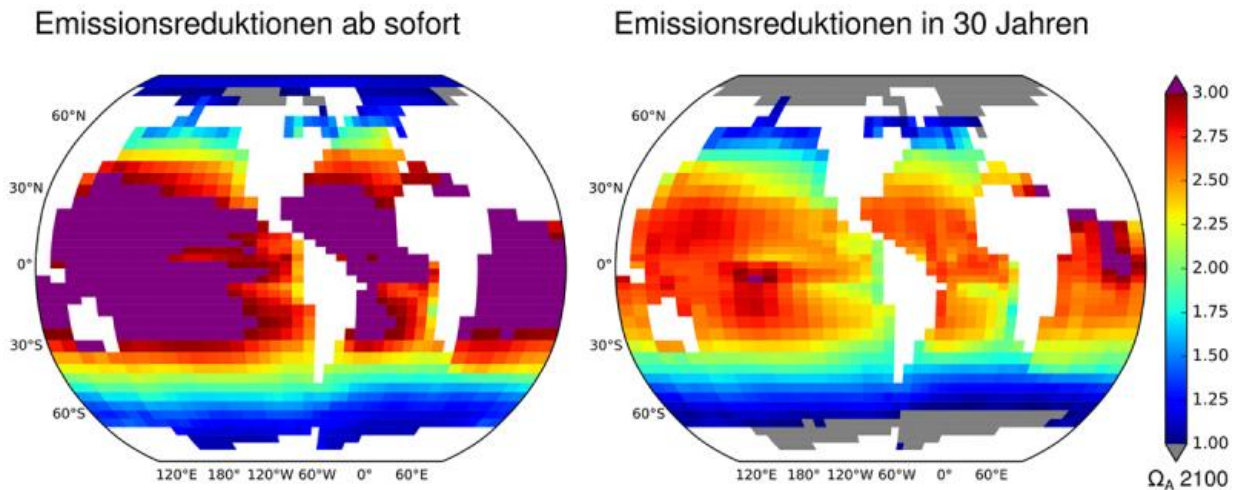


Timely action needed to meet climate targets

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Delaying global CO₂ emission reductions by few years to decades causes a substantial loss of ocean regions providing ideal conditions for coral reef growth (shown in purple). Credit: Patrik Pfister, Oeschger Center, University of Bern

The Paris Agreement of the UN climate change conference is deemed a historic step for climate protection, but its success depends on rapid implementations. The consequences of delaying global CO₂ emission reductions for the climate and the world oceans are assessed in a new study by climate physicists from the University of Bern.

In December 2015, an ambitious agreement has been adopted by the UN [climate change](#) conference COP 21. The "Paris Agreement" contains the objective to limit global warming to "well below 2 °C above pre-

industrial levels". This requires substantial reductions in CO₂ emissions caused by the burning of fossil fuels and deforestation. The net emissions should be reduced to zero in the second half of this century. However, during the last few decades, global CO₂ emissions have been rising by roughly 2 percent per year.

The Paris Agreement leaves a lot of leeway for the contributing countries, when to exactly start the emission reductions - "more than the [climate](#) system allows for meeting ambitious climate targets", says Patrik Pfister from the Oeschger Centre for Climate Change Research of the University of Bern. Together with climate physicist Thomas Stocker from the Oeschger Centre, Pfister has carried out a study quantifying the consequences of delaying global emission reductions. The study has now been published in the open access journal *Environmental Research Letters*.

Peak warming increases rapidly while emission reductions are delayed

The scientists employ their climate model to estimate the peak warming caused by ongoing CO₂ emissions. As long as emissions continue to increase, this future peak warming increases much faster than observed warming, namely 3 to 7.5 times as fast. "Short-term variations in the current warming rate could distract us from the urgency of the problem", says Patrik Pfister, lead author of the study. Due to the inertia of the Climate System and the long atmospheric lifetime of CO₂, "delaying emission reductions by 10 years causes an additional increase in peak warming of 0.3 to 0.7°C", Pfister continues. In 10 years without global reductions, a 2.5°C target will have become about as ambitious as the 2°C target is today. Little time remains to initiate reductions, if the Paris Agreement is to be met.

Existential importance for islands and coastal cities

Following the atmospheric warming, the ocean also warms globally and expands in the process. This thermal expansion is a major contributor to sea level rise, and increases drastically while emission reductions are delayed. "Until emission reductions start, the long-term thermal expansion increases even 7 to 25 times as fast as the now observed thermal expansion", Pfister cites from the study. A decade of delay in global emission reductions increases the long-term [sea level rise](#) by a total of roughly 0.4 to 1.2 meters, depending on the achievable rate of emission reductions. "For islands and coastal cities, the timing and rate of global emission reductions is therefore of existential importance", says Pfister.

Furthermore, ongoing emissions also cause ocean acidification, with substantial impacts on marine ecosystems. For example, the acidification diminishes the extent of of ocean areas that provide ideal chemical conditions for the growth of tropical coral reefs. A near-complete loss of such areas becomes imminent if emission reductions are delayed by few years to decades, again depending on the achievable reduction rate.

"The results of our study underscore the urgency of action", says Thomas Stocker, co-author of the study and past Co-Chair of the Intergovernmental Panel on Climate Change. "With every decade of delaying global [emission reductions](#), we lose roughly 0.5°C of climate target", Stocker remarks. This means that the most ambitious targets already become unachievable within the next few years.

More information: Patrik L Pfister et al. Earth system commitments due to delayed mitigation, *Environmental Research Letters* (2016). [DOI: 10.1088/1748-9326/11/1/014010](https://doi.org/10.1088/1748-9326/11/1/014010)

Provided by University of Bern

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