



10 September 2019

The Hon Sussan Ley MP
Minister for the Environment
M1-40 Parliament House (PO Box 2600)
CANBERRA ACT 2600

By email: sussan.ley.mp@aph.gov.au

Dear Minister

Proposed variation to the National Environment Protection (Ambient Air Quality) Measure standards for ozone, nitrogen dioxide and sulfur dioxide

*In many countries and institutions, policies promoting environmental health are absent, insufficient, unenforced or underfinanced in their implementation. Many public policies regarding environmental health and sustainability are also outdated and do not take into account new scientific research and case study findings.**

On behalf of our members, we are writing to you as Environment Minister, to ensure Australia's air pollution standards are revised using the latest evidence on pollutant control.

The Australian Nursing and Midwifery Federation (ANMF) is Australia's largest national union and professional nursing and midwifery organisation. In collaboration with the ANMF's eight state and territory Branches, we represent the professional, industrial and political interests of more than 270,000 nurses, midwives and carers across the country.

Our members work in the public and private health, aged care and disability sectors across a wide variety of urban, rural and remote locations. We work with them to improve their ability to deliver safe and best practice care in each and every one of these settings, fulfil their professional goals and achieve a healthy work/life balance.

Our strong and growing membership and integrated role as both a professional and industrial organisation provide us with a complete understanding of all aspects of the nursing and midwifery professions, and see us uniquely placed to defend and advance our professions.

.....
Canberra Office

Unit 3, 28 Eyre Street
Kingston ACT 2604
Australia

T +61 2 6232 6533
F +61 2 6232 6610
E anmffederal@anmf.org.au
W www.anmf.org.au
.....

Melbourne Office

Level 1, 365 Queen Street
Melbourne VIC 3000
Australia

T +61 3 9602 8500
F +61 3 9602 8567
E anmffederal@anmf.org.au
W www.anmf.org.au
.....

ANMF Journals

Australian Nursing and
Midwifery Journal (ANMJ)
E anmj@anmf.org.au

Australian Journal of
Advanced Nursing (AJAN)
E ajan@anmf.org.au

ABN 41 816 898 298



Through our work with members, we aim to strengthen the contribution of nursing and midwifery to improving Australia's health and aged care systems, and the health of our national and global communities.

Given the size of our membership, and the fact that nurses and midwives form the largest single component of the health workforce, the ANMF has a genuine concern for all matters relating to environmental effects on the health of individuals and communities. Nurses and midwives, our members, are the frontline health professionals who most particularly witness adverse health outcomes from climate change, especially respiratory conditions due to atmospheric pollutants. It is because of this that our members tell us they want governments to take a strong stance on climate change mitigation policies and actions. This includes implementing monitoring and reporting standards to minimise health damage from air pollution.

National Environmental Protection Measures (NEPM) Australian Air Quality Standards

The National Environmental Protection Measures Australian Air Quality Standards were first adopted over 20 years ago, with an objective to "minimise the risk of adverse health impacts from exposure to air pollution for all people, wherever they may live." Given the increase in health effects from air pollutants, as witnessed by our members, it is timely to revise these standards with contemporary evidence.

There is no safe threshold for exposure to air pollution. Adverse health impacts have been studied and reported at concentrations well below the current and proposed NEPM standards. In order to minimise ongoing damage to the health of all people living in Australia, best practice health based pollution control standards are required now, to achieve cleaner air.

As a member of the Climate and Health Alliance, the ANMF, along with other health and medical groups, is urging all Environment Ministers to adopt the minimum thresholds for these pollutants at levels consistent with the scientific evidence outlined in the accompanying Expert Position Statement.

Should you require further information from our office please contact me on 03 96028500 or afsec@anmf.org.au.

Yours sincerely

A handwritten signature in purple ink, appearing to read 'Lori-anne Sharp'.

Lori-anne Sharp

A/Federal Secretary

Enc. Expert Position Statement.

*Global Green and Healthy Hospitals, 2016, *A Comprehensive Environmental Health Agenda for Hospitals and Health Systems Around the World*. Retrieved on 2 Sept 2019 from <https://www.hospitalesporlasaludambiental.net/wp-content/uploads/2016/07/Global-Green-and-Healthy-Hospitals-Agenda.pdf>, p.8.

Expert Position Statement on health-based standards for Australian regulated thresholds of nitrogen dioxide, sulfur dioxide and ozone in ambient air.



