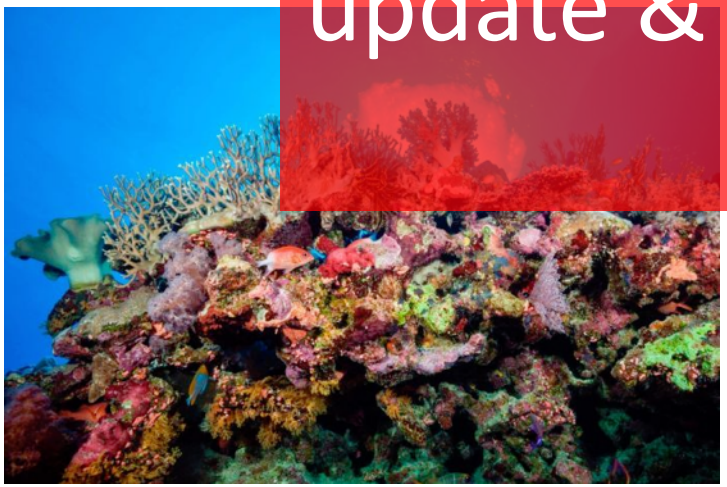
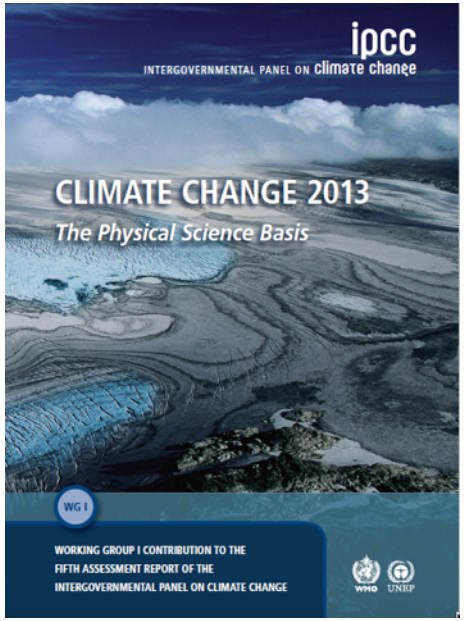
Climate science update & implications for livability



Prof Brendan Mackey, Director
Griffith Climate Change Response Program
Griffith University, Queensland
www.griffith.edu.au/climate-change-response-program

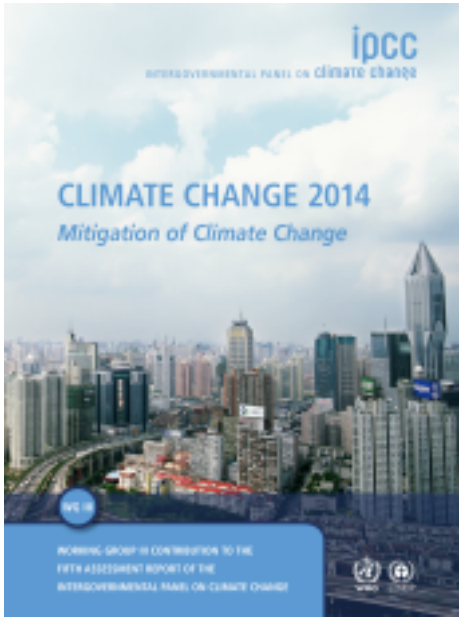
Griffith UNIVERSITY

The science is “in” on human forcing of natural processes that drive Earth’s climate system



Current & future climate

Impacts, vulnerability & adaptation



Mitigation

The Carbon Dioxide Theory of Climatic Change

By GILBERT N. PLASS

The Johns Hopkins University, Baltimore, Md.[1]

(Manuscript received August 9 1955)

Abstract

The most recent calculations of the infra-red flux in the region of the 15 micron CO_2 band show that the average surface temperature of the earth increases 3.6° C if the CO_2 concentration in the atmosphere is doubled and decreases 3.8° C if the CO_2 amount is halved, provided that no other factors change which influence the radiation balance. Variations in CO_2 amount of this magnitude must have occurred during geological history; the resulting temperature changes were sufficiently large to influence the climate. The CO_2 balance is discussed. The CO_2 equilibrium between atmosphere and oceans is calculated with and without $CaCO_3$ equilibrium, assuming that the average temperature changes with the CO_2 concentration by the amount predicted by the CO_2 theory. When the total CO_2 is reduced below a critical value, it is found that the climate continuously oscillates between a glacial and an inter-glacial stage with a period of tens of thousands of years; there is no possible stable state for the climate. Simple explanations are provided by the CO_2 theory for the increased precipitation at the onset of a glacial period, the time lag of millions of years between periods of mountain building and the ensuing glaciation, and the severe glaciation at the end of the Carboniferous. The extra CO_2 released into the atmosphere by industrial processes and other human activities may have caused the temperature rise during the present century. In contrast with other theories of climate, the CO_2 theory predicts that this warming trend will continue, at least for several centuries.

Prime Minister Margaret Thatcher
- Eco Warrior -

https://www.margaretthatcher.org/document/107817

Speech to United Nations General Assembly
1989 Nov 8

"….The United Kingdom therefore proposes that we prolong the role of the Inter-governmental Panel on Climate Change after it submits its report next year, so that it can provide an authoritative scientific base for the negotiation of this and other protocols……We can then agree to targets to reduce the greenhouse gases, and how much individual countries should contribute to their achievement…

…I believe we should aim to have a convention on global climate change ready by the time the World Conference on Environment and Development meets in 1992. That will be among the most important conferences the United Nations has ever held. I hope that we shall all accept a responsibility to meet this timetable…"

UK Parliament declares climate change emergency

1 May 2019

Queensland Government

The Queensland Climate Transition Strategy (PDF, 2.51MB) sets a vision of a zero net emissions future for Queensland that supports jobs, industries, communities and our environment.

