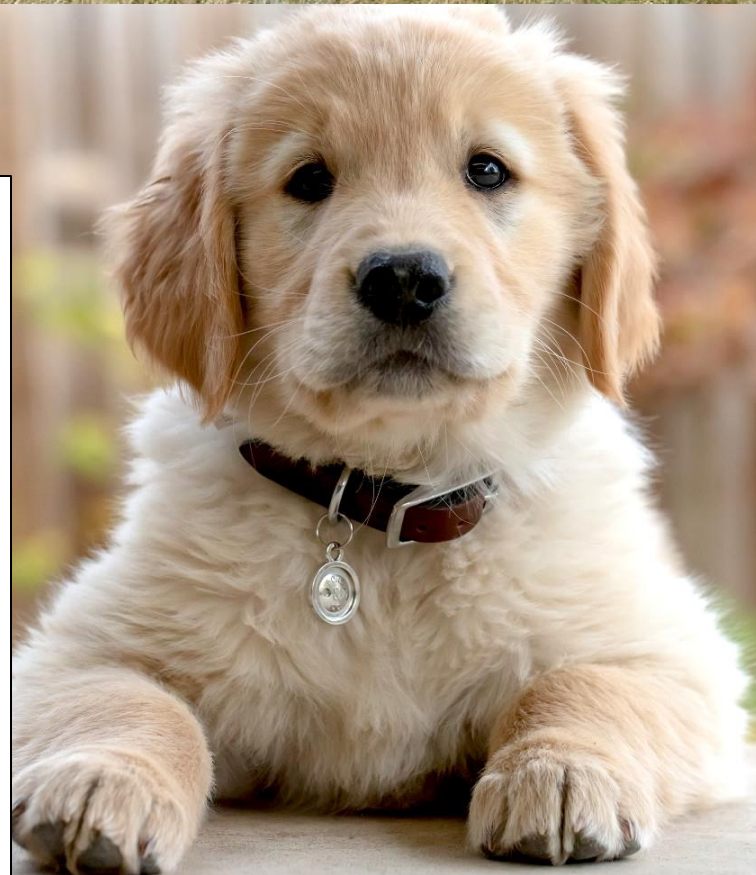
Australia's Changing Climate: Impacts on Animals & Ecosystems

Lesley Hughes

Climate Council



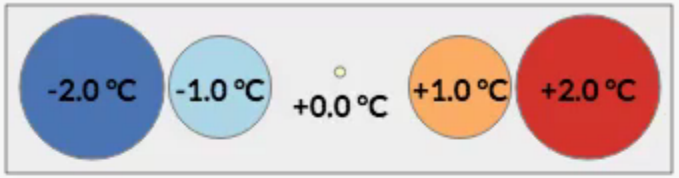
- Summary of climate trends & projections
- Impacts on:
  - Wildlife
  - Livestock
  - Pets


Atmospheric CO_2 now 417 ppm,
up 49% since pre-industrial

TEMPERATURE CHANGE

Years 1900–2018 & Projections 2020s–2090s

1900



Afghanistan
Albania
Algeria
Andorra
Angola
Argentina
Armenia
Australia
Austria
Azerbaijan
Bahamas
Bahrain
Bangladesh
Barbados
Belarus
Belgium
Belize
Benin
Bhutan
Bolivia
Bosnia and Herzegovina
Botswana
Brazil
Brunei
Bulgaria
Burkina Faso
Burundi
Cabo Verde
Cambodia
Cameroon
Canada
Central African Republic
Chad
Chile
China
Colombia
Comoros
Congo Dem. Rep.
Congo Rep.
Costa Rica
Côte d'Ivoire
Croatia
Cuba
Cyprus
Czechia
Denmark
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt
El Salvador
Equatorial Guinea
Eritrea
Estonia
Eswatini
Ethiopia
Fiji
Finland
France
Gabon
Gambia
Georgia
Germany
Ghana
Greece
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
Hungary
Iceland
India
Indonesia
Iran
Iraq
Ireland
Israel
Italy
Jamaica
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Jordan
Kazakhstan
Kenya
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North Korea
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Lao PDR
Latvia
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Libya
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Oman
Pakistan
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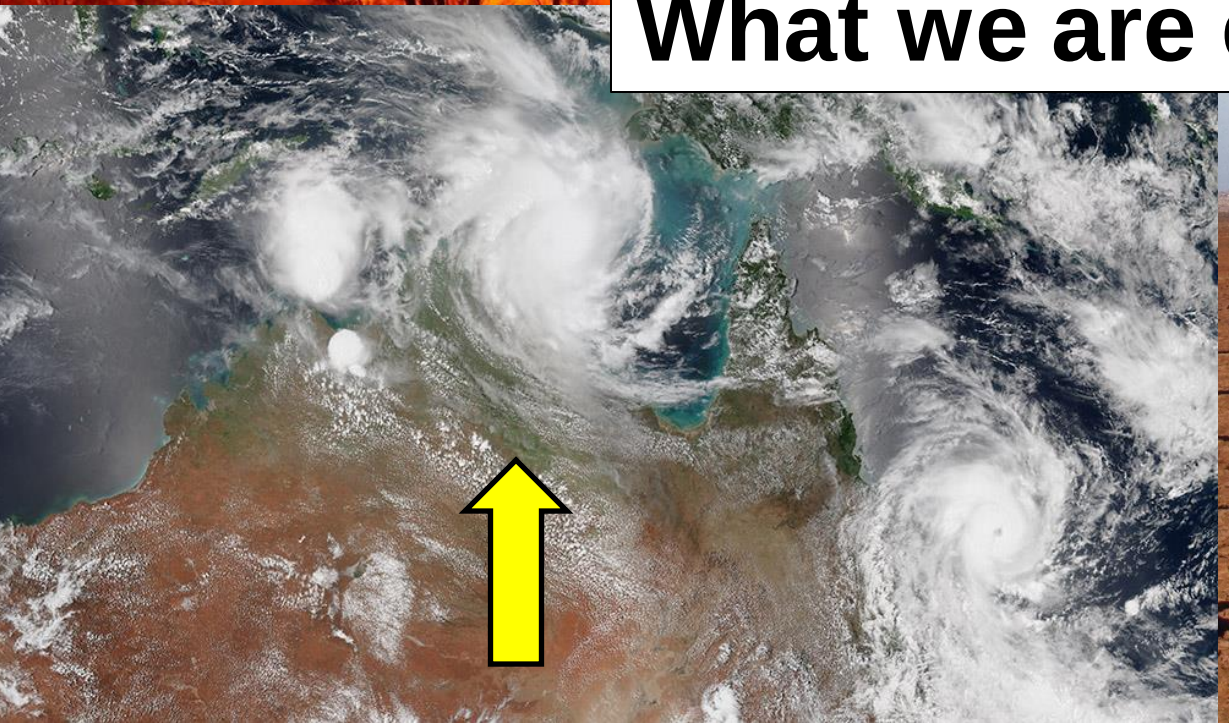
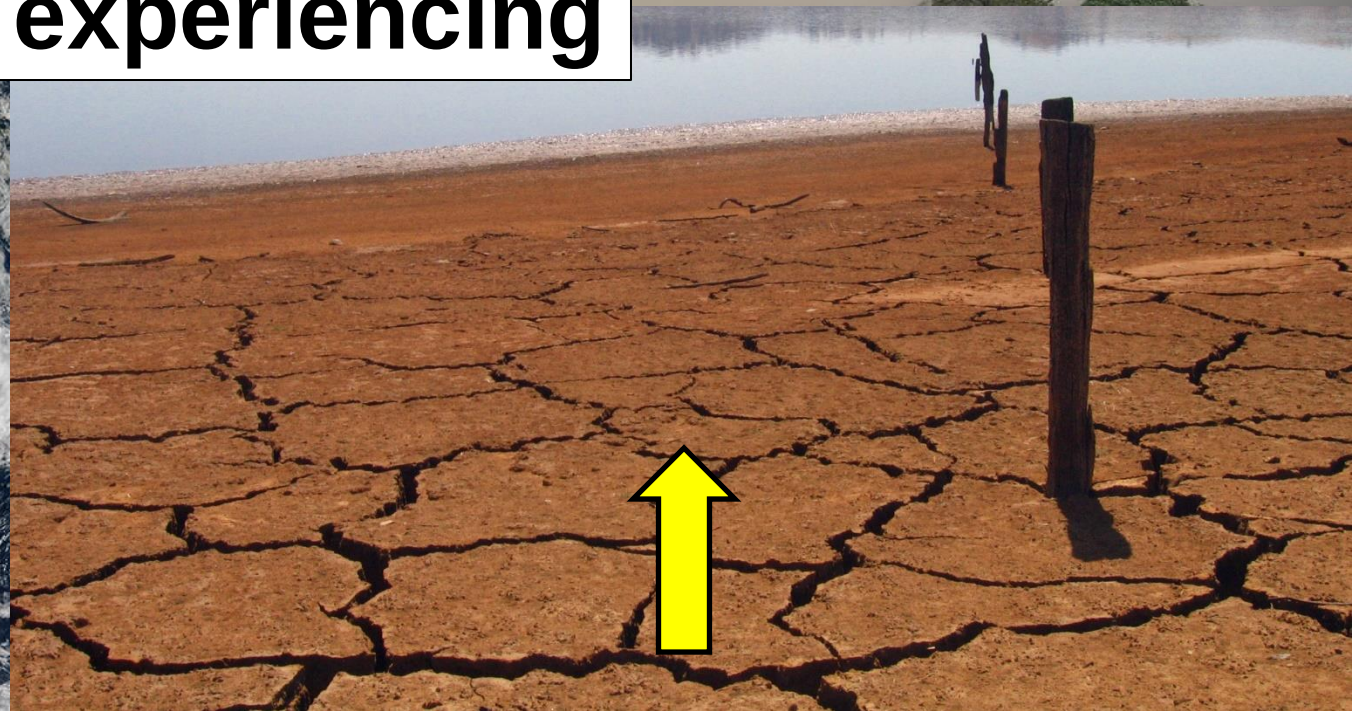
Panama
Papua New Guinea
Paraguay
Peru
Philippines
Poland
Portugal
Qatar
Romania
Russian Federation
Rwanda
Samoa
San Marino
Sao Tome and Principe
Saudi Arabia
Senegal
Seychelles
Sierra Leone
Singapore
Slovak Republic
Slovenia
Solomon Islands
Somalia
South Africa
South Sudan
Spain
Sri Lanka
St. Kitts and Nevis
St. Lucia
St. Vincent
Sudan
Suriname
Sweden
Switzerland
Syrian Arab Republic
Taiwan
Tajikistan
Thailand
Timor-Leste
Togo
Tonga
Trinidad and Tobago
Tunisia
Turkey
Turkmenistan
Uganda
Ukraine
United Arab Emirates
United Kingdom
Uruguay
USA
Uzbekistan
Vanuatu
Venezuela
Vietnam
Yemen
Zambia
Zimbabwe