This statement was coordinated by Clare Walter (Lung Health Research Centre) and Maxwell Smith (Environmental Justice Australia) in consultation with Ben Ewald, Eugenie Kayak and Ken Winkel (Doctors for the Environment Australia), Ekta Sharma and Paula Myott (Royal Australasian College of Physicians), Kelcie Herrmann and Judy Powell (Lung Foundation of Australia), Elena Schneider - Futschik (Lung Health Research Centre), Fiona Armstrong (Climate and Health Alliance), Robyn Schofield (Melbourne Energy Institute, Clean Air and Urban Landscapes Hub, University of Melbourne), Annabelle Workman (Melbourne Sustainable Society Institute), Prof Louis Irving (Royal Melbourne Hospital and the Peter MacCallum Cancer Centre), and Prof Gary Anderson (Lung Health Research Centre).

Background

Given the overwhelming importance of clean air to health, the statement addresses the pending revision of national standards for the air pollutants: nitrogen dioxide (NO₂), sulfur dioxide (SO₂), and ozone (O₃).

Our Recommendations:
1. Lower the thresholds of nitrogen dioxide, sulfur dioxide, and ozone, and alter the reporting metrics. The value and forms proposed are outlined in a table on pages 3-4.
2. The network of NEPM compliance monitors should be expanded to reflect particular risks from widespread source emissions and hotspots, such as traffic on major roadways.
3. Air quality monitoring data should be made publicly available through a coordinated national website, allowing access to real-time and historical data.
4. Air quality standards should include compliance obligations and enforcement mechanisms.
5. Strong health-based standards should be set now to protect health, with an exposure reduction framework in place for continual improvement of the standards.

Ambient air quality standards for Australia are set by agreement between the various state and territory environment ministers, in a process known as the National Environment Protection Measure, or NEPM. The purpose of the NEPM is to “minimise the risk of adverse health impacts from exposure to air pollution for all people, wherever they may live”. The NEPM standards are advisory and not enforceable under law. Individual states and territories use the Ambient Air Quality (AAQ) NEPM standards as a guide to form their own enforceable standards.

Australia’s first AAQ NEPM standards were adopted in 1998 for six criteria air pollutants; particulate matter, lead, carbon monoxide, nitrogen dioxide, sulfur dioxide and ozone. After 21 years, the standards for nitrogen dioxide, sulfur dioxide and ozone are under review. The standards for these pollutants are currently set well-above international best practice levels.

Nitrogen Dioxide (NO₂)

Nitrogen dioxide is formed from high temperature combustion, such as emissions from vehicles, coal-fired power stations and industrial processes. Nitrogen dioxide can irritate eyes, nose, throat and lungs, causes coughing, shortness of breath. Higher exposure causes illness and disease, impacting a wide range of organs including the lungs, heart and circulatory system. There is strong evidence for adverse effects in vulnerable groups including people with chronic disease, the elderly and children.¹

Sulfur Dioxide (SO₂)

Fossil fuels contain traces of sulfur compounds, producing sulfur dioxide when they are burnt. The majority of the sulfur dioxide emissions come from coal-fired power generation. Exposure to sulfur dioxide can damage the lungs. People with impaired heart or lung function including asthma are at increased risk. Sulfur dioxide is involved in the creation of acid rain and secondary fine particle air pollution which causes cardiovascular and respiratory diseases, including cancer.²

Ozone (O₃)

Ozone is a gas that is formed on hot sunny days when oxides of nitrogen react with organic substances in the air. Motor vehicle exhaust fumes produce as much as 70% of the oxides of nitrogen and 50% of the organic chemicals that form ozone. Ozone can impact the airways and lungs. People who are exposed to ozone can experience difficulty in breathing and coughing. Ozone can increase susceptibility to lung infections and aggravate lung diseases such as asthma, chronic obstructive pulmonary disease, and chronic bronchitis. People with asthma might have more attacks and athletes might find it harder to perform as well as usual.³

Health impacts: a summary of recent Australian evidence. (See table on pp.5-6)

Ambient air pollution contributes to over 3000 premature deaths each year in Australia.⁴ Even at low concentrations, nitrogen dioxide, sulfur dioxide and ozone are impacting the health of Australians. Coal-fired power stations and motor vehicles are the main sources of sulfur dioxide and nitrogen dioxide respectively, in Australia.^{5,6} Diesel powered vehicles emit a much higher amount of nitrogen dioxide compared to petrol vehicles.⁷

The following studies have been conducted in Australia and published in the last decade, demonstrating statistically significant health impacts at pollutant concentrations below NEPM thresholds (summarised in table on pp.5-6).

