Submission: Senate Inquiry - The impacts on health of air quality in Australia
Australian Air Quality Group

Thanks for the opportunity to contribute to this important inquiry. Research shows that current levels of air pollution are damaging our health – there is no safe level of PM2.5 pollution, considered responsible for the premature deaths of thousands of Australians every year, many more than the next worst pollutant, ozone. PM2.5 are so tiny they behave like gases and infiltrate houses even when all doors and windows are closed, and infiltrate the deepest recesses or our lungs where they cause inflammation leading to heart and respiratory diseases.

The latest NSW EPA emissions inventory shows that, even in Sydney's mild climate, more than 50% of man-made PM2.5 emissions are due to a relatively small proportion of houses using domestic wood heating, compared to 14.4% from traffic. A NSW Government report estimated the health costs of the average new wood heater installed in Sydney at $4436 per year – many times higher than the benefit of allowing such heaters to be installed.

The substantial damage to public health from inadequate regulation of the asbestos industry was widely condemned. History appears to be repeating itself with PM2.5 pollution. Governments have known for nearly a decade that new woodheaters installed in urban areas have estimated health costs of thousands of dollars per heater per year. NZ tried to address the problem by substantially reducing the emissions limit for all new heaters in 2005. In areas where woodsmoke builds up, NZ also legislated sunset clauses for existing heaters in conjunction with subsidies to remove them, and bans on installing new wood heaters in houses that don't have them. Australia allowed the problem to get worse. While traffic PM2.5 in Sydney fell to 14.4% of man-made PM2.5 emissions, domestic wood heater PM2.5 increased from 34.3% (2003 inventory) to 50.6% of man-made PM2.5 emissions (2008 inventory).

A family of chemicals known as PAH are covered by the Air Toxics NEPM. Although traffic pollution is normally blamed for PAH emissions, Australian NPI data show that domestic wood heaters emit 500,000 kg of PAH, compared to 300,000 for all Australia's motor vehicles - http://woodsmoke.3sc.net/pah

Government policies should address hazardous pollution in a timely manner by requiring the cost of inaction and delays to be included in regulatory impact statements (RIS). For example, with estimated benefit of $4.015 billion for an estimated cost just $36 million over 20 years (equivalent to a net benefit of about $10 billion for Australia as a whole) by requiring wood heaters to be removed when houses are sold, the costs of a 1 year delay is about half a billion dollars. With estimated benefits more than 1000 times the estimated cost, the continued delays in protecting public health are astounding. We therefore recommend that, for measures with health costs of more than $10 million, and estimated remediation costs less than a 10% of the damage to health, government policy should require temporary solutions (e.g. a moratorium on the installation of new heaters) until agreement is reached on the precise form of new regulations.

PM2.5 the most health-hazardous pollutant – many times more premature deaths as the next worst pollutant (O_3)

There is no safe level of PM2.5 pollution. In Europe, PM2.5 pollution is associated with more than 492,000 premature deaths, corresponding to a loss of almost 4.9 million years of life (YOLL)."[1] In contrast, European O_3 pollution is estimated to cause 21,000 premature deaths[2].

Current PM2.5 pollution - more health damage than passive smoking

Research continues to show that current air pollution levels have a large and significant impact on health, *even when air quality standards are met*. For example, a Canadian study with median PM2.5 levels of 7.3 ug/m^3 found that an increase of just 3 ug/m^3 in PM2.5 was associated with a 9% increase in deaths from ischemic heart disease and 3-4.5% increases in all deaths.[3] The Quebec Lung Association reports that wood heating is responsible for 61% of Quebec's fine particle emissions[4]

Studies show passive smoking (e.g. living with a smoker) produces similar increases in lung cancer (21-22%) and cardiovascular disease (CVD, 16-26%) to the increases (14-21%) in lung cancer and CVD (12-28%) from a 10 µg/m^3 increase in PM2.5 pollution[5]. Consequently, with only 15.9% of Australian adults smoking daily and a further 1.6% smoking weekly[6], but the entire population exposed to PM2.5 pollution of about 5 to over 8 µg/m^3, the impact of air pollution on health is now substantially greater than the effect of passive smoking.

WHO: New additional health concerns

The World Health Organisation's (WHO) review of air pollution and health[7] notes some new additional concerns in addition to the well-known increases in heart and lung disease:

"5. Additional studies linking long-term exposure to $PM_{2.5}$ to several new health outcomes including atherosclerosis, adverse birth outcomes and childhood respiratory disease;"

Cognitive impairment & genetic damage in babies

The WHO review[7] also notes: "*6. Emerging evidence also suggests possible links between long-term $PM_{2.5}$ exposure and neurodevelopment and cognitive function as well as other chronic disease.*"
…and expresses concern about polycyclic aromatic hydrocarbon (PAH) exposure: "***As PAHs are carcinogenic by a genotoxic mode of action, their levels in air should be kept as low as possible.***"

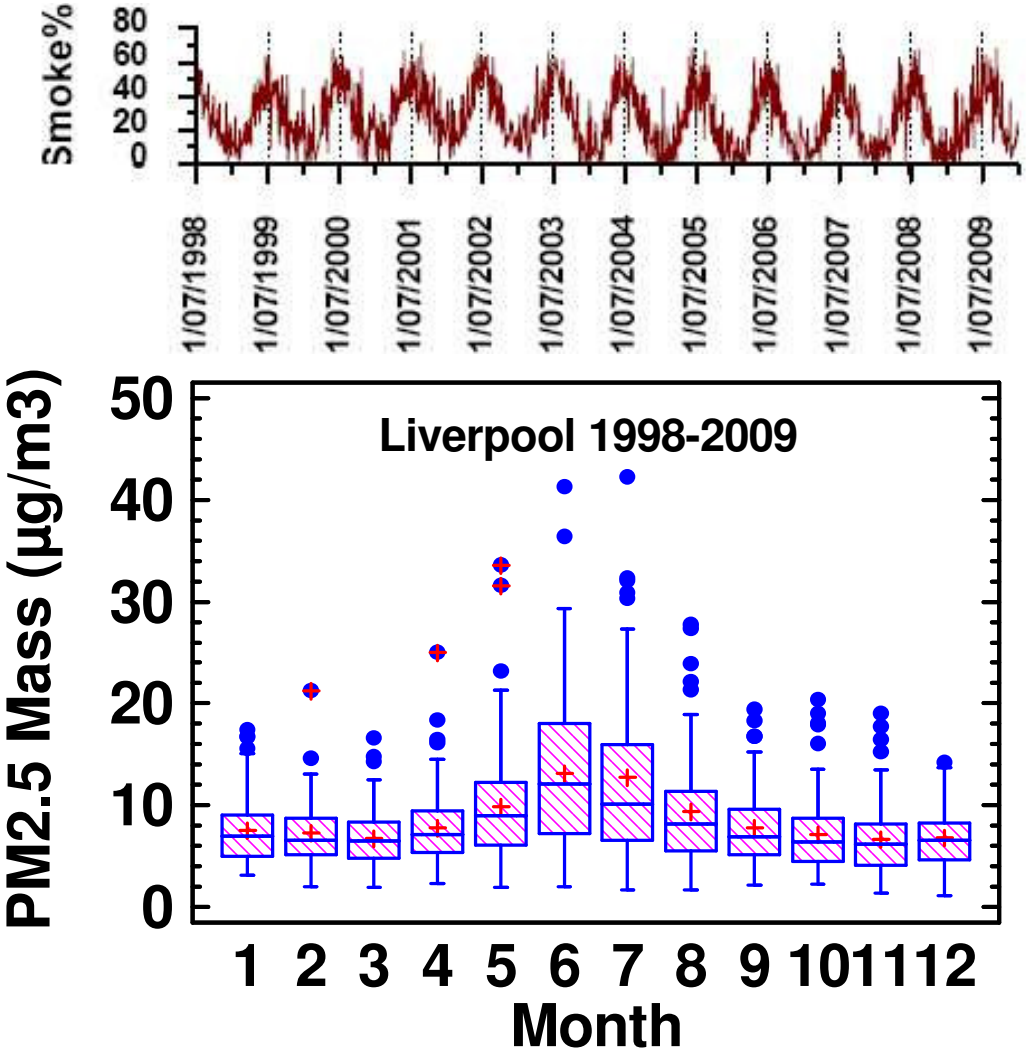
The evidence for cognitive impairment and genetic damage is quite strong. Several studies have linked PM2.5, PAH, or woodsmoke exposure to hastened cognitive decline in adults – increased exposure of 10 µg/m^3 PM2.5 being equivalent to 2 additional years[8] or 3 additional years[9] of ageing. In developing countries, children whose mothers cook with wood (as opposed to kerosene) stoves had reduced IQ, poorer memory and worse social skills in Belize, Kenya, Nepal and American Samoa[10], and also in Guatemala[11].

