



An initiative of
Economist Impact and The Nippon Foundation

PEAK PLASTICS: BENDING THE CONSUMPTION CURVE

Evaluating the effectiveness
of policy mechanisms to
reduce plastic use



About the report

Peak plastics is an Economist Impact report for Back to Blue, an initiative of Economist Impact and The Nippon Foundation. This report examines the potential impact of three key policies that cover the entire lifecycle of plastic, from production to disposal. These approaches are being considered by negotiators working on a legally binding UN treaty to reduce plastic pollution.

These three policy levers—a ban on problematic single-use plastic; a “polluter pays” extended producer responsibility scheme for full end-of-life costs; and a tax on virgin plastic production—all fail to prevent a relentless rise in plastic consumption, Economist Impact found. Only a combination of these policies and bolder action, including possible restrictions on virgin plastic production, will bring about peak plastic and see consumption slow in the future.

This report’s analysis is based on a model that examines whether and when each of the policy approaches could bring about a peak of global plastic consumption growth.

The analysis encompasses 19 countries from the G20 and models plastic consumption through 2050. (A detailed description of the model methodology is available to download from the Peak plastics website.)

Peak plastics builds on a canon of work by institutions, scientists and researchers who have raised the profile of the plastic pollution crisis, including work conducted by The Pew Charitable Trusts and SYSTEMIQ—*Breaking the Plastic Wave: A Comprehensive Assessment of Pathways Towards Stopping Ocean Plastic Pollution*—which developed a first-of-its-kind model to produce an evidence-based roadmap to drive convergent action to tackle ocean plastic pollution. Our research also refers to the extensive work of the OECD through its *Global Plastics Outlook: Policy Scenarios to 2060* report.

The model was devised and constructed by Shreyansh Jain, Aayushi Sharma and Divya Sharma Nag. The report was written by Denis McCauley and edited by Gillian Parker and Amanda Simms.

The project has benefitted from counsel provided at various stages by a panel of experts consisting of prominent authorities on plastic production, consumption and pollution. These include the following (listed alphabetically by institution):

- Martyn Tickner, chief advisor circular solutions, **Alliance to End Plastic Waste**
- Valentina Russo, senior engineer, **Council for Scientific and Industrial Research (CSIR)**
- Dominic Charles, director, finance and transparency, **Minderoo Foundation**
- Dan Hoornweg, associate professor and Richard Marceau Chair, **Ontario Tech University**
- Ruben Bibas, economist - modeller, **OECD**
- Aafrin Kidwai, editor-in-chief, **Solid Waste India**
- Joi Danielson, partner, **SYSTEMIQ**
- Sinclair Vincent, director, sustainable development innovation and markets, **Verra**
- Perinaz Bhada-Tata, consultant, **World Bank**

We also conducted a series of in-depth interviews with:

- Stewart Harris, senior director, global plastics policy, **American Chemistry Council**
- David Azoulay, managing attorney, Geneva office, and director of environmental health, **Center for International Environmental Law (CIEL)**
- Yonathan Shiran, partner and plastics lead, **SYSTEMIQ**
- Suneel Pandey, director, Environment & Waste Management Division, **The Energy and Resources Institute (TERI)**
- Winnie Lau, project director, Preventing Ocean Plastics, **The Pew Charitable Trusts**
- Ed Shepherd, senior global sustainability manager – circular economy, **Unilever**
- Steve Fletcher, professor, director, Global Plastics Policy Centre, **University of Portsmouth**
- Kristin Hughes, director, resource circularity pillar, Centre for Nature and Climate, **World Economic Forum**
- Erin Simon, vice president, plastic waste and business, **World Wildlife Fund (WWF)**

We would like to thank the panel and other experts for their time and insights.

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Executive summary

The world will continue to drown in plastic waste unless a bold and comprehensive set of policy changes are agreed by the UN. To bring about peak plastic consumption, these policies would need to be at the most ambitious end of the spectrum being debated by UN treaty negotiators, which include governments, the petrochemical and consumer goods industries, and environmental groups. This is according to research by Back to Blue, an initiative of Economist Impact and the Nippon Foundation, which models the impact of a selection of policies being considered by world leaders as they draft a legally binding treaty to stem plastic pollution.

Combined, the policies slow plastic consumption growth, but will not be enough to bring about a peak in plastic consumption by 2050, illustrating the scale of the challenge that lies ahead. If the negotiators fail to agree on any policy interventions, we project that plastic consumption in the studied G20 countries will nearly double by mid-century.

There is agreement among the 175 countries that have endorsed the negotiations, as well as major business stakeholders, that the treaty should address the entire lifecycle of plastic—its design, production, consumption and disposal—and not just plastic waste in isolation. There is currently less consensus, however, about which policy options offer the best chance of reducing plastic consumption and, ultimately, pollution.

To help all stakeholders understand the radical steps needed to stem plastic use, we forecast the potential impact of three of the policy options being considered and if they could bring about “peak plastic consumption”—or when the consumption curve bends down.

We model the impact of: a phased ban on problematic, unnecessary single-use plastic products (SUPPs); a mandatory extended producer responsibility (EPR) regime imposed on brands and retailers that introduce packaging to the market; and a tax on the production of virgin resin designed to redistribute the cost of negative environmental externalities on to polluters. Our model tests whether any of these, alone or together, can achieve peak plastic consumption before 2050. The analysis is focused on the 19 countries of the G20. (We refer to these as the “G20 countries” further in the report).¹

As with any project based around modelling projections, there is an exhaustive number of potential scenarios to consider. From the outset, it was going to be necessary to narrow the scope of the model to produce results that were rigorous enough to be meaningful. The three scenarios were chosen as a result of speaking to experts close to the negotiations. We chose three policies that cover the entire lifecycle of plastic and have a global scope. Put simply, these are three of the biggest talking points and areas we believe a closer analysis can have the biggest impact.

If the negotiators fail to agree on any policy interventions (in our view an unlikely possibility, but one that must be considered), we project plastic consumption in the G20 countries to grow to 451 million tonnes (mt) by 2050, which is nearly twofold the 2019 figure of 261mt—our baseline forecast. At the very least, the agreed policy interventions should have the possibility of substantially flattening this growth curve.

Our key findings

- Only bold and sweeping reforms will bend the curve.** None of the three modelled interventions will bring about peak plastic consumption by 2050. An integrated approach combining all three makes a dent—growth of 1.25 times the 2019 figure compared with the baseline forecast of 1.73 times—but this still leaves plastic consumption rising at an alarming rate. More stringent conditions than we have considered—for example, a wider scope to a SUPPs ban and higher rates of carbon tax on plastic production—or additional measures will be needed to bend the consumption growth curve downward by mid-century.
- A ban on problematic, unnecessary SUPPs yields the heaviest impact.** A globally agreed ban on SUPPs will do more to curb plastic consumption growth than an EPR mandate or a tax on the petroleum-based inputs that produce plastic. Assuming a ban rate that, for most G20 countries, starts at 1% in 2025 and rises incrementally each year, plastic consumption in 2050 is 1.48 times the 2019 figure. Although by 2050 the ban rates reach as high as 17-19% for some countries, they will need to be considerably more aggressive to stem or reverse consumption growth. This seems possible, as there are categories of unnecessary plastic that remain outside the scope of countries' existing bans.
- EPR will have a minimal effect on consumption but is a vital part of the solution.** EPR policies will require industry players that introduce packaging to the market to cover the cost of collecting and processing it after use. The assumed retail price increase that results from producers passing on the costs of an EPR scheme does little to stem consumption growth in our model. By 2050 consumption grows to 1.66 times the 2019 figure, only slightly less than in the baseline forecast. EPR is nonetheless vital, as it will improve waste collection and increase recycling rates, which will curtail plastic leakage into the environment. A rigorous EPR scheme may also encourage brands to find alternative packaging solutions, such as refills and concentrate products.
- A carbon tax on virgin plastic must be aggressive to be impactful.** An environmental tax would raise the cost on the principal input—virgin resin—helping to redress the existing anomaly of plastic prices, which do not fully reflect its true cost to society. It may also drive the use of recycled plastic as a raw material. However, our modelling suggests that the impact of such a tax on consumption growth will be limited. In a plastic tax scenario, consumption in 2050 is 1.57 times the 2019 figure, not much lower than the 1.73-times growth in our baseline forecast. To have a bigger impact, tax rates in each country would need to be higher than existing



45%

of all plastic is
used in packaging

benchmarks. A tax would perhaps need to be implemented alongside aggressive targets for recycled content in polymer production, with a cap on virgin-plastic production to curtail consumption.