Data sources:
Berkeley Earth temperature analysis (1900-2018)
The 'rcp45' experiment of the CMIP5 (2020–2100)
Base period 1951–1980.

What we are experiencing





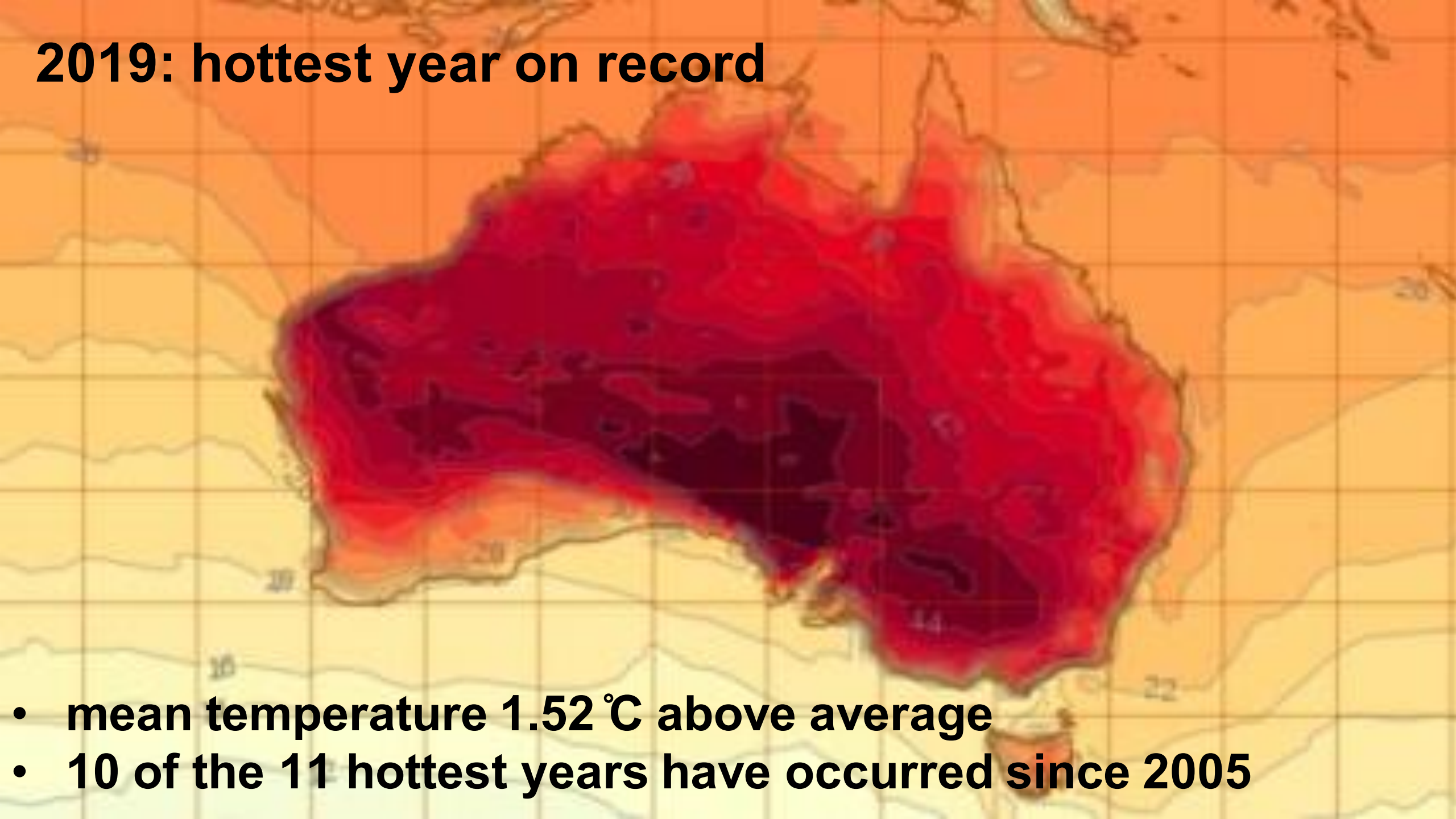
State of the Climate 2020

State of the Climate draws on the latest climate research, encompassing observations, analyses and projections to describe year-to-year variability and longer-term changes in Australia's climate.

