

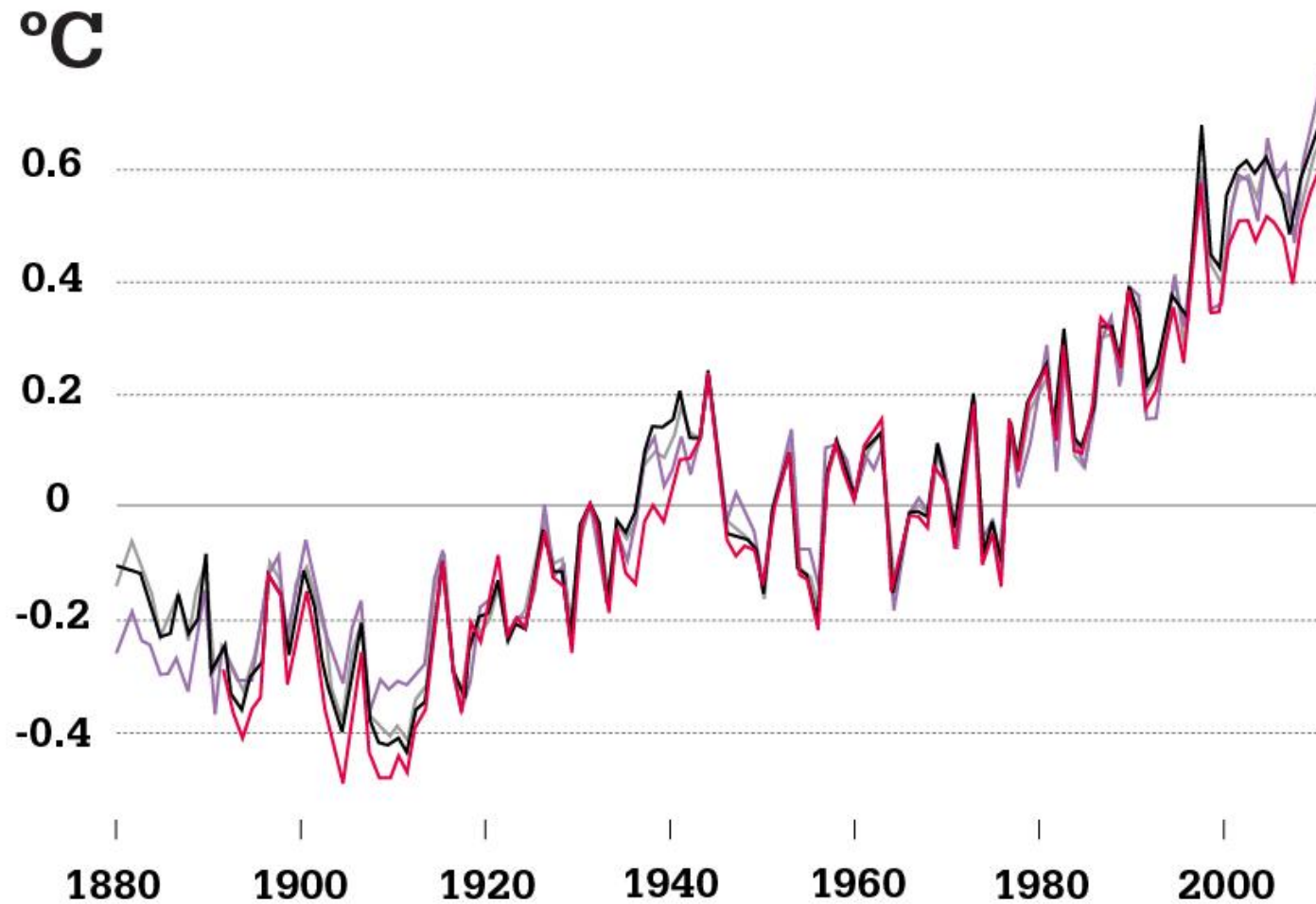


The Critical Decade 2013

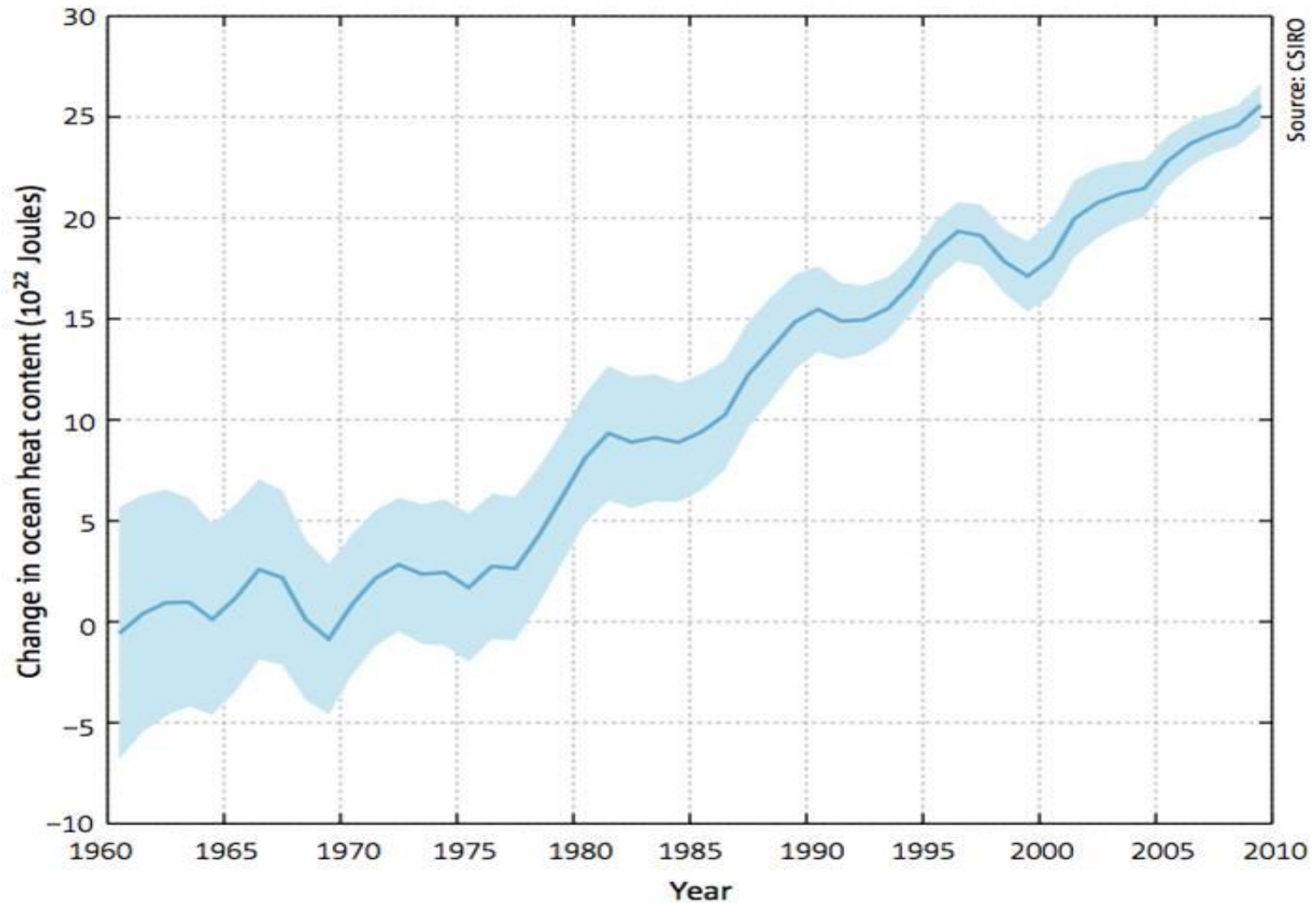
Climate change risks and responses

Professor Will Steffen

The atmosphere is warming



