



Australian Government
Great Barrier Reef
Marine Park Authority

Climate change

and the
Great Barrier Reef

Experts agree that the earth's climate is warming and that this trend will continue. Climate change is expected to increasingly affect the Great Barrier Reef, with some impacts already occurring. The Great Barrier Reef Marine Park Authority's Climate Change Response Team is working to maximise the resilience of the Reef to climate change.



Climate change results from an enhanced greenhouse effect

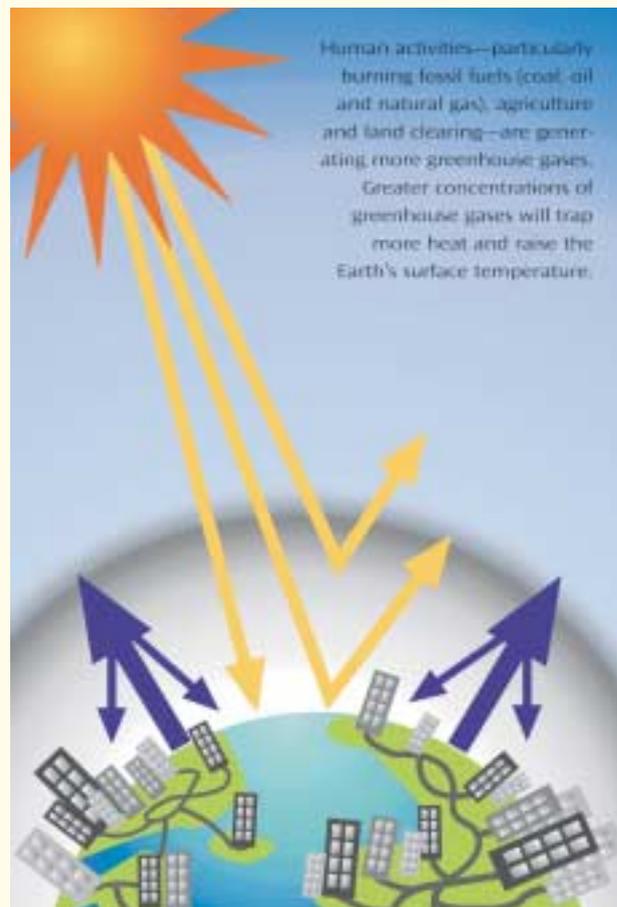
Gases in the atmosphere trap some of the heat that is radiated from the earth. This is called the greenhouse effect. This process keeps the earth at a temperature suitable for life. Climate change results from an enhanced greenhouse effect. Increased levels of greenhouse gases (mostly carbon dioxide) in the atmosphere mean that more heat is being trapped and the earth's temperature is increasing.

We have already seen evidence of climate change. Since the beginning of last century, air temperature has increased by 0.6°C on average world wide. In Australia, 2005 was the hottest year ever recorded. The temperature was 1.1°C higher than the average from the previous 30 years.

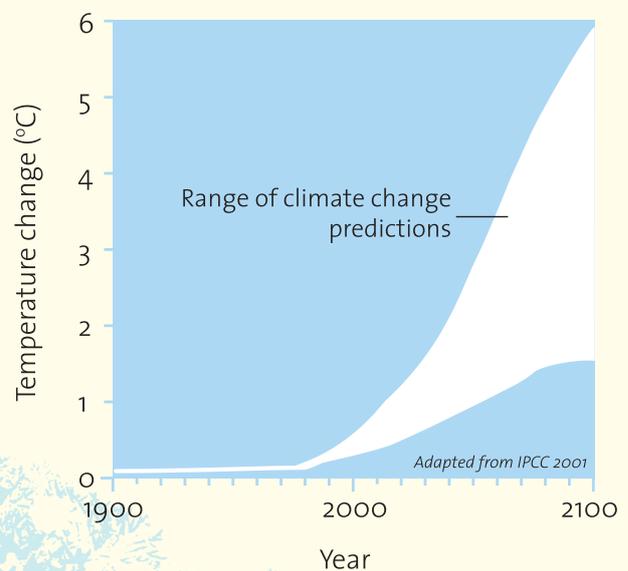
Continued change will occur in the future

Levels of greenhouse gases continue to increase, and therefore, temperatures around the world continue to rise. The Australian Greenhouse Office has worked with scientists to develop models that predict the future climate of Australia. They predict that Australia will warm by 1°C to 6°C by 2070. These Australian predictions vary slightly from global predictions.

This range in temperature predictions is quite large and there are two main reasons for this. The first is that the climate is very complex and it is difficult to predict how changes in one part of the climate, such as ocean currents, will affect other parts, such as storms. The major source of uncertainty, however, is the human factor. As there is now consensus that humans are contributing significantly to climate change, future actions by governments, societies and individuals will play a large role in determining future climate. The models used to predict temperature must take into account the range of future scenarios of human behaviour.