Adding to the complexity of the treaty negotiators' challenge in considering these and other measures are two important considerations. First, bans, taxes and price increases will need to treat unnecessary plastics differently from those that are useful to society, such as for medical applications. Second, care will also need to be taken to guard against an undue burden from such interventions falling on consumers in low-income countries, particularly in the absence of affordable alternatives to plastic packaging.

Introduction

In March 2022 the UN Environment Assembly resolved to draft a legally binding agreement to tackle plastic pollution, a decision endorsed by 175 countries. The negotiators started their work in Punta del Este, Uruguay in November 2022, with a mandate to forge the agreement by the end of 2024. The agreement they produce is not only to address plastic pollution in the oceans but also the full lifecycle of plastics from production to disposal.

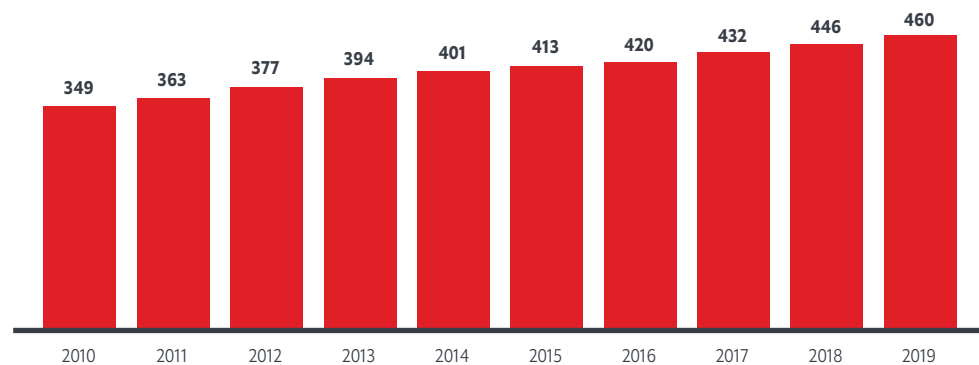
“I’m more hopeful than I’ve ever been,” says Erin Simon, vice president of plastic waste and business at the World Wildlife Fund (WWF), speaking about the treaty negotiations. “We have the tools in our toolbox to stop the flow of plastic.” Yonathan Shiran, partner and plastics lead at SYSTEMIQ, an advisory firm, harbours similar optimism. “The fact alone that negotiations are taking place and 175 countries have signed on to them is cause for optimism,” he says.

The negotiators will need all the optimism and enthusiasm they can muster, because the scale of the world’s plastic scourge is enormous and growing.

According to the OECD, annual global plastic production almost doubled between 2000 and 2019, rising from 234mt to 460mt. Global plastic waste more than doubled over that time period, says the OECD, reaching 353mt in 2019.²

Other data the OECD have published are similarly discouraging: just 9% of that plastic waste was recycled, the majority going to landfills, incineration, uncontrolled dumpsites or leaking into the environment. By 2019 109mt of plastic waste had accumulated in the world’s rivers and 30mt in its oceans.³

Figure 1: Uninterrupted plastic growth
Global plastics use, 2010-19 (mt)



Source: OECD, Global Plastics Outlook

Farewell, the piecemeal approach

To date, efforts to combat plastic pollution have suffered from three major weaknesses:

- **National focus:** with the notable exception of the EU, attempts to regulate parts of the plastic lifecycle have been left mainly to national or subnational authorities. There are worthy initiatives to mobilise legislative and multi-stakeholder action to reduce plastic flows within countries, including the Global Plastic Action Partnership established under the auspices of the World Economic Forum (WEF).⁴

Country-level initiatives are too fragmented, however, to generate a significant global impact. “All of the evidence demonstrates that isolated policies don't have the reach to influence the global plastics economy,” according to Steve Fletcher, professor and director of the Global Plastics Policy Centre at the University of Portsmouth. “Instead, the plastics value chain will shift and sidestep the places that implement those policies. And unfortunately that tends to disadvantage the places least able to cope with plastic pollution.”

- **Reliance on voluntarism:** many governments at the national, regional and municipal level have put rules in place on the sale or use of plastics that organisations or individuals must comply with. But many potentially impactful programmes are non-mandatory. A case in point: some country-level EPR schemes, in which major industrial consumers of plastic

packaging—notably, fast-moving consumer goods (FMCG) companies, brands and retailers—are often involved but smaller, local players in the plastics value chain are absent.

- **Limited scope:** it was once thought that recycling was the answer to plastic pollution. But as OECD recycling data confirm, current efforts are not making a big enough impact to dent plastic pollution, much less to support plastic circularity. Similarly, existing bans on SUPPs imposed by many governments have only scratched the surface. Our research shows that recycling and bans are part of the solution to reducing plastic pollution but alone will have a limited effect.

“We cannot just look at implementing recycling schemes and investing in downstream technologies,” says Kristin Hughes, director of the resource circularity pillar at the WEF’s Centre for Nature and Climate. According to Ed Shepherd, senior global sustainability manager – circular economy at consumer products company Unilever, “there needs to be a comprehensive plan that addresses the full lifecycle of plastic, extending from upstream production through to end use and disposal.”

Recognising these realities, the signatories to the UN Environment Assembly resolution have called on the negotiators to draft an agreement that is global in scope, legally binding (mandatory) on all parties and follows a lifecycle approach. At the same time, the agreement should enable a combination of policies that differ based on each country’s specific needs.

The negotiators will be considering a range of possible measures to incorporate in the treaty. These include:

- bans or restrictions on, for example, SUPPs, or on chemicals or additives used in plastic products;
- behavioural interventions such as public awareness campaigns or voluntary certification schemes;
- EPR schemes that would shift product lifecycle costs to producers through take-back mandates;
- standards on, for example, recycled content or the design of plastic products;
- labelling requirements on the plastic content of products;
- subsidies to, for example, help defray the cost of plastic recycling or building recycling infrastructure;
- taxes, tariffs and fees on, for example, the production of virgin polymer, the production and/or sale of plastic products, or use of landfill for plastic waste; and
- incentives for innovation, to support the development of new design techniques, technologies, processes or materials.⁵

Descending from the peak

The measures that are ultimately agreed by the negotiating parties should aim to bend the plastic consumption curve, which will help to reduce plastic pollution. We describe this as reaching “peak plastic consumption”—the point and volume at which global plastic consumption stops growing and begins to recede.