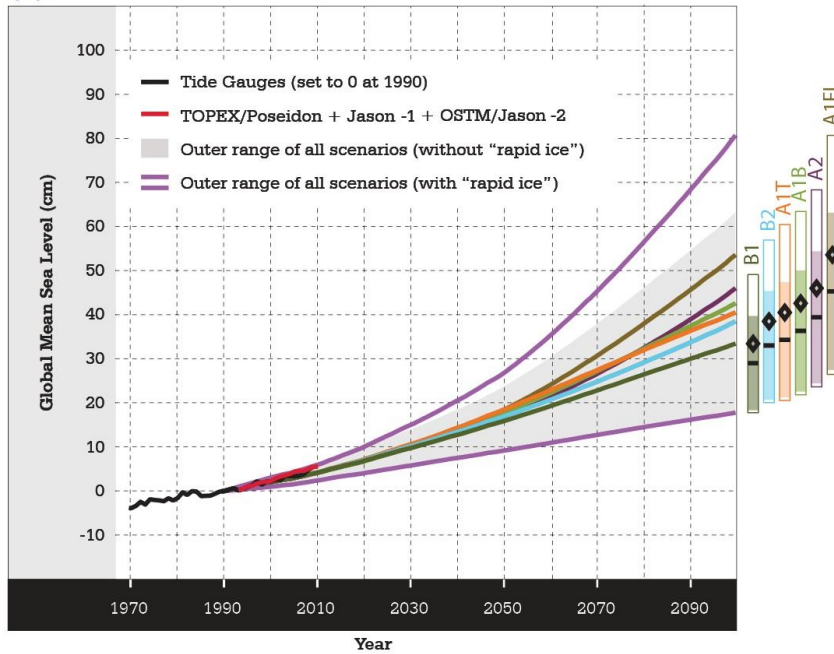
The ocean is warming



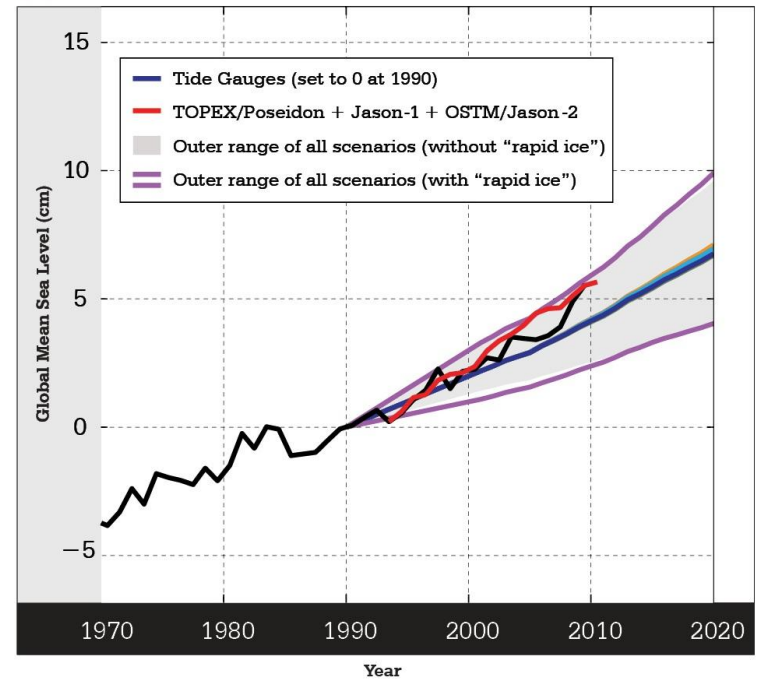
Sea-level rise projections



(a)

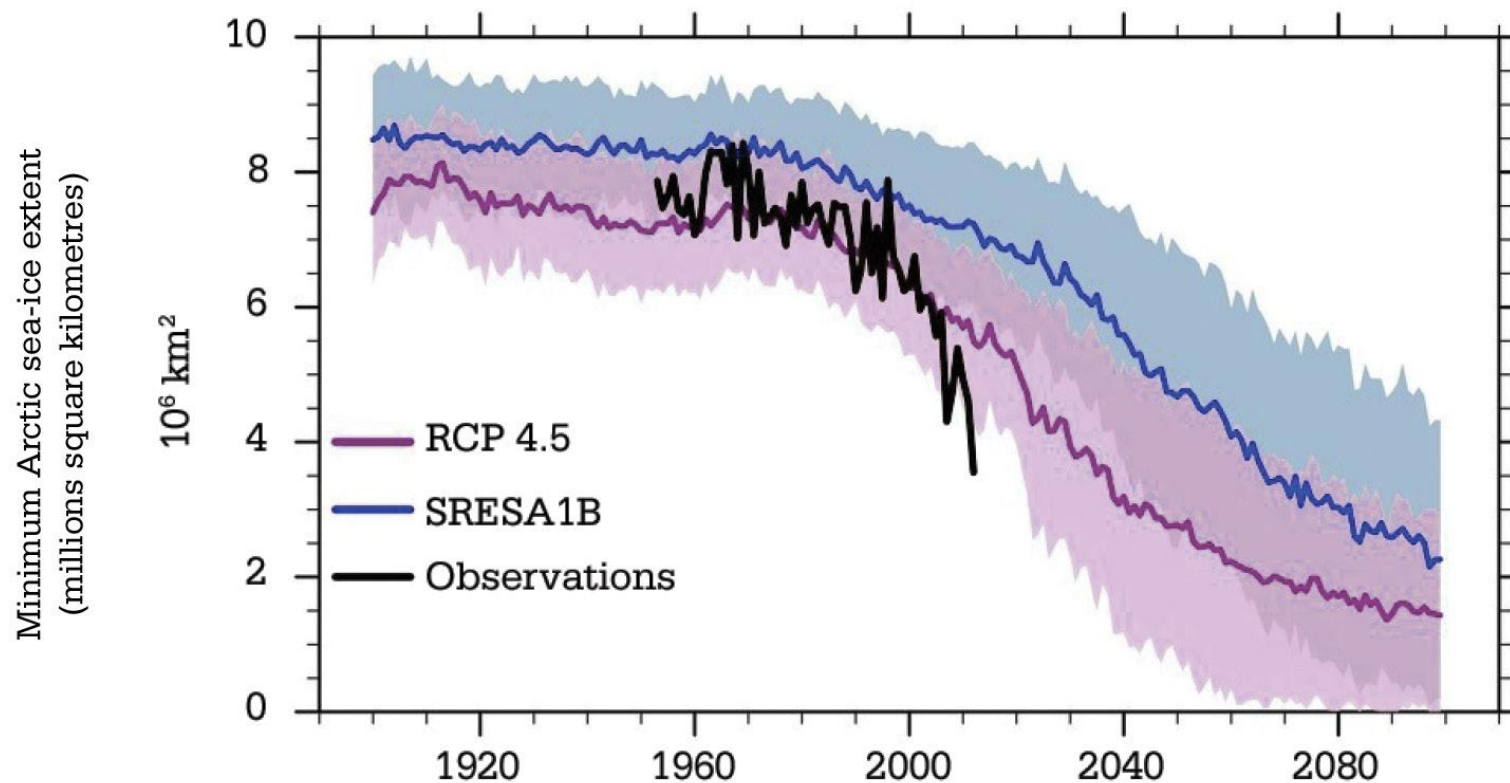


(b)



