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Paris climate scenarios lack transparency

In their Policy Forum “Can updated climate pledges limit warming well below 2°C?” (5 November 2021, p. 693), Y. Ou and coauthors explain that the updated pledges submitted as part of the Paris Agreement process, although an improvement, will only result in a ~33% chance of staying within 2°C of warming. We agree with Ou *et al.* that more ambition is required, but we think even the low chance of success they estimate is overly optimistic. The mitigation pathways based on Paris Agreement pledges lack transparency and immediacy, making them difficult to evaluate and decreasing the chances of success.

The updated pledges, if executed as written, will result in negligible global emission reductions of 1% by 2030 according to the authors. Substantive reductions are postponed until after 2030 on the assumption that countries will fulfill their softer commitment to “long-term strategies.” In line with earlier studies using integrated assessment models (IAMs) (1), these strategies heavily depend on negative emission technologies. For example, US fossil fuels and industry emissions are expected to fall from 2.7 GtCO₂ to –1.1 GtCO₂ between 2030 and 2050 according to the “Updated pledges-Continued ambition” scenario of Ou *et al.* However, implementing negative emission technologies at such a large scale remains highly speculative and would present serious challenges to other sustainability dimensions (2). Analyses of this nature need to be transparent about the extent that negative emission technologies are used. Only then can we evaluate the inherent risk of this goal not being achieved.

Other uncertainties merit structural attention as well. An energy transition to low-carbon alternatives could result in a lower average energy return, leading to additional energy costs and indirect emissions (3). Moreover, modeled transitions rely on decoupling gross domestic product and energy at a faster rate than historical trends, which underestimates rebound effects caused by energy-efficiency policies (4). And differing levels of pledge ambition could lead to carbon leakage where emissions are transferred to countries with weaker policies (5). The extent to which these neglected uncertainties are captured in current and future IAM studies of the Paris Agreement pathways needs to be transparent and, ideally, quantified.

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