

Plastic and climate change

Issues and concerns

Plastic has a significant and growing share in the global carbon budget. The global carbon footprint of plastic throughout its full lifecycle was estimated at 1.7 billion tonnes of CO₂ equivalent (CO₂e) in 2015, which would grow to 6.5 billion tonnes of CO₂e (equivalent to annual emissions from nearly 1,640 coal-fired power plants) by 2050, if the production, disposal, and incineration of plastic continue on their present growth trajectories. This also means that, by 2050, emissions from plastic alone will take up over a third of **the remaining carbon budget for a 1.5 °C target**.*

99 percent of plastic manufactured today comes from fossil fuels. Therefore, plastic results in massive emissions at each stage of the lifecycle—from extraction of fossil fuels, refining, plastic manufacturing, transport, and disposal. Often overlooked are emissions from oil and gas drilling, transport, and refining, which come from indirect emissions from electricity and heat, process CO₂ emissions, and emissions of non-CO₂ greenhouse gases.

While the majority of direct and indirect emissions stem from the extraction and manufacturing stage of the plastic lifecycle, burning plastic leads to extremely high greenhouse gas emissions. Waste incineration — whether it is in the form of “energy recovery,” co-firing in cement kilns, waste-derived fuels, or even open burning— is the primary source of greenhouse gas emissions from plastic waste management, even after taking into account energy generation potential.

- Burning plastic emits 2.7 tonnes of CO₂e for every tonne of plastic burned; even when energy recovered in a waste-to-energy incinerator is accounted for, burning one tonne of plastic in an incinerator still results in 1.43 tonnes of CO₂e.
- In Europe, without intervention, plastic incineration will result in an additional 90 megatonnes of CO₂ by 2050, which is equivalent to emissions from over 99 billion pounds of coal burned.
- Based on industry’s outlook, the annual emissions from burning plastic packaging will amount to 309 megatonnes of CO₂e by 2050, which is equivalent to annual emissions from nearly 78 coal-fired power plants).
- ‘Carbon lock-in’ is another threat to communities hosting waste incinerators. Incinerators are typically designed to operate for 20 to 25 years once built, and require a constant flow of plastic waste, a high-calorific feedstock, to be able to stay operational; all of which continuously release embedded carbon in plastic and hinder plastic reduction and recycling targets.

Similar to waste-to-energy incineration, technologies such as pyrolysis and gasification result in similar or higher climate impacts to directly burning fossil fuels. The only difference is that the fossil fuel in this case is in the form of plastic.

While mechanical recycling of plastic offers climate benefits with the potential of replacing virgin plastic production and associated fossil fuel use, recycling is far from a cure-all for the global plastic pollution crisis. Only a fraction of discarded plastic can be captured and effectively recycled, due to the low quality and value of most plastic in the marketplace, and the artificially low cost of virgin plastic out-competing recycled resin. It should be clearly noted that solutions higher up in the material stream offer greater climate benefits, especially reduction in plastic production and mainstreaming reuse systems.

Recommendations

The global plastics treaty must:

- **Clearly recognize climate impacts of plastic over the whole lifecycle**, from the point of extraction throughout waste disposal;
- **Impose legally-binding obligations** to reduce greenhouse gas emissions, document and report climate impacts of plastic in a transparent manner, and provide technical and financial assistance required for international cooperation;
- **Address the global plastic pollution crisis at the source**: waste prevention coupled with reduced plastic production, redesign, and reuse is by far the most effective way to reduce greenhouse gas emissions, and practically the only path forward in order to turn the tide on ever-intensifying climate change.

Pitfalls to avoid

Following approaches significantly undermine the global imperative to tackle climate change:

- Continued expansion of the petrochemical industry: despite grave concerns being raised on the adverse impact of plastic on climate and the environment, petrochemical and plastic industries are planning massive expansions, and the use of oil by the plastics industry is expected to increase at an annual growth rate of **3.5-3.8%**, which is evidently incompatible with the urgent need for climate mitigation.
- Many technologies proposed to address plastic problems, including plastic-to-fuel, burning plastic as fuel in cement kilns, carbon capture and storage (CCS), plastic made from CCS, plastic offset schemes, and "bioplastic" are only several examples of how major plastic producers and fast-moving consumer goods companies seek a way out of the pressure of reducing plastic by relying on unproven or ineffective technologies. These technologies and schemes **fail to actually remove carbon from the atmosphere**, distracting decision makers from real solutions.

* **Carbon budget for a 1.5 °C target**: according to the Sixth Assessment Report (AR6) released by the Intergovernmental Panel on Climate Change (IPCC) in 2021, the remaining carbon budget is about 360 billion tonnes, for a 66% chance of keeping global warming to 1.5 °C.

Further reading

- Center for International Environmental Law. 2021. "Plastic is Carbon: Unwrapping the "Net Zero" Myth." <https://www.ciel.org/reports/plastic-is-carbon-unwrapping-the-net-zero-myth>
- Hamilton, Lisa Anne, Steven Feit, Carroll Muffett, Matt Kelso, Samantha Malone Rubright, Courtney Bernhardt, Eric Schaeffer, Doun Moon, Jeffrey Morris, and Rachel Labbé-Bellas. 2019. "Plastic & Climate: The Hidden Costs Of A Plastic Planet." Center for International Environmental Law. <https://www.ciel.org/reports/plastic-health-the-hidden-costs-of-a-plastic-planet-may-2019>
- Ribeiro-Broomhead, John and Neil Tangri. 2021. "Wasted Opportunities: A review of international commitments for reducing plastic and waste-sector GHG emissions." Global Alliance for Incinerator Alternatives. <https://www.no-burn.org/cop26-ndcs>