

How much climate change can the planet take?

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The stated goal of the United Nations Framework Convention on Climate Change (1992) is to " stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic (human) interference with the climate system". (UNFCCC Art.2).

The planet is already committed to an average temperature rise of between 1.2 and 1.3°C over pre-industrial levels as a result of greenhouse gases already in the air. This degree of warming is already committed and inevitable. Keeping global average temperature rise below 2°C should be the goal for both international and national climate policy-makers. Even if this target met, tens of millions of people still stand to be seriously and negatively impacted by the adverse effects of future climate change. However, scientifically and pragmatically speaking---given the sort of time scales necessary to transform global energy systems---slightly below 2°C is probably the least amount of warming the planet is looking at, even under a best case scenario

Two degrees Centigrade global average warming:

Threatens tens of millions of people with increased risk of hunger, hundreds of millions with increased risk of malaria, millions with increased flooding, and billions of people with increased risk of water shortage (2) (3). The vast majority of damage falls largely on the poorest and developing countries, particularly in sub-Saharan Africa , South Asia , and parts of SE Asia and Latin America .

Two degrees Centigrade global average warming:

Risks melting of major ice sheets with commitments to many metres of sea level rise over several centuries, particularly the Greenland ice sheet (seven metres), and the West Antarctic Ice Sheet (WAIS) (5-7 metres). Greenland melting is accelerating. Rapid acceleration of melting of glaciers in large parts of the WAIS is now observed to be already under way. This possibly presages a dynamic collapse of this component of the ice sheet. Ensuing sea level rise threatens large populations everywhere, and particularly low lying areas in developing countries such as Bangladesh , South China , low-lying island states, not to mention low-lying parts of Europe --- Belgium , the Netherlands , NW Germany, southeast UK .

Two degrees Centigrade global average warming:

Threatens serious damage to major ecosystems everywhere, from the Arctic to the Antarctic, from mid-latitudes to the tropics. Potential loss of forests, rangelands and agricultural soils threatens livelihoods everywhere, with economic costs and loss of welfare falling disproportionately on the poor and developing countries.

And the news keeps getting worse.

Some of the highlights of the last twelve months include:

A multi-year international study published in Nature predicts that mid-range climate change scenarios will doom a million species to extinction by mid-century;

The Arctic Climate Impacts Assessment , commissioned by the Arctic Council, confirmed that the Arctic is warming much faster than the rest of the globe. At least half of the summer sea ice will disappear by the end of this century, along with significant melting of the Greenland ice sheet, with devastating consequences for seals, bears, local communities, and with global consequences including (but not limited to) sea level rise;

A study of the European heat wave in the summer of 2003, published in December , concluded that there was a clear global warming fingerprint on the killer heat wave, and that by mid-century, such a summer would be cooler than average;

Finally, scientists at the US National Center for Atmospheric Research concluded that the amount of the earth's surface suffering from drought has doubled in the last thirty years, and that at least half of this is as a result of increased temperatures rather than changes in precipitation (7).

Keep warming below 2 deg C - What CAN and should be avoided?

- * Limit damages to coral reefs, marine ecosystems and fisheries.
- * Limit risk of major ecosystem damage and threats to agricultural systems.
- * Limit both rate and extent of sea level rise and risks of coastal flooding.
- * Limit risk of Greenland ice sheet collapse
- * Limit risk of West Antarctic Ice Sheet instability.
- * Limit the spread of hunger, water scarcity, and disease burden, all of which accelerate under warming, even taking into account future economic growth and increased wealth.

CAN it be done ?

It is still technologically, economically and scientifically possible to limit global temperature rise to less than 2°C above pre-industrial levels.

But time is not on our side. We are within a decade or two of closing off those options with known technological means and capabilities.

Estimates of the 'sensitivity' of the climate to forcing from greenhouse gases are considered in terms of the amount of

temperature response within the climate system to a doubling of pre-industrial levels of greenhouse gases in the atmosphere, expressed in carbon dioxide equivalence in (ppm).

Pre-industrial levels of carbon dioxide were about 270 million parts per million (ppm). So the figure for doubling is 450 ppm. Today we are at about 379 ppm ---- a rise of over 40% in less than 150 years ----an extraordinary rate of change in geological terms. (See graph below)

Source: IPCC

The midline scientific estimate of the response to the climate system to a doubling of GHG concentrations to 550 ppm has, historically, been a 2.5°C increase in overall average global temperature. So politicians have tended to assume that a "best guess" at the climate's overall sensitivity is 2.5°C.

However, recent studies have revealed that the new best guess is that the climate sensitivity is in fact closer to 3.2°C. This means that the response from the climate to the anticipated rise in greenhouse gases will be far more dramatic and far more intense than previously assumed.

The world will have to act even faster and take even more dramatic action against the fossil fuels that cause climate change if we are to avoid the damage associated with a 2°C global average temperature rise.

This means that we have to start immediately if we aim to stabilise greenhouse gases in the atmosphere at a level below 400 ppm.

We then have to seek to bring concentrations down as rapidly as possible thereafter if we are to have any reasonable chance at all of keeping the overall global temperature rise below 2°C.

To meet these goals dramatic reductions in greenhouse gas emissions are needed, and they are needed soon.

From a moral, legal and practical perspective, the initial burden of emissions reductions has to fall on industrialized countries.

Reductions of at least 30% on 1990 levels (the 'baseline' year for the Kyoto Protocol) by 2020 from industrialized countries are required immediately, with a second target of at least 75% reductions by mid-century.

Globally, we need to bring total emissions back to 1990 levels by about 2020 and then reduce them by 50% by mid-century.

This means that rapidly industrializing economies like China , India , Mexico , Brazil , South Africa , Indonesia , Malaysia and others need to start reducing their emissions soon.

The consequences of delay in the process of reducing emissions means that we will face a dire global emergency in the 2020s which will require rates of emissions reductions which in the past have only been associated with massive economic collapse, i. e., with the collapse of the Soviet Union.

We must not be forced to choose between economic catastrophe and climate catastrophe. The most likely outcome in that case would be hesitation, policy uncertainty and, most likely an enhanced risk of both catastrophes occurring simultaneously----a situation we are looking at today.

We have a good chance of avoiding this. But it means we must start to ACT NOW.

1) <http://www.grian.ie/PDF/kyotoday/FrameworkToFightCC.pdf>

2) Hare, B (2003) "Assessment of Knowledge on Impacts of Climate Change - Contribution to the Specification of Art. 2 of the UNFCCC: Impacts on Ecosystems, Food Production, Water and Socioeconomic System", http://www.wbgu.de/wbgu_sn2003_ex01.pdf

3) See M Parry, N Arnell , T McMichael, R Nicholls, P Martens, S Kovats , M Livermore , C Rosenzweig, A Iglesias and G Fischer, Millions at Risk: Defining Critical Climate Change Threats and Targets, Global Environmental Change 11.3 (2001): 1-3.

4) Thomas, et. al, "Extinction risk from climate change", NATURE |VOL 427 | 8 JANUARY 2004 pp. 146 - 148

5) See <http://www.acia.uaf.edu/>

6) Stott, et. al., "Human contribution to the European heatwave of 2003", NATURE |VOL 432 | 2 DECEMBER 2004 pp. 610-614

7) Dai et. al, "A Global Dataset of Palmer Drought Severity Index for 1870-2002: Relationship with Soil Moisture and Effects of Surface Warming", American Meteorological Society, Vol 5, December 2004, pp. 1117- 1130