

# In the Age of Climate Change

by Rolf Tautkus

Every year, the "Gesellschaft für Deutsche Sprache" (Association for the German Language) publishes a linguistic review, selecting the word of the year. After a hot and dry summer in 2018, which many people in Central Europe felt had lasted from April to November, the organisation chose the word "Heisszeit". This German expression means "hot age" and is also a hint to one of the most challenging problems of the present: climate change. However, from a scientific point of view, it is a matter of fact that we still live in an ice age. Paleoclimatologists define it as an epoch of the earth's climate history, in which a permanent ice shield covers at least one of the poles. This definition implies that there have been warmer eras, which rather deserve to be called "Heisszeit" than the present one.

## **Is climate change natural or human-made?**

Worldwide weather data clearly show that global warming is an undeniable fact of the past 150 years. On the other hand, the shift from warm to cold conditions and vice versa has always been a typical characteristic in our planet's climate history. There has never been anything like a constant climate, and there will never be anything like it. Changes in the earth's orbit parameters, periods of high and low solar activity, volcanic eruptions as well as feedback processes within the terrestrial climate system make up the natural engine for these alterations.

With the Industrial Revolution, men started to release considerable amounts of carbon dioxide into the atmosphere, a gas which is one of the so-called greenhouse gases. It absorbs longwave radiation from the earth's surface and sends it back. Up to our days, the concentration of atmospheric carbon dioxide has risen from 280 ppm before the Industrial Revolution to about 409 ppm (data taken from NOAA). Given the physical characteristics, it seems natural to blame carbon dioxide for global warming, which is progressing at a speed that is unprecedented for the past 2000 years. Some recent studies suggest that there is a chance of less than 0.001 % to observe such a global temperature rise without anthropogenic carbon emissions.

Other studies, however, show that the concentration of atmospheric carbon dioxide cannot explain global warming altogether. The temperature started to recover from the cold conditions of the Little Ice Age around 1700 when anthropogenic emissions did not play a significant role. Scientists also found proof for climate changes in the past which took place at a rate comparable to that we see in the present. Finally, meteorologists found a strong correlation between the sun's activity and global temperature changes since the climate pessimum of the 17th century.

As it is often the case, the truth is likely to lie somewhere in the middle. The present climate change seems to be the result of natural and anthropogenic causes and humanity's share hard to determine.

### **The accuracy of climate predictions**

Time is running short. Only ten years remain to gain control of the climate crisis. If humanity wants to avoid global heating to get out of hand, the world needs to reduce carbon dioxide emissions to half of today's amount by 2030. That is what we can read in an article about climate change published in the Frankfurter Rundschau (daily German newspaper) on Jul 26, 2019. And that is what we often see on TV and hear from many climate activists. The scientific background of such statements is the existence of so-called tipping points. This theory describes that the climate system tolerates changes to a certain extent before irreversible processes start to run. We can identify tipping points in the melting of the polar ice caps or thawing of the permafrost.

But can we calculate the exact year when the tipping of a system will occur? The simple answer is: No, we can't. The climate system is not a steam engine in a lab we can control by turning some knobs on a panel. Its complexity makes it respond to changes in a non-linear way. There are many feedback mechanisms which influence and amplify each other. Quite small changes, such as the concentration of atmospheric carbon dioxide, can have a significant impact. It is the reason that science is still far from being able to predict the accurate time of a tipping event.

Scientists get their information about future climate conditions from simulations whose accuracy is limited. The reason for this is that scientists base the simulations on certain assumptions of determining factors which are plausible but not provable. Climate models play an essential role. Here, mathematical equations describe the physics of the climate system and the interactions between its subsystems (hydrosphere, cryosphere, biosphere, and atmosphere). And it is these interactions which are subject of current research. New findings here will undoubtedly change the design of climate models and probably vary the outcomes. On top of that, scientists need to consider non-physical and hard to foresee aspects such as demographic trends, technological progress and political changes when designing a simulation model.

What we get are probabilities of what can happen. That is also true for the effect of initiated measures against climate change. Even if humanity manages to reduce carbon dioxide emissions down to the intended level, the probability of reaching the 1.5 degrees goal is only about 50 %.

## **How our society will change**

Climate policy is always part of a firm environmental policy. It feeds on the knowledge that the earth's resources are limited. Time for acting may be late. Still, panic as Greta Thunberg wishes to spread among people and her glorification by some church officials as the modern Jesus will not get us anywhere. We do not need the Horsemen of the Climate Apocalypse telling us the end of the world to come. What we need is rational mind and action to find solutions to the issue.

Violence is no alternative, either. In September 2019, a group of radical climate activists committed an arson attack against the local railway network. According to their claim of responsibility, it was an action done to provide travellers from reaching the airport and to reduce carbon dioxide emissions. But it was merely an act of damage to public property and a dangerous intervention in railway traffic. Will it stop here or will there be a future where we have to worry about people being injured or killed for the sake of climate protection? Climate activists might justify themselves by pleading self-defence in the view of the impending climate disaster.

Our freedom and the rights we enjoy today are not cast in stone. Each generation will decide again if the values their fathers and mothers have fought for are worth defending or define new targets. But they will have to be content with statements of probability from science and weigh up how radical measures can become to fight climate change. Here, the actual or perceived need to get the transition into a climate-neutral society done will play an essential role.

We can give away our cars and get our weekly shopping home by cargo bicycle on a rainy and cold day. We can go to bed early in the evenings to save heating and electric power. We can spend our next holiday at the nearby quarry pond and drop meat from our menu. But if we all start calculating our carbon dioxide footprint like we count calories today, where will our freedom go?

The current climate policy brought forward by the state intends to scare away people and industries from using gas, oil, and coal by increasing prices. Can it be a promising way? In any case, it is unfair as long as there are no adequate alternatives to using fossil energy. Craftspeople in rural areas depend on their vehicles because they usually have to see several customers a day and need to cover long distances. They will not be able to do it by bus.

The number of people living on this planet has grown too big as to respond by moving to places where we can escape the consequences of climate change. If we want to reduce global warming, the whole world must join in and take substantial action. However, it seems unlikely that the majority of nations is willing to follow the example of green asceticism. Climate policy is subject to social and factual

constraints and will not work without compromises. Neglecting these facts can lead us into green despotism. It is good advice to place our hope in the genius of engineers. Their task will be to invent climate-neutral technologies that meet social and economic requirements and are affordable. Such techniques will help keep our freedom and become a positive example for many.