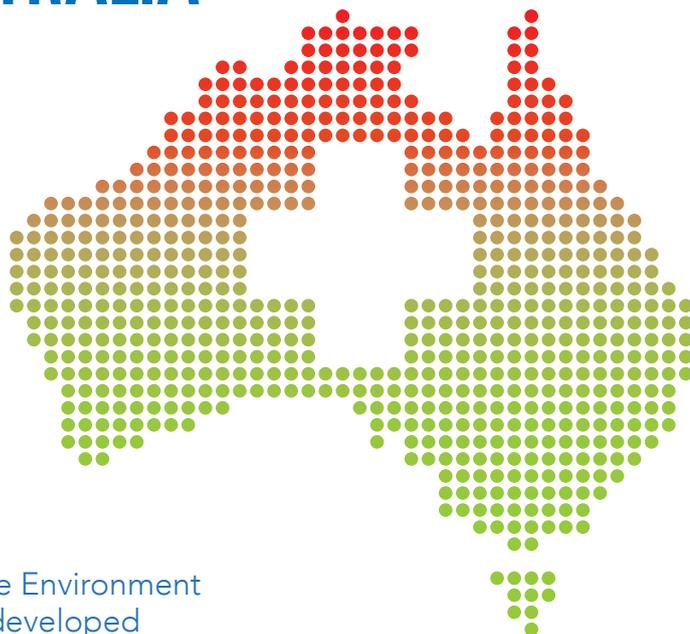


CLIMATE CHANGE & HEALTH IN AUSTRALIA

FACT SHEET



Doctors for the Environment Australia has developed this fact sheet to outline the effects of climate change on human health particularly in Australia, and how health can benefit from efforts to lessen and prevent climate change

BACKGROUND

Increasing greenhouse gas concentrations in the Earth's atmosphere are contributing to climate change. Greenhouse gases include carbon dioxide, methane, nitrous oxide and halocarbons. They are produced by fossil fuel combustion for electricity generation, as well as by the transport, mining, agricultural and land management sectors. Greenhouse gases increase the trapping of heat in the lower atmosphere, producing increases in air and sea temperature. This leads to changes in rainfall patterns, worsening extreme weather events (cyclones, floods, heatwaves, droughts and bushfires) and sea level rise through expansion of water volume and melting of ice that is on land. Increasing carbon dioxide levels also contribute to ocean acidification, with effects on marine ecosystems.

Climate change is widely regarded as the biggest threat to health in the 21st century (Costello *et al.* 2009; WHO 2015), yet the way we deal with this threat is a significant opportunity to improve health both locally and globally (Watts *et al.* 2015). Climate change affects health in many ways: directly through extreme events such as heatwaves, floods, bushfires, and indirectly via worsening air quality, changes in the patterns of infectious diseases, threats to food and water supplies, and effects on mental health.

EXTREME HEAT

In the past 50 years, average temperatures across Australia have increased, and heatwaves have become longer, hotter and more frequent (CSIRO & BOM 2014). Throughout the 21st century even longer, hotter heatwaves are expected due to climate change (Reisinger *et al.* 2014).

Heatwaves have caused more deaths in Australia over the past 100 years than any other natural event (Steffen *et al.* 2014). Recent heatwaves around Australia have caused increased hospital admissions and deaths. Exposure to prolonged high temperatures leads to higher rates of heat-related illnesses, such as dehydration, heat exhaustion, heatstroke, and worsening of existing health conditions, such as heart and kidney disease, and potentially death (Climate Commission 2011). Heatwaves put significant extra strain on healthcare and emergency services (Toloo *et al.* 2014; Wang *et al.* 2012; Turner *et al.* 2013).

Children, the elderly, people living in cities and those with pre-existing medical problems are more at risk during heatwaves. High temperatures also pose a risk to outdoor workers and those working in enclosed indoor areas; at particularly high risk are farmers, construction workers, and those working in emergency and essential services (Singh *et al.* 2013). Heat stress decreases productivity and causes significant economic loss (Kerstin *et al.* 2015).

Power outages are more common during heatwaves, causing refrigeration and air-conditioning systems to fail. Food spoilage may occur, increasing the risk of gastrointestinal infections such as Salmonella. Many medicines and vaccines must be refrigerated, and their supply may be threatened during heatwave events. Heatwaves also exacerbate drought, lead to higher levels of urban ozone air pollution, and increase the risk of bushfires. Transport services can be impacted, affecting supply chains, businesses and communities.

