



CLIMATE^{AND}
HEALTH
ALLIANCE

SUBMISSION

TO

**SENATE STANDING COMMITTEE ON ENVIRONMENT
AND COMMUNICATIONS**

**INQUIRY INTO RECENT TRENDS IN AND
PREPAREDNESS FOR EXTREME WEATHER EVENTS**

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About the Climate and Health Alliance

The Climate and Health Alliance (CAHA) is a not-for-profit organisation that is a national alliance of organisations and people in the health sector working together to raise awareness about the health risks of climate change and the health benefits of emissions reductions.

CAHA's members recognise that health care stakeholders have a particular responsibility to the community in advocating for public policy that will promote and protect human health. The membership of the Climate and Health Alliance includes a broad cross section of the health sector with 26 organisational members, representing health care professionals from a range of disciplines, health care service providers, institutions, academics, researchers, and health consumers.

For more information about the membership and governance of the Climate and Health Alliance, please see Appendix A. For further information see www.caha.org.au

Overview

There are serious implications for human health and wellbeing and safety from extreme weather events. Australians are already experiencing severe impacts from extremely dangerous and deadly weather events from relatively modest levels of global warming; warming that is anticipated to increase four-fold in the coming decades which is likely to create unprecedented conditions for our living environment, the parameters of which are beyond human experience.

Australians are neither prepared for, nor informed about, the dangers of the warming climate and the severity and scale of extreme events they are likely to experience in coming years and decades. The unprecedented national heatwave of January 2013, floods of 2011, wild weather of 2012, and bushfires of 2009 give an insight into the weather of a warming world. It is a world that may become increasingly dangerous in coming years, intolerable in coming decades and uninhabitable in coming centuries.

Australia healthcare systems are ill-prepared to cope with extreme events and Australia's health professionals lack understanding of the health impacts of climate change. This affects the ability of both individuals and the health care system to prepare for and respond to extreme weather events. This puts lives at risk – not only the lives of those already threatened by climate change eg people who are chronically and/or mentally ill, elderly, homeless and infants and children – but of all Australians, as we are all vulnerable to extreme weather events.

Key points

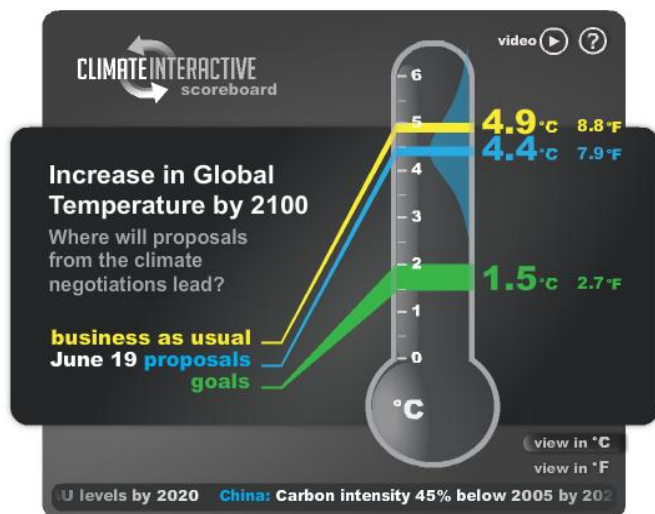
- Human induced climate change is contributing to increases in the frequency and severity of extreme weather events.
- Extreme weather is threatening the lives and health of all Australians, but particularly those in rural and remote areas, those who are disadvantaged, poor, unwell, disabled, homeless, elderly, or very young, and those who are highly exposed.
- The future impacts on health and wellbeing will continue to escalate as global warming increases and climate change contributes to more frequent and more severe weather events.
- Health is and will continue to be harmed primarily by lack of mitigation, but is also at risk from a lack of investment in preparation at the community and health service sector, and capacity building in response and recovery.
- The ability of the health sector to respond is compromised and there is an urgent need to improve the capacity of the health sector to manage future demand for services.
- A national plan must be developed to protect health from climate change, including from extreme weather events, and implemented in cooperation with state, territory and local governments, civil society and community organisations and businesses.
- As a national priority, and with the substantive response that a threat to national and global security demands, urgent action must be taken to reduce national greenhouse gas emissions in order for Australia to assume its fair share of the global responsibility to reduce emissions in order to arrest further climate change.
- Despite growing awareness among many Australians about the links between climate change and extreme weather events, the lack of understanding of the scope and scale of implications for human health, and for all aspects of our economy and society, is cause for serious concern and should be addressed by the development of national programs to raise awareness about climate impacts and to encourage emissions reductions.
- Given the serious and underestimated impacts on human health and wellbeing from extreme weather events, as well as the serious implications associated with the degree of unpreparedness in the Australian health system to respond, the Climate and Health Alliance calls on the Committee to host public hearings in each state and territory on health and extreme weather events to allow health professionals and health services and local communities to provide input to this Inquiry.