Traffic related nitrogen dioxide is strongly associated with childhood asthma with effect sizes much greater than previous studies.^{8,9,10} Increased susceptibilities have been noted in sub-groups such as younger children (between 0 - 4 years)^{10,11} and carriers of specific genetic variants.¹² Nitrogen dioxide is also associated with increased risk of atopy¹² and, consistent with international evidence,¹³ reduced lung function,^{8,12} which can lead to lifelong adverse health effects and premature death.¹³

Adverse neonatal outcomes, including preterm birth, low weight at birth and fetal growth restriction are associated with maternal exposures to nitrogen dioxide, sulfur dioxide, and ozone.^{14,15,16} Laboratory confirmed paediatric influenza has also been associated with ozone.¹⁷

Adverse health effects from nitrogen dioxide, sulfur dioxide and ozone are not limited to paediatric and neonatal outcomes. A longitudinal cohort of middle-aged Australians demonstrated positive associations between traffic-related nitrogen dioxide exposure and both current asthma, the incidence of new asthma, and atopy.^{9,12}

Long term exposure to sulfur dioxide has been associated with cardiorespiratory mortality. The association persisted at low concentrations and was found to vary across the geographic area of Brisbane.¹⁸

Reducing air pollution in Australia

Air pollution 'hotspots' - both in urban and regional areas close to freight routes, busy roads, intersections, certain industry, mining activities and coal-fired power stations - result in some communities bearing a higher burden of air pollution health impacts and environmental injustice.^{19,20,21,22}

In urban areas, vehicle emissions contribute up to 80% of nitrogen dioxide emissions.⁵ Australia holds the lowest rank out of the 35 OECD countries for fuel quality.²³ While diesel vehicles are being phased out in many OECD countries due to the health impacts associated with diesel emissions, in Australia the proportion of diesel vehicles on the roads has increased.^{24,25}

In response to the US Clean Air Act 1990, many US power plants installed wet flue-gas desulfurisation units (scrubbers) which can remove 99% of sulfur dioxide emissions.²⁶ Nitrogen

dioxide emissions can also be dramatically reduced with the instillation of selective catalytic reduction.²⁶ None of Australia’s ten largest coal-fired power stations have been fitted with these technologies. Yet internationally, many similar power stations have been successfully retrofitted with such pollution-reduction technology.^{27,28}

Lowering the NEPM standards for nitrogen dioxide and sulfur dioxide, and making them enforceable, will require Australian vehicle and coal-fired power station emissions to be reduced in line with international best practice. This is an important step towards addressing the current air pollution related health inequities.

Air pollution related mortality costs the Australian public an estimated \$16 billion per year.²⁹ In the United States, the cost benefit analysis of the US Clean Air Act for 1970 – 1990 has been estimated at a value of \$US 22.2 trillion (health related economic benefits) compared to the implementation costs of \$US 0.52 trillion.³⁰ In the UK, a study over four decades from 1970-2010, demonstrated that effective pollution control policies can bring substantial public health benefits.³¹

Our Recommendations:

1. Lower the thresholds of nitrogen dioxide, sulfur dioxide, and ozone, and alter the reporting metrics. The value and forms proposed are outlined in the table on p.4.

Table Key:	
Ppb	Parts per billion
RIS	Regulatory Impact Statement
99th centile	The value in a data set that is exceeded by 1% of data points
WHO	World Health Organization
Yearly worst hour	The highest value of the 8,760 1-hour values in a year. The 99th centile of hourly values potentially allows for 87 bad air days per year.
Daily worst hour	The 365 values for daily 1-hour maximum. The 99thcentile of daily worst hour permits 4 bad air days per year.

