the 20th century, for the last 10 years it has been more or less static, and the impact statement predicts that under a business as usual scenario it will get worse over coming decades due to increasing population, increasing vehicle use, climate change and increased mining activity. The health burden is predicted to increase, and this could occur without any extra exceedances of the NEPM standards. As a wealthy country with good governance and good science there is no reason we should tolerate an increasing health burden from air pollution.

The science on the health impacts of air pollution has become more certain over the last decade, and has been correctly encapsulated in the NEPM variation impact statement. DEA agrees that there is a substantial health burden from air pollution in Australia, that much of this burden is from particulates, and that this burden occurs despite air quality in Australia being mostly within the current standards and better than air quality in many other developed countries. The pathogenicity of particulates is probably from adsorbed polycyclic aromatic hydrocarbons, transition metals, micro-organisms, and substances that cause oxidative stress (Raaschou-Nielsen, Andersen et al. 2013) however as these cannot routinely be measured directly, the particulates should be regulated by size and mass.

Aspects that DEA strongly supports:

1) **The $PM_{2.5}$ annual standard should be a compliance rather than an advisory standard.** This is long overdue, and $PM_{2.5}$ is the size fraction with the greatest health impact so should be a strong focus of regulatory measures.

2) **That the annual $PM_{2.5}$ standard is set at 8 µg/m^3.** The epidemiology tells us that there is no safe level of $PM_{2.5}$, particularly the recent work by Crouse 2012 from Canada that has examined health effects right down to very low levels (Crouse, Peters et al. 2012). Specifically, the relative risk of death due to ischaemic heart disease due to moving from $PM_{2.5}$ of 5 µg/m^3 up to 10 µg/m^3 was 1.2 while a further increase from 10 µg/m^3 to 15 µg/m^3 gave a relative risk of 1.12. In the situation of there being no safe level of exposure the regulatory system should ensure that the levels are as low as can be achieved, and not simply below a given standard. The main regulatory strategy should be to continuously reduce exposure; however there should also be a limit value as a

backstop to guarantee equity for vulnerable exposed communities across Australia. The 8 μg/m^3 value for Australia is lower than most countries, but as we start from a lower natural background, and do not have cross border air pollution problems from neighbouring countries, it may be a similar amount of national anthropogenic particulate pollution.

3) **Making the 24 hour $PM_{2.5}$ standard a compliance rather than an advisory standard.** As for the annual standard, this is long overdue. The levels of 25 μg/m^3 or 20 μg/m^3 are proposed, and reducing the peak exposures would have health benefits of less hospitalisations and less exacerbations of respiratory symptoms. As for chronic effects and mortality, there is evidence for effects well below the standard levels so continuous reduction should be the main strategy and the standard is a backstop. The epidemiology points to chronic effects outweighing acute effects, so there is a smaller but still important health gain in modifying the 24 hour standard.

4) **Establishing an annual standard for PM_{10}.** Once we have a strong regulatory and exposure reduction framework for $PM_{2.5}$ the extra benefit of limits for PM_{10} are smaller but still substantial. The epidemiology for coarse fraction $PM_{2.5-10}$ particles shows exacerbation of lung disease, reduction in lung function in both children and adults (Forbes, Kapetanakis et al. 2009) (Gauderman, McConnell et al. 2000) and incidence of lung cancer to be the main problems. The European Study of Cohorts for Air Pollution Effects showed a hazard ratio for lung cancer of 1.22 (95% CI 1.03-1.45) for PM_{10}, which was not significant for $PM_{2.5}$ (Raaschou-Nielsen, Andersen et al. 2013). This matches the known physiology as the deposition of the larger particles is preferentially in the airways where these cancers arise rather than the terminal alveolus. The association was even stronger for the adenocarcinoma sub type of lung cancer, which is the only type of lung cancer that develops in a substantial number of non smokers. We find this compelling evidence in support of a standard for annual PM_{10}, and this goes beyond the justifications in Section 3.1.6: that Australia should have an annual PM_{10} limit as there is uncertainty in the science, and that many places do not have $PM_{2.5}$ monitoring so a PM_{10} limit gives defacto $PM_{2.5}$ protection. From the point of view of coal affected communities, their burden is likely to be in the PM_{10} fraction so this annual limit will give them protection.

5) **Revising the 24 hour standard for PM10 to 40 μg/m^3.** The impact statement (figure 8.2) shows that there are few exceedances of the 50 μg/m^3 standard and it would be relatively easy to progress to a 40 μg/m^3 standard with attendant health benefits.

