

GREENPEACE



Executive Summary

Lethal Power

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With a preface from Professor Fiona Stanley AC FAA



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Mother and child wearing a face mask to protect from air pollution. © Greenpeace/Lu Guang

Cover image: A billowing smoke stack. © Shutterstock

Preface

A curious observation by Danish epidemiologists caught my eye. Far fewer preterm babies are being born during the pandemic year. And not only in Denmark, but in Ireland, other European countries, Canada and the US. Researchers have suggested that mothers resting and partners working at home and providing social support may have lowered stress levels. But another interesting suggestion is that lower levels of air pollution may have had a beneficial effect. Babies born preterm have a higher risk of dying and developing disabilities like cerebral palsy, which seems like yet another compelling reason to address our polluting ways of living.

The 2020 pandemic is exposing many aspects of the ways we live on this planet and should raise questions about the wisdom of “snapping back” to “normal”. It is now obvious that the “normal” of pre-Covid was damaging to the lives and wellbeing of people, in a variety of ways. The most clear cut, scientifically studied and worrying challenge facing humankind is climate change. It is and will be far more damaging to us than the pandemic. Politicians and others in power ignored the science around the causes and impact of climate change, even after the devastating bushfires. Perhaps this virus will make them realise that science should be guiding our decisions on such big and complex issues.

In addition to the impact of climate change on global weather patterns, warming, catastrophic bushfires and rising sea levels, there is an immediate and significant impact right here, right now. The adverse impacts of coal-burning power stations on the health of people in Australia, are analysed in detail in this report.

I am an epidemiologist with a long-term commitment to improving the health and wellbeing of pregnant women, children and youth; the evidence is strong that if we create healthy environments early in life (such as not being born preterm), then the positive impacts are lifelong. I have been increasingly anguished and amazed that the health effects of changing climates have been relatively neglected in our responses to these changes. This report shows that they are causing significant illnesses, deaths, costly care and anguish.

Australians need to know that we have 22 active coal-burning power stations, spread across the country from east to west. Whilst most are not in cities they are close enough to them to damage the health of residents. The scarily clear diagrams in this report show how far the particulate matter, nitrogen and sulphur dioxide can travel, with levels way above those considered safe by international standards. And major cities with large populations such as Sydney, Melbourne and Perth with large towns in between have measured unacceptable levels of such pollution. Australians need to know that these coal-burning power stations also emit toxic chemicals, such as mercury, arsenic and lead. I was not aware of the level of these chemicals in pollution from coal power stations. I found these data the most scary: these three all cause brain damage in young children and teenagers whose brains are still vulnerable, particularly mercury and lead. They are known to cause intellectual disabilities and in the most severe exposures, cerebral palsy and birth defects. This vital information needs to get to the decision makers in our state and federal governments whose responsibility it is to enable, not disable, the healthy development of our children. Governments supporting new coal mines and continuing to fund coal-burning power stations are writing out prescriptions to maim Australian childrens' brains.



© Prof. Fiona Stanley

Professor Fiona Stanley AC FAA

Fiona Stanley AC FAA is a Distinguished Research Professor at the University of Western Australia, Honorary Professorial Fellow at the University of Melbourne and Founding Director and Patron of the Telethon Kids Institute. After studying epidemiology and maternal and child health in the UK, Professor Stanley returned home and established population data sets in Western Australia, including registers of major childhood problems and pioneered First Nations leadership in research. She is a scientific advisor to Doctors for the Environment, a UNICEF Ambassador and was made Australian of the Year in 2003.

The damaging effects of air pollution from burning coal on the lungs of both children and adults is also described and quantified in this report. Asthma, chronic lung disease and their effects on other organ systems are all higher with exposure to particulate air pollution. These effects are over and above those in coal miners themselves, with black lung still occurring at unacceptable levels. The cost of burning coal on the health system in Australia was assessed to be over \$2 billion every year by the Australian Academy of Technological Sciences and Engineering (ATSE) in 2009¹. This was before the Morwell fire disaster which would have increased this amount considerably.

The data in this report are compelling and build on the already well-established need to phase out coal and encourage the development and use of renewable energy, of which Australia has an abundance. This is the first on a list of urgent recommendations. The report also recommends that we urgently tighten our emission standards, to match the European Emission Directives (Australia is non-compliant). And that in assessing the cost benefits of coal versus other forms of energy, we include costings of the significant health effects of coal. Whilst we have peak health body demands for levels of particulate matter, the report recommends that these be implemented and that more data are collected on nitrogen and sulphur dioxide and their effects on health outcomes.

The last 200 years is littered with the stories of industries damaging the health of the people, from the cotton mills of Lancashire, child chimney sweeps in London, asbestos (everywhere) to mercury in Minamata, Japan. There is not one example of industries caring for the people, preventing exposures or compensating the victims in a timely fashion. The burning of coal is our biggest global health disaster. Martin Luther King said on receiving the Nobel Peace Prize in 1964, "We have allowed the means by which we live to outdistance the ends for which we live. We have guided missiles and misguided men". We must continue to fight for our health, and that of our children and their children and convince the misguided men to respond to this report.



Introduction

Air pollution from coal-burning power stations kill hundreds of Australians every year and represents a nationwide public health crisis. The ongoing pandemic has shown how important clean air is to human health with a growing body of evidence showing that exposure to air pollution can exacerbate the impacts of Covid-19. As well as causing deaths, air pollution provokes a myriad of other problems that afflict health from birth to adulthood.

