

A professional cyclist in a blue, yellow, and red jersey is shown in a dynamic pose, leaning forward on a road bike. The jersey features the word 'LE MONDIAL' and the number '24'. The cyclist is wearing a blue helmet and sunglasses. The background is blurred, showing a race track and spectators.

Vicious cycle

Climate change,
extreme heat and
the Tour Down Under



AUSTRALIAN
CONSERVATION
FOUNDATION



MONASH
CLIMATE CHANGE
COMMUNICATION
RESEARCH HUB

Vicious Cycle:

Climate change, extreme heat and the Tour Down Under.

*Front cover. Tour Down Under 2009. Photo. Paul Coster.
Below. Tour Down Under. Photo. AAP.*

Key findings

- Australian cycling and the Tour Down Under are already experiencing the impact of climate change and extreme heat—increasing the risk of heat stress on participants and the likelihood of race disruptions.
- Under current emissions scenarios, Adelaide will see a significant increase in the number of extreme heat days in January over the next 40-60 years.
- Without effective climate mitigation action, consideration should be given to permanent race adaptations that could reduce heat stress risk and provide greater certainty to participants. Viable options include moving the Tour Down Under to November or March, or shifting the start time of each race to earlier in the day.
- By adopting the principles of the United Nations Sports for Climate Action Framework, Cycling Australia is presented with an opportunity to address the root causes of climate change and, in doing so, contribute to safeguarding the longevity of cycling in Australia.



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Australian cycling and the Tour Down Under

Sport holds an almost unmatched position in Australian culture. It shapes the identity of a large majority of Australians and provides a vast range of physical and psychological benefits to the four out of five adults who play at least once a week.¹⁻³ It helps drive our economy too, contributing an estimated 2-3% of the nation's GDP.⁴

Cycling is one of the many sports Australians enjoy, with more than 2.3 million Australians aged 15 years and older participating each year.¹ It is enjoyed in a variety of ways: as recreation to socialise and improve health, as a means of transport, or in an organised environment, with around 8% of cycling being conducted in clubs, organisations or dedicated venues.⁵

Road cycling is the chosen format for many of the sport's enthusiasts, with summertime in particular seeing pelotons of lycra-clad cyclists descending on many of the nation's picturesque roads. Australia's premiere road cycling event is the Santos Tour Down Under. It was the first Union Cycliste International (UCI) event to be held outside Europe, and it's the first event on the annual World Tour calendar. Staged in and around Adelaide during January, the event attracts some of the world's best cyclists as they build towards the season's biggest events, like the Tour de France and the Giro d'Italia.

Beginning in 1999, the Tour Down Under has grown to become the biggest cycling race in the southern hemisphere.⁶ In 2019, more than 800,000 spectators attended, including 48,000 interstate or international visitors who travelled specifically for the event.⁶ It has major economic value for the South Australian Government which hosts the event, with \$70.7 million generated in 2019, creating the equivalent of 837 full time jobs.⁷ Santos, Australia's second biggest independent oil and gas company, has the naming rights to the Tour Down Under and is one of the country's biggest greenhouse gas emitters.⁸

Higher concentrations of greenhouse gases in our atmosphere mean that we are seeing changes in extreme summer heat,⁹ with the potential to compromise the long term viability of the Tour Down Under. This could have a detrimental impact on the global cycling calendar and also jeopardise the value of the event to the South Australian economy.

January is the hottest month of the year around Adelaide, so it's not surprising the Tour Down Under has been affected by extreme heat since its inception. In 2006, the race saw four consecutive days over 42°C and melting bitumen in Yankalilla.⁶ In the last three years organisers have had to alter or shorten stages of the race due to safety concerns relating to high temperatures.

The current national bushfire disaster further compounds these concerns. In December 2019, the Cudlee Creek bushfire in the Adelaide Hills destroyed more than one hundred homes, killed one person and injured many.¹⁰ Two legs of the race are scheduled to proceed in this area. With hot and dry conditions expected to continue into January, further fires remain a risk. Organisers are monitoring the situation, saying the Adelaide Hills Council hopes to proceed on the planned route through the region.¹¹

With so much riding on the Tour Down Under, **Vicious cycle** brings together health, sports and climate research to:

- Highlight the impact of extreme heat on cyclists
- Assess the current management of extreme heat in Australian cycling
- Investigate the viability of continuing to host the Tour Down Under in its current format under a "business as usual" greenhouse gas emissions scenario

This report presents an opportunity for the governing bodies of Australian cycling to recognise the capacity they hold to take effective action on climate change: not only to adapt to the changing impacts of extreme heat, but to lead by example in mitigating impacts in the future.



"...Because of the **burning of fossil fuels** and changes in land use, the concentrations of greenhouse gases in the atmosphere are rising and causing surface temperatures to increase, leading to an '**enhanced**' **greenhouse effect**."

