



The real climate impacts of individual fossil fuel projects

Bridging scientific evidence and decision-making



Every additional tonne of carbon dioxide emissions adds to global warming

Carbon dioxide persists in the atmosphere for centuries, accumulating year after year. The physical properties of carbon dioxide mean it traps extra heat in our atmosphere. Therefore, the total amount of long-term warming caused depends on how much carbon we emit.

The accumulation of global carbon dioxide emissions has been changing our planet's climate for the worse. Levels recorded in 1850 serve as the international baseline for determining how much additional carbon we can emit globally to remain below 1.5 °C and 2 °C.

Global warming experienced to date has already caused a rise in heat-related excess deaths, including **mass mortality events**.

If mitigation and adaptation actions are not implemented fast enough, the death burden from climate change in Europe will increase by 49% this century.

To reduce the impact and damage from climate change, the Paris Agreement calls for rapid, near-term emissions reductions.

Each and every fossil fuel project adds to climate change and has enormous social, economic and environmental consequences

Individual projects have a significant influence on climate change, despite proponents claiming their emissions have a negligible impact on global warming.

Calculating and reporting anticipated greenhouse gas emissions of fossil fuel production and use should not be enough to decide whether to approve a new fossil fuel project.

The consequences of those anticipated emissions can and must be quantified.

The anticipated greenhouse gas emissions from an individual project have far more impacts than their proposals suggest.

A simple and robust method that demonstrates the specific and tangible consequences of new individual fossil fuel projects



Quantifying the additional global warming resulting from each proposal, linked to the tonnes of additional CO₂ in the atmosphere: Global research shows a near-linear relationship between cumulative global CO₂ emissions and total global warming; every 1,000 billion tonnes of CO₂ emissions causes 0.45°C of additional warming.



Assessing the consequences of this additional warming in a risk assessment framework that considers the conditions that sustain human and natural life and functions.



Putting those emissions in the context of Australia's shrinking carbon budget and goal to achieve a 43% reduction by 2030, and to reach zero by 2050.

Case study



The Scarborough Offshore Gas Project Proposal

This case study sources information from Woodside's Scarborough Project Proposal.

LNG storage plant. (Photo: 16th)

Start
2026

End
2057



Production:
Liquefied Natural Gas (LNG)



Estimated greenhouse gas emissions:
876 million tonnes
of CO₂ emissions



Consequence of greenhouse gas emissions declared:

Negligible for all receptors

Proposed scientific method

Quantifying the additional global warming resulting from each proposal, linked to the tonnes of additional CO₂ in the atmosphere: Global research shows a near-linear relationship between cumulative global CO₂ emissions and total global warming; every 1,000 billion tonnes of CO₂ emissions causes 0.45°C of additional warming.

1 Quantifying the best estimate of additional global warming caused by CO₂ emissions from this project

$$\text{Additional warming (}^{\circ}\text{C)} = \text{Emissions (Mt CO}_2\text{)} \times \frac{0.45 (^{\circ}\text{C})}{1,000,000 \text{ (Mt CO}_2\text{)}}$$

Additional warming: 0.00039°C

2 Quantifying the consequences of this additional warming



The human climate niche. The *human climate niche* is a safe climate zone with suitable climate conditions for humans to thrive, determined by population distribution and mean annual temperature. Being outside the *human climate niche* increases mortality.

Every additional 1°C of warming, in the context of demographic change, will expose around 9.5% of the global population to a local climate shift, in which the mean annual temperature exceeds 29°C, the hot edge of the *human climate niche*.

The increase of 0.00039°C will expose 516,000 people to unprecedented heat and leave 356,000 people outside the *human climate niche*.



In a scenario where mitigation and adaptation actions are not implemented fast enough, the project will lead to an additional 484 heat-related deaths in Europe.



Additionally, global warming from the Scarborough project would increase the Great Barrier Reef's accumulated thermal exposure by 0.0017°C per week. These heat extremes will result in an additional 16 million corals lost in every mass bleaching event at the Great Barrier Reef Marine Park.

