Clean Air for New South Wales: 2018 Update

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Healthy planet, healthy people.

Executive Summary

Particle air pollution in New South Wales is getting worse, with the annual averages for both fine and coarse particle pollution higher in 2018 than in 2017.

Coarse particles exceeded the annual standard at nine locations, up from 2 locations in 2017 and none in previous years. All but one of these locations are in the Hunter Region.

Fine particles, which cause the most serious health problems, exceeded the annual standard at 14 locations, up from 4 to 6 locations over the previous 4 years.

The average value for fine particles ($PM_{2.5}$) across comparable monitors rose from 7.51 $\mu g/m^3$ in 2017 to 7.98 $\mu g/m^3$ in 2018. This is moving away from the stated national objective that all sites should be below 7 $\mu g/m^3$ by 2025.

Existing NSW policies on air pollution are failing to protect public health, and the resulting health problems will only get worse over time if this trend is allowed to continue. Readily available regulatory responses could reduce pollution from coal fired power stations, vehicles, industry, and wood fired heaters.

Recommendations

The following steps would reverse the trend of deteriorating air quality (appreciating that not all sources of air pollution are under human control):

- Modernise coal power station licenses to require capture of sulphur dioxide and nitrogen dioxide.
- Pollution checks to remove high air pollution emitting vehicles from our roads.
- Higher fees for the existing Load Based Licensing system for industry, that reflect the health costs imposed on the community by air pollution.
- Restrictions on the installation or use of wood fired heaters in urban areas.

Urgent research should be conducted to identify the sources of air pollution that are increasing.

Introduction

Regulation of air pollution is managed at the state level, and the NSW government has a responsibility to ensure air quality complies with the national standards.

In October 2016 the NSW government, through the Environment Protection Authority, launched a community consultation process to develop a clean air plan to be released in 2017. Consultation included a discussion paper '*Clean Air for NSW'* which proposed many worthy actions such as minimising emissions from coal fired power stations, reviewing the polluter pays licensing scheme for industry, investigating vehicle emissions standards, and reducing household wood smoke emissions.

The consultation never led to a finalised policy. This was in the context that the national standard for fine particle ($PM_{2.5}$) pollution had finally been formalised at the COAG meeting of environment ministers in 2015 at an annual limit of not more than 8µg per cubic metre in recognition of the serious health impacts of this form of air pollution. Even at 8µg/m^3 there is a health impact, so the COAG statement declared the ambition that the standard would be lowered to 7µg/m^3 in 2025.

Now 2 years on from '*Clean Air for NSW*' it is timely to examine trends in air quality.

Australian standards for particles and ozone set under the National Environment Protection Measure:

Pollutant	Averaging period	Standard	Allowable exceedances
Coarse particles PM_{10}	1 day	50 µg/m^3	None
	1 year	25 µg/m^3	None
Fine particles $PM_{2.5}$	1 day	25 µg/m^3	None
	1 year	8 µg/m^3	None
Ozone	1 hour	100 ppb	One day a year
	4 hours	80 ppb	One day a year

