environmental investigation agency

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BENDING THE CLIMATE CURVE

How Reducing Plastic Production Supports Climate Goals

Summary for Policymakers

BRIEFING

INTRODUCTION

Plastic pollution and climate change are increasingly recognised as interconnected global crises.[1,2]

While plastic pollution is often framed primarily as a waste management or marine environment challenge, plastics also contribute significantly to climate change. Plastics remain overwhelmingly dependent on fossil fuels and generate greenhouse gas (GHG) emissions throughout their lifecycle, from extraction and feedstock production through manufacturing, transport and end-of-life management.[3]

As these emissions accumulate in the atmosphere, they contribute to global heating, ocean acidification and related impacts such as increasingly severe and frequent weather events, causing millions of premature deaths each year.[4]

Climate change threatens ecosystems, imposes trillions of dollars in economic losses and undermines national and global security, with the heaviest burden falling on low-income communities.[5] Reducing emissions from plastics is therefore essential to broader efforts to limit global warming and safeguard communities.

EIA's *Bending the Curve* report highlighted the scale of this challenge. Plastic production has grown faster than any other bulk material during the past decade and remains on a trajectory which could double or even triple by 2050.[6,7,8] As production expands, plastic pollution is an escalating threat to terrestrial, freshwater and marine ecosystems and to human health.[9,10] The sector's climate footprint continues to grow.[11]

The latest science confirms we are living in an overshoot world; a dangerous temperature rise of 1.5°C is unavoidable, but the key question is how quickly we will return to 1.5°C or below. The continued expansion of plastic production is incompatible with international climate commitments.[12]

As countries prepare for future negotiations towards an international legally binding instrument (ILIB) to end plastic pollution under UNEA Resolution 5/14 and continue climate discussions under the UN Framework Convention on Climate Change (UNFCCC), including implementation of commitments relating to the Transition Away from Fossil Fuels (TAFF), there is growing recognition that plastics and climate cannot be addressed in isolation.[13,14,15]

This briefing examines the links between plastic production and climate change and highlights how action on primary plastic production can contribute to both pollution and climate objectives.

THE LINK BETWEEN PLASTICS AND CLIMATE

PLASTICS ARE FOSSIL FUEL PRODUCTS

Plastic production is fundamentally linked to fossil fuels, which are used as both an energy source for plastic production processes and as raw materials.

Approximately 99 per cent of all plastics are produced from petrochemical feedstocks, which are in turn derived from fossil fuels such as oil and natural gas.[16,17] As global economies move towards renewable energy sources in sectors such as transport and electricity generation, petrochemicals are increasingly viewed as a major source of future growth for the oil and gas industry. Petrochemicals are projected to account for more than one-third of growth in global oil demand by 2030 and nearly half of the growth by 2050.[18]

EIA's Bending the Curve report highlighted that primary plastic production could reach 766 million tonnes by 2040.[19] Expansion of plastic production risks locking in fossil fuel demand at a time when action to phase them out should instead be accelerating.[20,21]

GHG EMISSIONS ACROSS THE PLASTIC LIFECYCLE

GHG emissions occur throughout the plastic lifecycle, from fossil fuel extraction and feedstock production to manufacturing and end-of-life management.

