

CLIMATE CHANGE – ONE DEGREE TILL THE POINT OF NO RETURN

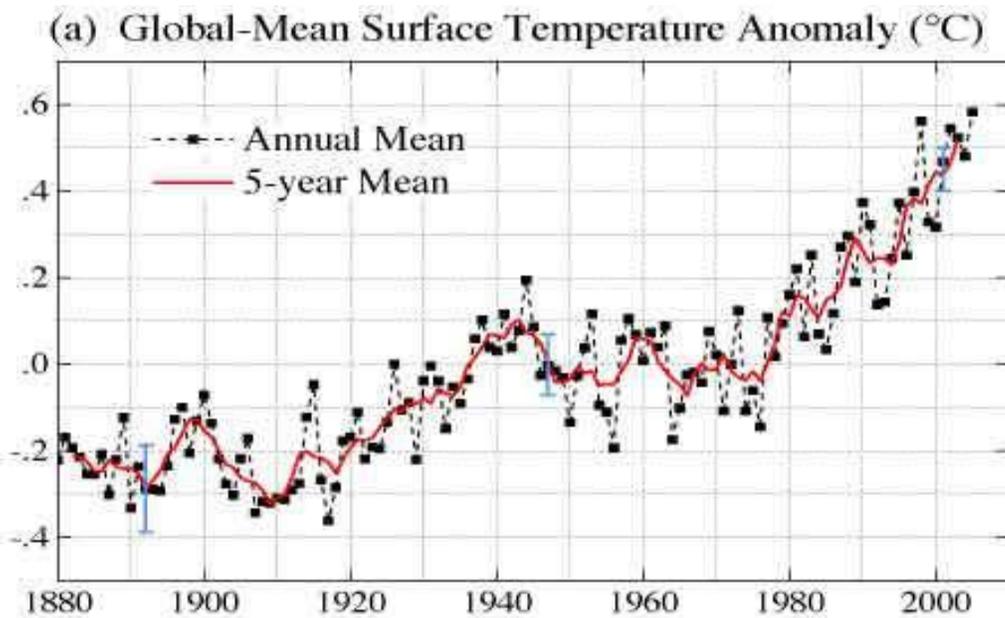
The world is beginning to take the problem of climate change very seriously, and it should. New data from NASA shows that the world is within a degree of the hottest temperature in the last million years. Hit this target, and the disastrous effects of global warming will become irreversible. We are nearing the point of no return.

When it comes to temperature, one degree Celsius seems like nothing. If the temperature outside changed by a single degree, almost none of us would notice and if it rose by this much, almost none of us would complain.

But according to new research, this single degree now separates us from the point of no return, when the threat and problems of climate change become irreversible.

Around the world, scientists, politicians and the public alike are starting to realise that climate change is a very real and very serious problem. Reports of record temperature levels seem to be an increasingly common fixture in the British press.

But the world's entire climate is connected. To get a proper picture of the impact of climate change, it is useful to look at the global situation.



This is what James Hansen and colleagues at NASA's Goddard Institute for Space Studies did in September of this year. They looked at global changes in the world's temperature over the last century, using a wealth of measurements from land stations, ships and satellites.

Their results show an unmistakable pattern of increasing temperatures, particularly during the turn of the century.

Compared to climate in 1951-1980, the world in the first five years of the 21st century is warmer almost everywhere, although more so over land than sea, and at high northern latitudes in particular.

Over the last century, the global temperature has risen by 0.8°C in the last century, and 0.6°C of that was in the last three decades. On average, 2005 was the warmest

year on record, largely because of aberrantly high temperatures in the Arctic.

Wasting time

As ever, climate sceptics are not convinced. Some have suggested that these higher average temperatures are invalid and biased because of measurements taken in typically hotter urban centres. But studies in some of the world's remotest regions are clearly saying otherwise.

Glaciers are retreating and the ice on rivers and lakes is breaking up earlier. Even the open ocean is heating up, and if that were not enough, the largest temperature rises have been found in remote locations in the northern hemisphere. Global climate change is very real and is happening faster than ever.

This is not the first time that Hansen has sounded the alarm. In 1988, he published a model for global temperature change and presented it to the US Congress.

Unfortunately, he was heavily criticised in some quarters, most notably by Michael Crichton in his lamentable novel, *State of Fear*, which asserted that Hansen's data was out by 300%.



The result was unproductive time-wasting at a critical juncture. As the window of opportunity shrank, Crichton, firmly leaning towards fiction over science, was invited to provide testimony to the US Senate and was even granted an audience with the President.

Hansen's new analysis soundly trashes Crichton's criticisms and shows that his earlier model of the 'most plausible' warming scenario has come to pass some 20 years later.

Looking into the past; staring into the future

The recent data all well and good, but variations over a short time could be one-off incidents, becoming mere blips when longer time-scales are considered. To account for this, Hansen compared our current temperature with that of prehistoric times, by looking at fossil shells.

Shelled animals deposit different amounts of minerals into their shells depending on the surrounding temperatures, so fossilised marine shell-wearers can tell us how hot it was in prehistoric times to within a degree's accuracy. .

The results are astonishing. Because of our unremitting greenhouse gas emissions, the Earth is now within one degree Celsius of the hottest temperature it has experienced in the last millions years.

The situation is especially stark in the Western Equatorial Pacific region, an crucial area that regulates much of the world's atmosphere and oceanic weather. Drastic changes here will not go unnoticed elsewhere.

They can even affect the rate at which the polar ice caps melt, as sub-tropical Pacific waters intermingle with Antarctic currents. Temperature rises in this region have not been matched by rises in the Eastern Pacific, and this difference may be driving more frequent El Nino events, like those in 1993 and 1998.

At the current rate, global temperatures are increasing by 0.2°C every ten years. By 2056, the world will be a degree higher, and Hansen's analysis shows that this is the turning points where things go from bad to irreversibly catastrophic.

If we halt climate change so that future warming occurs at under 0.1°C per decade, things still don't look rosy. Sea levels will still rise by about a metre every century, spelling problems for the world's substantial coastal populations, such as Bangladesh and many island nations.

But these problems are completely dwarfed by the terrifying potential of what could happen if we let greenhouse gas emissions continue unabated.



What happens if we do nothing

In this worst-case scenario, CO₂ emissions continue to grow at 2% a year and other greenhouse gases such as methane and nitrogen oxide continue to rise.

As a result, Earth becomes 2-3 degrees hotter by the turn of the next century, reaching a level not seen for 3 million years.

Much of the polar ice caps will melt. As they do, less sunlight will be reflected, ice streams will flow faster, and the structural integrity of ice shelves will collapse, accelerating the process in what scientists call 'positive feedback loops'.

The influx of meltwater will raise sea levels by several metres each century, driving coastlines 25-35 metres higher than they are today, and completely altering the face of the globe.

The world's animals and plants will undergo mass migrations in range, habitats will fragment and the carefully balanced ecosystems of today will be sundered. Extinction will claim some 60% of today's species, and if the planet's history is to be believed, a rise of 5°C could kill 90%.

The message to our generation is clear – global warming is real and is following a path that we can accurately model. For anyone under the age of 40, the point of no return will probably happen within our lifetimes if nothing is done.

In as little as another decade, a lack of action could render the challenge of climate change insurmountable. Everyone from Governments to individuals must do their part and they must do it now.

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