Aspects DEA would like to see improved:

Legislation or regulations

The limits set by the NEPM process are uniform across states, so states are not free to set weaker limits and this prevents a race to the bottom in which states offer weaker environmental standards to attract industrial development to their state. The Commonwealth however has no enforcement powers. It is a weakness of the current system that there are no consequences for state regulatory agencies that fail to meet the air quality standards. There is risk that state agencies fall under the influence of large industrial emitters and lose sight of the public interest. In the discussion papers the option of direct Commonwealth legislation is rejected because there may be a lack of constitutional power, and to set up national monitoring and reporting would cost money. Neither of these seem convincing arguments given the current large economic impact of air pollution, and DEA would like to see Commonwealth legislation explored further. It is difficult to claim that the current NEPM arrangements have led to great improvements in air quality in Australia, as major improvements occurred during the 1970s to 1990s prior to the NEPM but there has not been consistent improvement in particulate levels this century.

Monitoring by population size alone is not adequate protection. The draft NEPM sets out a requirement to monitor air quality in regions of 25,000 people or more and offers no reassurance to people in smaller towns. There is a clause (14.2) for optional extra monitoring:

Additional performance monitoring stations may be needed where pollutant levels are influenced by local characteristics such as topography, weather or emission sources.

This is weak and optional. It is of no use to people whose health is threatened by industrial activity setting up close to established residential areas. There should be stronger requirements for monitoring in small towns or suburbs that are close to industrial sources.

The impact statement argues that ambient air quality standards should apply only to measurements taken in the centre of populations away from emitters. This is derived from the original cohort studies where one central monitor was used to measure particulate air pollution in each city, and the city value was allocated to all individuals in the city. More recent work such as by Crouse used remote sensing to detect particulates across the whole country on a 10 km grid, and allocated individual exposures by the grid value of their place of residence. The analysis by Cesaroni of a cohort in Rome used a 1 km grid dispersion model to allocate exposure, thus capturing the effects of within city variance (Cesaroni, Badaloni et al. 2013). This supports that within city variation in exposure is as important as between city variation, and that to deny residents of suburbs close to industry the protection of air quality standards is based on a false interpretation. DEA supports the practice of monitoring at "Generally Representative Upper Bound" monitoring sites.

Within any region there will be places with higher and lower particulate pollution, which should be tackled by two strategies as illustrated in Figure 1. A continuous improvement strategy to push the median lower for large numbers of people (as indicated by the arrow) and a maximum permissible exposure strategy (as indicated by the circle) to look after highly exposed populations wherever they live to ensure environmental justice. This includes the towns and suburbs close to industrial and transport sources. There is an efficiency argument for focussing on the air quality in the biggest populations, and an equity argument for protecting those most exposed, so in practice an exposure reduction

system is most relevant to large cities while numerical standards provide an equitable upper exposure limit for people in smaller places.

