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## World on course for catastrophic 6° rise, reveal scientists

By Steve Connor and Michael McCarthy

*Fast-rising carbon emissions mean that worst-case predictions for climate change are coming true*

The world is now firmly on course for the worst-case scenario in terms of climate change, with average global temperatures rising by up to 6C by the end of the century, leading scientists said yesterday. Such a rise - which would be much higher nearer the poles - would have cataclysmic and irreversible consequences for the Earth, making large parts of the planet uninhabitable and threatening the basis of human civilisation.

We are headed for it, the scientists said, because the carbon dioxide emissions from industry, transport and deforestation which are responsible for warming the atmosphere have increased dramatically since 2002, in a way which no one anticipated, and are now running at treble the annual rate of the 1990s.

This means that the most extreme scenario envisaged in the last report from the UN Intergovernmental Panel on Climate Change, published in 2007, is now the one for which society is set, according to the 31 researchers from seven countries involved in the Global Carbon Project.

Although the 6C rise and its potential disastrous effects have been speculated upon before, this is the first time that scientists have said that society is now on a path to meet it.

Their chilling and remarkable prediction throws into sharp relief the importance of next month's UN climate conference in Copenhagen, where the world community will come together to try to construct a new agreement to bring the warming under control.

For the past month there has been a lowering of expectations about the conference, not least because the US may not be ready to commit itself to cuts in its emissions. But yesterday President Barack Obama and President Hu Jintao of China issued a joint communiqué after a meeting in Beijing, which reignited hopes that a serious deal might be possible after all.

It cannot come too soon, to judge by the results of the Global Carbon Project study, led by Professor Corinne Le Quéré, of the University of East Anglia and the British Antarctic Survey, which found that there has been a 29 per cent increase in global CO2 emissions from fossil fuel between 2000 and 2008, the last year for which figures are available.

On average, the researchers found, there was an annual increase in emissions of just over 3 per cent during the period, compared with an annual increase of 1 per cent between 1990 and 2000. Almost all of the increase this decade occurred after 2000 and resulted from the boom in the Chinese economy. The researchers predict a small decrease this year due to the recession, but further increases from 2010.

In total, CO2 emissions from the burning of fossil fuels have increased by 41 per cent between 1990 and 2008, yet global emissions in 1990 are the reference level set by the Kyoto Protocol, which countries are trying to fall below in terms of their own emissions.

The 6C rise now being anticipated is in stark contrast to the C rise at which all international climate policy, including that of Britain and the EU, hopes to stabilise the warming - two degrees being seen as the threshold of climate change which is dangerous for society and the natural world.

The study by Professor Le Quéré and her team, published in the journal Nature Geoscience, envisages a far higher figure. "We're at the top end of the IPCC scenario," she said.

Professor Le Quéré said that Copenhagen was the last chance of coming to a global agreement that would curb carbon-dioxide emissions on a time-course that would hopefully stabilise temperature rises to within the danger threshold. "The Copenhagen conference next month is in my opinion the last chance to stabilise climate at C above pre-industrial levels in a smooth and organised way," she said.

"If the agreement is too weak, or the commitments not respected, it is not 2.5C or 3C we will get: it's 5C or 6C - that is the path we're on. The timescales here are extremely tight for what is needed to stabilise the climate at C," she said.

Meanwhile, the scientists have for the first time detected a failure of the Earth's natural ability to absorb man-made carbon dioxide released into the air.

They found significant evidence that more man-made CO<sub>2</sub> is staying in the atmosphere to exacerbate the greenhouse effect because the natural "carbon sinks" that have absorbed it over previous decades on land and sea are beginning to fail, possibly as a result of rising global temperatures.

The amount of CO<sub>2</sub> that has remained in the atmosphere as a result has increased from about 40 per cent in 1990 to 45 per cent in 2008. This suggests that the sinks are beginning to fail, they said.

Professor Le Quéré emphasised that there are still many uncertainties over carbon sinks, such as the ability of the oceans to absorb dissolved CO<sub>2</sub>, but all the evidence suggests that there is now a cycle of "positive feedbacks", whereby rising carbon dioxide emissions are leading to rising temperatures and a corresponding rise in carbon dioxide in the atmosphere.

"Our understanding at the moment in the computer models we have used - and they are state of the art - suggests that carbon-cycle climate feedback has already kicked in," she said.

"These models, if you project them on into the century, show quite large feedbacks, with climate amplifying global warming by between 5 per cent and 30 per cent. There are still large uncertainties, but this is carbon-cycle climate feedback that has already started," she said.

The study also found that, for the first time since the 1960s, the burning of coal has overtaken the burning of oil as the major source of carbon-dioxide emissions produced by fossil fuels.

Much of this coal was burned by China in producing goods sold to the West - the scientists estimate that 45 per cent of Chinese emissions resulted from making products traded overseas.

It is clear that China, having overtaken the US as the world's biggest carbon emitter, must be central to any new climate deal, and so the communiqué from the Chinese and US leaders issued yesterday was widely seized on as a sign that progress may be possible in the Danish capital next month.

Presidents Hu and Obama specifically said an accord should include emission-reduction targets for rich nations, and a declaration of action plans to ease greenhouse-gas emissions in developing countries - key elements in any deal.

### **6C rise: The consequences**

If two degrees is generally accepted as the threshold of dangerous climate change, it is clear that a rise of six degrees in global average temperatures must be very dangerous indeed, writes Michael McCarthy. Just how dangerous was signalled in 2007 by the science writer Mark Lynas, who combed all the available scientific research to construct a picture of a world with temperatures three times higher than the danger limit.

His verdict was that a rise in temperatures of this magnitude "would catapult the planet into an extreme greenhouse state not seen for nearly 100 million years, when dinosaurs grazed on polar rainforests and deserts reached into the heart of Europe".

He said: "It would cause a mass extinction of almost all life and probably reduce humanity to a few struggling groups of embattled survivors clinging to life near the poles."

Very few species could adapt in time to the abruptness of the transition, he suggested. "With the tropics too hot to grow crops, and the sub-tropics too dry, billions of people would find themselves in areas of the planet which are essentially uninhabitable. This would probably even include southern Europe, as the Sahara desert crosses the Mediterranean.

"As the ice-caps melt, hundreds of millions will also be forced to move inland due to rapidly-rising seas. As world food supplies crash, the higher mid-latitude and sub-polar regions would become fiercely-contested refuges.

"The British Isles, indeed, might become one of the most desirable pieces of real estate on the planet. But, with a couple of billion people knocking on our door, things might quickly turn rather ugly."



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