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HeatWatch

Extreme heat in South East SA

Increasing extreme heat will have profound impacts on people, industries and ecosystems in South East SA. CSIRO and Bureau of Meteorology projections estimate that the average number of days over 35 could increase from historical averages of 21 at Murray Bridge and seven at Mount Gambier, to 56 and 22 days respectively by 2090 without strong climate action.

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Summary

Increased numbers of extremely hot days present a serious risk to the health and wellbeing of communities in South East South Australia. This report focuses on the two largest communities in South East SA, Murray Bridge and Mount Gambier and looks at CSIRO projections of extremely hot days in the region. Global warming will escalate South East SA's vulnerability to extreme heat unless greenhouse gas emissions are reduced.

Heatwaves can lead to serious illness and death. Heatwaves have caused more deaths in Australia since 1890 than cyclones, bushfires, floods, earthquakes and severe storms combined.[1]

At temperatures above 35 degrees, the human body's ability to cool itself reduces, making it a common benchmark temperature for occupational health and safety experts, academic and government researchers.

There has already been a clear increase in numbers of extreme heat days over recent decades. The number of days over 35 degrees has doubled at Murray Bridge since the late 1960s and the number has doubled at Mount Gambier since the 1940s.

The average annual number of days over 40 degrees at Murray Bridge has tripled since the late 1960s.

Looking forward, the average number of days over 35 degrees could more than double from 21 to a projected 56 days by 2090, as shown in Figure 1 below.

Equally concerning, at Mount Gambier days over 35 degrees could increase from seven to a projected twenty days by 2090.

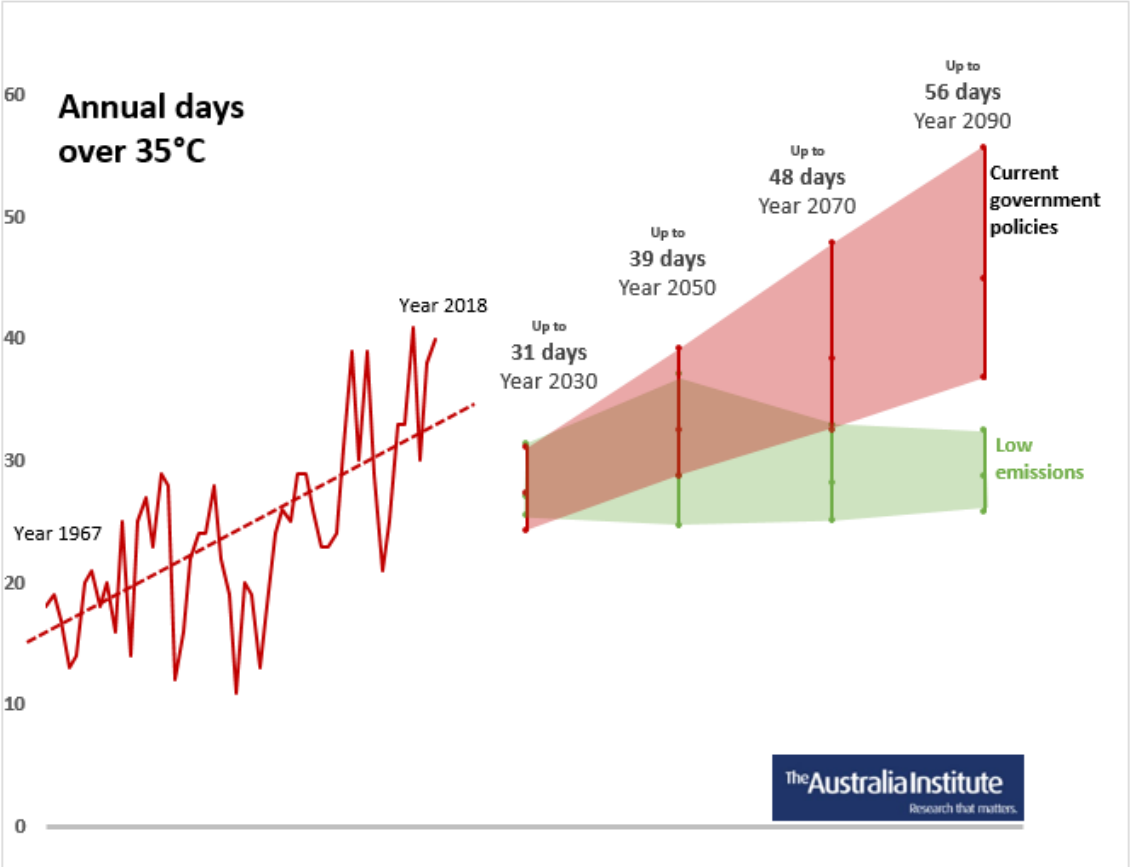
The dramatic increase in extreme temperatures in recent years (also shown in Figure 1) suggests that current levels of extreme heat may already be exceeding levels projected for 2030. If so, the climate models may be too conservative in their projections.

The data also predicts large increases in days over 40 degrees, from Murray Bridge's historical average of 4.1 days over 40 degrees per year up to 22 days over 40 degrees

[1] McMichael et al (2003) *Climate change and human health, risks and responses,* p 53, https://www.who.int/globalchange/publications/climchange.pdf

per year by 2090. Without strong action on climate change, days over 40 degrees will become more frequent than days over 35 degrees have historically been.

Figure 1: Forecast annual number of days over 35 degrees in Murray Bridge



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml; CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Extreme heat events present a risk to critical infrastructure including road, rail and electricity generation and have a major impact on productivity and economic activity.

Fortunately, if emissions can be reduced the increase in number of extreme heat days can be limited. As shown in Figure 1, with a decisive reduction in emissions the number of 35-degree days could be kept to a fraction of what would be expected under a business-as-usual scenario.

Australia makes a disproportionate contribution to global warming. We are one of the lowest ranked countries in the world on climate action and have among the highest rates of domestic greenhouse gas emissions per person in the world.