BUSHFIRES

Increasing temperatures, more frequent, intense and prolonged heatwaves, and declining rainfall are increasing the risk of bushfires in Australia (Reisinger *et al.* 2014; CSIRO & BOM 2014). The frequency of extreme fire weather has increased since the 1970s, particularly in south-east Australia, and the duration of the bushfire season has increased (CSIRO & BOM 2014). The risk of bushfires is expected to continue to increase with climate change, particularly in southern and eastern parts of Australia (CSIRO & BOM 2014; Reisinger *et al.* 2014).

Bushfires pose numerous risks to health. Burns, injuries and death may result directly from bushfires, while dehydration and heat exhaustion are particular risks for fire fighters. Smoke inhalation can damage the lungs and airways. Smoke may also be carried hundreds or thousands of kilometres away from the bushfire zone, affecting the health of communities across vast areas. Bushfires damage and destroy homes, infrastructure and services; health care services may be severely affected, for example due to damage to hospitals and medical centres. In Victoria in 2009, the Black Saturday bushfires resulted in 173 deaths, and 414 people presented to public hospital emergency departments in the first 72 hours after the fires (Cameron *et al.* 2009). Long-term mental health impacts on survivors can be significant. Greenhouse gas emissions from fires also contribute to our total emissions (Department of Climate Change and Energy Efficiency).



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FLOODS & STORM SURGES

The risk of severe flooding is expected to increase in many parts of Australia, due to an increase in the frequency and intensity of heavy rainfall episodes (CSIRO & BOM 2014) and sea level rise. The direct health effects of floods include drowning, injuries, hypothermia, and longer-term mental health impacts. In addition, flooding may cause damage to infrastructure such as sewerage and drinking water supply systems. Fresh water supplies may be limited, and contaminated flood waters may spread harmful bacteria and viruses, leading to an increased risk of diarrhoeal disease. After a flood, stagnant water provides a potential breeding ground for mosquitoes that may transmit diseases, while damp conditions promote mould growth which may aggravate asthma and other allergic diseases.

The 2011 Queensland floods followed an unprecedented wet season, and resulted in 33 deaths, while 3 people are still missing (Queensland Floods Commission of Inquiry 2012). The floods affected more than 78% of Queensland. People affected by the floods experienced reduced overall health and wellbeing in the months and years that followed, and were at least twice as likely to experience psychological symptoms, including those suggestive of post-traumatic stress disorder, as those not affected (Alderman et al. 2013).

CYCLONES

While the science of their development is complex, it is thought that cyclones may become more intense in some areas due to climate change (Reisinger et al. 2014; CSIRO & BOM 2014). Similar to floods, cyclones may cause injuries, drowning, deaths and damage to essential infrastructure. Outbreaks of diarrhoeal diseases, acute respiratory infections and wound infections may occur in the aftermath, and disruptions to routine medical care can cause worsening of pre-existing health conditions (Mitchell et al. 2014).

For example, severe tropical Cyclone Yasi, the largest cyclone ever to have crossed the Australian coast, hit North Queensland in February 2011 and led to a record number of presentations to the Townsville Hospital Emergency Department, and prompted the evacuation of the Cairns Base Hospital, with 356 patients, staff and relatives transferred by air to Brisbane (Little et al. 2012).

FOOD AND NUTRITION

A decline in rainfall across southern Australia has been observed in recent decades, associated with a reduction in river flows. In the southwest, average winter rainfall has declined by 17% since 1970, while a 15% decline in

late autumn and early winter rainfall has been observed in the southeast since the mid-1990s (CSIRO & BOM 2014). With ongoing climate change, further reductions in average rainfall across southern Australia are expected, with an increase in the frequency and severity of droughts (CSIRO & BOM 2014). Effects on agriculture are likely to result in reduced food production due to declining crop yields and stock losses. Bushfires, severe weather events (cyclones, flooding, heatwaves) and changing patterns of pests and diseases may also threaten and destroy food supply (Garnaut 2008).

Declining food production and resultant increasing prices threaten the availability of healthy food for Australian communities, meaning more people will be at risk of under-nutrition. In particular, healthy food may be less accessible for low income earners and those in regional and remote areas. In addition, Australia will likely be under pressure to increase food exports to other regions, particularly the Asia-Pacific, due to the negative effects of climate change on global food supply (Garnaut 2008).

INFECTIOUS DISEASES

Climate change is predicted to increase the risk of infectious disease transmission in Australia. For example, increasing temperatures and changing rainfall patterns are expected to change the patterns of mosquito-borne diseases, such as dengue fever and Ross River virus (Harley et al. 2011). Increasing temperatures may also increase the risk of food-borne infections such as bacterial gastroenteritis, due to increased growth of pathogens including *Salmonella*, *Campylobacter* and *E. coli*. Severe weather events associated with climate change can damage infrastructure essential for good health, including sewerage management and safe drinking water supply.