Climate change poses serious risks to health

The international medical journal *The Lancet* in May 2009 described climate change as the biggest global health threat of the 21st century. Since then, it has become apparent that climate change is already posing serious and immediate threats to the health and wellbeing of the Australian and global population, with grave implications for the medium to long term.

Average global temperature has increased almost 1°C over the last century.¹ The current global emissions trajectory is likely to deliver in excess of four degrees global average temperature rise by 2100, a scenario described in the 2012 World Bank report 'Turn Down the Heat' as one that would "vastly exceed the consequences experienced to date and potentially exceed the adaptive capacities of many societies and natural systems".²

Climate Interactive: Likely global average temperature increases by 2100 (as at 19 June 2012)



This would be a world of “unprecedented heatwaves, severe drought, and major floods in many regions, with serious impacts on human systems, ecosystems, and associated services”³ and “will likely lead to increased mortality and species extinction”⁴.

It would also transition the world’s ecosystems into “a state unknown in human experience”, according to the producers of the World Bank’s report, the Potsdam Institute for Climate Impact Research and Climate Analytics.⁵

Even a 2°C global average temperature rise is considered to pose “unacceptable risks to key natural and human systems, including significant loss of species, major reductions in food-production capacity in developing countries, severe water stress for hundreds of millions of people, and significant sea-level rise and coastal flooding”.⁶

The [recent DARA report](#) on the human and economic costs of climate change, estimates that climate change is already costing the global economy \$1.2 trillion annually and is responsible for 400,000 deaths each year.⁷ These figures are expected to rise exponentially, with climate change costing \$2.4 trillion annually, or 3.2% of GDP in net average global losses by 2030.⁸

The report, [Cold Calculus for a Hot Planet](#), commissioned by 20 governments, finds that the world's poorest communities are being the hardest hit, with average GDP losses of 8% in 2030, but every country in the world is affected, or as the report says: "not one country in the world is left unharmed".

It is extremely important to note here however that while these numbers are extremely, even shockingly high, the DARA report only includes *incremental impacts* as a result of climate change, and *does not include in any way* the "catastrophic impacts that could occur due to more rapid climate change fuelled by feedbacks such as a release of Arctic methane deposits, more rapid sea-level rise that could result from the disintegration of the West Antarctic Ice Sheet or large-scale climatic disruptions such as the collapse of ocean circulation mechanisms, all of which are understood to pose significantly larger human, economic and ecological risks".

Anthropogenic global warming is causing climate change and contributing to increases in the severity and frequency of extreme weather events that pose serious health risks to all Australians and all people around the world.⁹

Leading climatologist Kevin Trenberth succinctly outlined the relationship between global warming and extreme weather in a 2012 paper published in *Climatic Change*:

"all weather events are affected by climate change because the environment in which they occur is warmer and moister than it used to be".

Trenberth, Climatic Change, 2012

The risks posed by the increasing frequency and severity of extreme weather events such as heatwaves, fires, floods and storms and the injuries, deaths and trauma cause physical, emotional, and financial harm, and leave a legacy of health disadvantage for those affected, and their communities.

Extreme weather also increases other health risks, such as increased incidence of food and water-borne diseases associated with heatwaves and flooding. Rising temperatures lead to increased harmful air pollution and aeroallergens leading to increases in respiratory illnesses even among young healthy people; the changing climate affects food and water security; there are increased risks from vector borne diseases; and psychological impacts from a changing environment, ranging from solastalgia from a loss of the familiar natural environment to anxiety about the societal failure to respond, to bereavement, injury, displacement associated with extreme events.

In addition to the risk of death, and delayed – yet premature mortality, heatwaves can exacerbate mental illness, worsen chronic illnesses, and lead to increases in domestic violence and violent crime.

Health services are placed under increasing pressure during extreme events; supply chains of pharmaceutical and medical equipment can be disrupted; and health professionals and emergency professionals are impacted personally, limiting their ability to respond.

Children, the elderly, Indigenous Australians, people who are already unwell and those in coastal as well as rural, remote and regional communities are being disproportionately affected and are expected to continue to be severely impacted. Extreme events widen the gap of disadvantage.

Children are particularly vulnerable to the toxic effects of stress associated with extreme weather events.¹⁰ Increased exposure to trauma and stress can affect children's brain development and mental health – for example, children who experienced the severe bushfires in Canberra in 2003 showed much higher rates of emotional problems six months later and nearly half of those surveyed had elevated symptoms of post-traumatic stress disorder.

Prolonged exposure to adverse weather conditions is associated with increased child and adolescent psychological distress over time. As extreme weather events damage or alter familiar environments, both children and adults experience place-based distress (known as solastalgia) at the destruction of their home or familiar surroundings.¹¹

Severe storms, flooding, heatwaves, droughts and bushfires cause severe disruption to people's lives, damage to property and livelihoods, and disruption to services. In addition, increased demand on already overburdened health care systems may reach a point that they may not be able to cope, with the collapse of services leading to communities fracturing, and causing permanent dislocation and abandonment.¹²

Extreme weather around the world

Anthropogenic global warming has led to increases in the severity and frequency of extreme weather events around the world.¹³ The types of extreme weather events occurring in recent decades include increases in extreme heatwaves, intense rainfall, and drought.