A sharp reduction in Australia's domestic and exported emissions would be an important contribution to the global effort to prevent dangerous global warming and the associated increases in extreme heat that could have such a devasting impact on South East SA and the country.

Introduction

As the climate warms, the number of extremely hot days is increasing. The average number of days over 35 degrees each year in Murray Bridge and Mount Gambier (referred to collectively in this report as South East SA) has increased considerably in recent years and is forecast to increase at an even higher rate without a strong action on climate change.

South Australia is prone to heatwaves, and a heatwave in early February 2017 resulted in the hottest February day on record for South Australia as a whole.[2] Adelaide is the most vulnerable major city in Australia to heatwave deaths. Between 2001-2015 Adelaide had more days exceeding a crucial temperature threshold above average temperatures than other major cities. As a result, it had a higher death rate than any other major city in Australia.[3]

On 16 January 2019, sixteen people presented with heatwave related symptoms at hospital emergency departments across the state in a 24 hour period, with seven admitted for further treatment.[4] On 24 January , Mount Gambier hit 44 degrees, and Murray Bridge 46.8 degrees.[5]

EXTREME HEAT

Extreme heat is dangerous for human health, for ecosystems and agriculture. At temperatures above 35 degrees, the human body's main cooling mechanism – sweating – is far less effective. Sweating exchanges heat from the body to the atmosphere, but this heat exchange process diminishes significantly beyond 35

[2] BOM (April 2017) *Special Climate Statement 61—exceptional heat in southeast Australia in early 2017,* http://www.bom.gov.au/climate/current/statements/scs61.pdf

[3] Londen (2018) *Measuring temperature-related mortality using endogenously determined thresholds,* https://link.springer.com/article/10.1007/s10584-018-2269-0

[4] McNab (2019) *Heatwave conditions continue in Australia,* https://www.murrayvalleystandard.com.au/story/5853318/heatwave-conditions-continue-in-australia/

[5] Smith (2019) *South Australian heatwave 2019: Records fall as cities, towns swelter,* https://www.portpirierecorder.com.au/story/5868494/summer-swelter-for-north/?cs=1530

degrees, so body temperature rises. This creates discomfort and a range of health impacts, from mild to severe, and can ultimately be fatal without intervention.[6]

Because of this, many regulators and researchers use 35 degrees as an important threshold for safety, work and climatic conditions. 35 degrees is seen as the "limit of high temperature tolerance" by the Occupational Health and Safety Representatives of the Victorian Trades Hall Council and many academic researchers note it as the point where substantial productivity is lost. The CSIRO and Bureau of Meteorology publish 35-degree threshold predictions.[7]

A future with more extremely hot days represents a serious threat to the wellbeing of people in South East SA and to Australia's wider population. As well as an increase in heat-related deaths and illness, the rise in extreme heat increases irritability and psychological stress.[8] Hot weather affects patterns in domestic violence,[9] interrupts sleep patterns and reduces capacity and willingness to exercise. All carry broad ramifications, such as increased accident risk, sedentary life style-induced diabetes and cardio vascular disease.[10] Tracking and minimising the way climate change is affecting the number of hot days is of direct interest to the wellbeing of local communities, particularly in areas of high vulnerability to heatwaves like South East SA.

SOUTH EAST SA

CSIRO and the Bureau of Meteorology (BoM) have produced temperature projections under several climate change scenarios for most of terrestrial Australia. The CSIRO–BoM data is a time series from the Australian Water Availability Project (AWAP) where

[6] Hanna and Tait (2015) *Limitations to thermoregulation and acclimatisation challenges human adaptation to global warming,* Int J Environ Res Public Health, https://academic.oup.com/heapro/article/30/2/239/561863

[7] Victorian Trades Hall Council (2018) *Heat*, http://www.ohsrep.org.au/hazards/workplace-conditions/heat; Singh et al (2015) *Working in Australia's heat: health promotion concerns for health and productivity,* Health Promotion International, https://academic.oup.com/heapro/article/30/2/239/561863; CSIRO and BoM (2015) *Climate change in Australia: Projections for Australia's NRM Regions*, https://www.climatechangeinaustralia.gov.au/en/publications-library/technical-report/

[8] Queensland Health (2015) *Heatwave Response Plan* https://www.health.qld.gov.au/__data/assets/pdf_file/0032/628268/heatwave-response-plan.pdf

[9] Auliciems and Di Bartolo (1995) *Domestic violence in a subtropical environment: police calls and weather in Brisbane.* International Journal of Biometeorology 39 (1).

[10] Kjellstrom T et al (2009) *The Direct Impact of Climate Change on Regional Labor Productivity.* Archives of Environmental & Occupational Health 64 (4); World Health Organisation (2017) *Preventing noncommunicable diseases (NCDs) by reducing environmental risk factors*, http://apps.who.int/iris/bitstream/10665/258796/1/WHO-FWC-EPE-17.01-eng.pdf?ua=1

the average temperature was compiled in roughly five kilometre by five kilometre spatial grids between 1981 and 2010.[11] This time series uses between five and eight models to predict days over 35 degrees, over 37 degrees and over 40 degrees in 2030, 2050, 2070 and 2090.[12] It also has a historical average for the years 1981–2010.

The report also employs two IPCC scenarios for global climate action: RCP 2.6 ("low emissions") and RCP 8.5 ("high emissions/current government policies"). RCP 2.6 equates roughly to what is required to keep the world below 1.5 degrees warming and RCP 8.5 is the "business as usual" scenario where the world fails to act decisively on climate change. RCP 8.5 is the current trajectory due to the failure of most major polluting governments to implement necessary climate policies.

South East SA covers a lot of area, with over 350km between Murray Bridge and Mount Gambier. As its two largest centres at different ends of the region, projecting the rises in extreme heat days in these spatial grids (which encompass all of both towns respectfully) put the effects of climate change on the population of South East SA into perspective.

