



CLIMATE^{AND}
HEALTH
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Climate Change is a Health Issue

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1. Introduction

Climate change is the greatest threat to human health of the 21st century (Watts et al, 2015).

There are clear human, ethical, environmental and economic justifications for climate change action and there is an urgency for immediate action (McCoy et al, 2014; Tait, 2014; DARA, 2012). The timing of climate change action is the most influential factor in our success to limit global warming. The sooner we act, the better our chances of success (Hatfield-Dodds, 2013) and the longer we postpone, the more drastic action will be required (European Commission, 2016; Watts et al, 2017).

2. Health effects of climate change

There are many immediate, medium and long-term health effects of climate change, which are already being felt by many Australians (RACP, 2016; Armstrong & Tait, 2014) (Table 1).

Climate change threatens the health and wellbeing of the population through:

- increased frequency, intensity and duration of extreme weather events;
- increased air pollution and airborne allergens;
- increased prevalence of food, water and vector-borne pathogens;
- reduced availability of food and fresh water;
- sea level rise;
- loss of biodiversity; loss of inhabitable land;
- dislocation; forced migration; loss of homelands and familiar landscapes; economic hardship, and increased conflict (Watts et al, 2015/16; Bowles et al, 2015).

These contribute to an increased risk of infectious diseases, cardiovascular disease, respiratory disease, asthma, allergies, mental illness, psychosocial impacts, violence, poor nutrition, injury, poisoning and mortality (Watts et al, 2015; Krishnamurthy, 2014; IPCC, 2013; Berry et al, 2008; Clayton et al., 2017). As a result, health care services are adversely affected, often impacting more severely those living in rural and remote areas who may already have increased risk of ill health because of limited access to services. (Smith et al, 2014).

In Australia, health care services have experienced dramatic increases in service demand from climate change -related extreme weather events including heatwaves, storms, floods and fires (Carthey et al, 2009; Victorian Department of Human Services, 2009; ABC News, 2017; Loosemore and Chand, 2017; Green et al, 2017).

Table 1: Current and projected impacts of climate change on public health and health systems in Australia

EXTREME WEATHER EVENTS	Increased intensity, duration and frequency of extreme weather events such as floods, storms and heatwaves, are placing increasing pressure on health services and infrastructure and putting more Australians at risk of illness, death and post-traumatic stress. (Australian Academy of Science 2015, Australian Government 2013, Dupont 2009, Hughes 2016)
INFECTIOUS DISEASES	A warmer climate and changing rainfall patterns will increase the range and prevalence of food, water and vector-borne diseases such as dengue fever (which is expected to reach northern NSW by 2100), parasitic (zoonotic) diseases, and the prevalence of illnesses resulting from exposure to pathogens. (Dupont 2009, Hall 2011, Harley 2011, Spickett 2011)
FOOD AND WATER SECURITY	Changes in prevailing weather patterns may threaten the security and quality of water sources and the productivity of major agricultural regions in Australia, with implications for ensuring food and water security for a growing population (Dupont 2009, Harley 2011, Barrie 2015, Hughes 2015)
OCCUPATIONAL HEALTH IMPACTS	Hotter temperatures place outdoor and manual labourers at increased risk of heat related illnesses, work accidents and death, while the increased incidence of extreme weather events increases occupational risks for emergency services (Kjellstrom 2016, Maloney 2011, Wilks 2006)
MENTAL ILLNESS AND PSYCHOSOCIAL IMPACTS	Ongoing environmental change and more frequent and severe weather events, combined with the social and economic impacts of climate change, increase the risk that Australians will experience mental illness and psychosocial problems like stress, violence, economic insecurity, loss of identity, social dislocation. (Fritze 2008, Barrie 2015, Hughes 2015, Bourque 2014, Hanigan 2012, Parkinson 2015, Clayton et al., 2017)
AEROALLERGENS AND AIR POLLUTION	Increases in atmospheric temperatures may lengthen the pollen season and alter chemical reactions of some air pollutants such as ozone and particulate matter, increasing exposure to aeroallergens and aggravating conditions such as allergic rhinitis, as well as heart and lung conditions including asthma, while increasing the risk of mortality. (Barrie 2015, Beggs 2011, Beggs 2005, Broome 2015, Mateal 2012; Maxwell, 2017)
VULNERABLE POPULATIONS	Vulnerable populations will suffer disproportionately the adverse health impacts of climate change in Australia, with people with pre-existing medical conditions, older people, young, disabled, socioeconomically disadvantaged people, and Indigenous Australians identified as being particularly vulnerable. Climate change places undue burden on those least responsible and least able to respond. Women and children are at greater risk from climate-related disasters and more women than men die in disasters (AWHN, 2014). (Australian Academy of Science 2015, Bambrick 2008, Hughes 2016, Hall 2011, Dupont 2009, Bourque 2014, Parkinson 2015, 2017, Hansen 2013, Liu 2015)

Source: Horsburgh et al. *Framework for a National Strategy on Climate, Health and Well-being for Australia*. Climate and Health Alliance (CAHA), June 2017.