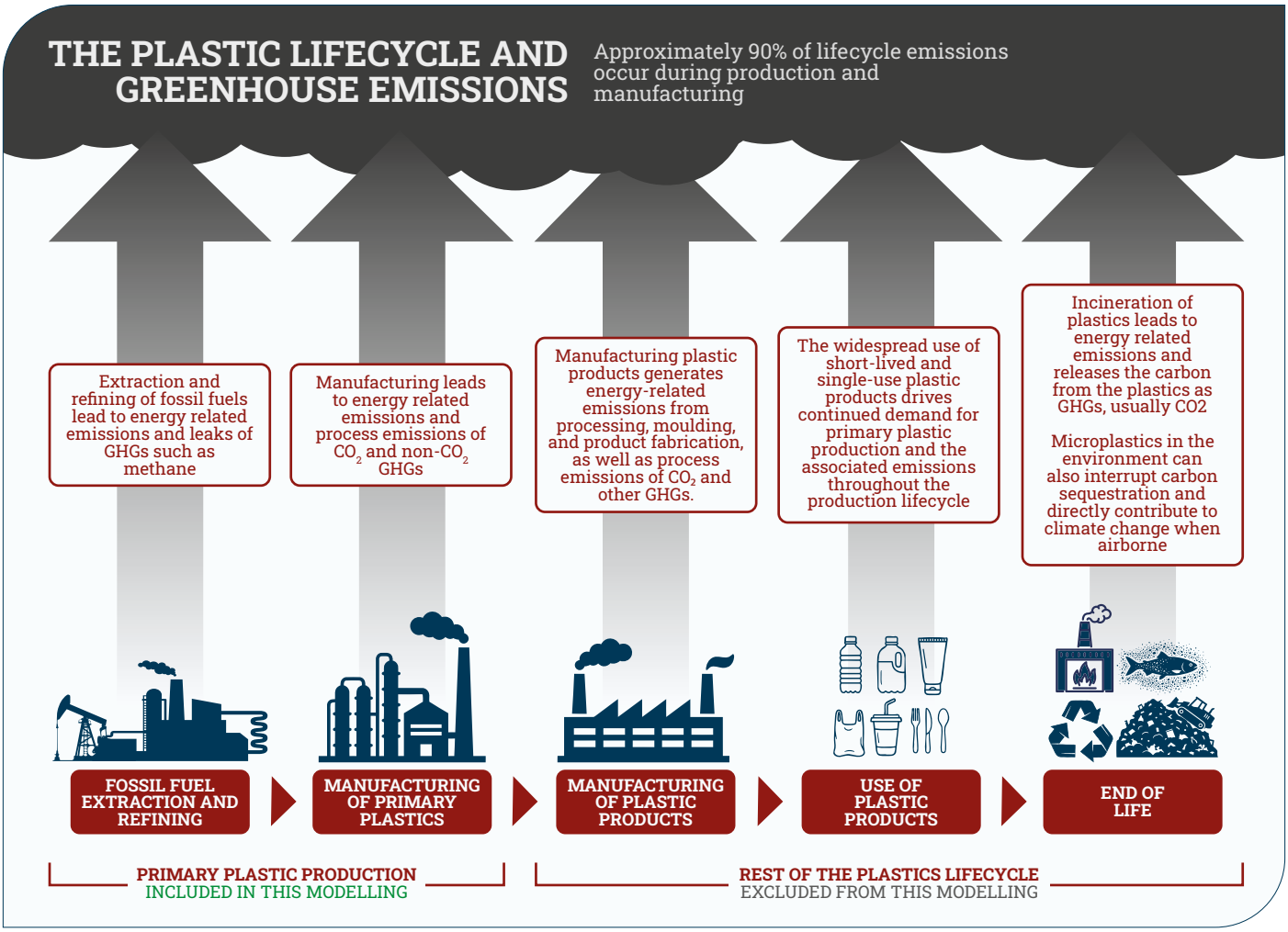
There are energy-related emissions, such as those from the combustion of fossil fuels, and non-energy-related emissions, such as those which occur when GHGs are directly released from production processes or from the breakdown of plastics at end-of-life.[22] (see Figure 1) Throughout the plastics lifecycle, there can be emissions of both carbon dioxide (CO_2) and non-CO_2 super pollutants such as methane or fluorinated greenhouse gases (F-gases).[23,24]

Emissions are heavily concentrated in upstream production stages. Approximately 90 per cent of lifecycle emissions occur during primary plastic production and product manufacturing, with most of these occurring before polymerisation[a] (see Figure 1).[25,26] This reinforces a central conclusion – plastic production drives climate change.

While improvements in collection, recycling and waste management remain important for reducing pollution, downstream action would address only a relatively small proportion of total lifecycle emissions.

EIA analysis has shown that recycling alone cannot offset continued production growth and, from a climate perspective, an over-reliance on climate-intensive recycling technologies could ultimately exacerbate the challenges.[27] Therefore, to address the climate impact of plastics, action must target emissions associated with plastic production and include both measures that reduce the sector's emission intensity and reliance on fossil fuels and reductions in primary plastic production and demand.[28]

Figure 1: *The Plastic Lifecycle and Greenhouse Gas Emissions.*



a. Polymerisation is the stage of plastic production where petrochemical feedstocks or monomers, such as ethylene and propylene, are chemically transformed into polymer, including polyethylene and polypropylene, which are then used to manufacture plastic products.

b (p3). High-ambition countries have proposed measures within the ILBI negotiations to reduce primary plastic production to sustainable levels, including a proposal for a target of 40% reduction by 2040.

