



Centre for Air pollution, energy and health Research

Position paper

Reducing the health impacts of wood heaters in Australia

Policy implications



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Title

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Key points

- In Australia, wood heater smoke significantly contributes to air pollution. Wood heater smoke can impact the health of people who often have no means of controlling their exposure.
- Wood heater emission and efficiency standards have tightened in recent years, but by themselves are very unlikely to reduce the smoke-related health impacts of wood heaters. Moreover, local councils cannot always ensure compliance with existing regulations relating to smoke emissions from individual chimneys.
- CAR proposes a multi-pronged policy approach that includes:
 1. the introduction of State/Territory-based regulatory policies with strong compliance and enforcement mechanisms and sufficient resourcing to support local governments to address the issue;
 2. the introduction of schemes to incentivise the replacement of wood heaters with low pollution heating options in existing homes in populated areas. This should be complemented by appropriate housing energy efficiency standards;
 3. introduction of much more stringent heater emissions standards that apply to real-world heater operation (see further details below regarding the Canterbury Method as an example); and
 4. national leadership to support public health action and proactive targeted initiatives to reduce the population health burden from wood heater smoke. This should include:
 - a. the establishment of a central registry of domestic wood heaters by their location, age, make, model and standards which they have been certified to meet, with annual publicly available reports.
 - b. working with States and Territories to support more comprehensive monitoring of air quality such as through wider sensor networks to better characterise wood heater pollution and the contribution of wood smoke to local and regional air pollution.

Why is reducing wood heater smoke important for health?

The most recent estimates suggest that, nationwide, one in ten Australian households use wood heaters as their main source of heating (ABS, 2008). Wood heater use is much higher in areas with cooler winters, such as Tasmania. However, wood heaters produce much more pollution than other heating options, and significantly contribute to air pollution in urban, regional and rural communities across Australia (Broome et al, 2020). Wood heater smoke causes numerous health impacts and creates a major health and economic burden for Australia (Borchers-Arriagada et al, 2020).

For some vulnerable groups of people, exposure to woodsmoke can result in dangerous health effects, even death. These groups include older people and those living with respiratory conditions such as asthma, chronic obstructive pulmonary disease (COPD), diabetes, or vascular diseases (like angina, heart failure and stroke) (Landrigan et al, 2018). Other groups who may be more vulnerable

to these air pollutants include pregnant women, infants and children, as air pollution is associated with increased complications of pregnancy, increased risks to the developing baby, and increased health risks for growing children (Melody et al, 2020).

The movement and accumulation of smoke are complex and are affected by numerous factors including wind speed and direction, temperature, geography and heater density. In unfavourable circumstances these factors can regularly result in high concentrations of wood heater smoke around communities for extended intervals in the cooler months of the year (Johnston et al, 2013; see photos below). Similar to passive smoking, those affected by wood heater smoke can have limited capacity to protect themselves.

For decades, wood heaters have been viewed as providing the 'cosy' family hearth. We recognise that reconciling this widespread perception with the reality that wood heater emissions reduce the quality and lifespan of many people in the community is a major challenge. Nevertheless, the health costs are now much more clearly known and alternative heating options that are on par economically are available (Robinson, 2020).



Figure: Launceston, Tasmania, showing reduced visibility associated with smoke from domestic wood heaters (left) and same view on clear day (right). Photos courtesy of Dr Jim Markos

How is wood heater smoke addressed in Australia?

The National Clean Air Agreement (2015) acknowledges reduction of emissions from wood heaters as part of its strategic approach (Australian Government, 2015). However, there is no formal national policy on reducing wood heaters emissions. While each local council should have a record of wood heater installations in their jurisdiction, no centralised wood heater register exists. Jurisdictions tend to use population density and/or spatially limited surveys to estimate the number of wood heaters in operation.

Australian States and Territories are responsible for adopting emissions and efficiency standards and sharing best practice management approaches (DEE, 2018). Current standards in many States and Territories require new wood heaters to comply with Australian/New Zealand Standards 4102 and 4103. However, these standards are not designed to reflect the pollution emitted by heaters under "real world" operating conditions. Further, they are not systemically enforced and regulation of the industry is inadequate. In practice, local councils and shires are responsible for ensuring wood heater smoke does not breach local air quality regulations.