In developed countries, genetic damage in babies, behavioural problems, childhood asthma and a 5 point reduction in IQ on starting school have all been linked to airborne PAH exposure during pregnancy[12-14]. Of particular interest is the relatively low levels required to cause the significant problems noted above – ambient benzo[a]pyrene was less than 0.5 ng/m^3 and high exposure was defined as exposure greater than the median of 2.27 ng/m^3 (sum of 8 PAH concentrations). These concentrations appear to be much less than average wintertime BaP concentrations of 1.30 ng/m^3 and PAH concentrations of 8.62 (max 24.0 ng/m^3 for a slightly wider set of PAH), in the small country town of Armidale, NSW, where wood heating is common.

In Utah, where the "PM2.5/PM10 ratio tends to be higher during winter months (December through February) for various reasons, such as more frequent and severe temperature inversions; more space heating, including wood burning"[15], *a group of Utah doctors are advising prospective parents to wait until the inversion season is over before trying to conceive* - http://www.sltrib.com/sltrib/news/55825755-78/pollution-utah-birth-studies.html.csp

NSW EPA Emissions Inventory – 50.6% of all Sydney's PM2.5 emissions are woodsmoke from domestic wood heaters.

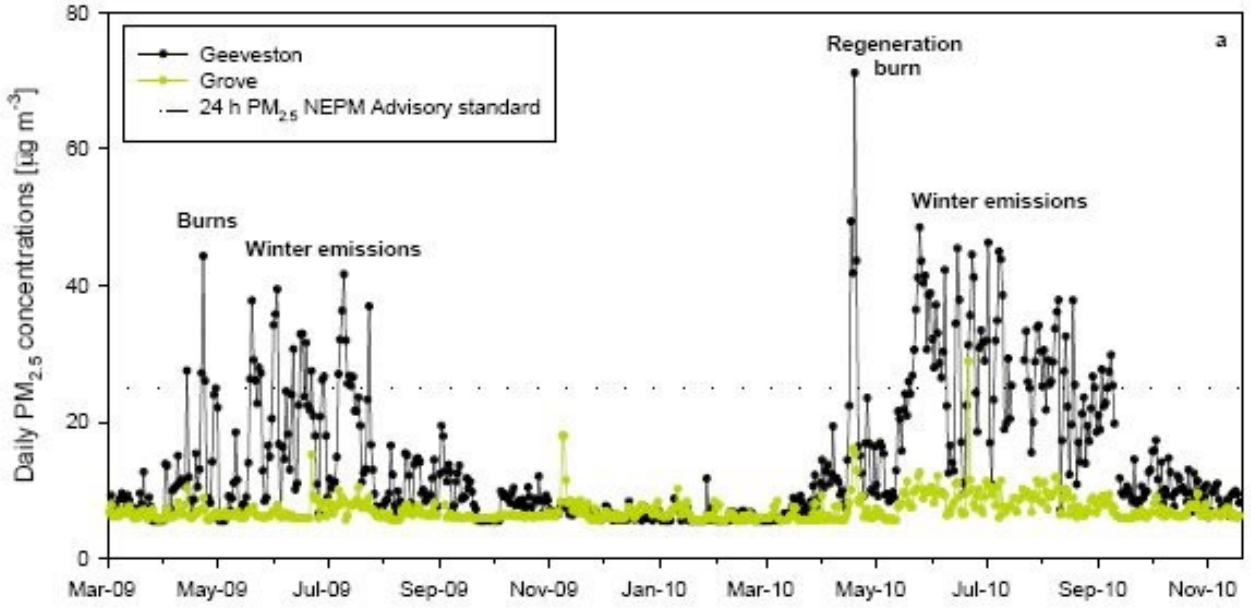
In Oct 2012, the NSW EPA updated its emissions inventory for Sydney. In the year studied (2008), 10,770 tonnes of PM2.5 were emitted to Sydney's air, of which 5,457 (50.6%) was from domestic wood heating. This is *2.6 times the PM2.5 emissions of all Sydney's on-road trucks, buses and passenger cars*. Sydney has 1.8 million vehicles but only 83,300 housholds (5%) using wood as the main form of heating[16]. More importantly, while PM2.5 emissions from vehicles decreased by 11% since 2003, wood heater emissions increased by 21%, resulting in *increased health costs of $224 million per year*. A typical new wood heater installed in Sydney will emit 19 kg of PM2.5 per year, *190 times* the PM2.5 pollution of a new diesel SUV or 4WD satisfying Euro 5 standards.



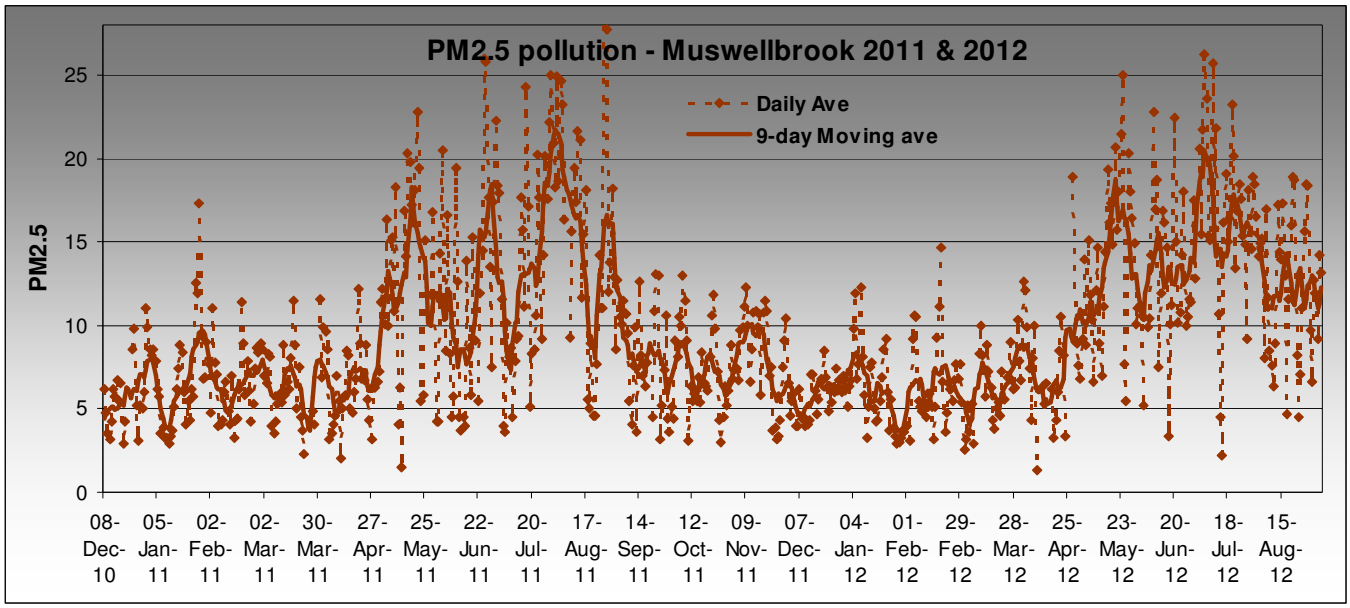
A study in 2011, characterised airborne particles in Liverpool, Sydney. Woodsmoke was identified as a major source of PM2.5: "*Clearly wood heaters in the Liverpool area in winter are a major source of fine particle pollution*"[17] – see graphs. This confirms the results of the NSW EPA