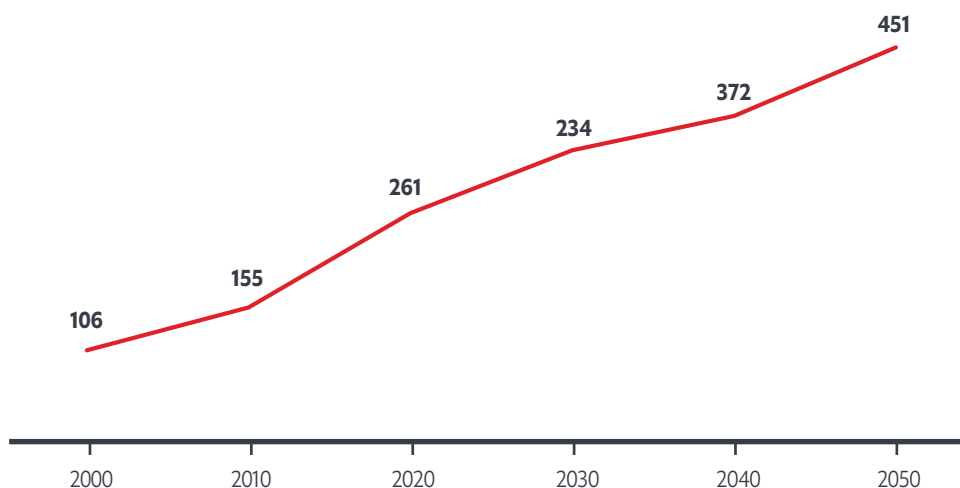
Based on our discussions with a range of experts in this field, we believe that three policy approaches have greater potential than others to bring about peak consumption in the foreseeable future. Furthermore, these policies are already in motion, albeit at different degrees of implementation. These are a ban on SUPPs, mandatory EPR and a tax on virgin plastic resin manufactured from petrochemical feedstock, such as crude oil or natural gas. To help inform the negotiating process, we built a model that tests whether these approaches, applied in isolation or together, can achieve peak consumption before 2050. We focus on consumption in the belief that a decline in plastic use will lead to less waste being generated, thereby reducing pollution.

Our projections under each of the policy scenarios use different levers to model the impact on our baseline forecast for plastic consumption. The latter represents the expected trend in plastic consumption from 2022 to 2050 in the absence of any policy interventions to prevent plastic pollution.

We believe there will be interventions. Should the treaty negotiations fail to yield any, however, the consequences would be dire. At the current pace of economic growth and consumption behaviour, and with policy interventions absent, the model forecasts plastic consumption in the G20 countries to grow to 451mt by 2050, nearly double the 2019 base-year figure of 261mt.⁶

Figure 2: The trajectory of plastic growth with “business as usual”

Plastic consumption forecast assuming no policy interventions, G20 countries (mt)



Source: Economist Impact, 2023

Table 1: Types of plastic polymers and their main uses

We consider six individual categories and one general category of plastic polymer in our model. The six categories (HDPE, LDPE, PET, PS, PVC and PP) account for 80% of global plastic production.⁷ The polymer categories and their main commercial uses are shown below.

PET (polyethylene terephthalate)	Water and soft drink bottles, salad domes, biscuit trays, salad dressing and peanut butter containers.
HDPE (high-density polyethylene)	Milk bottles, freezer bags, dip tubs, crinkly shopping bags, ice cream, containers, juice bottles, shampoo, chemical bottles and detergent bottles.
LDPE (low-density polyethylene)	Squeeze bottles, cling wrap, shrink wrap and bin-liner bags.
PS (polystyrene)	CD cases, water station cups, plastic cutlery, imitation “crystal glassware” and video cases.
PP (polypropylene)	Microwave dishes, ice cream tubs, potato chip bags and dip tubs.
PVC (polyvinyl chloride)	Cosmetic containers and commercial cling wrap.
Other	Polymers used, for example, in sunglasses, compact discs, hot beverage cups and protective packaging.

Sources: World Economic Forum (2016). See: <https://www.weforum.org/reports/the-new-plastics-economy-rethinking-the-future-of-plastics>; Plastics for Change (2021). See: <https://www.plasticsforchange.org/blog/different-types-of-plastic>

Table 2: Current policies in G20 countries relating to plastic bans, extended producer responsibility schemes and taxes

	Ban on single-use plastic products	Extended producer responsibility schemes	Plastic tax
Argentina	No national ban in place; a city-level ban in Buenos Aires for plastic bags and straws.	There are legislative frameworks in place to implement EPR systems. [1]	No evidence.
Australia	State level bans imposed from 2021. Items on the ban list include bags, cutlery, straws, food containers and earbuds.	Various EPR schemes are in place. [1]	No evidence.
Brazil	No national ban in place; a city-level ban in São Paulo exists for straws and hydro-carbon based bags.	There are legislative frameworks in place to implement EPR systems. [1]	Charge of R\$0.08 (US\$0.03) per bag for biodegradable plastic bags in Sao Paulo.
Canada	National ban in place from January 2022 on grocery bags, cutlery, and straws with an exception made for necessary medical supplies.	Most Canadian provinces introduced EPR for packaging two decades ago. [1]	No national legislation but regional initiatives in place. For example, Vancouver has a C\$0.25 (US\$0.19) charge for disposable cups.
China	National ban in place from January 2021 on non-biodegradable plastic bags, straws and food containers.	Developing an EPR model. [1]	No exact fee requirement, but there is a fee on the sale of plastic bags determined by the retailer (which cannot be lower than the manufacturing cost, have any discount or be free).
France	Before the EU issued a directive on single-use plastic in 2019, France had plans to ban plastic tableware and cutlery from 2020. In 2021 it introduced a ban on plastic packaging for fruits and vegetables.	A 2020 law on circular economy further strengthened the existing EPR mechanism. [2]	No evidence.
Germany	Following the EU directive, Germany introduced a ban on selected SUPPs in July 2021 and a ban on plastic bags in January 2022.	Some form of EPR has been in place since the 1990s, including for packaging waste. [3] Germany is further exploring the idea of an EPR scheme for certain SUPPs. [8]	A law, expected to come into force in 2025, will charge producers of SUPPs a levy. The amount is yet to be decided.
India	National ban effective from July 2022, which ranges from items like plastic cups and straws to ice cream sticks. Some disposable plastic bags will also be phased out and replaced with thicker ones.	Developing an EPR model. [1]	As per the Goods and Services Tax Act, the excise tax is higher for plastic packaging and single-use products including tableware and kitchenware (compared with glass, wood and tin packaging).
Indonesia	No national ban in place; city-level plastic bag bans in Jakarta and Bali.	Developing an EPR model. [1]	Excise tax of Rp450-500 (US\$0.03) per plastic bag, to be fully implemented.
Italy	National ban in place from January 2022, excluding SUPPs that are biodegradable or compostable.	EPR schemes exist, covering both household and commercial/industrial packaging. [3]	There is a tax of €450 (US\$491) per tonne on virgin plastic and a fee on the sale of plastic bags, which includes biodegradable and compostable bags (but the exact amount is not mentioned).
Japan	The country introduced a national law in 2022 that aims to reduce SUPPs; however, it lacks specific measures. The country is promoting recycling rather than bans.	Well-established EPR models. [1]	A mandatory fee of ¥3-5 (US\$0.03-0.05) for each plastic bag.