“Heat waves are longer and hotter. Heavy rains and flooding are more frequent. In a wide swing between extremes, drought, too, is more intense and more widespread.”

Climate Communication Science and Outreach, September 2011

In 2010, 19 countries set new national high-temperature records.¹⁴ Almost 900 weather and climate-related disasters that year resulted in 68,000 deaths and caused \$99 billion in damages.¹⁵ Sixty-five percent of the economic damages from all disasters in 2010 were related to extreme weather events (i.e. high winds, flooding, heavy snowfall, heat waves, droughts, and bushfires.)¹⁶

Five countries set heat records in 2012.¹⁷ In the US, 2012 saw its hottest month in record-keeping history in July, and more than 69,000 local heat records were set.¹⁸ A temperature spike of eight degrees above normal in Russia in 2010 led to 56,000 deaths. A severe heat event in Europe in 2003 is estimated to have cost US\$15 billion in damages.¹⁹

Predictions of future extreme weather events by the Intergovernmental Panel on Climate Change in 2012 indicates Australia will see large scale increases in days over 35°C or 40°C, with heat wave events likely to become more frequent and persist for longer.²⁰ Extreme rainfall is expected to increase, while drought will be longer and more intense. Extreme fire danger days will increase. There may be fewer cyclones, but they are likely to be stronger and cause more damage. As sea levels continue to rise, the extent of coastal erosion causing inundation from storm surges will increase.

Effects of extreme weather events

Extreme weather events lead to many and wide-ranging impacts on people, businesses, community services, economic productivity and the natural environment.

Bushfires

Bushfires cause injuries and fatalities, and lead to people losing their homes and businesses, and communities losing schools and other services, such as healthcare. Bushfires also kill and injure animals; destroy homes and livelihoods; cause loss of commercial property; damage farms and fences and kill livestock; discourage tourism; harm air, water, and soil quality; destroy forests and ecosystems; and cause biodiversity loss.

Bushfires also expose people to toxic smoke, particulate matter, and increased levels of ground level ozone exposure to which can cause respiratory illness and deaths.²¹

Inhalation of smoke from bushfires can cause chemical lung injuries and inflammation and lead to respiratory distress, which Northern Rivers University Department of Rural Health researcher Geoff Morgan describes as a “leading cause of death in burns units”.²² The Black Saturday Bushfires alone caused 173 deaths with an additional 414 patients presenting to emergency departments with fire related injuries and over 2000 homes destroyed.²³

There is also longer term health issues associated with bushfires. The 1983 Ash Wednesday fires were associated with subsequent increased general illness, significant increases in alcohol and drug abuse and an almost 300% increase in mental illness.²⁴ Professional and volunteer fire fighters and other emergency services personnel are being exposed to unprecedented, and likely worsening levels of physical and psychological stress and danger.

Heatwaves

Extreme heat can significantly affect people's health. The January 2009 South Eastern Australia heatwave had profound effects on population health. In Victoria 374 excess deaths were recorded, representing a 62% increase in overall mortality from 26th January to the 1st February compared to the average over the same week from 2004 - 2008. The state's health system also had to manage dramatically higher demands on services with a 25% increase in emergency ambulance cases and 12% increase in emergency department presentations. During the 2003 European Summer over 70-000 excess deaths were recorded compared to the average of 1998-2002.²⁵

People are particularly vulnerable particularly if they are unable to reduce, or easily moderate their own exposure.²⁶ This applies to people who are elderly, infants, those with existing illnesses, as well as those who work outdoors.²⁷ People who are homeless may be especially vulnerable as they often lack access to basic essentials including water, cool spaces and support services. People experiencing homelessness are often socially isolated and experience inadequate support from overburdened services.²⁸ Among the latter group for example, in addition to direct and immediate health impacts, there are implications for long term health associated with increases in the frequency and intensity of extreme heat events, and personal income. On a broader level there are implications for societal productivity, with economic impacts and social impacts associated with loss of goods and/or services.

Loss of power supply associated with extreme weather events can pose health risks. If a power outage occurs during a heatwave, it substantially increases the risk of people dying. Loss of power is also associated with an increase in accidents; but can also lead to the loss of vital telephone and communications equipment necessary for information sharing during extreme events.²⁹

Heatwaves claim more lives in Australia than any other natural hazard.³⁰ People's vulnerability to extreme heat varies according to the temperatures with which people are generally familiar - this significantly influences people's ability to adjust to changes to usual weather conditions.³¹

Extreme heat can trigger acute health conditions as well as worsen existing health problems.³² In addition to the elderly and infants, those with chronic medical conditions, such as heart and pulmonary disease, diabetes, alcoholism, spinal-cord injuries, and mental illness are particularly vulnerable.³³ Heat stress and heat exhaustion are serious conditions and can lead to heat stroke which can be fatal. Dehydration can also lead to serious health consequences - and can lead to heart attacks, worsen kidney disease, exacerbate mental illness³⁴ and adversely affect those taking medication.

