

Opportunities and Impacts of Single-Use Plastic Source Reduction in the Global Plastics Treaty

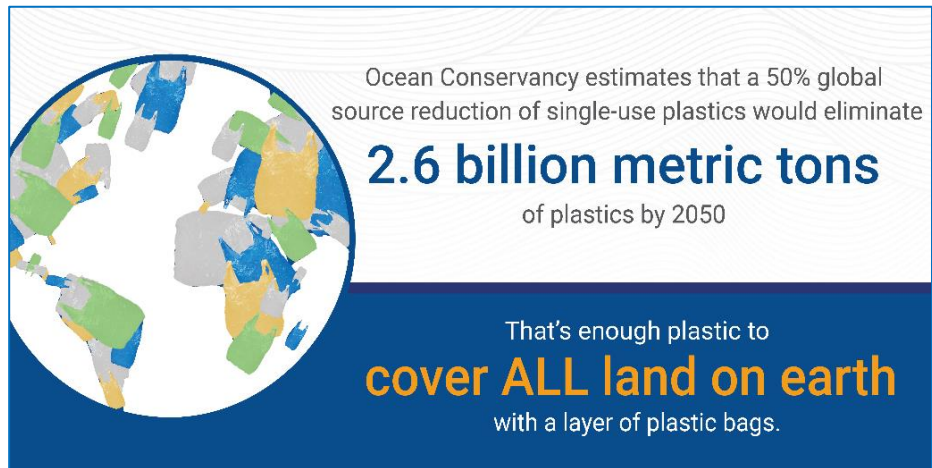


Impacts of a Global Single-Use Source Reduction Mandate

The science is clear: To tackle the crisis of plastic pollution and production we need to start with making and using less plastics in the first place. The simplest and most effective way to achieve this goal is through source reduction mandates – policies that require less plastics over time.

The international legally binding instrument (ILBI), more commonly known as the global plastics treaty, being negotiated globally

represents a unique and unparalleled opportunity to address a global problem through global action. Ocean Conservancy urges negotiators to include a minimum 50% target for source reduction of single-use plastics by 2050 as part of the ILBI, in combination with other measures and policies.



Ocean Conservancy scientists estimate that a 50% reduction of single-use plastics by 2050 would eliminate over 2.6 billion metric tons of plastics and prevent 10.8 to 11.5 billion metric tons of CO₂-equivalent emissions, equivalent to taking every car on earth off the road for 1.6 years.

A Comprehensive Approach to Tackling the Plastic Pollution Crisis

Numerous studies have modeled interventions necessary to achieve a significant reduction in ocean plastic pollution and the sector's associated climate emissions, all reaching the same conclusion: We need a comprehensive approach that starts with making less plastics in addition to improving waste management systems and continuing targeted cleanups. To avoid projected increases in ocean plastic pollution and reduce it back to 2010 levels of 8 million metric tons (MMT), models show that by 2030, we need to reduce plastic consumption and usage by 25-40% depending on country income level (as a proxy for plastic usage).¹ Other studies have found that to achieve a roughly 80% reduction in ocean plastic leakage, a 47% reduction (including direct efforts such as elimination and reuse, and switching to non-plastic materials) by 2040 will be necessary.² Still others have modeled efforts to reduce

What is source reduction?

Source reduction means eliminating waste before it is even created. For plastics, source reduction is any mechanism that results in a net reduction of usage of plastics. For single-use plastics, this requires upstream re-designing to eliminate or reduce plastics. This can include, but is not limited to, shifting from single-use plastics to reusable or refillable materials, eliminating unnecessary plastics, or reducing the amount of plastic used through right-sizing, concentrating, or switching to large or bulk formats.³

¹ Borrelle, S.B., et al. (2020). *Science*.

