Towards Eliminating Plastic Pollution by 2040

A Policy Scenario Analysis

INTERIM FINDINGS

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BETTER POLICIES FOR BETTER LIVES

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Contents

"Plastic pollution poses an increasing threat to the environment, impacting habitats and natural ecosystems, with consequences for sustainable economic growth and human wellbeing. As the negotiations for an international, legally binding treaty on plastic pollution unfold, there is a need for further evidence to inform decision-making. What level of policy stringency ought to be employed across the plastics life-cycle to achieve the goal of ending plastic pollution cost-effectively? What are the advantages and complexities of aiming for a 2040 target to end plastic pollution and what are the implications if action is delayed?

This new OECD analysis sheds light on the benefits and costs of alternative policy packages with varying levels of international co-ordination and policy stringency across the world. Interim findings from this ongoing line of work are presented here, ahead of the third session of the Intergovernmental Negotiating Committee to develop an international legally binding instrument on plastic pollution. The full report, containing a more in-depth analysis and more detailed policy guidance, will be published in the first half of 2024."

– **Jo Tyndall**, OECD Environment Director

Key messages

1. Business as usual is unsustainable. Under this Baseline scenario, plastics use would continue to grow, leading to a 50% increase in leakage of (macro)plastics to the environment by 2040 (30 million tonnes per year, of which 9 Mt would enter aquatic environments). Burgeoning plastic use and waste volumes would amplify adverse consequences for the environment, climate and health.

2. A scenario of bottom-up, uncoordinated policy action by countries could slow down growth in plastics use. However, plastics use and waste would still increase by more than 50% above 2020 levels by 2040. Likewise, improvements in waste collection and recycling would reduce leakage of plastics, but 23 Mt will still leak to the environment by 2040.

3. Moderate international alignment of policy approaches – with a focus on downstream interventions in non-OECD countries and ambitious action across the lifecycle for OECD countries – would further improve outcomes. Primary plastics use would stabilise at 2020 levels by 2040. However, in this scenario, plastic leakage would still be significant at 12 Mt in 2040.

4. Global ambition with early, stringent and co-ordinated policy action could cut plastic waste generation in 2040 by a quarter below Baseline and virtually eliminate mismanaged waste by 2040 (from 119 to 4 Mt). Consequently, plastic leakage would also be nearly eliminated (1.2 Mt in 2040). Stocks of plastics in rivers and oceans, however, would still rise from 152 Mt in 2020 to 226 Mt in 2040 (74 Mt less than in the Baseline).

5. Such ambitious policy action would cost 0.5% of global GDP in 2040 below Baseline. However, these costs exclude the avoided costs of inaction and must be viewed in the context of vastly improved environmental outcomes. A comprehensive approach including both upstream and downstream measures would limit the costs of the transition. Delayed action may have short term economic benefits but would bear longer term societal and environmental repercussions.

6. The largest costs (as a share of GDP) of global ambitious action are projected for fast-growing countries with less advanced management systems, not least in Sub-Saharan Africa. Investment needs for waste collection, sorting and treatment amount to more than 1 trillion USD between 2020 and 2040 for non-OECD countries combined. Reduced waste generation can limit these costs, as costs of collection, sorting and treatment are contained. The large financial needs and uneven distribution of costs imply a need for international co-operation.

7. Significant technical and economic barriers must be overcome to eliminate leakage of plastics by 2040, including recycling breakthroughs and scaling up well-functioning international markets for scrap and secondary plastics.

Objectives and scope

In March 2022, all 193 UN Member States united in a landmark decision to develop an international legally binding instrument ("instrument") on plastic pollution, including in the marine environment (UNEA Resolution 5/14 entitled "End Plastic Pollution: Towards an International Legally Binding Instrument"). Despite a growing sense of urgency to mitigate and prevent the multitude of adverse consequences of plastic pollution, current policies have fallen short in altering trends in plastic flows and pollution significantly. It is estimated that, in 2022, 21 million tonnes (Mt) of macroplastics (roughly speaking, plastics larger than 5mm) leaked to the environment globally, almost one-third more than a decade earlier. In addition, plastics generate a variety of lifecycle impacts, including contributing 3.8% of total global greenhouse gas emissions (1.9 $GtCO_2e$ in 2022). The future legal instrument presents a unique opportunity to co-ordinate and scale-up policy efforts and catalyse the much-needed, immediate and global response to combat plastic pollution.

As international negotiations unfold, policymakers and negotiators are discussing the strategies, targets and policy actions that could achieve the ambitious goal set by UNEA Resolution 5/14. There is growing political momentum for implementing comprehensive policy approaches that address the full lifecycle of plastics, towards a common, international target to 2040 for the elimination of plastic pollution. Beyond submissions by member states to the Intergovernmental Negotiating Committee on Plastic Pollution (INC), this ambition is bolstered by the following initiatives:

- Signatories of the High Ambition Coalition to End Plastic Pollution[1] (2023[1]) have called for the establishment of an ambitious and effective international legally binding treaty, "based on a comprehensive approach that addresses the full lifecycle of plastics, with a view to end plastic pollution by 2040 to protect human health and the environment from plastic pollution while contributing to the restoration of biodiversity and curbing climate change".
- In April 2023, the G7 Ministers of Climate, Energy and the Environment (2023[2]) committed to ending plastic pollution, with "the ambition to reduce additional plastic pollution to zero by 2040", and to continue and step up actions "based on a comprehensive lifecycle approach, promoting sustainable consumption and production of plastics, increasing their circularity in the economy and environmentally sound management of waste".

At the same time, countries and regions around the world face diverse local circumstances in reducing plastic pollution. As priorities vary, so may preferences on the types and stringency of policy instruments and views on the intended scope of the future instrument, including around the balance between action upstream in the plastics lifecycle to restrain production and demand versus downstream waste management. Furthermore, countries could face greater difficulty in ramping up policy action and investments. Notably, ending open dumping and open air burning and setting up waste collection and management systems are common challenges in many low-income countries.

In the run-up to the discussions on the zero draft of the treaty at the third session of the Intergovernmental Negotiating Committee on Plastic Pollution (INC-3), these Interim Findings of the forthcoming OECD report *Towards Eliminating Plastic Pollution by 2040: A Policy Scenario Analysis* support the ongoing negotiation process by providing a snapshot of the potential benefits and consequences of varying levels of international ambition and policy stringency across the plastics lifecycle. By presenting a set of alternative policy scenarios, this work provides an overview of the environmental consequences (including plastic leakage to the environment and its diffusion in rivers and oceans) and economic implications (including regional macroeconomic and

1. The High Ambition Coalition to End Plastic Pollution (HAC) is a group of like-minded countries committed to developing an ambitious legally binding international instrument to end plastic pollution by 2040. At this moment, 27 OECD countries are members of the HAC.