State of the Climate report,
CSIRO and Bureau of Meteorology (2018)

Climate change and Australia's role

2018's State of the Climate report, published by the CSIRO and Bureau of Meteorology, explains that recent global climate change trends are overwhelmingly human-caused.¹²

Humans have emitted more carbon dioxide since 1970 than we did in the two hundred years before that.¹³ This unprecedented acceleration has changed the climate system 170 faster than the last 7,000 years of human history.¹⁴ Recent figures from the United Nations Environment Programme show that this acceleration is ongoing, as GHG emissions have risen at a rate of 1.5% per year in the last decade.¹⁵

Although Australia has a relatively small population, its impact on global emissions is disproportionately large. In the 2020 Climate Change Performance Index, Australia was ranked worst on climate policy among all 57 countries assessed.¹⁶

Figure: Australia's domestic emissions (excluding land use and agriculture).²¹ Multiple of the world average is calculated by dividing this figure by global per-capita emissions less land use and agriculture.

Climate change is being felt heavily in Australia. All but one of the nation's ten warmest years on record have occurred since 2005,¹⁹ culminating in our hottest and driest year being recorded in 2019.²³ Nationally, Australia's climate has warmed by just over 1°C since 1910, accelerating in the last 70 years.¹²

This single degree of warming has led to drastic changes at a local level, increasing the frequency of extreme weather—particularly extreme heat.¹² Australia's hottest days and nights have warmed in the last century.²⁰ Monthly averages of daytime and nighttime temperatures are now “very high” six times more often than they were 30–60 years ago.¹²

Falling behind the pack

Australians make up just **0.3%** of the world's population...



We are also the world's
largest supplier of
coal

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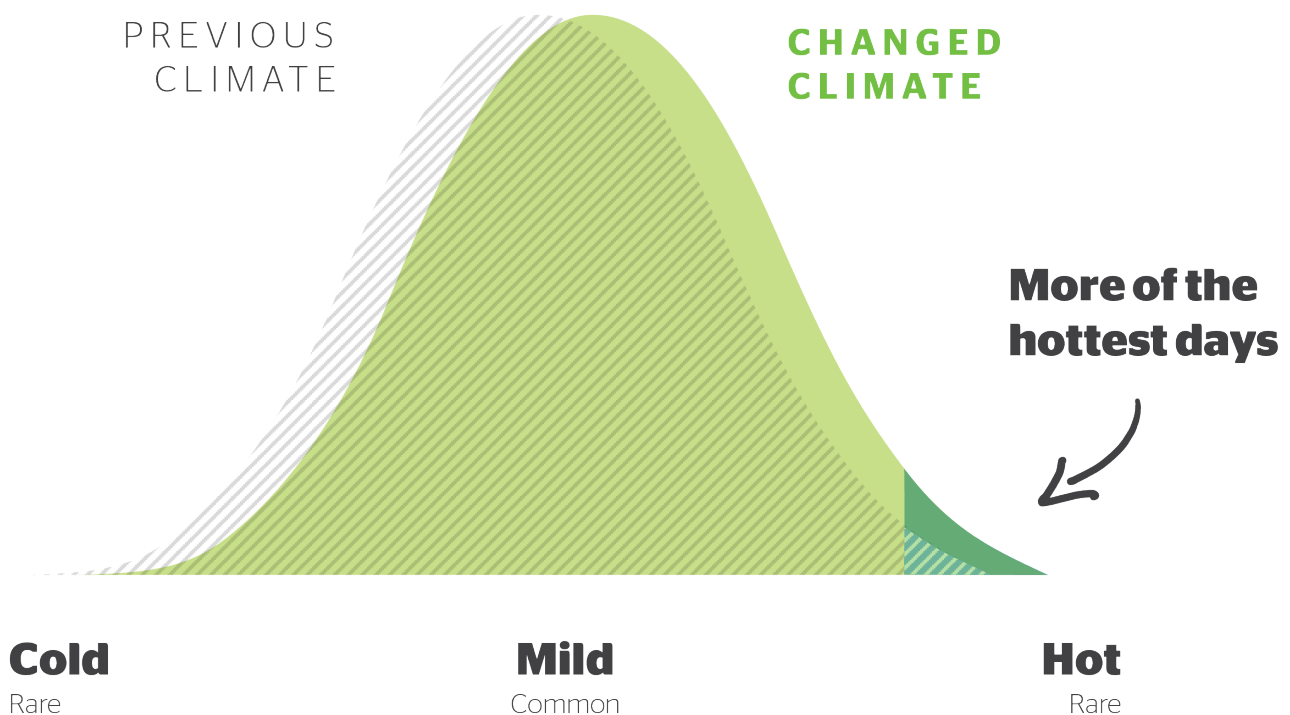
Australia also faces an increase in other extreme weather events, including storms, fire weather and flooding¹² with serious consequences for every region of Australia. The current bushfire crisis wreaking havoc across large parts of Australia underscores the risks that increases in extreme weather pose for the country.