Emissions Inventory, and the NSW EPA carbon dating analysis of samples collected a Rozelle, Sydney CBD Jul/Aug 1993 (4 pm to 8 am) – 67% of particle mass was from modern sources, i.e. wood, not traffic or coal.[18]

NEPM monitoring does not reflect the true situation. The current NEPM requires monitoring only in larger urban areas. In NSW, there are 4 NEPM PM2.5 monitors in Sydney (Chullora, Earlwood, Liverpool, Richmond), 2 in the lower Hunter (Beresfield andWallsend) and 1 in Wollongong. The NSW NEPM compliance report for NSW in 2010 shows just 1 exceedence of the PM2.5 standard at 1 monitoring station (Beresfield). Armidale (pop 22,000), NSW, is just under the threshold for a NEPM monitor. Data from the local council, which measures PM2.5 with a DusTrak calibrated by EPA TAS, show 37 breaches of the 24-hr PM2.5 standard in 2010. **Clearly NEPM compliance reports do not reflect the true situation!**

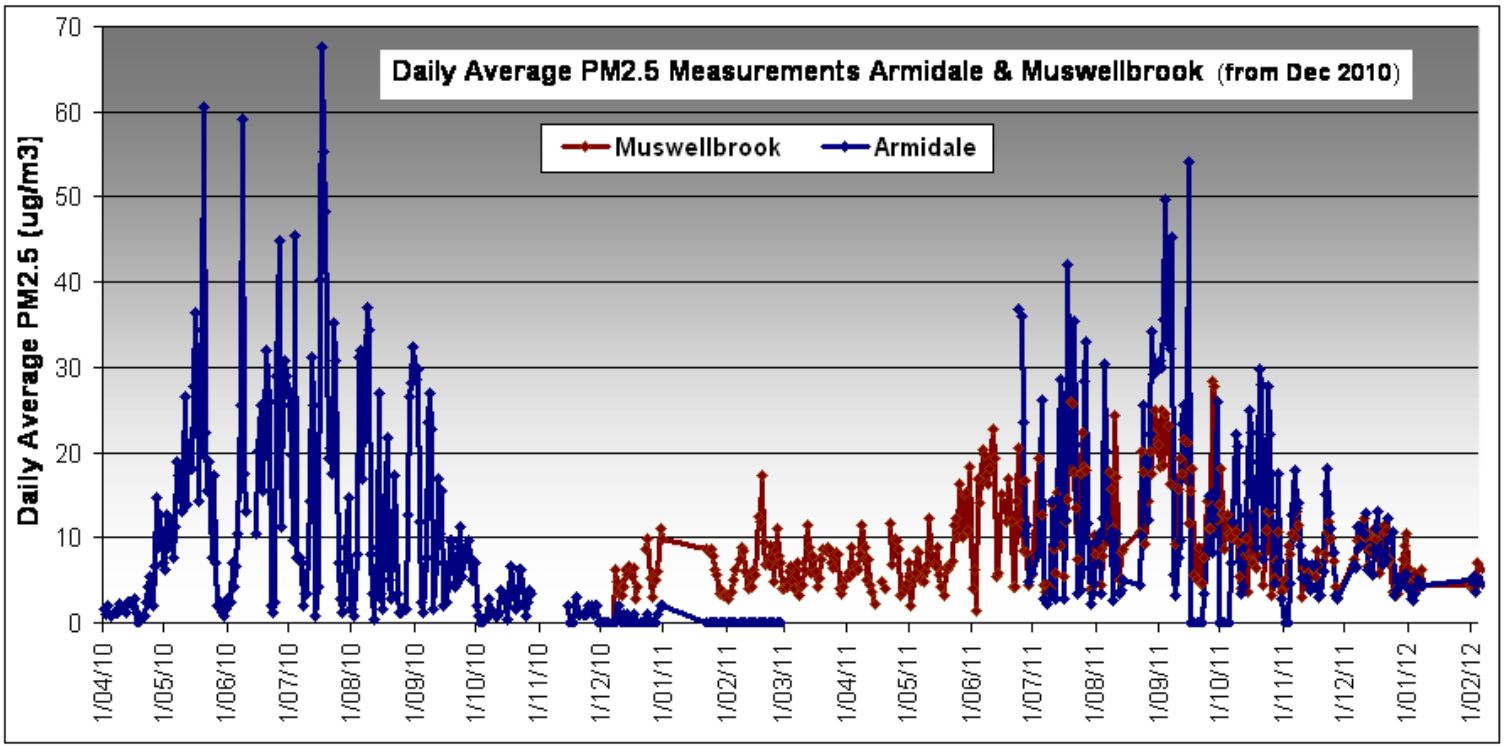


Domestic wood heating blamed for high PM2.5 pollution in mining town (Muswellbrook)



Media release: 28 June 2011: "The NSW Office of Environment and Heritage reports today that higher concentrations of PM2.5 particles measured at the Muswellbrook and Singleton air quality monitoring sites in the Upper Hunter over the weekend *was likely due to woodheater use*."

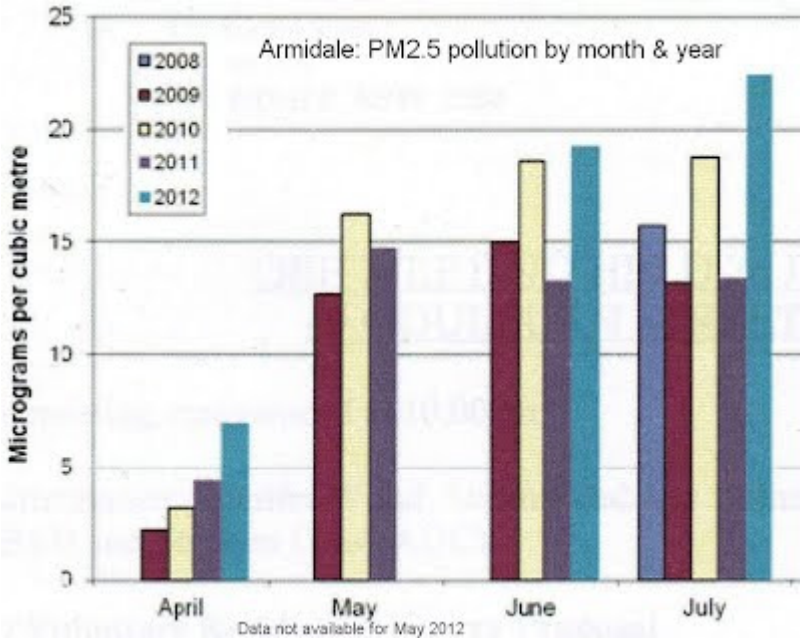
Colder areas such as Armidale have even worse PM2.5 pollution than mining towns.

