Inquiry by the Senate Standing Committees on Community Affairs into the Impacts on Health of Air Quality in Australia

Submission by: Clean Air Society Australia New Zealand
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Introduction

The Clean Air Society of Australia and New Zealand (CASANZ) is a non-government, non-profit organisation that brings together professionals working across a broad range of air quality management fields. Formed in 1966, the Society's members have been intimately involved with the evolving management of air quality in Australia and New Zealand. Various members of the Society have worked in all levels of government, conducted research in Universities and CSIRO, and worked as air quality consultants. The Society performs important roles in information and technology transfer, and training. The Society's goals are listed in Appendix 1.

CASANZ welcomes this Inquiry into the impacts of air pollutants on health. This submission includes the considered views of the Society as represented in peer-reviewed articles in the Society's Journal *Air Quality and Climate Change*[1]. This journal has played an important role in disseminating information about air quality with a strong focus on Australian and New Zealand issues for almost 50 years.

Although air quality is generally good in Australia as measured by compliance with the National Environmental Pollution Measures (NEPM), there are still regions of concern and the significant improvements in our understanding of the health risks associated with relatively low concentrations of pollutants in the air indicate that much still needs to be done.

[1]The title of the journal changed in 2009, prior to that it was called *Clean Air and Environmental Quality*

Response to Terms of Reference

(a) Particulate matter, its sources and effects

Fine and ultra-fine particles in the air are under scrutiny by air pollution and health researchers world-wide. Fine particles less than 2.5 microns aerodynamic diameter (PM2.5) result from many combustion processes, high temperature metal processing and some natural sources. Epidemiological studies (discussed in section (b) below) have shown clear correlations between fine particles and human health. Ultra-fine particles less than 0.1 microns aerodynamic diameter also result from some combustion processes and some metallurgical processes. They are under suspicion as a health risk but there is less evidence.

Transport continues to be a significant source of air pollutants, although big improvements have been achieved in recent years. The popularity of private diesel motor vehicles, especially as they age, means in-service monitoring of particle emissions is important. Some States, e.g. Tasmania, have no regular vehicle emission or safety checks.

An issue of concern in the Society is particle emissions from residential woodheaters. CASANZ believes this source of air pollutants should receive careful government scrutiny with the aim of minimising its adverse impact on health. Three specific areas of concern are:

- high ambient concentrations of fine particles and some air toxics in regions where firewood use is popular (this includes Sydney),
- localised pollution caused by high smoke concentrations from a single woodheater entering nearby homes, and
- smoke spillage into the living area of homes with woodheaters.

Our Journal has published numerous articles on these topics, including on particulate emissions (Xie *et al*. 2012 and Ancelet *et al*. 2010), on woodheater performance (Todd 2008a, b) and general issues relating to wood-smoke (Todd 2008c, d) .

A recent article by Johnston *et al*. (2013) in the British Medical Journal has particular relevance to the health impacts of wood-smoke in a small city. Johnston and colleagues examined mortality data in Launceston, Tasmania before and after a concerted effort to reduce the number of woodheaters in the city and improve the operation of woodheaters that remained in use. The intervention resulted in large improvements in air quality through winter. The analysis showed a statistically significant fall in annual deaths linked to cardiovascular and respiratory causes.

(a) Those populations most at risk and the causes that put those populations at risk

Epidemiological studies generally classify health risks into two broad groups: the effects of relatively short-term exposure to increased pollution (days) and log-term exposure (years).

Work-safety studies also deal in long and short-term exposure, the main difference being short-term exposure in an industrial context includes very short exposure (seconds to minutes).

High pollution concentrations (not normally experienced)

At high concentrations, short term exposure to various toxic gases or viable particles can cause illness or death in healthy adults. The risks are greatest in certain industries and fire fighting; in both cases risks are minimised through strict regulation, training and use of protective equipment. None-the-less, deaths do occur. Legionella presents risk of airborne infection affecting health adults through inadequately maintained air conditioning systems, again the risk is minimised through strict regulation. The general population may also be exposed to potentially fatal short-term air pollution concentrations due to faulty combustion appliances. There have been several cases of accidental carbon monoxide poisoning in homes reported in recent years. Lack of awareness by the general public increases this risk despite the small chance of combustion equipment failing thanks to safety regulations.

Relatively low pollution concentrations (typically experienced outdoors or indoors)

Individuals with pre-existing respiratory problems (e.g. asthma, emphysema) may experience health problems when exposed to relatively low levels of air pollutants for short time periods. Pollutants include, but are not limited to, elevated particle concentrations and acid gases. Exposure can occur outdoors or indoors. Air pollutant concentrations commonly observed in Australia (indoors and ambient) are capable of causing an adverse response in this sensitive population. The most likely health impact is an aggravation of an existing condition, possibly involving a doctor or hospital visit. In a small number of cases premature death may occur.

Long-term exposure to relatively low air pollution concentrations may cause health problems in otherwise healthy adults. Young children and the elderly show greater statistical risk. The presence of carcinogens, asbestos fibres, lead particles, oxides of nitrogen, fine particles, and a number of other air toxics can lead to illness or death in a relatively small proportion of individuals exposed to the pollutant.