The Queensland Government has made three key climate change commitments:

1. Powering Queensland with 50% renewable energy by 2030
2. Doing our fair share in the global effort to arrest damaging climate change by achieving zero net emissions by 2050
3. Demonstrating our commitment to reducing carbon pollution by setting an interim emissions reductions target of at least 30% below 2005 levels by 2030.

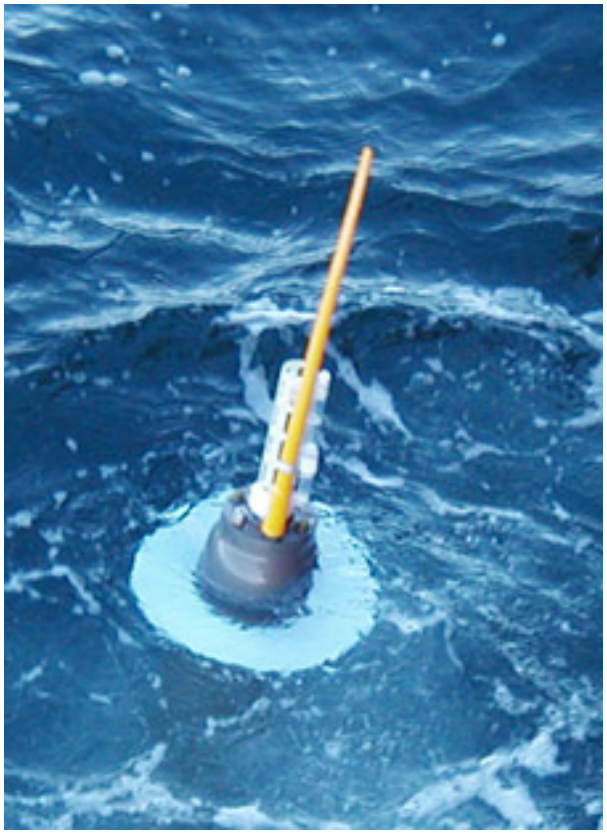
These targets will guide policy and drive the investment needed to put Queensland on the path to a zero net emissions economy.

Pathways to a climate resilient Queensland

Queensland Climate Adaptation Strategy
2017–2030

But doesn’t the climate change naturally?

“If climate change is happening, it is not because man is causing it to happen.” Ms Hanson said there had been extreme weather events before humans existed, meaning they couldn’t be blamed for the concerning shifts in climate.”



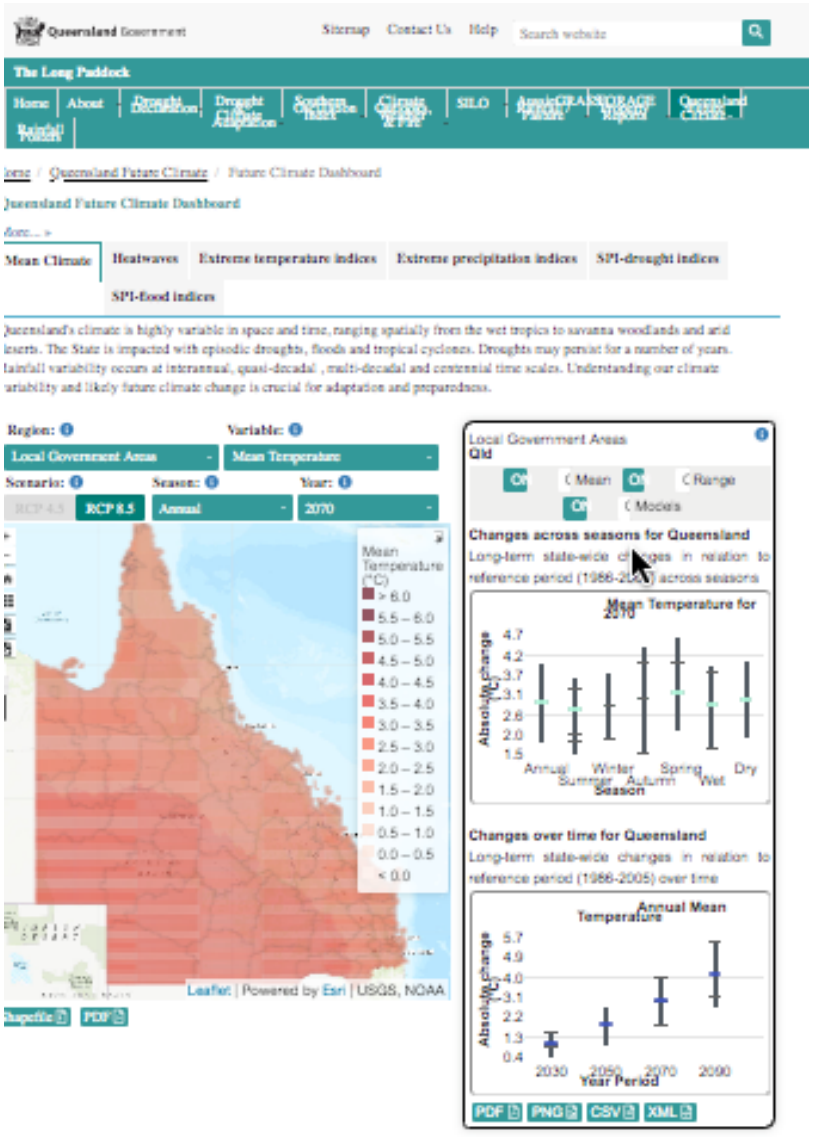
We know the climate is changing abnormally from observed weather data

