



Methodology:

Carbon budget: The IPCC estimated the remaining carbon budget at the end of 2019 to be 400 Gt CO₂ for a 67% chance of remaining below 1.5°C, and 500 Gt CO₂ for a 50% chance. We updated these figures with the annual carbon budgets from 2020 to 2023.¹ A more recent analysis finds that the remaining carbon budget is ~30 Gt CO₂ smaller than the IPCC estimates used in this policy brief.² This would imply the need for even steeper production cuts. An important caveat is that these figures refer only to carbon dioxide, and not the other greenhouse gasses. Given the current rise in methane emissions and atmospheric concentrations, this certainly results in an overestimation of the remaining carbon budget as of the end of 2023. Allotting shares of the carbon budget to different sectors is a political choice rather than a scientific one. For this calculation, we assume that the share of plastic in global emissions would remain constant at 5.3% even though plastic's contribution to the global economy has been estimated at only 1.1%.³

Overshoot: Plastic production has grown between 3.1% and 4.4% per year since 2010, depending on data sources.⁴ Karali et al. chose a range of 2.5% to 4% growth trajectories. We extrapolated the range of growth trajectories to find when plastics would consume the entire remaining carbon budget. This entails the highly unrealistic assumption that there are no other greenhouse gas emissions during this time; it is done for illustrative purposes alone.

Drawdown: For more realistic scenarios, we calculated the rate of drawdown required, beginning in 2024, if plastic production is to fit within its allotted carbon budget. The results depend primarily on the allotment of the carbon budget and secondarily on the degree of safety desired around achieving the 1.5°C goal as reflected in the IPCC's likelihood estimate of meeting this goal. We also added a business-as-usual (BAU) scenario based on continued growth with no production cuts. Results from highlighted scenarios are below:

¹ Friedlingstein et al., "Global Carbon Budget 2020"; Friedlingstein et al., "Global Carbon Budget 2021"; Friedlingstein et al., "Global Carbon Budget 2022"; Friedlingstein et al., "Global Carbon Budget 2023."

² Lamboll et al., "Assessing the Size and Uncertainty of Remaining Carbon Budgets."

³ Bachmann et al., "Towards Circular Plastics within Planetary Boundaries."

⁴ Geyer, Jambeck, and Law, "Production, Use, and Fate of All Plastics Ever Made"; Desalegn and Tangl, "Banning Vs Taxing, Reviewing the Potential Opportunities and Challenges of Plastic Products"; Shanmugam et al., "Polymer Recycling in Additive Manufacturing."



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Scenario	Chance of achieving 1.5°C goal	Plastic production growth, 2020-2023	Required production cuts beginning 2024
Ambitious	67%	4.4%	17.3%
Slow transition	50%	2.5%	11.8%
Business as usual (BAU)	50%	3.5%	No cut – growing at 3.45%