Australia has warmed 1.44°C since 1910

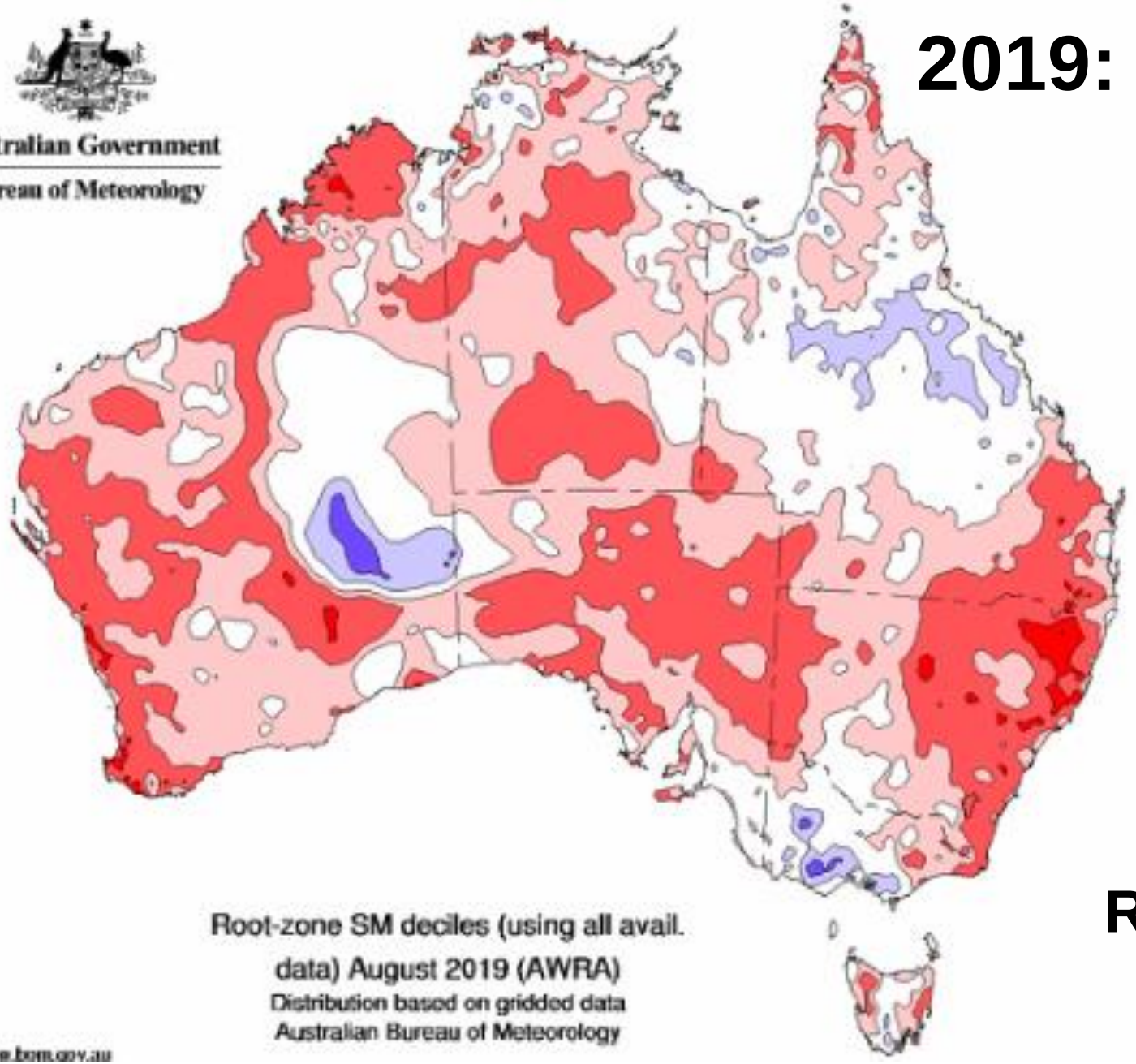
https://www.csiro.au/en/Showcase/state-of-the-climate

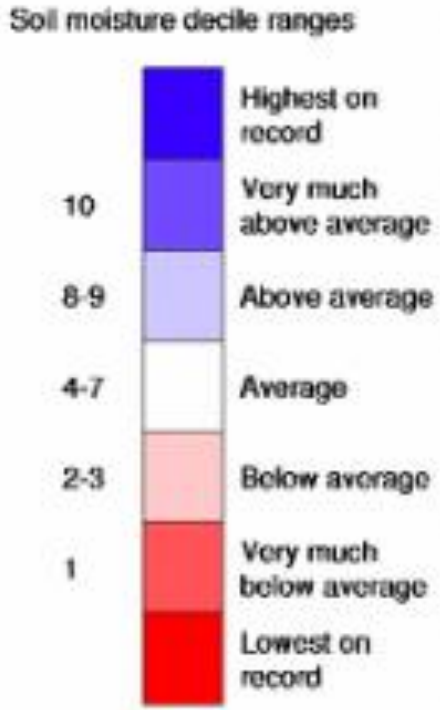
2019: hottest year on record



- mean temperature 1.52℃ above average
- 10 of the 11 hottest years have occurred since 2005