AIR POLLUTION

Burning of coal for electricity generation releases dangerous air pollutants, in addition to climate changing carbon dioxide; these include particulate matter, sulphur dioxide, nitrogen oxides, mercury, cadmium, and arsenic (Markandya & Wilkinson 2007). Air pollution from coal contributes to lung cancer, other lung diseases (including asthma), heart disease and stroke (WHO 2014; Mannucci 2013). Across Australia, air pollution contributes to approximately 3000 deaths per year (Begg et al. 2007); in comparison, 1209 people died on Australia's roads in 2015 (Department of Infrastructure and Regional Development 2016). The cost of health impacts from air pollution due to burning of coal in Australia is estimated to be approximately \$2.6 billion per year, placing a significant

burden on taxpayers and the health system (Biegler 2009).

Coal mine fires generate toxic emissions and pose a risk to health in nearby areas. In the Latrobe Valley in Victoria in 2014, the Hazelwood mine fire burned for 45 days, with smoke and ash spread over the town of Morwell and surrounding areas (Teague et al. 2014). Emissions produced by coal mine fires, especially particulate matter, are associated with heart disease, lung cancer, bronchitis and other medical problems (Finkelman 2004; Climate Council & Climate and Health Alliance 2014).

Urban smog contains air pollutants such as ground-level ozone. Ozone levels increase on hot sunny days, with models predicting increases with climate change (IPCC 2013). Ozone irritates airways and aggravates conditions like asthma. For example, hospitalisations in Sydney due to ozone pollution are expected to double by 2050 due to climate change (Cope et al. 2008). Air quality is also adversely affected by bushfires, with smoke containing harmful particulate matter and carbon monoxide (Johnston 2009).

ALLERGIES

Approximately 1 in 5 Australians has an allergic disease, (ASCI 2013) and 1 in 10 suffer from asthma (AIHW 2011). Asthma and other allergic diseases have a major impact on physical health and quality of life, affecting work, school, social activities and psychological health. Common asthma triggers include plant pollens and fungal spores, with both influenced by climatic and meteorological factors. Warmer temperatures and increasing levels of carbon dioxide in the atmosphere can increase the production, potency and release of allergens such as pollens and spores, aggravating allergic diseases including asthma (Beggs & Bambrick 2005; Blando et al. 2012). Changes to wind and rainfall patterns caused by climate change may also affect allergen production and distribution.

Asthma is also aggravated by air pollutants such as nitrogen oxides, sulphur dioxide, ozone and particulate matter. Exposure to air pollutants may contribute to the development of asthma in children, and nitrogen dioxide exposure has been associated with increased childhood wheezing and asthma medication use (Gauderman et al. 2005).

MENTAL HEALTH

Aside from its effects on physical health, climate change may adversely affect the mental health of many people in Australia. Extreme events such as cyclones, floods, droughts and bushfires cause psychological distress due to trauma, illness, loss of loved ones, destruction of property and disruption

of communities. Displacement causes significant distress, as does the disruption of goods and services, and uncertainty regarding employment, education and the risk of further natural disasters. Depression, anxiety and post-traumatic stress disorders may occur as a result, with major long term effects on personal, family and community function.

Previous events have demonstrated the potential effects of climate change on mental health. Children surveyed six months after the 2003 Canberra bushfires, which destroyed 500 homes, showed much higher rates of behavioural and emotional problems compared to the baseline rate in Australia, with nearly half showing symptoms of post-traumatic stress disorder (McDermott et al. 2005). After Cyclone Yasi, the prescription of antidepressant drugs increased in affected areas, suggesting an increase in psychosocial distress in those communities (Usher et al. 2012). Long term events such as prolonged droughts also have a negative effect on mental health, particularly in farming communities. The more severe the drought, the worse the effects on mental health and wellbeing (Edwards et al. 2014).

VULNERABLE GROUPS

Some groups of people are more vulnerable to the effects of climate change on health.

Children are particularly vulnerable for numerous reasons. For example, they have immature immune systems, putting them at increased risk of infections, and are more susceptible to heat stress and dehydration. In addition, their rapid growth and development means harmful exposures in childhood may have severe long term effects.

Elderly people and those with pre-existing medical conditions are more prone to dehydration, heat stress and exacerbations of heart and lung disease, particularly when routine health services are disrupted by extreme events such as heatwaves and bushfires.