² Lau, W.W.Y., et al. (2020) *Science*.

the climate impacts from the plastics sector and have found necessary reductions ranging between 24 and 30% by 2050 to achieve net-zero.^{4,5}

Single-use plastics are the ideal target for source reduction policies as they represent the types of plastics that are most easily eliminated, replaced by alternative delivery systems (e.g., reuse and refill), or transitioned to more sustainable material types. Data from Ocean Conservancy's International Coastal Cleanup® show that the most common items polluting beaches and waterways around the globe each year are single-use plastics. Notably, nearly 70% of the most common items – which include plastic bags, straws, food wrappers, and other single-use plastics – are not recyclable.⁶ Single-use plastics represent nearly 40% of annual plastics production globally⁷ and are one of the fastest areas for growth in the sector. This means that a focus on single-use plastics reduction now can have an outsized impact on preventing pollution from across the plastics lifecycle (including litter and emissions) while also cleaning up our recycling streams to enhance the transition to a circular economy.

Fortunately, there is precedent for ambitious source reduction. In 2022, California passed the first legislation in the world to require a significant reduction in single-use plastics. It mandates a 25% reduction in single-use plastic packaging and foodware over 10 years (by 2032).⁸ Ocean Conservancy scientists have estimated that this policy will lead to the elimination of 21 million metric tons of single-use plastics. Beyond establishing an ambitious model of subnational action, California's large market size will drive innovation in upstream redesign and transformative business models (e.g., reuse and refill) that can enable the success of reductions at the global scale. Assuming the ILBI is signed, as intended, by 2025, this would provide more than double the amount of time (25 years) to achieve twice the level of reduction (50%) as required by law in California by 2050.

Climate Benefits of Source Reduction

Plastics are the fastest growing source of oil and gas demand⁹ (99% are made of fossil fuels¹⁰), meaning we cannot address the climate crisis without addressing plastics. Already, the plastics sector is responsible for 3-4% of global greenhouse gas emissions and without bold action, those emissions are expected to triple by 2050.¹¹ Upstream reductions in plastics are the most cost-effective way to reduce the climate impacts from the sector.¹²

Transitioning to a strong, just and clean energy economy for our ocean and coastal communities requires that we stop the growth of virgin plastics production. Source reduction is a key part of stopping the linked threats of climate change and plastic pollution and should be a key component of government's holistic approach to climate action. Actions including source reduction mandates as part of the ILBI will help governments achieve the goals of the Paris Climate Agreement.

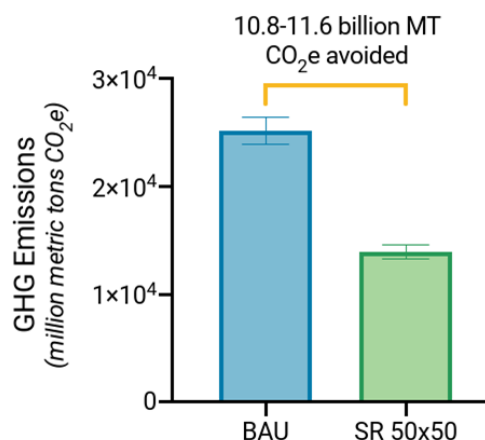


Figure 2. Projected cumulative greenhouse gas emissions (CO₂e) for global SUP (2025-2050), assuming business-as-usual (BAU, blue) and a 50% global source reduction target by 2050 as part of the ILBI (SR 50x50, green).

Incorporating Source Reduction in the ILBI

Countries were invited to submit options for elements to be included as part of the ILBI process, based on a comprehensive approach that addresses the full life cycle of plastics as called for by the United Nations Environment Assembly [resolution 5/14](#). The [options document prepared by UNEP](#) in advance of INC2 laid out the potential core obligations suggested by countries, including several that specifically focus on reducing plastics at the source. While core obligations 1, 2, 3, and 7, all focus on reducing plastics, recommended commitment 1(a)(ii) suggests establishing global targets to reduce production of primary plastic raw material. Other commitments suggested by countries focus on the phase out of problematic plastics,

³ CA [S.B. 54](#) § 42041 (aj)

⁴ Energy Transitions Commission. (2020). [Mission Possible](#).