EIA MODELLING

For *Bending the Curve* Eunomia Research & Consulting Ltd modelled future plastic production scenarios from 2025-40. The analysis moves beyond simply identifying the climate impacts of plastics and examines how different levels of international cooperation could influence future production, waste and emissions trajectories. It does not consider the additional measures that would be needed to decarbonise remaining production.[29]

The modelled scenarios reflect realistic political configurations which could emerge from negotiations on an ILBI, either through flexibility mechanisms built into the treaty architecture that allow ambitious countries to move forward or through alternative cooperation arrangements.

The scenarios range from business-as-usual, with no new action, to a Coalition of the Willing comprising high-ambition countries (Scenario one),[b] an expanded coalition that includes China as the world's major global producer (Scenario two) and the most ambitious scenario in which China is joined by a group of key middle countries such as Brazil, India and South Africa, whose positions could prove pivotal in determining whether global measures on plastic production are adopted (Scenario three).

The model assumed that from 2030 onwards, primary production in participating countries is restricted relative to 2026 levels and declines linearly to 40 per cent by 2040. Climate impacts are calculated using plastic production and end-of-life management emission factors from Lawrence Berkley National Laboratory (LBNL), the US Environmental Protection Agency (EPA) WARM model and Plastic Recyclers Europe.[30,31,32,33] This briefing summarises the key climate-related findings of the analysis. The full report provides a full description of the modelling framework, assumptions and methodology.

In 2025, emissions from primary plastic production were estimated at approximately 2.3 Gt CO_2e, equivalent to around four per cent of global GHG emissions, placing the sector among the major industrial sources of GHG emissions globally.[34,35] Under a business-as-usual scenario, annual emissions are projected to increase to 3.5 billion tonnes of CO_2-equivalent ($GtCO_2e$) by 2040, a 52 per cent increase. If emissions from end-of-life management are included alongside production, projected annual emissions in 2040 increase to more than 3.8 $GtCO_2e$.[36]

Previous modelling studies have reported comparable results. Modelling by LBNL projects primary plastic production emissions reaching between 4.75-6.78 $GtCO_2e$ by 2050 under current growth trajectories, while Zheng and Suh (2019) project plastics lifecycle emissions increasing to approximately 6.5 Gt CO_2e by 2050.[37,38] Although these models differ in methodology and scenarios, they all point to the same conclusion that plastics are already a significant source of emissions and their contribution continues to grow.

The Paris Agreement sets out a global ambition to limit the global average temperature rise to 2°C above pre-industrial levels by the end of the century and to pursue efforts to stay within 1.5°C with minimal overshoot.[39] To provide a 50 per cent chance of achieving these goals, the estimated remaining global carbon budgets from 2025 onwards are 1,050 Gt CO_2 for 2°C and just 130 Gt CO_2 for 1.5°C.[40]

Against this backdrop and under a business-as-usual scenario, plastic production and disposal are projected to generate approximately 51.1 $GtCO_2e$ between 2025-40. Plastics alone would therefore use up about five per cent of the remaining carbon budget for 2°C and almost 40 per cent of the remaining carbon budget for 1.5°C.[41] Such a large share of the available carbon budget would increase pressure on other sectors, including electricity generation, transport, cement, steel and agriculture to reduce emissions more rapidly.

It would also have important equity implications, further constraining the development and decarbonisation pathways available to many Global South countries.