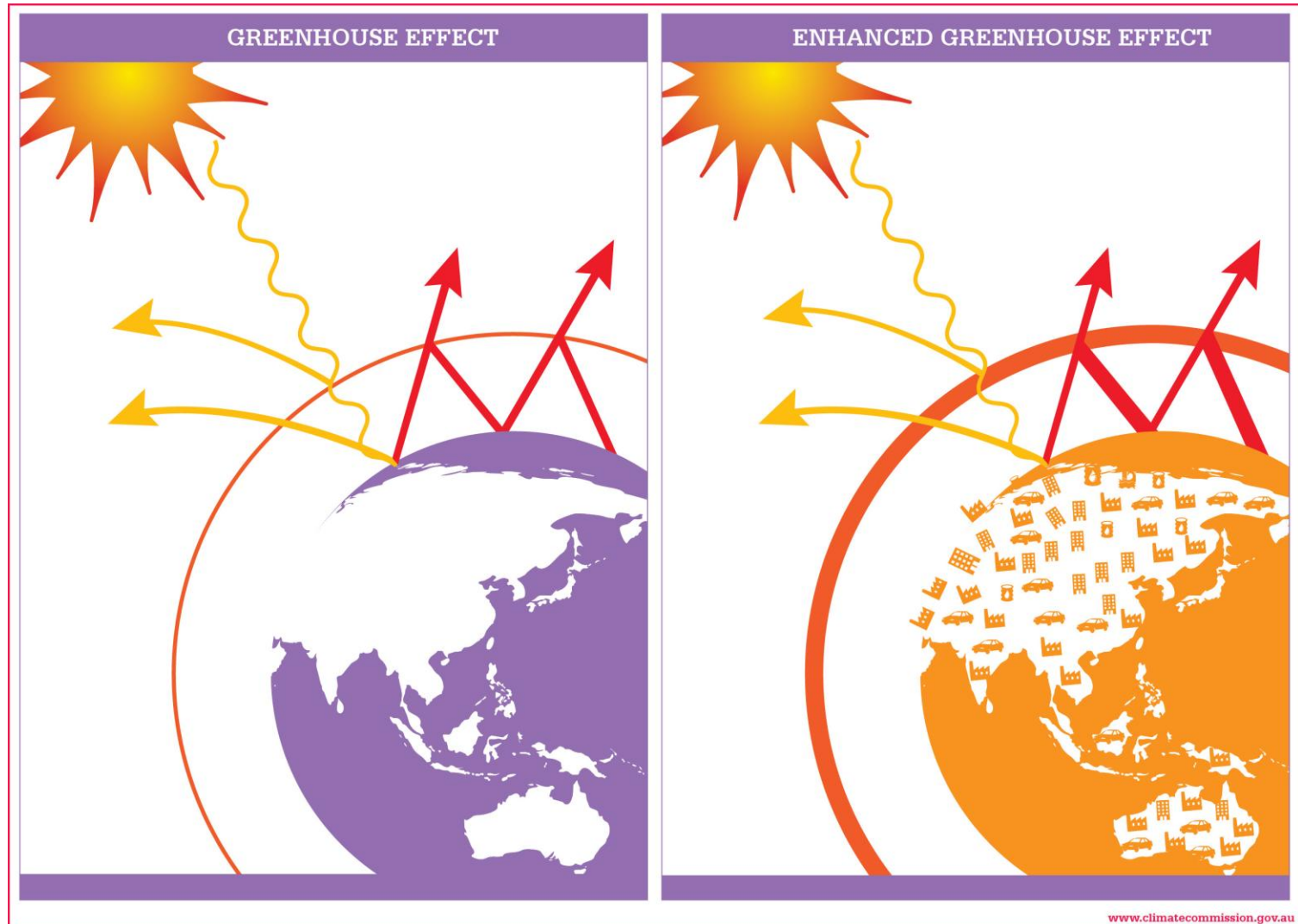
Source: Church et al., 2011a

Changes faster than predicted

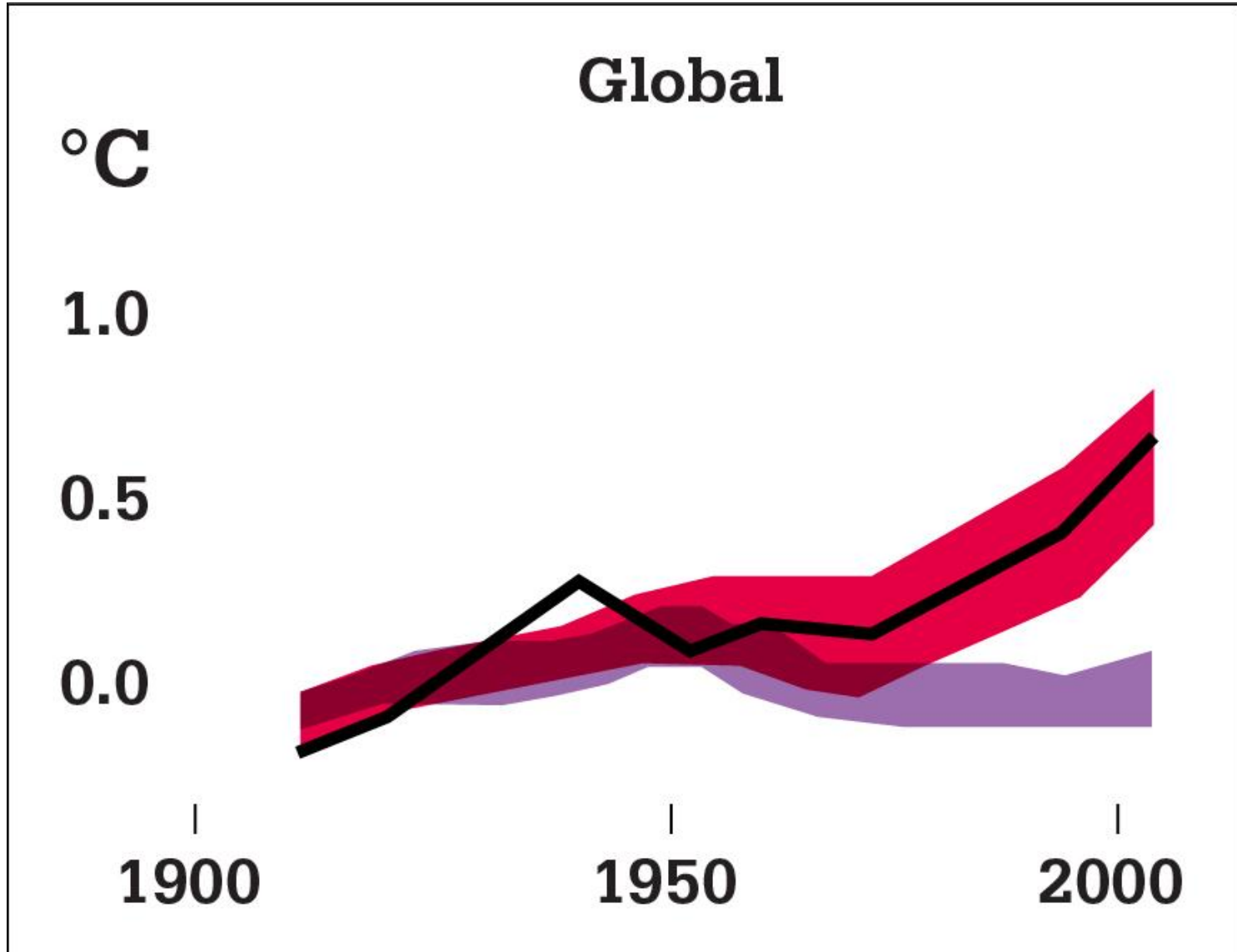


Source: Stroeve et al. (2012) updated to include observations to 2012

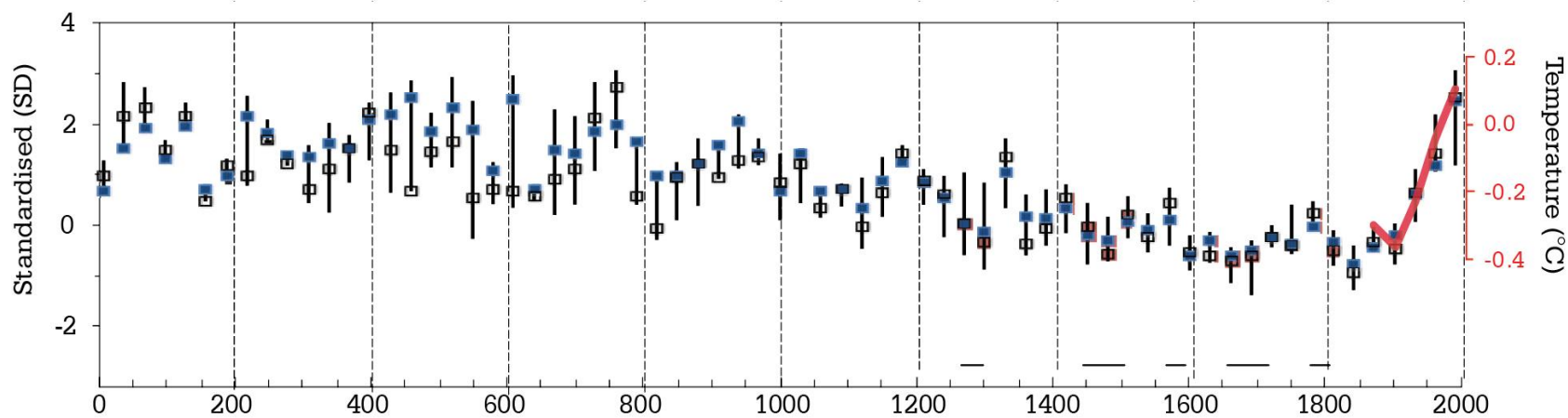
Enhanced Greenhouse Effect



Human activities making it warmer



2,000 year global temperature reconstruction



Source: Redrawn from PAGES 2k Consortium, 2013, which gives further information on the methodology used in the figure