Air monitoring in NSW

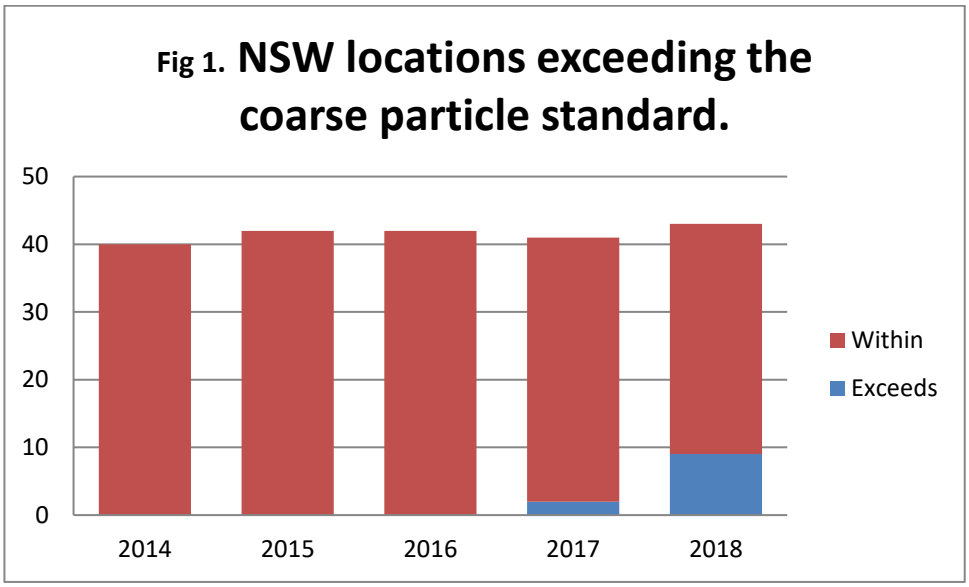
NSW currently has a network of 44 stations that measured coarse particle pollution (PM_{10}) in 2018 of which 30 can also measure fine particle pollution ($PM_{2.5}$). These monitors are generally located to measure background ambient air, ie away from any point source or busy road that would show locally higher readings.

The data is made publicly available on the website of the Office of Environment and Heritage[1], and NSW leads the states of Australia in the number of monitors and the public accessibility of the results. Several new monitors have been installed in recent years, but trends are derived only from monitors with historical site data. One monitor at Stockton is only 300m from the beach so detects a high level of sea salt as well as pollution from adjacent industry so that location should be examined separately and is excluded from the following analysis.

Trends in the number of sites exceeding the annual standards

Coarse particles exceeded the national standard of 25 µg/m^3 at 9 locations, up from 2 locations in 2017 and none in 2016. Apart from Wagga Wagga North with annual average

of 27.4 µg/m^3 the locations exceeding the standard were all in the Hunter Valley or in Newcastle.



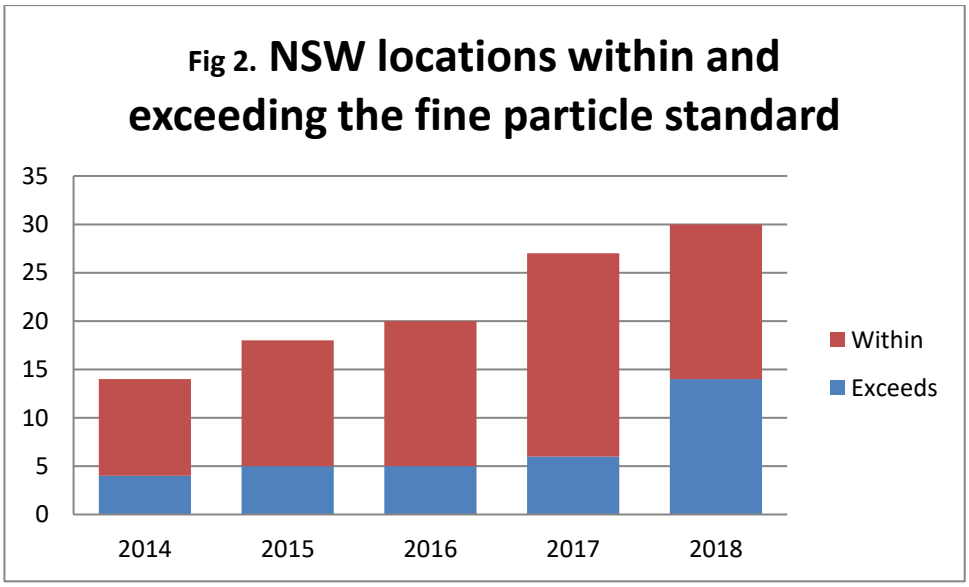
Fine particles exceeded the national standard of 8 µg/m^3 at 14 locations, up from 4 to 6 sites in previous years.

Of the four new sites reporting for the first time in 2018, only Parramatta North was above the standard, at 9.2 µg/m^3.

