



Australian Government

Chief Scientist

STATEMENT

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THE SCIENCE OF CLIMATE SPEAKS FOR ITSELF

In 2010, global leaders formally adopted +2°C as the upper level of temperature increase that would avoid ‘dangerous’ warming. This followed several decades of research into the complexities of the global climate.

The evidence for human activities influencing global temperatures is strong and strengthening. In this most relentlessly scrutinised of scientific fields, over decades, there has been no game changer – the climate is changing and human activity is part of the cause.

What is the science telling us? We know:

- The Earth’s lower atmosphere and oceans have warmed since the late nineteenth century, with a pattern in time and space that matches what we would expect from the increase in greenhouse gases.
- The isotopic mix of the carbon in atmospheric CO₂ is consistent with an addition from fossil fuels.
- Less of the infra-red part of the energy spectrum is escaping into space. It is trapped by greenhouse gases.
- Of the additional heat energy trapped by greenhouse gases, approximately 90% has been absorbed by the oceans.
- Ocean heat content is rising without pause.
- The slower rate of the increase in the warming of the atmosphere is accompanied by an accumulation of heat in the oceans. The planet is still warming.
- The oceans are becoming more acidic (less alkaline) by absorbing 25% of CO₂ emissions, and that is already having an impact on marine ecosystems, including coral reefs.
- Ice sheets and glaciers are melting now – even with an average global surface temperature increase that is now about +0.9°C from pre-industrial levels.
- Sea level is rising – partly from thermal expansion and partly because of the melting of ice-sheets and glaciers. The rate of this rise is increasing.
- Rainfall patterns in Australia are shifting, altering our ability to access water resources and grow food for ourselves and others.
- Some types of extreme weather events, such as heat waves, are becoming more likely and more severe, challenging our health, our energy systems, and our ability to manage fire risk.

All these observed changes in our climate are underpinned by multiple lines of accumulating evidence.

These lines of evidence, and physics, indicate a limit to the amount of CO₂ we can emit into the atmosphere before we cross thresholds that governments have agreed could trigger 'dangerous' climate change – that is +2°C.

The amount of CO₂ that could be released with a 2/3 probability of keeping temperature rises to no more than +2°C has been estimated to be around 3 trillion tonnes. Human actions have released 2 trillion tonnes since 1870: 1 trillion in the first 109 years, the other 1 trillion in the last 33. Unless there are changes in practices, there are 25 years before the proposed threshold for 'dangerous' warming is reached.

In the light of the scientific evidence, it is important for global leaders at the Paris conference later this year to commit to action now that will lead to near zero net emissions by 2100, spread equitably across generations.

Professor Ian Chubb AC