Scientific/medical evidence

There is a large body of scientific and medical evidence linking air quality with human health. It is beyond the scope of this submission to review this information. Of particular interest to Australia are those studies that address health risks associated with relatively clean air (i.e. the pollution concentrations routinely measured in Australian cities).

Fine particle concentrations are one widely used indicator of general air quality. Pope and Dockery's 2006 review of the health effects of fine particles provides compelling evidence that both short-term (days) and long-term (years) exposure to elevated particle concentrations contributes to increased mortality and morbidity. Moreover, adverse health effects appear to occur at fine particle ($PM_{2.5}$) concentrations as low as 20µg/m^3 – a level that is frequently exceeded in Australian cities and towns. Several Australian epidemiological studies have shown statistically significant links between some air pollutant concentrations and health,

which are consistent with the relationships found in overseas studies. Australian studies include those in Melbourne (EPA Vic 2000, EPA Vic 2001), Sydney (Morgan *et al.* 1998a, Morgan *et al.* 1998b) and Brisbane (Simpson *et al*. 1997, Chen *et al*. 2006).

The very recent study by Johnston *et al*. (2013), referred to previously, shows a measurable improvement in population health following intervention to reduce wood-smoke from residential heating in Launceston. This is a significant study because Launceston air pollution is caused almost entirely by smoke from woodheaters.

Concentrations of air toxics and fine particles (indoors and out), once assumed to be relatively benign, present challenging management issues. Large epidemiological studies, new technology for routinely measuring lower concentrations of pollutants and powerful statistical analysis methods combine to demonstrate the links between air pollution and health; even when risks of adverse health effects are low and the time between exposure and symptoms of poor health are many years apart. Indoor air quality is increasingly becoming an issue (Molloy *et al*. 2011). Issues include asbestos, indoor environmental tobacco smoke, emissions form unflued gas heaters, smoke spillage from woodheaters, off-gassing from paints, glues and materials, and damp environments with high mould risk.

Another air quality issue requiring careful attention is exposure of workers in high-risk industrial occupations. Rapid expansion of mining and processing operations raises issues related to (but not limited to) coal dust, silica, asbestos and various metals.

(b) The standards, monitoring and regulation of air quality at all levels of government

Although we have entered a period where air quality has, except for a few cases, reached the NEPM standards for the “adequate protection of human health and well-being”, these standards were set almost 20 years ago. Significant improvements in our understanding of the health risks associated with relatively low concentrations of pollutants in the air indicate that much still needs to be done. In addition, compliance with the NEPM is only assessed at performance monitoring stations, which are required to be “located in a manner such that they contribute to obtaining a representative measure of the air quality likely to be experienced by the general population in the region or sub-region”. This does not cover people living close to busy roads, in towns or suburbs with high woodheater use, or close to industry, etc.

Environmental impact assessments play an important role in ensuring that developments do not degrade air quality. The supply of good data is necessary for such assessments to be as accurate as possible. Although air quality and meteorological data is collected by many agencies and industries around Australia, much of it is not readily accessible to consultants engaged to undertake these assessments. CASANZ would like to see more coordinated approach to the collection of accessibility of such environmental data, possibly as part of the Bureau of Meteorology’s National Plan for Environmental Information.

(c) Any other related matters

From time to time studies are carried out to determine the health cost of exposure to air pollution. These studies can be useful if estimating the cost-benefit of pollution control measures. Many different conventions are used for putting dollar values on adverse health effects. Costs of hospital visits and GP visits can be relatively well quantified using available Australian data. However, putting a cost on a premature death is far more contentious. Various authors have used widely different values which makes comparisons of health costs difficult – almost meaningless. It would be very useful to have an Australian study that developed a method, acceptable to government, for putting a dollar cost on premature deaths.

Air emissions from shipping in Australian ports and coastal areas is the subject of a recent paper by Goldsworthy and Galbally (2011). It is argued that Australia needs an updated method for estimating this source of air pollutants.

Biological airborne contaminants indoors are reviewed by Nevalainen *et al*. (2013). Small particles including fungi, bacteria and viruses can be a problem in homes and commercial buildings. Problems can be exacerbated if buildings are relatively air tight.

A link between air pollution and water quality is discussed in a recent article by Morrow and Dunstan (2012) where they analyse tank water collected from roofs and find that atmospheric deposition in industrial areas contributes heavy metals in the water. Deposition of creosote from woodheater flues may also present a health risk for tank water.

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Appendix 1

The goals of CASANZ are (www.casanz.org.au):

1. The objects of the society are to promote the protection of the environment, through advancement of knowledge and practical experience of environmental and air quality science and management.

2. CASANZ is an organisation which gathers and distributes the experience and knowledge of its members, to benefit society members and the public.

3. CASANZ provides lectures, exhibitions, public meetings and conferences as a forum to expand knowledge of environmental matters, especially air quality, including causes, effects, measurement, legislative aspects and control of pollution.

4. CASANZ develops liaisons with organisations with similar interests in Australia and New Zealand, as well as other countries.

5. CASANZ prints and publishes papers, periodical articles, books and information leaflets for the benefit of its members and the public. An example is its Journal, *Air Quality and Climate Change*.

6. CASANZ may provide scholarships, bursaries, monetary grants, awards and prizes to encourage the study and presentation of relevant subjects and disciplines in air quality and climate change.