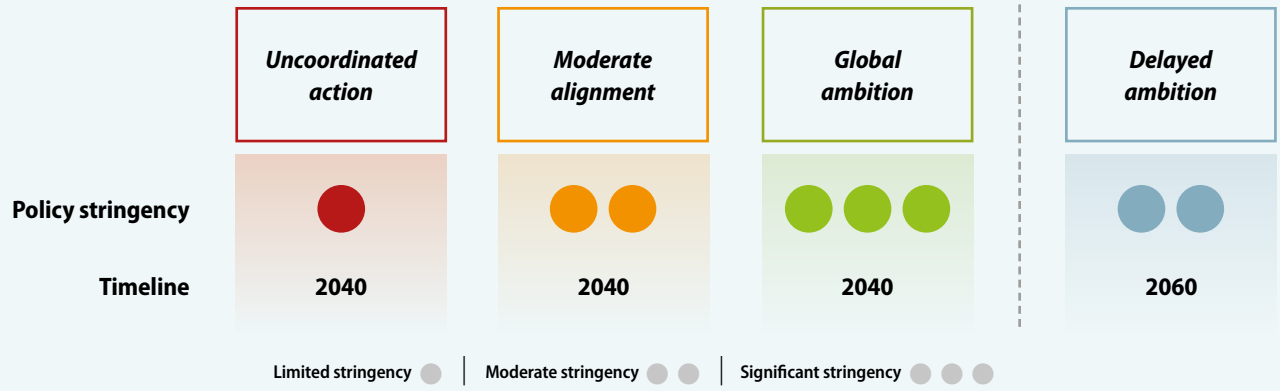
waste management costs) of varying levels of ambition in the scope and objectives of the legal instrument currently being negotiated. The analysis provides crucial insights into some of the key trade-offs on where to prioritise policy action, and how interventions along the plastic lifecycle (including curbing production and demand, designing for circularity, enhancing waste collection, sorting, recycling and treatment) can help charting the path towards ending plastic pollution.

The policy scenario analysis (Box 1) builds on the OECD Global Plastics Outlook publications (OECD, 2022[3]; OECD, 2022[4]). It exploits the same modelling framework, allowing to link the regional and sectoral drivers of plastics use and to track plastics throughout their lifecycle (see also Box 2). Four core policy scenarios are modelled with different levels of policy stringency: *Uncoordinated Action*, *Moderate Alignment*, *Global Ambition* and *Delayed Ambition*. The most ambitious scenario of the analysis, *Global Ambition*, aims to identify a package of policy interventions that could achieve a sustainable and circular plastics economy, setting the path towards the elimination of plastic pollution by 2040. It lays the basis for a discussion on the opportunities, barriers and priorities for policymakers to align with a 2040 target. This scenario is contrasted with the three additional scenarios that examine the environmental and macroeconomic consequences of lower ambition levels, either in the degree of policy stringency across countries or in the speed of implementation.

BOX 1: The report models policy scenarios to chart the elimination of plastic pollution

The analysis in this report uses large-scale modelling to quantify the main mechanisms that drive plastics use, waste and pollution. It considers alternative policy scenarios that link directly to issues and positions that have arisen in the ongoing negotiations for a legally binding instrument on plastic pollution. These alternative scenarios can serve as a strategic guide for policymakers to understand the economic and environmental implications of varying levels of ambition towards the elimination of plastic pollution, including in the degree of policy stringency, the coverage of the policy mix and the timelines for action.

Policy stringency across the scenarios modelled



- The ***Uncoordinated Action*** policy scenario models a heterogenous landscape of varying policy stringency across the globe, where countries do not agree on international, legally binding targets, but ramp up policy stringency throughout the plastics lifecycle independently and voluntarily, guided by national action plans and national (or regional) targets.
- In the ***Moderate Alignment*** scenario, countries agree on the need for co-ordinated urgent interventions to end plastic pollution but diverge on the choice of policies required. Countries that have committed to implementing comprehensive lifecycle approaches with a view to halt leakage by 2040 increase policy stringency at all stages of the plastics lifecycle. Other countries also ramp up policy action beyond the ***Uncoordinated Action*** scenario but opt for a policy mix focused on improving waste collection, sorting and treatment.
- The ***Global Ambition*** scenario models a comprehensive and co-ordinated approach that entails a global ramp up of policy action across the plastics lifecycle, in line with the common target to end macroplastic leakage by 2040.
- Finally, a ***Delayed Ambition*** scenario models the same policy package as the Global Ambition scenario but over a longer timeframe, aligned with a 2060 target for the elimination of macroplastic leakage.

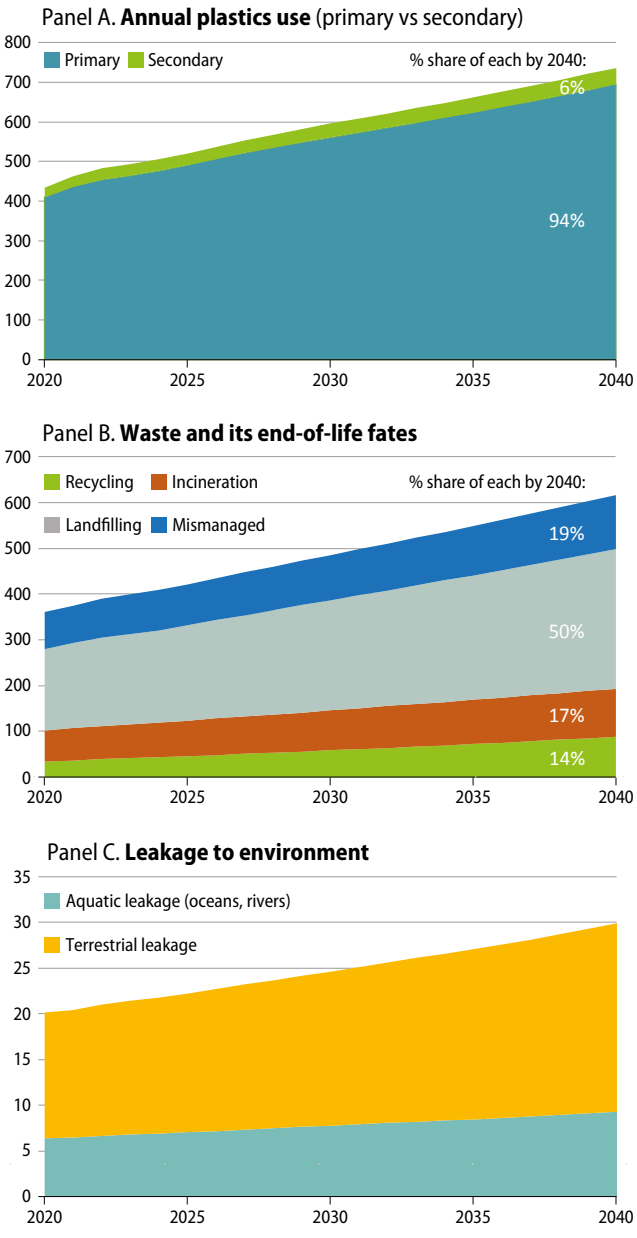
1 Business-as-usual is unsustainable

Plastics demand, waste generation and mismanaged waste would continue to rise in the absence of ambitious, co-ordinated and global policy action. Leakage of plastics to rivers and oceans would grow further by one-third, from 6 million tonnes (Mt) in 2020 to more than 9 Mt in 2040.

The *Baseline* scenario would see current trends of population growth and higher incomes lead to a 70% increase in annual plastics use and waste generation in 2040 compared to 2020. Despite expected improvements in waste collection, sorting and treatment, higher plastic waste generation would lead to an increase in the absolute volumes of mismanaged waste (i.e., waste that is not disposed of in an environmentally sound manner) compared to 2020 levels and significantly higher plastic waste management costs. Similarly, while recycling output is set to continue to increase, higher plastic waste generation would lead to a continued prominent role of landfilling and incineration in the end-of-life treatment of plastic waste (Figure 1, Panels A and B).