If global levels of greenhouse gas emissions continue to rise on current trajectories, Australia can expect to see further increases in temperatures, resulting in more extremely hot days and fewer extremely cold days.¹²

Figure: Warmer average temperatures can increase the heat extremes we experience. Changes in variability can further affect hot and cold extremes.

Mean

extremes



How heat impacts cyclists

Extreme heat is a major health hazard for cyclists, disrupting the thermoregulation that maintains core body temperature at around 37°C.²¹

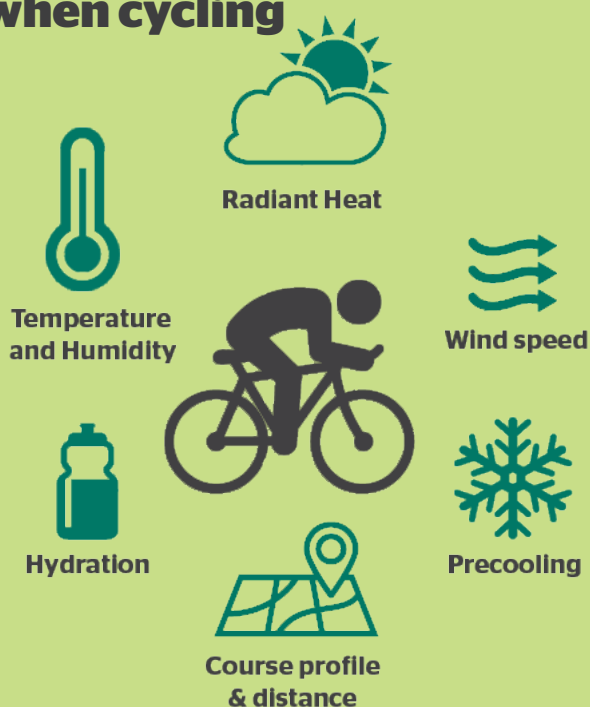
The British Association for Sustainable Sport describes the escalating symptoms of heat stress in sport, beginning with muscle cramps, profuse sweat, thirst and fatigue. But things change with more severe forms of heat stress. Participants often present surprising symptoms as they progress toward heat stroke: sweating often stops as participants run low on body fluids, they may feel chills, and problems with the nervous system may impair coordination and thinking.²² These symptoms, among others, are life-threatening.

Figure: Factors influencing heat stress risk in cycling. Adapted from the UCI Beat the Heat Guide.²⁴

Competitive cycling is a high-intensity activity in which cyclists push themselves beyond their normal boundaries, leading to an increase in heat production and body temperature.²³ When this intensive activity is combined with hot and/or humid conditions, the body's self-cooling system becomes less effective²⁴ and cyclists can suffer from significant heat stress.²⁵ As South Australian elite junior cyclist Ethan Egglesstone notes, "At around 38°C, [competitive cycling is] pretty exhausting and hard on the body."

Environmental factors which influence the risk of heat stress include high temperatures, humidity, radiant heat and wind. The risk of heat stress is therefore elevated in a midsummer cycling event like the Tour Down Under, with cyclists scheduled to race in the middle of the day when solar radiant heat is at its peak. In January, the elevated bushfire risk in and around the route has the potential to not only disrupt the race, but also pose health risks due to exposure to smoke pollution.

Factors influencing heat stress when cycling



The health risks of bushfire smoke.

The disastrous 2019-20 bushfire season has brought into sharp focus the impacts of smoke on human health—impacts that only intensify when playing sport.²⁶ An athlete's respiratory rate and volume increases when engaging in high intensity sports, which increases the amount of airway exposure to pollutants. This can negatively impact performance and lead to long term health effects including decreased lung function.²⁷

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Heat policies in Australian cycling

Cycling Australia's most recent heat policy was released five years ago. It outlines when the body's Extreme Heat Recommendations take effect, as well as procedures relating to competition modification, postponement and cancellation. Once the temperature hits 41°C, all competition must be postponed.²⁸

But this policy only applies to competitions governed by Cycling Australia. The Tour Down Under is governed by the UCI. The UCI Extreme Weather Protocol was published in 2016 in response to ongoing concerns over rider safety.²⁹ The protocol cites "extreme temperatures" as a condition that could lead to event amendments, but lacks specific detail crucial for decision-makers.

For instance, the protocol provides options for organisers to modify race timing, venue or route, and in the most serious instances, cancel a route or race.²⁹ But it gives no definitive measurement as to when temperatures become "extreme". When "hot" becomes "too hot" is decided at the event organisers' discretion.