Each year, air pollution from coal-burning power station is responsible for around 800 deaths, and 15,000 asthma symptoms in children and young adults, aged 5-19.

As pollutants can spread hundreds of kilometres from their source, the death toll is eight times greater than the average annual casualty number from all natural disasters combined and twice as high as the number of smoke inhalation deaths in the recent 2019/2020 bushfire season.

Air pollution also causes around 850 cases of low birth weight in newborns each year. Babies born with low birth weight are at increased risk of serious health conditions as adults, including cardiovascular diseases, high blood pressure, type 2 diabetes and an increased risk of premature death. These effects do not stop at state borders; up to 22 percent of cases occur in states and territories that are not home to the source of the emissions, which can degrade air quality over areas spanning hundreds of kilometres.

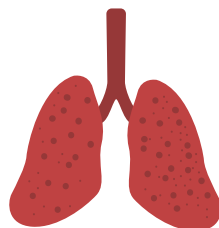
Despite the clearly detrimental health impacts, **Australia still operates 22 coal-burning power stations, some of which are among the oldest and most polluting in the world.** It would shock many Australians but coal-burning power stations in China are more strictly regulated and pollute less than those in Australia.

In addition to air pollutant concentrations, this report also estimates deposition of the potent neurotoxin mercury. Our results show that mercury deposition rates in some areas affected by coal power, double the already high modern background deposition rate and far exceed the pre-industrial natural background rate.



785

people die from exposure to pollution from burning coal every year in Australia



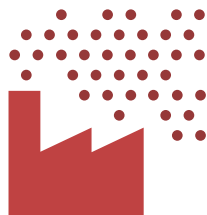
14,456

asthma symptoms are suffered by children due to air pollution from burning coal every year in Australia



845

babies are born prematurely due to pollution from burning coal every year in Australia



22

coal-burning power stations still operate in Australia some of which are among the oldest and most polluting in the world

Key findings

- Each year, air pollution from coal-burning power stations is responsible for around 800 premature deaths and 15,000 asthma symptoms in children and young adults, aged 5-19.
- Air pollution causes 850 cases of low birth weight in newborns each year .
- Up to 22% of cases of low birth weight in newborns occur in states and territories that are not home to the coal-burning power station.
- Australia still operates twenty-two coal-burning power stations, some of which are among the oldest and most polluting in the world.

Air pollution and SARS-CoV-2 / COVID-19

Previous research has revealed evidence that exposure to air pollution increases both the risk of infection with the SARS-CoV-2 virus, as well as the severity and mortality of the associated COVID-19 disease. This means that exposure to air pollution can exacerbate the health effects of the coronavirus pandemic. Therefore, addressing air pollution from Australia's poorly regulated coal-burning power stations would not only reduce the health impacts studied in this report but also lower the risk posed by COVID-19.



Air pollution in Australia's major cities

Pollutants emitted by the Sydney, Melbourne, Brisbane, Perth, and Rockhampton coal-burning power station groups affect air quality over areas spanning hundreds of kilometres and affecting millions of Australians. Both rural communities and urban areas are affected.

The annual average $PM_{2.5}$ pollution from each of the modelled power station groups include both primary $PM_{2.5}$ pollution and secondary $PM_{2.5}$ pollution (Figures 3-7). The model results only include pollutant emissions arising from the included coal-burning power stations and no other natural or anthropogenic sources of air pollution are accounted for. The results presented therefore do not represent the full burden of air pollution experienced by Australians.

