

BY MARLENE WEISS

For a long time, climate change was a phenomenon of the future. While always more and more threatening with each new scientific forecast, its gloom and doom has remained something most of us could manage to ignore – until now. Who could really say for sure whether this particular flood or that extremely hot, dry summer wasn't just a natural event like so many others throughout history?

Today, that phase of comfortable ignorance has definitely come to an end. The last five years were the warmest on the planet since humans began recording temperatures around 1880; since then, the Earth has become roughly one degree Celsius (1.8F) warmer. This trend is unambiguous and extends far beyond anything we could explain by means of normal fluctuations. Climate change is very obviously in full swing.

According to the International Energy Agency, global energy consumption in 2018 increased at nearly twice the average rate of growth since 2010. This has tangible consequences. For example, while tropical cyclones have not increased in frequency, they have become more violent and are marked by greater wind speeds. The amount of rain they bring has also increased, owing to the fact that warmer air can absorb more moisture. In 2017, the devastating Hurricane Harvey brought more rain to the United States than any storm before it. Only two years later, Tropical Cyclone Idai followed in eastern Africa; the World Meteorological Association (WMO) called it one of the deadliest weather-related disasters to hit the southern hemisphere.

We are also seeing an increasing number of incidents having an irreparable impact on nature. For example, in 2016 and 2017, the Great Barrier Reef in Australia suffered from two consecutive years of extremely warm water that



## Mother Nature calls in her loan

Severe storms are on the rise, glaciers are melting, coral reefs are dying and soils are eroding: climate change is more painfully noticeable today than ever before

resulted in so-called mass bleaching. Coral polyps live in a kind of symbiosis there with colorful algae. In their limestone skeleton, these animals provide algae with a place to live and also offer them protection; in return, the algae provide nourishment for their hosts. If the water becomes too warm, however, the algae start to produce toxins and are repelled by the coral. If the heat wave lasts too long, the coral end up starving, and the only thing that remains is their bleached calcareous skeleton.

Usually, the reefs can recover from such episodes. But the research team under Terry Hughes at James Cook University in Queensland recently examined the reef and determined that its recoup capacity has decreased dramatically. The number of coral larvae settling within the reef has plummeted to 11 percent of normal levels, the team reported in *Nature*. Simply too many parents are dead. Plus, the rate of new offspring among the species of coral that have, until now, dominated the unique ecosystem, has declined even more. Other species are taking over.

"We're not saying the Barrier Reef is doomed, but it is on a new trajec-

tory," head author Terry Hughes told *The Guardian*. "The way it's connected, the mix of species, it's all changing." And, presumably, this is a permanent change; indeed, experts say it is likely that there will be another bleaching episode before the reef has an opportunity to find its way back to its original form. In the past few decades, the gap between these marine heat waves has dropped from 25 to under 6 years.

For many scientists, the fact that such drastic events are happening more frequently is hardly surprising. After all, these are the people who have been warning us for decades that we need to keep global warming under 1.5 degrees Celsius (2.7F) in this century, if possible. This is why that number appears in the Paris Climate Agreement: if we exceed 1.5 degrees, then we dramatically increase the likelihood that irreversible and global damages will take place.

Although the 1.5-degree goal is indeed mentioned in the Paris Agreement, it is noted solely as an ideal target to work toward. The nations that have signed the agreement have, in fact, officially committed themselves to only two degrees (3.6F). As long as emissions

continue to rise rather than fall, however, both goals seem equally as unrealistic. Having said that, 1.5 degrees is actually a natural border, and we are seeing at this very moment what happens when we approach that number: The planet starts sending us the bill for damages caused.

Some of the changes can be best seen from outer space. For example, in the case of the Arctic Ocean, satellite images show that minimal expansion in September has been declining at an increasingly faster pace, at the moment by almost 13 percent per decade. The Intergovernmental Panel of Climate Change (IPCC) says it is possible the Arctic will see its first ice-free summer by mid-century. This would mark a major geological break, as the Arctic has presumably been continuously frozen for roughly 2.6 million years.