The Bureau of Meteorology has one long-standing measurement station each in Murray Bridge and Mount Gambier, both which provide year-by-year historical measurements for our purposes: a Murray Bridge station and a Mount Gambier Aero station.

ABOUT HEATWATCH

The Australia Institute's HeatWatch initiative puts current Australian research about temperature increases due to global warming into context, using data from the Bureau of Meteorology and the CSIRO. Global temperature increases of 1.5 or 2 degrees above pre-industrial levels will have dramatic impacts on human health, the ecosystem and the economy. The IPCC has found that human-induced warming reached 1 degree above pre-industrial levels in 2017.[13]

Current policy settings would see more extreme warming than 2 degrees above pre-industrial levels. However, temperatures fluctuate by much more than a few degrees

[11] CSIRO and Bureau of Meteorology (2015) *Climate Change in Australia Information for Australia's Natural Resource Management Regions: Technical Report*, CSIRO and Bureau of Meteorology.

[12] All eight models – ACCESS1.0, CESM1-CAM5, CNRM-CM5, GFDL-ESM2M, HadGEM2-CC, CanESM2, MIROC5 and NorESM1-M – are available for the RCP 4.5 and RCP 8.5 scenarios. Five models – CESM1-CAM5, CNRM-CM5, CanESM2, MIROC5 and NorESM1-M – are available for the RCP 2.6 scenario.

[13] IPCC (2018) *Global Warming of 1.5 °C,* p 1:4, https://www.ipcc.ch/report/sr15/

every day, meaning that the compounding and extreme effects of temperature increases can be difficult to imagine.

HeatWatch uses extreme heat days (days over 35 degrees) along with other thresholds like 37 degrees and 40 degrees to highlight that the effects of global warming will include a dramatic increase in days where it is uncomfortable or dangerous to operate outside – affecting industries like construction, sport and other outdoor activities.

HeatWatch began with *Cooked with gas: Extreme heat in Darwin,* which highlighted that the Northern Territory's plans to exploit emission-intensive oil and gas reserves will contribute to global warming which could increase the number of days over 35 degrees in Darwin from the current rate of 22 per year to 275 per year in 2070.[14]

Other HeatWatch reports have covered extreme heat in Rockhampton, Gladstone, Roma, the Sunshine Coast, the Gold Coast, Western Sydney and Adelaide. Three Queensland reports were presented alongside Queensland Fire and Emergency Services workshops on extreme heat.

The Australia Institute will continue to focus on additional locations and welcomes interest in collaborating on local versions of the reports.

All HeatWatch reports are available on our website: http://www.tai.org.au/heatwatch

[14] Hanna and Ogge (2018) *Cooked with gas: Extreme heat in Darwin,* http://www.tai.org.au/content/cooked-gas-extreme-heat-darwin

Extreme heat in South East SA

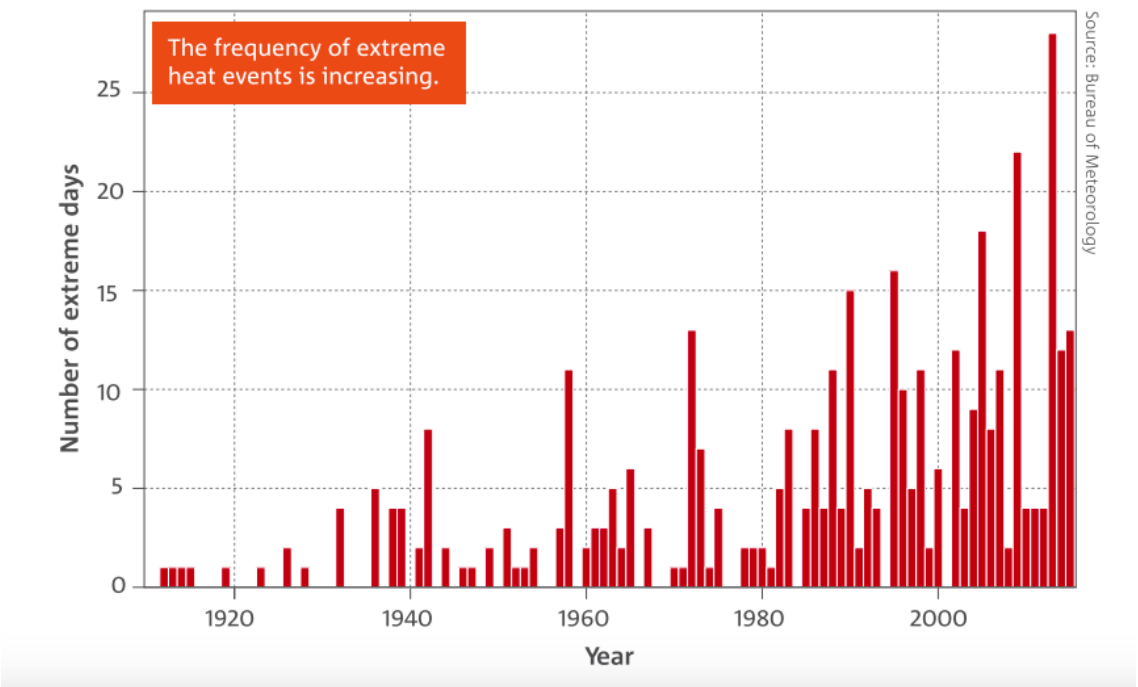
In Australia and globally there has been a clear trend of increasing temperatures and extreme heat events that are attributable to global warming.

The increase in extreme heat events across Australia as a whole is shown in Figure 2 below. This Bureau of Meteorology graph shows the annual number of days exceeding the 99th percentile of each month from 1910–2015.