3. Who will be affected?

Although developing countries are the most affected by climate change (DARA, 2012), Australians are not immune, with the impacts of climate change already being felt (RACP, 2016; Armstrong & Tait, 2014).

The risks of climate change to health are amplified by social and environmental factors, placing our most vulnerable communities at greatest risk (Watts et al 2017). This includes the poor, elderly, women, young children, Indigenous, people with disabilities, homeless and marginalized people, those living in rural and remote areas, and those working in heavy

labour occupations or in humid, poorly ventilated conditions (Kjellstrom et al, 2016; Watts et al, 2015; Berry et al, 2008; Bi & Parton, 2008).

The degree of vulnerability will vary for these groups but are considered in the context of three major determinants:

- exposure;
- sensitivity or susceptibility;
- and adaptive capacity or resilience (Gamble & Balbus, 2016).

In accordance with the Paris Agreement, action to address climate change will be enhanced by attention to gender. Health outcomes can be improved through awareness of the differential impacts on men and women of climate change (Parkinson, 2017).

4. The human and economic costs

The predicted human health and economic costs of climate change are significant and unsustainable (Watts et al, 2015; Watts et al 2017).

Climate change is already responsible for 400,000 deaths globally each year, together with the carbon economy amounting to 5 million deaths. By 2030 this is projected to increase to a total of 6 million deaths per year, 600,000 of which will be attributable to climate change (DARA report, 2012).

The total value of economic losses resulting from climate related events has been increasing since 1990, with losses of about \$700 billion dollars in 2010 and together with losses of the carbon-intensive economy, this amounts to more than 1.2 trillion dollars (DARA report, 2012). In 2016 alone, 797 events further resulted in a total of \$129 billion dollars (USD) in overall economic losses, with 99% of losses in uninsured low income countries (Watts et al 2017). In Australia, conservative estimates of the human health costs from burning fossil fuels is \$AUS 6 billion annually (Climate and Health Alliance, 2014; Armstrong, 2012; Biegler et al, 2009).

Direct costs of six climate change-related extreme weather events that occurred in the United States between 2000 and 2009 resulted in costs to the health system in excess of \$14 billion and included 1,689 premature deaths, 8,992 hospitalisations, 21,113 emergency department visits and 743,398 outpatient visits, (Knowlton et al, 2011). Note these estimates do not include all of the indirect health costs, infrastructure and social costs that would have resulted from these events (Knowlton et al, 2011). The social costs of natural disasters equal the more traditionally defined economic costs – and are sometimes even higher (Deloitte Access Economics, 2016). The long-term economic cost of natural disasters may be underestimated by more than 50%.

Women bear a disproportionate human cost associated with climate change. As primary carer-givers, and comprising 70% of the world's poor, many of whom are dependent for their livelihood on natural resources, women are particularly vulnerable to climate change and natural disasters (UN WomenWatch, 2009). There is growing evidence that violence against women increases after natural disasters (Parkinson, 2017).

5. The health and economic benefits of tackling climate change

There is strong evidence and global recognition that action against climate change is necessary to protect and promote the health and wellbeing of the population (Watts et al, 2017).

Mitigating climate change can not only reduce health risks and environmental harm, thus avoiding or mitigating against predicted impacts, but can improve health and wellbeing and reduce health care costs (Watts et al, 2016, 2017; RACP, 2016; DARA, 2012; Maibach et al, 2010; Haines et al, 2009).

Health co-benefits should inform the development of climate change mitigation policies and strategies. Such mitigation strategies may also be felt in the near term whereas other benefits may take longer to be observed (Watts et al, 2016; EPA, 2015). For example, improving air quality can result in local and short-term health benefits (West et al, 2013).

Tackling climate change not only results in savings for the health sector (McCoy et al, 2014) but provides net economic benefits across multiple sectors (Global Commission on the Economy and Climate, 2015; EPA, 2015; Watts et al, 2015, 2017; Resutek, 2014; Thompson et al, 2014; DARA, 2012). In Europe, estimated annual benefits as a result of climate change mitigation through reduced air pollution and associated mortality and health care costs is €17-38 billion by 2050, with additional annual savings on air pollution control measures nearly € 50 billion (Watts et al, 2015, 2017; European Commission, 2011). In the US, GHGE reduction strategies are estimated to provide an annual economic benefit between \$6 and \$30 billion (USD) in 2020 (Balbus et al, 2014).

The most ambitious action for emissions reduction generates economic benefits well beyond any mitigation costs outlaid (DARA report, 2012; Watts et al, 2017). A national cap and trade program was found to result in larger net economic benefits than policies targeting certain sectors such as electricity and transport sectors, with savings from avoided ill health returning up to 10.5 times the cost of implementation (Thompson et al, 2014).

6. Climate change action

An effective response by nations and their governments to climate change has the potential to significantly reduce the health costs faced in the next decade and the coming century and will require exceptional governance and coordination of a comprehensive set of policies and strategies across varied government levels and sectors (CAHA, 2014; DARA, 2012).