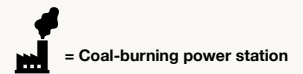
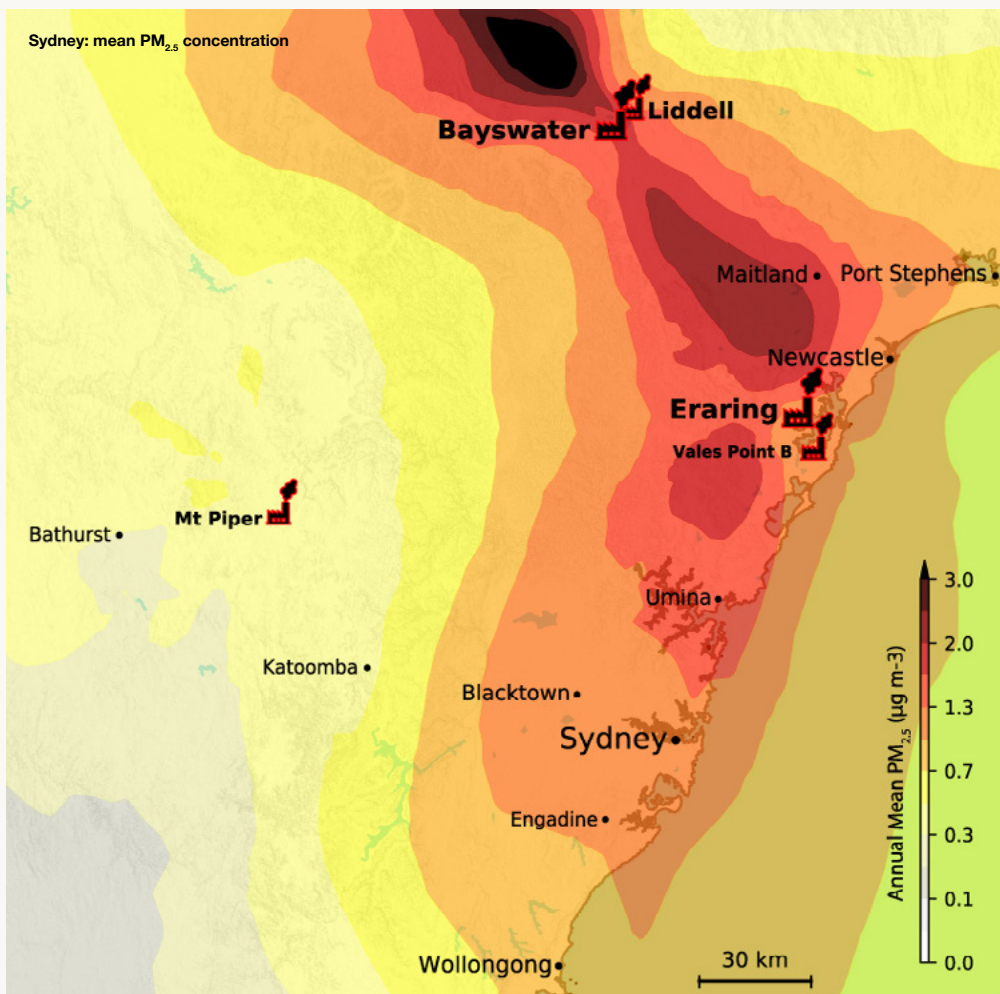
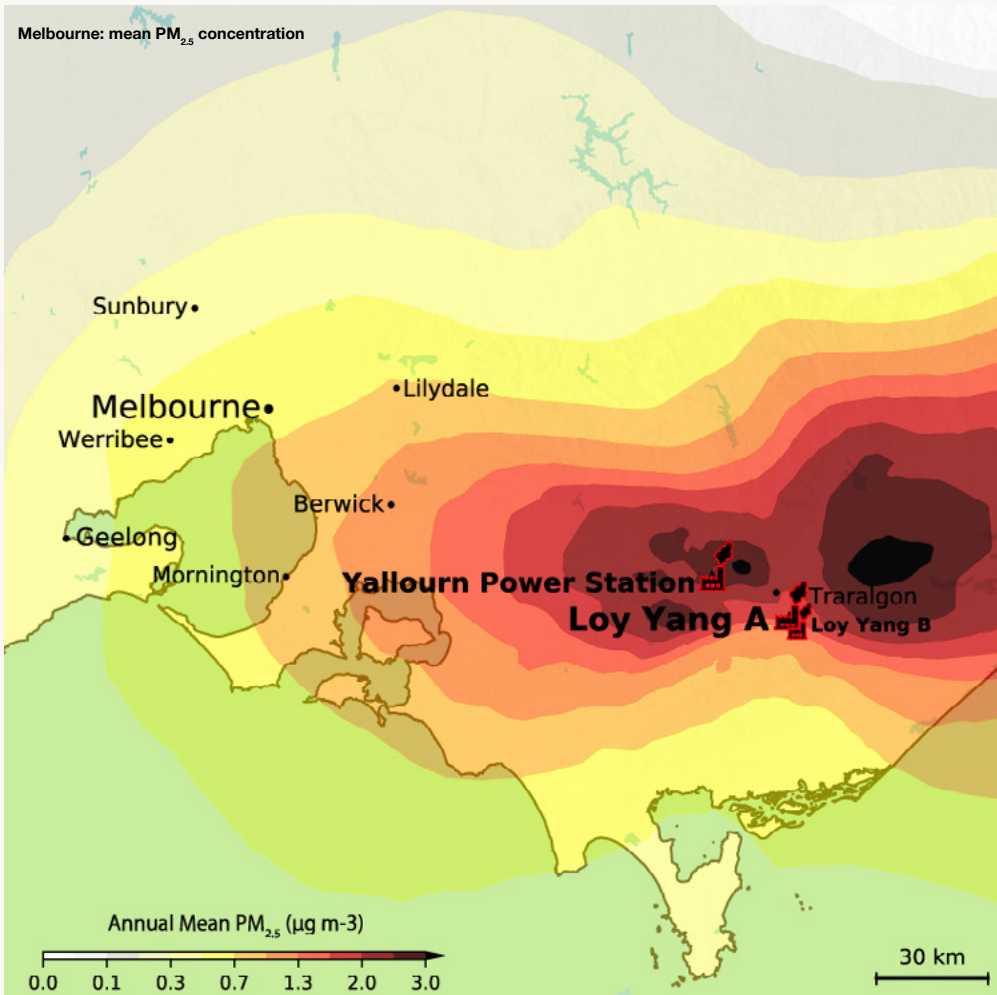


Figure 1. Annual mean near-surface $PM_{2.5}$ concentration due to emissions by the Sydney power station group. **Note:** $\mu\text{g m}^{-3}$ refers to pollution concentration.




