Climate Trends to Date

SELECTION OF KEY GLOBAL FINDINGS RELEVANT TO AUSTRALIA
From the United Nations **Intergovernmental Panel on Climate Change's (IPCC's)** Synthesis Report. This is the final report in the IPCC's Sixth Assessment Cycle (AR6), integrating all IPCC reports from the past 7 years.

Widespread and rapid changes have occurred
in the ocean, atmosphere, frozen areas, and ecosystems

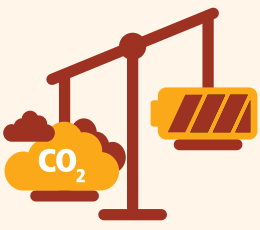
Greenhouse gas emissions from human activities
have warmed the climate at a rate never seen before

Climate change impacts are larger and more severe
than reported in previous assessments

Average global surface temperatures for 2011–2020 reached 1.1°C above
pre-industrial levels

Globally and in Australia, climate change has caused impacts to:

- Crop production
- Livestock health and productivity
- Fisheries yield and aquaculture production
- Flood/storm damages to coastal areas
- Damages to infrastructure
- Damages to key economic sectors



Technological progress has lowered the energy used in producing each unit of Gross Domestic Product (GDP)
but the reduction has not been enough to counteract the increasing emissions from major industries

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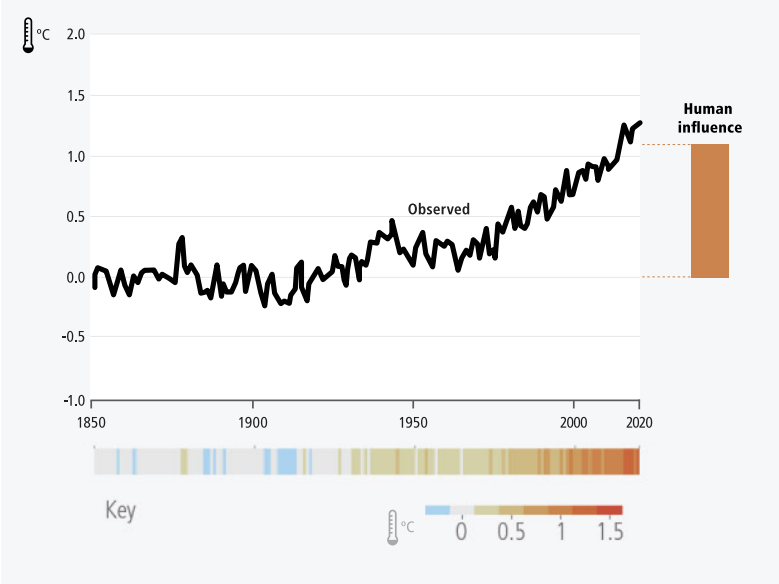
Greenhouse gas emissions (GHG emissions) from human activities have warmed the climate at a rate never seen before[1] in human history. Average global surface temperatures for 2011–2020 reached 1.1°C above pre-industrial (1850–1900) levels.

CHANGES SO FAR

2010–2019 had the highest average decadal GHG emissions on record.** The largest growth in absolute emissions came from fossil fuel and industry CO_2 emissions, followed by methane emissions. Emissions from energy, transport and buildings have also risen since 2010 and together with industry made up 79% of global GHG emissions in 2019.** While technological changes have reduced the energy intensity of Gross Domestic Product (GDP), this has not been enough to offset rising emissions from the growth of these sectors.[2]

The last ten years of warming is a result of past and current unsustainable development patterns. Contributions to warming differ across regions, between and within countries and among individuals. For example, globally 10% of households contribute 34–45% of global consumption-based household GHG emissions, while the bottom 50% contribute 13–15%.** Individuals with high socio-economic status contribute disproportionately to emissions and have the highest potential to reduce emissions.**[3] This is particularly relevant as Australia currently has the highest per capita emissions of all OECD countries.[4]

Human activities are responsible for global warming since 1850



Adapted from Figure 2.1

Global surface temperature has increased by 1.09°C by 2011–2020 compared to 1850–1900. The best estimate of human-caused warming (1.07°C) is almost the same as the observed warming (1.09°C).

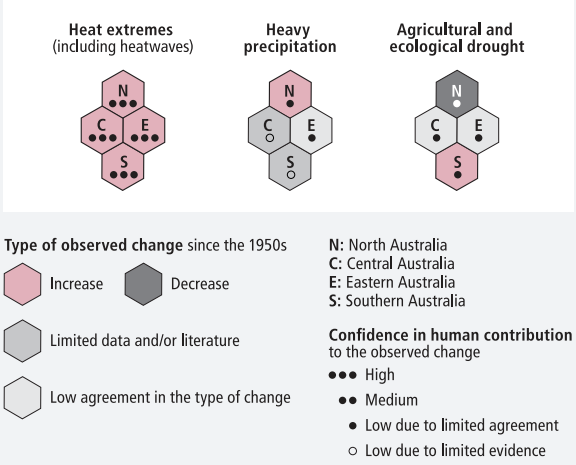
1 Summary for Policymakers (SPM) A.1
2 SPM A.1.4
3 SPM A.1.5
4 Organisation for Economic Co-operation and Development; https://data.oecd.org/australia.htm

* = medium confidence
** = high confidence
*** = very high confidence

OBSERVED IMPACTS

Climate change impacts are larger and more severe than reported in previous assessments[5].**

In every region we have increasingly experienced changes in climate, including more severe extremes.