Consequences of climate change



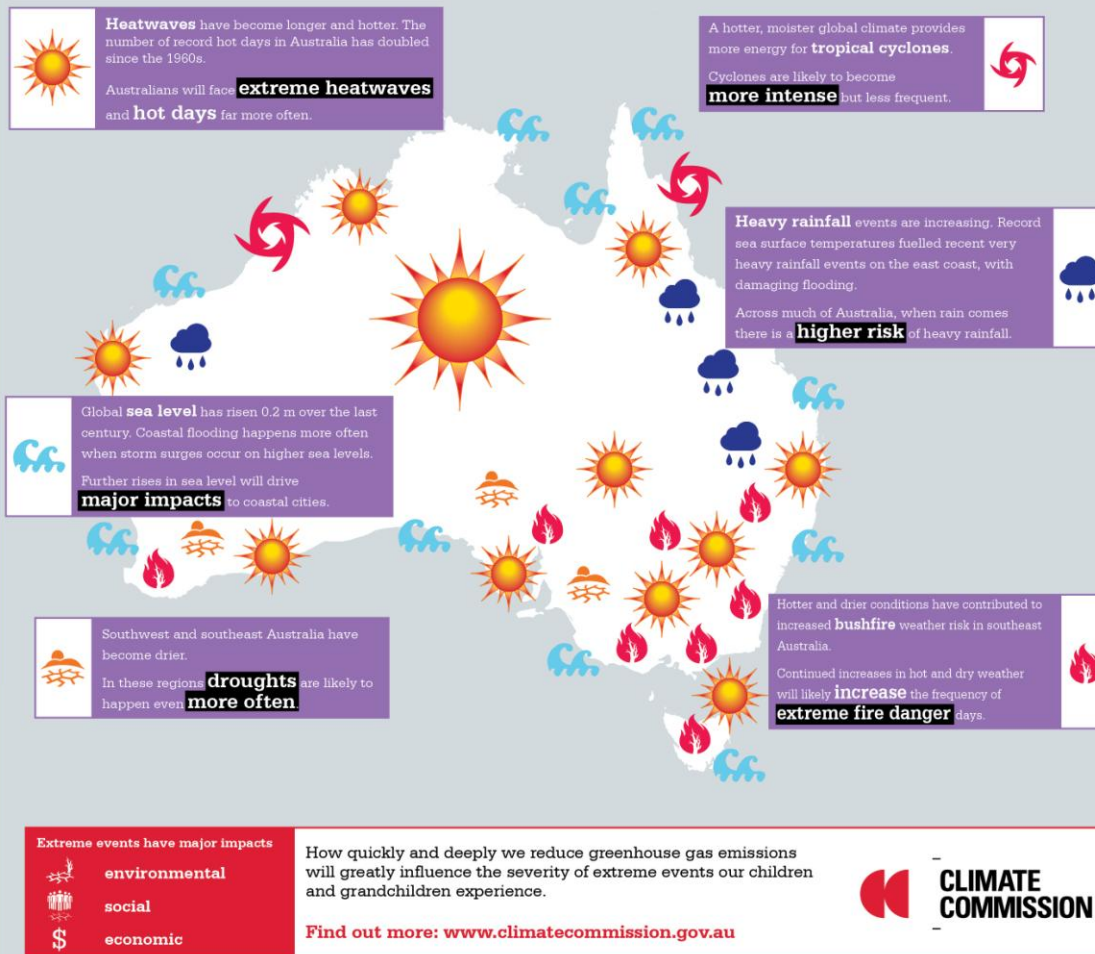
Extreme weather and climate change



Extreme weather has always occurred. But due to additional **greenhouse gases** in the atmosphere, the **climate system** now contains significantly **more heat** compared to 50 years ago.

This means that **all extreme weather** events are **influenced** by **climate change**.