There are many emissions reductions measures that can result in substantive health benefits (Table 2). These include:

- a shift from carbon-intensive (coal) to low-carbon (solar and wind) energy sources in the transport, agriculture and energy sectors;
- improving design and energy efficiency in buildings;

- shifting modes of transport from private vehicles to forms of active transport through new and modified infrastructure;
- reducing consumption of animal products, specifically red and processed meats; and protecting our natural ecosystems (Watts et al, 2015).

Table 2: Health co-benefits of climate change action

Action on climate change	Impact on the environment	Impact on human health & wellbeing
Shift from carbon-intensive to low-carbon energy sources: target transport, agriculture and the energy sectors	Reduced GHGE and improved air quality	Reduced incidence of cardiovascular disease, respiratory disease, asthma and lung cancer
Improve the design and thermal efficiency of residential and commercial buildings	Reduced GHGE, improved air quality and reduced spread of vector-borne disease	Reduced cold and heat-related illnesses and vector-borne disease
Shift from private cars to forms of public and active transport such as walking and cycling	Reduced GHGE and improved air quality	Reduced asthma, chronic obstructive pulmonary disease, cancer and cardiovascular disease; Increased physical activity, contributing to reduced risk of cardiovascular disease, diabetes, certain cancers, overweight & obesity, dementia and improved mental wellbeing
Reduce consumption of red and processed meat and increase consumption of plant-based foods	Reduced GHGE from livestock production	Reduced incidence of cardiovascular disease, diabetes and some cancers
Protect and restore natural ecosystems by maintaining forests and reducing land clearing	Sustained biodiversity, air and water quality, carbon stored in the landscape	Mental health benefits, reduced spread of disease

Sources: RACP, 2016; Watts et al, 2015, 2017; McCoy et al, 2014; Haines & Dora, 2012.

Electricity is one of the largest drivers of climate change, with the current energy sector accounting for 75% of Australia's Greenhouse Gas Emissions (GHGE), consequently our current reliance on fossil fuel generated power is resulting in a large burden of disease and mortality (Jensen et al, 2016; Armstrong & Tait, 2014). We need to phase out fossil fuels as quickly as possible, by mid-century at the latest, in order to achieve targets to stay below a two degree temperature increase (Jensen et al, 2016) and avoid the potentially catastrophic risk to human health (Watts et al, 2015). A large shift to low-carbon technologies is required, which is feasible and affordable but requires significant initial investment and innovation (European Commission, 2016; Watts et al, 2015; The New Climate Economy, 2014) with incentives, policy support and political will (Watts et al, 2015).

Carbon pricing mechanisms are regarded as the most cost-effective policy option for transitioning towards zero GHG emissions, and widely supported by climate and energy experts, economists and Australian businesses (Climate and Health Alliance, 2014). In Australia, wind power is now cheaper than power supplied by coal or gas (Bullard et al, 2013), and in many parts of the world, solar power is now also cheaper than fossil fuels (Sioshansi, 2017).

7. A Call for Action

Public support for stronger climate change action is necessary and concern about the impacts of climate change and support for action is increasing (Watts et al 2017).

The majority of Australians believe that Australia should be a global leader in tackling climate change, and recognise the economic benefits in taking action¹ (The Climate Institute, 2016). There is now overwhelming support for renewable energy sources (Armstrong et al, 2014). Health is consistently a top priority issue for Australians and climate change, and when presented in a public health context becomes more personally relevant (Maibach et al, 2010).

The Australian government's current emission reduction targets are inadequate and not in line with other developed countries (Marmot, 2016; The Climate Institute, 2015). Australia is well behind other industrialised countries in protecting the health and wellbeing of its population from climate change (Chand et al, 2015).

Australian public health professionals have highlighted the urgency of climate change mitigation to protect the health of the population and are calling on the Australian government to provide leadership, coordination and support to take more immediate and stronger action on climate change (RACP, 2016; CAHA, 2016; Butler et al, 2015; Tait et al, 2014; Armstrong et al, 2012).

Investment in research, surveillance and monitoring of climate change and public health is needed to build understanding of the needs for adaptation and potential health co-benefits of mitigation strategies (Watts et al, 2016, 2017; Green et al, 2017).

Climate change is a health issue for Australians right now, and we must move urgently to protect our own population from further adverse effects by committing to substantial and rapid emissions reductions. This is an important risk management strategy against the increase of catastrophic health and environmental effects of climate change and is vital for protecting human health and wellbeing.

Without urgent action on climate change, the conditions that underpin the health and well-being of the human population will be greatly diminished in coming decades and may only be available to a small number of people living in a few parts of the planet by the end of this century.

Foreword by Prof Peter Doherty. Nobel Laureate for Medicine (Horsburgh et al, 2017).

¹ Taking action on climate change can also provide important psychological protection for people, helping them to feel more in control, more hopeful and more resilient.

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