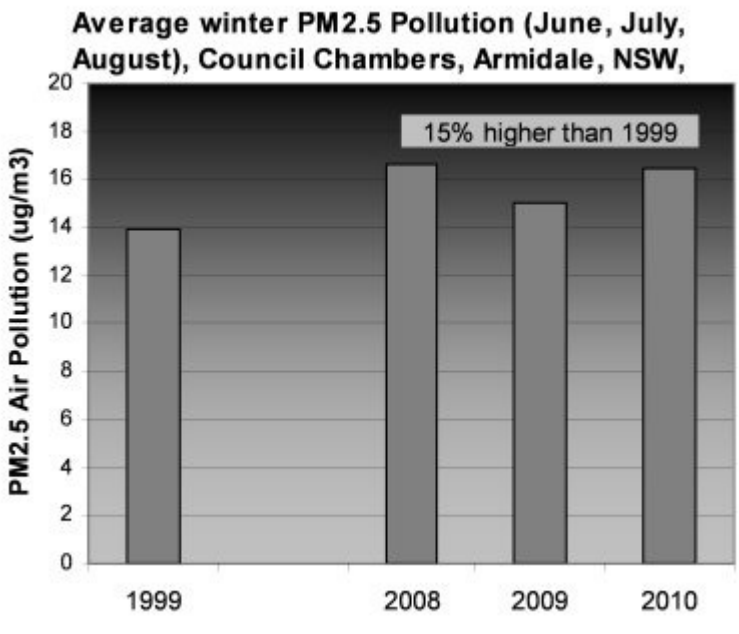


Despite Armidale's high PM2.5 levels, State and Federal Governments provide little assistance to solve the problem, or even measure pollution. Armidale Council bought a DuskTrak monitor (calibrated for woodsmoke by John Innis, EPA, Tasmania) to measure PM2.5.

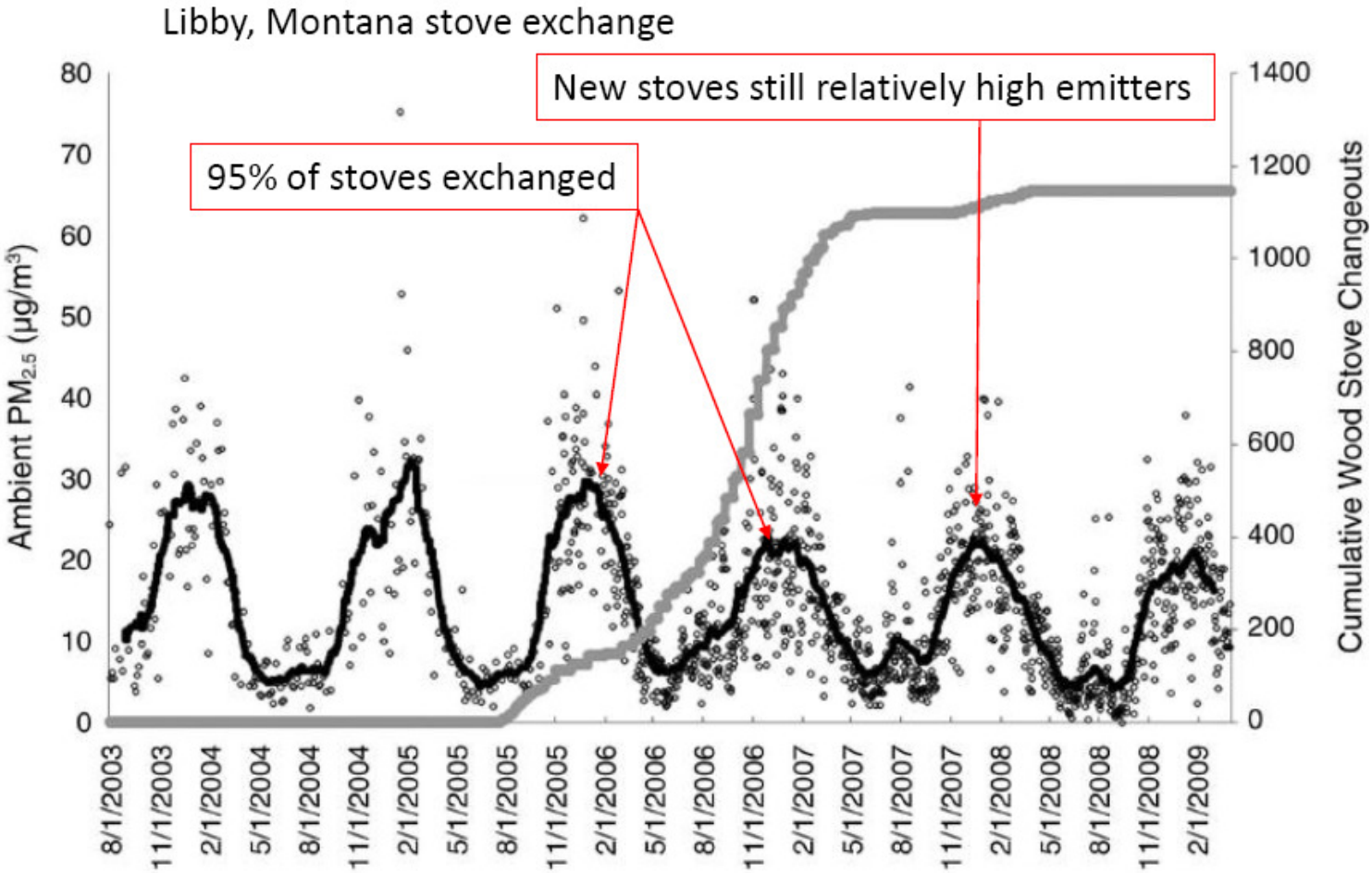
Big improvements in health from Launceston' s $2 million woodsmoke reduction program. "From 2001 to 2004, the number of households that used wood-burning stoves fell from 66 to 30 per cent." Wintertime particulate pollution fell by 40 per cent. "*The difference between deaths in 1994-2001 and 2001-2007 were statistically significant in men: differences of 11.4 per cent for all-cause mortality; 17.9 per cent for cardiovascular and 22.8 per cent for respiratory. "Results taken during the winter months (June – August) for males and females combined showed even higher reductions: cardiovascular 20 per cent; respiratory 28 per cent.*"[19]

Few people who understand the serious health consequences of breathing woodsmoke, including heart and lung disease, genetic damage in babies, low birthweights, reduced cognitive function, would want to use wood heaters. Successful woodsmoke programs, such as in Launceston, focused on the health effects of woodsmoke and emphasise the importance of switching to non-polluting heating. As well as providing subsidies to low-income families to cover the cost of switching, education is also needed on the most cost effective ways to heat homes (and if necessary upgrade insulation), to ensure that switching away from wood heating does not compromise cost or comfort.