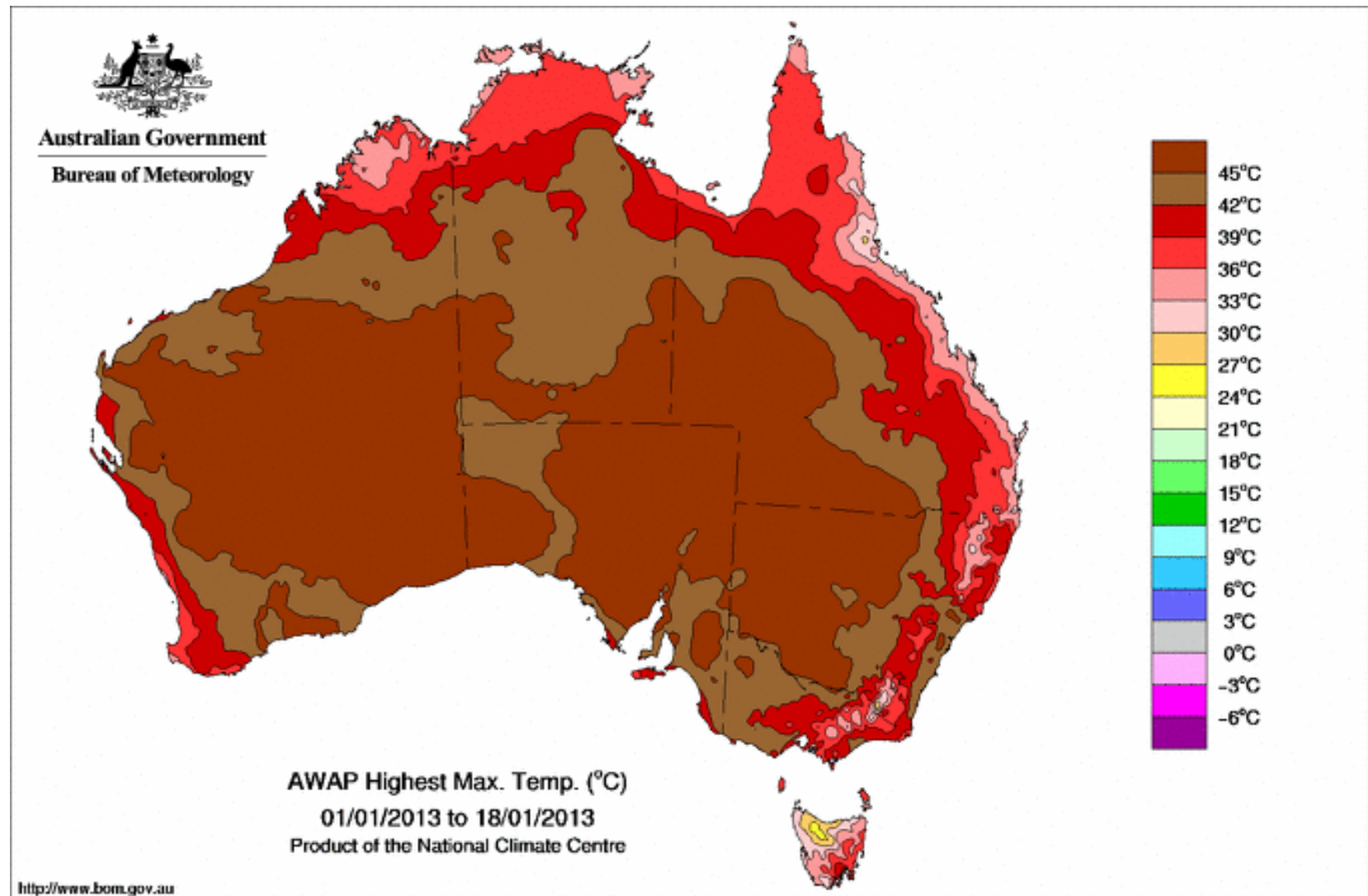
The **severity** and **frequency** of many **extreme weather** events are increasing due to **climate change**.



Sources: Hot days and Heatwaves: CSIRO and BoM, 2012; Perkins and Alexander, 2013; Alexander and Arblaster, 2009. Cyclones: Emanuel, 2000; Wing et al., 2007. Rainfall: Donat et al., 2013a; IPCC, 2012. Bushfires: Lucas et al., 2007; Clarke et al., 2011. Drought: BoM, 2013h; IPCC, 2012. Sea Level: Church and White, 2011; Church et al., 2006; Hunter, 2012.

Full references available in **The Critical Decade: Extreme Weather** www.climatecommission.gov.au/report/extreme-weather

Heatwaves

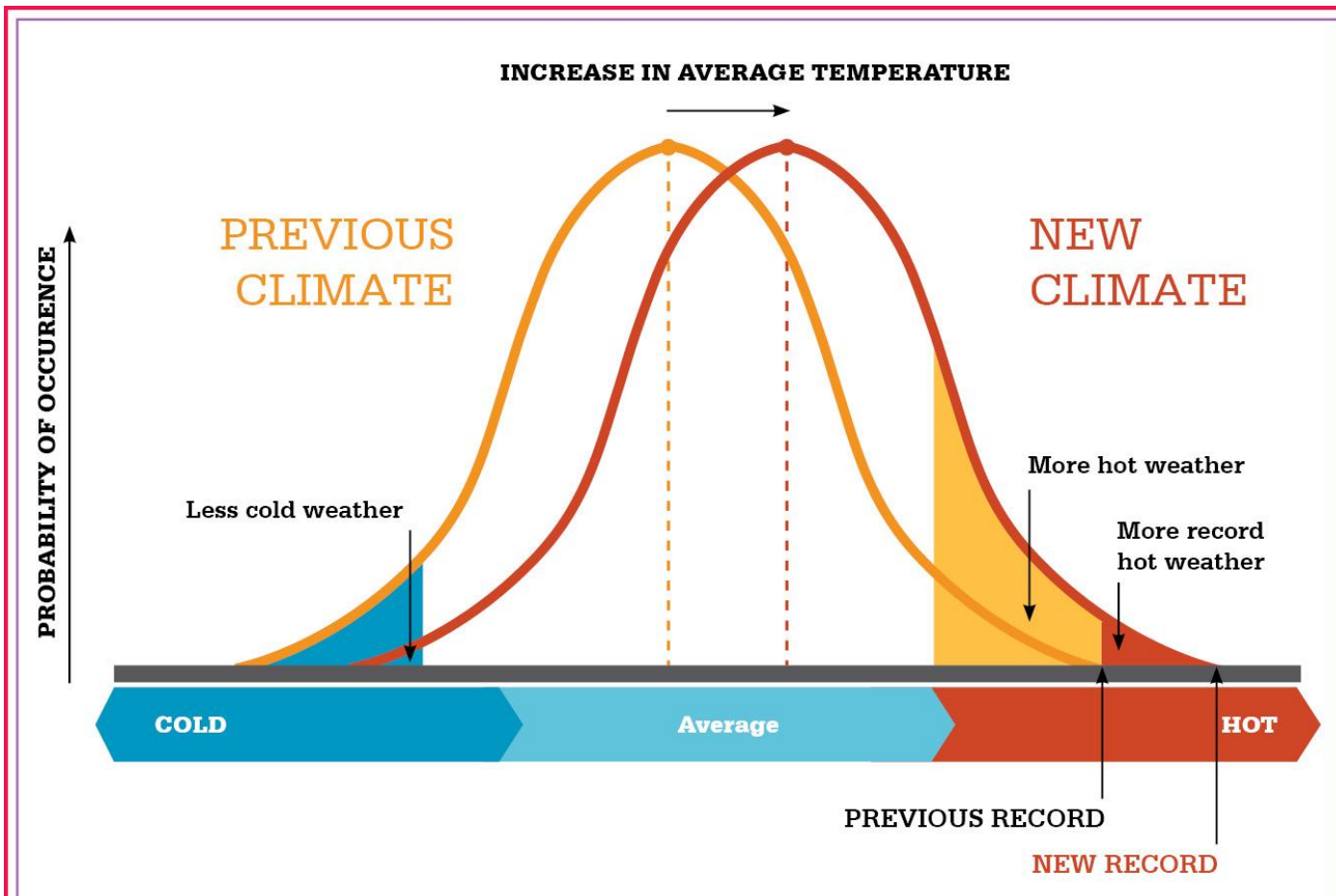


The Angry Summer – heatwaves



- Severe heatwave across 70% of Australia late Dec 2012 /early Jan 2013. Temperature records set in every state and territory
- Hottest ever area-averaged Australian maximum temperature, 7 January 2013: 40.30 C
- Hottest month on record for Australia – January 2013
- All-time high maximum temperatures at 44 weather stations
- Average daily maximum temperature for the whole of Australia was over 39 C for seven consecutive days (2-8 January)