2019: Driest year on record

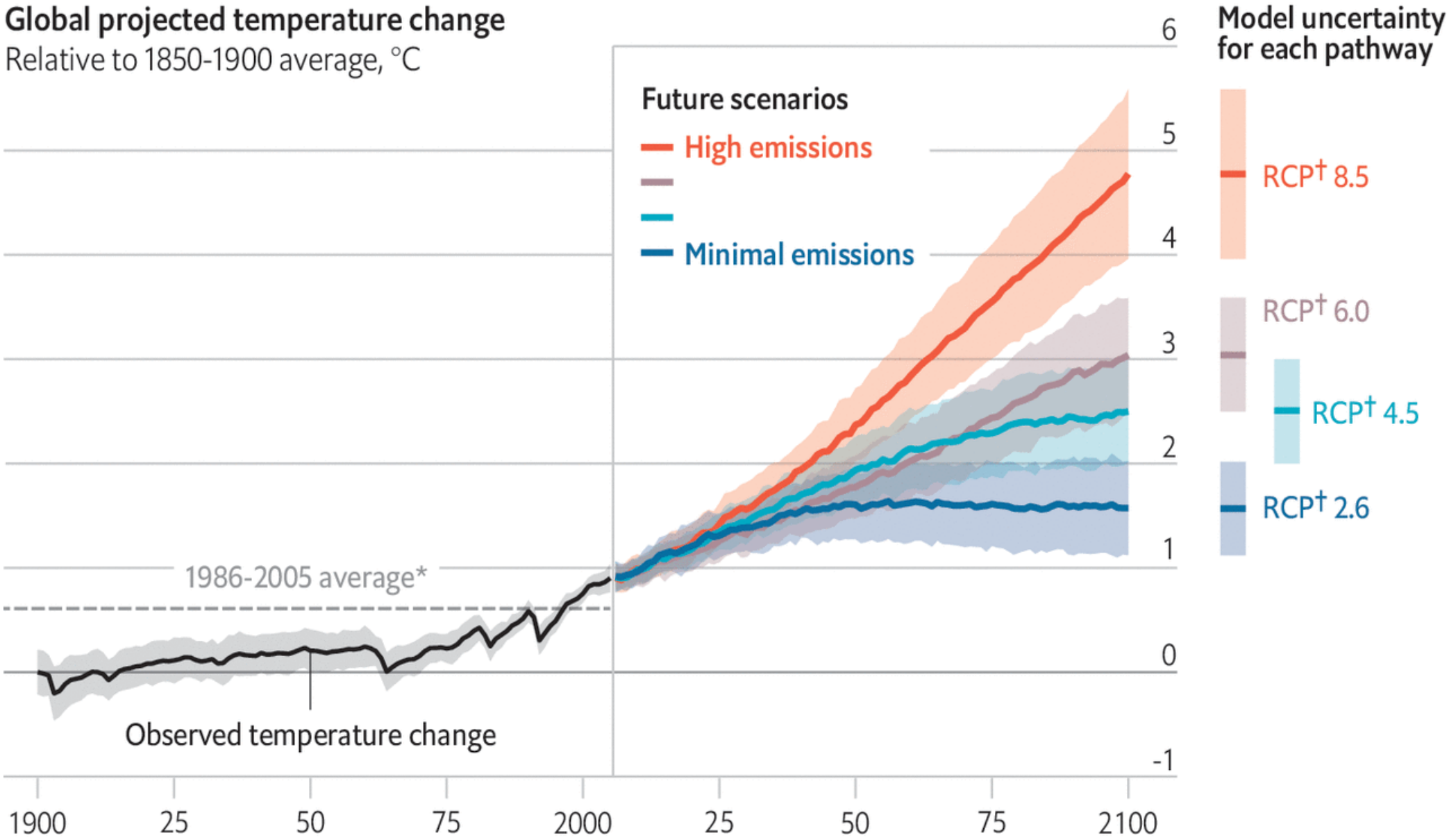




Rainfall 40% below average

Global projected temperature change

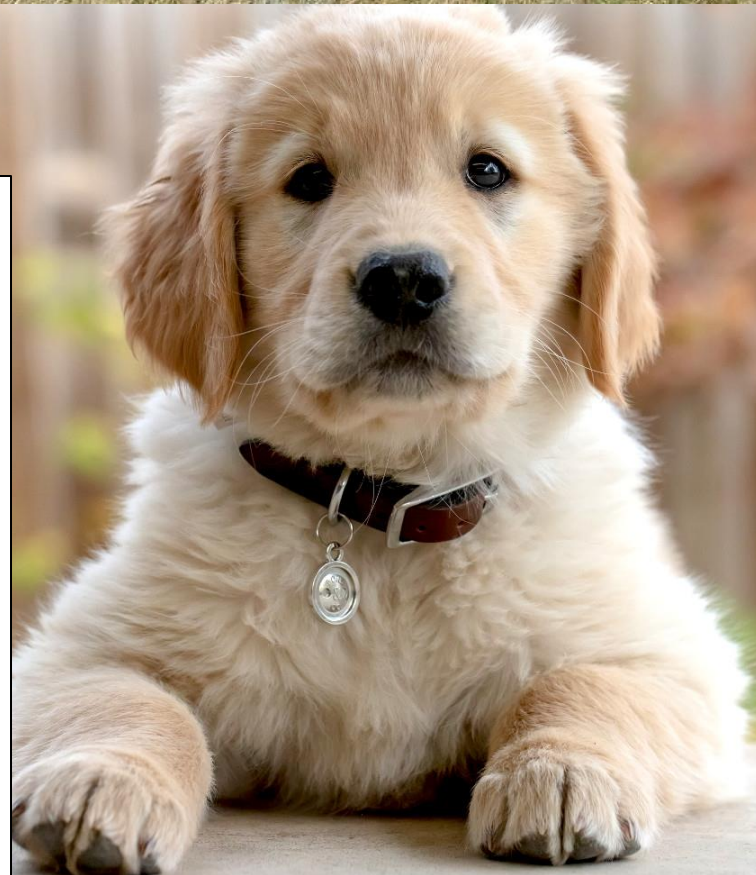
Relative to 1850-1900 average, °C



Source: IPCC AR5, adjusted to an 1850-1900 baseline

*Uncertainties calibrated to 1986-2005, as shown †Representative Concentration Pathway

The Economist



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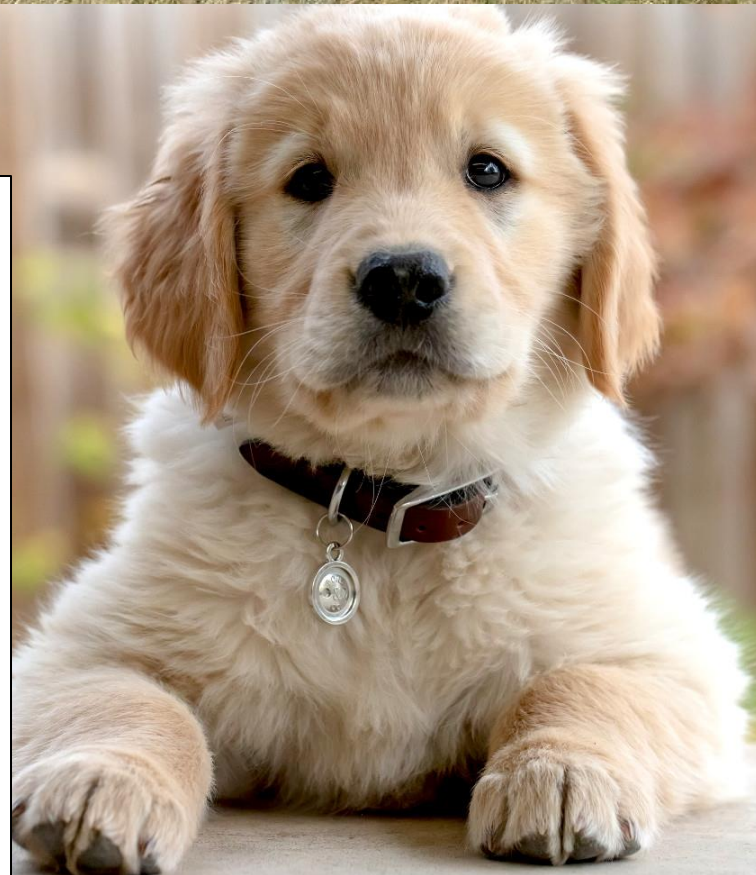

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The context……our ecosystems are transforming

Coral reefs are bleaching


Mangroves are dying

River red gums affected by drought & salinity

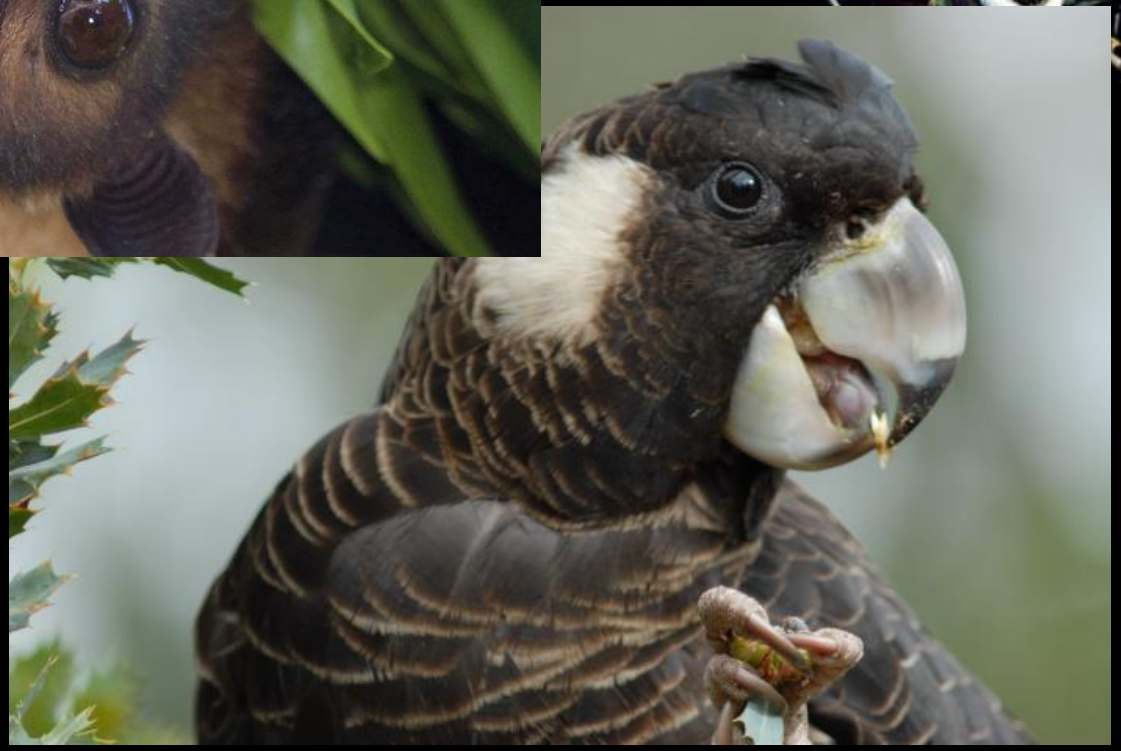
Massive fish mortality in Menindee Lakes