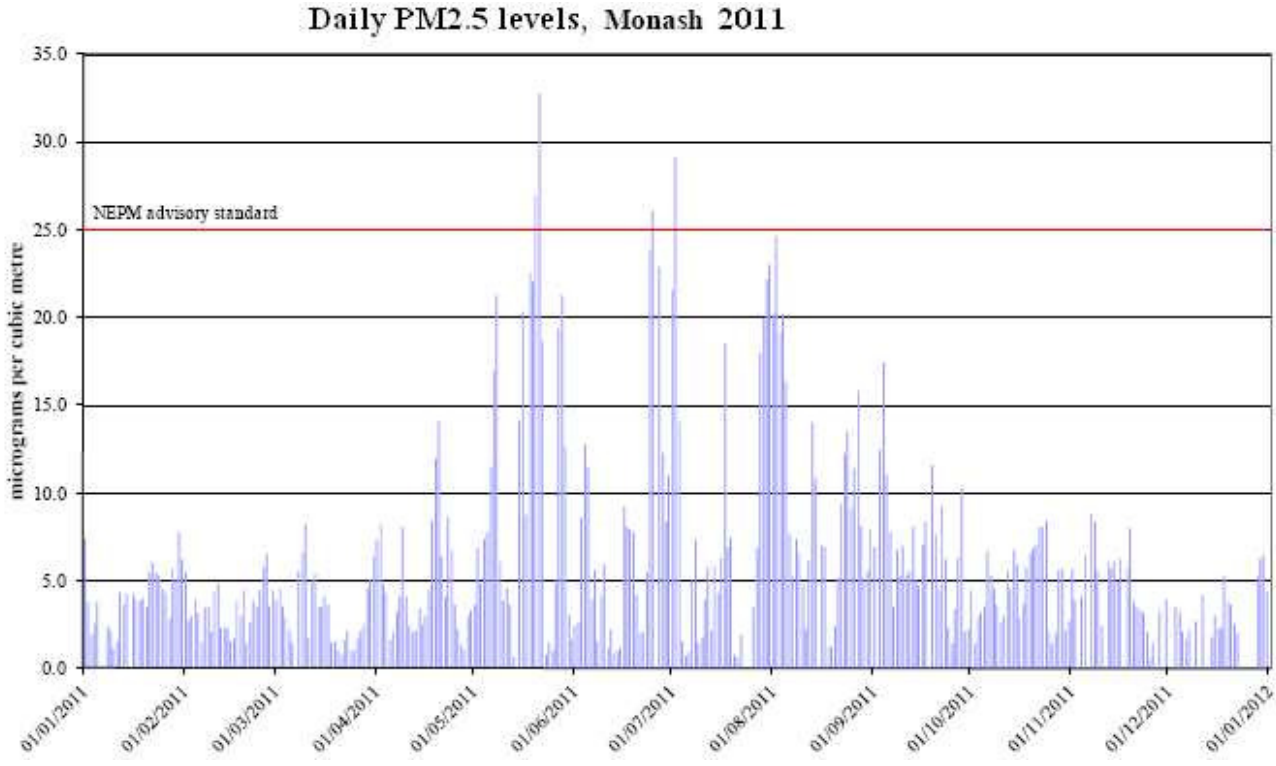




Unsuccessful programs, such as in Armidale, where PM2.5 levels are now higher than in 1999 tried to follow the industry line that switching to new heaters will solve the problem. A change-out in Libby, Montana (pop 2,600) cost over $2.5 million, but reduced pollution by only 28% - see graph below - many winter days still have totally unacceptable woodsmoke levels. The AHHA, representing the Australian wood heating industry, are creating considerable confusion and misleading people by their claim: “On completion of the change-out program, Libby, Montana, has improved its air quality by more than 80%”. ‘Truth in Advertising’ legislation is needed to prevent those who profit from wood heaters sales from mis-representing the truth.



Canberra -2.3% of households using wood as the main form of heating cause high wintertime PM2.5 pollution and exceedences of the PM2.5 standard in Canberra



Climate change: Soot's role 'underestimated' says study "Scientists say that particles from diesel engines and wood burning could be having twice as much warming effect as assessed in past estimates. They say it ranks second only to carbon dioxide as the most important climate warming agent ...This new study concludes the dark particles are having a warming effect approximately two thirds that of carbon dioxide, and greater than methane."

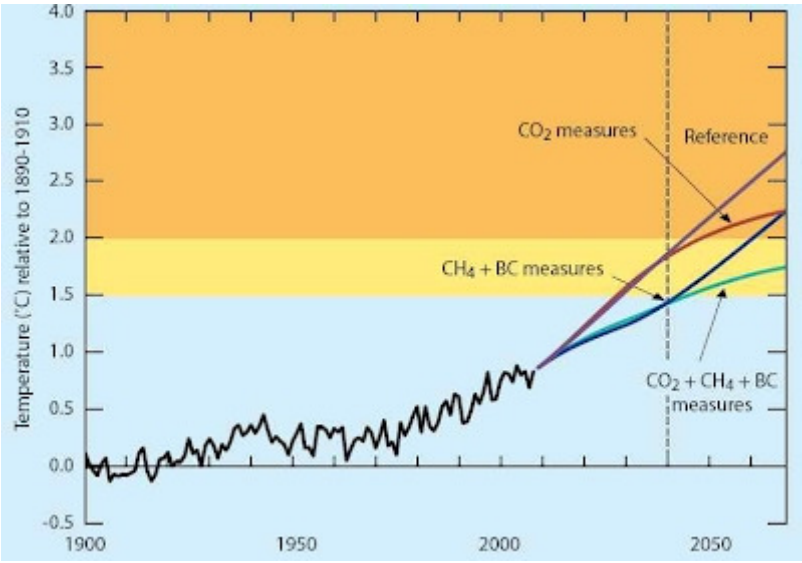
"*Reducing emissions from diesel engines and domestic wood and coal fires is a no-brainer as there are tandem health and climate benefits," said Professor Piers Forster from the University of Leeds.*

"If we did everything we could to reduce these emissions we could buy ourselves up to half a degree less warming, or a couple of decades of respite," he added. - http://www.bbc.co.uk/news/science-environment-21033078

UN Environment Program and World Meteorological Association recommend phasing out log-burning heaters in developed countries to reduce global warming and improve health.

A United Nations report calls for fast action to reduce emissions of black carbon, ground level ozone and methane to help reduce current global warming and prevent the Earth from overheating. **Recommended procedures** include mandatory diesel filters on vehicles, **phasing out wood-burning stoves in wealthy countries**, use of clean-burning biomass stoves for cooking and heating in developing nations, and a ban on the open burning of agricultural waste - http://www.redorbit.com/news/science/2063763/curbing_soot_smog_could_help_limit_global_temperature_rise/

Methane, ground-level ozone and black carbon cause about half of current global warming. The UN report calls for immediate action to reduce these emissions to help limit global temperature rises over the next 20 years that could lead to catastrophic climate change from melting of glaciers and polar icecaps (that reflect radiation back into space) as well as methane permafrost and frozen sub-sea methane, which have been described as a "ticking time bombs" for our climate – http://woodsmoke.3sc.net/greenhouse



The graph (left) from the 2011 UNEP report http://www.unep.org/newscentre/Default.aspx?DocumentID=2659&ArticleID=8958&1=en) shows the effect of the measures to reduce methane (CH_4) and black carbon (BC) on global temperatures. Compared to the purple Reference (business as usual) line the dark blue line shows a rapid reduction in global temperatures of about 0.4 degrees by 2040, complementing the measures to reduce CO_2 emissions. Measures to reduce CO_2 start to generate benefits from about 2040. By about 2070, half the reduction is due to the reductions in methane and black carbon emissions and about half due to the reduction in CO_2 emissions.

Costs and Benefits of woodsmoke reduction measures

Table 1. Estimated health benefits and costs of woodsmoke control options in NSW

	Health Benefit $million	Cost $million	Net Benefit $million
4) Phase out at sale of house	$4,015	-$36	$3,978
2) Ban on heater sales	$2,206	-$134	$2,071
7) Licensing fees	$1,267	$11	$1,278
6) Sales tax on new wood heaters	$1,049	-$1	$1,048
9) Cash incentive phase out	$879	-$12	$867
8) Levying an excise/tax on biomass fuels	$419	$36	$455
5) Fuel moisture content regulations	$399	-$33	$366
3) Emission standards (3g/kg, 60% efficiency)	$301	-$3	$298

Source: Tables 26 and 28, AECOM Office of Environment & Heritage: Economic Appraisal of Wood Smoke Control Measures - Final Report, 29 June 2011

As shown in the above table, the health benefits of reducing woodsmoke are considerably greater than the costs. The above estimates, together with the realised health benefits from Launceston's woodsmoke reduction program demonstrate the importance a National Woodsmoke Reduction Program.

The Senate Committee should consider making the following recommendations

1) Fund a National Woodsmoke Reduction and Education Program by a tax or levy on woodheater use. The Australian Lung Foundation, the American Lung Association the team of 50 scientists from the UN Environment program and World Meteorological Association all recommended switching to alternative heating.[a] Under the "polluter pays" principle, the best way to encourage the switch is to provide a financial incentive, e.g. a tax on buying and using wood heaters. The tax revenue could help fund public education on the health effects of woodsmoke, provide subsidies for low income families to replace wood heaters and upgrade insulation, and help solve the problems suffered by people who are affected by other people's woodsmoke.