Mexico	No national ban in place. Inconsistent regulations enacted by states or cities, some of which exclude biodegradable plastics or plastics required for hygiene purposes.	There are legislative frameworks in place to implement EPR systems. [1]	A national level initiative to charge a Ps0.10 (<US\$0.01) tax on each straw or plastic bag has not yet been approved. Mexico City was charging for plastic bags, before banning them altogether.
Russia	No national ban in place.	Introduced EPR in 2015. [4]	There is no specific tax for plastic packaging, but producers and importers must pay an environmental fee annually based on the approved rates for failure to meet the set compulsory recycling targets.
Saudi Arabia	Prohibited to manufacture, advertise, sell, import, or use polypropylene and polyethylene plastics intended for one-time use, including personal care products, plastic bags intended for one-time use, and disposable food products such as spoons, plates, and cups.	A 2021 Waste Management Law includes EPR for waste. [7]	No evidence.
South Africa	Prohibition of the manufacture, trade and commercial distribution of domestically produced and imported plastic carrier bags.	In the process of implementing EPR systems in some sectors. [1]	There is a R0.12 (<US\$0.01) levy per bag on the manufacture of plastic bags.
South Korea	National ban introduced in 2019; suspended in 2020 (due to covid-19) and reintroduced in November 2022. Banned items include plastic bags, straws and cups.	Well-established EPR models. [1]	There is a charge of W0.5 (<US\$0.01) per bag on single-use plastic bags and shopping bags.
Turkey	No national ban in place.	Amended existing legislative frameworks in 2017 in compliance with EPR principle. [6]	There is a charge of ₺0.25 (US\$0.01) per single use plastic bag.
UK	National ban in place, but limited in scope and regional coverage.	Set to implement EPR for packaging from 2024. [5]	There is a charge of £200 (US\$247.42) per tonne on plastic packaging components and a 5 pence fee on the sale of plastic bags.
US	No national ban in place; some states have banned plastic bags; a ban on SUPPs in national parks is planned.	Several states have announced the establishment of an EPR legal framework (Maine, Oregon, Colorado, California). [1]	Discussions are ongoing on a US\$0.20 per pound fee on the sale of virgin plastic used to make single-use plastics.

Sources:

- [1] Integrate Extended Producer Responsibility within the International plastics treaty, UNEP, November 2022
- [2] Extended producer responsibility (EPR) in France", Jacques Vernier, 2021, Available: <https://journals.openedition.org/factsreports/6557>
- [3] How to implement extended producer responsibility (EPR), WWF, 2019, https://d2ouvy59podg6k.cloudfront.net/downloads/wwf_germany_epr_briefing___final_230819_2.pdf
- [4] Extended Producer Responsibility: Status around the world. Available: <https://recykal.com/2021/07/30/extended-producer-responsibility-status-around-the-world/>
- [5] Packaging and packaging waste: introducing Extended Producer Responsibility, Department for Environment, Food & Rural Affairs, Available: <https://www.gov.uk/government/consultations/packaging-and-packaging-waste-introducing-extended-producer-responsibility>
- [6] G20 Report on actions taken against marine plastic litter, 2020, Available: <https://www.env.go.jp/press/files/en/872.pdf>
- [7] Saudi Arabia introduces new waste management law, 2021, Available: https://enviliance.com/regions/west-asia/sa/report_4447 (Note: text of the law was not available to confirm if plastics or packaging is explicitly called out)
- [8] EY (2022). Germany's Ministry for the Environment circulates proposal on implementation of Extended Producer Responsibility regime for single-use plastic items. See: https://www.ey.com/en_gl/tax-alerts/germany-s-ministry-for-the-environment-circulates-proposal-on-implementation-of-extended-producer-responsibility-regime-for-single-use-plastic-items

Scenario 1: Banning single-use plastic products

Bans on SUPPs feature in various guises in most G20 countries. South Korea was the first to do so nationally for selected products in 2019, later expanding the ban to other items. France, Germany, Italy, Canada, China and India have also imposed nationwide bans, and all but one of Australia's states have banned several plastic items. Partial bans are in place in the UK and US, while Japan has legislated to reduce, but not ban, such products' use.

“Banning plastic straws and stir sticks are not going to eliminate the problem.”

Erin Simon, vice president, plastic waste and business, World Wildlife Fund

The scope of bans differs across most of the countries. The most commonly proscribed items are plastic bags, cups, plates, cutlery, straws, stirrers, cotton buds, cigarette filters, food containers and balloon sticks. These are all examples of single-use plastic packaging, which is the largest source of plastic waste.

Most SUPPs consist of difficult-to-recycle multilayer and flexible packaging. The most ubiquitous is the plastic sachet that can contain single servings of tomato ketchup, shampoo, laundry detergent, toothpaste and other staples. The Ellen MacArthur Foundation calls for the elimination of these types of “problematic and

unnecessary plastic items”.⁹ Indeed, the multi-layered design was described in 2019 by Hanneke Faber, Unilever's president for global foods and refreshment, as “evil because you cannot recycle it.”¹⁰ Sold in most developing countries, the small plastic packets are congesting waterways and harming marine life. The use of plastic sachets is expected to reach one trillion by 2030, taking hundreds of years to decompose.¹¹

“It is critical that the treaty addresses these SUPPs,” says Mr Shiran of SYSTEMIQ. “Our analysis shows that flexible and multi-layer packaging accounts for 80% of all municipal solid-waste packaging that is leaked into the environment ... If we can deal with SUPPs, then we will have made a massive improvement from a plastic pollution perspective.”

Bans are positive steps, says Ms Simon of WWF, but they only scratch the surface of what's needed. “Banning plastic straws and stir sticks are not going to eliminate the problem,” she says.

Professor Fletcher warns that plastic bans need to be carefully calibrated, as there are some useful single-use plastics that can contribute to people's health or quality of life, including some used in medical products. “We should focus our efforts on banning plastics that are not reusable, that contain toxins or that can't be collected easily like sachets.”

A ban by itself only addresses part of the problem, says Suneel Pandey, who is director of the Environment and Waste Management Division at The Energy and Resources Institute (TERI), which is based in New Delhi, India. “It is important that FMCG companies transition from using plastic packaging to eco-friendly alternatives,” he says. “Bans must therefore be accompanied by measures that encourage the development and scaling up of alternative technologies and alternative materials.”

“Bans must...be accompanied by measures that encourage the development and scaling up of alternative technologies and alternative materials.”

Suneel Pandey, director, Environment and Waste Management

At the same time, warns Ms Simon, alternatives to plastic packaging should not create a different type of burden on the environment. “In imposing a ban on SUPPs, we need to ensure that we do not create a problem elsewhere in the system. We must, for example, avoid spurring the growth of single-use pulp paper, aluminium or glass, which would lead to more deforestation or bauxite mining.”

Impact of a staged ban

In this scenario, we test if, and at what rates, bans on SUPPs in the G20 countries can bend the consumption curve to achieve peak plastic.

To understand the effects of the policy interventions, we compare future plastic consumption levels with those in the base year of 2019. As mentioned earlier, without any policy interventions, we expect plastic consumption in

Key scenario assumptions

Strict implementation of bans: plastic bans introduced in the G20 countries are strictly followed by businesses and individuals. The model results do not consider the implications of incomplete implementation.

Differing ban rates: for modelling purposes, we use actual ban rates for the G20 countries that have already introduced these measures. For those yet to do so, we assume that the global plastics treaty will make a ban on single-use plastic products (SUPPs) mandatory, beginning from 2025. We assume that the ban rates will begin at 1% of the existing volume of plastic waste for all but two of these countries, this rate having been set following a literature review.

For the UK and US, we use 0.5% as the starting point for their bans on SUPPs, due to the limited scope of their existing bans. In the UK, a ban on straws, stirrers and cotton buds is limited to England (although Scotland follows the EU-wide ban). In the US, only eight states have implemented some form of legislation that limits the use of plastic bags.