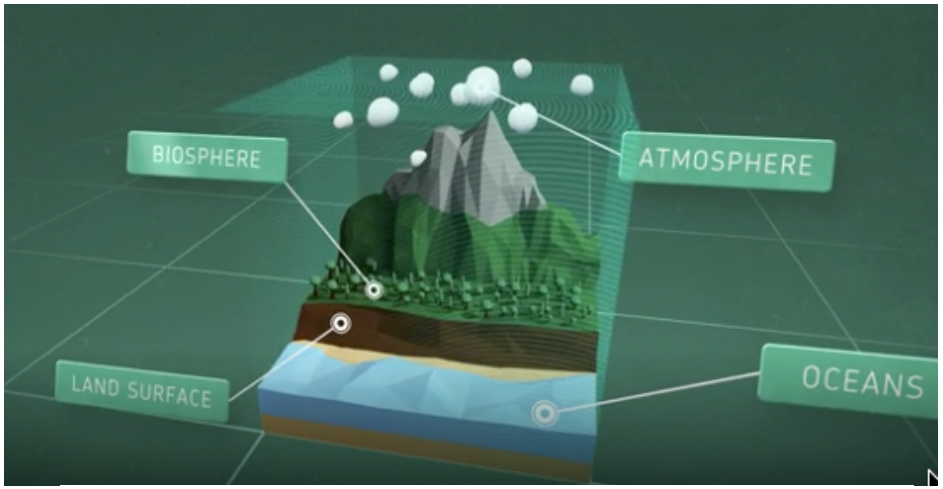
And we can scientifically project future climate using models