2) National Monitoring and Reporting System. The Final Impact statement of the Air Quality NEPM (National Environment Protection Measure) in 1998 set out an ultimate aim of "*providing equivalent protection for all Australians, wherever they live*". However, with PM2.5 generally considered the most health-hazardous pollutant (estimated health costs of $235 per kg of emissions in capital cities and $56 in rural areas - DITRDLG, 2010) and many locations that exceed the PM2.5 standard lacking NEPM monitors, this aim cannot be achieved. For example, Geeveston, a small town in Tasmania with 277 houses, had 99 exceedences of the PM2.5 standard, the vast majority due to emissions from domestic wood heaters. Armidale, NSW, had 37 exceedences in 2010, none of which appear in the NSW NEPM report because the population is just below the 25,000 needed for an official NEPM monitor. Armidale Dumaresq council measures PM2.5, without any state or federal assistance. By ignoring these measurements, the 2010 NSW NEPM report, claiming only 1 exceedence for the whole of NSW is highly misleading!

PM2.5 monitoring need not be expensive. Tasmania's BLANkET system (Base Line Air Network EPA Tasmania, epa.tas.gov.au/epa/blanket-reports) uses a series of DusTrak monitors calibrated for woodsmoke. The results are available in real-time. The accuracy of the system is checked by co-located NEPM accredited monitors. With DusTrak monitors costing less than $10,000, and real-time connections to the internet readily available, PM2.5 can be measured in most locations where the PM2.5 standard is likely to be exceeded, and information on current measurements and summary reports distributed via the web.

Although NEPM monitoring is normally carried out by the States, there is no reason why the Federal Government couldn't set up PM2.5 monitoring in areas that have fallen through the cracks in the NEPM. Once the system has been established, the States could take over, or simply delegate this area of operation to the Federal Government. The $8 billion health costs of woodsmoke in NSW (and no doubt similar per capita costs in other States) are a compelling reason for co-ordinated national action, rather than the additional expense and delays of each individual state having to research the issue and reinvent the wheel.

3) Implement a National Woodsmoke Education Campaign. The wood heating industry make many misleading claims, .e.g: "*In addition to being the most cost effective form of domestic heating, later model wood heaters emit fewer particles and have the lowest greenhouse emissions when compared with heating alternatives. Today, you can choose a cleaner and greener wood heater that exceeds the most stringent Australian Standards*."

Why would the UN Environment Program and the World Meteorological Association recommend phasing out log-burning heaters in developed countries to reduce global warming as well as improve health, if wood had the lowest greenhouse emissions? Prof Piers Forster, Coordinating lead author of the IPCC report "Changes in Atmospheric Constituents and in Radiative Forcing"[b] (i.e. what changes in the atmosphere are causing global warming) stated that "*Reducing emissions from diesel engines and domestic wood and coal fires is a no-brainer as there are tandem health and climate benefits,"*

---

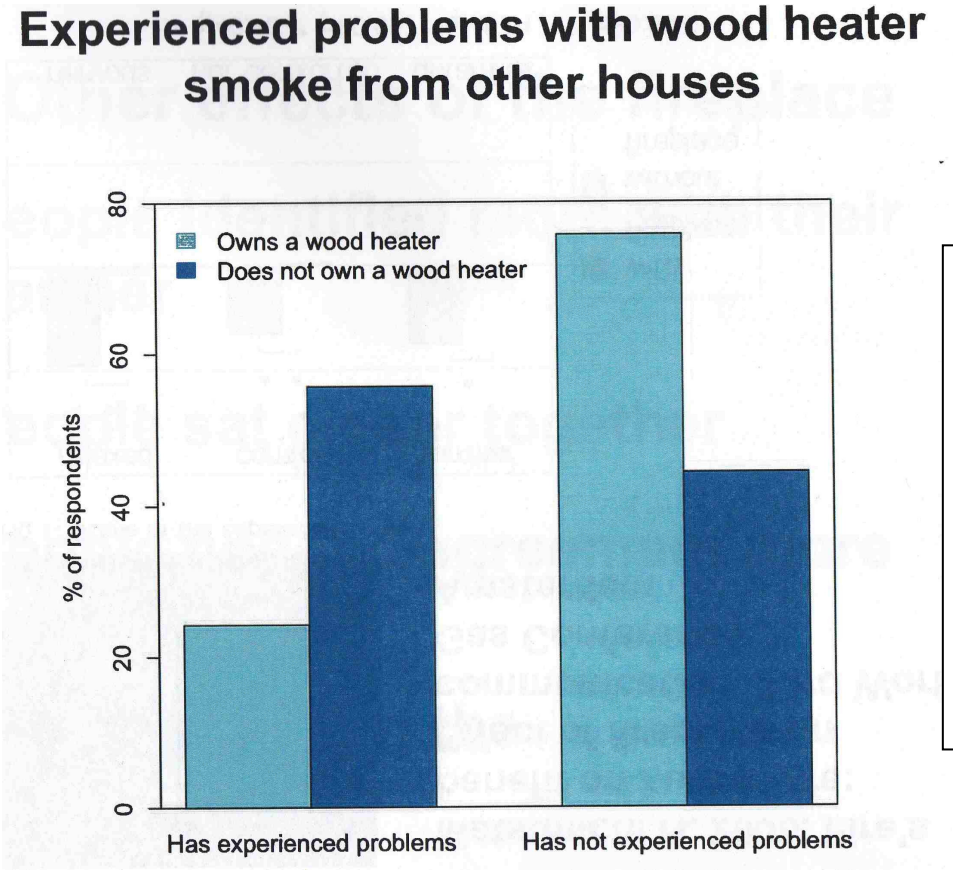
[a] The **Australian Lung Foundation** (**ALF**) recommends: "*use alternative methods (instead of wood heaters) for climate control, including insulating and improving the energy efficiency of homes, flued gas and electric heaters and energy efficient house design"* http://www.lungfoundation.com.au/lung-information/patient-educational-material/fact-sheets/99-woodsmoke-the-burning-issues

The **American Lung Association** "strongly recommends using cleaner, **less toxic** sources of heat. Converting a wood-burning fireplace or stove to use either natural gas or propane will eliminate exposure to the dangerous toxins wood burning generates including dioxin, arsenic and formaldehyde" see http://www.lungusa.org/press-room/press-releases/cleaner-alternatives-for-winter-heat.html

[b] IPCC Climate Change 2007: Working Group I: The Physical Science Basis. Prof Forster is cording lead author of chapter 2 "Changes in Atmospheric Constituents and in Radiative Forcing" http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch2.html

The National Education campaign should correct misleading information from AHHA, and others who make money from selling new heaters. It should aim to make all Australians aware that:

- There is no safe level of PM2.5 pollution
- The average *brand new* wood heater emits more health-hazardous PM2.5 pollution per year than several hundred new cars, and that using it for just 10 hours creates more PM2.5 pollution than the average car emits in an entire year. There are no "stringent Australian standards" because the wood heating industry rejected changes recommended 15 votes to 4 by the majority of the Australian Standards Committee.[c]
- The Australian Lung Foundation and the American Lung Association both recommend that, where possible, households use alternatives to wood heating
- High pollution can build up in areas where woodheaters are used. In previous years, air pollution was included in weather reports. Sydney also issued voluntary 'Don't light (your woodheater) tonight!" requests on days when high particulate pollution was forecast. A National pollution and monitoring and reporting system could provide 'Don't light tonight!' information requests in conjunction with weather reports for all areas with high forecast PM2.5 pollution. This would increase understanding of the issues.
- Good neighbours don't smoke - wood heater emissions have been found to affect the health of neighbours. Neighbours should therefore be consulted before wood heaters are installed and simple criteria developed (e.g. medical evidence of adverse health effects, or a chimney lower than the windows of neighbouring houses) to identify cases where currently-installed wood heaters pose an unacceptable risk to a neighbour's health and should therefore be removed asap. In a survey in Armidale, nearly 60% of respondents without woodheaters had experienced problems from wood heater smoke from other houses.
- As well as heart and lung diseases, wood smoke and PM2.5 pollution have been associated with many other problems including low birthweight and genetic damage in babies, reduced IQ on starting school, middle ear infections, and reduced cognitive function in the elderly. In developing countries, children whose mothers cook with wood (as opposed to kerosene) stoves have reduced IQ, memory and poorer social skills.