Figure 1: **Plastic flows and adverse impacts are set to increase substantially, without more ambitious policies**

Million tonnes (Mt), Baseline scenario



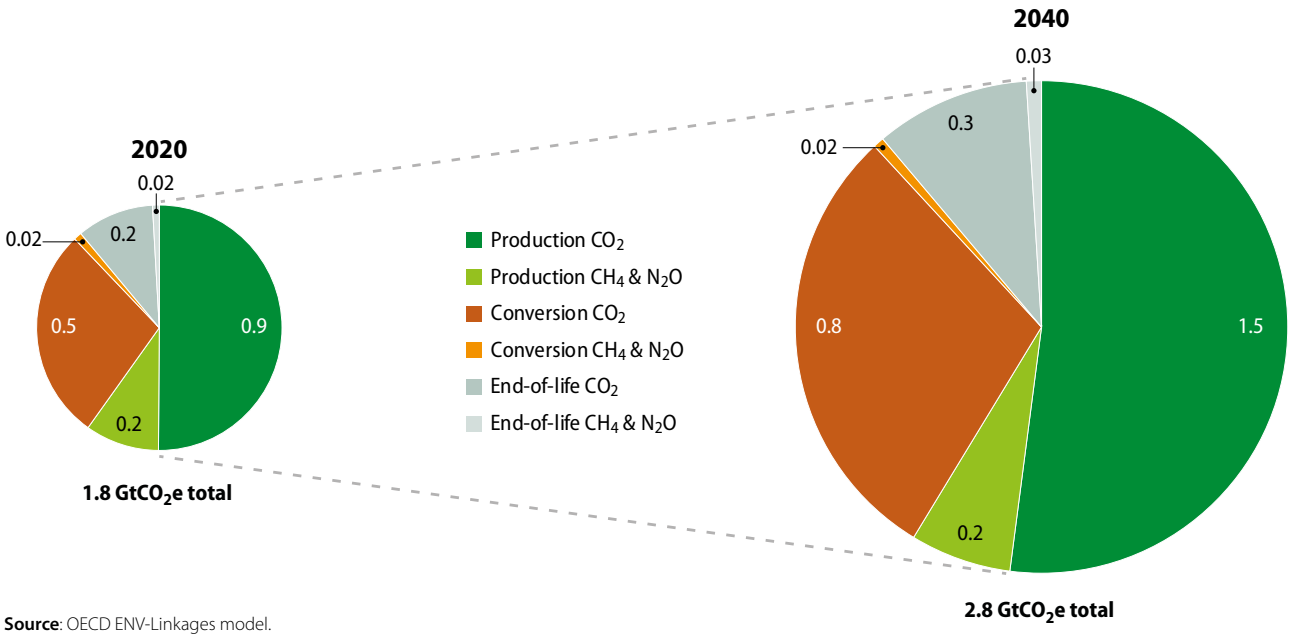
Source: OECD ENV-Linkages model; aquatic leakage from (Lebreton, 2023[5]).

As a consequence of these projected trends, plastic leakage to both terrestrial and aquatic environments is set to accelerate, leading to further adverse consequences for the environment (Figure 1, Panel C). Annual leakage of (macro)plastics alone would increase by 50% between 2020 and 2040 to 30 Mt and it is expected that microplastic leakage would also continue to grow. Importantly, the accumulation of plastics in aquatic environments will continue to worsen and nearly double, to reach 300 Mt by 2040 (from an estimated 152 Mt in 2020), amplifying negative impacts for ecosystems, human wellbeing, coastal economies as well as risks of potentially irreversible damage.

The plastics lifecycle is expected to be a growing source of greenhouse gas (GHG) emissions in the coming decades. In the *Baseline* scenario, which reflects climate policies in place as of 2021, GHG emissions from the plastics lifecycle would increase by 60% in 2040 compared to 2020 levels (1.8 $GtCO_2e$). While climate policies in place already limit the growth of GHG emissions, the majority of quantified plastics-related emissions (almost 90%) are attributed to the production and conversion stage in plastic manufacturing (Figure 2) and are relatively hard to abate. Emissions from the plastics lifecycle accounted for 3.6% of total global emissions in 2020, and the share is projected to rise to 5.0% by 2040; an undesirable outcome not in line with the Paris Agreement. The increasing share reflects a combination of continued growth of emissions related to plastics and slower growth in overall emissions due to climate commitments.

Figure 2: **GHG emissions from plastics are projected to rise significantly**

Annual GHG emissions from the plastics lifecycle, gigatonnes carbon dioxide equivalent ($GtCO_2e$),Baseline scenario



Source: OECD ENV-Linkages model.

BOX 2: **Modelling tools used in the analysis**

The analysis relies on a combination of modelling tools. The OECD's in-house dynamic computable general equilibrium model ENV-Linkages is used as the basis to estimate the economic activities that drive plastics use. ENV-Linkages is a dynamic multi-sectoral, multi-regional model that links economic activities to energy and environmental issues (see Chateau, Dellink and Lanzi [2014[6]]) for a comprehensive model description) and provides annual projections of economic activity and environmental pressures between 2020 and 2060. ENV-Linkages has been enhanced to include data on plastics use, waste and waste treatment (see OECD [2022[7]]) for more details).

Although "plastic pollution" encompasses a range of emissions and risks resulting from different stages of the plastics lifecycle (OECD, 2022[3]), the policy scenarios presented here focus on the elimination of the leakage of plastics to the environment. Building on the methodology presented in the Global Plastics Outlook (OECD, 2022[3]), the model calculates plastic leakage. Macroplastic leakage to the aquatic environment is derived from the ENV-Linkages projections using a spatially explicit model (Lebreton, 2023[5]) that assesses the probability that plastic waste ends up in aquatic environments (see also [OECD, 2022[3]]). Plastics-related greenhouse gas emissions are also quantified. The quantification of other adverse impacts is beyond the scope of this analysis, although some of these aspects are presented qualitatively to provide context to the reader.

Additional details on the modelling framework are available in Supplementary Information online.

Projecting the regional and sectoral drivers of plastics use
The dynamic global general equilibrium model ENV-Linkages is used to represent the complex dynamics of economic activities across sectors and regions.

Projecting plastics use
Plastics are included in the ENV-Linkages model by categories of polymers and linked to the most relevant economic activities to obtain projections of plastics use.

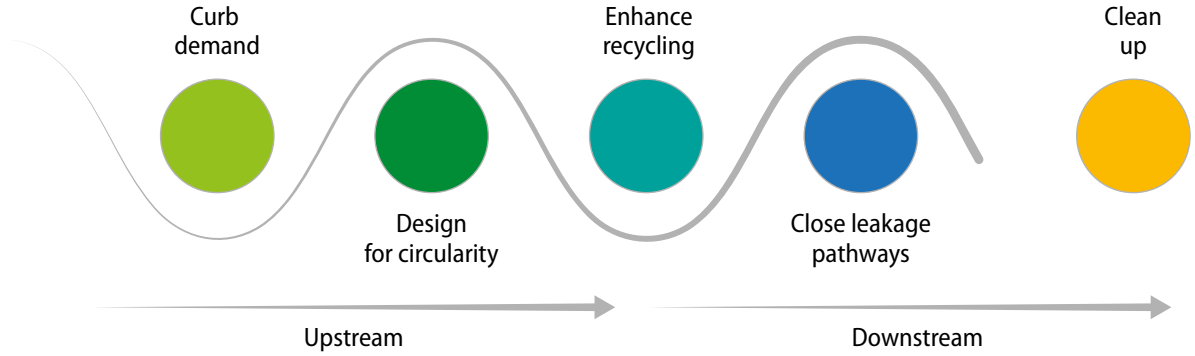
Projecting plastic waste
Plastic waste is calculated in ENV-Linkages based on the projections of plastics use, the life span of products and international trade patterns. Plastic waste is then differentiated by end-of-life fates.

