
THE GREAT DISRUPTION HAS BEGUN.

We have entered a period of crisis, chaos, and disruption - to the climate, to the global economy and to our lives. This moment was always coming.

BY PAUL GILDING, FELLOW UNIVERSITY OF CAMBRIDGE INSTITUTE FOR SUSTAINABILITY LEADERSHIP

We're living through a virtual tsunami of terrifying climate news. Extreme fire, flood and heat events are smashing records across the globe. Simultaneously, monitoring of various natural processes that regulate our climate indicates unprecedented system changes are underway.

As a result, I argue here we have hit a multi-system tipping point – the “crash” that I have long argued would trigger “the great disruption”. We can now expect a destabilisation of the global climate system at a scale that is so chaotic, unpredictable and costly, it will trigger cascading disruptive change in the global economy, national politics, investment markets and geopolitical security. The implications are profound.

Spoiler alerts:

- The future is terrifying, but paradoxically exciting because of the pace and scale of positive change that is now inevitable. We have everything we need to fix this, if we choose to.
- It will be a wild ride, on a tight rope between transformation and spiralling chaos.
- There should be no surprise in any of this, it was always the most likely outcome.
- This is not the apocalypse. The human species is here to stay.

Was 2023 The Year It All Changed?

You've all seen the news. The hottest day in [120,000 years](#); 50% of the US living under extreme [heat warnings](#). China hitting a [record high of 52°C](#), just 6 months after its [lowest of minus 53°C](#). Extreme [glacial melt](#) and torrential rains causing massive floods in [Asia](#), [Europe](#), [Africa](#) and the [Americas](#). “Off the chart” record breaking [cyclones](#) and [sea surface temperatures](#) - some as warm as [bath water](#). Unprecedented wildfires in Hawaii with “[urban infernos](#)” ripping through suburban areas. [The list goes on.](#)

As UCLA climate scientist Daniel Swain recently [said](#):

“There is now so much going on that it is difficult even to digest it all. There’s just too much. It’s everything everywhere all at once.”

These extreme events are significant indicators given their global spread, but they are *not* evidence of a climate tipping point. There are many potential reasons they could be ‘just’ extreme weather coming on top of the climate warming trend that is happening [largely as expected](#). El Nino is perhaps the largest, but also changes in aerosols, volcanoes, dust flow and others. This means we could see *less* extremes in the

coming years. Or perhaps not. David Wallace-Wells in the NYT provides [an excellent summary of the complexity](#) in analysing the science on these short term variations.

Of more concern to me than this year's extremes, are signs of *system* changes happening faster and more chaotically than expected. I suspect they are connected – science will tell us later - but it is these *system* changes that are key to my conclusion.

For example:

- Major ocean currents which are responsible for stabilising global temperatures, rain patterns and growing seasons are showing disturbing signs of destabilisation. The Antarctic ocean circulation has slowed [decades ahead of schedule](#) while recent research warns that the AMOC, which was assumed to stay stable until 2100, could now [collapse](#) mid-century - or as early as 2025.
- The [consequences](#) of this could include rapid sea level rise in North America, sudden and severe drops in temperatures across northern [Europe](#), serious disruption to tropical rain patterns and food shortages [throughout India, South America and West Africa impacting billions of people](#).
- Greenland and the Antarctic are losing ice [six times](#) faster than expected, tracking with the IPCCs 'worst case' climate warming scenario. In March 2022, temperatures up to [38.5°C higher](#) than normal were seen in the interior of East Antarctica, shocking scientific experts.
- The Thwaites Glacier (aka "the Doomsday Glacier" with enough ice to raise global sea levels 2 feet) is of particular concern, showing the potential for chaotic, unpredictable change. It's melting *slower* than forecast but retreating *faster* inland, indicating [destabilisation at lower temperatures](#) than expected.
- Sea surface temperatures in some regions have been literally 'off the charts', [not in one region but in most](#). Increased sea temperatures drive droughts and wildfires and damage marine ecosystems, causing coral bleaching - further risking food supply. They also [accelerate ice melt in polar regions](#) worsening the system risks above.
- The Sahara Desert, whose sand and dust has global climate impacts, is [greening](#) as the monsoon rains shift North due to the warmer climate. This greening directly reduces albedo but also lessens the volume of dust delivered to the atmosphere. This dust has a cooling effect on the atmosphere, as well as helping to [break down methane](#) and fertilise the Amazon. It's decline has global impacts.
- The Amazon Rainforest is showing unexpected signs that it's releasing more carbon than it can [drawdown, due to deforestation and water stress](#). It is "[effectively dying more than growing](#)". This has potential to set off [cascading tipping points](#) across the globe as the "[Amazon feeds back to everything](#)".

