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Roll back time to safeguard climate, expert warns

A return to pre-industrial levels of carbon dioxide urged as the only way to prevent the worst impacts of global warming

David Adam
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Scientists may have to turn back time and clean the atmosphere of all man-made carbon dioxide to prevent the worst impacts of global warming, one of Europe's most senior climate scientists has warned.

Professor John Schellnhuber, director of the Potsdam Institute for Climate Impact Research in Germany, told the Guardian that only a return to pre-industrial levels of CO_2 would be enough to guarantee a safe future for the planet. He said that current political targets to slow the growth in emissions and stabilise carbon levels were insufficient, and that ways may have to be found to actively remove CO_2 from the air.

Schellnhuber said: "We have to start pondering that it might not be enough to stabilise carbon levels. We should not rule out that it might be necessary to bring them down again."

Carbon levels have fluctuated over the last few hundred thousand years, but have rarely gone much beyond 280 parts per million (ppm), which is commonly referred to as the pre-industrial concentration. Over the last few centuries, human emissions of greenhouse gases have forced that concentration up as high as 387ppm, and it is rising at more than 2ppm each year.

World governments are currently trying to agree a deal that would restrict emissions and stabilise carbon levels at 450ppm, in an effort to limit global temperatures to 2C warmer than pre-industrial times.

Schellnhuber, who has advised the German government and European Commission on climate, said: "It is a compromise between ambition and feasibility. A rise of 2C could avoid some of the big environmental disasters, but it is still only a compromise."

He said even a small increase in temperature could trigger one of several climatic tipping points, such as methane released from melting permafrost, and bring much more severe global warming.

"It is a very sweeping argument, but nobody can say for sure that 330ppm is safe," he said. "Perhaps it will not matter whether we have 270ppm or 320ppm, but operating well outside the [historic] realm of carbon dioxide concentrations is risky as long as we have not fully understood the relevant feedback mechanisms."

He calls the plan to remove man-made emissions "atmospheric restitution" and has discussed it at recent seminars, but not written it up for a scientific journal. "It's such a bold idea and sounds very desperate," he said.

Schellnhuber said the most severe long-term impact could be sea-level rise. Over several centuries or more, a 1C global rise would correspond to a 15-20m rise in sea level. "Since we have built all our coastal zones for the current sea level we should not change [it] by tens of metres."

If CO_2 levels are stabilised over the next decades, he said, then "science fiction" technology could be developed to bring the level down again by 2200. He suggested the large-scale burning of plant material for energy, with the resulting carbon dioxide captured and stored, could reduce CO_2 levels by about 50ppm. Other techniques would be needed as well, he said.

Scientists in the US, led by Klaus Lackner at Columbia University, are developing a device that could scrub carbon dioxide from the air using absorbent plastic strips. Richard Branson has promised $25m (£14m) to the inventor of a machine that could take CO_2 from the air on a large scale.

Schellnhuber's warning comes as climate experts say current emissions trends show the world is unlikely to stabilise carbon dioxide levels below 650ppm, which could see a 4C rise. Alice Bows and Kevin Anderson, of the Tyndall Centre for Climate Change Research at the University of Manchester, say carbon pollution is rising faster than officially admitted. They say emissions would need to peak by 2015 and then decrease by up to 6.5% each year for atmospheric CO_2 levels to stabilise at 450ppm.

Even a goal of 650ppm – way above most government projections – would need world emissions to peak in 2020 and then reduce 3% each year. They say this year's G8 pledge to cut global emissions 50% by 2050, in an effort to limit global warming to 2C, has no scientific basis and could lead to "dangerously misguided" policies.