Projecting environmental impacts from plastics use and waste
Plastics-related emissions of greenhouse gases and leakage of macroplastics to the environment are calculated in ENV-Linkages, while dedicated calculations by Lebreton (2023) are used for plastic leakage to aquatic environments.

2 Policy levers and instruments to reverse these unsustainable trends

Growing awareness of the adverse impacts associated with the plastics lifecycle has led policymakers and governments worldwide to seek out effective policy instruments that could counter the current unsustainable trends. In this sense, a range of policy interventions that can mitigate plastics-related adverse impacts, including the leakage of plastic waste and litter to the environment, are available to policymakers.

POLICY LEVERS TO INFLUENCE PLASTICS MANAGEMENT



Policy interventions span across the entire plastics lifecycle and can be grouped into four core policy approaches (OECD, 2022[4]):

UPSTREAM

1. **Curb production and demand (hereafter "Curb demand")**: restrain production and demand towards sustainable levels, e.g., by avoiding unnecessary and problematic plastics or by promoting longer product lifespans, reuse and a demand shift to services. Controlling the production of virgin plastics, and especially of specific polymers, can also be an effective part of curbing plastics use.

2. **Design for circularity**: make the plastic production process more circular, for instance by avoiding hazardous materials and chemicals, facilitating reuse practices, or introducing product-standards to improve repairability and substitution away from plastic inputs.

DOWNSTREAM

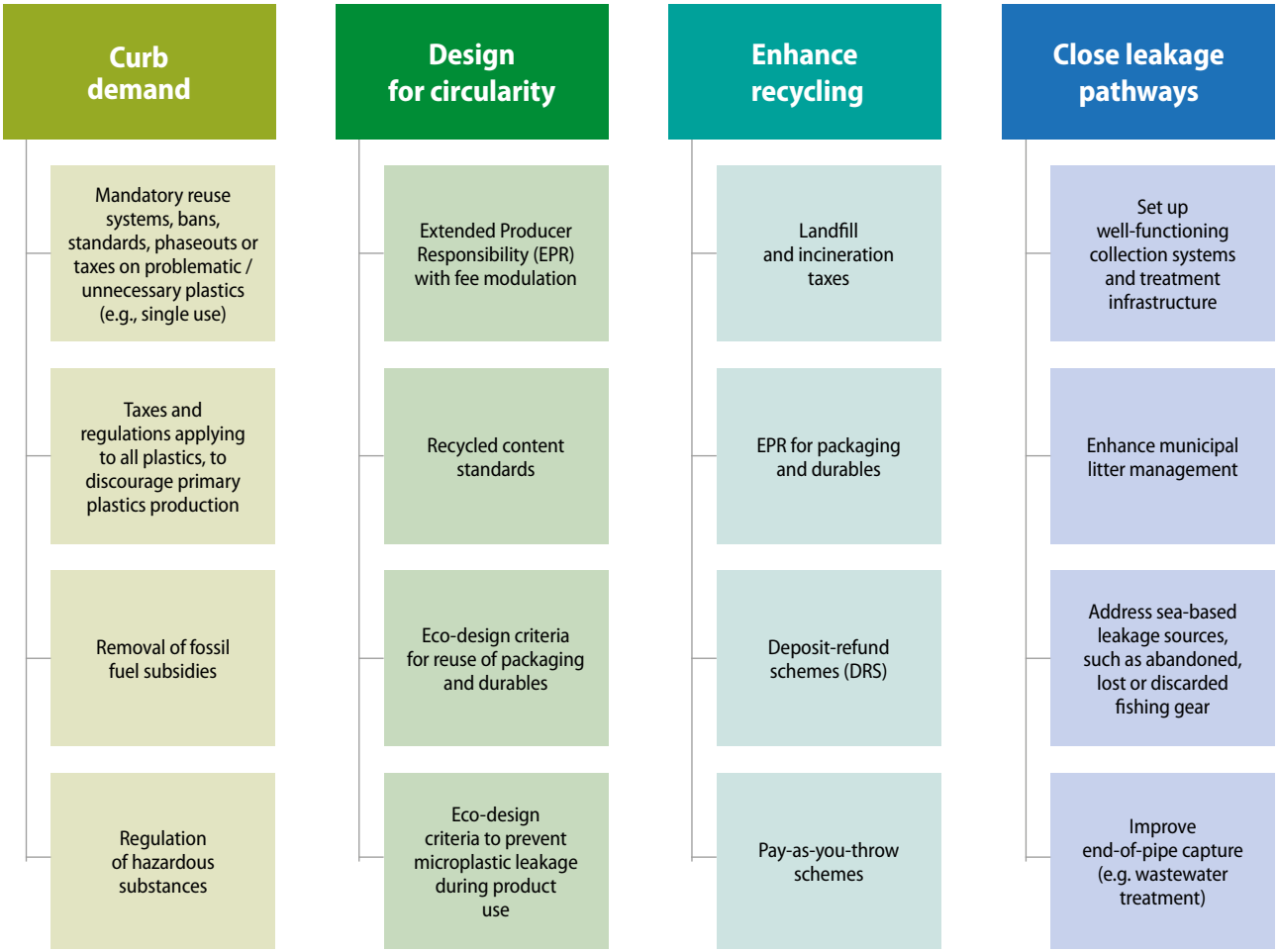
3. **Enhance recycling**: close material loops by improving separate collection, sorting and recycling of plastic waste.

4. **Close leakage pathways**: decrease losses into the environment, including via effective waste collection and disposal.

Additionally, a fifth lever concerns **clean up**, i.e., the removal of plastic from the environment, for instance via collection on beaches or via the installation of river litter booms that capture plastics. Evaluation of this approach is left for future analysis.

To mitigate the adverse impacts on the environment and human health, countries have a wide array of policy tools at their disposal to target different stages of the plastics lifecycle. Figure 3 presents a selection of relevant policy instruments. These vary in focus: some policy instruments are specific to plastics (e.g., single-use plastic bans and taxes), while others address a wider spectrum of waste or material types (e.g., landfill taxes, that discourage disposal of solid waste and promote recycling more generally). There are also opportunities to leverage sectoral policies, such as those related to chemicals or waste management as well as policies designed to address specific externalities, like carbon taxes. No single policy instrument operates effectively in isolation: they should be part of a broad policy mix that combines mutually reinforcing and complementary tools. Regulatory and economic instruments work in tandem with enabling policies,

Figure 3: **A variety of policy instruments are available to facilitate the transition towards more sustainable plastics use**



Note: A selection of these instruments has been used in the development of policy scenarios presented in the next sections.

Source: Adapted from the policy roadmap presented in (OECD, 2022[4]).

including investments in research and development, information, education, nudging and stakeholder alliances, as part of a comprehensive approach.