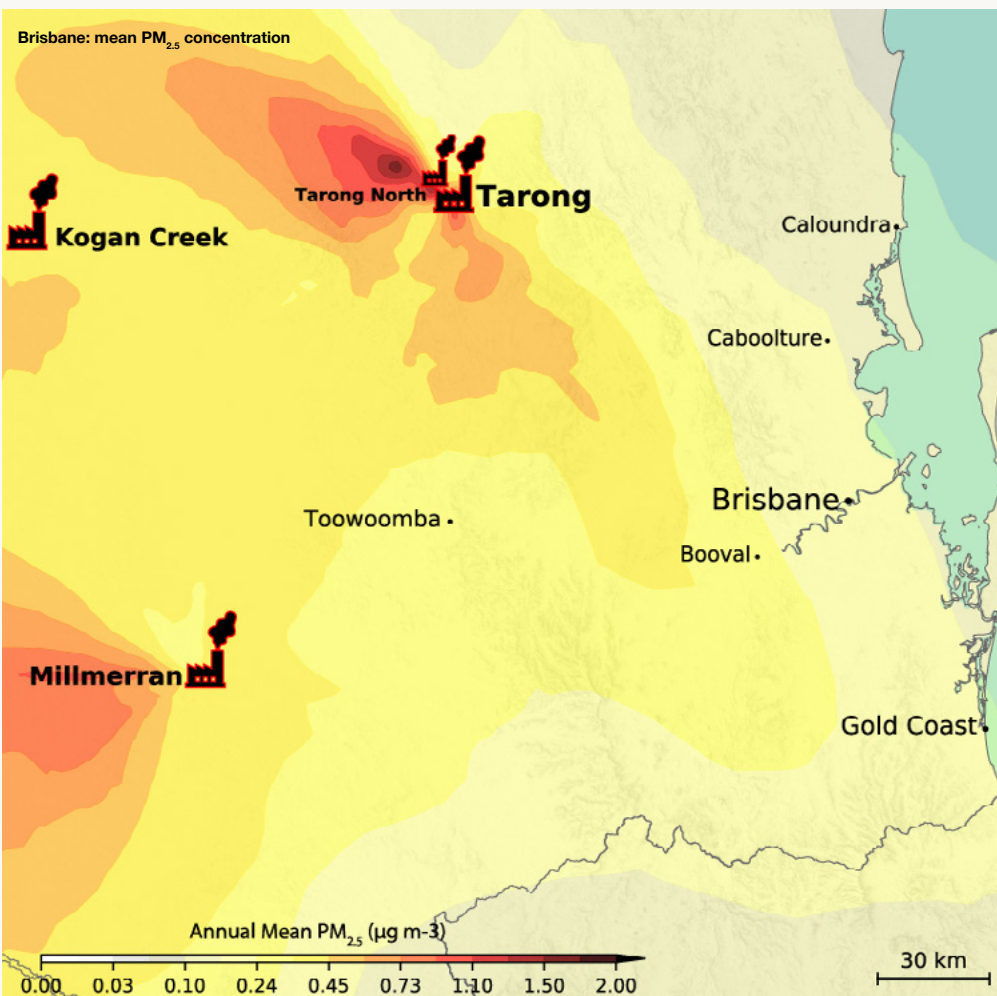
 = Coal-burning power station

Figure 2. Annual mean near-surface $PM_{2.5}$ concentration due to emissions by the Melbourne power station group. **Note:** $\mu\text{g}/\text{m}^3$ refers to pollution concentration.




 = Coal-burning power station

Figure 3. Annual mean near-surface $PM_{2.5}$ concentration due to emissions by the Brisbane power station group. **Note:** $\mu\text{g}/\text{m}^3$ refers to pollution concentration.

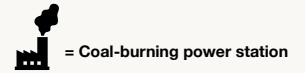
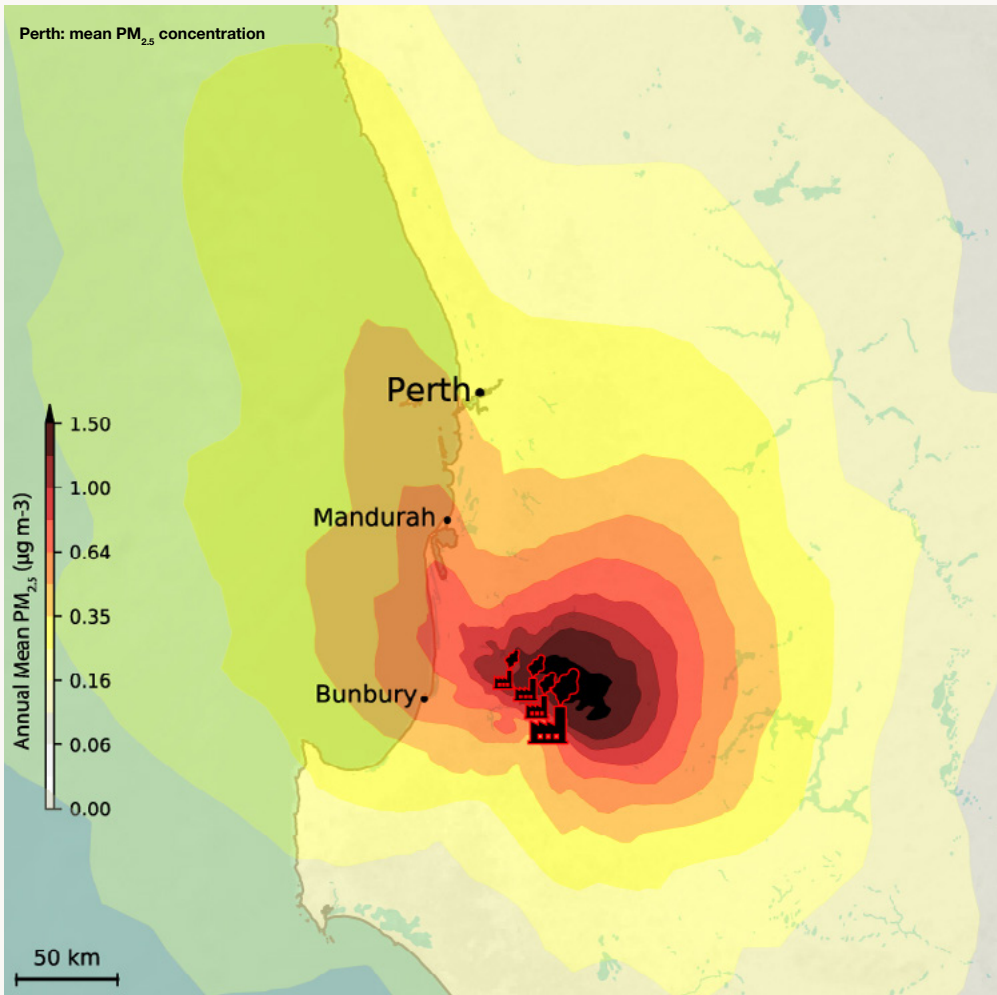


