A new approach to assessing policies in the climate crisis

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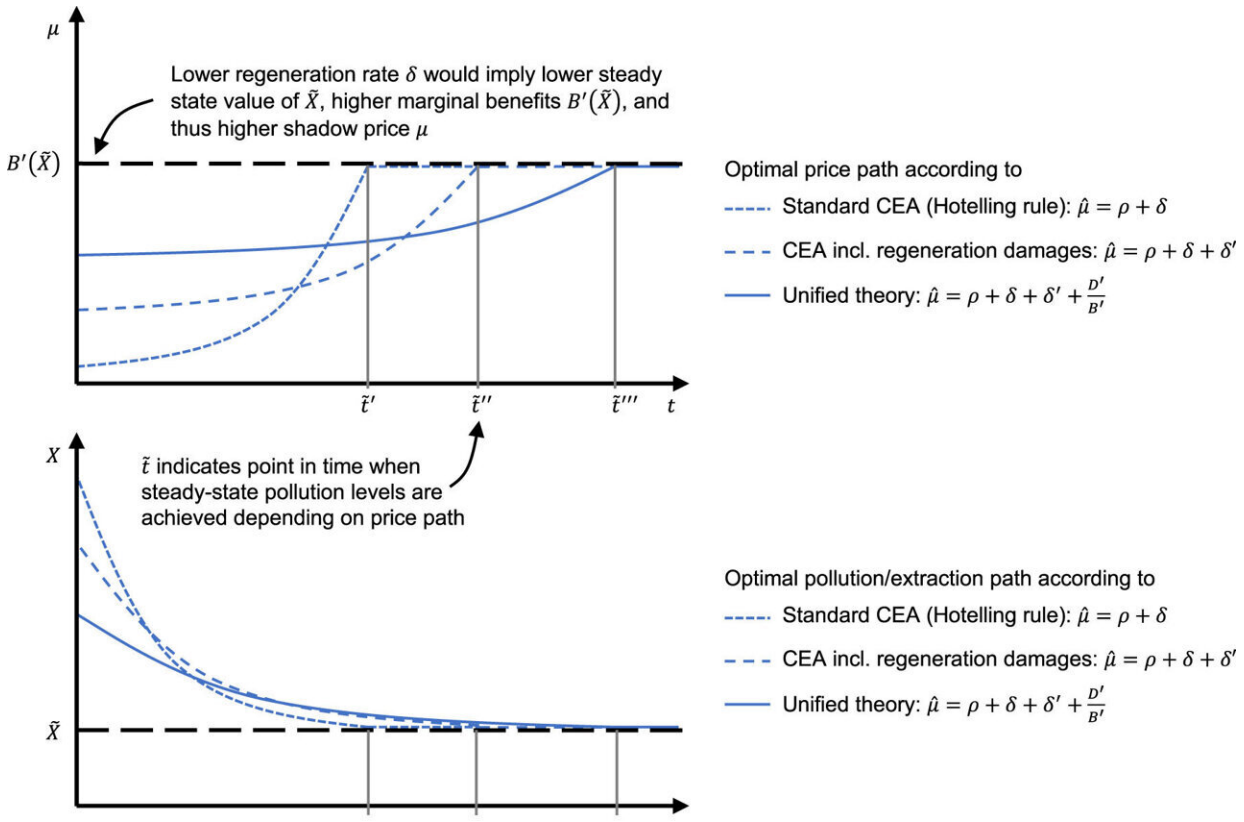

Optimal shadow price μ and pollution flow X over time to stay below the limit Z. Credit: *Jahrbücher für Nationalökonomie und Statistik* (2023). DOI: 10.1515/jbnst-2022-0022

Abruptly melting ice sheets, the collapse of coral reefs and rainforests: nature is complex—and climate policy must consider physical "tipping

points" as well as uncertainties and measurement problems. How can the fight against the greenhouse effect be shaped, given that the world is not as simple as a greenhouse?

A study now provides a new, interdisciplinary approach. It was prepared by the Berlin-based climate research institute MCC (Mercator Research Institute on Global Commons and Climate Change) and the Potsdam Institute for Climate Impact Research (PIK). It is published in the *Journal of Economics and Statistics*.

"The starting point is the cost-benefit analysis used in welfare economics," explains Michael Sureth, Ph.D. student in the MCC working group Economic Growth and Human Development, and lead author of the study.

"This method compares, for example, the economic benefits of using fossil fuels with the costs in terms of climate damages, and thus calculates the optimal time path for the phase-out. However, there is often a lack of data to estimate the damages—especially in the case of disruptive changes in the Earth system. This is also a key issue in the natural science concept of planetary boundaries. We now provide an extended analytical model that bridges this gap."

Co-authors include climate economist Ottmar Edenhofer, Director of MCC and PIK, and Earth system researcher Johann Rockström, who is also PIK Director and developed the concept of planetary boundaries in 2009. The boundaries represent stress limits in nine systems forming the basis of human life, from the climate, to the state of forests and oceans, to biodiversity.

The alternative to the classic cost-benefit analysis presented in this study takes this into account. While it too seeks the welfare-maximizing option, it does so only within the operating space allowed by the

boundaries. Until now, such boundaries were either ignored or regarded as rigid targets to be achieved as cheaply as possible, with economic benefits from avoided environmental damage ignored in the model.

The strength of the new method can be seen in the example of fossil fuels: the implementation of the temperature target is still a precondition, but the model also provides that climate damages which can be well documented empirically are directly priced in by the policy. This means that if climate damages are high or prices for renewable energies are favorable, it may be welfare optimal to stay below the boundary, and a more ambitious climate target bay become reasonable.

"With regard to policy advice and social debate in the climate crisis, our new approach offers three advantages," says MCC Director Edenhofer.

"Firstly, the scope for action is obviously better illuminated. Secondly, climate policy does not appear to be a requirement of natural science, but rather an economic trade-off. And thirdly, it becomes clear that climate damages are an economic factor, and that avoiding climate damages serves welfare just as much as producing goods. All this is necessary to ensure acceptance of the transition to a climate-neutral future."

How the boundaries can be justified, and how they can be integrated into the cost-benefit analysis, is outlined in the study in different variants. They can be an expression of a concrete tipping point in the respective natural system, or they can indicate the lower edge of a "danger zone" according to a general precautionary principle.

And where the state of a natural system cannot be measured exactly, such as the integrity of the biosphere, "proxy variables" serve a useful purpose, such as tree cover, habitat size, or species diversity. The authors translate the planetary boundaries into economic terminology and,

derived from this, unfold a broader research agenda with regard to the dynamics of Earth systems, the economic impacts of human-caused perturbations, and opportunities for policy influence.

"Human-caused perturbations in natural systems carry the risk of catastrophic welfare damages", warns PIK Director Rockström. "Including boundaries in the cost-benefit analysis of policy pathways tends to lead to the recommendation of earlier and stronger countermeasures. The model framework presented in our study could lay the groundwork for economic research to better focus on planetary boundaries, helping ensure that environmental resources are finally governed sustainably as global commons."

More information: Michael Sureth et al, A Welfare Economic Approach to Planetary Boundaries, *Journal of Economics and Statistics* (2023). DOI: 10.1515/jbnst-2022-0022

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