But not toy models, like Lego models

www.stedscathedral.uk

…I mean scientific models

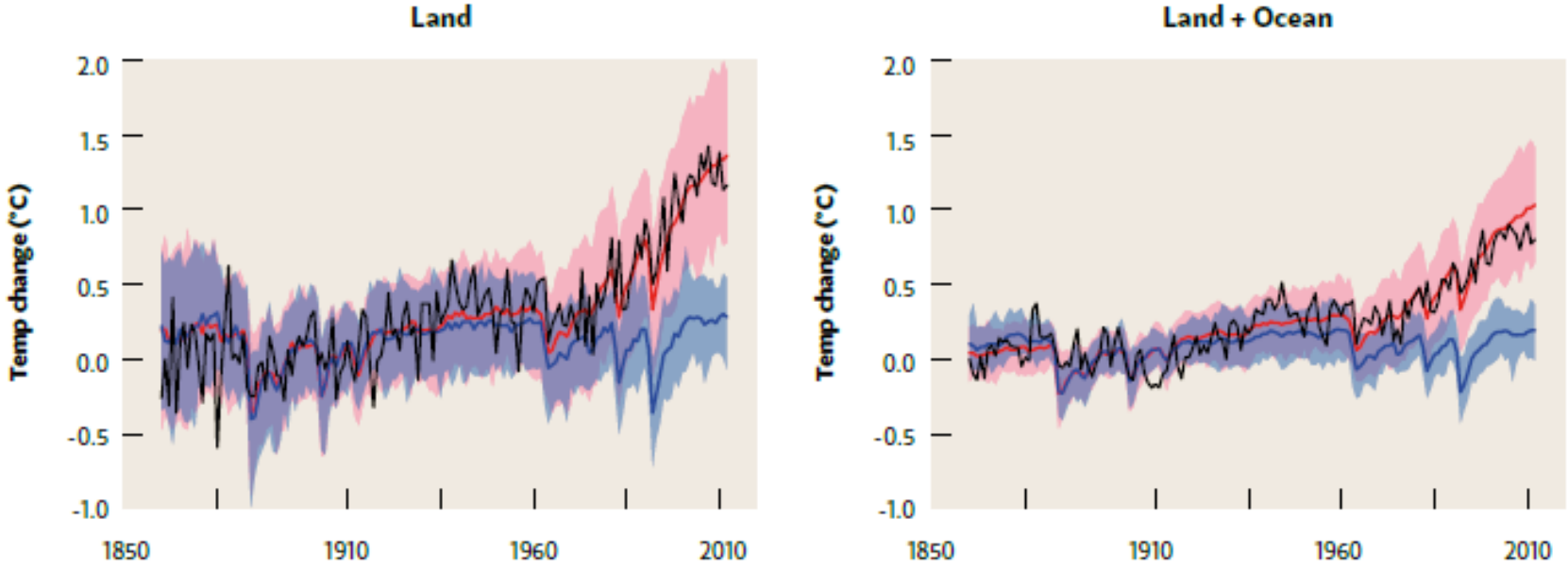




Black = observed

Blue = model natural

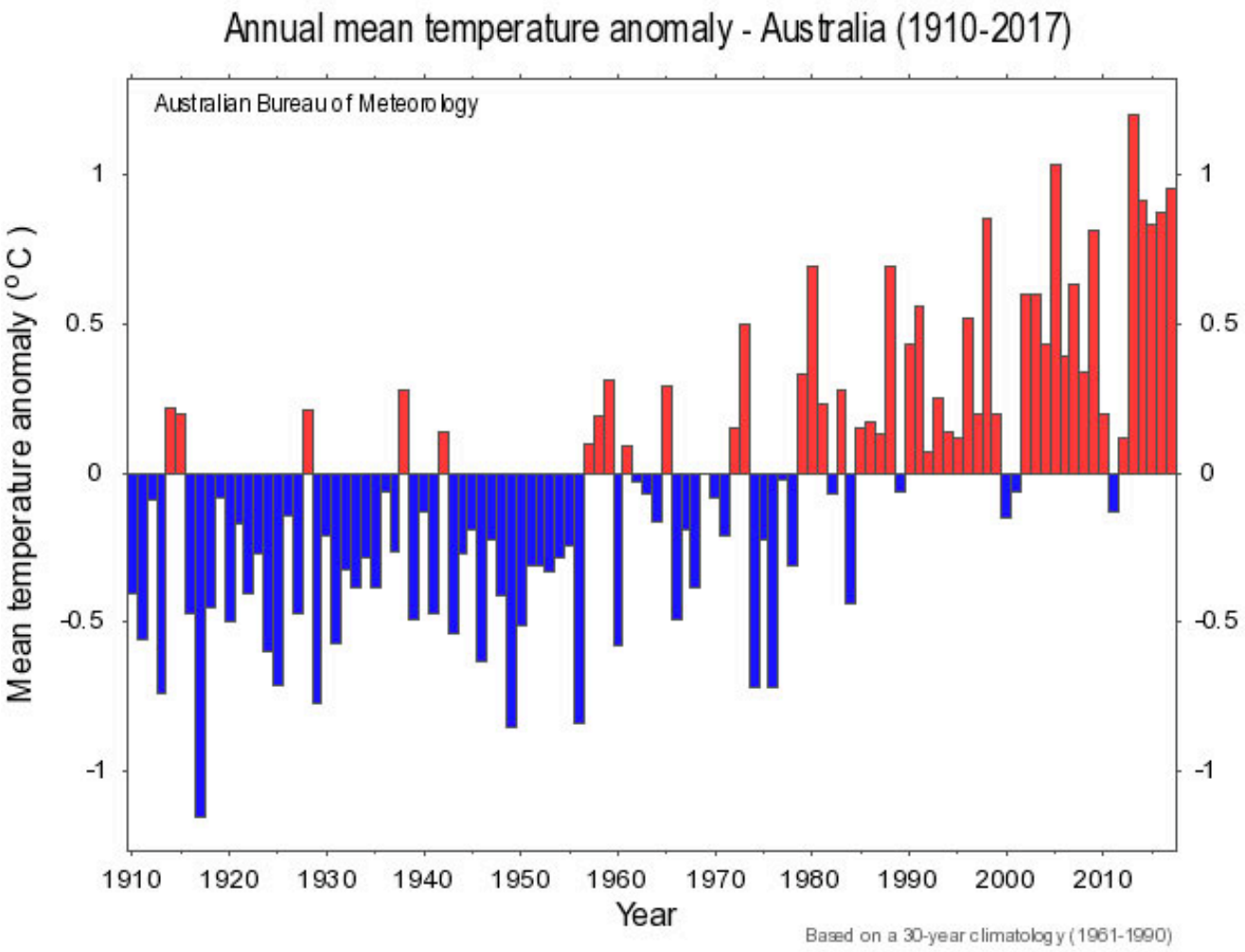
Pink = model natural + human

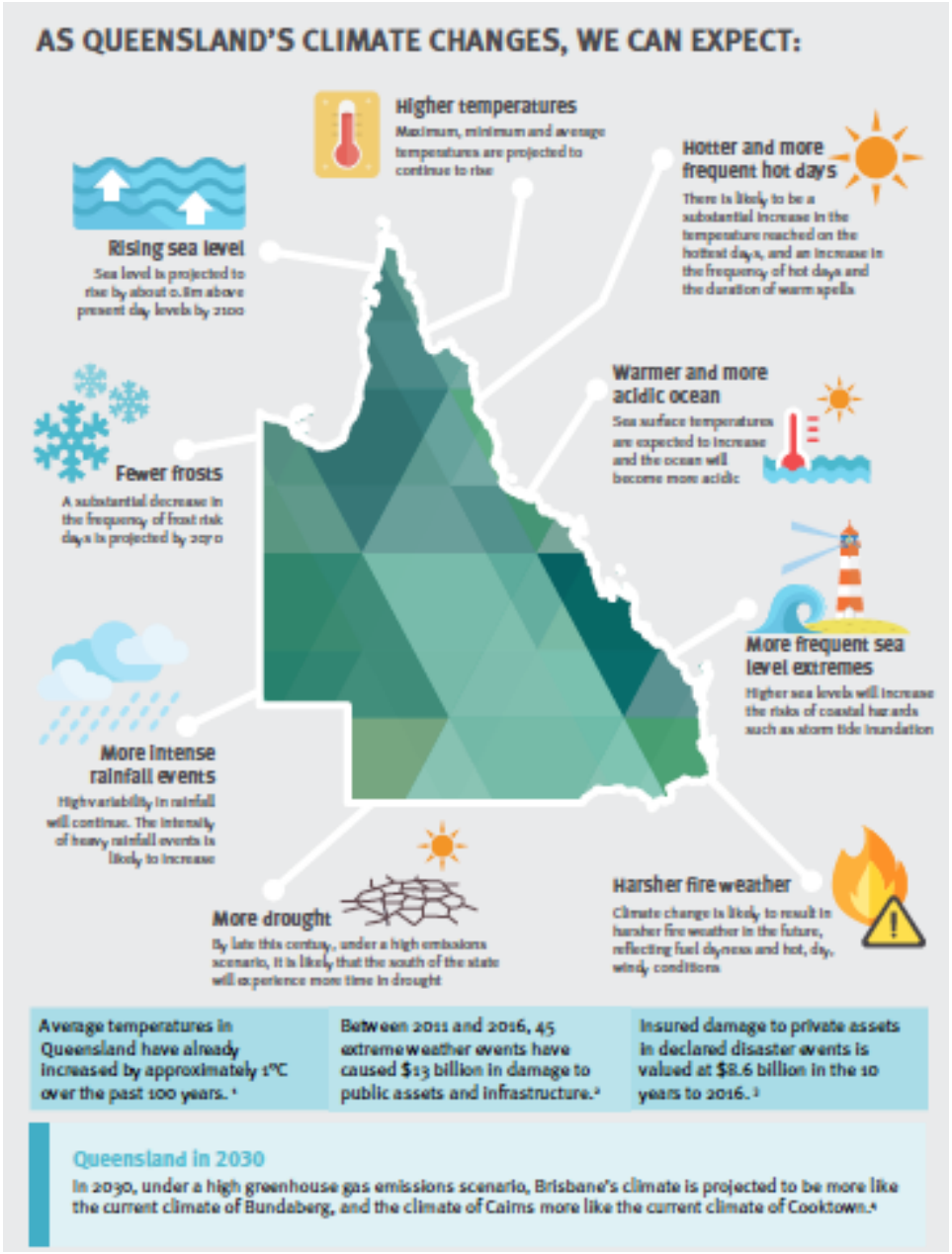


Climate models can correctly replicate recent warming only if they include human influences