The Bureau of Meteorology attributes this trend to global warming:

> As the global climate system has warmed, changes have occurred to both the frequency and severity of extreme weather. In Australia, the most obvious change has been an increase in the occurrence of record-breaking heat.[15]

Figure 2: Frequency of extreme heat days, Australia



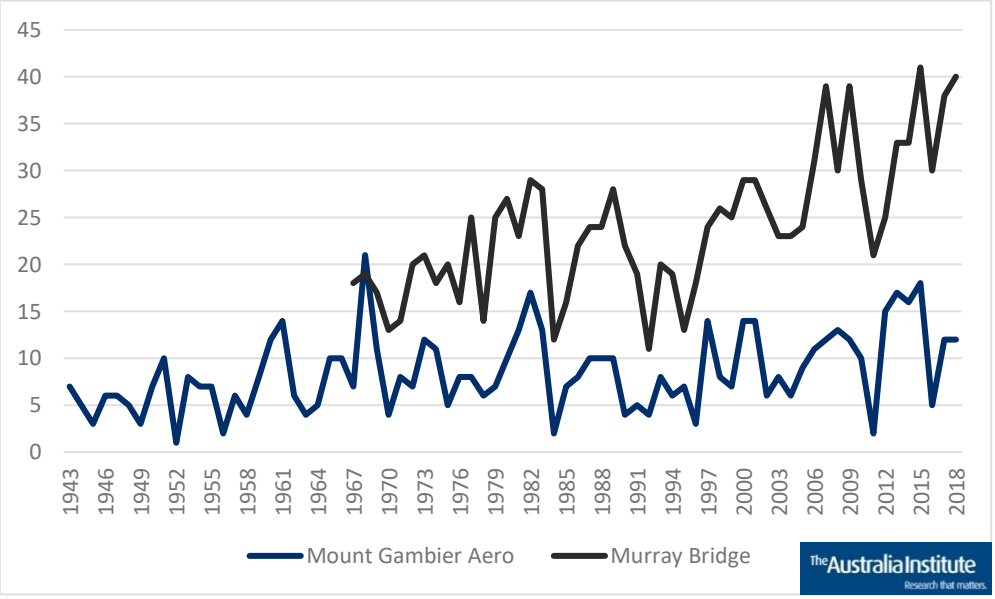
Source: BoM (2016) *State of the Climate*

[15] BoM (2016) *State of the Climate*, http://www.bom.gov.au/state-of-the-climate/State-of-the-Climate-2016.pdf

The Bureau of Meteorology has long-term temperature records for a site in both Murray Bridge (since 1967) and Mount Gambier (since 1943).

Figure 3 below shows the average number of days over 35 degrees in each year from 1943 onwards at Mount Gambier and from 1967 onwards in Murray Bridge.

Figure 3: Annual number of days over 35 degrees South East SA, 1943–2018



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml

Figure 3 shows that the number of days over 35 degrees in South East SA has increased over the time spans. Despite drought and heatwaves in the early 1980s and the Millennium Drought of the early 2000s, the past ten years have the highest number of hot days recorded over a ten year period.

This clear increase in numbers of extreme heat days over the recorded period is summarised in Table 1 below:

Table 1: Average days per year above 35 degrees, South East SA

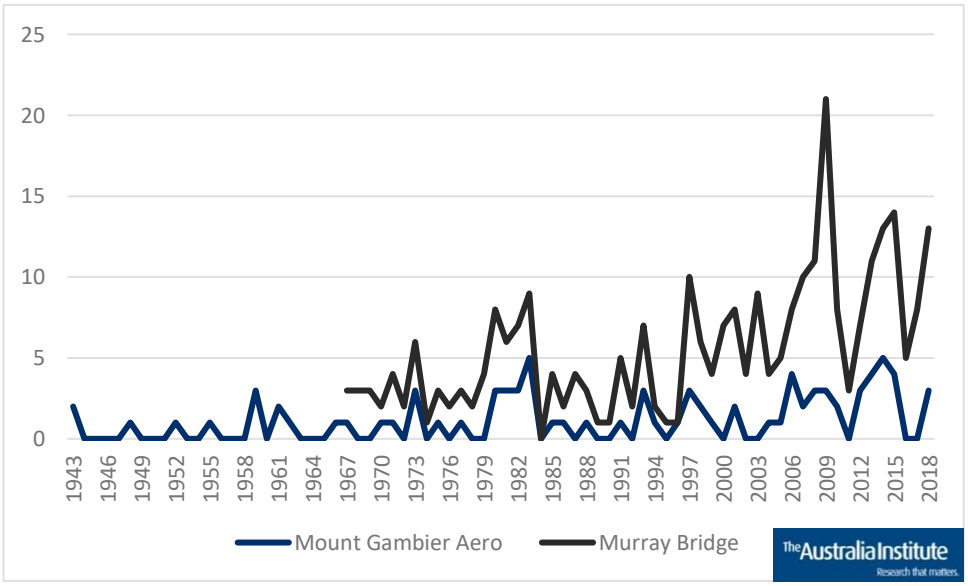
Years	Murray Bridge	Mount Gambier
1943–1954		5.7
1955–1966		7.3
1967–1976	17.6	9.4
1977–1986	22.1	9.1
1987–1996	19.8	6.7
1997–2006	26.0	9.7
2007–2018	33.2	12.0
Average	**24.1**	**8.5**

Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml

Table 1 shows that since the beginning of records, the average number of days over 35 degrees has roughly doubled at both Murray Bridge and Mount Gambier.