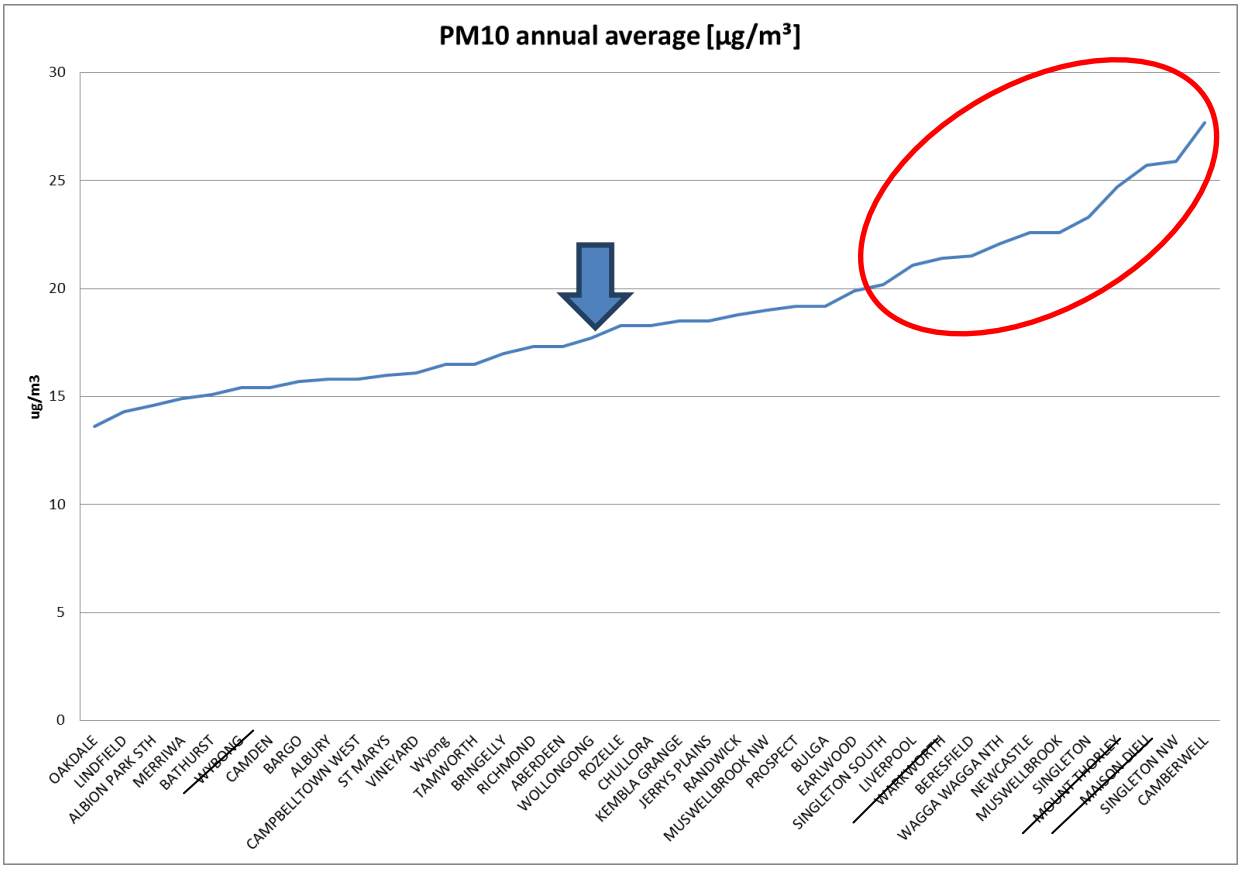

Figure 1. Annual average PM_{10} values for 2013 from 39 EPA monitoring sites in NSW. The median value Rozelle represents a large number of people in central Sydney, while the extreme value of Camberwell is a small rural village. Maison Dieu, Warkworth, Wybong, and Mt Thorley are rural sites where hardly anyone lives. Singleton NW is 900m from homes, but all the other sites are at residential areas.

Exposure reduction framework (ERF)

DEA agrees that the biggest health gains are to be made by reducing the median exposure of a population. If effects are truly linear reducing the exposure of 100,000 people from 8-7 µg/m^3 gives ten times the health benefit of reducing the exposure of 1,000 people from 18-8 µg/m^3.

Business as usual is predicted to increase particulate air pollution in many parts of Australia over coming decades, due to increases in population, vehicle use, and mining activities. These increases will have adverse health impacts even if they do not result in exceedances of the NEPM standards. An adequate regulatory framework would have as its starting point that air quality should not be allowed to get worse, and that over time there should be continuous improvement. An exposure reduction framework is proposed in section 7.7 of the impact statement but it does not appear in the legislative instrument. Two options for ERF are proposed, one has a 10 year target for a 10% reduction in annual average $PM_{2.5}$ the other has no specific target, but that there should be no deterioration. As the science is well established that current exposure is causing health problems, why would we not adopt long term targets to decrease the exposure?

Form of standards

Options are presented for allowing a prescribed number of exceedances for 24 hour values, either 5 as currently, or using the 98th centile which works out to 7 days per year. Some exceedances will be due to dust storms or bushfires, but we cannot predict that there will be only 5 or 7 in a year especially in a changing climate. As these occur in summer, there is the arbitrary ending of the calendar year right in the middle of the fire & dust season. It seems logical to exclude dust storms and bushfire days from 24 hour readings, although this would need technical work to develop definitions of which fires are taken into account for which exceedances, based on size, distance, duration, direction and meteorology. The risk that such a system would not evenly applied across jurisdictions is substantial.

Future work

When there is technical capacity to do so, we would like to see monitoring and regulation of the specific components of $PM_{2.5}$ such as diesel exhaust and secondary sulphate particles, as these have major health impacts, and distinct regulatory responses.

Sulphur Dioxide (SO_2)

DEA requests that revised SO_2 standards should also be included in the current variation of the AAQ NEPM, or that a further variation dealing with SO_2 should be issued as soon as practicable.

The National Environment Protection Council 2011 review of the AAQ NEPM found that health effects are observed at current levels of SO_2 in Australian cities which are well below the NEPM standard, that current standards are not meeting the requirement for adequate protection of human health and that there is evidence that these standards should be revised to minimise the impact of air pollution on the health of the Australian population. The Review Team also considered that the SO_2 standards should be revised with consideration given to sensitive groups, including people with asthma (NEPC, 2011). The World Health Organization (WHO) and the United States Environmental Protection Agency (USEPA) have concluded that there is no safe level of exposure to SO_2 in particular for sensitive groups (Denison, 2011).

In light of the existing scientific evidence, WHO and the USEPA have issued revised air quality standards for SO_2 which are significantly more stringent than those in Australia's AAQ NEPM and relevant state legislation such as Victoria's State Environment Protection Policy (Ambient Air Quality) (SEPP (AAQ)). The current EU standard for SO_2 averaged over a one-hour period is equivalent to 132 ppb (parts per billion) and the US standard is 75 ppb while the NEPM (AAQ) standard is equivalent to 200 ppb (Denison, 2011; European Commission, 2014; US EPA, 2012).

Failure to revise down SO_2 standards in the current AAQ NEPM variation will leave Australia's air quality standards significantly behind current world standards, and allow continued exposure of Australian communities to levels of SO_2 known to be associated with serious negative health outcomes, particularly for vulnerable groups.

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