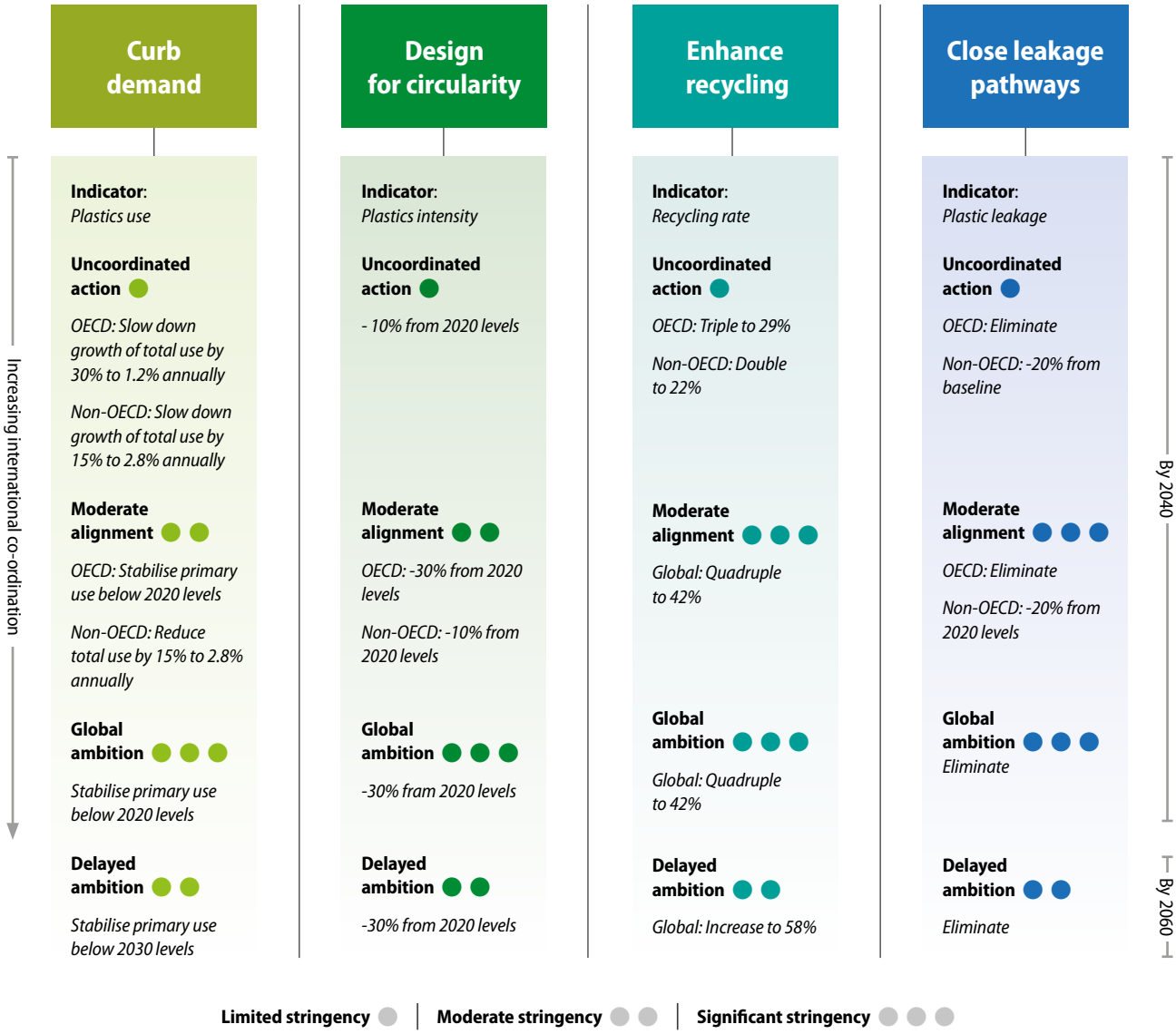
Countries will need to expand and strengthen policy packages and select the instruments that are best suited to their specific circumstances from the policy toolbox, across the four levers presented above. Some countries may prioritise the establishment of efficient waste collection and treatment systems as the foundational step towards safe and effective plastic waste management. Meanwhile, countries with well-established waste management systems may focus on internalising negative externalities more effectively, and further the use of advanced policy instruments such as pay-as-you-throw schemes or Extended Producer Responsibility with modulated fees. Overall, there is not one blueprint that applies to all countries, rather a multitude of tailored approaches will need to be developed.

3 Policy scenarios chart alternative paths to eliminate plastic pollution

The analysis in this report considers alternative policy scenarios that link directly to issues and positions that have arisen in the context of ongoing negotiations for an instrument on plastic pollution. The four policy scenarios modelled in this analysis are ***Uncoordinated Action, Moderate Alignment, Global Ambition*** and ***Delayed Ambition***. They vary in their degree of ambition, international co-ordination, and stringency of domestic policy mixes, as summarised in Figure 4.

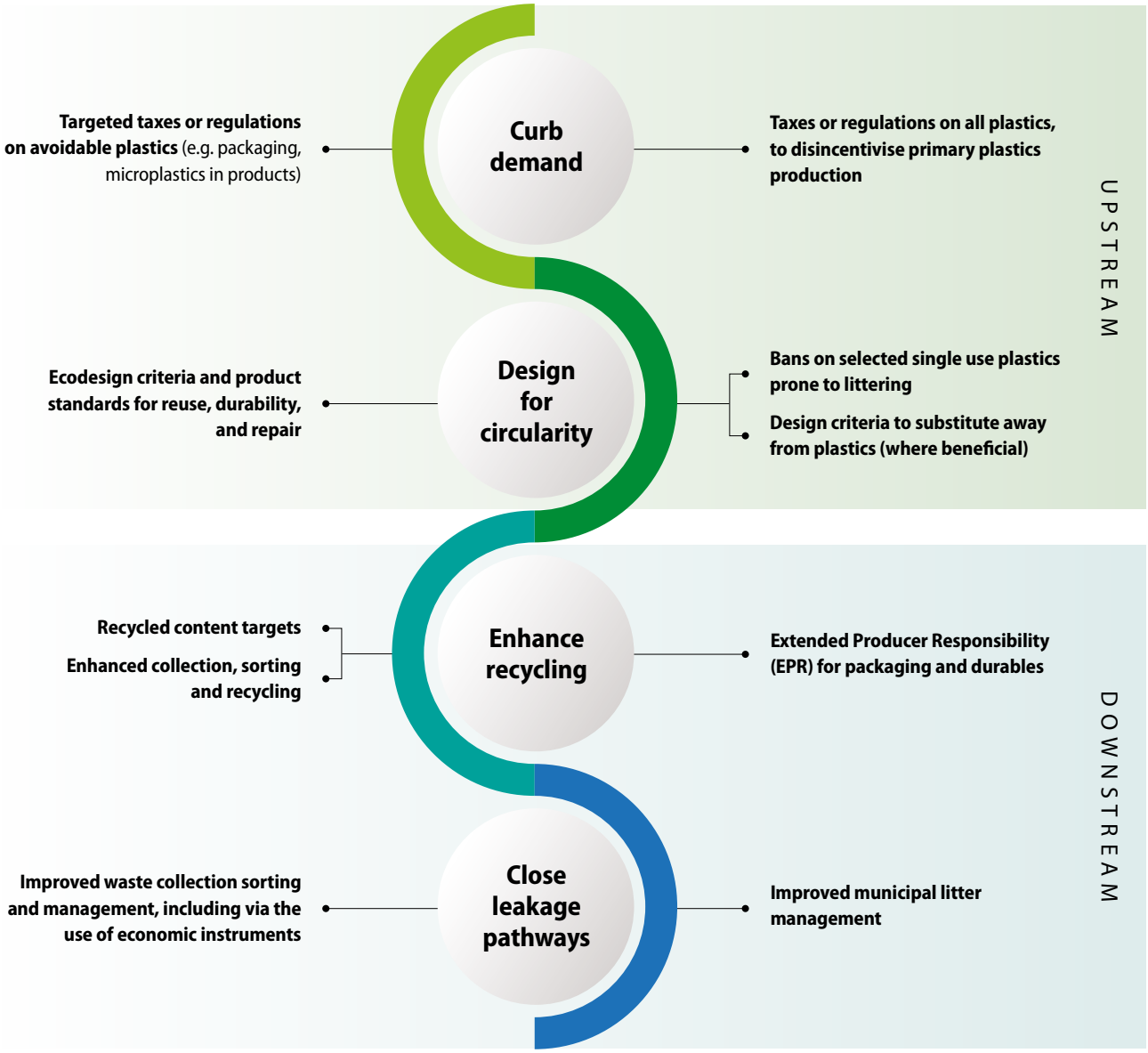
Although degrees of policy stringency vary, all scenarios involve the combination of ten policy instruments (Figure 5) across the four key policy levers outlined in the previous section. In the following, each of them is presented in more detail.