The number of days over 40 degrees has also risen in both towns, most significantly at Murray Bridge, as shown in Figure 4 below:

Figure 4: Annual number of days over 40 degrees South East SA, 1943–2018



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml

Table 2: Average days per year above 40 degrees, South East SA

Years	Murray Bridge	Mount Gambier
1943–1954		0.3
1955–1966		0.6
1967–1976	2.9	0.7
1977–1986	4.5	1.7
1987–1996	2.7	0.7
1997–2006	6.5	1.4
2007–2018	10.3	2.4
Average	**5.6**	**1.1**

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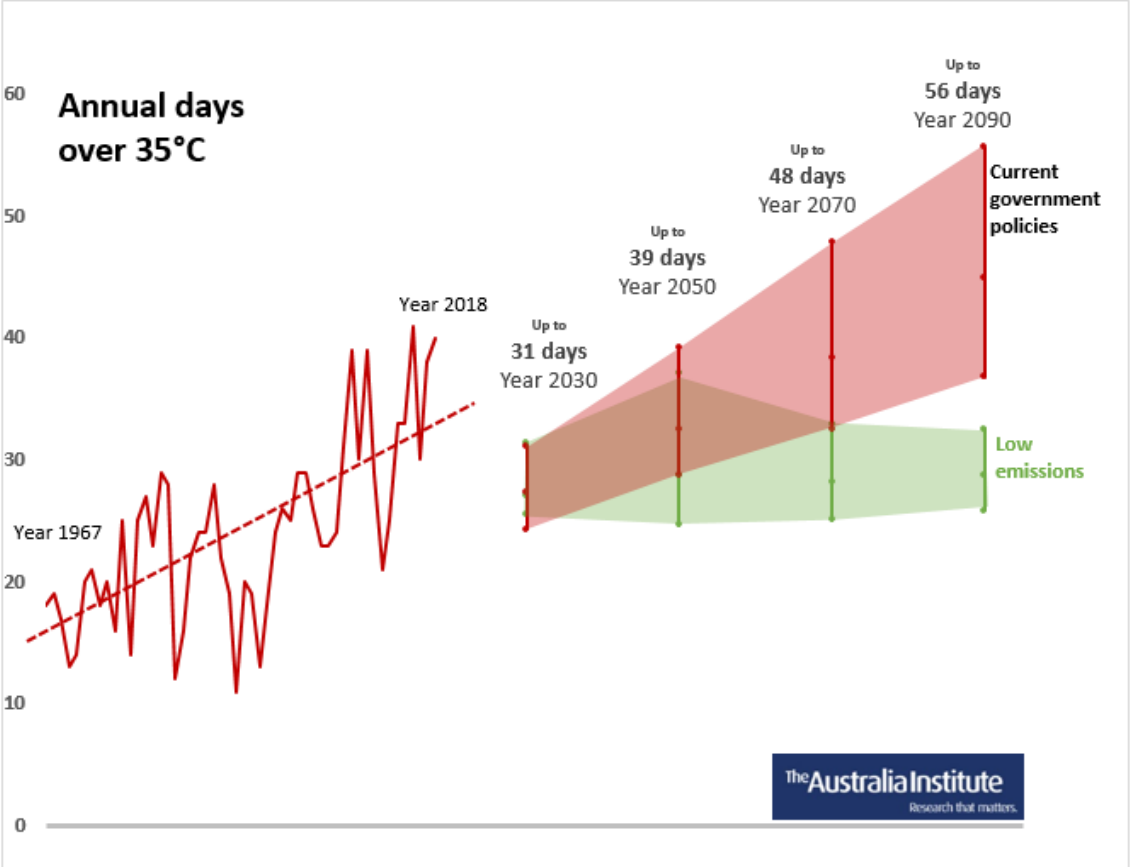
Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml

As shown in Table 2 above, average annual days over 40 degrees in the last decade at both Murray Bridge and Mount Gambier have tripled averages since the 1970s. More worrying still, the following decades are likely to exacerbate these challenges.

Projections: Murray Bridge

Under current government policies, in Murray Bridge average annual days over 35 degrees would go from a historical[16] average of 21 days per year to a maximum of 31 days by 2030, 39 days by 2050, 48 days by 2070 and 56 days by 2090. The current trajectory of BoM station data is already higher than the CSIRO-BoM projections, suggesting the projections could possibly be conservative.

Figure 5: Forecast annual number of days over 35 degrees Murray Bridge



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml; CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

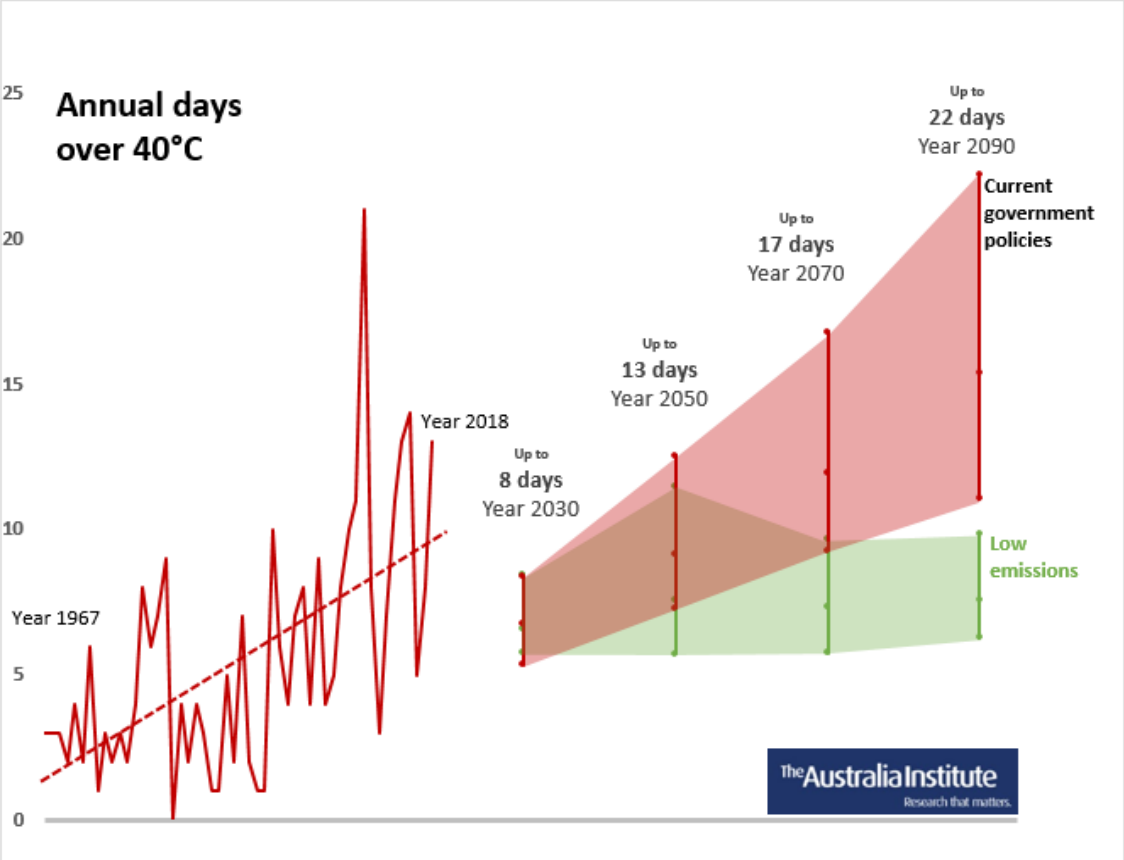
Murray Bridge would benefit significantly if climate policies can keep warming below 1.5 degrees, as represented by the RCP 2.6 scenario. This scenario would reduce