We are living in a new climate

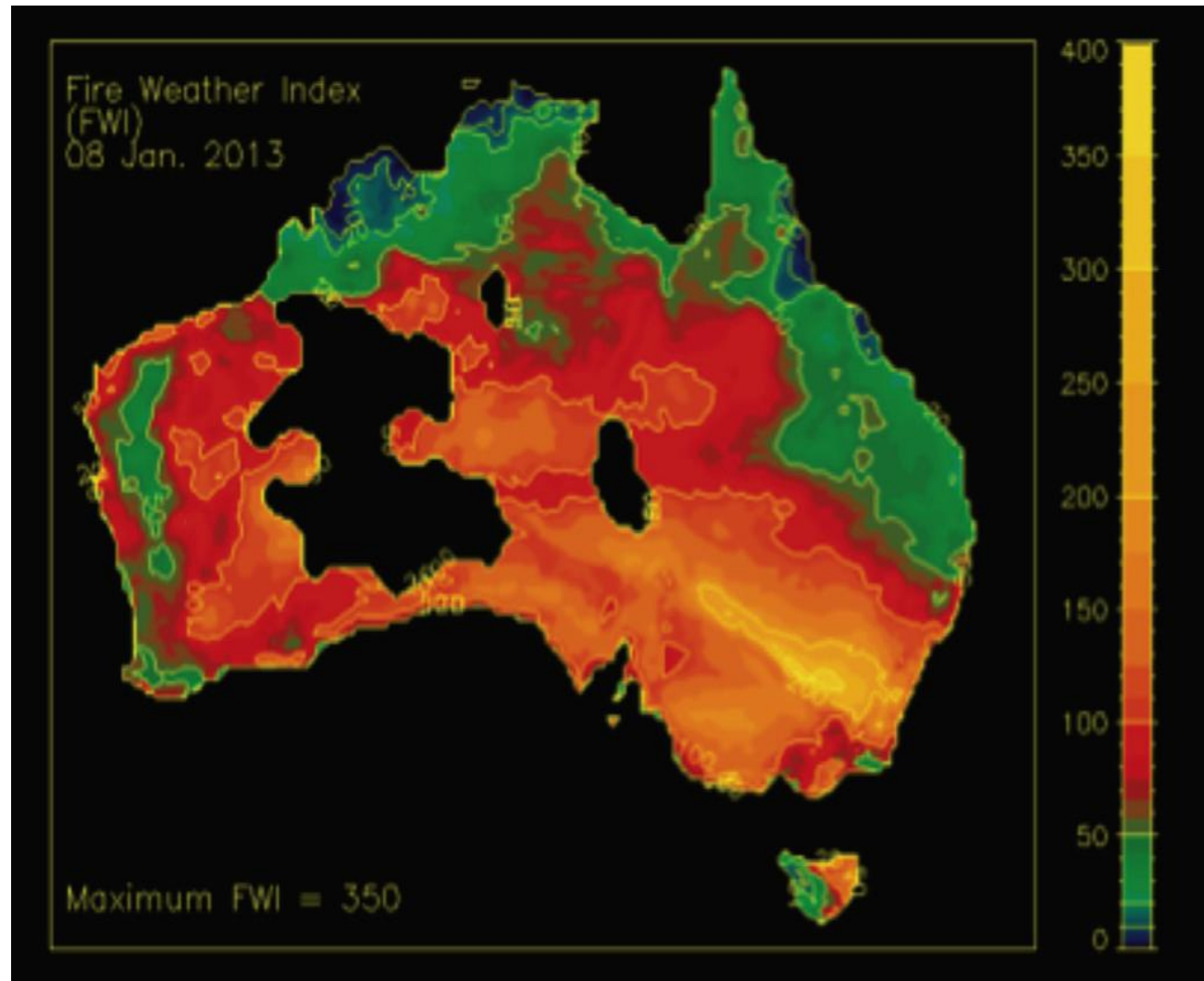


Source: Modified from IPCC, 2007

Bushfires



Fire Weather Index, 8 Jan 2013



Bushfires and Climate Change

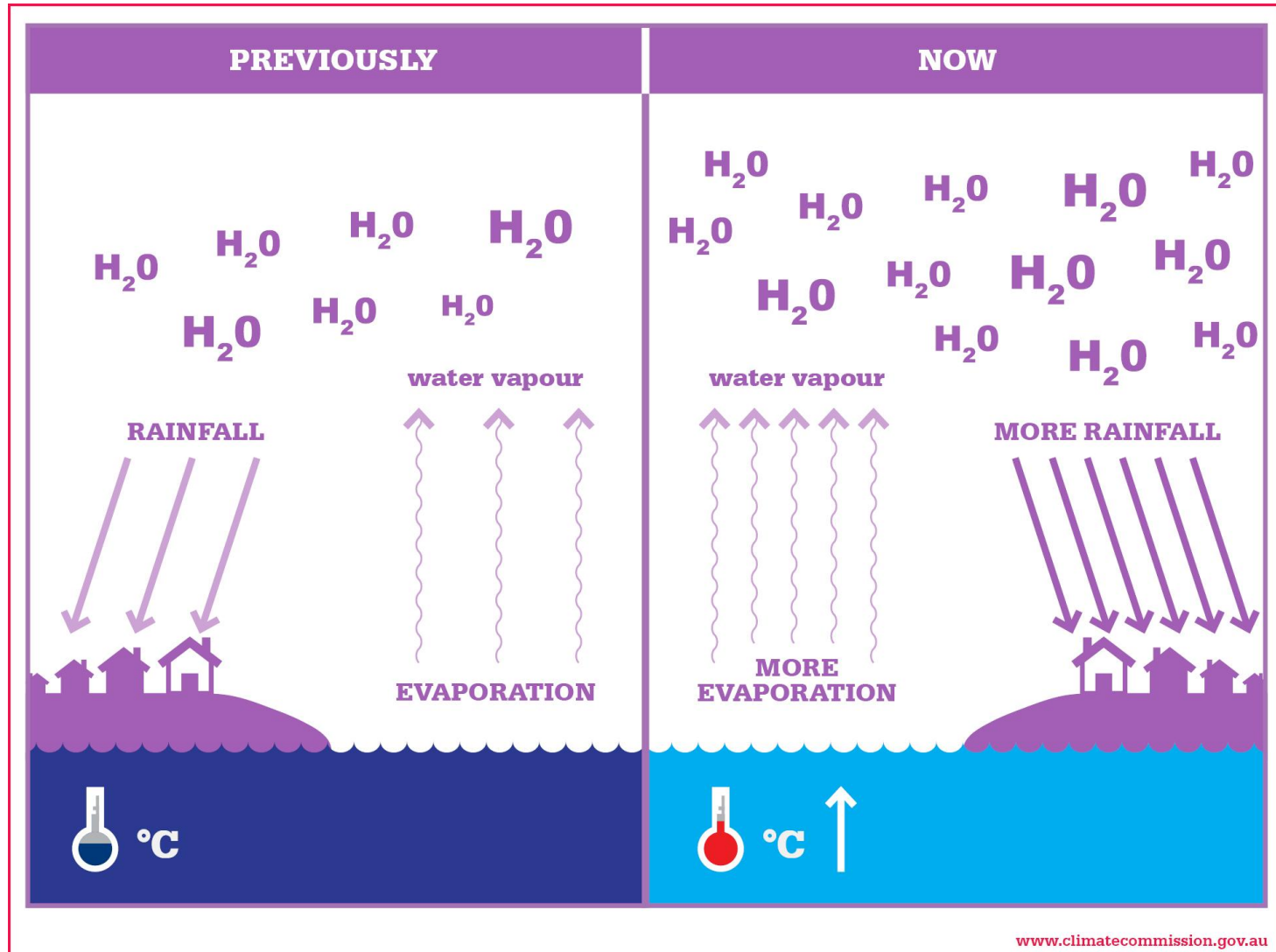


- Climate change exacerbates bushfire conditions by increasing the frequency of very hot days.
- Between 1973 and 2010 the Forest Fire Danger Index increased significantly at 16 of 38 weather stations across Australia, mostly in the southeast. None of the stations showed a significant decrease.
- Projected increases in hot days across Australia, and in dry conditions in the southwest and southeast, will very likely lead to more days with extreme fire danger in those regions.

