

# ‘I am an optimistic person’: the scientist who studies climate catastrophes



Friederike Otto says the climate crisis is ‘a social issue we will only be able to deal with if we invest in social systems, make our societies more resilient’. Photograph: Sarah Lee/The Guardian

Friederike Otto, a member of the world’s only rapid reaction force of climate scientists, on looking into the apocalypse of extreme weather

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Cycling over London Bridge as the dry heat pushed the temperature above 40C and a hot wind gusted down the River Thames, Friederike Otto paused to look at the monument to the city’s great fire more than 350 years earlier.

“The heat was intense, the humidity was so low and there were these winds. You could almost feel if there was one spark now, London will burn again,” she said.

For Otto, who spends her working life looking into the apocalypse of extreme weather, the homes it destroys, the lives it takes, the children it leaves orphaned, she had found herself inside one of her own studies.

Otto, known as Fredi, and a small team of researchers are the world's only rapid reaction force of climate scientists. They target extreme weather across the world almost as it happens, reach out to local people on the ground, and carry out deep, rigorous statistical analysis, which is transforming our understanding of how human-caused global heating is affecting the planet and our lives.

Until now, scientists have had to be equivocal about whether a single weather event is linked to global heating. Otto's work makes the connection between the string of disasters the world is suffering and global heating, much clearer. Her work was recognised internationally in 2021 when she was named one of Time magazine's 100 most influential people.



A house lays in ruins after Cyclone Batsirai in Mananjary, Madagascar, 10 February 2022. Photograph: Vivienne Rakotoarivony/AP

Otto cuts a striking figure in a striped blazer, leggings and pink sparkly Converse trainers on the campus of Imperial College in London, where she is a senior lecturer at the Grantham Institute for Climate Change and the Environment. A physics graduate, with a PhD in the philosophy of science, she

moved to London with her son just over a year ago from Oxford University, where she had a post-doctoral position in the Environmental Change Institute with Prof Myles Allen.

It was Allen who presented her with a rare gift, which helped unlock her future – an untapped treasure trove of climate data. “He said to me: ‘Look, we have this large ensemble of climate models here, do something with it.’

“So I was handed this huge gathering of data, and what that allows you to do is build statistics about rare and extreme events.”

Otto was armed with the information which would lead her a few years later, with her late colleague Geert Jan van Oldenborgh, to create the world’s first climate attribution unit to examine to what extent human driven climate change is responsible for extreme heatwaves, droughts and floods.

The journey from the creation of the **World Weather Attribution** unit to its current iteration, began with a paper Otto and Oldenborgh wrote on a heatwave in Russia in 2010. It was a classical academic paper, peer reviewed and published long after the event.

But when Heidi Cullen, one time chief scientist at the NGO Climate Central, suggested the work would be more powerful if it could be carried out faster, it was a breakthrough moment. “There was no reason we shouldn’t be able to do it faster,” said Otto. “We had the methodology that in principle doesn’t take a huge amount of time technically to run, so we could do it.”

Otto’s conclusions now come at speed, but are still written within the structure of scientific rigour and the available evidence. A great part of the work is communicating to the wider public and politicians the dangers of extreme weather and the message, most crucially, that it is being created by us.



Floods in Nigeria were made 80 times more likely as a result of climate change, Otto says. Photograph: Temilade Adelaja/Reuters

In 2022, Otto was busier than ever, peering into the dark centre of many disasters: the tropical cyclones in Madagascar, Malawi and Mozambique, the **heatwaves in India and Pakistan**, droughts in west and east Africa, floods in Brazil, floods in KwaZulu-Natal, South Africa, **the last heatwave in the UK**, drought in western Europe, **flooding in Germany**, the floods in Pakistan, and most recently severe flooding in Nigeria, Niger and Chad.

This last study drew her up short by the starkness of its findings. “One of the biggest scientific surprises for me this year was the floods in Nigeria because there was such a huge climate change impact,” said Otto. “They were made 80 times more likely as a result of climate change. That makes me think: ‘Oh wow, there is really a lot that we don’t understand in Africa’.”

It is the vulnerability of a population and a region, Otto says, that is crucial to whether an extreme weather event becomes a human disaster.

“The droughts in west Africa, for example, were not very extreme but the population is so dependent on regular rain, which only very rarely happens, that any change is catastrophic.

“Another example are the floods in Germany in 2022. Because there was no early warning system, people died – because of that vulnerability.”

After the German floods the country installed an early warning system. “It is a source of hope that what really drives how much of an impact each of these events will have is the vulnerability of a population, because it is something where we have agency to change things,” she said.

Otto says she tries to avoid being engulfed by the overwhelming nature of climate crisis impacts.

“I am an optimistic person. It makes me want to do more to make an impact, to get the message across, so that the changes that we need will happen.”

Otto could be likened to Dr Randall Mindy, Leonardo DiCaprio’s character in the film *Don’t Look Up*. Mindy warns that an asteroid will hit the planet in six months, but finds no one wants to hear his message.

But Otto disliked the film’s metaphor. “I felt the analogy was wrong – that there is this big physical threat, which would be fine if only we could invest in technology to fix it.

“Climate change is not like that. It is a social issue we will only be able to deal with if we invest in social systems, make our societies more resilient, less vulnerable and change our economic system from burning fossil fuels.”

In the coming year she would like to see climate attribution used much more widely by forecasters to provide a more comprehensive understanding of the role of climate change.

“My team could then focus on the really complex interplay between the social drivers of things like population vulnerability and the climate system, as well as working much more on finding out where we have levers to really bring change.”