



# PUSH-BUTTON RAIN

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Precipitation by means of electroshocks? Algae that bind carbon dioxide and serve as the basis for fuels? Scientists are now extensively researching a variety of geoengineering technologies that could be vital for humanity's survival

Since the beginning of the industrial revolution, human beings have been changing global systems such as the climate and the earth's surface more than ever before. For example, we are emitting greenhouse gases and releasing long-lived man-made materials such as aluminum and plastics into the environment. Around the beginning of this millennium, the chemist and Nobel Prize winner Paul Crutzen and the biologist Eugene Stoermer proposed a new geological epoch in which human beings have become the biggest influence on the development of the earth's biological, geological, and climatological conditions. They called it the Anthropocene.

The International Panel on Climate Change (IPCC) also describes the serious consequences of our actions. In August 2021, this panel published a report that evaluated around 14,000 studies and came to the conclusion that humanity has clearly caused global climate change and that we can expect this change to lead to severe climatic, economic, and social upheaval. In order to prevent this from happening, the scientists at the IPCC state that mankind will have to not only substantially reduce emissions but also promote innovation in geoengineering.

## COOLER THANKS TO REFLECTION

Geoengineering refers to technologies that enable people to intervene in the earth's geochemical and biochemical cycles on a

large scale. Crutzen had already realized that such technologies would be necessary. As a result, he suggested in 2006 that sulfur dioxide be distributed throughout the stratosphere. His idea was that this would lead to the formation of sulfate particles large enough to reflect sunlight and thus reduce global warming.

Reflection is also the principle used by a group of researchers at Purdue University in the USA, who presented the world's whitest white last year. The paint that they developed reflects more than 98 percent of the light incident on it. Roofs on which this paint is applied would cool buildings more effectively than power-guzzling air conditioners.

## REACHING FOR THE CLOUDS

Other technologies want to utilize clouds. In the case of cloud seeding, for example, airplanes, cannons or rockets disperse a substance (generally silver iodide or potassium iodide) into clouds. These chemicals serve as condensation or ice kernels for initiating precipitation. In 2008, rain was specifically caused in some areas of China in order to keep the venues of the Summer Olympics dry. In the future, some people even want to use laser beams or electric shocks to cause clouds to rain.

## ATMOSPHERE SWEEPERS

Another important geoengineering concept is carbon capture and utilization (CCU), which aims to eliminate carbon dioxide from the atmosphere. In direct air capture, for example, air is sucked in and the CO<sub>2</sub> is extracted from it. Other initiatives utilize algae. The German startup Carbon Biotech wants to use algae as a biological means of binding carbon dioxide that is then converted into food or fuel. According to the company, one ton of *Spirulina* algae can absorb 1.8 tons of CO<sub>2</sub>.

At Evonik, the Foresight team at Creavis is pursuing geoengineering approaches as part of the focus topic Sustainable Food Futures 2040. These approaches could be used in the production of food. Among other things, the Creavis incubation cluster Defossilation is investigating the possibilities of carbon capture.

Many of these technologies are still in their early stages. Their environmental, energy, and cost efficiency are still unclear, as are the consequences of their large-scale application. However, it's becoming increasingly clear that they will probably become indispensable. And who knows, maybe we will someday have sunshine or snow at the push of a button—and then the weather forecast will also be right all the time. —



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