[16] In future sections referring to historical averages, we will be using the CSIRO-BoM 1981-2010 historical averages which the projections are built off, not BoM weather station averages.

predicted days over 35 degrees to 31 days by 2030, increase to 37 days by 2050 and lower and stabilise at 33 days by 2070.

Murray Bridge experienced an average of 4.1 days over 40 degrees per year from 1980 to 2010. Without strong climate action, this could increase to up to 17 days by 2070 and 22 days by 2090. With strong climate policies, the number of days over 40 degrees could be limited to 10 per year on average.

Figure 6: Forecast annual number of days over 40 degrees Murray Bridge



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml; CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Table 3: Murray Bridge – projected average annual days over 35 degrees

	1981-2010	2030	2050	2070	2090
Historical	20.8				
Low emissions		25.5-31.3	24.6-37.1	25.1-32.9	25.9-32.5
Current policies		24.3-31.2	28.7-39.1	32.4-47.8	36.8-55.6

Source: CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Table 4: Murray Bridge – projected average annual days over 40 degrees

	1981-2010	2030	2050	2070	2090
Historical	4.1				
Low emissions		5.7-8.5	5.7-11.5	5.8-9.5	6.2-9.9
Current policies		5.3-8.4	7.3-12.5	9.3-16.8	11.1-22.2

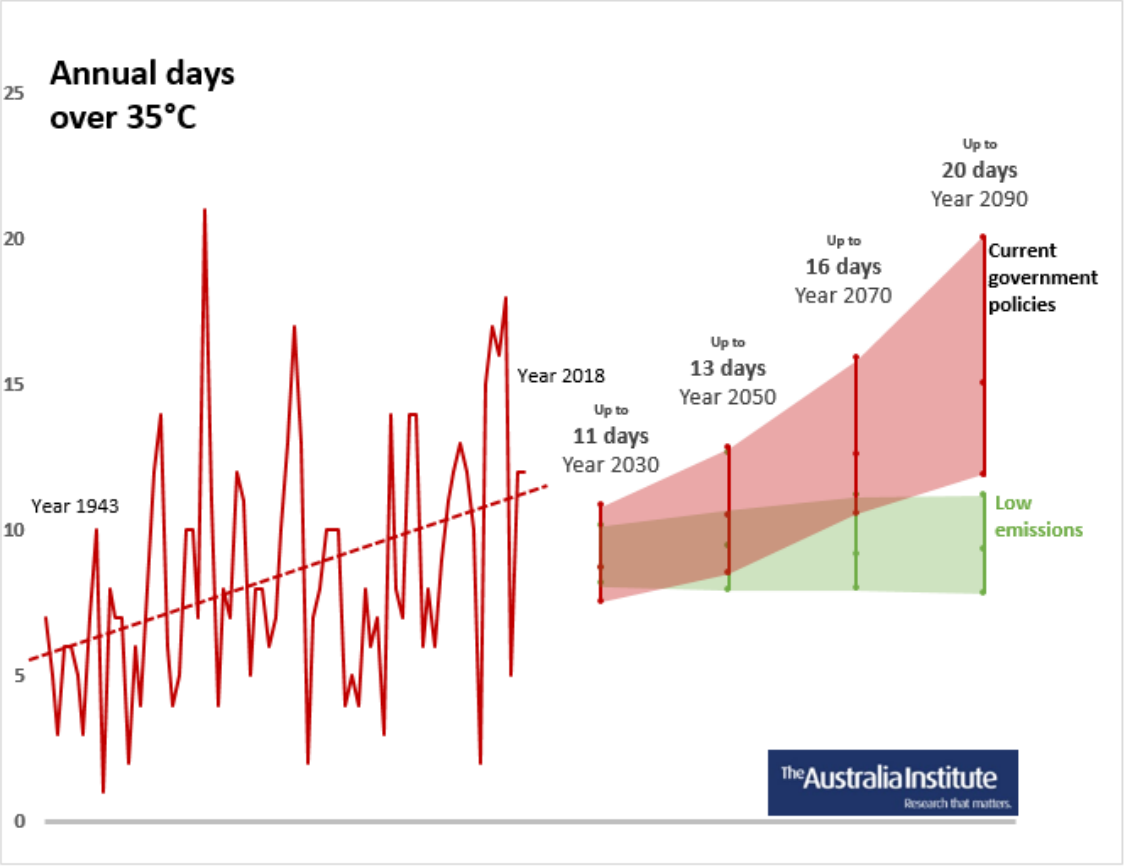
Source: CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Projections: Mount Gambier

Under current government policies, Mount Gambier would see days over 35 degrees go from a historical average of 6.5 days per year to a maximum of 11 days by 2030, 13 days by 2050, 16 days by 2070 and 20 days by 2090. The current trajectory of BoM station data is already higher than the CSIRO-BoM projections, suggesting the projections could possibly be conservative.