Saltwater intruding into freshwater ecosystems

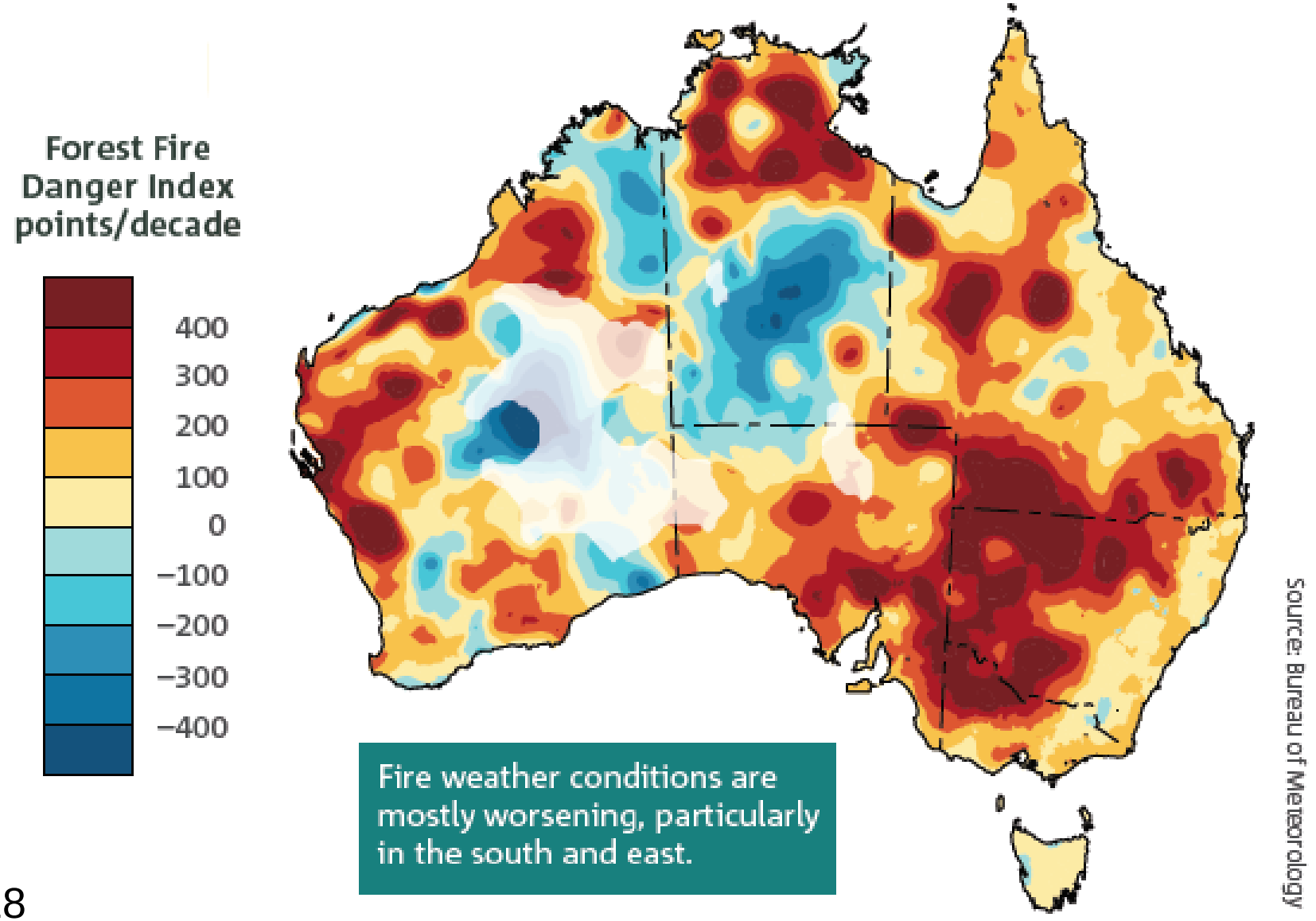
Fires penetrating into new ecosystems

Jarrah forest dieback due to heat and drought

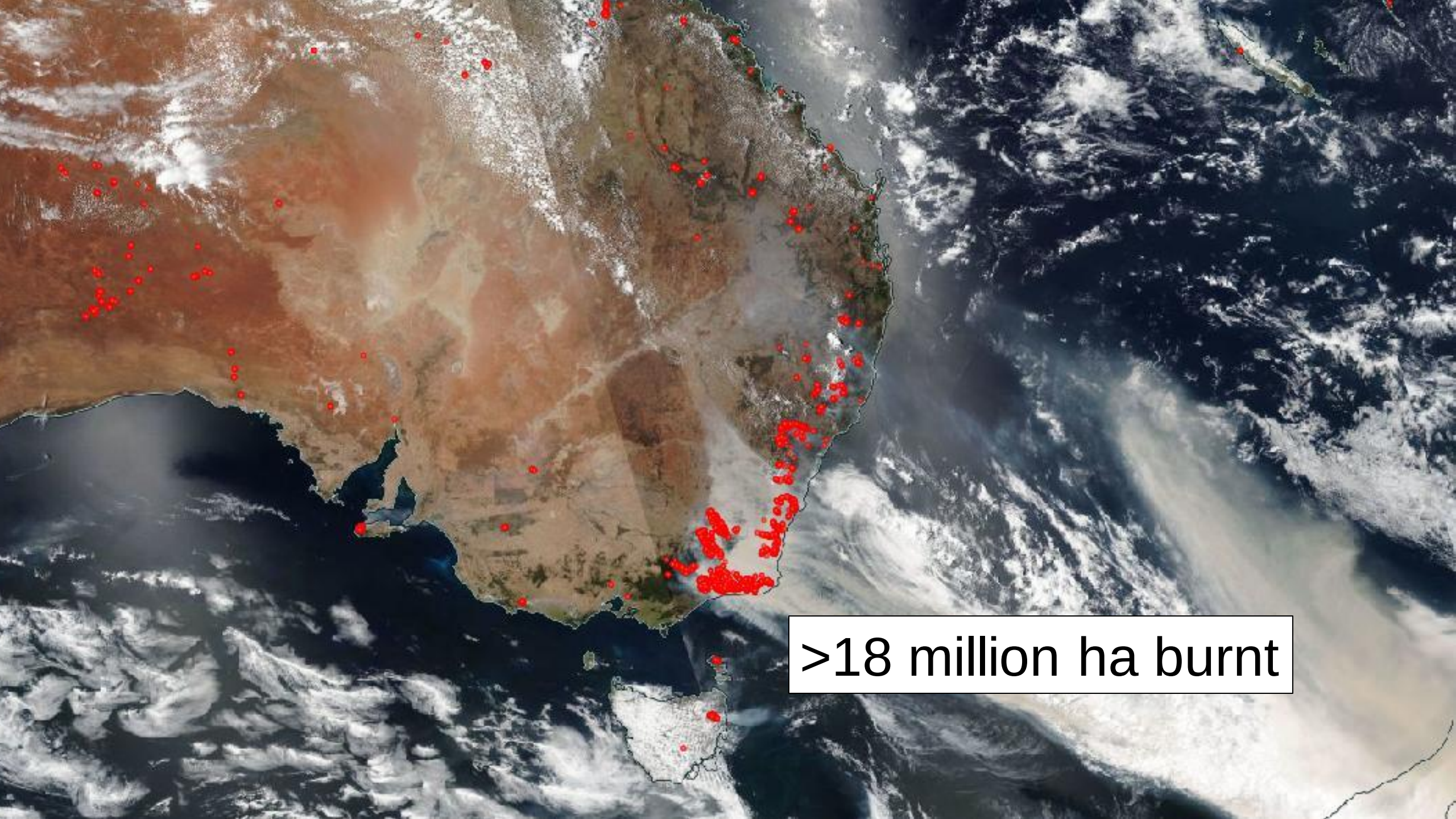
Wildlife



Observed trends in Forest Fire Danger Index (1978 – 2017)