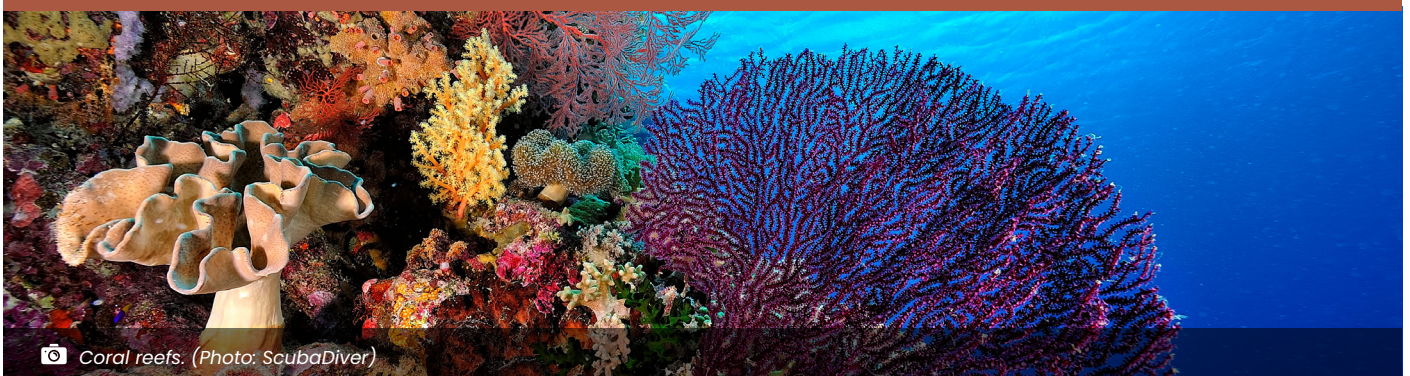
*This assessment does not quantify the impacts of worsening heat stress on other climate-sensitive species in the GBRMP, such as mangroves, seagrasses, turtles, dugongs and seabirds.

Risk assessment
result:

Impacts:
Highest levels of risk



Result (including likelihood and consequence of impacts):
Severe



📷 Coral reefs. (Photo: ScubaDiver)

3 Contextualising the Scarborough project emissions

In the context of Australian global emission commitments and the rapidly depleting remaining carbon budgets to stay below 2°C of global warming, these proposed emissions will be around 1.9% of the national annual CO₂ budget in 2026, increasing to 2.5% by 2030 and 4.9% by 2040. By 2049, eight years before the project ends, its emissions will account for 49% of Australia's annual CO₂ emissions budget. Beyond 2050, the project emissions would exceed Australia's budget, requiring active CO₂ removal.

Every fraction of a degree of additional warming matters

These are the impacts of one single project. In Australia and globally, many approved and proposed fossil fuel projects have lifespans extending beyond legislated commitments to achieve net zero and limit global warming.

Projects exist within the national and global context.

As CO₂ emissions accumulate, our climate continues to degrade. And anticipated emissions from new fossil fuel projects set us back from internationally agreed decarbonisation trajectories.

Decisions made now will have an impact for many decades and centuries to come.

Imminent risks

Australians, as outlined in the recent National Climate Risk Assessment, face immediate risks from climate change.

Risks are physical, financial, and personal, often affecting those who are least responsible for climate change.

Projected future warming will continue to worsen the frequency and intensity of many climate change-related hazards.

Alarmingly, changes to several crucial parts of the Earth system, such as the Boreal permafrost, the Atlantic Meridional Overturning Circulation and the Arctic and Antarctic ice sheets, may be triggered at higher levels of warming, starting irreversible and potentially catastrophic chain reactions and amplifying the warming caused by CO₂ emissions.

What is 21st Century Weather doing?



Future work will broaden the quantified consequences enabling to incorporate the best available scientific evidence into climate-relevant decision-making globally.



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