Comparing only the sites that have a value for both 2017 and 2018, the annual average across all available sites in 2017 was 7.51 and in 2018 was 7.98.

The worst site in the state was Liverpool with 10.1 µg/m^3. Liverpool has a long history of bad air quality, frequently having the worst $PM_{2.5}$ level in the state, sharing this dubious honour with Muswellbrook, Prospect and Chullora.

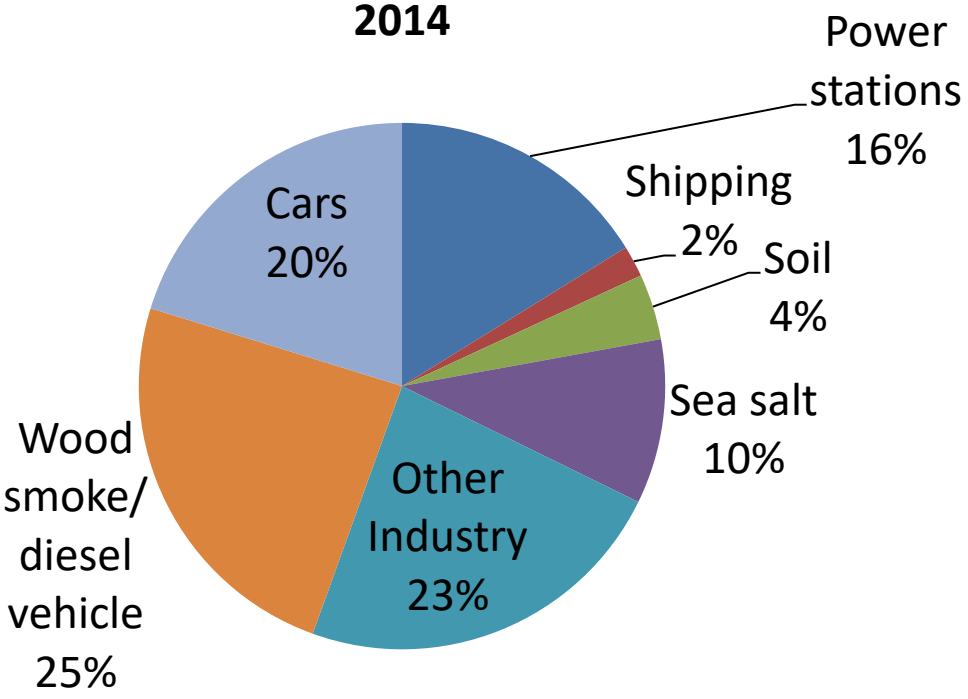
The Western Sydney monitors represent the exposure of several million people, so are of the greatest health concern.



The sources of fine particle pollution have been studied in the Sydney Particle Characterisation Study using data from 2000 to 2014. The following source

apportionment is derived from that study and several other sources. The available ambient air data does not tell us which sources are driving the trend to deteriorating air quality.

Fig 3. Sources of fine particles in Sydney, 2000-2014



List of monitors exceeding national standards for annual average particles in 2018.