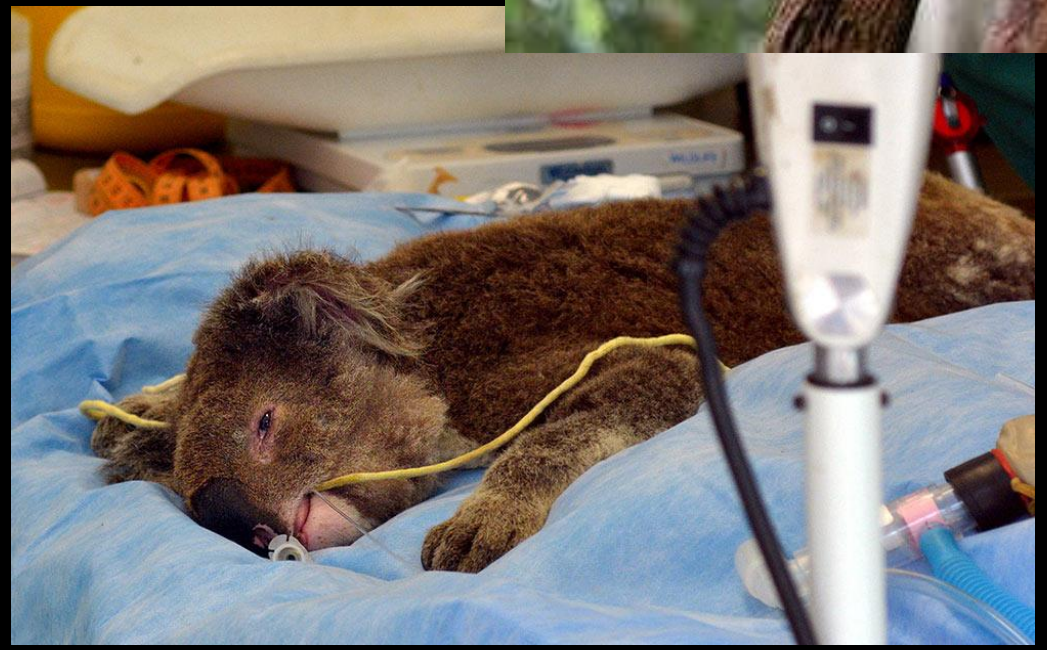
CSIRO & BoM 2018

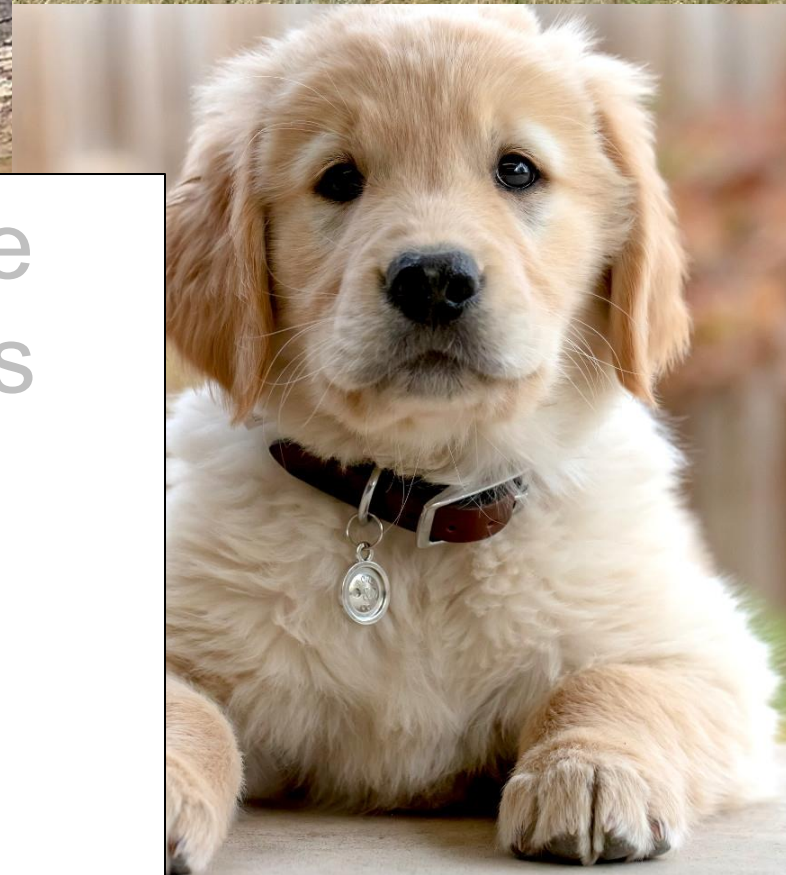

>18 million ha burnt

- **~3 billion vertebrates killed (mammals, birds & reptiles)**
- **Death from smoke inhalation recorded for wildlife 50 km from fire front**
- **Many threatened species lost most or all of their habitat**

- Up to 10,000 koalas died in NSW (1/3 population)
- 25,000 died on Kangaroo Island (1/2 population)
- Post fire conditions: further mortality due to lack of food and shelter

- Animals brought into hospitals and rehabilitation centres subject to stress during handling, transport & housing





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Extreme events

- Mortality

Heat stress

- Metabolic disruption
- Oxidative stress
- Immune suppression

Indirect impacts

- Quality & quantity of food & drinking water
- Distribution, transmission & virulence of pests & pathogens


Feb 2019 ~600,000 cattle killed in N QLD floods

Estimated ~50-100,000 head of sheep and cattle lost across NSW, VIC & SA in Black Summer bushfires

https://www.beefcentral.com/news/bushfire-livestock-loss-estimates-downgraded/

Heat stress

- Rapidly growing, high-producing stock most at risk as they already tend to have higher internal heat loads

- Heat stress reduces appetite via several mechanisms including the expression of ghrelin; subsequent decreased food intake can cause weight loss, lethargy and malaise

Heat stress

- Ruminants: increased ambient temperature increases risk of lameness, metabolic disorders, acidosis, respiratory alkalosis and altered energy balance

- Indoor farm animals at risk from failure of ventilation and air conditioning systems

Jan 2019: Heatwave in Adelaide caused death of 2000 layer chickens on single farm

Nutrition

- Affected positively and negatively via effects on pasture growth, quality & variability
- Decreased pasture growth in marginal areas increases risk of hunger and starvation
- Higher temperatures also associated with increased incidence of fungal toxins in feed
- If supplementary concentrates are fed routinely (such as in feedlots) or as compensation for low pasture, protein digestion may be elevated & body temperature increased, increasing risk of heat-related illness

Parasites & vector- borne disease

- Hotter & more humid conditions more conducive to spread of parasites and vectors including mosquitoes, flies, lice, ticks and mites
- Implications for pets eg for heartworm spread by mosquitoes
- Implications for livestock as tropical parasites spread into more southerly areas eg. cattle ticks
- Direct impacts of temperature increase on pest physiology e.g. 3°C increase associated with 2x increased incidence of fly strike in lambs and 4x increase in ewes

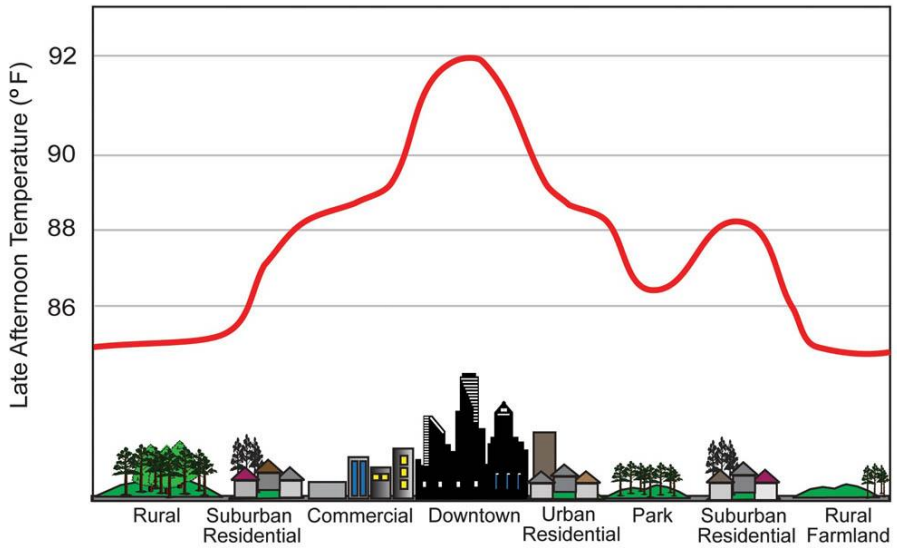
Pets

- Rising average temperatures and more extreme hot days →TNZs will be exceeded more often and for longer periods, especially in urban areas which may be several degrees hotter on a given day than surrounds (Urban Heat Island Effect); ambient temperatures of 25^{o}C can mean footpath temperatures of >50^{o}C

- Thermal Neutral zone (TNZ) of dogs is 20-30^{o}C; guinea pigs 18-26^{o}C, heat stress at >28^{o}C

- Heat stress vulnerability affected by age, pre-existing conditions, breed, reproductive status

- Behaviour also affected: disruption of social dynamics, sleep, increased stress, foraging times



- Pets also at risk of being displaced during evacuations in extreme events
- Many evacuation centres do not allow pets
- Pet owners may delay evacuation action and increase own risk