Climate researcher Corey Watts wrote recently in regard to the 2013 national record heatwave about the human impacts of extreme heat that are less often considered.

“In a heat wave, people quickly become grumpier, more strained. Tempers flare. Thinking and concentration are impaired. We tire and snap and snarl more easily. Normal road rage is amplified. Domestic disputes turn nasty more easily. This has costs and consequences: it ties up law enforcement, hospitals, and other critical services.”³⁵

Population health researchers Banwell, Dixon, Bambrick, Edwards, and Kjellstrom concur that extreme heat, compounded by other factors, can lead to: “increasing mental stress, depression, and suicide”, and trigger “irritability and risky behaviours such as excessive alcohol consumption, violence, and aggression.”³⁶

Heatwaves also lead to increase in the incidence of food-borne illnesses, as bacteria such as Salmonella thrive in higher temperatures.³⁷

In 2009, Victoria experienced temperatures between 12-15 degrees above the average. That single heatwave saw a 62% increase in mortality, from both direct heat related illnesses and associated exacerbations of chronic medical conditions. The Victorian Department of Human Services reported that during this five day event, ambulances had a 46% increase in demand; emergency departments experienced an eight-fold increase in heat related presentations; a 2.8 fold increase in cardiac arrests; and a threefold increase in patients dead on arrival.

Storms and flooding

Extreme rainfall and cyclones can cause direct fatalities and injuries as well as lead to further injuries associated with accidents during the clean-up of flood waters.³⁸

Floods and cyclones disrupt normal services and can severely affect health care services: the 2011 Qld floods caused 1,396 surgical cases to be cancelled, which led to a 73% increase in waiting times for elective surgery.³⁹ In addition the Queensland floods caused 33 deaths and destroyed over 3600 homes.

Floods can cause sewage run-off, and have been associated with outbreaks of cryptosporidiosis and giardiasis.⁴⁰ Contaminated flood water can cause diarrhoeal diseases and skin and soft-tissue infections.⁴¹

Floodwaters can expose people to the potentially deadly water and soil-borne bacterial disease melioidosis and leptospirosis, a pathogen found in rat urine, both of which affected people in Qld following the 2011 floods.⁴²

The major direct health impacts of floods are associated with injury and death due to drowning and trauma. The most common injuries are: sprains; lacerations; and abrasions. Floods may also be associated with electrical injuries and burns, caused by disruptions to electrical equipment and the storage of flammable substances. Hypothermia can also result from contact with flood waters.^{43,44}

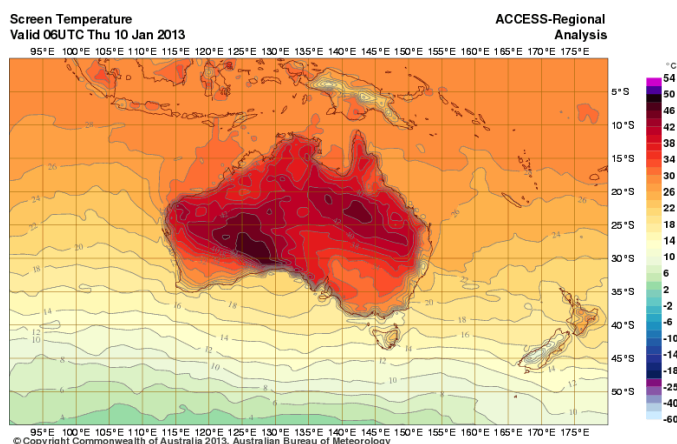
The damp conditions that inevitably follow flooding lead to the development of mould and with it, serious risks to health.⁴⁵ It can lead to respiratory illness and the development of asthma. The degradation of building materials following floods can lead to emissions of toxic gases known as volatile organic compounds (VOCs), such as phthalates.⁴⁶

Like all extreme events, floods lead to post traumatic stress disorder, with reported declines in overall well-being and increased psychological distress after the event.⁴⁷

Extreme weather in Australia

The national heatwave of January 2013 offered a startling insight into hitherto unimaginable scenarios of extreme heat (with a national average of 40.3 degrees on 7th January) associated with the global average temperature rise of 0.8°C. These events caused the Australian Bureau of Meteorology to issue new forecast maps including new sections for temperatures beyond 50 degrees Celsius.

Australian Bureau of Meteorology Forecast for 10 January 2013



In South Australia the mercury hit, 47 degrees Celsius in Oodnadatta on 7th January, making it the 10th consecutive day over 40 degrees in the town.⁴⁸ New records were set in the Northern Territory, where Alice Springs experienced six days straight of temperatures above 42°C and Yulara (near Uluru) had five consecutive days above 44°C.

