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Climate change impacts on Australia and benefits of early action to reduce global greenhouse gas emissions

This 40-page consultancy report written for the Australian Business Roundtable on Climate Change is by CSIRO's Dr Benjamin Preston and Dr Roger Jones, and addresses the impact of climate change on Australia.

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Executive summary

Australia is one of the many global regions experiencing significant climate change as a result of global emissions of greenhouse gases (GHGs) from human activities. The average surface air temperature of Australia increased by 0.7 °C over the past century – warming that has been accompanied by marked declines in regional precipitation, particularly along the east and west coasts of the continent. These seemingly small changes have already had widespread consequences for Australia. Unfortunately, even if all GHG emissions ceased today, the Earth would still be committed to an additional warming of 0.2–1.0 °C by the end of the century.

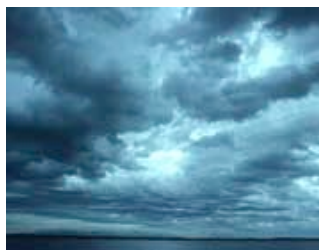
Yet the momentum of the world's fossil fuel economy precludes the elimination of GHG emissions over the near-term, and thus future global warming is likely to be well above 1 °C. Analysis of future emissions trajectories indicates that, left unchecked, human GHG emissions will increase several fold over the 21st century. As a consequence, Australia's annual average temperatures are projected to increase 0.4–2.0 °C above 1990 levels by the year 2030, and 1–6 °C by 2070. Average precipitation in South-West and South-East Australia is projected to decline further in future decades, while regions such as the North-West may experience increases in precipitation. Meanwhile, Australia's coastlines will experience erosion and inundation from an estimated 8–88 cm increase in global sea level.

Such changes in climate will have diverse implications for Australia's environment, economy, and public health. The biodiversity, ecosystems, and natural habitats of Australia are world renowned, yet potentially the most fragile of the systems that will be exposed to climate change. For example, the Great Barrier Reef, a UNESCO World Heritage area, has experienced unprecedented rates of coral bleaching over the past two decades, and additional warming of only 1 °C is anticipated to cause considerable losses or contractions of species associated with coral communities.

Australian crop agriculture and forestry may experience transient benefits from longer growing seasons and a warmer climate, yet such benefits are unlikely to be sustained under the more extreme projections of global warming. Furthermore, changes in precipitation and, subsequently water management, are particularly critical factors affecting the future productivity of the Australian landscape. The declines in precipitation projected over much of Australia will exacerbate existing challenges to water availability and quality for agriculture as well as for commercial and residential uses.

Future changes in climate extremes, such as tropical cyclones, heat waves, and extreme precipitation events, would degrade Australian infrastructure and public health, for example, through increased energy demands, maintenance costs for transportation infrastructure, and coastal flooding. Global large-scale singularities, such as a slowing or collapse of the ocean's thermohaline circulation or the collapse of the ice sheets of West Antarctica or Greenland, would also have important long-term implications for Australia's climate and coastline.

Avoiding, or at the very least reducing, the adverse effects of climate change is a global challenge, yet one that will generate direct benefits for species and habitat conservation, saved lives, and reduced economic and infrastructure



Changes in weather patterns will affect us all.

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costs. For example, limiting future increases in atmospheric CO₂ to 550 ppmv, though not a panacea for global warming, would reduce 21st century global warming to an estimated 1.5–2.9 °C, effectively avoiding the more extreme climate changes. Lower stabilisation levels, such as 450 ppmv CO₂ would reduce future warming even further, to approximately 1.2–2.3 °C. For Australia, such constraints on global warming would give natural ecosystems and their associated species greater time to adapt to changing environmental conditions, reduce the likelihood of major adverse consequences for agriculture and forestry, help ensure Australia's public health infrastructure can keep pace with emerging health challenges, and reduce the chance of large-scale singularities. Nevertheless, even with a 350 ppmv stabilisation level, the Earth will not be able to avoid its current commitment to additional future warming. Therefore, prudence dictates that GHG mitigation activities be pursued in conjunction with adaptive responses to address the residual risks posed by this commitment.

There is broad, and growing, international support for GHG mitigation. The 1992 United Nation's Framework Convention on Climate Change, supported by 166 nations, calls for the 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.' A number of national governments and climate scientists have suggested atmospheric CO₂ concentrations between 375 and 550 ppmv and/or temperature increases of 0.9–2.9 °C above 1990 levels as global thresholds for 'dangerous' climate change.

Although a specific long-term stabilisation target has not been adopted by the UNFCCC, several national governments, including that of the United Kingdom and Sweden, have committed to GHG emissions reductions of 60 per cent by the year 2050, a general benchmark estimate of the effort needed by developed, Annex I countries to place the world on a path to achieving a global stabilisation level of no more than 550 ppmv. Similar targets have been explored or recommended by institutions in the United States, the European Union, and recently in Australia, by New South Wales' Greenhouse Advisory Panel. This technical report outlines the likely impacts on Australia of climate change, and the benefits of global emissions reductions.

Find out more about CSIRO's work with [Climate Change](#).

REFERENCES

Preston BL, Jones RN. 2006. Climate Change Impacts on Australia and the Benefits of Early Action to Reduce Global Greenhouse Gas Emissions. A consultancy report for the Australian Business Roundtable on Climate Change. CSIRO. Canberra, Australian Capital Territory.