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Press release

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An Economic Case for the UN Climate Targets: Early and strong climate action pays off

Climate action is not cheap – but climate damages aren't, either. So what level of climate action is best, economically speaking? This question has puzzled economists for decades, and in particular since the 2018 Nobel Prize in Economics went to William Nordhaus, who found 3.5 degrees of warming by 2100 might be an economically desirable outcome. An international team of scientists led by the Potsdam Institute has now updated the computer simulation model used to come to this conclusion with latest data and insights from both climate science and economics.

They found that limiting global warming to below 2 degrees strikes an economically optimal balance between future climate damages and today's climate mitigation costs. This would require a price of CO_2 of more than 100 US Dollar per ton.

The day the Intergovernmental Panel on Climate Change (IPCC) published its 1.5 degree report, commissioned by the UN, was also the day William Nordhaus was awarded the Nobel Prize in Economics "for integrating climate change into long-run macroeconomic analysis" as embodied in his influential Dynamic Integrated Climate-Economy (DICE) model. The UN Paris Agreement called to limit global warming to well below 2 degrees to contain climate risks. Nordhaus' numbers point to 3.5 degrees as the economically optimal warming by the year 2100. Now a new study published in Nature Climate Change has produced an update to the DICE model that can help to reconcile the camps.

"We essentially unpacked Nordhaus' model, checked it thoroughly, and made some key updates based on most recent findings from the latest climate science and economic analysis," Martin Hänsel, lead author and researcher at the Potsdam Institute for Climate Impact Research (PIK), explains. "We found that results from the updated version are in fact in good agreement with the Paris 2°C limit for global warming." The updates include an updated carbon cycle model, a recalibration of the temperature model, an adjustment of the damage function, and new evidence on the normative assumptions in the model's social discount rate based on a broad range of expert recommendations. This is complemented by revised assumptions regarding non-CO_2 greenhouse gas emissions, negative emission technologies, and constraints on the feasible speed of decarbonisation.

How bad will it be? Key determinant: The damage function

The damage function assesses how heavily future changes in the climate will impact the world economy. Co-author Thomas Sterner, professor at the University of Gothenburg explains, "The standard DICE damage function has a number of methodological shortcomings. Our analysis builds on a recent meta-analysis, in which we address these shortcomings. As a result, we find higher damages than in the standard DICE model. From what we've seen over the last decade alone, assuming high climate-related damages is what unfortunately is realistic."

How much does it count? Key determinant: The discount rate

Beyond damages, the study also opened what is sometimes perceived as the black box of normative assumptions: As often in economics, what looks like a prosaic mathematical function holds a set of normative beliefs. The so called "social discount rate" is one such case. It affects how we value the future wellbeing of our children and grandchildren – a fundamentally moral question. "The climate impact of our emissions extends far into future generations. To appropriately assess these long-term consequences we have to consider different views on how to strike a balance between the interests of current and future generations," explains Moritz Drupp, co-author and professor at the Cluster of Excellence Climate, Climate change and Society (CLICCS) at Hamburg University. For the first time, the study includes a representative range of recommendations from more than 170 experts on the normative assumptions of the social discount rate. "Our updated model shows that the 2 degrees target is economically optimal according to the discount rates suggested by the majority of experts."

The right price for CO_2

The changes made to the model, including setting the social discount rate more in favour of future generations' wellbeing, has further ramifications: It produces a higher price on carbon. The median of all model runs in the updated DICE model yields a CO_2 price of around USD 100 per ton of carbon in 2020. CO_2 prices resulting from the majority of expert views on social discounting are, with few exceptions, higher than what is being implemented in most sectors even in the most ambitious regions of the world. "This is one more piece of evidence for how crucial a policy instrument smart CO_2 pricing is," co-author Ben Groom, professor at Exeter University and Associate at the Grantham Research Institute on Climate Change at the London School of Economics, concludes, "Our study calls for more stringent climate policies to avoid leaving an unfairly high burden of climate impact to our children."

Article: Martin C. Hänsel, Moritz A. Drupp, Daniel J.A. Johansson, Frikk Nesje, Christian Azar, Mark C. Freeman, Ben Groom, Thomas Sterner: "Climate economics support for the UN Climate targets". Nature Climate Change (2020). DOI: [10.1038/s41558-020-0833-x]

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