These record temperatures exceed many set by record heatwaves in 2004.⁴⁹ A three week event in February of that year saw mean maximum temperatures reach 5-6°C above average, with two-thirds of continental Australia recording maximum temperatures over 39°C. Temperatures peaked at 48.5°C in western New South Wales.

A severe heatwave in South Australia in 2008 saw temperatures reach 35°C for 15 consecutive days, seven days more than the previous record heatwave duration.

In January 2011, repeated periods of very intense rainfall caused severe flooding across Queensland, northern and western Victoria, inland New South Wales and northern Tasmania.⁵⁰ The floods in Qld caused the loss of 23 lives and inundated around 18,000 properties.

In 2012, record rainfall led to six Victorian rivers experiencing major flooding and causing closures of 130 roads.⁵¹ In June 2012, severe weather saw winds reach 120km/h in Victoria, while seven metre waves lashed the NSW coastline.⁵²

A case study: A recent report from the Commissioner for Environmental Sustainability in Victoria provides a useful case study example of how extreme weather events are impacting Australia.⁵³ In 2009, the Black Saturday bushfires burnt 388,000 hectares of land, and affected 78 communities, causing almost \$1billion in economic losses.⁵⁴ The bushfires destroyed 2,298 houses and caused 173 deaths, but the severe heatwave that preceded the fires (12-15 degrees Celsius above average maximum temperatures) caused 374 deaths, led to a 34 fold increase in heat related illness, and a 46% increase in emergency cases.⁵⁵ In 2010/11, flooding severely affected western Victorian communities, and impacted farming and food production, damaging 123,077 hectares of grazing pasture and killing 345,645 livestock. Over 200 schools were affected by the floods and the damage bill came to \$826 million.⁵⁶

Effects of extreme events on health services

The Climate and Health Alliance holds serious concerns regarding the ability of Australian health care services to respond to extreme weather events and to cope with the increased demand on services and resources that such events create.

A 2013 study by the Australian Council of Social Service found community service organisations were unable to cope with the demands associated with extreme weather, and that increased demand from these kinds of events likely to cause many to permanently collapse.⁵⁷

The loss of critical infrastructure from extreme weather events would severely diminish the capacity of social services to provide support to mothers, children, those requiring welfare and elderly people and would lead to “an increased risk of deaths”, the report said.

Improvements in early warning systems are needed for extreme weather events such as heatwaves, floods and storms and outbreaks of infectious diseases, and regional risk and health impact assessments are needed to assist in the development of effective responses of services and communities at a local level.

The recent Hurricane Sandy in New York provides a sobering insight into the health care consequences associated with extreme events.

Two hospitals that lost power at the height of the storm were obliged to suddenly evacuate patients, with 300 patients evacuated from the New York University Langone Medical Center via

darkened stairwells,⁵⁸ and over 700 patients evacuated from Bellevue Hospital.⁵⁹ It is estimated 17 million gallons of water flooded into the Bellevue Hospital's basement, damaging fuel pumps designed to power its generators.⁶⁰

A failure to anticipate and prepare for these kinds of extreme events could exacerbate already catastrophic consequences. Leading infrastructure engineer Professor Priyan Mendis warned recently in relation to Hurricane Sandy that “we can’t rule out the possibility of these catastrophic events in our major cities” but there is “very limited research and development funding available to come up with innovative methods to prevent loss of life”. Professor Mendis also says cities such as Melbourne and Sydney have many vulnerabilities to extreme events; that buildings are not designed to withstand extreme events and could either completely collapse or face severe damage, even under less severe events.⁶¹

Closer to home, Cyclone Larry caused significant damage to hospital infrastructure in Qld in 2006, with Innisfail Hospital forced to close, the Herberton Hospital losing power, and a leaking roof at the Atherton Hospital forcing a partial evacuation. The demand for services overwhelmed available human resources and nurses were required to travel from Brisbane to provide support to the region.⁶² Community based health services are equally vulnerable to such pressures.

Predictions of extreme weather events suggest there is likely to be considerable increases in both the demand for, and the impacts on, health services as a result. This will place burdens on already overstretched services and personnel and healthcare infrastructure.

A critical focus in assessing preparedness is to ensure health and other systems are able to meet the needs of all members of society during extreme weather events, including those who are marginalised and/or experience increased vulnerability. As outlined above, groups who are more vulnerable during extreme weather and may have special needs during emergency preparations and responses include the elderly, the very young as well as those experiencing disadvantage, homelessness, chronic disease and mental illness. A specific approach must be targeted to the specific needs of each of these groups.^{63,64}

Cost implications

Increasingly overstretched health services and infrastructure will have to compete for their share of an increasingly precarious GDP in the face of rising damage to, and falling productivity of all sectors of the economy under current slow emissions reductions scenarios.