Sport

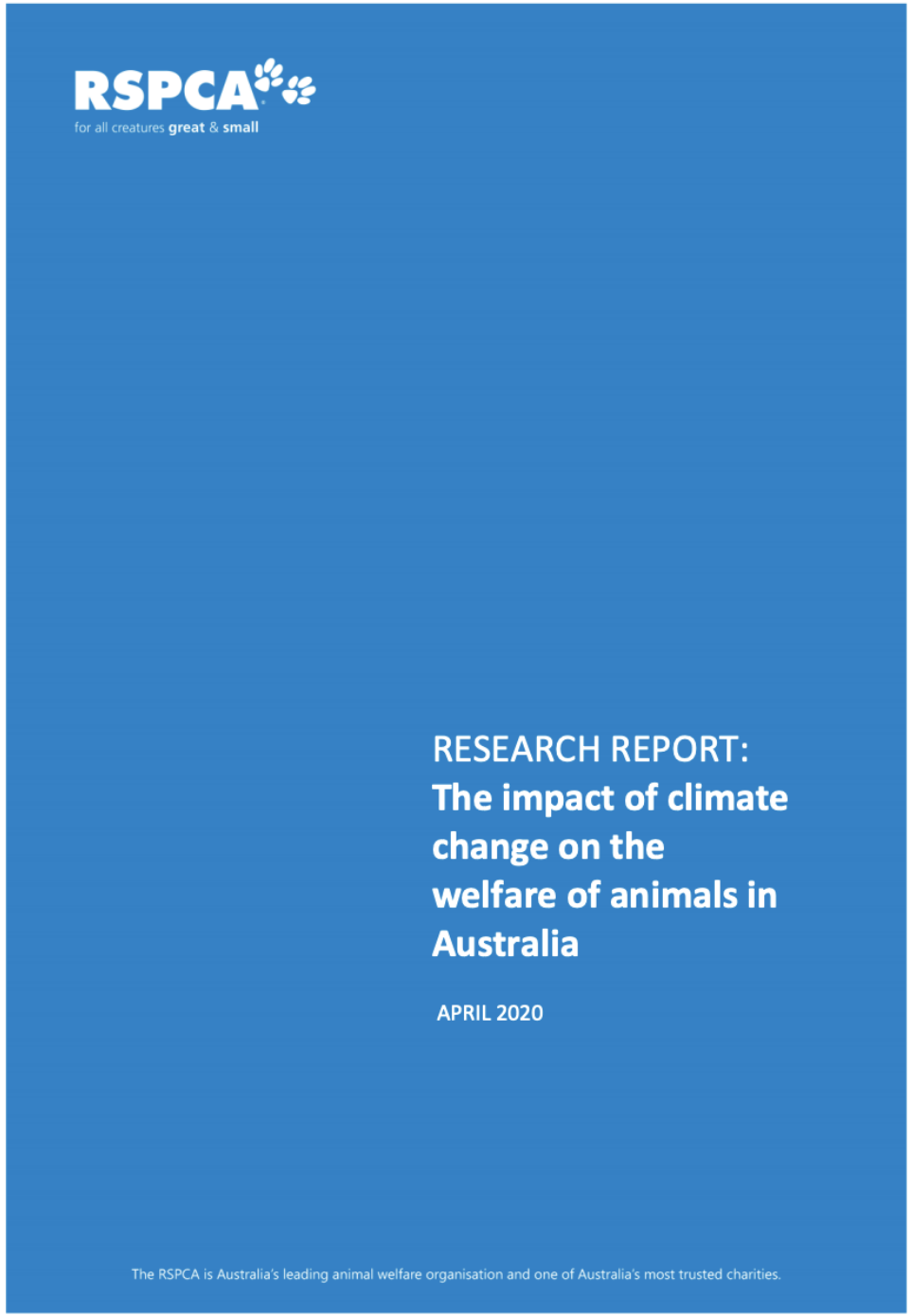
- Thoroughbreds: body temperature increases 1^{o}C per minute of racing
- Greyhounds increase by over 2^{o}C in less than 1 minute

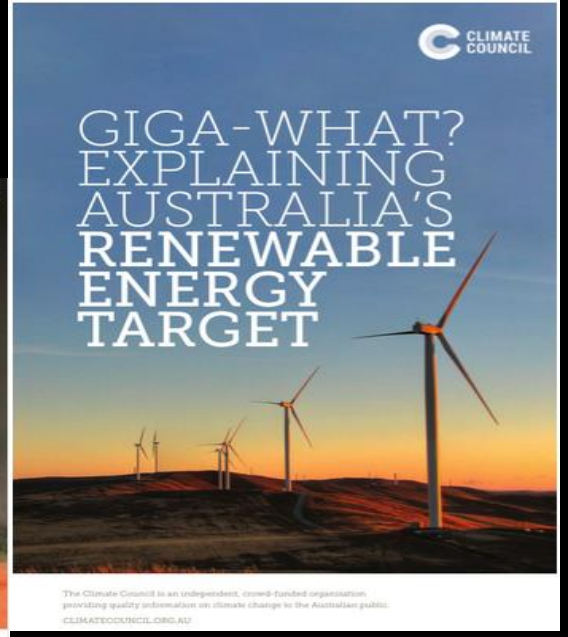
Useful references

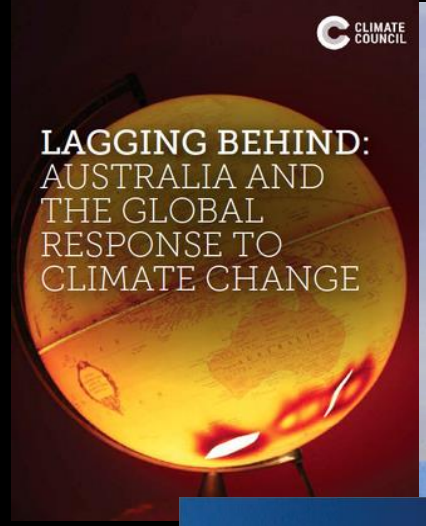
- Lacetera N (2019) Impact of climate change on animal health and welfare. Animal Frontiers 9(1): 26–31. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6951873/

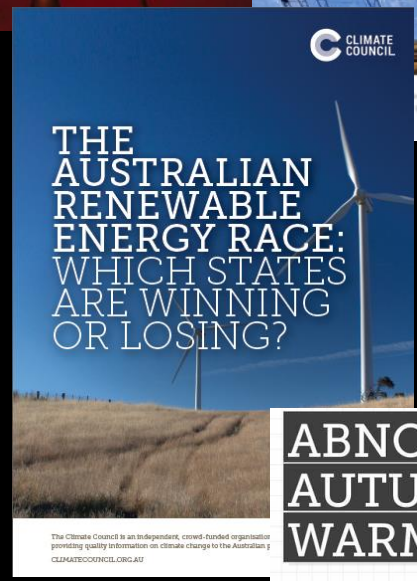
- https://vetpracticemag.com.au/global-warming-rising-cost-australias-livestock-industries/

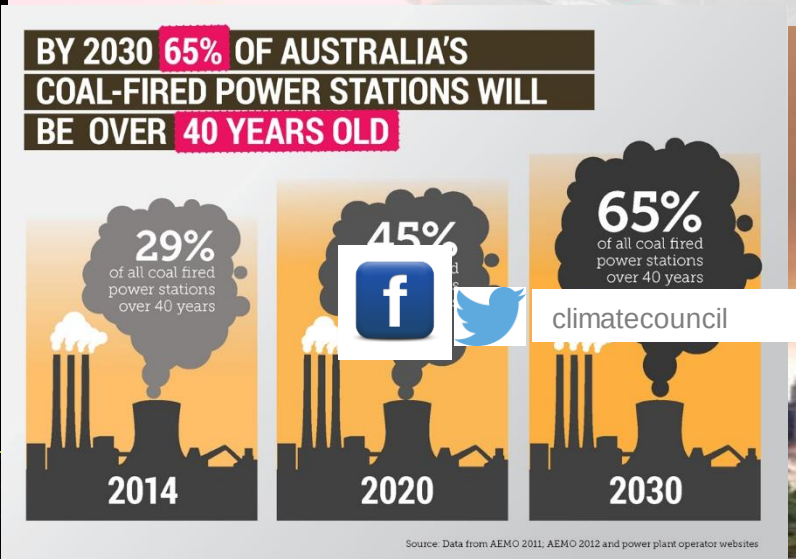
- https://kb.rspca.org.au/wp-content/uploads/2020/05/Climate-Change-and-Animal-Welfare-RSPCA-Australia-Research-Report-May-2020.pdf