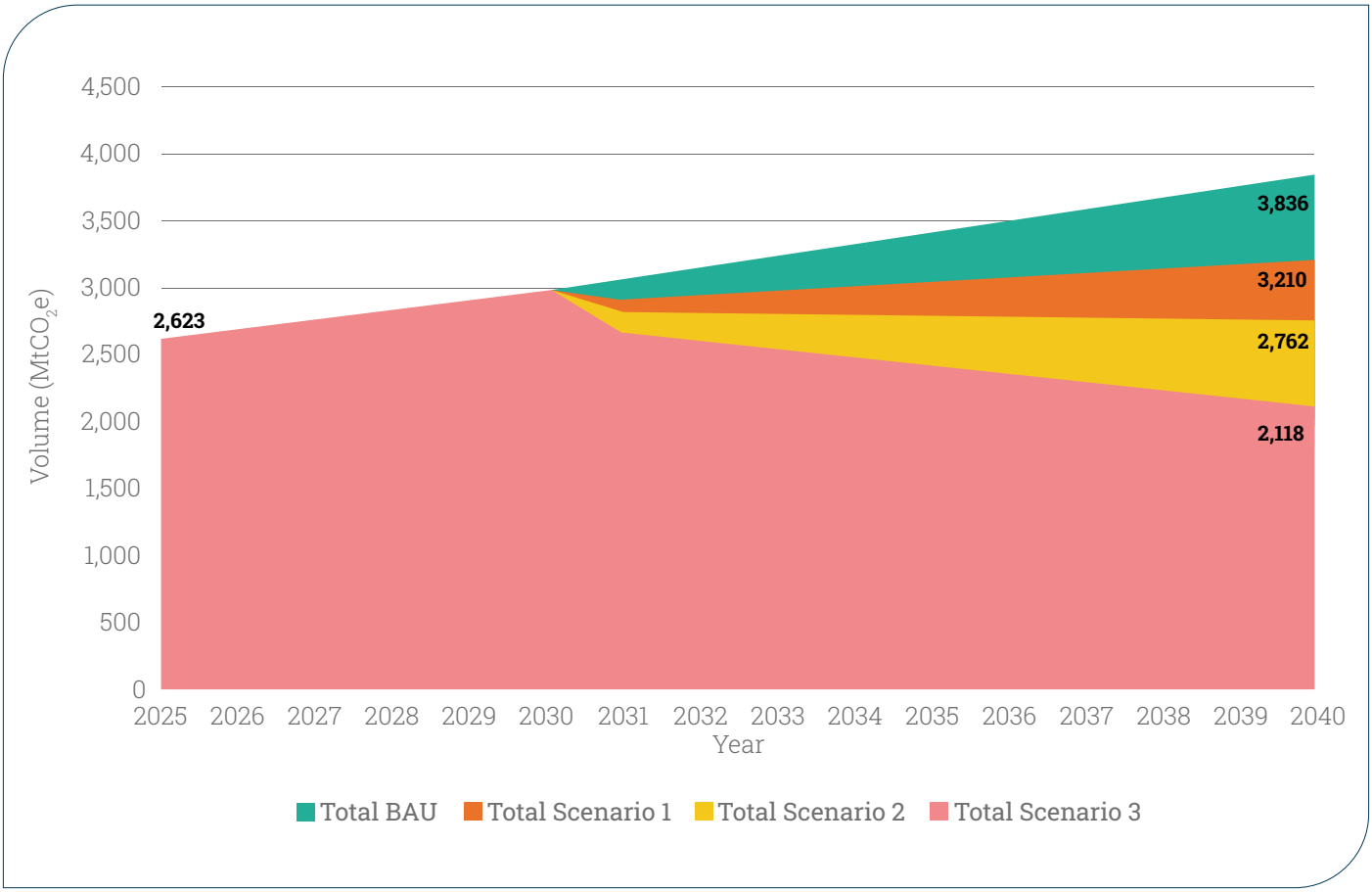
The modelling also demonstrates that reducing primary plastic production delivers substantial climate benefits (see Table 1 and Figure 2). Under the most ambitious scenario – where action is taken by the Coalition of the Willing, plus China and middle countries such as Brazil, India and South Africa – cumulative emissions from 2025-40 are reduced by more than 10 Gt CO_2e (20.5-21.1 per cent) compared to business as usual and there are also reductions in plastic consumption, waste generation and waste mismanagement. Importantly, it preserves almost eight per cent of the world's remaining carbon budget for limiting warming to 1.5°C, increasing the flexibility available to other sectors and countries as they pursue their own emissions reductions.

Taken together with previous EIA analysis,[42] this points to the clear conclusion that addressing primary plastic production is essential to achieving our global climate goals. These findings also demonstrate that ambitious coalitions of countries can help bend the global plastics curve without requiring consensus from all parties. This suggests that flexibility mechanisms and other pathways that enable action to progress should be explored, rather than progress being constrained by a small number of countries opposed to upstream measures.