Mount Gambier would benefit significantly if global warming can be limited to below 1.5 degrees, as represented by the RCP 2.6 scenario. Climate policies to keep warming below 1.5 degrees would reduce predicted days over 35 degrees to 10 days by 2030, increase to 13 days by 2050, and lower and stabilise at 11 days by 2070.

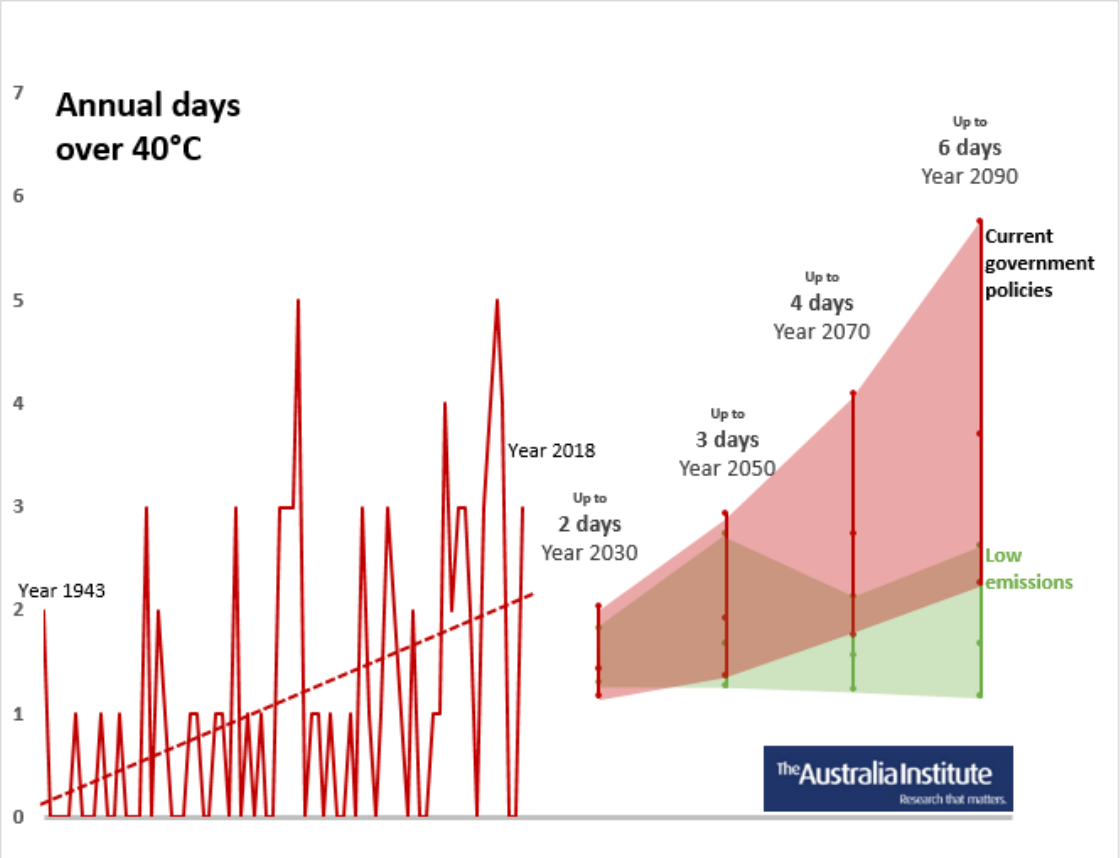
Figure 7: Forecast annual number of days over 35 degrees Mount Gambier



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml; CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Mount Gambier has historically experienced 1 day over 40 degrees per year. Without strong climate action, this could increase to up to 4 days by 2070 and 6 days by 2090. With strong climate action, the number of days over 40 degrees could be limited to 3 per year on average.

Figure 8: Forecast annual number of days over 40 degrees Mount Gambier



Source: Bureau of Meteorology (2019) *Climate data online,* http://www.bom.gov.au/climate/data/index.shtml; CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Table 5: Mount Gambier – projected average annual days over 35 degrees

	1981-2010	2030	2050	2070	2090
Historical	6.5				
Low emissions		8.2-10.2	8.0-12.7	8.0-11.2	7.9-11.2
Current policies		7.6-10.9	8.5-12.9	10.6-15.9	11.9-20.1

Source: CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Table 6: Mount Gambier – projected average annual days over 40 degrees

	1981-2010	2030	2050	2070	2090
Historical	0.9				
Low emissions		1.3-1.8	1.3-2.7	1.2-2.1	1.2-2.6
Current policies		1.1-2.0	1.4-2.9	1.8-4.1	2.3-5.8

Source: CSIRO and Bureau of Meteorology (2018) *Climate projections,* provided on request

Health, industry and productivity impacts of extreme heat

The impact of extreme heat on human health, particularly over extended periods, is severe. Although people living in hot areas do acclimatise to help cope with extreme temperatures, there are limits.[17] A large increase in days over 35 degrees will push past those limits.

The health impacts of increasing extreme heat can include both direct heat illnesses such as heat exhaustion and indirect illnesses such as heart failure and even death.

WorkSafe Queensland lists a range of illnesses arising directly from extreme temperatures from mild cramps, rashes, and dehydration to severe injuries such as heat stroke, exhaustion and even death if treatment is delayed.[18] As climate change worsens this can be expected to put people that are more vulnerable at increasingly greater risk.

The groups most vulnerable to heat impacts include the elderly, the very young, and those with pre-existing health conditions. Illnesses such as angina, kidney disease, and diabetes are at higher risk of being triggered or exacerbated when people are unable to maintain a safe body temperature.[19]

People suffering from mental disorders are also vulnerable. This vulnerability to extreme heat can result from altered behavioral responses to high temperatures or the impact of medications.