Incremental increases in ban rates: we expect countries to continue widening the scope of their bans to include more products. We quantify this in the model by adding a 10% year-on-year increment to the rate across all countries. The rates begin to become aggressive from around 2040, exceeding 5% in all but the UK and US. By 2050 the ban rates in some countries (France, Germany, Italy, Australia, China) approach 20%.

2050 to be 451mt, nearly twofold that in 2019. In the case of a staged ban on SUPPs that starts at a rate between 0.5% and 1% and rises to close to 20% (see “Key assumptions”), 2050 consumption will be 14% lower than the baseline, at 385mt. This is a slower growth rate, but still 1.48 times the 2019 figure in 2050.

To make a significant dent in the growth of plastic consumption by the middle of this century, the bans on SUPPs imposed by countries must be considerably more aggressive than those considered here. This can be achieved without unduly limiting the production of plastic products that are necessary, such as those

used for medical or food hygiene purposes. But there are unnecessary plastic items that are not yet being considered as part of country bans, including extremely hazardous ones such as fishing nets. Abandoned, lost or discarded fishing gear has a serious impact on marine organisms through entanglement and ingestion.

Table 3: Plastic consumption under baseline and SUPPs ban scenarios (mt)

	Baseline	SUPPs ban
2019	261	261
2030	334	327
2040	372	352
2050	451	385

Source: Economist Impact, 2023

Scenario 2: Extended producer responsibility

Effective recycling is integral to any effort to reduce plastic pollution and support circularity. Governments and industry groups have been actively supporting recycling since the 1980s yet, as noted earlier, less than one-tenth of all plastic produced has been recycled. There are several reasons for this, foremost among which is cost.

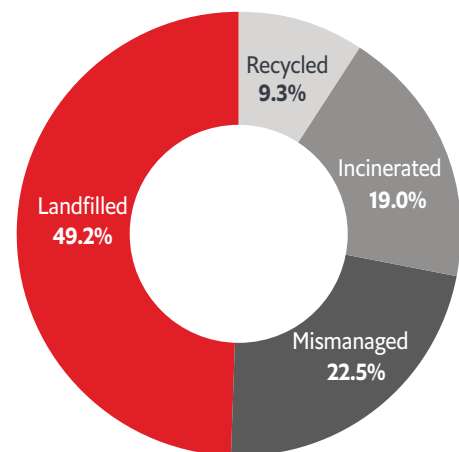
The abysmally low rate of plastic recycling

Converting discarded plastic products into material of sufficient quality to meet existing product standards is costly, often requiring expensive technology and other infrastructure. The collection, sorting and transport of plastic waste can also be expensive. By contrast, virgin plastic is cheap to produce. “We don't have the right infrastructure, consistent products going into it or consistent collection to create viable end-markets for recycled plastic,” says Ms Simon.

EPR schemes address part of this dilemma. They place the onus on packaging producers and industrial consumers (mainly FMCGs) to collect, sort and deliver the plastic packaging they produce or use to be eventually recycled. The idea behind shifting the cost to these companies is that they will innovate to make the process more streamlined and cost-efficient, at the same time encouraging the redesign of products to make them easier to recycle.

But that's not happening yet, as evidenced by the globally low recycling rates. One reason is that many current EPR schemes are voluntary. Large packaging producers and FMCGs are likely to be participants but, particularly in middle- and low-income countries, smaller domestic producers often resist signing up if not required to by law. The putative treaty will resolve this if, as anticipated, it requires EPR regimes to be mandatory everywhere.

Figure 3: Plastic consumption under baseline and SUPPs ban scenarios (mt)



Source: Economist Impact, 2023

The Business Coalition for a Global Plastics Treaty, representing businesses and financial institutions, has set out a clear position that

includes the need for mandatory measures across the full lifecycle of plastic, including on EPR and setting clear targets and obligations within the treaty. The adoption of EPR schemes is broadly in line with the positions of many governments, including members of the High Ambition Coalition to End Plastic Pollution, which has over 60 country signatories.

“We often hear from FMCGs that they favour mandatory EPR schemes,” says Ms Hughes of the WEF. “It will be important, however, to ensure, first, that these are not patchwork designs with numerous differences from country to country. Furthermore, it is critical to ensure that EPR tax proceeds are channelled specifically toward addressing plastic pollution.”

“...it is critical to ensure that EPR tax proceeds are channelled specifically toward addressing plastic pollution.”

Kristin Hughes, director, resource circularity pillar, Centre for Nature and Climate, World Economic Forum

No room for interpretation

Mandating EPR globally will be easier said than done, however. The first challenge will be to define what it actually looks like. There is a diversity of EPR schemes around the world today, each with their own approach to assigning responsibilities to participants. In many countries, for example, it is large FMCG companies that organise post-production collection, sorting and delivery of plastic waste. In India’s mandatory system, by contrast, packaging producers bear most of this responsibility and not FMCGs, says Mr Pandey of TERI. “This is a weakness of EPR in India,” he says.

Professor Fletcher believes that mandatory global EPR will fail to have the desired impact unless minimum operational standards are also agreed. “These should stipulate the need for a country EPR scheme to, for example, have a substitution policy and a ‘design-for-circularity’ policy,” he says. “Minimum standards should be met for waste collection, sorting systems and other elements of EPR.” Such standards must be prescriptive, according to Professor Fletcher: “Anything less than globally consistent interventions in the plastics economy and lifecycle are not going to solve the problem.”

A prescriptive approach need not preclude tailoring for specific groups of countries. Mr Pandey points out that less developed countries that currently lack EPR will find it difficult to meet the same targets that wealthier, experienced nations will. Collection rates differ across countries. The average rate is 36-43% in low-income countries, increasing to 64-68% in lower-middle-income countries. By contrast, the waste collection rate in high-income countries is nearly 100%.¹³

Winnie Lau, who is project director for Preventing Ocean Plastics at The Pew Charitable Trusts, says that many developing countries lack the funding to establish the state-of-the-art waste management infrastructure that can be found in western Europe, for example. “It’s more important to agree on specific outcomes that countries need to achieve,” she says.

It’s all in the design

A well-functioning EPR system’s greatest advantage, according to Mr Shepherd of Unilever, is that it provides long-term, designated funding to build up a country’s recycling infrastructure. “For materials that have to enter the waste stream, well-designed EPR offers the best

opportunity for high-quality recycling. But according to Mr Shepherd, EPR is about more than funding: “If set up right, EPR provides much better visibility over the flow of materials going through the waste management system, making it easier for manufacturers like Unilever to increase its levels of recycled content.”

“Anything less than globally consistent interventions in the plastics economy and lifecycle are not going to solve the problem.”

Steve Fletcher, professor, director, Global Plastics Policy Centre, University of Portsmouth

“But it is also increasingly important that policy is used to harmonise packaging design guidelines to support recycling systems to become more effective to operate,” he said. The design

guidelines Mr Shepherd has in mind are already being implemented through voluntary initiatives such as the Consumer Goods Forum, and include phasing out materials that hinder recyclability, such as PVC. “Design principles are exactly the kind of thing where regulations should be harmonised across countries to ensure that the ideas and innovations we as manufacturers find can be scaled to everyone.”

According to Mr Shepherd: “Legislation is critical to making EPR work—whether that’s from design, collection, washing and sorting or public communications—all parts of the recycling chain need to be clear about their obligations.”

The mandatory EPR impact

In this scenario, we test the potential of applying a mandatory EPR policy to achieve a worldwide decline in plastic consumption. The scenario uses the price effect to understand the impact on demand.