Source: IPCC (2013), Fifth Assessment Report, Working Group 1, Figure 10.21.

Observed climate change





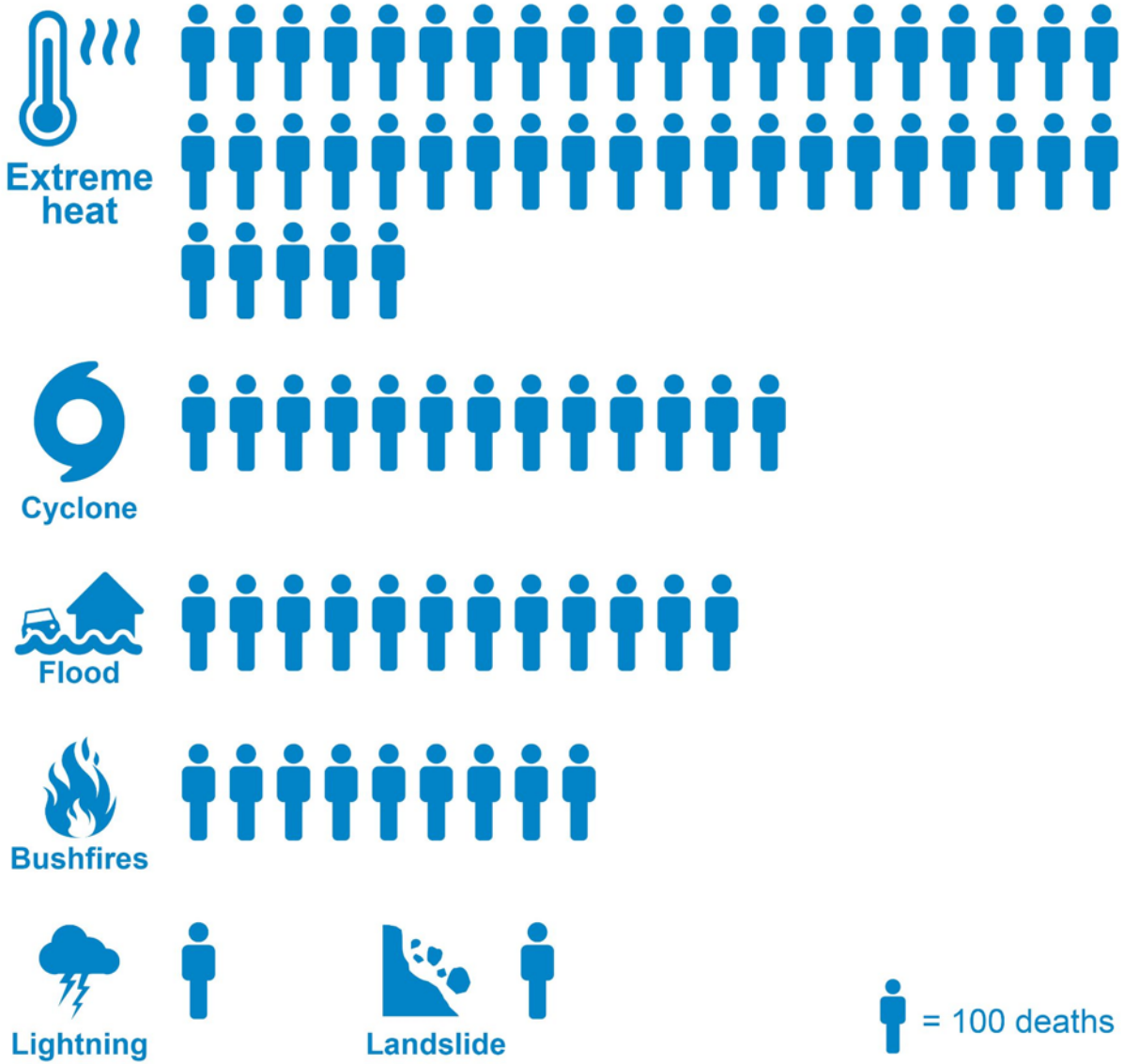
Adapting to manage climate-related risks is no longer optional

- The climate will continue to change forever
- The new (climatic) norm, is no (climatic) norm
- Climate-risk profiles will continue to change "forever"

Hazards under future climate for livability on the Gold Coast from:

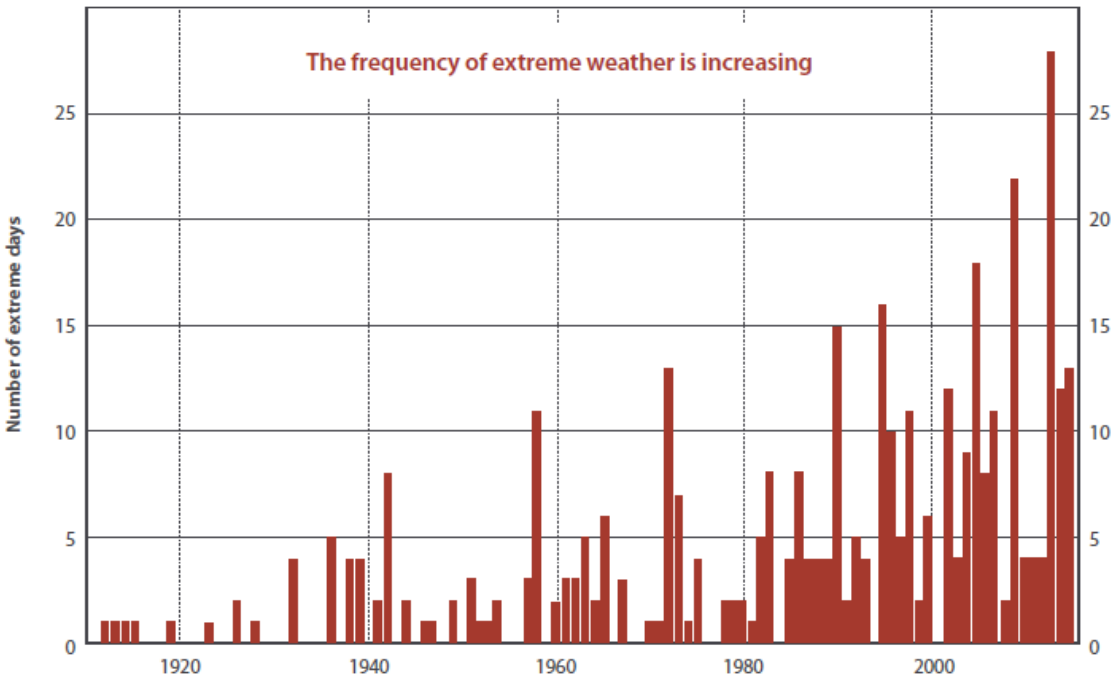
- heat waves
- coastal erosion
- inland flooding?

Deaths from natural hazards 1900-2011



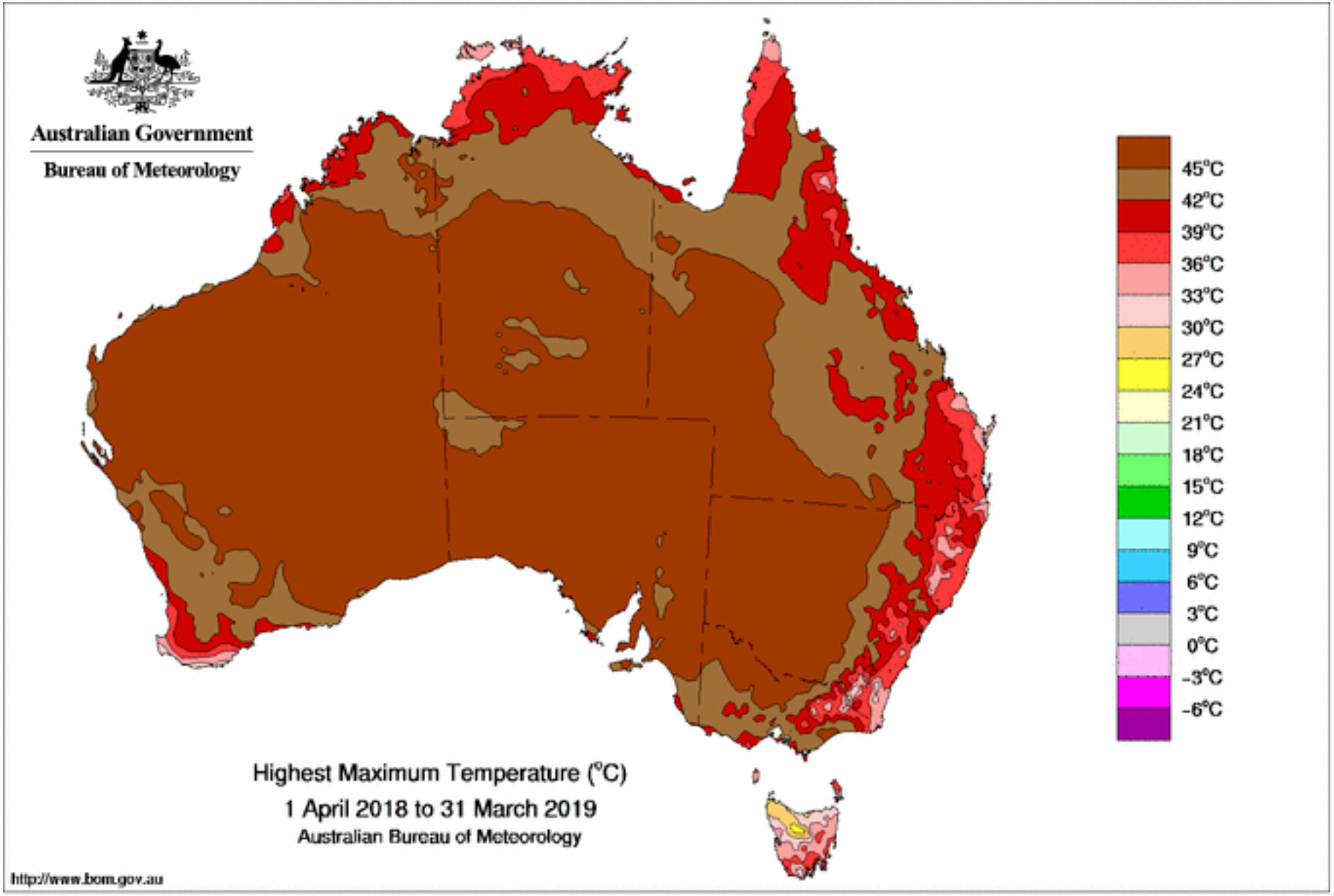
Observed change in extreme heat events

Figure 2.6: Frequency of extreme heat events 1910-2015



Source: Bureau of Meteorology, State of the Climate 2016, page 7

Number of days each year where the Australian area-averaged daily mean temperature is extreme. Extreme days are those above the 99th percentile of each month from the years 1910–2017. These extreme daily events typically occur over a large area, with generally more than 40 per cent of Australia experiencing temperatures in the warmest 10 per cent for that month