The graph (right) shows results for a recent survey of people living in Armidale and other towns on the Northern Tablelands, showing that nearly 60% of respondents who did not have a wood heater reported experiencing problems with wood heater smoke from other houses.

[c] See Todd (2007) in "Clean Air and Environmental Quality: "*through a series of circumstances, largely unplanned by government authorities, a situation has developed where the industry association, which represents some, but not all, Australian wood heater manufacturers, has a veto on the emission test method, a veto on the emission and efficiency limit (unless individual states choose to set their own limits in legislation), runs the certification process covering all manufacturers and both test laboratories, and participates in the auditing of the whole process*"[21]

3) Undertake research to develop an acceptable health-based standard for new wood heaters, and impose a moratorium on new wood heater installation (except pellet heaters) until the new standard has been approved and mandated for all new heaters. Attempts to review the current wood heater standard and apply a tighter emissions standard failed. A Federal Government Scoping Paper states: *"Governments have been unable to achieve improvements to national wood heater emission standards due to industry veto in Standards Australia processes. The emissions standard was last revised in 1999 and the current level of 4 grams of particles per kilogram of wood burnt is well above levels achievable by latest technologies and the emissions standard set in New Zealand (ie. 1.5 g/kg)."[20]* This unsatisfactory situation – that the wood heating industry can veto improvements in the Australian standard – was also noted in the Aus/NZ Clean Air Society Journal[21]

The Standards Australia Committee has not met to reconsider wood heater standards, after failing to reach a consensus on a new emissions limit. Yet a recent media release the Australian Home Heating Association (AHHA) claimed that wood heaters *"exceed the most stringent Australian Standards."[22]* This is despite the fact, as shown above, the current Australian standard is considered out of date. Indeed, many wood heaters sold in Australia today would be considered so polluting they would be banned in many parts of the world.

Wood heater and air pollution expert, Prof John Todd wrote: *"We must develop a new generation of wood heaters that burn cleanly when used in people's homes. How cleanly? Well, the present heaters emit somewhere around 10g of fine particles per kg (dry-weight) of firewood. The next generation must be 1 g kg or less in order to achieve acceptable air quality in areas with a high proportion of wood- users, and ideally we should aim for a further order of magnitude improvement to 0.lg/kg[23]*

The new standard must be based on a new test that reflects real-life emissions. Tests show that new wood heaters satisfying the current "standard" are just as polluting as older models when operated under real-life conditions[24]. When four models with an average emissions rating of 1.0 g/kg were tested in NZ, real-life emissions averaged 15.5 g/k, worse than the average Australian model.[25] With the estimated health costs of thousands of dollars per year for every new heater installed in urban areas, the only option to protect public health is moratorium on the installation of new heaters until a satisfactory standard and emissions test have been developed. The decision by the Australian wood heating industry to veto the recommendation passed 15 votes to 4 by the Australia/NS Standards Committee to reduce emissions resulted in the abandonment of work to develop a new test protocol for woodheaters as well as a new emissions limit. Given the unsatisfactory nature of the current test and the current emissions limit, the only way to protect public health is a moratorium on new heaters until the previously-abandoned work has been completed.

4) Implement the five most cost-effective strategies in the NSW Woodsmoke Control Options Report –

	Health Benefit $million	Cost $million	Net Benefit $million
4) Phase out at sale of house	$4,015	-$36	$3,978
2) Ban on heater sales	$2,206	-$134	$2,071
7) Licensing fees	$1,267	$11	$1,278
6) Sales tax on new wood heaters	$1,049	-$1	$1,048
9) Cash incentive phase out	$879	-$12	$867

Measures 2, 6 and 9 appear to be within the scope of the Federal Government, which could also recommend an appropriate licencing fee. For example, a fee of $200 per year would represent about 5% of the estimated health costs in Sydney. The Federal Government should also take the lead in obtaining agreement on building codes requiring all wood heaters to conform to a new (yet-to-be-developed) health-based standard and that all heaters not complying with the new standard should be removed when houses are sold.

5) Consider additional infrastructure funding. Governments accept responsibility for helping to fund replacement infrastructure such as roads and libraries. With measured PAH pollution at substantially less than half Armidale's wintertime pollution associated with genetic damage in babies, a 5 point reduction in IQ when starting school and increased risk of behavioural problems such a ADHD, upgrading the 'infrastructure" for home heating and insulation would appear to be far more important for public health and welfare than provision of the NBN to households, or new library facilities.

4) Use/strengthen 'Truth in Advertising' laws to prevent the misleading claims (discussed above & at http://woodsmoke.3sc.net/ahha-tactics) from those who profit from selling new wood heaters.

5) Sunset clause. Require all woodheaters that do not meed the new health-based standard to be removed within 5 years.

6) Provide subsidies for HEPA filters in areas where woodsmoke levels are detrimental to public health. For healthy adults *living in areas with average PM2.5 levels of 10 ug/m^3 (less than average winter woodsmoke levels in Armidale)*, HEPA filters were considered an inexpensive way to reduce cardiovascular disease risks. In the study, use of two HEPA filters (costing about $125 each) in the living and bed rooms reduced average concentrations of fine particulates inside homes by 60% and woodsmoke by 75%, and their use was associated with improved endothelial (inner lining of the blood vessels) function (a 9.4% increase in reactive hyperemia index) and decreased inflammation (a 32.6% decrease in C-reactive protein), both predictors of cardiovascular morbidity. Ryan Allen, PhD, assistant professor, Simon Fraser University, said: "*Reducing air pollution appears to provide health benefits even if the pollution levels are already relatively low*."[26, 27]

Policies in Australia and elsewhere. Several jurisdictions are getting starting to solve their woodsmoke problems. For example, in Montreal, Canada, the installation of new log-burning heaters was banned from 28 April 2009 and subsidies of up to $900 are available to replace existing wood heaters with alternatives - http://www.feuvert.org/home Montreal's education programs highlight the level of emissions from wood heaters: "A **CONVENTIONAL WOOD STOVE** burning for only nine hours *emits as many fine particles as a car does in one year (18,000 km of driving)* - http://www.feuvert.org/why-change/quality"

Subsidies and requirements to remove existing woodheaters and restrictions on the installation of new ones are also common in New Zealand. For example, in Christchurch the installation of new wood heaters is not permitted, except for models with emissions rating less than 1.0 g/kg installed as replacements for more polluting wood heaters. In Otago, all wood heaters with emissions rating of more than 1.5 g/kg had to be removed by 1 Jan 2012.

The vast majority of heaters being installed in Australia have higher emissions ratings than some of the models that had to be removed in Otago. The photo below shows emissions, observed for nearly 1 hour, from a brand new model with emissions rating < 2.0 g/kg installed in a brand new house in Armidale, NSW. This is what the AHHA means by a "cleaner and greener wood heater that exceeds the most stringent Australian Standards and even outperform the tighter standards imposed by Armidale Dumaresq Council."

Several Australian jurisdictions do not allow new solid fuel heaters to be installed, e.g. the Sydney Councils of Waverley and Holroyd, with others requiring non-polluting heating in new developments, e.g. Manooka Valley, Oran Park and Turner Road Growth Precincts. As well as not permitting the installation of new heaters (e.g. California's San Joaquin Valley, new houses throughout southern California), many US jurisdictions have 'burn bans' during periods where temperature inversions are likely to trap the smoke and allow it to build up to unacceptable levels.

Motor vehicles. Vehicle manufacturers accepted health-based emissions, standards, despite expectation that the new standards will push up the price of a $40,000 diesel vehicle by about $980, or 2.5 per cent. The new standards, to be fully implemented by 2018, will cut vehicle emissions by as much as 90 percent. This is on top of previous regulations that cut emissions from diesel cars by more than 97 percent. If vehicles can be made cleaner and more efficient, then why not wood heaters, especially if wood heaters, not vehicles, are the major source of PM2.5 pollution in Australian towns and cities?
The reduction in health costs of $1.5 billion for new vehicle standards for the whole of Australia is much smaller than the estimated $8 billion for wood heaters in NSW, despite the fact that NSW had only 372,203 wood heaters but 4,633,100 registered vehicles in 2010.