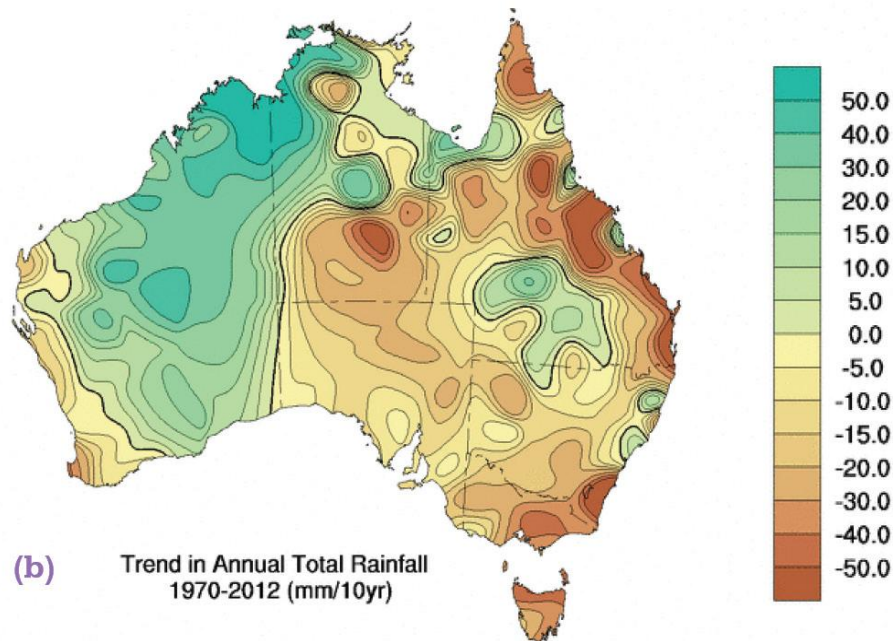
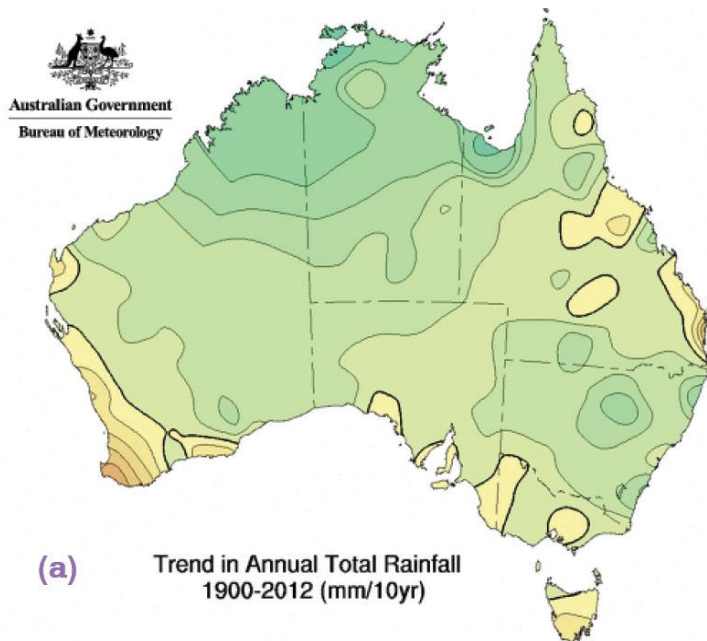
Heavy rainfall and flooding