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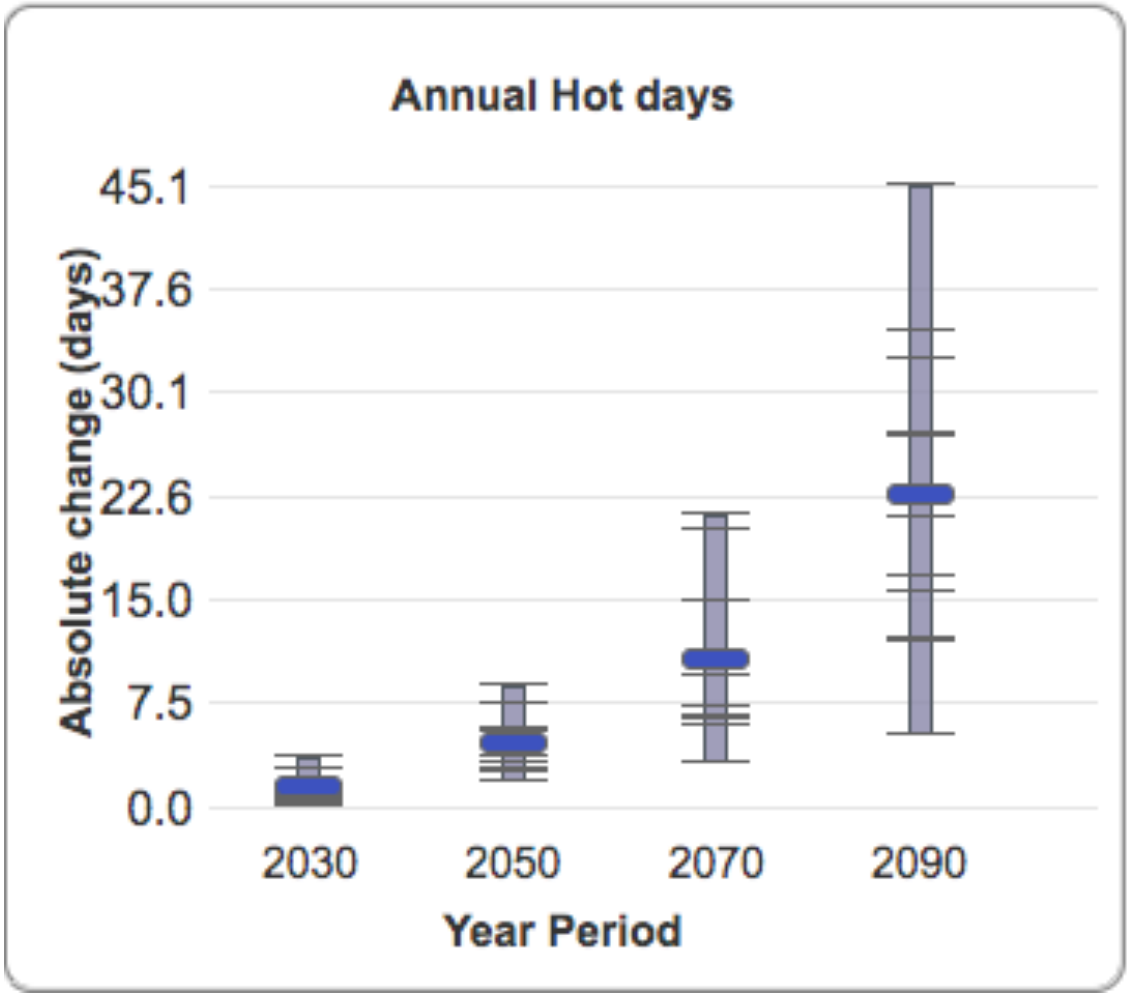
Issued: 01/04/2019