Key scenario assumptions

Mandatory extended producer responsibility (EPR) policy: all industrial consumers (namely retailers and brands) are required to collect post-consumer packaging waste and send it for recycling. Businesses are responsible for the physical collection and sorting the post-consumer discarded packaging that they place on the market. They are also responsible for sending back this collected packaging to proper recycling facilities.

Strict regulation of EPR implementation: although an ambitious supposition, we assume that EPR regulations are strictly enforced by governments to ensure compliance by businesses.

Industrial consumers pass on costs to retail consumers: industrial consumers of plastic packaging bear the financial costs of collecting, sorting and transporting the collected packaging for recycling. We assume these costs are passed on to retail consumers, which leads to higher retail prices for various products.

Price effects: we’ve used a univariate regression model to calculate the price elasticity for each country and each polymer category. The elasticity reflects the sensitivity of demand to price changes, based on historical data from 2000–20. We assume an average increase of 2% in polymer prices borne by retail consumers.

With a global mandate to implement EPR, plastic consumption grows at a slower rate over the forecast period than in the baseline scenario of no policy interventions. The impact is marginal in the initial years of the mandate (we assume its implementation begins in 2025) but grows the longer that EPR is in place. By 2050 worldwide plastic consumption under the EPR scenario rises to 434mt, which is 1.66 times the 2019 figure. This compares with a baseline forecast growth of 1.73 times the 2019 figure.

However, the EPR impact on consumption growth will be more limited over the long run than that achieved by either a ban on SUPPs or a plastic tax. At the assumed rate of price increase, there will be no plateau in polymer consumption by the middle of this century.

While the result of this scenario is less encouraging than the others, a mandatory EPR policy will make producers, retailers and brands responsible for the end-of-life of the products they put on the market. This should improve recyclability of plastic products by motivating industrial consumers to use packaging that is easy to collect, sort and recycle.

Table 4: Plastic consumption under baseline and mandated EPR scenarios (mt)

	Baseline	Mandated EPR
2019	261	261
2030	334	320
2040	372	357
2050	451	434

Source: Economist Impact, 2023

Scenario 3: Taxing plastic at source

Plastic products are widely used because they are affordable. However, the current price of virgin plastic resin used in packaging and other products only incorporates the price of production and not its social and environmental externalities. This represents a market failure. The fossil fuel feedstocks for plastic production are also subsidised, creating an additional market distortion.

“Taxing a material that is used in preserving food, in medical products and in other necessary applications will most hurt consumers that can least afford to pay it or to find alternatives.”

Stewart Harris, senior director, global plastics policy, American Chemistry Council

The third scenario we examine seeks to change that by imposing a tax on the production of virgin plastic resin, to be levied on its producers and collected by governments. Our assumption is that a tax that increases the cost of fossil fuel inputs for primary plastic production reflects wider climate change mitigation efforts and efforts to reduce the intensity of greenhouse gas (GHG) emissions from producing virgin plastic. The cost increase should also spur the greater use of more recycled plastics.

This is arguably the most contentious of the main policy measures the treaty negotiators are likely to consider. Virgin polymer producers have often been vocal and effective opponents of proposed plastic taxes in the past. In the US, for example, the American Chemistry Council (ACC), which represents chemical and plastic producers, has lobbied against the introduction of a federal tax on the sale of plastic products and similar initiatives at state level.

The ACC's position is that such a tax would be regressive, says Stewart Harris, the organisation's senior director for global plastics policy. “Taxing a material that is used in preserving food, in medical products and in other necessary applications will most hurt consumers that can least afford to pay it or to find alternatives,” he says.

The ACC also questions the utility of revenue-raising measures that channel their proceeds into government budgets. “We think more targeted policy mechanisms like EPR are far more effective at driving circularity than broad brush taxes that go into the general funds,” says Mr Harris.

FMCG companies such as Unilever also favour a focus on EPR rather than production taxes. However, they may balk at an agreement that does not have “critical pre-requisites” in place such as waste management legislation and infrastructure to handle plastic waste, according to a paper by the Consumer Goods Forum, which has been endorsed by large brands.¹⁴

NGOs and other experts who are open to a production tax acknowledge some of the producers' concerns. WWF's Ms Simon, for example, says it is imperative that the proceeds of any tax are invested in developing circular systems. Professor Fletcher believes a tax could be useful as an interim measure to try and rein in production until such time as "we can determine the true cost of plastics." But he acknowledges that it will likely disadvantage poorer people, especially in low-income countries, who rely on products sold in single units in multi-layered plastic

sachets to meet their everyday needs. "We must find a way to make the transition [to circularity] easier for people," he says.

Ms Lau of The Pew Charitable Trusts, meanwhile, believes that the discussion around how much of an additional cost consumers will bear misses an important point. "If companies continue to use plastic packaging, they will likely pass the tax on to consumers," she says. "But that assumes that the only option is to continue using plastic. It may not be feasible for all products, but there are also options to redesign some to have little or no plastic."

Downstream or upstream?

Many countries tax plastic at one or more stages of its lifecycle. Most such taxes are levied downstream. According to the UN Environment Programme, 27 countries had introduced taxes on the manufacture or import of plastic bags as of 2018, and 30 countries levied a point-of-sale fee on consumers.¹⁵ According to the OECD's analysis, in several countries such taxes and other measures to curb plastic bag use are not fully implemented or not enforced. A focus on plastic bags is in any case suboptimal for the purpose of encouraging circularity, the OECD says: such measures cover only small product streams and fail to affect the volume of plastics produced, even if they succeed in reducing waste.¹⁶

Taxes aimed further upstream and with a wider scope are not common but beginning to find favour among policymakers, particularly in Europe. Spain, for example, recently instituted an excise tax on the consumption of "non-reusable plastic packaging", which includes non-reusable plastic containers, semi-finished plastic products and plastic lids or other container closures. The tax is levied on manufacturers and importers of plastic packaging and on volume (US\$0.49/kg of packaging).¹⁷ A similar tax (with the same rate) is scheduled to come into force in Italy in 2024.^{18,19}

An analogous tax in force in the UK since April 2022 differs from the above examples in that it covers packaging or finished products in which recycled plastic does not exceed 30% of the item's total plastic content. Packaging manufacturers, importers and some retailers are required to register and pay the tax. (The latter is levied at the rate of US\$243.61 per tonne.)²⁰

The above European examples hold promise for eventually reducing demand for plastic products. It is our belief, however, that a tax aimed at reducing consumption of plastic should be aimed as close to its source as possible.

The impact of a tax on production

In this scenario, we study the impact of imposing a production tax on reducing plastic consumption. As with EPR, we use the price effect to understand the impact on demand.



5,023
million tonnes
the amount of plastic waste
generated between 2000- 2019



9%
of all plastic waste generated
until now has been recycled

The carbon footprint of plastic is the total amount of carbon dioxide (CO₂) and other GHG that are emitted during its production, use and disposal. Overall, the production and disposal of plastic are significant contributors to GHG emissions and climate change. Putting a price on the carbon that is emitted across the plastic lifecycle helps redress the reality that inexpensive plastic products do not reflect the environmental cost to produce them. A carbon tax encompasses something close to the true cost of producing, consuming and disposing of plastic products. While it may not substantially stem plastic use, a tax on fossil-fuel based feedstock could have a significant impact on new plastic demand.

We apply a carbon pricing score (CPS) to measure the effectiveness of a country's carbon pricing policy for reducing carbon emissions and incentivising the use of low-carbon technologies. For example, a CPS of 100% against a US\$33 per tonne of CO₂ benchmark means that a country prices all carbon emissions from energy use in its territory at US\$33 or more. Similarly, a CPS of 100% against a US\$65 or US\$130 per tonne CO₂ benchmark means that all emissions are priced at or above those levels. Hence, the scores vary across the G20 based on the countries' effectiveness of compliance.