Figure 4. Annual mean near-surface $PM_{2.5}$ concentration due to emissions by the Perth power station group. **Note:** $\mu\text{g}/\text{m}^3$ refers to pollution concentration.

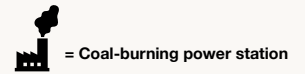
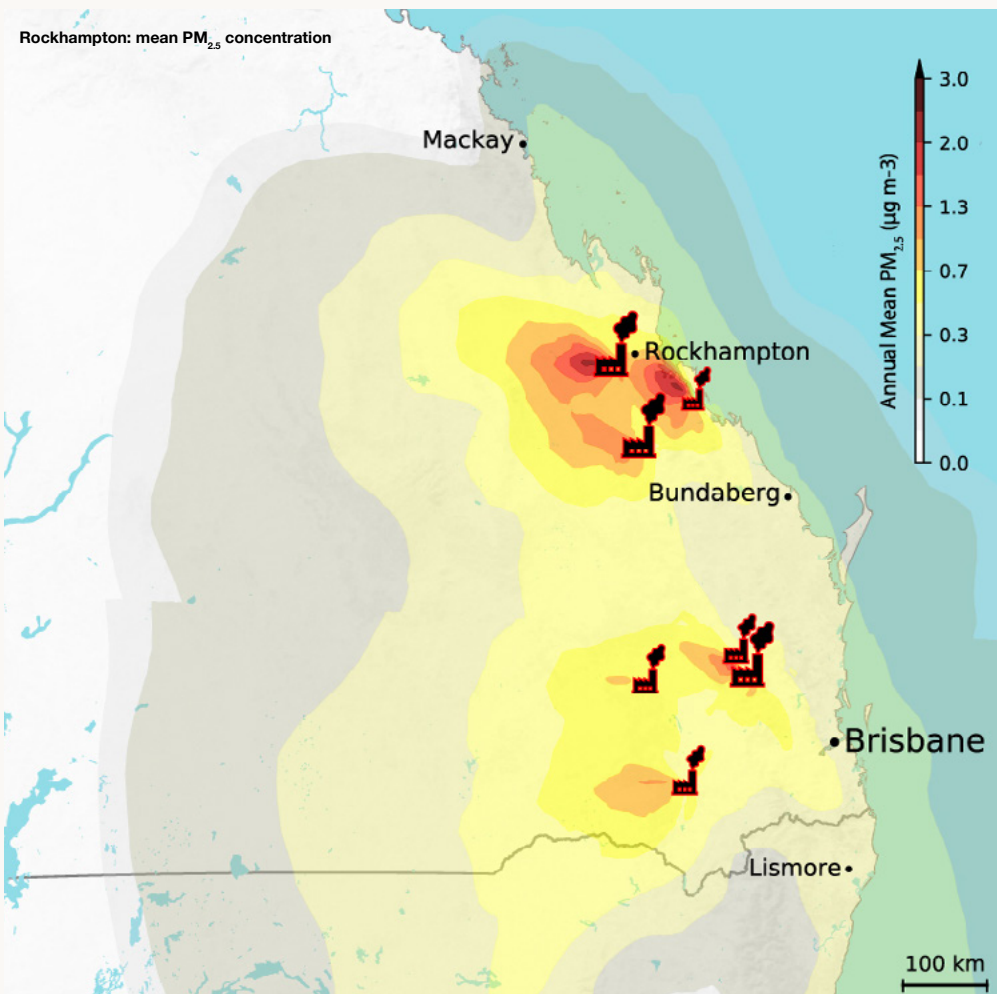


Figure 5. Annual mean near-surface $PM_{2.5}$ concentration due to emissions by the Rockhampton power station group. **Note:** $\mu\text{g}/\text{m}^3$ refers to pollution concentration.

Effects of air pollution on human health

Brain

Air pollution has been linked to fatigue, headache, anxiety, dementia, cognitive disorders, memory loss and ADHD in adults and children.

Upper respiratory tract

Air pollution has been linked to upper respiratory tract infections in adults and children.

Heart and circulatory system

Air pollution has been linked to ischaemic heart disease and chronic obstructive pulmonary disease in adults.