⁵ CGC & Systemiq. (2022). [Planet Positive Chemicals](#).

⁶ Ocean Conservancy. (2021). [We Clean On](#).

⁷ Geyer, R., et al. (2017). Science.

⁸ Ocean Conservancy (2022). [California Senate Bill 54: A Win for Our Ocean](#).

⁹ International Energy Agency. (2018) [The Future of Petrochemicals](#).

¹⁰ CIEL. (2019). [Plastics & Climate](#).

¹¹ Zheng, J., & Suh, S. (2019). *Nature Climate Change*.

¹² Energy Transitions Commission. (2020). [Mission Possible](#).

plastics that are not recyclable and are highly polluting, which further supports targeting single-use plastics first for source reduction efforts.

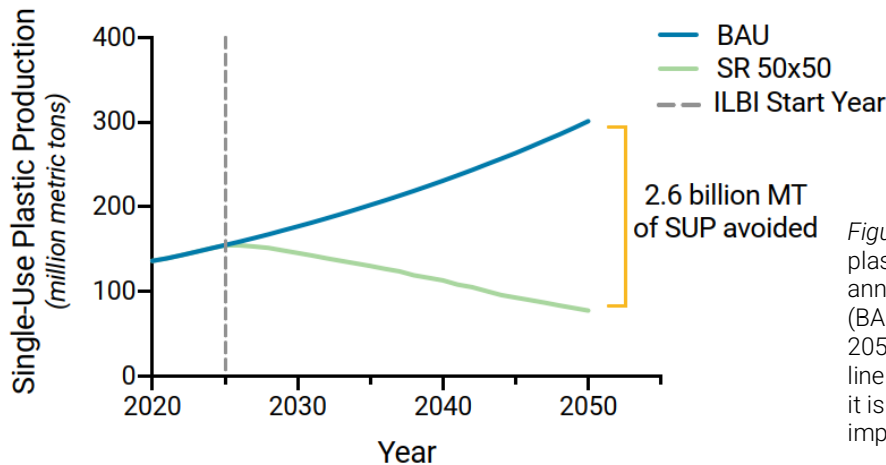


Figure 3. Two paths for the future of single-use plastic (SUP) production. Projected estimates for annual global SUP based on business-as-usual (BAU, blue) and 50% global source reduction by 2050 (SR 50x50, green) scenarios. Grey dashed line shows the starting year of the ILBI, assuming it is completed as intended by 2024 and implemented beginning in 2025.

Analysis and Methods

To quantify the impact of a global source reduction we modeled two scenarios for single-use plastics production between 2025 (the intended signing year of the ILBI) and 2050: one is based on a business-as-usual scenario in which single-use plastics continue to increase, and the other is based on the potential impacts of source reduction at a global scale.

Data Sources

We used data on single-use plastic (SUP) production in 2019 and 2021 from The Plastic Waste Makers Index 2023¹³ (pg. 12). Since source reduction policies are directed at making and using less plastics overall, we combined the production of virgin SUP and SUP made from recycled content for a total global annual SUP production value.

We used the predicted compound annual growth rate (CAGR) of 2.7% for demand estimated in the same report to project 2021 data to 2025 – the intended signing year of the ILBI. For this analysis, we looked at all plastic polymers together.

Greenhouse Gas Emissions Estimates

To determine greenhouse gas emissions (GHG) associated with the two scenarios outlined below, we averaged the cradle-to-crave GHG emissions (metric ton [MT] CO₂e/MT plastic) across all polymer types, using the estimates reported in The Plastic Waste Makers Index 2021.¹³

We determined the proportion of total annual SUP production from recycled content using a CAGR of 12% for plastics made from recycled content from the same report (pg. 40). We then calculated the GHG emissions savings for the proportion of SUP made from recycled content using the GHG emission estimates for recycled resin from a separate report, averaged across polymer types (Table 3-4, open-loop).¹⁷

These GHG emissions analyses do not include uncontrolled methane emissions from feedstock and electricity production. To better capture the full climate impacts of plastics, we added a range of 0.6-0.9 MT CO₂e/MT plastic to the GHG estimates for both plastics made from virgin and recycled content to account for uncontrolled methane based on previous estimates.^{11,18,19}

What are single-use plastics?