What factors are contributing to our lack of progress in addressing this problem in Australia?

1. Current air quality standards and regulations are insufficient to protect health and difficult to enforce.

There is no safe lower level of air pollution and wood heaters significantly contribute to the burden

The scientific evidence clearly demonstrates that there is no 'safe' level of particulate air pollution (Liu et al, 2019; Hanigan et al, 2019). There are significant health costs associated with wood heaters contributing to air pollution and health impacts such as increased mortality, even where they rarely contribute to exceedances of current air quality standards, for example in Sydney (Broome et al, 2020).

Peak concentrations of wood heater smoke may not be measured by jurisdictional environment departments or authorities.

Because wood heater smoke emissions can be highly localised to a street or neighbourhood, the peak concentrations experienced in residential areas are most likely not being measured by existing stationary air quality monitors, sited in accordance with the Australian standards. For example, Innis (2019) measured significantly higher concentrations of air pollution in residential areas (likely from wood heater smoke) compared with air pollution measurements captured at the nearest stationary air quality monitor. This means that these concentrations are not well represented in reference-level air pollution data provided by jurisdictional environment departments or authorities.

Enforcing air quality regulations is difficult.

Even in places like Tasmania and rural New South Wales where wood heater emissions are the main reason for severe air pollution that frequently breaches national air quality standards (e.g., Robinson, 2011; Borchers-Arriagada et al, 2020; Robinson et al, 2021), this source of air pollution is difficult to regulate.

Local councils usually rely on a visual estimate of a smoke plume to determine compliance with existing regulations. For example, in many Australian jurisdictions regulations mandate that a 10-metre visible smoke plume from a chimney must be sighted to be classified as a breach. The visual appearance of a plume is heavily dependent on background contrast and light-levels. It is very difficult to discern a smoke plume at night against a cloudy sky. Smoke emissions are variable in time, hence council officers making spot checks may not be able to form an accurate view of the level of peak or mean emissions from a particular chimney. Additionally, the peak emissions are often in the evening hours which provides a further, logistical challenge, and discourages the pursuit of compliance outside of normal working hours, when council staff are less available. In general, air quality monitoring instrumentation is not directly available to local councils and shires, and current smoke regulations do not explicitly reference the application of quantitative measures to wood heater management.

2. Current Australian wood heater standards are insufficient to protect health.

Standards do not reflect "real world" emissions

Current standards apply to tests on heaters in a controlled setting that do not reflect usual everyday operation, such as the highly polluting start-up phase, real-world fuel-types, or suboptimal operation and maintenance. However, work has been undertaken in New Zealand (Environment Canterbury) to develop real-world test methods for ultra-low emission wood heaters. This is of direct relevance to the issues we face in Australia.

Standards are not adequately enforced

In 2004, the Commonwealth Government (DEH, 2004) released the results of an audit of 47 models of retail wood heaters in Australia. Over half (55%) had one or more serious design faults that could affect emissions, and 72% had one or more labelling faults that could affect emissions. Twelve models underwent full laboratory testing and 58% of these failed the test due to serious design faults with average emissions 4 times higher than when initially certified. No further audits have been carried out in the past 17 years. This suggests inadequate regulation of the industry.

Standards currently only apply to new wood heaters

Unfortunately, wood heaters often have a very long life – in excess of 20 years. Even with appropriate standards based on real-world emissions, the current stock of wood heaters will not be replaced for many years. It is likely too, that many of the older heaters in operation have not been maintained adequately and would no longer even meet the emission standards that were in force at the time of manufacture.

3. Education campaigns alone have not led to improved air quality

There is some evidence to suggest that educational campaigns can lead to shorter-term behaviour change in individuals to reduce their emissions, (Johnston et al, 2013; Hine et al, 2011). However, there is no evidence that educational campaigns have led to reduced community-wide air pollution unless they have been conducted in conjunction with programs that also reduce wood heater numbers in the community (Webster, 2015). There has also been a lack of education about the availability of alternative, less polluting heating options.

4. Affordability of heating options

A common misconception is that wood heaters constitute a more economic heating option compared with alternative options, such as reverse cycle air conditioners. For a relatively small group of people who have access to their own wood supply, the use of wood heaters may be the most economical heating option. For a majority of people, however, electric heating options, especially reverse cycle air conditioning, represent the cheapest method for home heating (Sustainable Living Tasmania, 2015).