Lungs

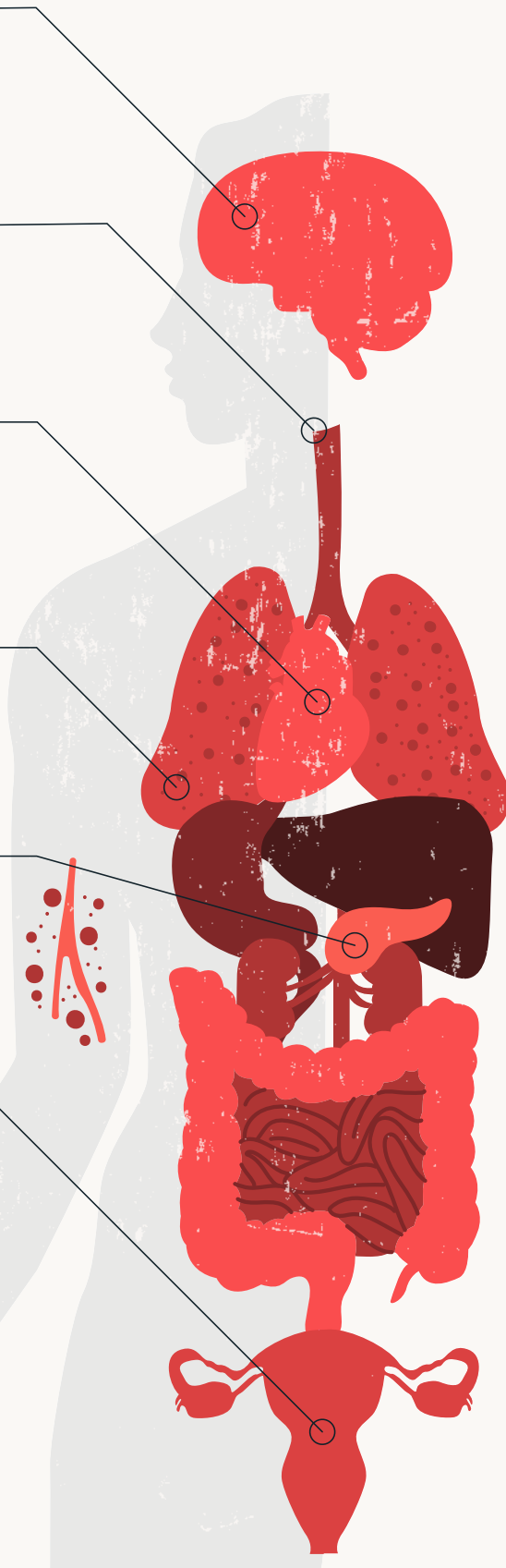
Air pollution has been linked to breathing problems, asthma, chronic lung disease, bronchitis and emphysema.

Pancreas

Air pollution has been linked to diabetes in adults.

Reproductive system and pregnancy

Air pollution has been linked to infertility, pre-term birth and developmental disorders in the developing fetus.



Human health impacts

The health impact assessment uses modelled pollutant concentrations to quantify the effect of power station emissions on people's health - from birth to death.

Low birth weight

Long-term exposure to PM_{2.5} pollution during pregnancy has been linked to low birth weight.² Babies born with low birthweight are at increased risk of health conditions including cardiovascular diseases, high blood pressure, type 2 diabetes, and premature mortality.³ Our model suggests that the pollution from Australia's coal-burning power stations is responsible for 439 to 1253 cases of low birth weight each year. As pollution spread does not stop at state borders, 22% of these cases occur in states and territories that are not host to the emitting power station.

Power station group	95%-confidence interval		
	Best estimate	Low estimate	High estimate
Total	845	439	1,253
Brisbane	55	29	81
Melbourne	259	134	383
Perth	47	24	68
Rockhampton	35	18	52
Sydney	450	233	669

Table 1: Modelled number of annual cases of low birth weight due to PM_{2.5} pollution from coal-burning power stations in Australia - sums per power station group.

Asthma symptoms in children and young adults

PM₁₀ pollution is also known to trigger asthma attacks and symptoms for people with asthma. Children and young adults are at particularly high risk. We find that each year, there are 1,800 to 27,000 incidents where people in Australia aged 5-19 years experience asthma symptoms attributable to emissions from coal-burning power stations (Table 2). Some asthma symptoms are attributable to cross-state power station pollution. The power station groups in Melbourne and Sydney both contribute asthma symptoms in four other states.

Power station group	95%-confidence interval		
	Best estimate	Low estimate	High estimate
Total	14,434	1,816	27,305
Brisbane	1,023	129	1,934
Melbourne	4,376	550	8,277
Perth	807	102	1,526
Rockhampton	647	81	1,222
Sydney	7,582	953	14,345

Table 2: Number of days and persons aged 5-19 where asthma symptoms are observed that are attributable to emissions from coal-burning power stations in Australia.

Premature deaths

There are well established relationships between PM_{2.5} and NO₂ pollution and premature death. Pollution from power stations in Australia is responsible for approximately 800 additional premature deaths each year (95%-confidence interval: 373 to 1310). The results are shown per power station group in Table 3 and it should be noted that premature deaths occur in states located considerable distances away from the emitting power stations.