Figure 4: **Overview of policy stringency across the scenarios modelled**



Note: Plastics intensity (tonne / mln USD) refers to the intensity of plastics use relative to GDP. It is a normalised indicator that can allow for comparison of plastics use across countries and regions and over time.

Figure 5: **Policy instruments modelled in the policy scenarios**



Note: The choice of policy instruments modelled in the policy scenarios is not intended to be prescriptive, but indicative of a potential set of effective instruments that could be implemented.

UNCOORDINATED ACTION

The *Uncoordinated Action* policy scenario models a heterogenous landscape of varying policy stringency across the globe, where countries independently ramp up policy action from existing levels, in the absence of internationally agreed, binding targets and approaches. As global awareness of the detrimental impacts of plastic pollution grows, countries have been increasing the stringency of their policy initiatives voluntarily, even in the absence of internationally agreed targets. At the same time, countries confront unique sets of circumstances, challenges and available resources in their efforts to address this issue and may identify different sets of priorities. It is likely that, in the absence of strong international co-ordination, complexities would arise in the implementation of several measures, such as the development of harmonised eco-design rules and criteria, the phase out of unnecessary and problematic plastics and of chemicals, or the scale up of reuse systems. Furthermore, the potential contribution of international co-operation and financial support would remain more limited with low levels of co-ordination.

Overall, this scenario implies additional policy action in all countries for both upstream and downstream measures, but with relatively low policy stringency.

The ***Global Ambition*** scenario combines globally co-ordinated, stringent measures both upstream and downstream in the plastics lifecycle, to achieve the near elimination of plastic leakage.

MODERATE ALIGNMENT

In the complex international landscape, countries offer diverging perspectives on the possible elements of a global instrument on plastic pollution, including in its scope and the foreseen implementation measures. Some countries call for comprehensive approaches targeting all lifecycle stages, while others would prioritise downstream interventions (i.e., improve waste collection, sorting, recycling and municipal litter management) and opt for less ambitious upstream interventions (i.e., curb production and demand, design for circularity).

Recognising these differences in approaches, the *Moderate Alignment* scenario models a situation where countries have a common understanding of the need for urgent action to end plastic pollution, but they diverge on how they prioritise interventions along the plastics lifecycle. In this scenario, OECD countries[2] adopt comprehensive lifecycle approaches with a view to end plastic pollution by 2040, aligned with the *Global Ambition* scenario (see below). The majority of non-OECD countries prioritise interventions downstream to improve waste and litter management implement modestly ambitious policies (i.e., aligned with *Uncoordinated Action*), but with additional interventions to improve waste collection and management.

Thus, from a global perspective, there is some increase in the stringency of upstream action compared to *Uncoordinated Action*, and stronger increases in the stringency of downstream action.

GLOBAL AMBITION

The *Global Ambition* scenario models a combination of interventions across all stages of the lifecycle of plastics, aligned with the common target to end (macro)plastic leakage by 2040. It entails a comprehensive approach where all world regions ambitiously ramp up policy action at all stages of the plastics lifecycle, to i) curb production and demand towards sustainable levels, ii) design plastics for circularity, iii) enhance recycling and implement Extended Producer Responsibility (EPR) schemes, and iv) close leakage pathways, including to improve waste collection and management and municipal litter management.

The *Global Ambition* combines ambitious, globally co-ordinated, stringent measures both upstream and downstream in the plastics lifecycle, to achieve the near elimination of plastic leakage.

DELAYED AMBITION

Finally, a variant of the *Global Ambition* scenario is the *Delayed Ambition* scenario. It models the implementation of the policy package of the *Global Ambition* scenario over an extended timeframe, towards a 2060 target for the elimination of leakage.

HOW DOES THIS ANALYSIS COMPARE TO THE OECD GLOBAL PLASTICS OUTLOOK?

The ***Uncoordinated Action*** and ***Delayed Ambition*** scenarios have been explored in the *Global Plastics Outlook* (OECD, 2022[4]), where the *Delayed Ambition* scenario was labelled "Global Ambition". They have been recalculated using the latest economic Baseline projection (OECD, 2021[9]) and the *Uncoordinated Action* scenario is aligned with the 2040 horizon of the current report (versus the 2060 horizon of the Global Plastics Outlook). The numbers presented here therefore are an update from those presented in the *Global Plastics Outlook*. All projections show minor differences in numbers compared to *Global Plastics Outlook* scenarios, due to the different underlying *Baseline* economic trends. However, trends in plastic flows remain very similar (see the Supplementary Information for more details).

2. OECD countries and non-OECD European Union countries, grouped together.

4 Uncoordinated policy action will not eliminate plastic leakage

The ***Uncoordinated Action*** policy scenario models a heterogenous landscape of varying policy stringency across the globe, where countries do not agree on international, legally binding targets, but ramp up policy stringency throughout the plastics lifecycle independently and voluntarily, guided by national (or regional) targets. While the choice of policy instruments and stringency is arbitrary to some extent, the scenario is a representation of the ramp up of domestic policies that is considered feasible in the absence of strong international co-ordination and co-operation.