Given all the above evidence, we hope that the Senate Inquiry will recommend swift and comprehensive action such as outlined in Recommendations 1 to 5 above to reduce the public health damage from the large proportion of PM2.5 emissions from domestic wood heaters. More importantly, if these measures can't be implemented immediately, temporary measures such as the introduction of a moratorium on the installations of new wood heaters should be implemented immediately (ideally before the start of the 2013 winter) to prevent further worsening of the problem while long-term solutions are under development.

Dr Dorothy L Robinson,
pp Australian Air Quality Group, woodsmoke.3sc.net

References

1. Leeuw, F.d. and J. Horálek, eds. *Assessment of the health impacts of exposure to PM2.5 at a European level.* 2009, European Topic Centre on Air and Climate Change. Available at http://air-climate.eionet.europa.eu/reports/ETCACC_TP_2009_1_European_PM2.5_HIA: Bilthoven.
2. NSW EPA, *Action for air - 2009 update. Available at: http://www.environment.nsw.gov.au/air/actionforair/ActionforAir2009.htm*. 2009.
3. Crouse, D.L., et al., *Risk of Non-accidental and Cardiovascular Mortality in Relation to Long-term Exposure to Low Concentrations of Fine Particulate Matter: A Canadian National-level Cohort Study.* Environ Health Perspect, 2012.
4. Lung Association of Quebec, *Wood heating: a public health issue for the Montréal region. http://www.pq.lung.ca/environment-environnement/wood_smoke-fumee_bois/enjeu-montreal/*. 2009.
5. Pope Iii, C.A., et al., *Lung cancer and cardiovascular disease mortality associated with ambient air pollution and cigarette smoke: shape of the exposure-response relationships.* Environmental Health Perspectives, 2011. **119**(11): p. 1616.
6. Scollo, M. and M. Winstanley, *Tobacco in Australia: Facts and issues. 4th edn. Melbourne: Cancer Council Victoria. Available from www.TobaccoInAustralia.org.au.* 2012.
7. WHO, *Review of evidence on health aspects of air pollution – REVIHAAP. Available at http://www.euro.who.int/en/what-we-do/health-topics/environment-and-health/air-quality/publications/2013/review-of-evidence-on-health-aspects-of-air-pollution-revihaap*. 2013.
8. Weuve, J., et al., *Exposure to Particulate Air Pollution and Cognitive Decline in Older Women.* Arch Intern Med, 2012. **172**(3): p. 219-227.
9. Kluss, T. (2012) *Bad Air Means Bad News for Seniors' Brainpower. http://www.geron.org/About%20Us/press-room/Archived%20Press%20Releases/80-2012-press-releases/1460-bad-air-means-bad-news-for-seniors-brainpower*. **Volume**,
10. Munroe, R.L. and M. Gauvain, *Exposure to open-fire cooking and cognitive performance in children.* International Journal of Environmental Health Research, 2012. **22**(2): p. 156-164.
11. Dix-Cooper, L., et al., *Neurodevelopmental performance among school age children in rural Guatemala is associated with prenatal and postnatal exposure to carbon monoxide, a marker for exposure to woodsmoke.* NeuroToxicology, 2011. **33**(2): p. 246–254.
12. Perera, F.P., et al., *Prenatal Airborne Polycyclic Aromatic Hydrocarbon Exposure and Child IQ at Age 5 Years.* Pediatrics, 2009. **124**(2): p. e195-202.
13. Perera, F.P., et al., *Prenatal Polycyclic Aromatic Hydrocarbon (PAH) Exposure and Child Behavior at age 6-7.* Environ Health Perspect, 2012.
14. Perera, F.P., et al., *PAH/Aromatic DNA Adducts in Cord Blood and Behavior Scores in New York City Children.* Environ Health Perspect, 2011.
15. Pope, C.A., III, et al., *Ischemic Heart Disease Events Triggered by Short-Term Exposure to Fine Particulate Air Pollution.* Circulation, 2006. **114**(23): p. 2443-2448.
16. ABS, *4602055001DO001_201103 Environmental Issues: Energy Use and Conservation, Mar 2011.* 2011.
17. Cohen, D.D., et al., *Fine particle characterisation, Source Apportionment and Long Range Dust Transport into the Sydney Basin: A long term study between 1998 and 2009.* Atmospheric Pollution Research, 2011. **2**: p. 182-189
18. NSW EPA, *Air Pollution from solid fuel home heaters.* 1996, NSW Environment Protection Authority, Sydney.

19. ABC News. *Wood smoke worse than car exhausts.* *http://www.abc.net.au/news/stories/2008/04/24/2226672.htm*. 2008; Available from: http://www.abc.net.au/news/stories/2008/04/24/2226672.htm.
20. EHPC, *EPHC17/8.1 National Approach to Reducing Woodheater Emissions Scoping Paper on Regulatory Options. Available at: http://woodsmoke.3sc.net/files/EHPC_NationalApproach_Reducing_WoodheaterEmissions_ScopingPaper.pdf*. 2008.
21. Todd, J., *Regulation of residential woodsmoke in Australia.* Clean Air and Environmental Quality, 2007. **41**: p. (3),15-18.
22. AHHA. *New model wood heaters are a sound environmental investment. http://www.homeheat.com.au/pdf/new_model_wood_heaters_are_a_sound_environmental_investment_may_2012_copy1.pdf*. 2012.
23. Todd, J., *It's Time for More Action on Reducing Wood-Smoke.* Clean Air and Environmental Quality, 2008. **42**(4): p. 17-18.
24. Meyer, C.P., et al., *Measurement of real-world PM10 emission factors and emission profiles from woodheaters by in situ source monitoring and atmospheric verification methods*. 2008, CSIRO Marine and Atmospheric Research (CMAR), (available at: http://www.environment.gov.au/atmosphere/airquality/publications/emission-factor.html).
25. Scott, A.J., *Real-life emissions from residential wood burning appliances in New Zealand*. 2005, Environment Canterbury, August 2005.
26. Kell, B. *HEPA filters reduce cardiovascular health risks associated with air pollution.* . 2011.
27. *HEPA filtres improve health. http://www.scientistlive.com/European-Science-News/Medical/HEPA_filtres_improve_health/19772/*.

Other information

Health costs. NSWDECC, *Air Pollution Economics – Health Costs in the Greater Sydney Metropolitan Region (see Table 6.3.1 http://www.environment.nsw.gov.au/resources/airpollution05623.pdf*. 2005

Woodsmoke - a witch's brew of carcinogens. Stone R. Environmental toxicants under scrutiny at Baltimore meeting. *Science*, March 24, 1995 p1770

Thousands of Australians will die prematurely from PM2.5 pollution, even when air meets the current PM2.5 "standard". NEPC, *National Environment Protection Council. Summary of submissions received in relation to the Draft Variation to the National Environment Protection (Ambient Air Quality) Measure for Particles as PM2.5 and NEPC's Responses to those submissions*. 2003, (available at: http://www.ephc.gov.au/nepms/air/air_variation_dl.html).

Crouse, D.L., et al., *Risk of Non-accidental and Cardiovascular Mortality in Relation to Long-term Exposure to Low Concentrations of Fine Particulate Matter: A Canadian National-level Cohort Study.* Environ Health Perspect, 2012.

Current wood heater test does not reflect real-life emissions. Meyer, C.P., et al., *Measurement of real-world PM10 emission factors and emission profiles from woodheaters by in situ source monitoring and atmospheric verification methods*. 2008, CSIRO Marine and Atmospheric Research (CMAR), (available at: http://www.environment.gov.au/atmosphere/airquality/publications/emission-factor.html).

A fireplace pollutes the air as much as 1,000 cars
http://www.grreporter.info/en/fireplace_pollutes_air_much_1000_cars/8814