Standard (All units in ppb)	International standards	Current Australian standard	NEPM RIS proposal	Our proposal
SO₂ 1-hour	US: 75, as 99th centile of daily worst hour Canada: 70, as 99th centile of daily worst hour EU: 124	200, as yearly worst hour, not to be exceeded.	100, as yearly worst hour, not to be exceeded.	60, as 99th centile of daily worst hour.
SO₂ 24-hour	WHO: 7.6 EU: 44 UK: 44	80	20, no exceedances.	8, no exceedances.
SO₂ annual	Canada: 5 No standard in other jurisdictions.	20	No standard	No standard
NO₂ 1-hour	WHO: 97 US: 100, as 99th centile of daily worst hour EU: 97	120, as yearly worst hour, not to be exceeded.	90, as yearly worst hour.	72, as 99th centile of daily worst hour.
NO₂ annual	WHO: 19 US: 53 EU: 19	30	19, no exceedances.	9, no exceedances.
O₃ 1-hour	NZ: 70 Japan: 60	100	No standard	70
O₃ 4-hour	No standard in other jurisdictions.	80	No standard	No standard
O₃ 8-hour	WHO: 47 US: 70, as 99th centile of daily worst hour Canada: 63 EU: 56	No standard	65	47

2. The network of NEPM compliance monitors should be expanded to reflect particular risks from widespread source emissions and hotspots, such as traffic on major roadways. Air quality standards should protect people wherever they live, including those close to coal-fired power stations and major roadways. To accurately reflect population exposure, the network of NEPM compliance monitors should be expanded to more effectively evaluate the exposure of vulnerable groups and populations living near major sources of air pollution. This includes urban roadside locations where people live, work and learn, including schools and childcare centres.

3. Air quality monitoring data should be made publicly available through a coordinated national website, allowing access to real-time and historical data. This should include records from daily monitoring of key pollutants, health alerts for the general public and at-risk population sub-groups, and regular modelling of dispersal from all major point sources, such as coal-fired power stations and major roadways. This is critical to provide individuals and communities with information about what they are breathing.

4. Air quality standards should include compliance obligations and enforcement mechanisms. A strong and proactive approach to air pollution prevention requires robust and well-resourced institutional arrangements capable of decisive policy intervention. This includes incentives and penalties that create a sufficient deterrent to prevent non-compliance. This is critical to provide affected members of the community a recourse for action when adversely affected by air pollution.

5. Strong health-based standards should be set now to protect health, with an exposure reduction framework in place for continual improvement of the standard, in order to “minimise the risk of adverse health impacts from exposure to air pollution for all people, wherever they may live.” There is no rational basis for proposing a weak standard now and a tighter standard in future. An exposure reduction framework is required to drive human exposure even lower than the standards where this would provide greater health benefits.

Table of Australian Studies demonstrating statistically significant health impacts of nitrogen dioxide, sulfur dioxide, and ozone at concentrations well-below current and NEPM RIS proposed thresholds (published in the last decade):

Study and location	Findings
Knibbs et al. (2018) ⁸ Across 12 Australian cities	Small increases in nitrogen dioxide exposure are significantly associated with increased risk of asthma and reduced lung function in children (7 – 11 years). Mean NO ₂ exposure 8.8ppb.
Chen (2018) ¹⁴ Brisbane	SO ₂ , NO ₂ and O ₃ associated with adverse birth effects (preterm birth and low birth weight) with the strongest effect observed for sulfur dioxide and ozone and trimester 3 exposure. Mean SO ₂ 1.84ppb. Mean NO ₂ 6.74ppb. Mean O ₃ 16.76ppb.
Bowatte (2018) ⁹ Cohort of Australians, originally recruited from Tasmania, now residing across Australia	NO ₂ associated with Increased risk of both the development and persistence of asthma in middle-aged Australians. Mean NO ₂ 5.4ppb.
Bowatte (2017) ¹² Cohort of Australians, originally recruited from Tasmania, now residing across Australia	Long term exposure to NO ₂ associated with allergies, wheeze, and reduced lung function in middle aged. Carriers of GSTT1 null genotype

	are at increased risk. Mean NO ₂ 5.4ppb.
Perret et al. (2017) ³² Cohort of Australians, originally recruited from Tasmania, now residing across Australia	Positive association between NO ₂ and raised Interleukin6 levels (marker of systemic inflammation). Mean NO ₂ 4.2 ppb.
Li et al. (2016) ¹⁵ Brisbane	Preterm birth associated with exposure to NO ₂ and SO ₂ directly prior to onset of labour. Mean NO ₂ 6.52 ppb. Mean SO ₂ 1.95 ppb.
Xu et al. (2013) ¹⁷ Brisbane	O ₃ significantly associated with lab confirmed influenza in children 0 – 14 years. Mean O ₃ 15.3 ppb.
Perreira (2012) ¹⁶ Perth	Exposure to NO ₂ in mid-late pregnancy is associated with increased risk of fetal growth restriction. Mean NO ₂ 23.04ppb.
Periera et al. (2010) ¹⁰ Perth	NO ₂ exposure associated with increased hospital ED admissions for asthma in children. Children 0 – 4 years most vulnerable to the effects. Mean NO ₂ 6.79 ppb.
Wang et al. (2009) ¹⁸ Brisbane	Long-term exposure to SO ₂ associated with cardio-respiratory mortality. Mean SO ₂ 5.4ppb.
Hu et al. (2008) ³³ Sydney	SO ₂ and high temperatures contribute to excess mortality in summers in Sydney. Mean SO ₂ 1 ppb.
Jalaludin et al (2008) ¹¹ Sydney	NO ₂ , SO ₂ and O ₃ associated with ED visits for asthma in children. Results most consistent for 1 – 4 years age group. Mean NO ₂ 23.2 ppb.

