

Runaway Climate Change

The danger of positive feedback



The world may have woken up to climate change being a reality, but it's still not doing nearly enough to stop it.

Most people, including the world's political leaders, now accept that climate change is happening. Global average temperatures keep rising year on year and decade after decade. Extreme weather events are becoming more frequent and more extreme. The polar ice caps and mountain glaciers are melting faster and faster. The evidence can no longer be ignored or denied.

Almost every new scientific report concludes that global warming is moving faster than previously predicted, but still we do too little too late while hoping that more business as usual will somehow see us through, or that some new technological breakthrough will save us at the last moment. But to have any chance of averting the greatest disaster in human history we have to face up to the true extent of the crisis which confronts us.

Climate Change will continue to accelerate

The world's climate system has a number of positive feedback loops which mean that as things get worse, they will continue to get worse still, quicker and quicker.

1. Ice reflects heat: water absorbs it. As the polar ice caps melt and shrink, it's not just bad news for polar bears. With less ice, more of the sun's heat falls on the sea and is absorbed, causing the water to warm and the ice to melt faster. Temperatures in the Arctic are already rising more than twice as fast as the global average.



2. Warmer seas absorb less CO₂. 30% of all our CO₂ emissions are absorbed by the oceans, but as they warm they can absorb less. So more of our emissions will end up in the atmosphere, adding to the greenhouse effect and causing yet more warming.

3. The Permafrost is thawing. Throughout the Arctic regions of Canada, Siberia and Scandinavia, the permafrost is melting. This land, which has been permanently frozen for thousands of years, contains frozen methane deposits from decayed plants dating back to prehistoric times. As the ground thaws, this methane is being released and other previously frozen plant material is decaying, producing yet more methane. Methane is over 20 times more potent than CO₂ as a greenhouse gas (although less long-lasting). Its release will further accelerate climate change.



4. The Forests are Burning. Instead of absorbing and storing carbon, forests across North and South America, Europe and Australia have been devastated by wildfires due to droughts and heatwaves, emitting masses more CO₂. They will take decades to recover, if they ever do, before they become net carbon stores again. Meanwhile, other forests are still being felled to make way for agriculture or development, and climate change is making other plants less able to store carbon.

5. Even ocean currents may change. As the Antarctic and Greenland icesheets continue to melt, it is possible that enough cold melt water would flow into the oceans to disrupt or permanently change ocean currents like the Gulf Stream, with wholly unpredictable results for the climate.

The existence of these feedback mechanisms makes it vital that we act now

The effects of these positive feedback mechanisms are difficult to predict, either individually or in combination, but any one of them could take us past a tipping point at which, whatever we do, we will be unable to stop climate change continuing to worsen under its own momentum. We cannot afford to sit back and wait for 2030 or 2050 to see what happens.

There is a real danger that we could find ourselves in a "worst case scenario" in which runaway climate change has got beyond our control. A future of widespread climate breakdown would lead to crop failures, famine and social disorder on a massive global scale, with unimaginably horrific consequences.

The 1.5 degree Paris Agreement pledge

In the 2016 Paris Climate Agreement, governments around the world promised to aim to limit global warming to no more than 1.5°C above pre-industrial levels. The global average rise was already 1.09° by 2021, and around the poles it is almost 3°. We are not on course to meet the Paris targets, even without allowing for the uncertainty of positive feedback effects.

What the science tells us

According to the 2021 Intergovernmental Panel on Climate Change (IPCC) report, to meet the Paris target we have to reduce global CO₂ emissions steadily by 45% by 2030, and to net zero by 2050.

Put another way, this means that if total global CO₂ emissions from 2020 to 2050 can be limited to 300 Gigatonnes (Gt) - an average of 10 Gt per year - we will have an 83% chance of meeting the target: if that total reaches 500 Gt, our chances will be only 50-50.

The bad news is that actual global emissions in 2021 were 36.3 Gt, and are still increasing, so we are way over target. At their present rate, emissions since 2020 will hit the 300 Gt figure in mid 2028, reach 500 Gt in 2034, and are heading for a total by 2050 of over 1,000 Gt. If that happens, then climate change will be spiralling completely beyond our control.

But isn't the UK doing well?

Our governments like to claim that the UK is a global leader in combatting climate change, but they are marking their own homework, and it all depends on how you choose to interpret the statistics.

It is true that our Territorial Emissions (those produced within the UK) have fallen since 1990, but that reduction is not as good as it appears.

Firstly, it is largely because we have switched the bulk of our electricity generation from coal, the most polluting fossil fuel, to natural gas. Natural gas is still a fossil fuel, and still produces CO₂ (although not as much as coal), so it is only a short-term fix, not a long-term solution on the path to zero carbon emissions. Our reliance on natural gas has also left us extremely vulnerable to gas price rises, as the Ukraine war has revealed.

The second big reason for the apparent reduction since 1990 is that we now make less and import more of what we consume, so the emissions from the production of those goods are counted as those of the producer countries rather than the UK (and international transport emissions aren't counted at all). When imported goods are included, the UK's annual carbon footprint rises from 6.8 to 11.58 tonnes per head, still excluding shipping. Like our consumer goods, we have a long way to go.