Predictions of the costs associated with further delay in reducing greenhouse gas emissions suggest costs are significantly less if stronger action is taken before 2015. Commencing the cuts committed to by 195 countries in December 2011 by 2015 instead of 2025 would increase the odds of limiting warming to 2 °C from 34% to 60% and would make action much cheaper.⁶⁵

A 2012 paper from the ClimateCost project, led by the Stockholm Environment Institute, suggests that extreme outcomes from catastrophic or near catastrophic events are significantly

underestimated in many global climate change impacts assessments, including the IPCC reports.⁶⁶

For example, recent estimates of sea level rise (SLR) suggest a 1.65 m of SLR is possible by the 2080s and would result in a 60% loss of global wetlands and put over 30 million additional people year at risk from coastal flooding. The economic costs of this scenario alone, excluding other extreme climate impacts, are estimated at \$1 trillion per year.

The global economic losses associated with more frequent extreme weather events amounted to US\$380bn in 2011, much higher than the previous record (US\$220bn) from 2005.⁶⁷

With rising global emissions driving rapid warming, the number of unprecedented heatwaves such as those experienced in Russia in 2010, the US in 2012, and Australia in 2013, can be expected to increase. In addition to the direct human health impacts associated with this kind of event, subsequent shocks to agricultural production will also impact human health and livelihoods, worsening food insecurity and poverty in vulnerable populations.⁶⁸

Using the health ‘frame’ to build public support for action on climate change

There is strong evidence that action on climate change can improve, even promote health. Communicating about climate change in a health context is also an important and effective way to build public understanding of the links between climate change and health, and can help build support for action on climate change. For example, Maibach et al found that when presented in a health context, climate change is more likely to be considered an issue of personal significance, and using the health ‘frame’ leads to greater support for mitigation and adaptation.⁶⁹ Further studies by Myers et al reveal that talking about climate change as a health issue is more likely to lead to people having a sense of hope and optimism about responding – an important feature in relation to encouraging effective behaviour and attitudinal changes to support climate action initiatives.⁷⁰

Conclusion

Australia is ill-prepared to respond to extreme weather events associated with climate change. Australian governments at all levels appear to have been paralysed by apparently conflicting needs to develop the nation’s economy and act to prevent climate change. But despite a robust economy, governments have been negligent not to respond to the scientific evidence that has been available, including from the Intergovernmental Panel on Climate Change (IPCC), for many years.

The health, social, environmental, and economic outcomes described by IPCC and other scientists over the last 20 years are beginning to be acutely felt, *and are resulting in unacceptable economic, social and environmental costs*. Now is the time for the Australian

Government to take a far stronger leadership role on climate change; to acknowledge the emerging and demonstrated links between human health and climate change, and to work with all sectors of the community to find ways to balance the need for a stable and secure economy, and protect human health and the natural environment.

Most of all, Australia needs to work hard to shift its energy focus from fossil fuels to non-carbon emitting fuels, and limit the extent of climate change as much as possible.

Recommendations

For the Committee:

- Conduct public hearings in all state and territories on health and extreme weather events

For the Australian Government:

- Develop and implement a national plan to protect health from climate change, including a national heatwave plan
- Legislate to achieve urgent and substantial national emissions reductions – this should include: a moratorium on further fossil fuel exploration and development; and the rapid removal of fossil fuel subsidies
- Establish national programs to raise public awareness about climate impacts and to encourage emissions reductions
- Include Climate Impact Assessment and Health Impact Assessment in all government policy and program decisions
- To strongly encourage other nations (particularly wealthy countries such as the US and Canada with high per capita emissions) to stand up to vested interests and act swiftly to reduce emissions to protect the health of current and future generations

For all Australian governments (federal, state, territory and local):

- Establish and include ecological economic indicators in policy, program and development assessments.
- Fund the development and delivery of quality professional development for health and other community services personnel on climate change causes, impacts and solutions

APPENDIX A

Climate and Health Alliance (CAHA) Committee of Management

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CAHA Organisational Members

Australian Association of Social Workers (AASW)
Australian College of Nursing (ACN)
Australian College of Rural and Remote Medicine (ACRRM)
Australian Council of Social Service (ACOSS)
Australian Hospitals and Healthcare Association (AHHA)
Australian Health Promotion Association (AHPA)
Australian Medical Students Association of Australia (AMSA)
Australian Physiotherapy Association (APA)
Australian Institute of Health Innovation (AIHI)
Australian Women's Health Network (AWHN)
Australian Nursing Federation (ANF)
Australian Psychological Society
Australian Research Council for Children and Youth (ARACY)
Australian Rural Health Education Network (ARHEN)
CRAN*Aplus*
Doctors Reform Society (DRS)
Friends of CAHA
Health Consumers' Network (Qld)
Health Issues Centre (HIC)
Public Health Association of Australia (PHAA)
Royal Australasian College of Physicians (RACP)
North Yarra Community Health (NYCH)
Services for Australian Rural and Remote Allied Health (SARRAH)
Women's Health East
Women's Health in the North
World Vision