Power station group	95%-confidence interval		
	Best estimate	Low estimate	High estimate
Total	785	373	1,310
Brisbane	39	18	63
Melbourne	205	98	339
Perth	31	15	50
Rockhampton	34	16	57
Sydney	477	226	801

Table 3: Modelled number of annual premature deaths due to pollution from coal-burning power stations in Australia by power station group.

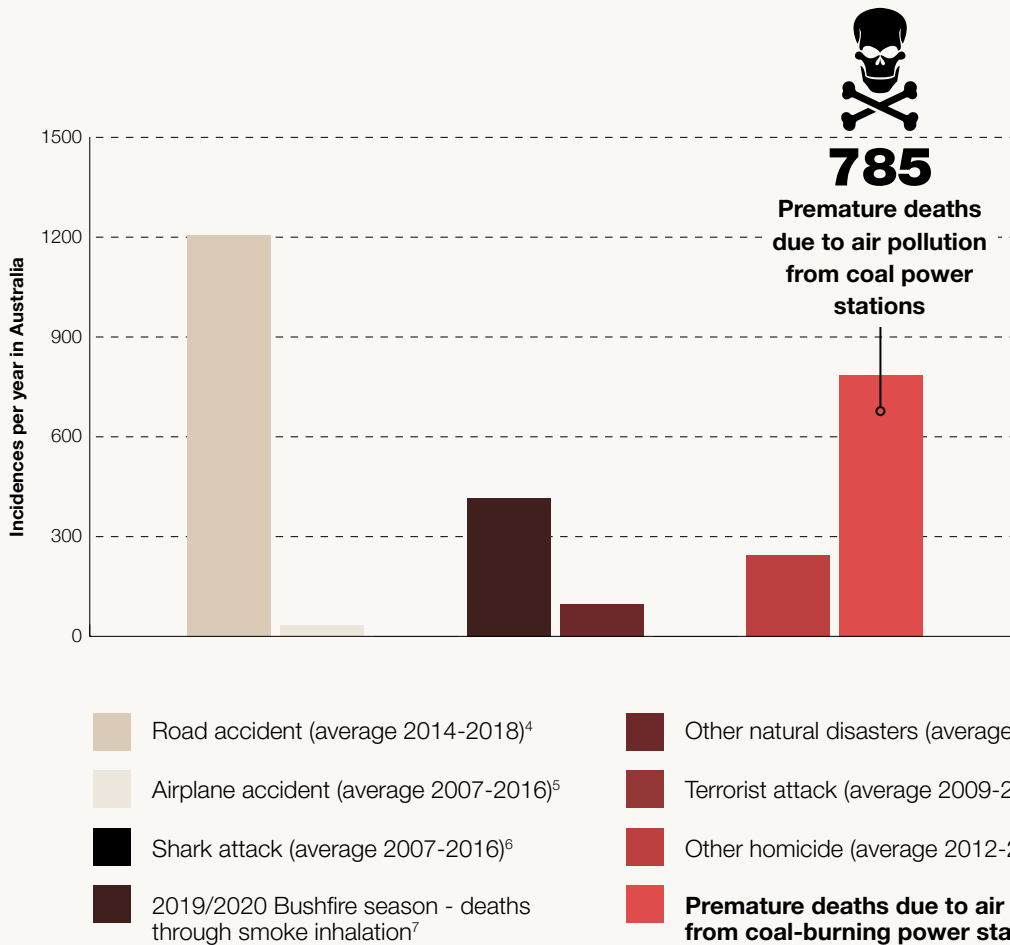
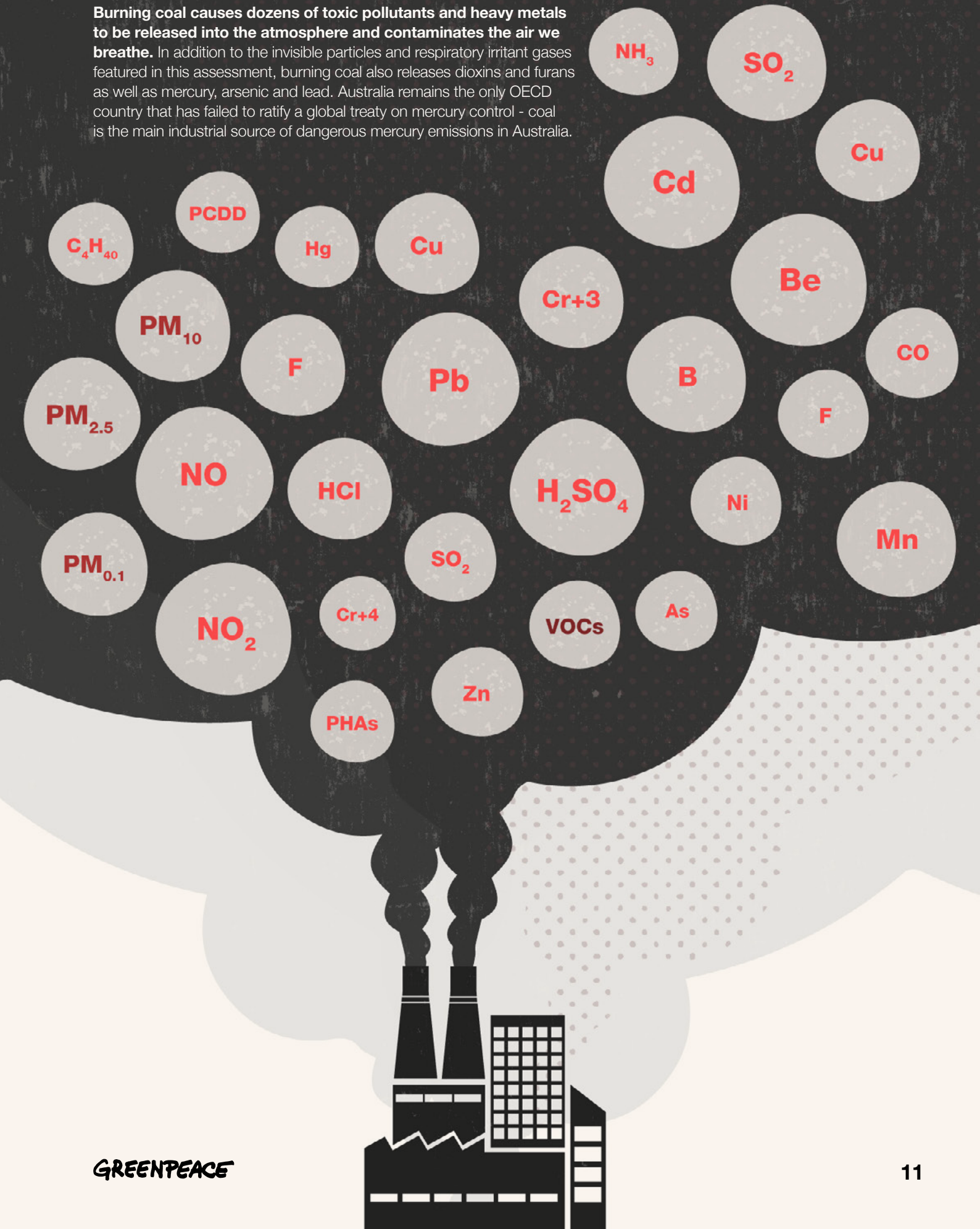


