Shifting focus to plastic production: Tackling plastics' climate impacts, fossil fuel lock-ins, and global policy gaps

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Abstract: Plastic pollution has long been framed as a waste issue, but its climate impact demands a shift from disposal to production. Beyond greenhouse gas (GHG) emissions, plastics drive fossil fuel lock-ins, making decarbonization alone insufficient. Cutting primary plastic production is essential, yet existing climate instruments have critical gaps in addressing plastic climate impacts. The plastics treaty is equipped to fill this gap, ensuring action by halting new production capacity and driving reductions in existing production levels to achieve global climate goals.

Plastics are a significant driver of the climate crisis. Global primary plastic production will increase exponentially over the next 25 years. If production keeps growing at the rate it is expected today, it could consume up to 31% of the remaining carbon budget needed to limit global warming to 1.5°C and, therefore, to achieve the global climate goals set by the Paris Agreement [1].

In a scenario, it is also crucial to recognize that primary plastic production deeply relies on fossil fuels and reinforces fossil fuel lock-ins [2]. Today, primary plastic production accounts for 12,5% of global oil demand and 8,5% of global gas demand, with 70% of fossil fuels used as raw materials and only 30% as energy sources [1]. As the energy transition progresses, fossil fuel companies have ramped up investments in primary plastic production facilities, redirecting fossil fuels that will no longer be used for energy into plastic manufacturing [6]. The International Energy Agency (IEA) reports that petrochemicals—of which plastics are the primary output—are currently the main driver of oil demand growth. By 2050, they could account for 50% of global oil demand [3].

This underscores the need to assess the climate impacts of plastics beyond the lens of GHG emissions and decarbonization, requiring a shift in perspective toward the defossilization of global economies [4]. However, it is crucial to recognize that defossilizing the plastics lifecycle

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while maintaining current production levels and projected growth could risk exacerbating the climate crisis, environmental degradation and threatening human rights.

ALTERNATIVES TO ADDRESS THE CLIMATE IMPACTS OF PLASTICS: LIMITATIONS OF DECARBONIZATION

Current decarbonization strategies, including transitioning energy grids and replacing fossil-based feedstocks with bio-based alternatives, and as well deploying technologies such as carbon capture and storage, are often presented as key solutions to mitigate the climate impacts of plastics, particularly in its production phase. However, given existing production levels, these measures yield only marginal climate benefits and fail to address the broader environmental and social consequences of continued large-scale plastic production [5].

First, electrifying energy grids in plastic production presents significant technical challenges and offers limited climate benefits, particularly if production levels continue to rise [5]. Industry projections estimate that over 1,400 new plastic production facilities could become operational between 2023 and 2027 [6]. Given the complexity of altering chemical processes post-construction, these new and existing plants will largely remain dependent on fossil fuels, as their designs are not easily adaptable to alternative energy sources [2]. Electrifying key processes in plastic production, such as steam cracking and polymerization, is technically challenging and yields only marginal emissions reductions [1]. Effectively addressing the climate impacts of plastic production requires not only technological shifts but also a concurrent reduction in both supply and demand [5].

Second, replacing fossil-fuel feedstocks with bio-based alternatives offers limited climate benefits [5]. The cultivation and processing of bio-feedstocks can lead to substantial GHG emissions due to land disturbance, potentially making them no less carbon-intensive than fossil-based plastics. Additionally, shifting from fossil-based to bio-based feedstocks in plastics production may drive increased reliance on fossil-fuel-derived fertilizers and pesticides to sustain large-scale cultivation, ultimately undermining the intended benefits of feedstock substitution in achieving a fossil fuel phase-out.

Current modeling exercises indicate that electrification and technological fixes alone will not be sufficient to align plastic production with climate goals [5]. Evidence indicates that the first step toward achieving these goals is halting the construction of new plastic production facilities, which are emissions-intensive and heavily reliant on fossil fuels [2] [5]. Second, models suggest that significant reductions in plastic production levels are necessary. However, existing models have limitations: their

figures lack peer review, they consider only partial climate impacts, and they exclude critical factors such as the effects of microplastics on ocean carbon sequestration [5]. To align with a 1.5°C pathway, two models estimate that global primary plastic production must be reduced to between 140 Mt and 246 Mt by 2050, requiring a 46% to 70% cut from 2019 levels [5]. Additionally, recent analyses suggest that a 40% reduction in primary plastic production by 2040 from 2025 levels will be insufficient to meet the goal of limiting global warming to 1.5°C, indicating that even steeper cuts may be necessary [7].

A GLOBAL POLITICAL TURNING POINT: LEVERAGING THE PLASTICS TREATY NEGOTIATIONS FOR CLIMATE ACTION

The existing international legal framework for climate change, including the United Nations Framework Convention on Climate Change (UNFCC) and the Paris Agreement, is not equipped to comprehensively address the climate impacts of plastics, particularly plastic production. The Paris Agreement focuses on voluntary national emissions reductions, leaving plastics largely unregulated, as the petrochemical sector remains overlooked in most nationally determined contributions. At the same time, it lacks mechanisms to regulate fossil fuels and to reduce plastic production—both necessary steps to mitigate plastics' climate impacts [5]. The plastics treaty negotiations, however, are uniquely positioned to close this gap. By directly controlling plastic production, the future treaty can introduce legally binding measures that prevent plastics from driving further climate instability. Global efforts to limit warming to 1.5°C without such targeted action will remain incomplete.

To achieve that, the plastics treaty must establish a global target to reduce plastic production, implemented through a halt on new plastic production capacity, followed by legally binding national reduction targets that account for climate considerations while also addressing other planetary boundaries (such as land system change, ocean acidification, and novel entities), toxicity and human health, biodiversity loss, human rights, and environmental justice, among others.

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