Whilst Cycling Australia's policy has important detail which the UCI protocol lacks, its maximum temperature threshold of 41°C is higher than comparable policies:

- The South Australian Sports Medicine Association's Hot Weather Policy states that risk of heat illness is classified as "extreme" if the temperature exceeds 36°C with 30% relative humidity.³⁰
- Cycling South Australia (CSA)'s Extreme Weather Policy states events should be cancelled or postponed if the temperature is forecast to reach 37°C.³¹

An analysis of the Tour Down Under's days of extreme heat across the history of the event show that if the CSA's guidelines were in force, individual stages would have been cancelled 15 times.

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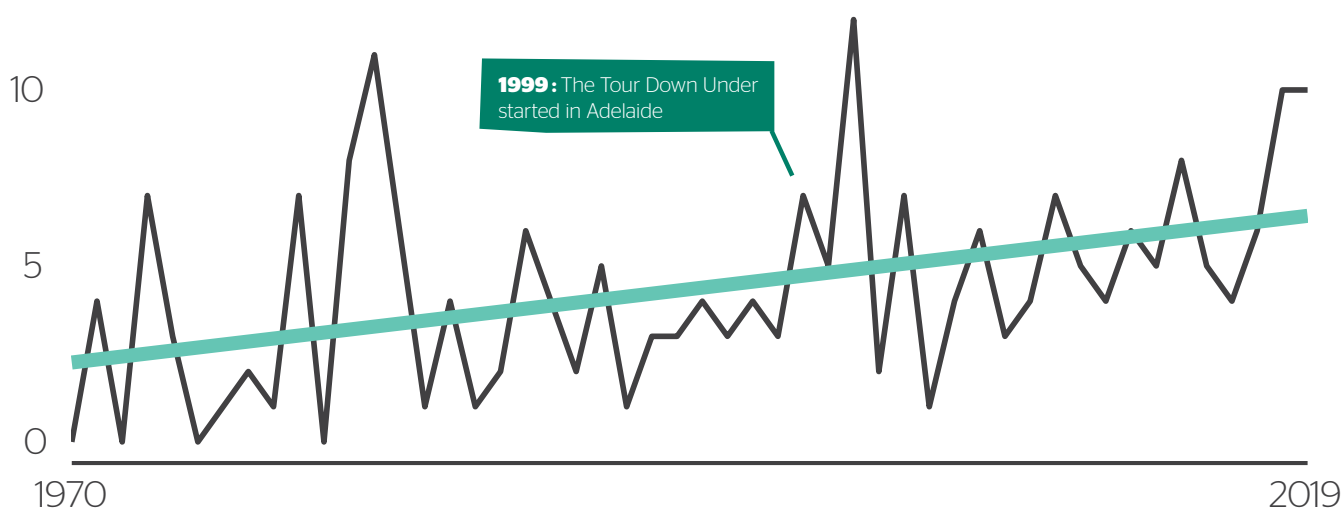
Since 1970, Adelaide now experiences around 4.2 more January days of 37°C or above. Nuriootpa, which stage one of the Tour Down Under visits, has seen a similar increase of 3.5 more days of 37°C or above.


Of the heat policies discussed, only the UCI lacks specific guidelines on when to cancel or postpone cycling competitions. The others outline various tools and thresholds to determine whether a race should proceed. Even so, these policies generally measure environmental heat stress rather than human heat strain, which has been criticised as inadequate.³² Further research in this area is recommended to ensure governing bodies can accurately determine the heat stress risk of an event to cyclists.³²

Figure: The number of January days of at least 37°C each year at the Adelaide weather station (023090). Data from the Bureau of Meteorology's ACORN-SAT dataset.

Adelaide's January Days of 37°C or above

+4.2 more days since 1970





Since 1970,
Adelaide now
experiences
around **4.2 more**
January days of
37°C or above.

Local snapshot

Wheel Women Cycling Club

It's not just professional cyclists that are impacted by increasing temperatures; grassroots cycling communities are also feeling the heat.

Melbourne-based cycling group Wheel Women Cycling (WWC) encourages female participation in road cycling by providing a supportive and accessible environment. The group runs several weekly rides across the city and state for its membership of more than 500 women.

But observed increases in summer heat throughout Victoria are proving to be detrimental to the safety of participants. At the Moorabbin weather station in Melbourne's bayside region, where many of WWC's rides take place, January's hottest days have increased by more than 5°C since the early 1970s.

Tina McCarthy, the founder of WWC, has grave concerns about the future of summer riding in Victoria, lamenting that the 2019 season was especially difficult. "I don't think we've ever had this many rides cancelled, ever."

Figure: The hottest day in January since 1972 at the Bureau of Meteorology's Moorabbin weather station (086077).