Converting plastic into its equivalent carbon footprint and then applying the average CPS across the three carbon pricing benchmarks (US\$33, US\$65 and US\$130 per tonne of CO₂) helps us derive the amount of effective carbon tax for each G20 country.²¹ We are then able to estimate the elasticity of carbon taxes on the volume of plastic produced through regression estimates, allowing us to gauge the volume effects of the carbon tax in each country.

Key scenario assumptions

Carbon potential: we assume plastics to have a global warming potential of between 1.7kg and 3.5kg of CO₂, depending on the type of plastic. This means that for every kilogram of fossil-fuel based plastic produced, anywhere between 1.7kg and 3.5kg of carbon dioxide is released.²²

Effective carbon rate: the effective carbon rate is a combination of three components: emission permit price, carbon tax and fuel excise tax. The inclusion of each of these components incentivises the use of lower carbon energy alternatives by making it costlier to use energy sources with a high carbon footprint.

Carbon price benchmark: a benchmark value in the form of a minimum carbon price for all energy-related carbon emissions. Carbon prices may be set at or above this benchmark. We assume these benchmark prices to be implemented uniformly across all geographies from a historical low-end price of US\$33/tonne of CO₂ in the early 2000s, to US\$65/tonne until 2015, increasing to US\$130/tonne by 2030. We keep along the same growth trajectory all the way to 2050.

Price effects: the increase in carbon taxes is absorbed by polymer prices, leading to virgin plastic getting costlier over time. We should point out that the exact price at which carbon should be taxed remains unclear. If the rate is too high, it risks causing large price increases for necessary products that require virgin resin. If the rate is too low, it risks having no meaningful impact and will likely be a cost absorbed by the plastics industry, limiting the impact on individual behaviour and plastic consumption.

The result: the application of an effective tax reduces the growth of plastic consumption by mid-century compared with the baseline scenario, but it does not stem or reverse it, similar to the ban on SUPPs and mandatory EPR scenarios. By 2050 worldwide plastic consumption with the application of a carbon tax rises to 409mt, which is 1.57 times the 2019 figure, compared with the baseline forecast growth of 1.73 times.

Taxes upstream would have more of an impact on plastic consumption growth in the G20 countries than an EPR mandate but less than a ban on SUPPs. It is likely that a suite of taxes is needed to drive the response that is needed from producers and consumers.

Table 5: Plastic consumption under baseline and production tax scenarios (mt)

	Baseline	Tax on production
2019	261	261
2030	334	325
2040	372	348
2050	451	409

Source: Economist Impact, 2023

Conclusion: A painful but necessary process

We have examined the potential impact of the three policy measures separately, but the future plastics treaty will ideally call for the

implementation of multiple measures. "Achieving a reduction in plastic pollution is going to require all the stakeholders to implement all the known solutions," says Ms Lau.

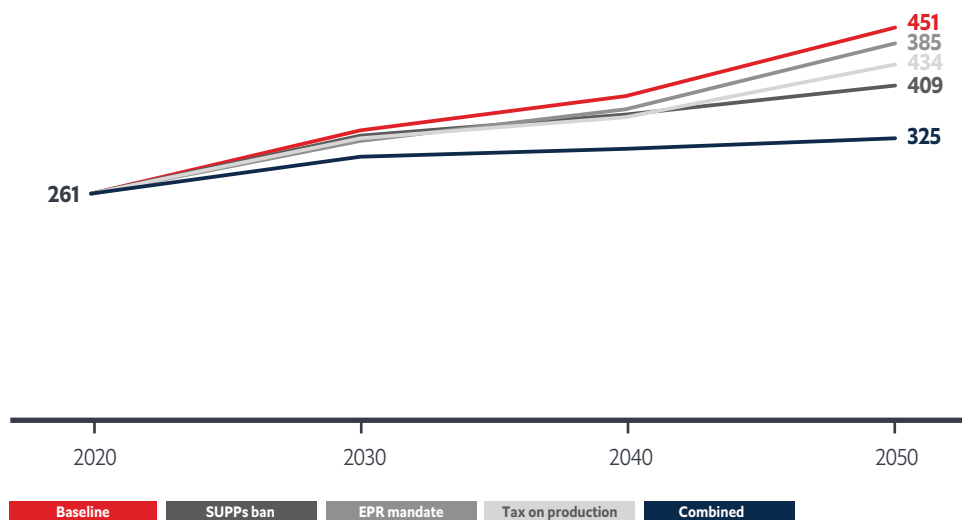
"Achieving a reduction in plastic pollution is going to require all the stakeholders to implement all the known solutions."

Winnie Lau, project director, Preventing Ocean Plastics, The Pew Charitable Trusts

In our analysis, combining a ban on SUPPs with an EPR mandate and a production tax will certainly do more to flatten the consumption growth curve in the G20 countries than any of these measures in isolation. But the impact of this integrated approach is disappointingly limited: consumption of 325mt in 2050 is still 1.25 times higher than in 2019.

Figure 4: Farewell to the piecemeal approach

All the scenarios modelled fail to produce a peak in plastic consumption, suggesting more ambitious policies will be required to achieve that goal (mt)



Source: Economist Impact, 2023

Table 6: Plastic consumption under all scenarios (mt)

	Baseline	SUPPs ban	EPR mandate	Tax on production	Integrated approach
2019	261	261	261	261	261
2030	334	327	320	325	304
2040	372	352	357	348	313
2050	451	385	434	409	325

Source: Economist Impact, 2023

Clearly, to reverse plastic consumption growth by mid-century, the plastics treaty will need to stipulate more stringent measures and conditions than we have factored into our model. For example, the phasing of bans on SUPPs in countries will likely need to be faster and on a steeper trajectory than we’ve assumed. And a tax on virgin feedstock—that is, derived from fossil fuels—in the upstream production of plastic will also need to be higher.

at city and regional levels to ensure that all the funds generated flow into circularity-building efforts. Fines imposed on producers, industrial consumers or retailers for missing targets or circumventing bans need to be stiff enough to enforce compliance. And bans must be enacted at the highest government level possible—preferably national but in some large countries at state or provincial level—to guard against the backtracking that results in plastic leakage from some localities to others. There are countries and stakeholders that wish to push for a bottom-up approach based on national action plans, or those that would prefer to not have clear targets and obligations within the treaty.



325 million tonnes plastic consumption in 2050 under the integrated approach. This is equivalent to **238 million** filled rubbish trucks.

Implicit in our scenario analysis is that bans and limits to plastic demand growth due to higher retail prices will motivate industry to push harder on technological innovation. Such innovation must, for example, bring about the redesign of packaging and products that contain little or no plastic. The capabilities of sorting and recycling technologies must also advance to ensure that all recyclable plastic is actually recycled.

No one should underestimate the opposition that such measures are likely to encounter from some producers, retailers, industry bodies, consumer groups or other actors, even if the world’s major stakeholders have signed on to them.

There should be no illusions that the treaty negotiations will be anything but difficult and possibly treacherous. The chances of failure—not just that no treaty emerges but one that is too weak to reverse the plastic tide—are considerable. The negotiators must nevertheless succeed, as there may never be as much goodwill as there exists now among the different stakeholders to achieve a breakthrough.