Pregnant women are at increased risk of heat stress during heatwaves due to the physiological demands of pregnancy, and hot weather during pregnancy increases the risk of babies being underweight at birth (Greenstone et al. 2013).

People living in rural and remote areas, and Aboriginal and Torres Strait Islander people are also at increased risk, in part due to their higher levels of underlying disease and limited access to health care services.

WHAT CAN BE DONE?

The recent acceptance of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC) has emphasised

the need for urgent and substantial reductions in greenhouse gas emissions to limit temperature increases to less than 2°C, whilst highlighting the inadequacy of current emissions reduction targets and the risks of unchecked climate change.

To reduce risks to human health, further climate change must be minimised. In particular, the burning of fossil fuels must be phased out; it is estimated that 80% of the world's known fossil fuel reserves must be left in the ground, including vast known reserves in Australia, to limit global warming to 2°C (The Climate Institute 2013). Importantly, Australian coal-fired power stations are among the least carbon-efficient in the developed world, producing approximately 60% more carbon dioxide than those in the USA, and more than double that produced by power stations in Europe (Kennedy 2015). Furthermore, while it is essential that we move to decarbonise our electricity sector, greenhouse gas emissions from Australia's fossil fuel exports significantly exceed those from electricity generation in Australia. Presently these export emissions are not included in Australia's greenhouse gas inventory. Australia could manage exported emissions through consideration of the impact of resulting climate change in the approval process for both the mining and exporting of coal and gas (Haverd et al. 2013).

Australia needs to reduce unnecessary consumption and continue urgently transitioning to renewable energy sources like solar and wind, instead of relying on coal, oil and gas. This switch is economically and technologically feasible, but there is a need for robust political commitment to halt new coal mine development, ensure the decommissioning of existing coal mines and support the transition to renewable energy (Watts et al. 2015). We also need stronger regulation of air quality in Australia, to better limit emissions of harmful particulate matter and gases. Protecting forests and other ecosystems is also essential to further reduce greenhouse gas emissions; deforestation accounts for a significant proportion of Australia's greenhouse gas emissions (Australian Government Department of the Environment 2015), and rates of land clearing are increasing in many parts of the country, particularly in Queensland and New South Wales (The Wilderness Society 2015).

Individuals, communities and governments need to increase their use of active transport (cycling, walking and public transport) to reduce vehicular greenhouse gas emissions, and avoid unnecessary air travel. Dietary changes are also important; the agricultural sector is a major contributor to greenhouse gas emissions, and reducing our consumption of processed foods,

red meat and dairy products will help to combat climate change (O'Mara 2011).

While mitigation of climate change by reducing greenhouse gas emissions is essential, we must also seek to adapt to changing climate conditions in anticipation of their likely effects on health. In particular, health systems and services must be adequately resourced and prepared to cope with the health effects of climate change. Potential effects on housing, essential services, community function and the economy must also be considered, to ensure that all members of society have the opportunity for good health and wellbeing (Selvey 2015; Watts et al. 2015).

HEALTH AND CLIMATE.WIN:WINS

Aside from reductions in greenhouse gas emissions, there are numerous immediate and lasting health 'co-benefits' to be gained by action to limit climate change. Reducing our use of fossil fuels (particularly coal) will help to improve air quality, through reductions in particulate matter and other air pollutants. This will help to reduce rates of lung cancer, other lung diseases, heart disease and stroke. Reducing our reliance on private vehicles, and increasing our use of 'active transport' (walking, cycling and public transport) can make urban spaces more attractive and help to reduce rates of obesity, diabetes, heart disease, some cancers, and many musculoskeletal conditions. Reduced consumption of red meat can also reduce heart disease and cancer risk, particularly bowel cancer (Smolińska & Paluszkiwicz 2010). Protecting forests and natural ecosystems helps reduce atmospheric carbon dioxide levels by sequestering carbon, improves air and water quality, supports biodiversity, and promotes mental health and well-being by supporting human connections with the environment. The greening of urban areas decreases the heat island effect, reducing the need for air conditioning and improving the quality of urban life. These benefits are not only important for public health, but also help to reduce demands on the health system.

MORE INFORMATION

For more information about climate change and health, visit:

- Doctors for the Environment Australia
<http://dea.org.au/>
- Climate Council
<https://www.climatecouncil.org.au/>
- Intergovernmental Panel on Climate Change
<http://www.ipcc.ch/>
- 2015 Lancet Commission on Health and Climate Change
[http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736\(15\)60854-6.pdf](http://www.thelancet.com/pdfs/journals/lancet/PIIS0140-6736(15)60854-6.pdf)

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