References:

1. United States Environmental Protection Agency; Nitrogen Dioxide Pollution. <https://www.epa.gov/no2-pollution/basic-information-about-no2> Accessed 15th June, 2019
2. United States Environmental Protection Agency; Sulfur Dioxide Pollution. <https://www.epa.gov/so2-pollution/sulfur-dioxide-basics#effects> Accessed 15th June, 2019
3. United States Environmental Protection Agency; Ozone Pollution. <https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution> Accessed 15th June, 2019
4. Institute for Health Metrics and Evaluation (IHME). GBD Compare Data Visualization. Seattle, WA: IHME, University of Washington, 2016. Available from: <http://vizhub.healthdata.org/gbd-compare>. (Accessed 8/5/2018)
5. Australian Government Department of the Environment and Energy. Nitrogen Dioxide Air Quality fact sheet (2005). <http://www.environment.gov.au/protection/publications/factsheet-nitrogen-dioxide-no2> Accessed 15th June, 2019
6. Australian Government Department of the Environment and Energy. Sulfur Dioxide fact sheet (2005) <http://www.environment.gov.au/protection/publications/factsheet-sulfur-dioxide-so2> Accessed 15th June, 2019
7. Cames, M. & Helmers, E. Environ Sci Eur (2013) 25: 15. <https://doi.org/10.1186/2190-4715-25-159>.
8. Knibbs, Cortés de Waterman, Toelle, Guo, Denison, Jalaludin, Williams. (2018). The Australian Child Health and Air Pollution Study (ACHAPS): A national population-based cross-sectional study of long-term exposure to outdoor air pollution, asthma, and lung function. *Environment International*, 120, 394-403.
9. Bowatte, G., Lodge, C., Knibbs, L., Erbas, B., Perret, J., Jalaludin, B., Dharmage, S. (2018). Traffic related air pollution and development and persistence of asthma and low lung function. *Environment International*, 113, 170-176.
10. Pereira, Gavin, Cook, Angus, De Vos, Annemarie J.B.M., & Holman, C DEArcy J. (2010). A case-crossover analysis of traffic-related air pollution and emergency department presentations for asthma in Perth, Western Australia. (Clinical report). *The Medical Journal of Australia*, 193(9), 511-514.
11. Jalaludin, B., Khalaj, B., Sheppeard, V., & Morgan, G. (2008). Air pollution and ED visits for asthma in Australian children: A case-crossover analysis. *International Archives of Occupational and Environmental Health*, 81(8), 967-974.
12. Bowatte, Lodge, Knibbs, Lowe, Erbas, Dennekamp, . . . Dharmage. (2017). Traffic-related air pollution exposure is associated with allergic sensitization, asthma, and poor lung function in middle age. *The Journal of Allergy and Clinical Immunology*, 139(1), 122-129.e1.
13. Gauderman WJ, Urman R, Avol E, et al. (2015). 'Association of improved air quality with lung development in children'. *NEJM* 2015;372;10:905-913
14. Chen, Guo, Abramson, Williams, & Li. (2018). Exposure to low concentrations of air pollutants and adverse birth outcomes in Brisbane, Australia, 2003–2013. *Science of the Total Environment*, 622-623, 721-726.
15. Li, S., Guo, Y., & Williams, G. (2016). Acute Impact of Hourly Ambient Air Pollution on Preterm Birth. *Environmental Health Perspectives*, 124(10), 1623-1629.
16. Pereira, G.; Cook, A. G.; Haggard, F.; Bower, C.; Nassar, N., Locally derived traffic-related air pollution and fetal growth restriction: a retrospective cohort study. *Occupational and environmental medicine* 2012, 69 (11), 815-822.
17. Xu, Z. W.; Hu, W. B.; Williams, G.; Clements, A. C. A.; Kan, H. D.; Tong, S. L., Air pollution, temperature and pediatric influenza in Brisbane, Australia. *Environment international* 2013, 59, 384-388.