Adapted from Figure 2.3 (a) — In Australia we have increasingly experienced changes in climate, including more severe extremes. Confidence in the human contribution to these changes has strengthened.

Synthesis of assessment of observed change in hot extremes, heavy precipitation and drought.

Widespread and rapid changes have occurred in the ocean, frozen areas, atmosphere, and ecosystems around the world. Evidence of observed changes in extremes such as heatwaves, heavy precipitation, droughts and tropical cyclones, and, in particular, their attribution to human influence, has strengthened since the last IPCC assessment.[6] These climate changes have resulted in substantial impacts. For example, globally we have lost nearly 50% of coastal wetland area[7], similarly to what has happened in Australia[8], due to the combined effects of localised human pressures, sea level rise, warming and extreme climate events.** In addition, increases in extreme heat events have resulted in human mortality and morbidity in all regions.[9]

Compound extreme events[10] have increased since the 1950s, with impacts seen across natural and human systems. These events often combine with impacts from other human activities and lead to further impacts and risks to health, ecosystems, infrastructure, livelihoods and food.**[11]

In urban settings, observed climate change including hot extremes and flooding, has caused negative impacts on human health, livelihoods and key infrastructure[12].** For example, during 2007–2016, flooding alone cost Australia AUD$8.8 billion per year.[13]

11% of the global population are exposed to coastal hazards[14] and Australia is no exception. 87% of the Australian population lived within 50km of the coast in 2021. With more frequent and severe extreme weather events, the impacts of climate-related pressures on the coastal environment are fast outweighing impacts of population and industry, and coastal adaptation is far behind what is needed to adequately prepare for future climate change.[15]

Climate and weather extremes are increasingly driving displacement in some regions, and small islands states in the South Pacific are disproportionately affected relative to their small population size.[16]

First Nations Peoples in Australia have experienced loss of land and cultural resources, nutritional changes from forced diet change and loss of biocultural diversity due to climate-related impacts[17]. Across the globe, First Nations Peoples experience high vulnerability, influenced by ongoing patterns of inequity such as colonialism.**[18]

Vulnerability is increased by inequalities linked to gender, ethnicity, low incomes, disability, age, and ongoing colonialism, especially for many Indigenous Peoples and local communities.[19]

5 SPM B.2
6 SPM A.2.1
7 Section 2.1.1
8 State of the Environment Report, 2021, https://data.gov.au/data/dataset/2021-soe-water-changes-in-time-in-wetland-area-1983-2019-horizontal-lines-show-long-term-averages
9 SPM A.2.5
10 Compound events occur when (1) two or more events occur at the same time or one after the other, (2) extreme event combines with underlying conditions that amplify the impact of the event or (3) When events that are not themselves extreme combine with others and lead to an extreme event or impact. An example compound event is high sea level coinciding with tropical cyclone landfall.
11 SPM A.2.1; SPM B.2
12 SPM A.2.7
13 Working Group II (WGII) Chapter 11.3.5.1
14 Section 2.1.2
15 State of the Environment Report, 2021, https://soe.dcceew.gov.au/coasts/outlook-and-impact
16 SPM A.2.5
17 WGII Chapter 11.4.1
18 SPM C.5.3
19 SPM C.5.3

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RESPONSES SO FAR

Current actions and policies are not yet sufficient to limit climate change to globally agreed levels. Global GHG emissions implied by Nationally Determined Contributions (NDCs) announced by October 2021 or prior to COP26 make it likely that warming will exceed 1.5°C during the 21st century and make it harder to limit warming to below 2°C. There are also substantial gaps between projected emissions implied by these NDCs and policies enacted by the end of 2020, indicating an 'implementation gap'.**[20] Adaptation gaps also exist between current levels of adaptation and levels needed to respond to impacts and reduce climate risks.**[21]

Some adaptation options are effective in reducing climate risks for specific contexts, sectors and regions and some provide multiple benefits across sectors.** Solutions that address social inequities and adjust responses based on climate risks that cut across systems, increase the effectiveness of adaptation in multiple sectors.**[22]

Economic instruments have been effective in reducing emissions, especially when paired with regulatory instruments. These measures have been effective at the national, sub-national and regional levels.[23] At least 18 countries have sustained CO_2 emission reductions for over 10 years through energy supply decarbonisation, energy efficiency gains, and energy demand reduction, which resulted from both policies and changes in economic structure.**[24]

In addition to deep, rapid, and sustained emission reductions, Carbon Dioxide Removal (CDR) can both counterbalance 'hard-to-abate' residual[25] emissions to help reach net zero emissions, and help achieve net negative emissions.[26]** CDR methods vary in terms of their maturity, removal process, timescale of carbon storage, storage medium, mitigation potential, cost, co-benefits, impacts and risks, and governance requirements**. Afforestation, reforestation, improved forest management, agroforestry and soil carbon sequestration are currently the only widely practiced CDR methods.**[27]

20 SPM A.4
21 SPM A.3
22 SPM B.4.1
23 SPM A.4.1
24 SPM A.4.1
25 Residual emissions are those that remain on an annual basis after all efforts to reduce them have been implemented (UNFCCC RCZ Lexicon)
26 SPM B.5.1; SPM B.6.2
27 SPM B.6.4

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