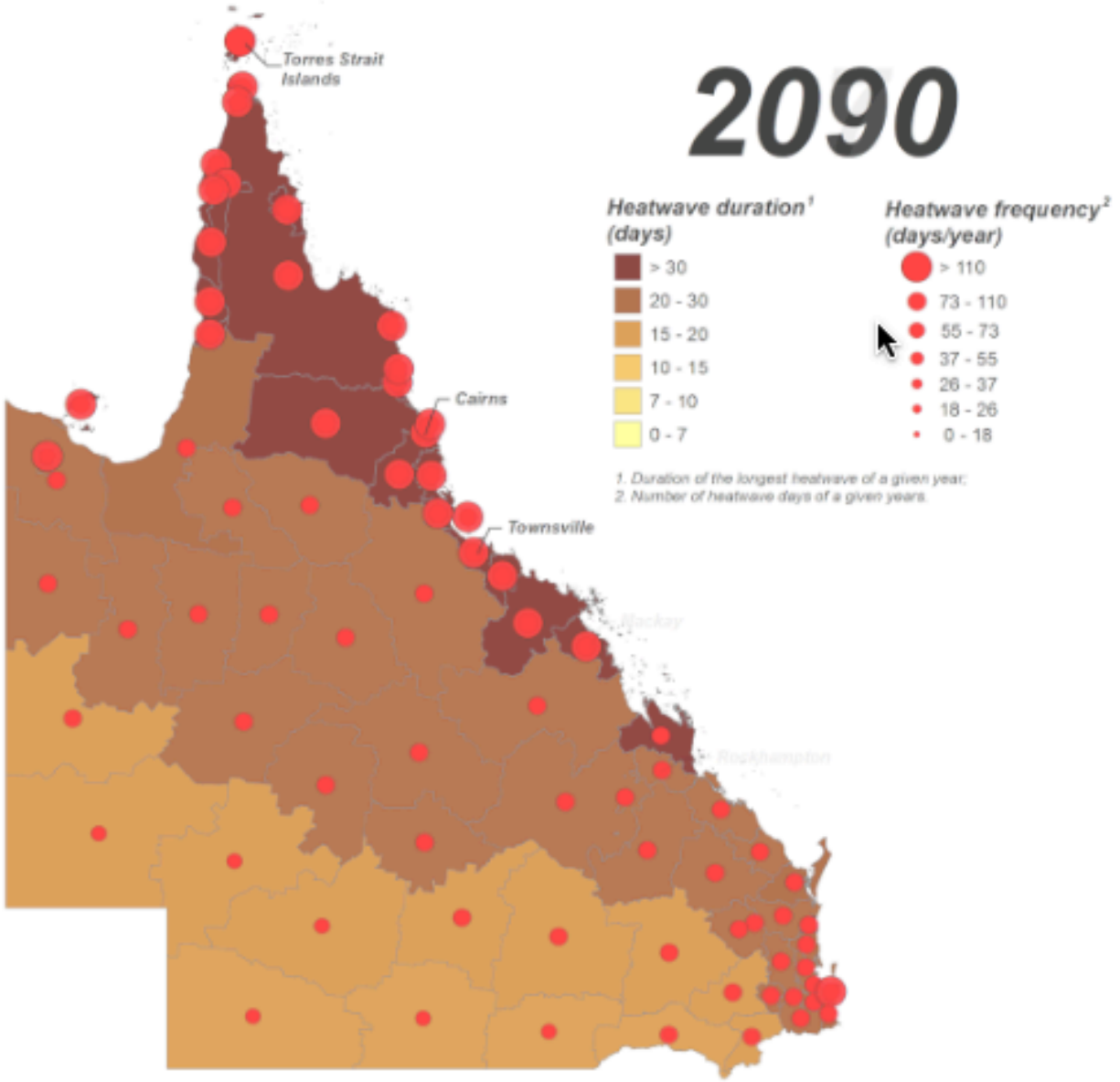
Changes over time for regions

Long-term regional changes in relation to reference period (1986-2005) over time

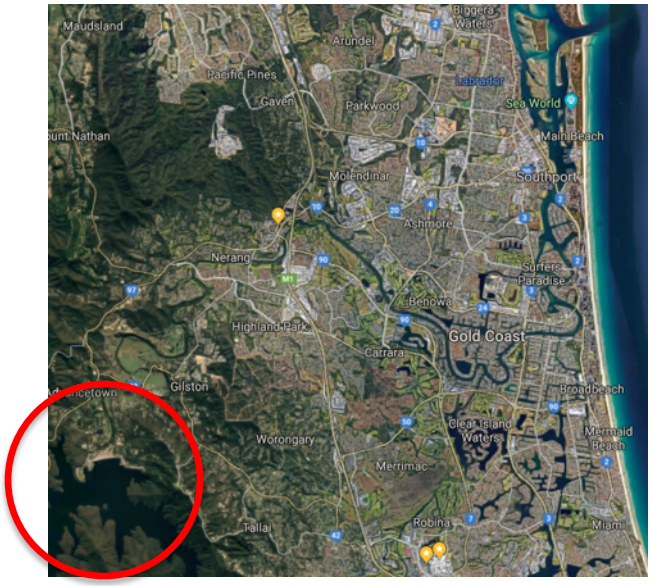


https://app.longpaddock.qld.gov.au/dashboard/#responseTab1

Projected heat waves



Will climate change alter the 1:100 year flood level?



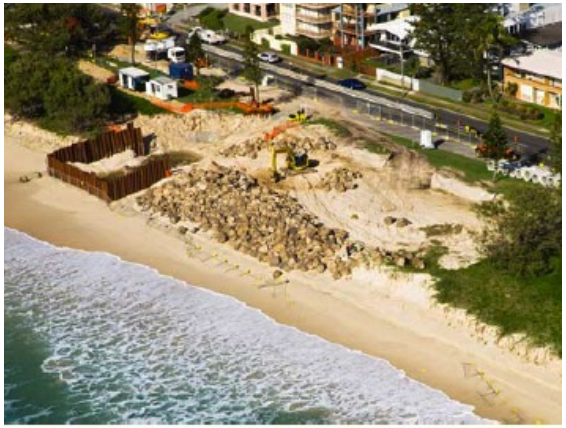
What should be allowed to be built downstream from the Hinze Dam?

Maintaining flood planning levels at Hinze Dam Stage 2 benefits the entire Gold Coast community and no one will be worse off.

…raising Hinze Dam to stage 3 is the last structural flood mitigation opportunity for the City. If the City finds a need to reduce its flood risk in future, there is no viable structural mitigation alternative to generate any substantial reduction in flood risk.

Will coastal erosion increase under future climate?

The A-Line is Gold Coast City's main defense against storms under current climate, but will it suffice under future climate?



Cost = $2,000 per m x 18,000 m = $36 million

The Netherlands Solution

In 1953, a massive North Sea flood disintegrated all the dikes, dams, and sea walls, once again washing away everything that stood in its path.

The solution was a new plan called Deltaplan which revitalize 3,700 km of dikes and dams including an immense seawall costing $ 2.5 billion