As far as the concentration of CO<sub>2</sub> is concerned, the earth already has a level that it once had even further back in history. Since the dawn of industrialization, the concentration of carbon dioxide in the air has risen from 280 ppm (parts-per-million) to more than 400 ppm. The last time so much carbon dioxide was in the air was three million years ago, that is, in the Pliocene

era. The climate of that era was significantly different from ours today: It was two to four degrees warmer than the era before the industrial revolution; there were even trees growing in the Antarctic; and the sea level was an unimaginable 15 meters higher than it is today.

The fact that our climate has changed over the millennia is sometimes used to insist that CO<sub>2</sub> levels are only one aspect to consider. But this is a fatal mistake: in fact, the earth is simply very slow. Only the temperature at the surface is increasing relatively rapidly. "If you have 400 ppm CO<sub>2</sub> and you keep it there for long enough, then you start to get additional feedback from the slower-responding components of the system, that amplifies warming," says Alan Haywood from the University of Leeds, an expert in past climates. It takes a while until the ice sheets or the oceans change. But when the time comes, they start raising the temperature further upwards, for example, because ice-free water surfaces reflect less solar radiation. "Actually, there are already indications that these components are starting to react," says Haywood: The Arctic ice cover is shrinking, Greenland is changing, and even the huge cold

eastern Antarctic is losing ice in places.

This means that the earth could actually become a warm Pliocene climate over the long term – even if the Paris target is, in fact, met in the current century. In order to prevent that, we would not only have to reduce emissions to zero, but we would also have to take excess CO<sub>2</sub> out of the atmosphere, for example, by following Bioenergy with Carbon Capture and Storage principles in forestry.

Failing that, we are most likely going to have greater worries than a bit of forest in the Antarctic. Indeed, it is entirely unclear how the planet is going to react if it gets catapulted into another geological age within a few centuries – usually such processes take tens of thousands of years. This is another reason why scientists see the second and even more urgent

upper limit at two degrees: that is the temperature at which climate change becomes pretty much incalculable.

As Johan Rockström, director of the Potsdam Institute for Climate Impact Research and a scholar known worldwide for his work on the planet's natural stability, notes: "Going past 2 degrees global mean temperature means pushing ourselves into the unknown: Over 3 million years, and during all of human civilization, the planet has never been warmer." And Rockström continues to watch exactly how things are developing: "For the past 15 years, change has been somewhat faster than predicted," he says, admitting that the Greenland ice shield and the Thwaites Glacier in western Antarctica are perhaps even more sensitive than expected. In fact, both have already started showing the signs of change now – right now, not in the distant future.

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BY HEIKE HOLDINGHAUSEN

For many Germans, the demonstrations held on Fridays by schoolchildren calling for climate protection have exposed a family scandal of sorts. While everyone knows and quietly accepts that the entire family has long been dumping its waste behind the house, the sudden demands made by their youngest to bring an end to the ignorance and denial seem as cheeky as they are inspiring.

While it's true that there's been a public discussion surrounding the fact that greenhouse gas emissions in Germany have not been decreasing but rather remaining constant for about 10 years now – with some sectors even registering an increase in emissions thanks to the economic boom – the vehemence of this new generation of students now calling for serious climate policy goals has nevertheless taken journalists, political parties, politicians, parents and the business lobby completely by surprise.

The German public's bewilderment regarding the protests was expressed initially with sheer speechlessness. Instead of taking the tangible climate concerns of their own offspring into consideration, the generations of parents and grandparents focused entirely on whether it was even permitted to cut class to protest in favor of climate protection. In the German tabloid *Bild*, Hans-Peter

Meidinger, head of the German Teachers Association, complained that the state was making a fool of itself by not enforcing the children's legal obligation to attend school. Meidinger argued that the demonstrations were far from "education-related" events. Christian Lindner, chairman of the liberal FDP party, took to Twitter to old-man-splain to the young students that climate protection was something they "should leave to the professionals."