Single-use plastics are broadly defined as plastics that are designed to be used once and readily disposed of, either through recycling or other methods.¹⁵ These items include many of the plastics we encounter most in our daily lives: from foodware like plates, bowls, cups, lids, and wrappers to packaging used to contain, protect, handle, deliver, or present products. Single-use packaging includes sales packaging (also known as primary packaging), grouped packaging to sell items in bulk (also known as secondary packaging), and transport packaging (also known as tertiary packaging). Over the last 35+ years, single-use plastics have comprised over half of the debris collected in Ocean Conservancy’s International Coastal Cleanup®.¹⁶

¹³ Minderoo. (2023). [Plastic Waste Makers Index](#).

¹⁴ CA [S.B. 54](#) § 42041 (e)(1)(A)

¹⁵ CA [S.B. 54](#) § 42041 (s)

¹⁶ Ocean Conservancy. (2021). [We Clean Up](#).

¹⁷ APR. (2018). [Life Cycle Impacts for Postconsumer Recycled Resins](#).

GHG emissions are known to vary based on end-of-life treatment (e.g., mechanically recycled, landfilled, incinerated or other waste to energy). Our analysis includes emissions associated with the current end-of-life treatment mix of plastics. While out of scope for this analysis, various studies^{18,19} have modeled increases in GHG emission estimates based on changing end-of-life treatments over time (e.g., changes in landfilling or waste-to-energy), which further highlights the need for source reduction and investments in sustainable, circular end-of-life technologies.

Business-as-Usual Scenario

We projected annual production of single-use plastics globally from 2021 data (139.1 MMT) for each year using the predicted compound annual growth rate (CAGR) of 2.7%. At this rate, we estimate annual production of single-use plastics globally in 2050 would be just over 300 MMT assuming business-as-usual.

- Without bold action, we are on-track to produce **over 5.8 billion metric tons of single-use plastics** globally between 2025 to 2050.
- The emissions associated with the business-as-usual scenario from 2025 to 2050 would be **24.2 to 26 billion metric tons of CO₂-equivalent emissions**, equivalent to driving **every car on earth for 3.8 years**.

Source Reduction Scenario

To model a global 50% source reduction mandate in the ILBI for single-use plastics by 2050, we assumed slow initial changes followed by accelerated reduction in future years enabled by shifting markets and innovation in alternative delivery systems and design (e.g., packaging free, reuse-refill). We projected growth in single-use plastic production from 2021 through 2025, the first-year of the ILBI being in effect assuming it is completed on the intended timeline, following the business-as-usual scenario. We assumed 2025 as the baseline to then reduce single-use plastics by 50% by 2050. We assumed the first year post-ILBI implementation would be flat, followed by slow initial reductions (flat growth than 1% annual reduction), followed by roughly 2% reduction on an annual basis. This achieves key milestones such as a 25% reduction from the 2025 baseline by 2039, 40% by 2045, and the goal of a 50% reduction by 2050.

- A 50% source reduction scenario would prevent the production of **over 2.6 billion metric tons** of plastics.
- That elimination would result in preventing **10.8 to 11.5 billion metric tons of CO₂-equivalent emissions** and **equivalent to taking every car on earth off the road for 1.6 years**.
- This reduction would shrink global single-use plastic production from 300 MMT in the business-as-usual scenario to roughly **77 million metric tons annually in 2050**.

¹⁸ ODI. (2020). [Phasing Out Plastics](#).

¹⁹ Materials Economics. (2018). [The Circular Economy](#).