What policy options exist to address the health impacts of wood heaters?

CAR recommends a multi-faceted approach to address the health impacts of wood heaters. We advocate for programs that incorporate:

- 1. Jurisdictionally based regulatory policies with strong compliance and enforcement mechanisms and sufficient resourcing to support local governments to address local wood heater smoke.** Regulation should be amended to remove the requirement on local councils to sight a 10-metre visible smoke plume, replacing this with: (1) the requirement for no visible smoke, other than for periods of 10-15 minutes associated with start-up and reloading; and (2) the ability to take regulatory action based on the measurement of air pollution and investigation of pollution sources, conducted by authorised officers. Finally, mechanisms for enforcing regulatory compliance must also include the manufacture, sale, and installation of wood heaters by households.
- 2. Improved measurement and monitoring of air quality across Australia to protect the health of all Australians.** States and Territories to consider impacts on air pollution and community health. Comprehensive air quality monitoring networks to support individuals to manage their

health, and local councils to monitor local air quality and address excessive heater emissions. This could include establishment of low-cost sensor networks and other instrumentation to identify problematic locations. Appropriate education and support should be given to individual households experiencing difficulty in reducing their pollution emissions.

3. **The introduction of schemes to incentivise the replacement of wood heaters in existing homes and discourage the inclusion of wood heaters in new homes in populated areas.** States and Territories should introduce schemes that encourage the replacement of wood heaters in existing homes, such as a buy-back scheme. The social and health cost savings associated from reduced wood heater pollution, are far greater than the up-front capital cost of such programs. (Borchers-Arriagada et al 2020, Robinson et al 2021) This is of high priority in populated areas with demonstrated seasonal increases in air pollution due to wood heaters. Such schemes have been utilised historically to great effect with demonstrated reductions in associated community illness and death rates (Johnston et al, 2013). Secondly, States and Territories should also introduce schemes that encourage the use of alternative heating modes in new homes. Such schemes may include subsidies for more efficient and less polluting heating options, such as reverse cycle air conditioners. This should be complemented by efforts to support appropriate housing that is well insulated and reduces the need for heating.
4. **The introduction of rigorous emissions standards for “real world” heater operation.** This will enable consumers to know the likely potential of new heaters to contribute to regional air pollution. States and Territories can use this to support local policy to drive air quality and building regulations. This approach has been successfully implemented in Canterbury, New Zealand, with the introduction of the Canterbury Method which drove the development of ultra-low emitting enclosed burners (Pearce and Scott, 2019).
5. **National leadership on driving wood heater emission reductions by revitalising the central wood heater register.** Similar to car ownership, wood heater ownership should be captured in a central repository, which could facilitate the introduction of targeted education programs for owners, annual checks on wood heaters and chimneys, and the introduction of a licencing program to support optimal operational use. It would provide information to calculate annual pollution emissions and health impacts from wood heaters and regional data to prioritise and support and evaluate public health interventions to reduce this source of air pollution.
6. **The introduction of well-funded, comprehensively implemented, and evaluated public health promotion programs.** This strategy is a crucial component of policy, but inadequate on its own. In addition to the strategies above, public health programs should include education about air pollution and its health impacts, evidence-based interventions for reducing air pollution, why wood heaters generate so much air pollution, and how to protect personal health from the effects of air pollution. These programs should clearly identify alternatives to encourage individuals to switch domestic heating sources and access to current local or regional programs that support this switch with targeted and resourced programs.

About the Centre for Air pollution, energy and health Research

The Centre for Air pollution, energy and health Research (CAR) is a National Health and Medical Research Council Centre for Research Excellence in Australia. It is the only group of its kind nationally to bring together researchers focusing on the impacts of air pollution and new versus traditional forms of energy on our health. Our vision for a healthier community is the driving force behind our research.

CAR supports teams of researchers in the fields of epidemiology, exposure assessment, toxicology, chemistry, biostatistics and clinical respiratory medicine to pursue collaborative projects and to develop their capacity. We are based in seven of Australia's leading universities and research institutions.

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For more information

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