Table 4: Annual premature deaths in Australia by various causes.

Coal power station air pollution

Burning coal causes dozens of toxic pollutants and heavy metals to be released into the atmosphere and contaminates the air we breathe. In addition to the invisible particles and respiratory irritant gases featured in this assessment, burning coal also releases dioxins and furans as well as mercury, arsenic and lead. Australia remains the only OECD country that has failed to ratify a global treaty on mercury control - coal is the main industrial source of dangerous mercury emissions in Australia.





Air pollution protest
© Greenpeace/Wason Wanichakorn

Recommendations



La Trobe Valley coal-burning power station air pollution
© Greenpeace

Greenpeace Australia Pacific recommends the following measures to mitigate the health effects of pollution from coal-burning power stations.

- Develop a plan to ensure coal is completely phased out and replaced with renewable energy in the shortest possible time, with regional plans to prepare communities for economic adjustment.
- Significantly tighten emission limits in existing power stations equivalent to the lower atmospheric emission limit described by the European Industrial Emission Directive best available technique conclusions, until their closure.
- Ensure any load-based licensing or pollution fee schemes reflect the damage to human health and costs to the healthcare system caused by air pollution, to ensure these costs are no longer externalised by electricity generators.
- Conduct independent health-risk assessments for major sources of air pollution to ensure air pollution policy reflects the best available public health evidence.
- Adopt the advice of peak health organisations¹¹ on the appropriate science-based values for ambient air quality standards for sulfur dioxide, nitrogen dioxide and ozone.
- Ratify and implement the Minamata convention, the International treaty on mercury emission reduction.

Endnotes

- 1 <https://www.scribd.com/document/36842518/ATSE-Hidden-Costs-Electricity-report>
- 2 Pedersen M, Giorgis-Allemand L, et al., *Ambient air pollution and low birthweight: a European cohort study (ESCAPE)*, Nov 2013 Nov, 1(9):695-704, DOI:[10.1016/S2213-2600\(13\)70192-9](https://doi.org/10.1016/S2213-2600(13)70192-9)
- 3 Risnes, Kari R., et al. "Birthweight and mortality in adulthood: a systematic review and meta-analysis." *International journal of epidemiology* 40.3 (2011): 647-661.
- 4 *Road Deaths Australia 2018 Statistical Summary (PDF)*. Bureau of Infrastructure, Transport and Regional Economics. Department of Infrastructure and Transport. December 2018. Retrieved 23 July 2019
- 5 *Australian Transport Safety Bureau, Aviation Occurrence Statistics*, January 2018, https://www.atsb.gov.au/media/5773880/ar-2017-104_final.pdf
- 6 <http://www.sharkattackdata.com/place/australia> Last accessed 2 Dec 2019
- 7 <https://www.mja.com.au/journal/2020/213/6/unprecedented-smoke-related-health-burden-associated-2019-20-bushfires-eastern>
- 8 Ladds, MA, Magee, L, Handmer, J (2015) - AUS-DIS, *Database of losses from disasters in Australia 1967-2013*. <https://github.com/liammagee/sealand>
- 9 *Global Terrorism Index*, Institute of Economics and Peace, <http://visionofhumanity.org/indexes/terrorism-index/>, accessed 9 December 2019
- 10 <https://www.crimestats.aic.gov.au/NHMP/> accessed 2 Dec 2019.
- 11 https://d3n8a8pro7vhmx.cloudfront.net/caha/pages/36/attachments/original/1566475401/NOXSO2O3_Expert_Position_Statement_FINAL.pdf?1566475401

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