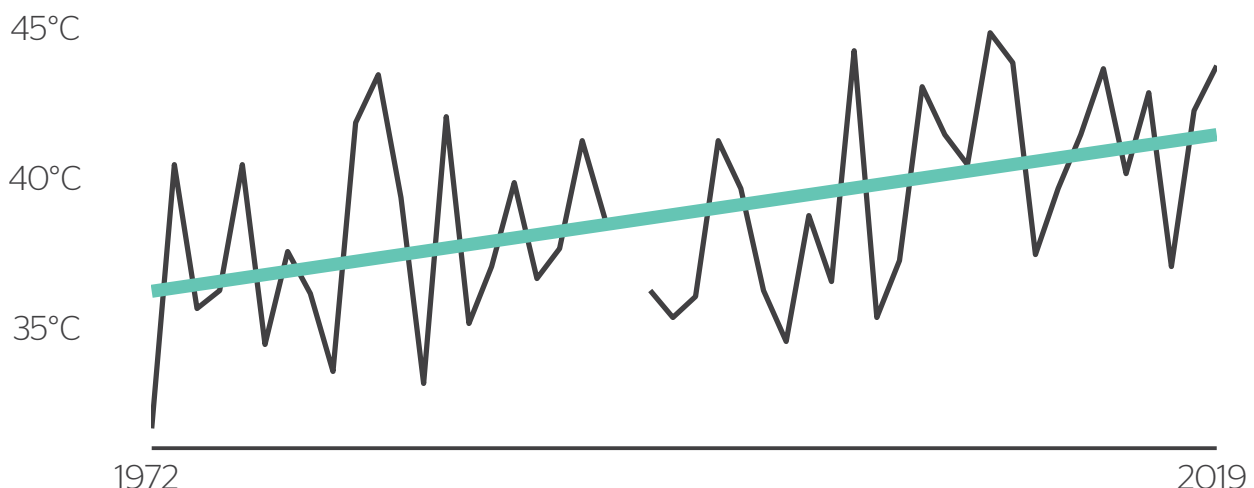
In 2017, a rider became extremely unwell with heat exhaustion, which McCarthy described as "a tipping point." Following this incident, and a spate of ride cancellations due to soaring temperatures, WWC brought in an extreme heat policy in 2017. In addition to a mandatory requirement for cyclists to carry two water bottles on every ride, the policy specifies that at 32°C, rides will be called off.

McCarthy recognises that 32°C seems like a low temperature threshold compared to other policies. However, many of WWC's participants either have a lower fitness level or are older. Older Australians are particularly susceptible to heat stress illnesses because they may have pre-existing medical conditions or take medications that can interfere with thermoregulation.³³

McCarthy notes that even experienced riders, herself included, have had issues riding when the mercury creeps above 30°C. McCarthy notes that "you can only drink so much. Beyond added hydration, we're really going to have to think about what else we can do."

Moorabbin Airport's Hottest Day in January

+5.2 °C warmer since 1972



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Below. Wheel Women Cycling Club. Photo. Tina McCarthy

“You can only drink so much. Beyond added hydration, **we’re really going to have to think about what else we can do.**”

- Tina McCarthy, founder of WWC



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Climate modelling suggests the number of January days above 32°C is set to increase under current emissions scenarios. This doesn't bode well for the longevity of the kind of community cycling in Australia currently enjoyed by the Wheel Women.

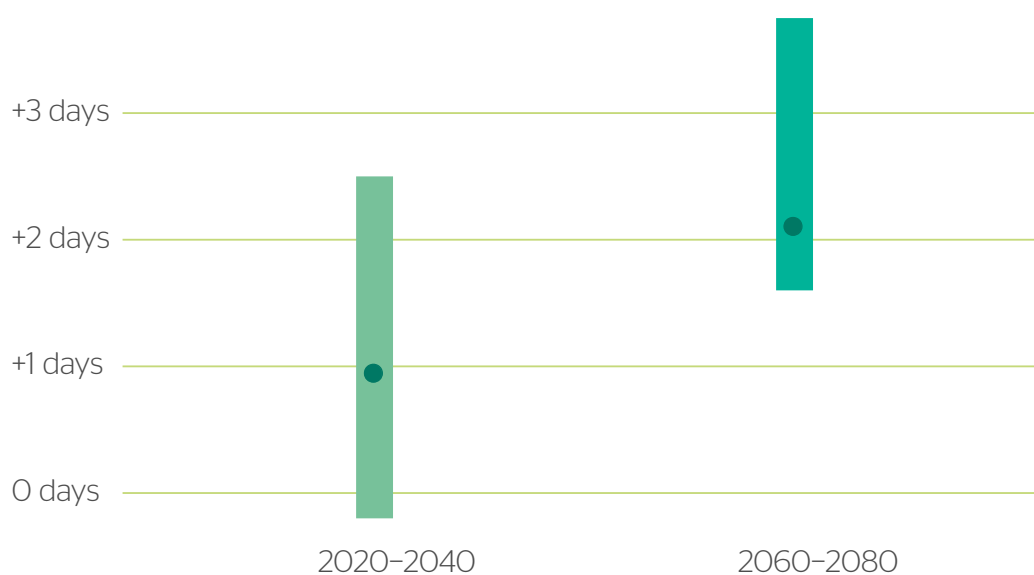
Figure: The projected change in the average number of January days of at least 32°C each year near the Moorabbin Airport station relative to 1990–2010. Projections are for the SRES A2 scenario—often referred to as a “business as usual” scenario—projecting a global temperature rise of 2.0–5.4°C by 2100.³² Bars represent the range of estimates for each month across an ensemble of climate models; points represent the average estimate for the ensemble.