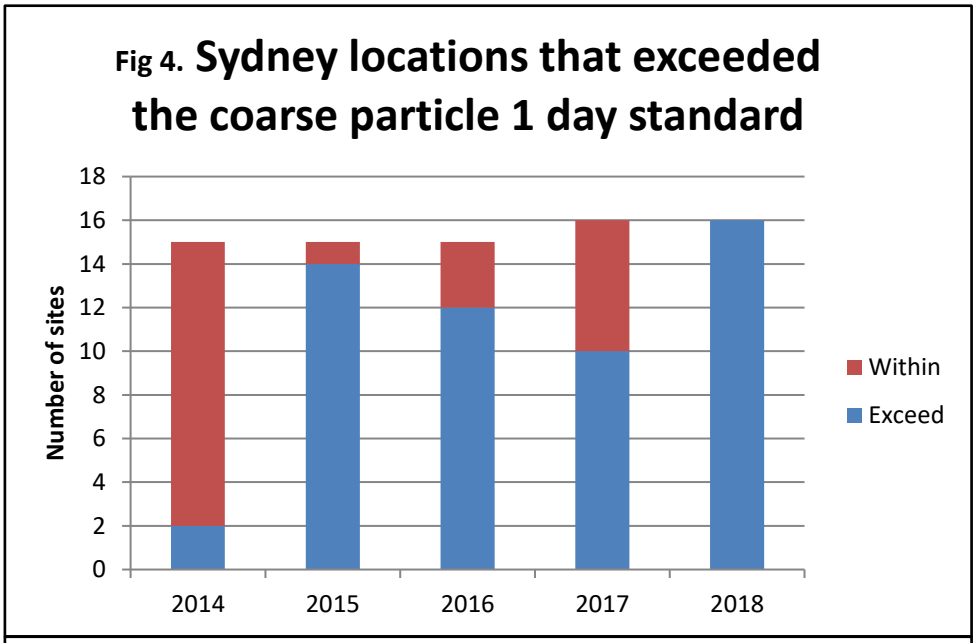
Location	PM $_{2.5}$ µg/m^3	PM $_{10}$ µg/m^3
Sydney Basin		
Liverpool	10.1	
Chullora	8.6	
Richmond	8.1	
Paramatta North	9.2	
Prospect	8.5	
Campbelltown	8.4	
Lower Hunter		
Carrington	8.2	27.3
Mayfield	8.3	26.9
Beresfield	8.7	
Upper Hunter		
Muswellbrook	9.4	27.2
Singleton	8.1	
Singleton NW		26.9
Camberwell	8.4	31.3
Maison Dieu		27.9
Mt Thorley		29.1
Warkworth		26.4
Rest of NSW		
Wagga Wagga North	8.4	27.4
Tamworth	8.3	

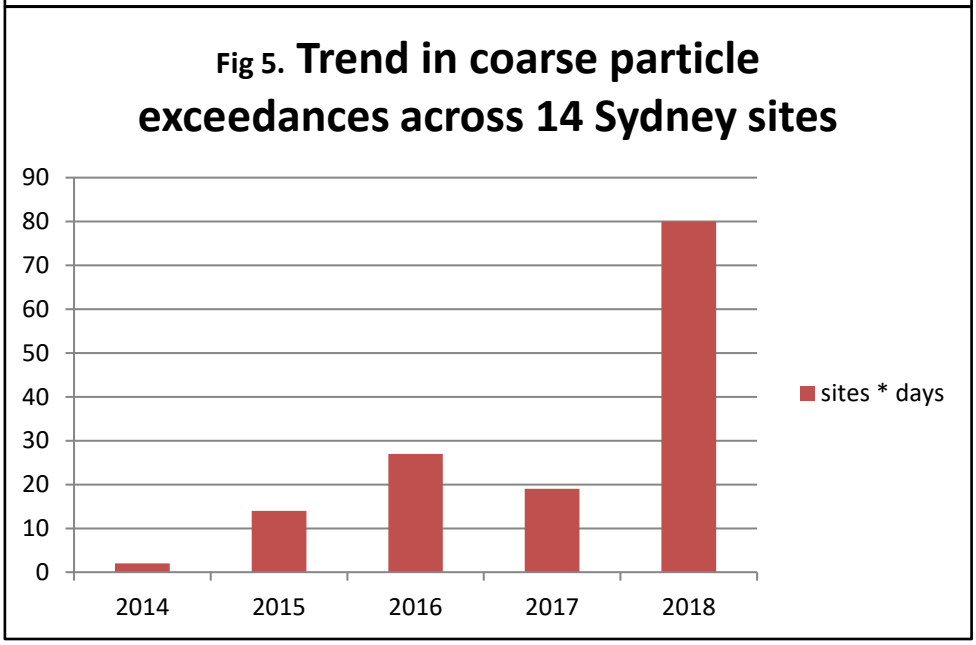
One day standards

As well as setting a standard for annual average exposure, the National Environment Protection Measures sets a one-day standard for particle concentrations in recognition that some health effects can be triggered by short exposure to high levels. The daily limit for coarse particles is to not exceed 50 µg/m^3 and for fine particles 25 µg/m^3.