This makes it all the more important that the treaty also addresses monitoring and enforcement. Experience suggests that numerous potential loopholes could undercut the achievement of targets. For example, EPR schemes—particularly in low-income countries—will need to be closely monitored

Glossary

- **Ban:** a ban on the sale and consumption of problematic, non-essential single-use plastic products (SUPPs). For each country, we calculate the decline in plastic consumption that would result from a ban on SUPPs. This ban rate will vary for each country, based on existing policy dynamics. We assume that these bans progressively increase over time, expanding the products under the purview.
- **Consumption:** the purchase of virgin resins by industries, which are then processed into virgin plastic products to be used by individuals. For the purpose of this study, the purchase of PET by a bottle manufacturer is accounted for in the consumption data (and not the purchase of a soft-drink plastic bottle by a household). The consumption number here is the total consumption at country level irrespective of production, import and export. For example, some of the countries may have zero production but instead its consumption is purely via imports. This is also referred to as 'use' in the paper.
- **GDP:** the gross domestic product is the market value of all finished goods and services produced in a country in a given period of time.
- **Landfills:** modern landfills are well-engineered and managed facilities for disposing of solid waste. They are located, designed, operated and monitored to ensure compliance with federal regulations and are also designed to protect the environment from contaminants, which may be present in the waste stream.
- **Peak plastics:** Economist Impact defines this as the hypothetical point in time when the consumption of plastic reaches its maximum rate, beyond which it will gradually decline due to various mitigation measures.
- **PET:** polyethylene terephthalate, a type of plastic polymer.
- **Plastic leakage:** this refers to plastics that enter terrestrial and aquatic environments.
- **Primary or virgin plastic:** plastics manufactured from fossil-based feedstock (eg, crude oil) that has never been used or processed before.

- **Problematic and unnecessary plastic items:** The New Plastics Economy Global Commitment²³ proposes the following criteria for identifying problematic or unnecessary plastic packaging or plastic packaging components:
 - It is not reusable, recyclable or compostable.
 - It contains, or its manufacturing requires, hazardous chemicals that pose a significant risk to human health or the environment.
 - It can be avoided (or replaced by a reuse model) while maintaining utility.
 - It hinders or disrupts the recyclability or compostability of other items.
 - It has a high likelihood of becoming litter or ending up in the natural environment.
- **Producers:** firms that make polymers—the building blocks of all plastics—almost exclusively from fossil fuels. Economist Impact identifies these firms as producers of new “virgin” polymers from oil, gas and coal feedstock. In 2019 more than half of all the single-use plastic waste created was made by 20 polymer producers, while the top 100 producers were the origin of 90%.²⁴
- **Recycling:** means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes reprocessing organic material but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations.
- **Single-use plastic products:** items designed and produced to be used once before being thrown away or recycled, such as plastic bags, straws, coffee stirrers, soda and water bottles, and most food packaging.
- **Virgin plastics:** new plastic polymers that have been produced using fossil fuels such as crude oil, coal or natural gas.
- **Waste:** means any substance or object that the holder discards or is required to discard.

**The definitions of problematic plastic items, short-lived plastic products and SUPPs are adapted from working documents of the UN Plastics Treaty. The definition of consumption has been formulated in accordance with the data we have used for the model.*

End notes

- 1 For ease of reference, we refer to these as the “G20 countries” further in the report.
- 2 OECD (2022). Global Plastics Outlook: Economic Drivers, Environmental Impacts and Policy Options. See: <https://doi.org/10.1787/de747aef-en>
- 3 Ibid
- 4 The national programmes are part of the WEF’s Global Plastic Action Partnership initiative. Local partnerships are currently or soon to be in place with six countries (Indonesia, Vietnam, Ghana, Nigeria, Pakistan and Ecuador), one state (Maharashtra, India) and one city (Mexico City, Mexico). Global Plastic Action Partnership. See: <https://www.globalplasticaction.org/home>
- 5 This and the above measures are summarised from UNEP (2022). Intergovernmental negotiating committee to develop an international legally binding instrument on plastic pollution, including in the marine environment: Plastics science (advance version). See: <https://wedocs.unep.org/bitstream/handle/20.500.11822/40767/K2221533%20-%20%20UNEP-PP-INC.1-7%20-%20ADVANCE.pdf?sequence=1&isAllowed=y>
- 6 In our modelling we have used 2019 as the base year in order to compare our forecasts to pre-pandemic consumption levels.
- 7 Prescient & Scientific Intelligence: G-20 Polymer Market (2022)
- 8 The EU Directive on single-use plastics aims to prevent and reduce the impact on the environment of certain plastic products and to promote a transition to a circular economy. It discusses various measures on SUPPs, including market restrictions, consumption reductions and mandatory recycled content.
- 9 Ellen MacArther Foundation, Our vision for a circular economy for plastics . See: <https://ellenmacarthurfoundation.org/plastics-vision>
- 10 Hanneke Faber, Unilever Foods & Refreshment, Investor Event, 2019.
- 11 A Plastic Planet, “A Plastic Planet - Inspiring Change.” See: <https://aplasticplanet.com/inspiring-change/>
- 12 Business Coalition for a Global Plastics Treaty (2022). “Vision Statement — Business Coalition for a Global Plastics Treaty.” See: <https://www.businessforplasticstreaty.org/vision-statement>.
- 13 UNEP and ISWA (2015), Global Waste Management Outlook. See: <https://www.unep.org/resources/report/global-waste-management-outlook>
- 14 The Consumer Goods Forum (2020). Building a Circular Economy for Packaging. See: <https://www.theconsumergoodsforum.com/wp-content/uploads/Building-a-Circular-Economy-for-Packaging-Dec-2022.pdf>
- 15 UNEP (2018), Legal Limits on Single-Use Plastics and Microplastics: A Global Review of National Laws and Regulations. See: <https://www.unep.org/resources/report/legal-limits-single-use-plastics-and-microplastics>
- 16 OECD (2022), Global Plastics Outlook.
- 17 “Spain introduces new indirect tax on non-reusable plastic packaging as of 1 January 2023”, EY Tax News Update, April 13, 2022. See: <https://globaltaxnews.ey.com/news/2022-5395-spain-introduces-new-indirect-tax-on-non-reusable-plastic-packaging-as-of-1-january-2023>
- 18 “Plastic Tax in the European Union – An Overview”, VATupdate, September 2, 2022. See: <https://www.vatupdate.com/2022/09/02/plastic-tax-in-the-europe-an-overview/>
- 19 “Italy’s plastic and sugar taxes have been postponed”, Fiscal Solutions, December 9, 2022. See: <https://www.fiscal-requirements.com/news/1867#:~:text=Both%20taxes%20have%20been%20postponed,draft%20budget%20law%20for%202023>
- 20 “Plastic Packaging Tax: steps to take”, Gov.UK, February 7, 2022. See: <https://www.gov.uk/guidance/check-if-you-need-to-register-for-plastic-packaging-tax>
- 21 The carbon tax trajectory follows the benchmarks in decarbonisation scenarios outlined in OECD, Effective Carbon Rates 2021. See: <https://www.oecd.org/tax/tax-policy/effective-carbon-rates-2021-brochure.pdf>
- 22 Woodyly (2021). “What is the carbon footprint of plastic?” See: https://woodyly.com/carbon_neutrality/what-is-the-carbon-footprint-of-plastic/
- 23 “The New Plastics Economy Global Commitment | UNEP” n.d. UN Environment Programme. Accessed February 16, 2023. <https://www.unep.org/new-plastics-economy-global-commitment>.
- 24 “Executive Summary | Plastic Waste Makers Index.” 2021. The Minderoo Foundation. <https://www.minderoo.org/plastic-waste-makers-index/pwmi-2021/findings/executive-summary/>.

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