"The sad thing is, while we're trying to get people to ride, **we can't because it's too dangerous.**"

- Tina McCarthy, founder of WWC

More January heat projected for Moorabbin

Under business as usual, Moorabbin is projected to see more days of 32 °C+ over the next 60 years compared to 1990-2010.



Vicious Cycle:

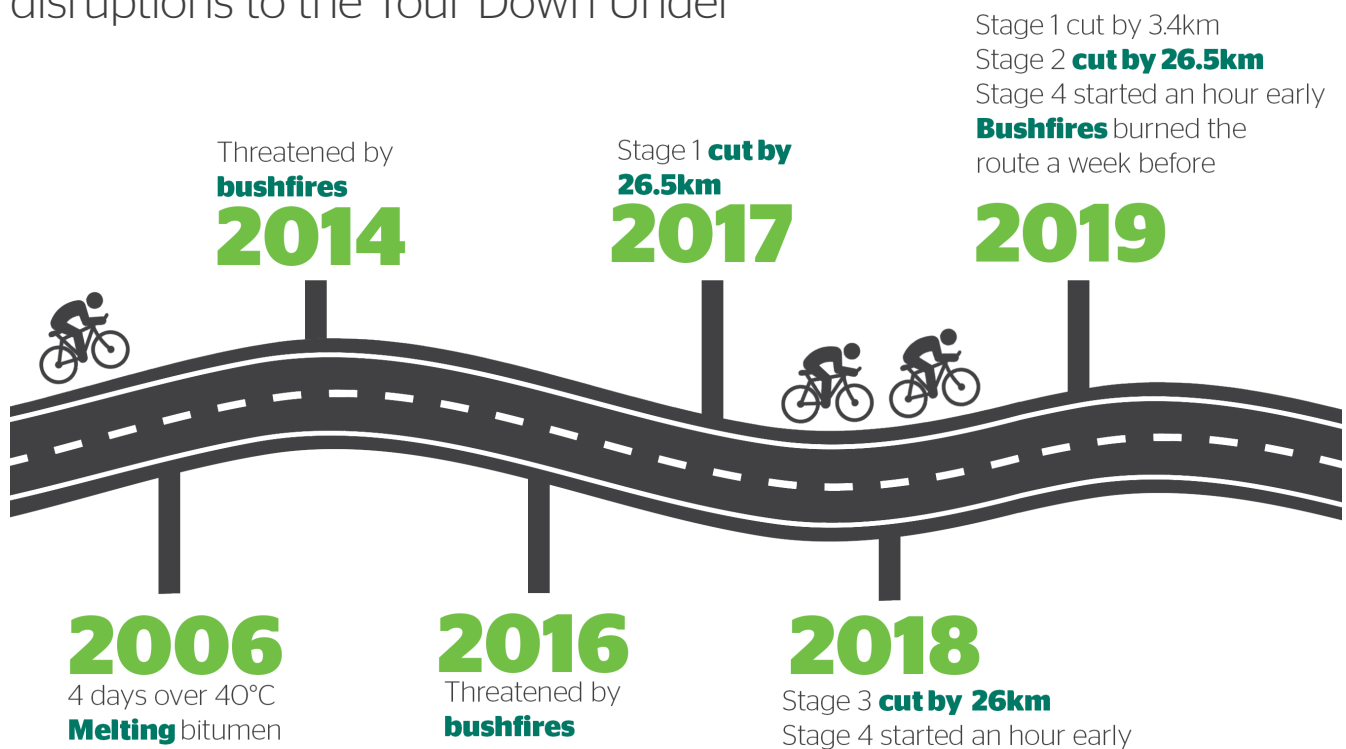
Climate change, extreme heat and the Tour Down Under.

The future of the Tour Down Under

Held in the peak of Australian summer, the Tour Down Under has always been hit by periods of extreme heat. For the two decades the event has been running, Januarys in and around Adelaide have seen increases in average daytime temperatures and the number of extreme heat days.

While no significant long-term changes have been made to the competition, past instances of extreme heat have resulted in several last minute race adaptations to protect competitors and fans. For example, scorching heat over the last three years has forced event organisers to shorten or alter stages of the race.

Road blocks Climate and heat disruptions to the Tour Down Under



These instances suggest that even current levels of extreme heat pose significant risks to participants' health. Looking ahead, high resolution climate models show that under current emissions

scenarios, Januarys in Adelaide will continue to heat up, increasing the likelihood of more race disruptions. Over the next 40–60 years, the number of days at 37°C or above is projected to increase.