In 2018 all locations in the Hunter valley had days exceeding the standard for coarse particles. The lowest number of exceedances was at Wallsend with 5, while the highest was Camberwell with 44. The five exceedances at Wallsend represent regional dust storms across large parts of NSW. With 5 regional dust storm days, probably 39 of the exceedances at Camberwell were due to local factors. Camberwell is a small town with open cut coal mines on three sides. All locations had more exceedances in 2018 than in 2017, even after removing 5 regional dust storm days.

All locations in Sydney also had at least one day exceeding the coarse particle standard, ranging from 2 days at St Marys and Rozelle, up to 13 days at Liverpool. The trend over time is for more sites to have exceedances, and the number of bad air days per year is increasing.





Ozone

Ozone is a secondary pollutant formed in the atmosphere from precursors including unburnt hydrocarbon fuel, and nitrogen dioxide which is released by diesel engines and coal combustion. Ground level ozone is a rapid acting respiratory irritant, not to be confused with stratospheric ozone which protects the earth's surface from UV radiation. Ground level ozone is formed by the action of sunlight on precursors, so can have high levels in summer and is worse in the afternoon. Because of the fast onset effects, the air quality standards set a maximum 1-hour value of 100ppb and a maximum rolling 4-hour average of 80ppb, and the goal is to have no more than 1 day a year beyond these values.

In 2018 ozone levels were generally better than in 2017 which was an unusually bad year. There were three sites that had 2 or more days on which the hourly standard was exceeded, down from 13 sites in 2017. The locations most prone to Ozone exceedances are Kembla Grange and Albion Park in the Illawarra, but this did not occur in 2018. The location with the highest number of days with high ozone in 2018 was Campbelltown with 4 followed by Camden with 3.

Commentary

The deteriorating air quality in NSW is not evenly distributed, with pollution from coarse particles concentrated in the coal producing areas of the Hunter Valley, and fine particle pollution affecting both the Hunter Valley and Western Sydney.

Fine particle air pollution is of the greatest health concern as it is linked to heart disease, stroke, deaths, diabetes, low birth weight for babies, and restricted lung growth in children. The coarse particle pollution is not harmless however, and is associated with lung disease, especially lung cancer in non-smokers. Fine particle air pollution in 2007 was estimated to cause 430 premature deaths annually in the Sydney basin[2] and 2017 exposure was estimated to cause 1,469 deaths across a wider area of central NSW[3]. This is a serious public health burden that needs a rigorous government response. Areas with high $PM_{2.5}$ levels are concentrated in regions of socioeconomic disadvantage, compounding the health inequality already seen in those regions.

It is not possible to determine from the available data which sources have led to the deterioration in air quality, but the following possibilities must be examined.

Drought. Many areas of NSW were drought affected in 2018, causing dust storms at times such as that experienced on 22nd November which gave high particle readings right across the state. A few extreme days make little difference to the annual average however, and if this was the explanation the exceedances would be seen at all monitors. Drought causes dust suppression to be more difficult at open cut coal mines and from overburden stockpiles, however, this is a problem of mine management which is amenable to better regulation. Dust storms generally create coarse particles more than fine particles.

Bushfires and hazard reduction burning can cause high levels of particulates, and these occur every year although climate change is extending the fire season. Planned burns should ideally be conducted when smoke will be carried away from populated areas but this is not always possible. Similarly to dust storms, a few fire days does not greatly influence the annual average value. The national air quality standards allow for exceedances of one day standards due to exceptional events, but there is a lack of certainty about the scale and distance of a fire to qualify as an exceptional event.