Expert Advisory Committee

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Professor Garry Egger, School of Health & Human Sciences, Southern Cross University
Professor David Karoly, Federation Fellow in the School of Earth Sciences, University of Melbourne
Professor Stephan Lewandowsky, School of Psychology, University of Western Australia
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Professor Anthony Capon, National Centre for Epidemiology and Population Health, Australian National University
Professor Simon Chapman, Professor of Public Health, University of Sydney
Dr Susie Burke, Senior Psychologist, Public Interest, Environment & Disaster Response, Australian Psychological Society

ENDNOTES

- ¹ Spratt, D, and Sutton, P. *Climate Code Red*, 2008.
- ² World Bank, Turn Down the Heat: Why a 4°C Warmer World Must be Avoided, A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics, November 2012, p. xv.
- ³ World Bank report, p. xiv
- ⁴ World Bank report, p. xvi
- ⁵ World Bank report, p. xvi.
- ⁶ W. L. Hare, leading author of the IPCC 2007 report, quoted in Worldwatch Institute, *State of the World 2009: Into a Warming World*, Washington.
- ⁷ DARA 2012 Climate Vulnerability Monitor, A Guide to the Cold Calculus for a Hot Planet, 2012.
- ⁸ *ibid*
- ⁹ Trenberth, K. Framing the way to relate climate extremes to climate change, *Climatic Change*, 2012, DOI 10.1007/s10584-012-0441-5.
- ¹⁰ Farrant, B., Armstrong, F., and Albrecht, G. Future under threat: climate change and children's health, *The Conversation*, 9 October 2012.
- ¹¹ Albrecht, G. The age of solastalgia, *The Conversation*, 7 August 2012.
- ¹² Hannam, P. Extreme weather a peril for vulnerable, *Sydney Morning Herald*, 6 January 2013.
- ¹³ Climate Communication Science and Outreach, Current Extreme Weather and Climate Change, 7 September 2011. Available at: <http://climatecommunication.org/wp-content/uploads/2011/09/Extreme-Weather-and-Climate-Change.pdf>
- ¹⁴ Huber, D., and Gulledege, J. Extreme Weather & Climate Change: Understanding the Link and Managing the Risk, Center for Climate and Energy Solutions, December 2011.
- ¹⁵ *ibid*
- ¹⁶ *ibid*
- ¹⁷ Borenstein, S. 2012 Extreme Weather Sets Records, Fits Climate Change Forecasts, *Huffington Post*, 20 December 2012.
- ¹⁸ *ibid*
- ¹⁹ Price Waterhouse Coopers, *Protecting human health and safety during severe and extreme heat events: A national framework*, Report for the Commonwealth Government, November 2011, p.19.
- ²⁰ Climate Commission, Grim warning on extreme weather for Australia, Summary of Response to Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX).
- ²¹ Reisen F, Brown SK, Australian firefighters' exposure to air toxics during bushfire burns of autumn 2005 and 2006, *Environ Int.* 2009 Feb;35(2):342-52.
- ²² Morgan, G. The Health Impacts of Bushfires, Presentation to Clean Air Forum, 2010. Available at: <http://www.environment.nsw.gov.au/video/seminars/cleanairforum/2010/GeoffMorgan/resources/geoffmorgan.pdf>
- ²³ Victorian Government Department of Human Services , January 2009 Heatwave in Victoria: an Assessment of Health Impacts. Melbourne, Victoria: 2009.
- ²⁴ State Government of Victoria, A literature review on the economic, social and environmental impacts of severe bushfires in south-eastern Australia, Fire and adaptive management, Report No. 87; The impacts, losses and benefits sustained from five severe bushfires in south-eastern Australia; Fire and adaptive management, Report no. 88.
- ²⁵ JM Robine SC, S Le Roy, H Van Oyen et F R Herrmann. Report on excess mortality in Europe during summer 2003 2007 28 February.
- ²⁶ Hanna, E. et al. Climate Change and Rising Heat: Population Health Implications for Working People in Australia, *Asia Pacific Journal of Public Health*, 2011, Supplement to 23 (2) 14S-26S.
- ²⁷ *ibid*
- ²⁸ Ramin B, Svoboda T. Health of the homeless and climate change. *J Urban Health.* 2009;86(4):654-64.
- ²⁹ Richard A Broome and Wayne T Smith, The definite health risks from cutting power outweigh possible bushfire prevention benefits, *Med J Aust* 2012; 197 (8): 440-441.
- ³⁰ PWC *ibid*
- ³¹ Banwell, C. et al. Socio-cultural reflections on heat in Australia with implications for health and climate change adaptation, *Glob Health Action* 2012, 5: 19277.