Table 1: *GHG emissions in 2040 under three policy scenarios compared with a business-as-usual trajectory. Results are presented under both unrestricted and restricted trade assumptions. Restricted trade scenarios assume that measures to reduce primary plastic production are accompanied by trade-related provisions that help limit the displacement of production and consumption between countries, while unrestricted trade scenarios assume trade continues without additional controls.*

MODELS SCENARIO	TRADE SCENARIO	CUMULATIVE TOTAL GHG EMISSIONS 2025-40 ($GtCO_2e$)	REDUCTION COMPARED WITH BAU ($GtCO_2e$)	% REDUCTION
Business-as-usual (BAU)	Unrestricted	51.1	Baseline	Baseline
	Restricted	-	-	-
Scenario 1 (Coalition of the Willing)	Unrestricted	47.3	3.8	7.44%
	Restricted	46	5.1	9.98%
Scenario 2 (Coalition of the Willing, plus China)	Unrestricted	44.6	6.5	12.7%
	Restricted	41.7	9.4	18.4%
Scenario 3 (Coalition of the Willing + China + middle countries such as Brazil, India and South Africa)	Unrestricted	40.6	10.5	20.5%
	Restricted	40.3	10.8	21.1%

Figure 2: *Projected GHG emissions from plastics under business-as-usual and alternative policy scenarios, 2025-40. The findings demonstrate that ambitious action to reduce primary plastic production can help bend the curve on plastics-related emissions, highlighting the climate benefits of upstream measures within the Global Plastics Treaty.*



POLICY IMPLICATIONS

As negotiations towards an ILBI continue, measures on plastic production and consumption have been progressively sidelined despite widespread support and growing evidence linking primary plastic production to both plastic pollution and GHG emissions. Focusing primarily on downstream waste management will not achieve either the proposed treaty objective of ending plastic pollution or broader climate goals.[43,44,45]

While plastics-related emissions are captured within the existing UNFCCC reporting framework, few mechanisms directly address the production and consumption drivers behind those emissions.[46] The ILBI offers an opportunity to complement climate processes by addressing emissions at source and ensuring no governance gaps exist across the plastics lifecycle.

Importantly, the evidence shows that meaningful progress does not depend on universal participation. International law provides multiple legitimate pathways for states to cooperate, even when negotiation processes stall or are diluted.

In current negotiations, there has been limited opportunity to explore flexibility mechanisms that consider a country's capacity and readiness. This approach can prevent a minority from delaying countries willing to act. Moreover, combining flexibility mechanisms with robust financial and technical support can promote equitable participation in achieving collective global goals.[47,48,49]

Beyond pollution and climate benefits, reducing reliance on primary plastic production and consumption can also strengthen resilience, improve resource security and support wider efforts to phase out fossil fuels.

POLICY RECOMMENDATIONS

GOVERNMENTS SEEKING TO ALIGN THE GLOBAL PLASTICS TREATY WITH CLIMATE GOALS SHOULD:

1. Provide clear recognition within the ILBI that primary production is a significant driver of both plastic pollution and GHG emissions

2. Agree on measures to achieve sustainable production and consumption of plastics, including reporting requirements, target-setting processes, national implementation measures and review mechanisms linked to monitoring progress and effectiveness evaluation

3. Ensure treaty implementation contributes to climate objectives, recognising the role of plastic production in driving emissions and consuming an increasing share of the remaining carbon budget

4. Enable ambitious countries to move forward through flexibility mechanisms and coalition approaches, allowing progressive action on production and consumption while creating pathways for broader participation over time

5. Support measures that reduce demand for primary plastic production, including reuse systems, refill models, product redesign and the elimination of unnecessary plastic use.

OUTSIDE OF THE NEGOTIATIONS, GOVERNMENT SHOULD:

1. Align plastic policy with climate policy, recognising plastic production as a significant and growing source of GHG and future fossil fuel demand

2. Prioritise prevention and reduction measures within national plastic strategies and climate plans, in line with the waste hierarchy

3. Deploy complementary policy measures, including public procurement, industrial policy, extended producer responsibility and trade measures that reduce reliance on primary plastic production

4. Invest in systems designed to facilitate reduction, reuse, repair and refill, supported by financial and technical assistance for developing countries and Small Island Developing States.

CONCLUSION

The plastic crisis is increasingly part of the climate crisis. Continued growth in primary plastic production will drive rising GHG emissions, increase fossil fuel demand and place additional pressure on the remaining carbon budget available to limit warming to 1.5°C.

EIA's modelling demonstrates that coordinated upstream action can rapidly alter current trajectories, delivering substantial reductions in plastic production, pollution and climate emissions within the next 15 years. The modelling shows that plurilateral coalitions can bend the global plastics curve without universal participation and supports exploring flexibility mechanisms and alternative pathways to prevent blocking forces from holding ambitious action hostage.

The time to act is now. Managing pollution downstream while allowing plastic production to continue will not deliver the change needed. Achieving both pollution and climate goals requires action on the crisis's upstream drivers, including reducing primary plastic production and consumption.

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