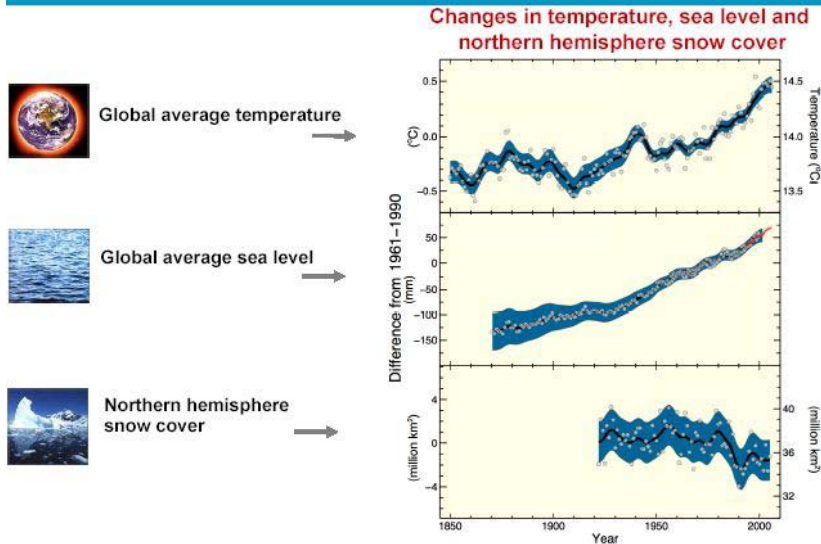


Meltdown: Global Warming by the Numbers

Jon Sumbly
Hobart, March 2008.

Direct observations of recent climate change

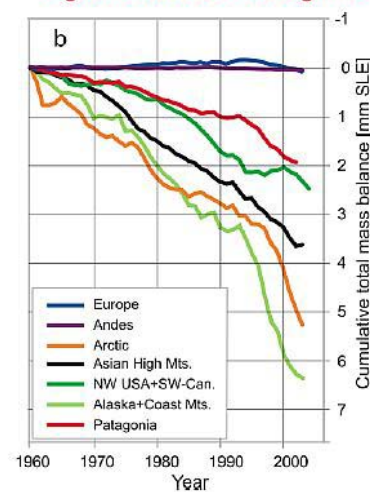


Glacier mass balance

During the 20th century, glaciers and ice caps have experienced **widespread mass losses** and have contributed to **sea level rise**

Further **decline of mountain glaciers** projected to **reduce water availability** in many regions

Cumulative balance of glacier mass in some regions



0.8° C

This is where we are now. Because of the lag in temperature rise between carbon emissions and temperature rise, global heating will continue for decades. This is particularly the case as we continue to live a consumer lifestyle in a 'business-as-usual' world. There is 0.6 of a degree of heating to come soon; this will put the world into what is called 'dangerous' global warming. We have already seen a major loss of Arctic ice cover. The earlier IPCC estimates for the complete loss of Arctic ice cover was 2080-2100; this has been revised to 2030-2040 but some recent research through NASA indicates that complete loss of the Arctic may happen as early as 2013. This is dangerous global warming. It will cause major change in the global environment, with rises in Northern temperature on the order of twelve degrees in summer. Even more dangerous is the melt in the North will trigger the release of large amounts of methane as the permafrost melts.

Adding this methane to the atmosphere is conservatively estimated to double global warming and last year researchers working in Siberia discovered that methane is presently venting into the atmosphere five times faster than the IPCC estimates. In Antarctica, the most recent research shows that the icesheet is disappearing at a significantly increased rate.

We continue to live with 'business-as-usual' despite all the talk about reducing carbon emissions. At our present rate of growth and lifestyle, the IEA and DEFRA recently estimated that by the end of the century our carbon emissions will have increased by 63%, at a time when they should be reduced by 80%. Since 1995, global carbon emissions have increased by 22%. The recent Bali talks brought no concrete action, with various delegates (*e.g.* the USA and Russia) lobbying to have firm targets and emission estimates removed or downgraded from the final documents; just as the Saudi Arabian delegates did at the last IPCC meeting. The next round of discussion about carbon reduction targets is in 2012, although this is unlikely to change the *status quo*.

1° C

We will reach this temperature in the next few years. At this temperature, the UK Government's Meteorological Office: Hadley Centre says that the agricultural grain belt in the US northwest will revert to the desert it once was 6000 years ago. Regional drying will accelerate while droughts will become more severe and longer lasting. The Amazon will start to dry and animals, plants, and ecosystems around the world will begin dying off. Rainfall will decrease by about 20% across southeastern Australia.

Because of the effects we are already seeing happen and because the measures of global warming are happening faster than the IPCC estimates (Arctic sea ice loss; sea level rise; methane release; Greenland ice melting; reduction in Southern Ocean carbon sink capacity; Antarctic ice sheet loss; etc.) the current concern is that we may have already passed the 'tipping point' where feedback effects and accelerating change begins to drive global warming. Recent work looking at the rate of warming indicates that global warming will start to surge around 2011, the change we have seen so far has been relatively gradual and global warming will really show effect within five years. James Hansen, the internationally respected head of NASA's Goddard Space Research Centre, estimates the tipping point as 1.8 degrees, although other workers are now saying 1.5 degrees. Certainly, the two-degree level for dangerous global warming is dated, even though that is what governments are using in their non-binding, aspirational, policies that promise carbon reductions by 2060.

