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Worst Case Scenario: Can We Adapt to a World 2 to 4 Degrees Warmer?

Oxford scientists have contributed to a series of research papers about the impacts of global warming to coincide with the opening of the Climate Change Conference in Cancun, Mexico.

One study, led by Niel Bowerman of the Oxford University's Department of Physics, warns that the conference will fail to meet its objectives unless it addresses not just how much the planet warms, but also how fast it warms. Potentially dangerous rates of global warming could outpace the ability of ecosystems and artificial infrastructure to adapt, it argues.

The papers are in a special report 'Four degrees and beyond: the potential for a global temperature increase of four degrees and its implications' published Nov. 29 in *Philosophical Transactions of the Royal Society A*.

Bowerman's study shows that to achieve their aims, negotiators must limit the maximum global emission rate as well as the total amount of carbon emitted through to 2200. He explains: 'Many people think that the reason why emissions need to peak soon is to save the climate of the 22nd century, but our research highlights a more immediate reason. We need to start cutting emissions soon to avoid potentially dangerous rates of warming within our lifetimes, and to avoid committing ourselves to potentially unfeasible rates of emission reduction in a couple of decade's time.'

'Peak warming is determined by the total amount of carbon dioxide we release into the atmosphere, not the rate we release it in any given year,' said Dr Myles Allen of Oxford University's Department of Physics and a co-author of the study.

At the Cancun conference, politicians will be discussing emission targets for 2020 and 2050 with the aim of limiting global warming to not more than two degrees Celsius. The new study found that setting targets for the peak rate of emission and total cumulative emissions to 2200 would be a much better way of framing an evidence-based policy for carbon dioxide emissions.

In an introduction to the special report, lead author Dr Mark New from the School of Geography and the Environment at Oxford University wrote: 'The 2009 Copenhagen Accord recognized the scientific view "that the increase in global temperatures should be below two degrees Celsius" despite growing views that this might be too high. At the same time, the continued rise in greenhouse gas emissions in the last decade, and the delays in a comprehensive global emissions reduction agreement, has made achieving this target extremely difficult, arguably impossible, raising the likelihood of global temperature rises of three or four degrees Celsius within this century. Yet there are few studies that assess the potential impacts and consequences of a warming of four degrees Celsius or greater in a systematic manner.'

Another study, led by Dr Fai Fung from the School of Geography and the Environment, has analyzed the extent of water scarcity in some of the world's largest river basins in the next 50 years, if global mean temperatures rise by two or four degrees Celsius.

Even if, global warming is limited to two degrees Celsius, the study suggests water supplies will dwindle in most river basins because of the increased demands for water from the world's growing populations. In a four degree Celsius world, impacts of climate change would become the biggest threat. Projections suggest that in a world that is two degrees warmer, river basins will become drier and some wetter. An increase of four degrees will amplify the changes even more.

The study also points out that the problem of water scarcity in most river basins will be made worse if warming proceeds more rapidly and large climate impacts coincide with a peak in world population.