-
- ³² Bi., P. et al. The effects of extreme heat on human mortality and morbidity in Australia, *Asia Pacific Journal of Public Health*, Supplement to Volume 23, Number 2, March 2011.
- ³³ Banwell et al
- ³⁴ Alana Hansen et al. The Effect of Heat Waves on Mental Health in a Temperate Australian City, *Environ Health Perspect*. 2008 October; 116(10): 1369–1375.
- ³⁵ Watts, C. Hot Australia takes a toll on mental health, *The Drum*, 8 January 2013.
- ³⁶ Banwell et al
- ³⁷ Hall GV, D’Souza RM, Kirk MD. Foodborne disease in the new millennium: out of the frying pan and into the fire? *Med. J. Aust*. 2002; 177 (11/12): 614-18.
- ³⁸ Jenkins, R. Health risks remain after floodwater subsides, *ABC Health and Wellbeing*, 10 February 2011.
- ³⁹ Climate Commission, *The Critical Decade: Climate Change and Health*, November 2011.
- ⁴⁰ *ibid*
- ⁴¹ Jenkins, R. *ibid*
- ⁴² *ibid*
- ⁴³ Du W, FitzGerald GJ, Clark M, Hou XY. Health impacts of floods. *Prehospital and disaster medicine: the official journal of the National Association of EMS Physicians and the World Association for Emergency and Disaster Medicine in association with the Acute Care Foundation*. 2010;25(3):265-72.
- ⁴⁴ Mike Ahern SK, Paul Wilkinson, Roger Few, and Franziska Matthies. Global Health Impacts of Floods: Epidemiologic Evidence. *Epidemiol Rev*. [Review]. 2005 25 January;27:36-46.
- ⁴⁵ Jeavons, T. and Abramson, M. Floods herald creeping problem of mould and growing health risks, *The Conversation*, 21 March 2012.
- ⁴⁶ *ibid*
- ⁴⁷ Alderman, Katarzyna, Turner, Lyle, & Tong, Shilu (2012) Assessment of the health impacts of the 2011 summer floods in Brisbane. In *2012 NCCARF National Adaptation Conference*, 26-28 June 2012, Melbourne, VIC.
- ⁴⁸ Brice, R. Australia swelters through hottest ever day, *ABC News*, 9 January 2013.
- ⁴⁹ Neville Nicholls, *Australian Climate And Weather Extremes: Past, Present And Future*, A Report for the Department of Climate Change, January 2008.
- ⁵⁰ Robin C. van den Honert and John McAneney, *The 2011 Brisbane Floods: Causes, Impacts and Implications*, *Water* 2011, 3(4), 1149-1173; doi:10.3390/w3041149.
- ⁵¹ Commissioner for Environmental Sustainability, *Foundation Paper One, Climate Change, Victoria: The science, our people and our state of play*, 2012, p.21.
- ⁵² Box, D. Extreme weather creates havoc across two states, *The Australian*, 6 June 2012.
- ⁵³ Commissioner for Environmental Sustainability, *Foundation Paper One, Climate Change, Victoria: The science, our people and our state of play*, 2012.
- ⁵⁴ *Ibid*, p.21.
- ⁵⁵ *Ibid*, p.20.
- ⁵⁶ *Ibid*, p.20.
- ⁵⁷ Hannam, P. Extreme weather a peril for vulnerable, *Sydney Morning Herald*, 6 January 2013.
- ⁵⁸ Leanne Italie And Marilyn Marchione, *NYU Hospital Evacuation: Hurricane Sandy Power Failure Moves More Than 200 Patients*, *Huffington Post*, 30 October 2012.
- ⁵⁹ CNN, *Down many flights of stairs, National Guard evacuates patients from hospital*, 1 November 2012.
- ⁶⁰ *ibid*
- ⁶¹ Mendis, P. Is Australia prepared for a storm like Sandy? *The Conversation*, 31 October 2012.
- ⁶² Carthey, J. and Chandra, V. *The Impact Of Climate Change On Health Facilities, A preliminary investigation of mitigation and adaptation strategies*, Centre for Health Assets Australasia, 2007.
- ⁶³ Evaluation of the Victorian Government heatwave framework Executive summary: Access Economics and the National Ageing Research Institute 2011 January; Edgington S. *Disaster Planning for People Experiencing Homelessness*. Nashville, USA: National Health Care for the Homeless Council, 2009 March.
- ⁶⁴ Edgington S. *Disaster Planning for People Experiencing Homelessness*. Nashville, USA: National Health Care for the Homeless Council 2009 March.

⁶⁵ Zoë Corbyn, Politics is biggest factor in climate uncertainty, Delaying action on emissions will increase costs and reduce chances of limiting temperature increase, *Nature*, 02 January 2013.

⁶⁶ Downing, TE and Butterfield, RE (2012). *Extreme Outcomes: Prospects for major tipping and socially contingent events and associated economic and social costs*. Summary of cross-sectoral results from the ClimateCost project funded by the European Community's Seventh Framework Programme. Technical Policy Briefing Note 7. Oxford: Stockholm Environment Institute.

⁶⁷ Vic CES Report

⁶⁸ World Bank, *ibid*.

⁶⁹ Maibach *et al.* *BMC Public Health* 2010, 10:299.

⁷⁰ Myers, T. et al, A public health frame arouses hopeful emotions about climate change, *Climatic Change*, 2012.