2° C

We will exceed this temperature change in the next few decades. This is accepted in climate science and policy. At the recent Bali talks there were suggestions by policy-makers that the 'dangerous' level of temperature rise be raised to three degrees, in order to allow more time for the global economy to 'adjust' to emission cuts. This two-degree temperature level has never been the start of 'dangerous' warming, it is an upper boundary that should not be exceeded and is best not approached. At this level up to 30% of the world's freshwater sources will vanish putting 2.8 billion people under agricultural and water stress. An estimated 200 million refugees will be on the move. Coral reefs will die off globally, while sea level rise (already double previous estimates) will be measured in the metres. Up to a quarter of the species on Earth will disappear. The IPCC is now saying that global temperatures will rise by between 2.4 and six degrees by 2100. Other estimates put the minimum temperature rise as 3.4 degrees.

4° C

Your grandchild's world - caused by your lifestyle now. Freshwater will be scarcer and agricultural production reduced globally by 10-15%, even though the world will be even more populated. El Nino events are expected to be more severe, storms bigger and more frequent, droughts harsher and longer. The Arctic ice mass will no longer exist. Sea level will be metres higher. The oceans will be acidified around the Antarctic. Up to a third the world's species will be extinct or going extinct as ecosystems fail. Feedback processes, such as methane releases, albedo changes, and ocean current changes will be operating. These lead us into the realm of non-linear

change, where the feedback effects force more rapid and sudden rises in temperature change rates. These non-linear changes ('runaway' global warming) are the fear behind the two-degree boundary and while there is some indication that these changes are already appearing, at four degrees they are certain. The magnitude of these effects is uncertain, with most research indicating that they will add between five and eight degrees to global warming.

8° C

It is difficult to imagine a world with eight or more degrees of warming, just as it is difficult to imagine what shape human society will take. Certainly it will not be like ours, especially as even the oil companies estimate peak oil as between 2080 and 2100. It is not likely to include cheap spaceflight to orbiting Hilton hotels, personal robots for everyone, computer-controlled houses, fusion-powered cities, 'green' cars for everyone, brilliant virtual reality TV and slimming pills that work; all the important things technology and our consumer culture promises us now – if we just keep burning oil and coal, we will have it all...

Action needs to be taken now, within the decade, but is unlikely. To take action now will crimp our lifestyles and economy; something the average consumer will not like and will be offended by. For example, there are people in Tasmania who think nothing of flying to Melbourne to go shopping, visit a friend, go to a party, see a band or an art exhibition that is not travelling to Tasmania. Stopping recreational air travel and tourism globally would be a logical start, as this sort of travel is purely personal pleasure and an indulgence in a global warming world. Is this possible given the size, power, and economic value of the passenger air travel industry? Senator Bob Brown has suggested closing down Australia's coal industry. This is a sensible suggestion but with a major economic cost, including over 30,000 job losses; but as Ian Lowe recently pointed out, over the last decade or so thousands of jobs have been lost offshore and Australia has not measurably suffered. The coal industry is also very rich and powerful and would not cease operation just to help combat global warming. These sort of changes are the type and magnitude of changes needed, which is why we hold out to continue our lifestyle unchanged but 'greener' with technological fixes that have yet to appear (like carbon capture from power stations), even if they may not be feasible at all or possible to implement globally.

We have reached the point where dangerous global warming will happen, we've lost the opportunity to prevent it and from the moment when the tipping point is tripped we will be in the grip of uncontrollable warming that is likely to be self-magnifying and on the order of 4-8 degrees. If we take strong action now and severely curtail carbon emissions globally, we can hope to minimise this change. But the world runs on growth: in production; consumption; in population; trade; wealth. Growth that is fuelled by coal, run by oil, and made of plastic. The answer to global warming is simple and held within the question: 'In our culture of growth, can we stop growing?'

'Mitigation needs to start in short term, even when benefits may only arise in a few decades.'

– Dr R. K. Pachauri, Chair of the IPCC, September 2007

The images

The graphs come from a presentation by the Chair of the IPCC, Dr R.K. Pachauri, to the UN in September 2007. The full presentation is available at:

www.ipcc.ch/pdf/presentations/pachauri-un_nyc_2007-09-07.pdf

Recommended reading

Climate Code Red (2008) Available at: www.climatecodered.net

Avoiding Catastrophe (2007) Available at: www.carbonequity.info/PDFs/Avoidingcatastrophe.pdf

For a current article on the need for immediate action visit *New Scientist* at:

<http://environment.newscientist.com/channel/earth/climate-change/mg19726454.500-no-time-to-lose-in-cutting-cosub2sub-emissions.html>