Source: Diagram representing the enhanced greenhouse effect courtesy of the Australian Greenhouse Office



Global temperature predictions based on climate change scenarios. Adapted from the Intergovernmental Panel on Climate Change Third Assessment Report 2001

Climate change will impact the Great Barrier Reef

Climate change will have direct impacts on the Great Barrier Reef through:

- increased water temperature
- increased sea level
- increased severity of storms and cyclones
- ocean acidification
- changed rainfall and runoff
- changes to the El Niño Southern Oscillation

The ecological consequences of these climatic changes will be serious, and some have already been observed. Coral bleaching has started to increase in frequency and severity due to increases in water temperature. But corals face other threats as well. For example, as the oceans become slightly more acidic the ability of corals to form their calcium carbonate skeleton will be reduced. Weakened skeletons will also make corals more susceptible to storm damage and coral reef structure will be more vulnerable to erosion.

Other habitats, including mangrove forests and seagrass beds, are also at risk. Rising sea levels will be the biggest challenge for mangroves. Seagrass in the intertidal zone will face more extreme temperatures, powerful waves and river run-off following intense storms. Coral reefs will probably be the most severely affected, however, shifting toward reefs with less coral and lower biodiversity.

Butterfly fish only eat corals and their populations are at risk if coral reefs are degraded.



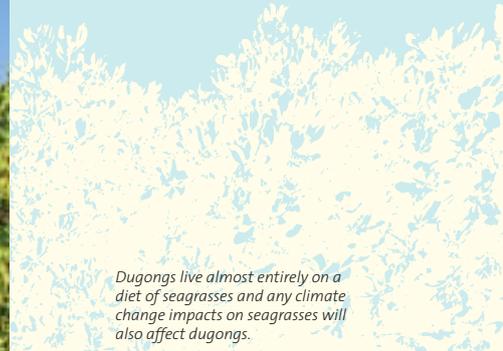
Coastal inundation, or flooding, seen here during a king tide at Horn Island, will become more common and extreme on the Great Barrier Reef according to climate change projections.



Source: Miya Isherwood



Mangroves are an important habitat and nursery ground for many fish species and are at risk from climate change impacts.



Dugongs live almost entirely on a diet of seagrasses and any climate change impacts on seagrasses will also affect dugongs.



There will be consequences for the animals that live and feed in coral reefs and associated habitats. For example, a number of fish are directly dependant on corals, for habitat and for food and scientists have already seen the numbers of these fish reduce when coral is lost. If coral habitats are degraded, reef-dependant fish are likely to decline in favour of species less dependant on coral.

Many larger animals, such as sharks and other fish, sea birds and marine mammals, depend on smaller fish for food. Declines in the habitats of these prey fish are likely to have flow-on effects throughout the ecosystem. In addition to habitat loss, these animals are also prone to the direct effects of climate change. Changes in temperature, water quality and ocean acidity can affect growth rates, the timing of breeding, ability to feed young and other critical aspects of their life-cycles.

Changes to the health of the Great Barrier Reef ecosystem will have important implications for the people and industries that depend on it. Many tourism, fishing and recreational activities are dependent on a healthy reef. Efforts to reduce the effects of climate change on the Great Barrier Reef will benefit people and industries, as well as the animals and plants that live on the Reef.



This diver is monitoring the extent of coral bleaching, a task carried out by the GBRMPA every year.

We are working to protect the reef

Climate change is a global issue but there are ways that we can minimise its impact on the Great Barrier Reef.

Understanding climate change impacts and identifying strategies to reduce stress on the Great Barrier Reef are urgent challenges for the conservation of coral reefs worldwide. The Climate Change Response Team is currently working with experts to assess the vulnerability of the entire Great Barrier Reef to climate change and to recommend management strategies that will minimise its impact on the Reef.

In addition, the Great Barrier Reef Marine Park Authority (GBRMPA), in conjunction with leading experts, monitors water temperature and coral bleaching each summer. Satellite measurements of sea temperature, regional weather forecasts and reports from BleachWatch volunteers (call 4750 0700 or go to www.gbrmpa.gov.au to join) help determine when and where bleaching occurs. Once bleaching is detected, the Climate Change Response team uses SCUBA to survey the full extent of bleaching and its ecological impacts. This information is used to understand the vulnerability of the reef and to inform policy and management strategies that aim to increase the resilience of the reef to climate change.

Climate change is not the only threat to our reef. Pressures from river run-off, over-fishing and losses of biodiversity reduce the ability of reefs to cope with climate change. The GBRMPA is working to look after the health of the Great Barrier Reef through strategies such as the Zoning Plan and the Reef Water Quality Protection Plan.

You can help

Everyone can play a role in reducing the impacts of climate change on the Great Barrier Reef. The first step is to reduce the amount of greenhouse gases you produce at home, in your business or in your travels. There are many strategies that can minimise your contribution to climate change. See www.greenhouse.gov.au for details on how to reduce energy usage and decrease or offset your greenhouse gas emissions.

Secondly, you can help to ensure that the Great Barrier Reef is healthy. Individuals should remember that what goes down the drain will end up at sea. People living along the coastline of the Reef should remember to wash your car on the lawn and keep litter out of the drains. When fishing on the Reef, take only what you need to, within allowable limits and locations. See www.gbrmpa.gov.au for more information on how to look after your reef.



The Great Barrier Reef will be more tolerant of climate change if other pressures, such as poor water quality associated with this river flood plume, are carefully controlled.

Further Reading

The Great Barrier Reef Marine Park Authority
www.gbrmpa.gov.au

The Australian Greenhouse Office
www.greenhouse.gov.au

The Intergovernmental Panel on Climate Change
www.ipcc.ch



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