Whether these system indicators, taken together with this year's extreme events, indicate the type of runaway warming the late Prof Will Steffen called [Hothouse Earth](#) is not yet clear. Science is cautious. It will take years to analyse and draw consensus conclusions.

However, knowing the science community has [long underestimated climate impacts](#), it is my *judgement* that the climate system has crossed a critical threshold. I believe its destabilisation will now trigger cascading and chaotic changes and disruption to human social and economic systems – and do so globally.

As a result, the assumptions we've been making, about steadily worsening climate impacts from a steadily warming climate, no longer apply. Rather than a boiling frog scenario, it's more like we've taken a blow torch to the climate.

Science cannot tell us what happens next. It can produce hypothesis and explain risks but that's all. Nor can we know what will happen economically and socially, with those global human systems being similarly complex and interconnected.

However, we can make *judgements*. Here are mine – based on 20 years of analysing and writing on this question – on what the next decade holds.

Everything, Everywhere, All at Once.

- The climate system will now spiral into new territory. Various physical tipping points are underway and will accelerate. They will interact in unexpected and surprising ways, driving a series of self-reinforcing social, economic, and geopolitical disruptions. It's not just that climate impacts will be worse than expected. They will in turn also drive greater economic impacts than expected.
 - We tend to think of climate's economic impact narrowly, for example the cost of climate disasters, or the loss of value in the fossil fuel industry. This dramatically underestimates the breadth and depth of climate change's economic implications. Increasing costs for infrastructure, disruptions to supply chains, inflationary impacts, higher insurance costs, sovereign debt risks, geopolitical instability, failed states, military conflict and so on.
 - Like nature, the economy is an interconnected and interdependent system without sentiment. When it turns, it ruthlessly eliminates weakness, as I argued it would in my 2020 paper Climate Contagion. Bad news for laggards.
- There will be a global food crisis, or a series of them, starting in the next 0 - 2 years. The food system is where global sustainability risks come together – climate change, water supply, inequality, conflict, soil degradation and biodiversity loss. With the food system already unstable, climate chaos will tip it over the edge.
 - Extreme weather across Asia in 2022/23 has already triggered trade bans on staples, such as rice, wheat and corn, as exporting countries preserve stocks to feed their own people. Without an adequate response, we now risk what The World Food Programme calls a "humanitarian doom loop".
- These food crises will merge with extreme weather and existing geopolitical risks to accelerate conflicts and tensions, with failed states, greater refugee flows and war.
 - Many security experts now see climate as the most "worrying threat to world security". Imagine if the Pakistan floods from 2022 happened in multiple places simultaneously. Ponder India, Pakistan and China facing off over water and food. Or the Taliban going to war with Iran over water. And all this on top of the war in Ukraine. Everything, everywhere, all at once.

- The energy market disruption is already inevitable and still accelerating. It will now be injected with steroids by a combination of policy action, investor recognition and shifting public sentiment all responding to a new sense of urgency. This has huge and global, market, social and geopolitical implications.
 - With energy now a technology, price drops in renewables and storage would have continued anyway but will accelerate further as greater deployment is driven by the urgency of emissions reduction.
 - Market support for the oil and gas industry will collapse, as investors act on long-argued “carbon bubble” risks. The key will be market recognition that demand will rapidly decline in 10 years’ time, damaging the value of reserves and current investments in future supply.
 - Hindsight shows the oil and gas industry’s strategy has long been to delay the transition, behind a smokescreen of pretending to plan a new future. In reality they were never going to change. Recognition of this will reinforce the anger referred to below, which will then also accelerate these financial risks.
 - The global economic and geopolitical impacts of the energy transition are still not fully appreciated. Imagine key countries losing the oil income on which they depend for internal stability, while others gain from massive reductions in their import bills, with that value diverted to in-country investment and consumer spending.