18. Wang, X., Hu, W., & Tong, S. (2009). Long-term exposure to gaseous air pollutants and cardio-respiratory mortality in Brisbane, Australia. *Geospatial Health*, 3(2), 257-263.
19. Chakarabarty and Green, Australia's first national level quantitative environmental justice assessment of industrial air pollution, *Environmental Research Letters* 9 (2014) 044010.
20. Higginbotham, Freeman, Connor, & Albrecht. (2010). Environmental injustice and air pollution in coal affected communities, Hunter Valley, Australia. *Health and Place*, 16(2), 259-266.
21. Victorian Environmental Protection Agency. May 2012. Publication 1460. Francis Street Air Pollution and Noise Monitoring. <http://www.epa.vic.gov.au/~media/Publications/1460.pdf>
22. Maribyrnong Truck Action Group. Submission to the inquiry into the proposed lease of Port Melbourne. September 2015. https://www.parliament.vic.gov.au/images/stories/committees/pomsc/Submissions/Submission_32_-_Maribyrnong_Truck_Action_Group.pdf
23. Schofield, R., Walter, C., Silver, J., Brear, M., Rayner, P., Bush, M. (2017), 'Submission on the "Better fuel for cleaner air" discussion paper'. Melbourne: Clean Air and Urban Landscapes Hub/ Melbourne Energy Institute.
24. Department of the Environment and Energy. *Better fuel for cleaner air*. Draft Regulation Impact Statement. January 2018 <http://www.environment.gov.au/fuel-quality-standards-review>
25. OECD (2014), *The Cost of Air Pollution: Health Impacts of Road Transport*, OECD Publishing, Paris. <http://dx.doi.org/10.1787/9789264210448-en>
26. Anthony L Morrison et al., Analysis of Pollution Control Costs in Coal Based Electricity Generation – Technology Assessment Report, Cooperative Research Centre for Coal in Sustainable Development (January 2008) (hereinafter "Morrison 2008"), at 26, https://www.researchgate.net/publication/237460048_ANALYSIS_OF_POLLUTION_CONTROL_COSTS_IN_COAL_BASED_ELECTRICITY_GENERATION_TECHNOLOGY_ASSESSMENT_REPORT_68 ("A high velocity limestone with forced oxidation wet FGD system is capable of removing 99.6% of SO₂ under test conditions.")
27. Dr Ron Sahu, 'Recommended Retrofits for Loy Yang A, Loy Yang B, and Yallourn Power Plants', attachment to Environmental Justice Australia *Submission to EPA Victoria on the brown coal power stations licence review*, 8 February
28. <http://www.epa.vic.gov.au/our-work/licences-and-approvals/improving-the-system/licensing-improvement/~media/Files/Our%20work/Licences%20and%20approvals/Improving%20licensing%20and%20approvals/Brown%20coal/Environmental-Justice-Aus-submission.pdf2018>
29. Health Effects Institute (2017), 'State of Global Air 2017' (online database), www.stateofglobalair.org. (Accessed 07/05/2018) Ambient PM + Ozone mortality: Australia – 3099 deaths (2015 global burden of disease x \$A5.2M the 2010 value of statistical life).
30. Giannadaki et al. Implementing the US air quality standard for PM_{2.5} worldwide...*Environmental Health* (2016) 15:88.
31. Carnell E., Vieno M., Vardoulakis S., Beck R., Heaviside C., Tomlinson S., Dragosits U., Heal M., Reis S., (2019). Modelling public health improvements as a result of air pollution control policies in the UK over four decades – 1970 to 2010. *Environmental Research Letters* 14, 074001.
32. Perret, J., Bowatte, Lodge, Knibbs, Gurrin, Kandane-Rathnayake, Dharmage. (2017). The dose–response association between nitrogen dioxide exposure and serum interleukin-6 concentrations. *Environmental Health Perspectives* 125(5), 08 May 2017.
33. Hu, W., Mengersen, K., McMichael, A., & Tong, S. (2008). Temperature, air pollution and total mortality during summers in Sydney, 1994–2004. *International Journal of Biometeorology*, 52(7), 689-696.