

# Study finds world economy already committed to income reduction of 19% due to climate change

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Even if CO<sub>2</sub> emissions were to be drastically cut down starting today, the world economy is already committed to an income reduction of 19%

until 2050 due to climate change, a study published in *Nature* finds. These damages are six times larger than the mitigation costs needed to limit global warming to two degrees.

Based on [empirical data](#) from more than 1,600 regions worldwide over the past 40 years, scientists at the Potsdam Institute for Climate Impact Research (PIK) assessed future impacts of changing [climatic conditions](#) on economic growth and their persistence.

"Strong income reductions are projected for the majority of regions, including North America and Europe, with South Asia and Africa being most strongly affected. These are caused by the impact of [climate change](#) on various aspects that are relevant for economic growth such as agricultural yields, labor productivity or infrastructure," says PIK scientist and first author of the study Maximilian Kotz.

Overall, global annual damages are estimated to be at 38 trillion dollars, with a likely range of 19–59 trillion dollars in 2050. These damages mainly result from rising temperatures but also from changes in rainfall and [temperature](#) variability. Accounting for other weather extremes such as storms or wildfires could further raise them.

## **Huge economic costs also for the United States and European Union**

"Our analysis shows that climate change will cause massive economic damages within the next 25 years in almost all countries around the world, also in highly-developed ones such as Germany, France and the United States," says PIK scientist Leonie Wenz who led the study.

"These near-term damages are a result of our past emissions. We will need more adaptation efforts if we want to avoid at least some of them.

And we have to cut down our emissions drastically and immediately—if not, [economic losses](#) will become even bigger in the second half of the century, amounting to up to 60% on global average by 2100. This clearly shows that protecting our climate is much cheaper than not doing so, and that is without even considering non-economic impacts such as loss of life or biodiversity."

To date, global projections of economic damages caused by climate change typically focus on national impacts from average annual temperatures over long-time horizons.

By including the latest empirical findings from climate impacts on [economic growth](#) in more than 1,600 subnational regions worldwide over the past 40 years and by focusing on the next 26 years, the researchers were able to project sub-national damages from temperature and rainfall changes in great detail across time and space all the while reducing the large uncertainties associated with long-term projections.

The scientists combined empirical models with state-of-the-art climate simulations (CMIP-6). Importantly, they also assessed how persistently climate impacts have affected the economy in the past and took this into account as well.

## **Countries least responsible will suffer most**

"Our study highlights the considerable inequity of climate impacts: We find [damages](#) almost everywhere, but countries in the tropics will suffer the most because they are already warmer. Further temperature increases will therefore be most harmful there. The countries least responsible for climate change, are predicted to suffer income loss that is 60% greater than the higher-income countries and 40% greater than higher-emission countries," says Anders Levermann, Head of Research Department Complexity Science at the Potsdam Institute and co-author of the study.

"They are also the ones with the least resources to adapt to its impacts. It is on us to decide: structural change towards a renewable energy system is needed for our security and will save us money. Staying on the path we are currently on, will lead to catastrophic consequences. The temperature of the planet can only be stabilized if we stop burning oil, gas and coal."

**More information:** Leonie Wenz, The economic commitment of climate change, *Nature* (2024). DOI: [10.1038/s41586-024-07219-0](https://doi.org/10.1038/s41586-024-07219-0). [www.nature.com/articles/s41586-024-07219-0](https://www.nature.com/articles/s41586-024-07219-0)

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