

Examen blanc

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Earth's climate monsters could be unleashed as temperatures rise

Graham Readfearn , The Guardian, 5 October 2018

This week, hundreds of scientists and government officials from more than 190 countries have been buzzing around a convention centre in the South Korean city of Incheon. They are trying to agree on the first official release of a report – the bit called the Summary for Policymakers – that pulls together all of what’s known about how the world might be affected once global warming gets to 1.5C.

What will happen to coral reefs? How will extreme weather events and droughts change? What about heatwaves? And then, what are the different “pathways” that economies could choose to keep temperatures to 1.5C? On Monday morning, the summary document is expected to be released, and there will be a cascade of headlines around the world. The report, being pulled together by the United Nations Intergovernmental Panel on Climate Change, was one tiny part of the Paris climate change agreement.

As things stand, if you add up all the things that the 190-plus countries have committed to do as part of that Paris deal, global temperatures will probably go well above 3C. We’re already at 1C of warming, so the extra half a degree isn’t far away – many scientists will say it’s already locked in, while others say there are plausible ways to stabilise temperatures at that level.

But in August, one of the world’s leading scientific journals – the Proceedings of the National Academy of Sciences – published a “perspective” article that has become known as the “hothouse earth” paper. There was no new science in the paper and while it was speculative, it did raise fundamental questions about the ability of governments around the world to stop the Earth from spiralling into a “hothouse”.

One of the report’s authors, Professor Will Steffen, of Australian National University and the Stockholm Resilience Centre, talked me through it. The problem lies with “feedbacks” – in the “supplementary information” attached to the paper, Steffen and colleagues actually listed 10 of them. With each, they include estimates of how much extra CO₂ and temperature they could add once you hit about 2C of global warming. For example, the ability of the land and ocean to keep soaking up CO₂ could weaken, giving you an extra 0.25C of warming. Dieback of trees in the Amazon and subarctic could give us another 0.1C. Permafrost, which is already starting to defy its name by not being all that permanent, could release ever more methane and carbon that might add a bit more warming again (0.09C is the estimate there).

The point is that once you add them all up, you get close to 0.5C of warming by the end of the century. Given we’re already at 1C of global warming, that makes the job of keeping warming “well below 2C” or even holding it at 1.5C much, much harder than it already is. And there’s the rub.

While governments have the means to affect how much CO₂ gets released through policies that radically cut the use of fossil fuels, it would be much harder to get a grip on thawing permafrosts, mass forest collapses or the loss of polar sea ice. By failing to get a grip on a thing that's feasibly under your control, we end up risking the release a whole gang of other monsters that we can't.

This gets us to another big issue, says Steffen, because climate models don't include some of these feedbacks. In essence, the warmer things get, the less reliable the models become. He tells me: "I think the dominant linear, deterministic framework for assessing climate change is flawed, especially at higher levels of temperature rise. So, yes, model projections using models that don't include these processes indeed become less useful at higher temperature levels. Or, as my co-author John Schellnhuber says, we are making a big mistake when we think we can "park" the Earth System at any given temperature rise – say 2C – and expect it to stay there." For those who understand the idea of a carbon budget – where scientists have calculated how much CO₂ you could emit before hitting certain temperature rises – it looks even meaner than before if Steffen and his colleagues are right.

But as they also point out, several of these feedbacks might have "tipping points" that then set off a cascade of other issues. Steffen says: "Even at the current level of warming of about 1C above pre-industrial, we may have already crossed a tipping point for one of the feedback processes (Arctic summer sea ice), and we see instabilities in others – permafrost melting, Amazon forest dieback, boreal forest dieback and weakening of land and ocean physiological carbon sinks.

And we emphasise that these processes are not linear and often have built-in feedback processes that generate tipping point behaviour. For example, for melting permafrost, the chemical process that decomposes the peat generates heat itself, which leads to further melting and so on." For the record, Steffen thinks the assumptions in climate models that cuts in fossil fuel emissions will deliver relative cuts in temperatures "is OK for perhaps lower temperature rises of 1.5 or 2C" but beyond that, he's sceptical.

The paper has received a bit of pushback from scientists, largely, it appears, because of the sensational headlines it attracted. For example, Professor Richard Betts, of the UK's MetOffice, has a measured perspective that's well worth a look. Dr Glen Peters, an Australian scientist and climate modeller based at the Centre for International Climate Research in Norway, also thought some of the media coverage went too far with the doomsday vibe.

But he told me that while it was true that many of the feedbacks in the paper were not well covered by climate models, this was partly because they were not that well understood. I'll leave you with his thoughts: "The hothouse earth paper conjectures that many of these feedbacks may interact like a domino effect, lead the Earth system to spiral out of control to reach a new steady state very different from today, and these processes may even start if we are successful at meeting the goals of the Paris Agreement. "There is also an important timescale question, are we talking decades or millennia, and that is very important for how society may respond. While all the claims made in the hothouse earth paper are justified, we simply don't have the data to verify if those claims are true. While the paper put in plenty of language to indicate its exploratory nature ... many headlines and statements went too far, indicating we had already gone too far and there was no turning back."