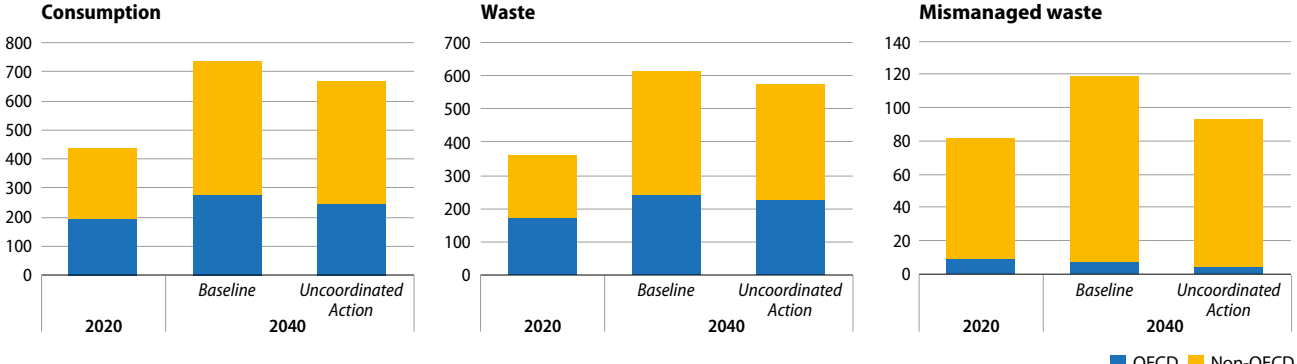
Curb demand	Design for circularity	Enhance recycling	Close leakage pathways
OECD: Slow down growth of total plastics use by 30% to 1.2% annually **Non-OECD: Slow down growth of total plastics use by 15% to 2.8% annually**	**Reduce plastics intensity by 10% from 2020 levels**	**OECD: Triple plastics recycling rate to 29%** **Non-OECD: Double plastics recycling rate to 22%**	**OECD: Eliminate plastic leakage** **Non-OECD: Reduce plastic leakage by 20% from baseline**

In this policy scenario, countries around the world independently and gradually scale up policy action. With limited international co-ordination, this scenario will not be sufficient to end plastic pollution.

Sustained, incremental increases in the stringency of domestic policies could slow down plastics flows compared to *Baseline*, but the improvements modelled in the *Uncoordinated Action* scenario remain insufficient to reverse current trends (Figure 6). The *Uncoordinated Action* scenario projects a modest (7%) decrease in plastic waste generation below *Baseline* in 2040 (reaching 573 Mt), not least from the implemented policies that restrain demand and improve design for circularity. It is expected that countries put significant efforts to enhance recycling all over the world, resulting in a substantial shift to recycling from less virtuous disposal options. Efforts expected in non-OECD countries to improve waste collection, sorting and treatment would be responsible for a large part of reductions in mismanaged waste and plastic leakage. The enhanced stringency of downstream

Figure 6: ***Uncoordinated Action*** **is unlikely to prevent plastic flows from increasing over time**

Volumes of plastic flows in 2020 and 2040, Mt



Note: the scales are different across the three charts. **Source**: OECD ENV-Linkages model.

policies in OECD and non-OECD countries combined could prevent 230 Mt of additional mismanaged waste between 2020-2040 compared to *Baseline*.

Nevertheless, the limited international co-ordination could hinder the potential of a range of policy interventions to bring about the structural changes required to alter plastic flows significantly. Upstream in the plastics lifecycle, a limited level of co-ordination across countries could limit the potential of interventions such as the introduction of harmonised eco-design criteria. As a result, despite a gradual decoupling of plastics use from economic growth, plastics use and waste generation levels would still increase by 2040 (by 53% and 59%, respectively, compared to 2020 levels).

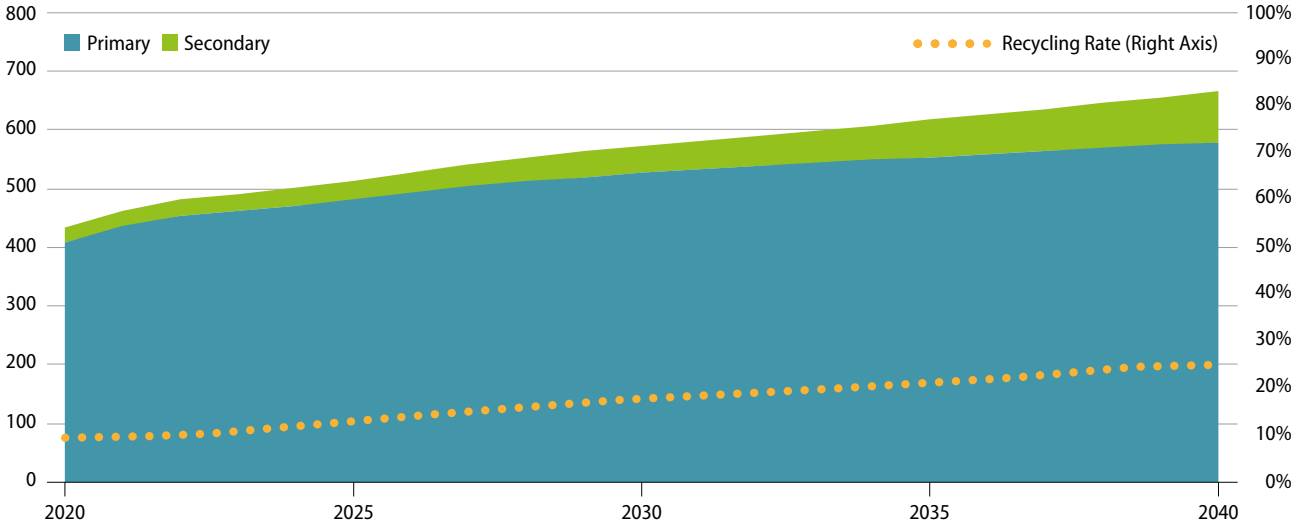
While recycling is expected to improve in line with increased domestic policy ambition, this is likely insufficient to counter growth in primary plastic production and deliver substantial environmental gains. Owing to the implementation of policies that incentivise both the supply and demand of recycled plastics (e.g., recycled content requirements, recycling targets, EPR schemes), recycling output is projected to increase compared to *Baseline*. Especially in non-OECD countries, the share of waste that is recycled into new plastics more than doubles, from 10% in 2020 to 22% in 2040. As shown in Figure 7, the global volume of secondary plastics would more than triple in the 2020-2040 period, from 25 Mt to 89 Mt. However, in the absence of more significant reductions in plastics use levels, the higher recycling output would not displace growth in primary plastics production. Primary plastics use grows in the *Uncoordinated Action* scenario, from 409 Mt in 2020 to 579 Mt in 2040. Hence, the expected environmental gains, such as reduced dependence on fossil-based feedstock and reduced plastics production-related GHG emissions, would remain limited.

Downstream in the plastics lifecycle, limited international co-ordination could constrain international co-operation and support. In particular, there are risks that it could hinder the capacity building required in a number of developing countries in setting up well-functioning waste management systems, including adopting the necessary policy and regulatory frameworks, setting up strong governance mechanisms and ensuring stable financing that cover the operational costs of waste collection and sorting. As a result, in the *Uncoordinated Action* scenario, the global mismanaged waste and leakage rates remain significant by 2040. The scenario would result in the release of an additional 131 Mt of plastics to rivers and oceans over the 2020-2040 period, 18 Mt less than the accumulated release in the *Baseline* scenario.

Overall, strategies that rely on scaling up of domestic policies, in the absence of internationally agreed, binding targets and co-ordinated strategies, offer limited potential to reverse current trends and set countries on a pathway towards the elimination of plastic pollution. Importantly, the international community would remain far off the goal of eliminating plastic pollution in the foreseeable future.

Figure 7: ***Uncoordinated Action*** **would improve recycling rates substantially, but plastics demand still grows**

Global plastics use (primary and secondary, left) and average recycling rate (right), Uncoordinated Action, Mt



Source: OECD ENV-Linkages model.