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These projections suggest that continuing to race the Santos Tour Down Under in its current format will expose competitors and fans to unprecedented levels of extreme heat. As such, consideration should be given to adaptation options to reduce the risk of heat stress for race participants and spectators.

One option would be to move the event to either November or March. Modelling suggests that in the future, these months may look similar to the Januarys of recent memory (1990–2010). However, such a change would inevitably present significant economic, logistical and cultural challenges. In particular, this could have major implications for the UCI World Tour schedule.

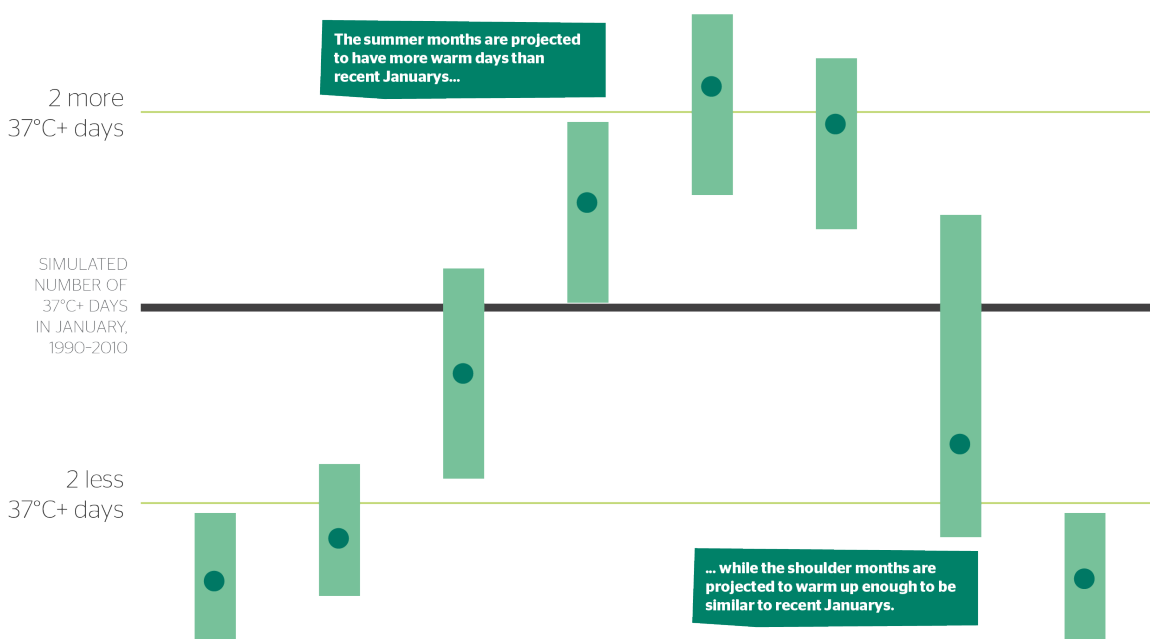
Figure: The projected change in the average annual number of hot days (37°C or hotter) near Adelaide's Kent Town station each month of the summer and shoulder seasons in 2060–2080, relative to January in 1990–2010. Projections are for the SRES A2 scenario—often referred to as a “business as usual” scenario—projecting a global temperature rise of 2.0–5.4°C by 2100.³² Bars represent the range of estimates for each month across an ensemble of climate models; points represent the average estimate for the ensemble. Results are similar at all temperature thresholds from 30°C to 43°C, although at more extreme thresholds November and March have a lower number of days.

If disruption to the World Tour schedule was deemed unworkable, consideration could also be given to adjusting the start times of each stage of the race. At present, race stages are held in the middle of the day where radiant heat is at its strongest. By starting—and subsequently finishing—stages earlier in the day when radiant heat isn't as intense, race organisers could reduce a major heat stress risk factor. For example, stage six of 2020's competition, which is the longest stage of the race at 151km, is scheduled to start at 10:40am and finish at 2:28pm. By starting at 7am and finishing before 11am, the most extreme heat of the day could be avoided. This option could also appeal to the UCI, which does not have any specific rules dictating when races are to be held. But this option could be unattractive to spectators as it may present logistical difficulties in getting to the varied stage locations so early in the morning.

While neither option—changing the time of year or changing the time of day—is without risk, this is the unfortunate reality of outdoor sports in a changing climate. These changes could provide more certainty around event logistics to competitors and fans than recent last minute adaptations.

Turning up the heat on the Tour Down Under

Under business as usual, the heat of recent Januarys is projected to expand to the shoulder season by 2060–2080, while the summer months get hotter still.



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Climate action scorecard for Cycling Australia

Supports Australia becoming a net zero greenhouse gas polluter by 2050?