Vehicle emissions. Diesel engines release much more particle pollution than petrol engines, and the proportion of the vehicle fleet burning diesel has progressively increased. This is compounded as vehicles age, and a large share of pollution is from a small number of dirty vehicles. Many jurisdictions around the world include measurement of exhaust emissions in annual registration checks and this would assist in removing the worst offenders from the roads. The high degree of car dependency in Sydney means that the number of vehicle Km driven per year keeps increasing. An effective regulatory response would include public transport that is quicker, cheaper and more convenient than driving.

Coal fired power stations are estimated to contribute 16% of fine particles in Sydney[4] even though they are located far away. Due to prevailing winds the Central Coast power stations Eraring and Vales Point are most frequently the source, and these have increased production in 2018. Eraring generated 15.9 TWh in 2018, a 14% increase in output on 2017[5] which implies a 14% increase in pollutant release. While the power stations all have fabric filters that effectively capture particles at the chimney, they do not have control measures for the gases SO_2 and NO_2 which lead to secondary particle formation in the atmosphere. Post combustion capture of SO_2 and NO_2 are standard practice in power stations in Europe, North America and North Asia, and could be required under the environmental operation licenses issued by the NSW government to these plants. As of January 2019, the licenses of three power stations have been reviewed, unfortunately however in these reviews the NSW Environment Protection Authority failed to take the opportunity to protect the environment.

Wood heaters are used by a minority of households in Sydney but make a disproportionate contribution to air pollution, even the heaters that meet current standards. It is no longer reasonable that a wood fire in one house could be contributing to asthma attacks in people up and down the street. The NSW government could regulate to ban the installation of new log-burning heaters, require existing heaters to be removed when houses are sold, and require households to pay a small 'polluter-pays' annual licence for wood heaters. The power to regulate wood burning heaters has recently been handed to local government, but they do not have the resources to do this, or responsibility for air quality.

Industry in NSW is regulated by a system of pollution licenses under which the polluter pays a fee in proportion to the quantity of each pollutant released, known as Load Based Licensing. This system could provide a financial incentive for cleaner production, and similar schemes have been very successful overseas to clean up the problem of acid rain. The fees in NSW however are set at unrealistically low levels so most companies pay the fee rather than modify their production. The Load Based Licensing system has been under review by the NSW EPA since 2016 however after receiving public submissions the review does not appear to have progressed. Load based licensing could be an excellent mechanism to reduce the state's air pollution if it was implemented with a degree of political will.

Shipping is a small but measurable contributor to poor air quality. Mechanisms exist under the Marine Pollution Control (MARPOL Annex VI 1997) regulations to mandate the use of low sulphur fuel while ships are in Australian waters, which would virtually eliminate the problem. This would give an environmental benefit at zero cost to Australia.

All the actions required to reduce air pollution will incur some cost, but where it has been studied the benefits of action on air pollution far outweigh the costs. Analysis of the US Clean Air Act showed an economic return of $30 for every dollar spent on improving air quality.[6]

Summary

The progressive deterioration of air quality in NSW is a cause for public concern and requires a strong regulatory response from the state government. Particulate sources such as bushfires cannot be fully prevented but there are many sources amenable to regulatory control. The diseases caused by air pollution are common and serious, placing a burden on people and health services. While Australia has generally had good air quality in comparison to other countries this is will not last if the current trend is allowed to continue.

References

[1] NSW Office Environment and Heritage. "Search and download data." from https://www.environment.nsw.gov.au/AQMS/search.htm.

[2] Broome, R. A., et al. (2015). "The health benefits of reducing air pollution in Sydney, Australia." Environmental Research **143**: 19-25.

[3] Ewald, B. (2018). The health burden of fine particle air pollution from electricity generation in NSW. Melbourne, Environment Justice Australia.

[4] Cohen, D., et al. (2012). "Application of positive matrix factorisation, multilinear engine and back trajectory techniques to the quantification of coal-fired power station pollution in Sydney " Atmospheric Environment **61**: 204-211.

[5] Origin Energy Ltd (2018). Annual Report 2018**:** 15.

[6] US-EPA (2011). The benefits and costs of the Clean Air Act from 1990 to 2020., US Environment Protection Agency Office of Air and Radiation.