Responding to a changing climate

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Key messages

- Evidence from many different sources shows human activities are contributing to the Earth's changing climate.
- The impacts of climate change on Australia, its industries, and people over the coming decades and centuries will be significant, with some of these impacts already apparent.
- The Earth is committed to some degree of climate change as a result of past greenhouse gas emissions, so we will need to adapt to this change.
- Adaptation on a scale far more extensive than is currently occurring will be essential in all walks of life if we are to limit the social, economic, and environmental impacts of climate change.
- Action within the next decade to lower greenhouse gas emissions will reduce the probability and severity of climate change impacts.
- Agriculture and forestry hold great potential for mitigating greenhouse gas emissions through afforestation, soil carbon management, and better management of livestock and cropping emissions.
- Making the right energy choices for Australia's future from among our abundant options will often be a matter of choosing the energy source, or combination of sources, for a particular context.
- Practical and sometimes beneficial or low cost actions can make significant progress in tackling climate change.

The evidence amassed by CSIRO, the Australian Bureau of Meteorology, universities, and other scientific institutions around the world shows overwhelmingly that human activities are contributing to the Earth's changing climate. Even if there were mechanisms in place to halt and eventually reverse the growth in net greenhouse gas emissions, their long life in the atmosphere means some climate change is already 'locked-in' as a result of past emissions. We will need to adapt to this committed change, which will challenge us with rising temperatures and sea levels, increasing storm intensity, and greater risk of fire, flood, and drought. Evidence shows that proactive adaptation to these challenges can create future opportunities for growth, development, and sustainability.

While some impacts of climate change will take many decades to unfold, it is increasingly likely that the level of global warming will exceed the 2ºC threshold of 'dangerous' climate change. There is a limited window of opportunity before thresholds for largely irreversible environmental impacts are reached. Action within the next decade to lower greenhouse gas emissions will reduce the probability and severity of climate change impacts.

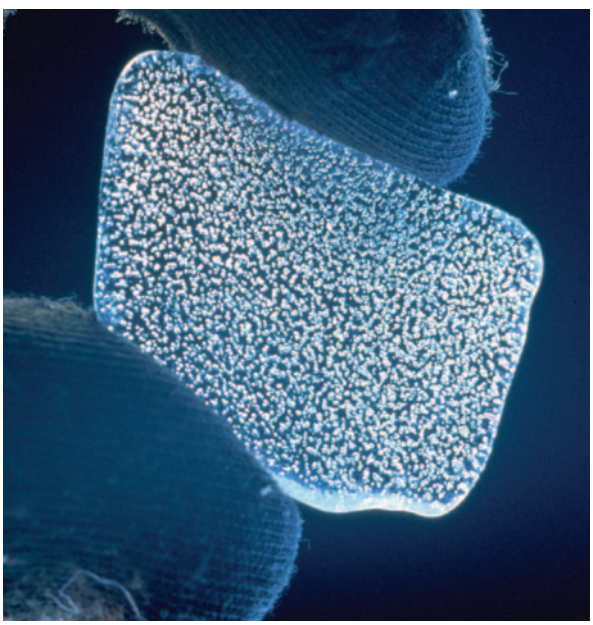
Australia has a significant task ahead if the nation chooses to make large reductions in its greenhouse gas emissions. We have a relatively high per capita emissions intensity and energy use per unit of GDP. This is a function of the structure of our economy, which includes low-cost fossil fuel and mineral resource extraction and processing industries. On the other hand, Australia is endowed with a very wide array of low-carbon energy resources. Exploiting these resources would create new industries, and may have other co-benefits such as improved energy security.

Our choices will have different sets of impacts over time on the economy, environment, and society. Many global economies are leading Australia in their responses to climate change and are using these responses to create new economic opportunities. In partnership with industry, government, and the community CSIRO continues to work to understand the range of responses, solutions, and opportunities available to Australia.

The following central messages of this book summarise the conclusions drawn from many years of research carried out by CSIRO, the Bureau of Meteorology, universities, and many other organisations.

The science of climate change, and the role of humans, is clear

Observations on land and in the oceans, of ocean level, acidity, and salinity, and of other aspects of the climate system give us a picture of our climate over time. There is a great deal of evidence from many different sources that the Earth's climate has warmed over the last century. It is very likely that the primary cause of this warming is the emission of greenhouse gases (carbon dioxide and others) by human activities.



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Australia is highly vulnerable to climate change

Projections of future climates from mathematical representations of the Earth's climate system indicate that it is very likely that warming and other climate changes will continue and also accelerate through the coming century if emissions of greenhouse gases continue to increase. The impacts of climate change on Australia, its industries, and people over the coming decades and centuries will be significant, and changes can now be clearly seen in stresses on our water supplies and farming, changed natural ecosystems, reduced seasonal snow cover, and extreme events.

Gregory Heath/CSIRO

Adaptation can reduce the impacts of climate change that are already locked-in

Significant climate change impacts are unavoidable due to the greenhouse gases that are already in the atmosphere, as well as likely future emissions. The impacts of climate change will pose a large risk to human wellbeing in the future, and will require the drawing up of action plans at national, state, regional, and local levels to adapt to the most likely changes. Adaptation on a scale far more extensive than is currently occurring will be essential in all walks of life if we are to limit the social, economic, and environmental impacts of climate change.

Willem van Aken/CSIRO

Reducing greenhouse gas emissions can limit the impact of climate change

Adaptation alone cannot absorb all the projected impacts of climate change, especially over the long term. Some of these can be further avoided, reduced, or delayed by effective reduction in global net greenhouse gas emissions. Agriculture and forestry hold great potential for mitigating greenhouse gas emissions through afforestation, soil carbon management, and better management of livestock and cropping emissions. Making the right energy choices for Australia's future from among our abundant resources and technologies will often be an issue of which energy source, or combination of sources, best suits a particular context. Australia's greatest need is for low-emissions technologies that are competitively priced, resilient, and flexible enough to cope with a range of possible future energy challenges and demands. All options are still in the mix for a future energy system with many niches and opportunities.

In summary, the work of CSIRO and others shows that human-driven climate change is real, that it is already happening, and that its impact on our society, economy, and environment will be far-reaching. The timeframe for choosing the form and level of response to reduce these impacts is limited. While the choices are challenging, research shows that there continues to be support within the Australian community and industry for addressing climate change and capturing the opportunities. Through practical and sometimes beneficial or low-cost actions, we can make significant progress in tackling climate change.