Yes

Supports the transition of Australia's electricity sector to 100% renewable energy?

Yes

Plans to transition electricity use to 100% renewable energy?

Maybe

Assessed what impact predicted increases in extreme heat will have on elite and community participants?

Somewhat

Assessed what impact heat stress will have on community participation in a changing climate?

No

Tracks the number of event days that are delayed or abandoned as a result of extreme heat?

Yes

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Opportunities for **Cycling Australia**

With the development of its heat policy, Cycling Australia has taken a first step to protect its athletes from the worst impacts of heat stress. But this progress could be for nothing if instances of extreme heat continue to intensify without an appropriate response. As argued by the International Olympic Committee and the United Nations, “while the sport sector alone cannot turn back the tide of climate change, it is a hugely important player in this issue.”³⁴

In correspondence provided to the Australian Conservation Foundation, Cycling Australia stated its support for a range of climate-focused initiatives. However, neither its 2019 Annual Report³⁵ nor documentation associated with its Strategy 2020³⁶⁻³⁷ report make any mention of sustainability, environmental responsibility or climate change.

Cycling Australia said it was considering signing the United Nations Sports for Climate Action Framework. This framework calls on sporting organisations to acknowledge the contribution of the sports sector to climate change and their responsibility to strive towards climate neutrality.³⁸

Becoming a signatory to the UN framework would present Cycling Australia with an opportunity to harness its visibility as the peak national body for cycling, and realise its vision for Australia to become “the world’s leading cycling nation”.³⁹ By implementing the framework’s principles, Cycling Australia would take action to address the root causes of climate change, recognising that this could help safeguard the longevity of the sport.

Adopting and implementing the framework also has the potential to send a strong message to the UCI that proactive climate mitigation is ultimately in the interest of all involved in international cycling. It should be noted that if the international cycling community were to recognise that it plays a key role in the global response to climate change, this would raise questions around World Tour events being sponsored by fossil fuel companies like Santos.

"While the sport sector alone cannot turn back the tide of climate change, it is a **hugely important player** in this issue."

- International Olympics Committee

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UN Sports for Climate Action Framework

SYSTEMATIC CHANGE	TAKE ACTION		EDUCATE & INSPIRE OTHERS		
<p>Undertake systematic efforts</p> <p>Comprehensively incorporate climate change and its impacts into business strategy.</p> <p>Establish responsibility for sustainability at the board level.</p> <p>Implement robust approaches to reduce climate impact.</p>	<p>Measure overall climate impact</p> <p>Gather information on current activities to establish a baseline carbon footprint.</p> <p>Evaluate overall climate impacts of the organisation's GHG emissions.</p> <p>Understand how the organisation can take effective action.</p> <p>Top priority should be on activities with the highest climate footprint.</p>	<p>Reduce overall climate impact</p> <p>Prioritise activities & opportunities that avoid carbon emissions.</p> <p>Choose to optimise resource efficiency.</p> <p>Switch to more efficient renewable energy and low-carbon technologies.</p> <p>Implement measures to deal with unavoidable emissions, e.g. carbon offsetting.</p>	<p>Educate others on climate action</p> <p>Communicate efforts both internally & externally to raise awareness about sustainability.</p> <p>Optimise the impact of collective effort on climate action.</p> <p>Inform stakeholders about climate action initiatives.</p> <p>Encourage stakeholders to take action themselves.</p>	<p>Promote sustainable consumption</p> <p>Adopt sustainable procurement policies to motivate providers to develop cleaner options.</p> <p>Communicate with fans & other stakeholders to promote the use of greener sustainable options.</p> <p>(E.g. give preference to sustainable means of transport.)</p>	<p>Advocate for climate action</p> <p>Consistently support climate action by mobilising resources.</p> <p>Showcase sustainable action via broadcasting channels, social media, athletes as role models & ambassadors, events & association & club networks.</p>

Cycling's vulnerability to increases in extreme heat also raises legal considerations. Operational decisions to not directly address future sustainability challenges may place Cycling Australia in a precarious position. There is growing discussion that, under Australian law, governing bodies that continue to fall behind the pack when it comes to climate risk could potentially soon be held legally responsible for their inaction.⁴⁰

Environmental concerns have previously been considered secondary to a director's duties. However, climate change risks may soon represent "material financial issues" for Cycling Australia. In such a scenario, directors could face liability—either jointly with a corporation or individually—under the current Corporations Act for failing to adequately address⁴¹ and report⁴² these risks.

Cycling Australia has the opportunity to take the lead in Australian sport. By reducing its impact on the climate, protecting cyclists from extreme heat and promoting collective climate action, Cycling Australia can ensure the longevity of this national sport in the community.

“

It is conceivable that **directors who fail to consider the impacts of climate change** risk for their business, now, **could be found liable** for breaching their statutory duty of due care and diligence going forwards.

”

- The Centre for Policy Development

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