Other politicians proved to be more open-minded: Chancellor Angela Merkel (CDU) and Environment Minister Svenja Schulze (SPD), for example, expressed their support and praised the political commitment of the young generation, while in no way responding to their substantive demands. The students did, however, receive momentum from 23,000 scientists worldwide who signed the Scientists for Future petition in favor of their climate concerns.

The young men and women involved in the Fridays for Future movement in Germany are now organized into roughly 310 local groups. And, like their peers in more than 100 countries, they are calling on politicians to commit to responsible climate policies. In Germany, this includes the following: a faster withdrawal from coal energy – by 2030 at the latest, rather the German government's current target of 2035 – and the fulfillment of the Paris climate goal of a maximum of 1.5 degrees



Greta Thunberg with her German counterpart Luisa Neubauer (right) in Berlin

## Power to the pupil!

German youths have taken up the mantle, cutting class on Fridays to demand more effective climate protection

of global warming. In individual cases, the students are also calling for taxes on meat and measures relating to carbon-dioxide reduction, both designed to ensure more sustainability.

In Germany, as elsewhere, 16-year-old Swedish student Greta Thunberg is the face of the protests and a role model for the young protestors. Now nominated for the Nobel Peace Prize, she became known worldwide after a short speech she gave at the World Economic Forum in Davos in 2018

went viral. Still, it would be wise not to overestimate her influence. As Dieter Rucht, a sociologist at the WZB Berlin Social Science Center, determined at one of the largest demonstrations in Berlin on March 15, although Thunberg is at the heart of a growing interest in climate issues among large numbers of German youth and has even prompted many to join in demonstrating, roughly one-third of the demonstrators insisted the Swede had little to no influence on their decision to participate.

Instead, they offered concepts like "future," "climate change" and "climate protection" as the reasons for their participation.

According to Rucht, the Fridays for Future demonstrators differ from previous protest movements in one characteristic above all, namely that roughly 57 percent of participants are female. And a majority of these young women self-define as belonging to the upper middle class, with many of their parents being academics themselves. On the political map, they appear to be located mainly in the left-liberal milieu and among the Greens.

No matter what their gender, these young students are protesting at a time when the issue of climate protection has gained new political relevance. Germany's grand coalition has stated its intent to pass climate protection legislation before the summer holidays. However, the draft presented by Environment Minister Schulze caused outrage among her cabinet colleagues for a number of reasons. For one, the ministers for transport, agriculture and building would be obliged to provide a detailed portrayal of the measures they intend to take in order to save the required amounts of greenhouse gases. In addition, each ministry would also be expected to pay any potential penalties to the European Union out of its own budget.

The EU already requires Germany to emit 38 percent less greenhouse gas by 2030. If Germany doesn't achieve this goal, it will

have to pay penalties. The transport sector – a genuine problem child in Germany's overall climate and environmental policy – could be hit first. Plus, there's the threat of high fines from Brussels. Accordingly, in its draft budget for the coming years, the German federal government has already planned an annual sum of €100 million for the years 2020 to 2022.

While the coalition remains bogged down by day-to-day political minutia, the demonstrating youngsters are undeterred in proving the seriousness of their cause. These angry offspring are not letting up in their demand for change. According to a survey by the WZB's Rucht, the students see their protest as a form of "political self-empowerment." And roughly 60 percent of them are convinced that climate change can be managed by means of tangible and prescient policymaking. One of the organizers, Julia Neubauer, even announced her intention to make the European Parliament elections in May into a "climate election." For a Europe otherwise preoccupied with the rise of right-wing populists, this is hopeful and welcome news.

**Heike Holdinghausen** is a business and environment editor for the Berlin daily *taz*. In March, she published the book *Uns stinkt's! Was jetzt für eine zweite ökologische Wende zu tun ist* (This stinks! What we need for a second ecological transformation).