As stated earlier, irritability and psychological stress also increase in heat. When hot days are combined with hot nights, heat load and stress carry over and the body has no opportunity to cool down and recover. Studies show that there is an association between the mortality of not just stroke patients but also the general population and high night temperatures.[20] The 'synergistic effect' of night humidity, increased temperatures, and urban heat island effects in heatwaves has been estimated in some studies to double general mortality risk by the end of

[17] Hanna and Tait (2015) *Limitations to thermoregulation and acclimatisation challenges human adaptation to global warming,* Int J Environ Res Public Health 12.
[18] WorkSafe Queensland (n.d.) *Health effects,* https://www.worksafe.qld.gov.au/injury-prevention-safety/hazardous-exposures/heat-stress/health-effects
[19] Hanna et al (2016) *The silent killer: Climate Change and the Health Impacts of Extreme Heat,* The Climate Council, https://research-management.mq.edu.au/ws/portalfiles/portal/72578140/72578105.pdf
[20] Murage et al (2017) *Effect of night-time temperatures on cause and age-specific mortality in London,* Environmental Epidemiology 1; Roye (2017) *The effects of hot nights on mortality in Barcelona, Spain,* International Journal of Biometeorology 61.

the century under RCP 8.5.[21] Often underrated, major heatwaves have been dubbed the 'silent killer', causing more deaths in the last century in Australia than all natural disasters put together.[22]

Extreme heat nights also cause increased insomnia and lack of rest. This is exacerbated by the higher relative humidity overnight. As sleep is vital for healthy human functioning, a deficit means more susceptibility to disease, obesity, chronic illness and harm to our psychological and cognitive functioning.[23]

Productivity decreases significantly under these stresses as people are affected with the consequences of extreme heat. Workplace safety and the ability to work declines. This can also be displayed in economic terms as costs rise to account for the lack of labour productivity and changes needed in workplaces.[24]

Like most parts of Australia, a significant proportion of the local workforce is exposed to the heat. Construction, forestry and manufacturing are all significant employers in South East SA and are particularly exposed to extreme heat events. Most industries will also be impacted by extreme heat to various degrees.

Extreme heat can also cause failures to critical infrastructure, particularly transport and electricity supply. Coal and gas power stations in particular are highly vulnerable to extreme heat, experiencing both reduced output and an increased level of breakdowns. This is exacerbated by high electricity demand as a result increased use of air-conditioning during extreme heat conditions. During the February 2017 heatwave in South Australia, 17% of gas generation (438 MW) failed to deliver during the peak demand period on the heatwave day (8th of February),[25] leading to widespread blackouts.[26]

The cost of lost productivity because of extreme heat in Australia has been estimated at almost $7 billion in 2013-14 alone.[27]

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[21] Zhao et al (2018) *Interactions between urban heat islands and heat waves,* Environmental Research Letters 13.

[22] Hanna et al (2016) *The silent killer: Climate Change and the Health Impacts of Extreme Heat,* The Climate Council

[23] Obradovich et al (2017) *Nighttime temperature and human sleep loss in a changing climate,* Science Advances 3.

[24] Climate Council (2014) *Heatwaves: Hotter, Longer, More Often,* https://www.climatecouncil.org.au/uploads/9901f6614a2cac7b2b888f55b4dff9cc.pdf

[25] Ogge and Aulby (2017) *Can't stand the heat; The energy security risk of Australia's reliance on coal and gas generators in an era of increasing heatwaves*, http://www.tai.org.au/sites/defualt/files/P454%20Can%27t%20stand%20the%20heat%20FINAL%202.31.pdf

[26] Harvey and Shepherd (February 2017) *Rolling blackouts ordered as Adelaide swelters in heatwave,* https://www.news.com.au/national/south-australia/rolling-blackouts-ordered-as-adelaide-swelters-in-heatwave/news-story/13394f19db1ee94a59f4036fccdc1ba7

[27] Zander, Opperman and Garnet (2015) *Extreme heat poses a billion-dollar threat to Australia's economy,* https://theconversation.com/extreme-heat-poses-a-billion-dollar-threat-to-australias-economy-41153

Conclusion

An increase in days of temperature over 35 degrees will have severe impacts on human health, including increased rates of heat-related deaths.

South East SA is already experiencing a large increase in extreme heat events, affecting people's ability to work and enjoy the outdoors, to play and watch sport.

Fortunately, the increases projected are not inevitable. The CSIRO projections clearly show that if emissions are reduced in line with the Paris target of limiting global temperature increases to below 1.5 degrees, the increase in extreme temperature days will be a small fraction of the increase projected for our current emissions trajectory.

Australia makes a vastly disproportionate contribution to global warming. We are one of the lowest ranked countries in the world on climate action. As well as having one of the highest rates of domestic greenhouse gas emissions per person in the world, we export a staggering 44 tonnes per person of greenhouse gas emissions each via our fossil fuel exports, even greater then Saudi Arabia (35.5 tonnes per person).[28] Even worse, there are plans for huge expansions in gas exports from the Northern Territory and Western Australia that could add a billion tonnes more of greenhouse gases to the atmosphere.[29]

Stopping any further expansion of Australia's coal and gas exports, phasing out existing exports and reducing emissions produced at home are all essential to the global effort required to prevent increases in extreme heat that will have such a devastating effect on South East SA and Australia as a whole.

[28] Thwaites and Kestin (July 2018) *Australia ranked worst in world on climate action,* https://reneweconomy.com.au/australia-ranked-worst-world-climate-action-49472/

[29] Climate Analytics (2018) *Western Australia's gas gamble, Implications of exploiting Canning Basin and other unconventional gas resources for achieving climate targets,* https://climateanalytics.org/media/climateanalytics-report-westernaustraliasgasgamble-2018.pdf