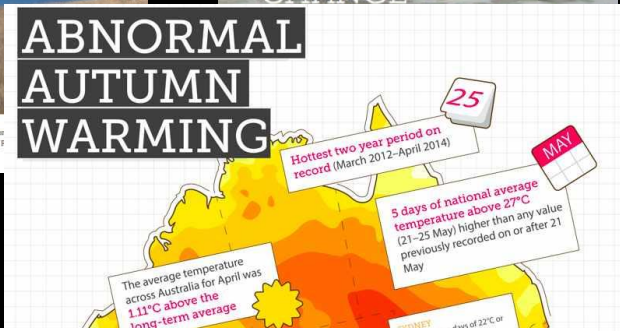












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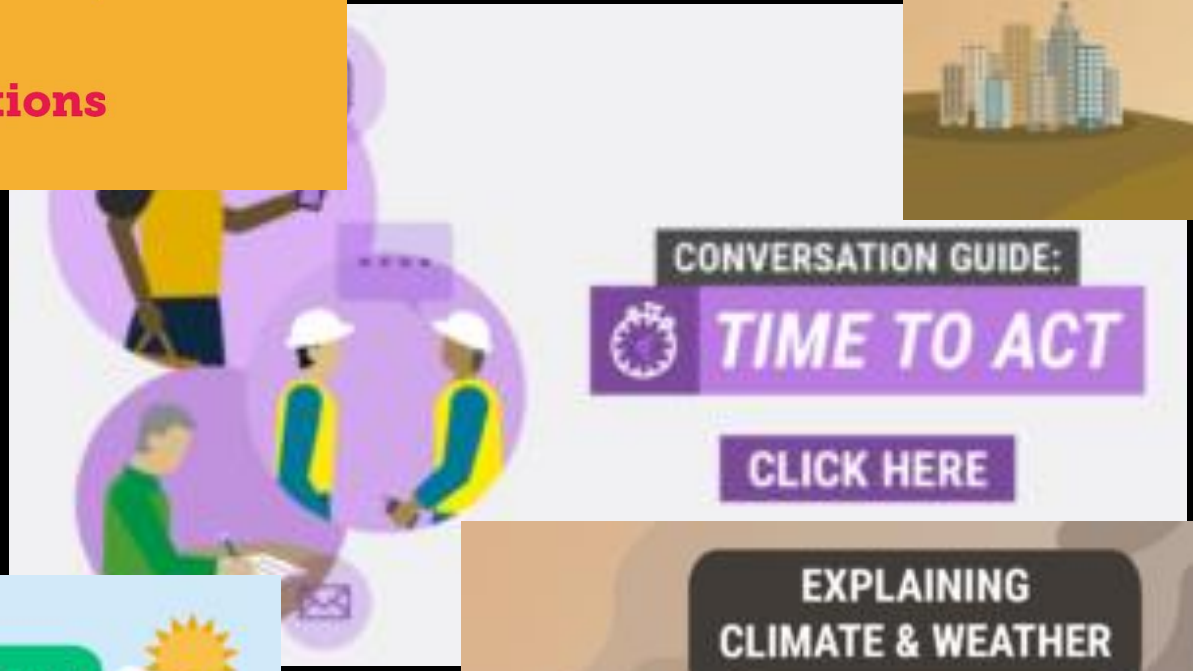
www.climatecouncil.org.au
www.facebook.com/climatecouncil

How to have a

CLIMATE CONVERSATION

Topic #2: Renewable Solutions



https://www.climatecouncil.org.au/resources/climate-conversation-guides/

https://www.climatecouncil.org.au/actions/download-your-climate-action-toolkit/

We are in a climate emergency

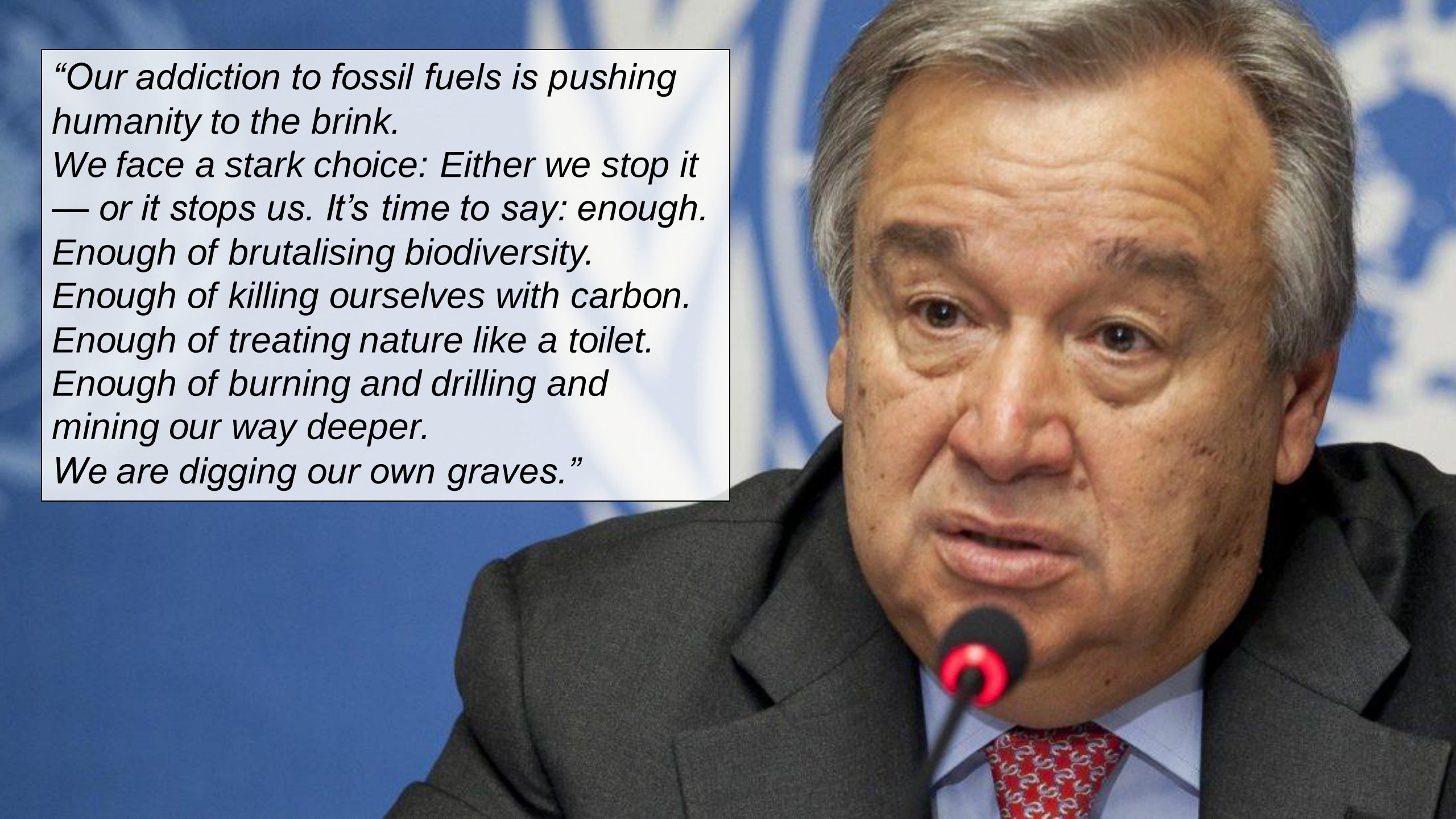
Our physical & biological world is transforming

We don’t have much time

Every fraction of a degree matters

Every year matters

Every choice matters


“Our addiction to fossil fuels is pushing humanity to the brink.
We face a stark choice: Either we stop it — or it stops us. It’s time to say: enough.
Enough of brutalising biodiversity.
Enough of killing ourselves with carbon.
Enough of treating nature like a toilet.
Enough of burning and drilling and mining our way deeper.
We are digging our own graves.”