Influence of warming on the water cycle

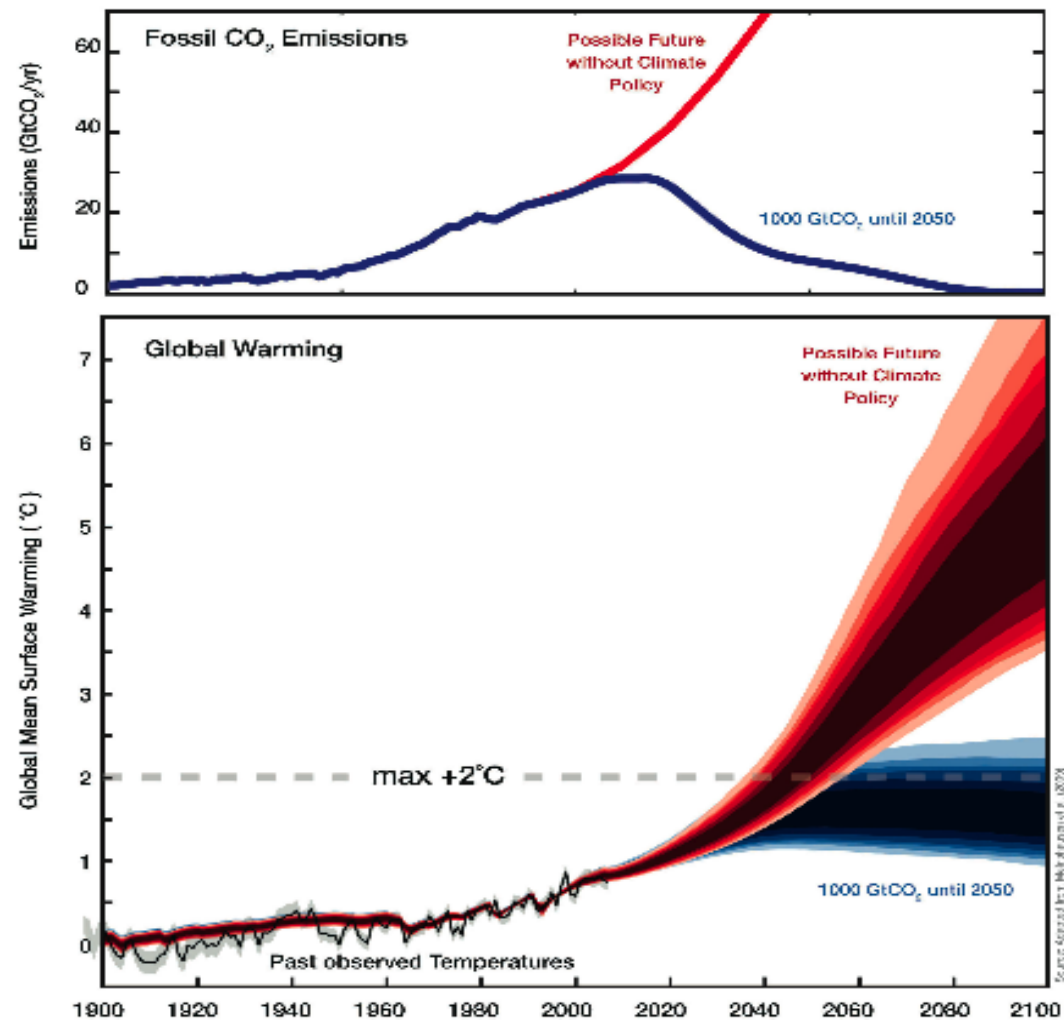


With changing rainfall patterns



Source: BoM, 2013c

The carbon maths



Overspend in the carbon budget



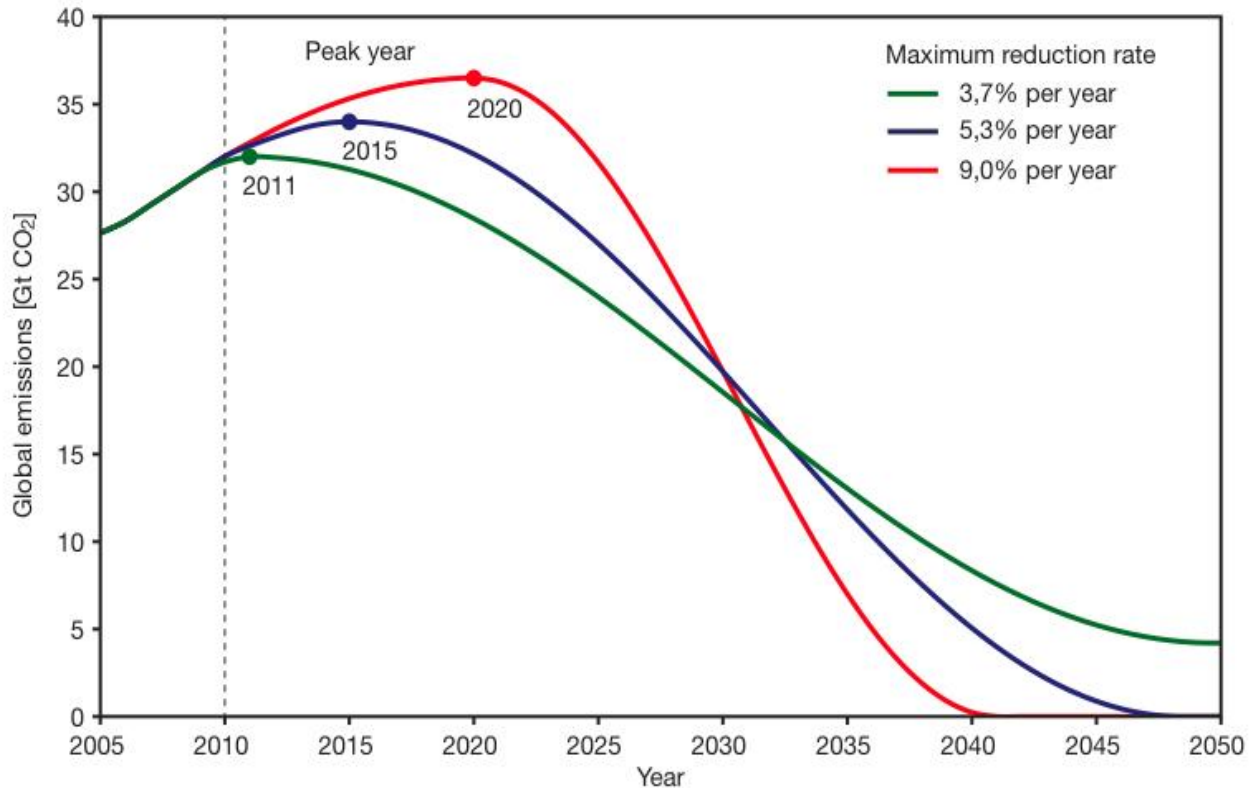
For a 75% chance of meeting the 2°C limit we can emit no more than 1,000 billion tonnes of CO₂ between 2000 and 2050.

In the first 13 years we have emitted nearly 40% of our carbon budget.

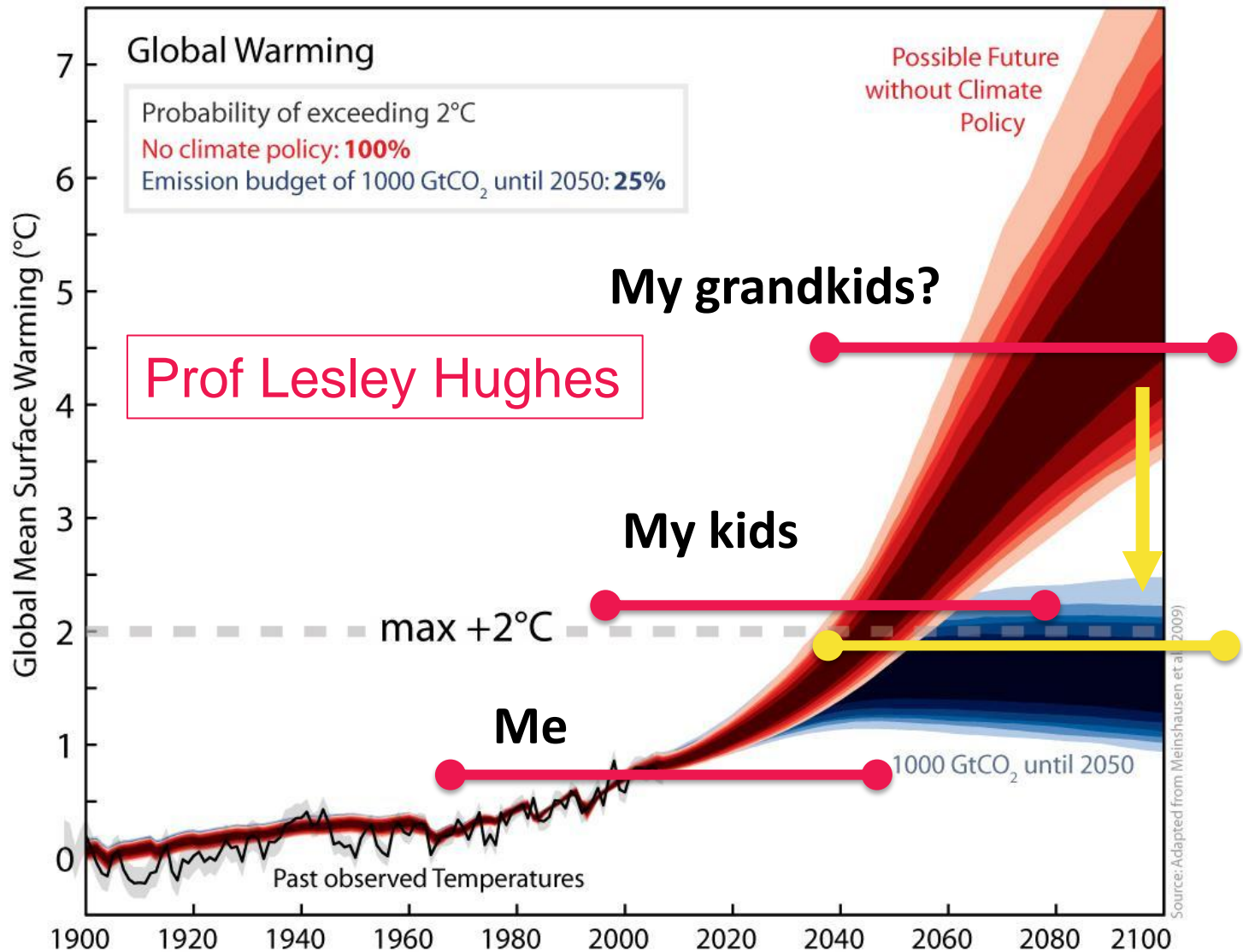
So, we have only 60% of our carbon budget to last the next 37 years.

If we continue to spend our allowable emissions at our current rate, we will use up all of our allowable emissions by 2028. After the budget is completely spent, the world's economy will need to be completely decarbonised.

Emission trajectories for 2 C limit



This is the critical decade for action



Key Messages



- The evidence for climate change is overwhelming and clear. It is beyond reasonable doubt that the burning of fossil fuels is the primary cause.
- We are already seeing the social, economic and environmental impacts of a changing climate, especially extreme events. The risks rise as climate shifts further.
- To stabilise the climate at a manageable level, most of the world's fossil fuel reserves must stay in the ground.
- This is the critical decade. Decisions we make from now to 2020 will determine the severity of climate change our children and grandchildren experience.

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