- With the world hungry, drowning and burning – and increasingly angry and fearful - international climate negotiations and governments will face pressure to give up on the steady, consensus based, incremental action that has objectively failed.
 - Activist groups will become dominated by disruptive activism including widespread civil disobedience. The level of anger towards the fossil fuel industry will become more and more intense, with talk of crimes against humanity and ecocide. There will be growing legal and political pressure for fossil fuel companies to be held financially liable for profiting from climate change, while deliberately slowing down action to address it.

- One of the most significant shifts to result from all of this will be to recognise the urgent need to slow the rate of warming – to reduce tipping point risks and buy us time. Cutting CO₂ alone *cannot* deliver this and, as a result, methane will take centre stage as the most substantive short-term action we can take to slow warming.
 - This will be the death of fossil gas’s reputation as a credible energy source, further undermining market assumptions on the oil and gas industry’s future.
 - Rapidly following fossil gas will be agriculture, with meat and dairy becoming a key methane focus of policy makers, investors and activists. Will they see the need to transform? Or will they pursue the same denial and delay strategy as fossil fuels, with the same declining market size and loss of social licence?
 - While livestock will be the first hit, the entire food and agriculture industry faces a profound disruption as I argued in this research paper I co-authored at the University of Cambridge. This will be every bit as significant as the one hitting energy, perhaps even more so given food supply’s outsized social and economic influence. This technology disruption has only just begun but will hit a tipping point and accelerate during the next decade.

Is the Future Terrifying? Or Exciting?

When I wrote [Scream Crash Boom](#) in 2005, the precursor to [The Great Disruption](#) in 2011, it seemed inevitable that the market would seize the opportunities presented by the coming crisis. That is after all what markets do – address opportunities. I asked whether this could ultimately even leave us better off as a civilization?

Some like RethinkX argue this is now clearly on offer, with rapidly emerging and synergistic technologies enabling transformative and positive change across the economy, starting in our [energy](#), [food](#) and [transportation](#) systems. They argue these changes will not just address sustainability but deliver lower costs, fairer distribution, higher quality and more resilience.

They are not alone in seeing the future optimistically. RMI's [Kingsmill Bond and Sam Butler-Sloss](#) argue climate action is “no longer an expensive collective action problem; it is a technology revolution with enormous wealth-generating and redistributive potential”. What they call a shift in attitude from “pain to gain” could prove to be *the* crucial difference between a positive transformation and spiralling chaos.

Whether such a global transformation occurs, and whether it adequately balances the economic decline and chaos of the crisis I describe above, is unknowable. But either way, it will certainly be a wild ride.

So perhaps terrifying *and* exciting? Remember Scott Fitzgerald's argument that: “[The test of a first-rate intelligence](#) is the ability to hold two opposed ideas in the mind at the same time, and still retain the ability to function.”

One thing we do know for sure is this is where we are. That, we cannot now change.

What we can change is what happens next. I still have no doubt that, even in the midst of the coming chaos, we can choose to turn this around. We will certainly cross an ugly threshold, with dreadful consequences, but we can then bring ourselves back.

It will take extraordinary effort, along the lines that Professor Jorgen Randers and I argued in our 2011 paper [The One Degree War Plan](#). But there is absolutely nothing in technology or economics in our way. We *can* slow, then stop the warming and we can probably even reverse it.

We just have to decide our future depends on it. Which it clearly now does.

“The evidence is everywhere: Humanity has unleashed destruction. This must not inspire despair, but action. We can still stop the worst. But to do so we must turn a year of burning heat into a year of burning ambition.” António Guterres, the U.N. secretary general, July 2023