5 Disproportionately focusing policy action on waste management relative to upstream interventions will be insufficient

In the ***Moderate Alignment*** scenario, countries agree on the need for co-ordinated urgent interventions to end plastic pollution but diverge on the choice of policies required. Countries that have committed to implementing comprehensive lifecycle approaches with a view to halt leakage by 2040[3] increase policy stringency at all stages of the plastics lifecycle, aligned with the ***Global Ambition*** scenario. Other countries also ramp up policy action beyond the ***Uncoordinated Action*** scenario but opt for a policy mix focused on improving waste collection, sorting and treatment.

Curb demand	Design for circularity	Enhance recycling	Close leakage pathways
OECD: Stabilise primary plastics use below 2020 levels **Non-OECD: Reduce total plastics use by 15% to 2.8% annually**	**OECD: Reduce plastics intensity by 30% from 2020 levels** **Non-OECD: Reduce plastics intensity by 10% from 2020 levels**	**Quadruple global plastics recycling rate to 42%**	**OECD: Eliminate plastic leakage** **Non-OECD: Reduce plastic leakage by 20% from 2020 levels**

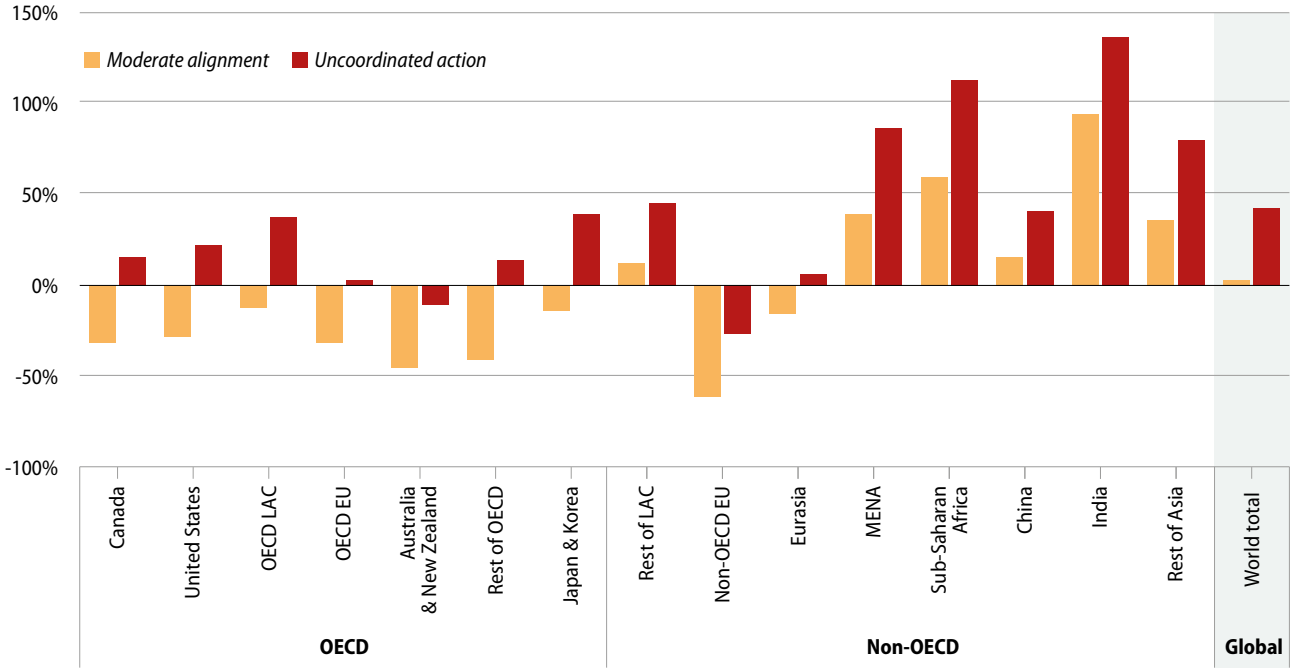
Moderate international alignment of policy approaches, where some countries advocate for comprehensive policy mixes, while others prioritise downstream interventions over upstream measures, would further improve outcomes compared to *Uncoordinated Action*. Primary plastics use would stabilise at 2020 levels by 2040. However, in this scenario, plastic leakage would persist and double over the next 20 years (12 Mt in 2040).

Strong upstream and downstream action in OECD countries (and non-OECD EU countries), aiming to eliminate regional plastic leakage and stabilising primary plastics use below 2020 levels can bring global benefits. In non-OECD countries, plastics use would continue to grow, surging to 413 Mt by 2040. Significant reductions of primary plastics in OECD countries below *Baseline* levels can however compensate for growth in non-OECD countries and deliver a near stabilisation of global primary plastics use (Figure 8).

3. This group of countries is approximated as OECD and non-OECD European Union countries. Although a number of non-OECD, non-EU countries are committed to a 2040 target as signatories to the High Ambition Coalition to End Plastic Pollution, the regional aggregation of the model does not allow this to be reflected in this scenario.

Figure 8: **International co-ordination on upstream measures, even if limited to selected world regions, can be pivotal to help stabilise primary plastics use when combined with strong downstream action to stimulate recycling**

Primary plastics use by 2040, in percentage change from 2020 levels



Note: LAC = Latin America and the Caribbean, MENA = Middle East and North Africa.

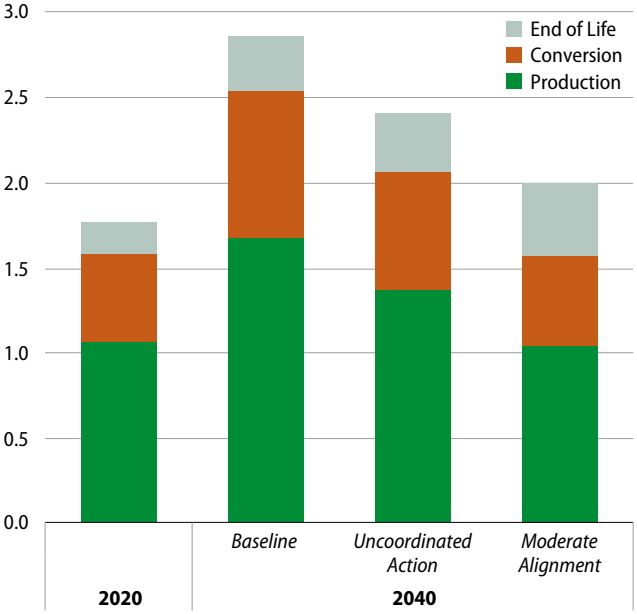
Source: OECD ENV-Linkages model.

A global elimination of plastic leakage rests on the assumption that countries are willing and able to co-ordinate their efforts, for instance by sharing advanced recycling technologies, agreeing on the phase out of problematic or avoidable plastic products, harmonising criteria and guidelines for design for circularity, scaling up international markets for scrap and secondary plastics, and co-ordinating the implementation of reuse systems (for instance via harmonised design standards and certification and labelling requirements). Assuming that limited international co-ordinating on upstream interventions hinders the potential of at least some of these interventions, the *Moderate Alignment* scenario forecasts an additional 163 Mt of waste generated by 2040 over 2020 levels, and 48 Mt of mismanaged waste would remain in 2040. As a consequence, lifecycle impacts are amplified. Approximately 12 Mt of leakage would persist in 2040, with a path to near-zero charted only by 2060. By comparison, the implementation of ambitious policies all along the lifecycle in OECD countries leads to stabilisation in plastics demand and waste generation in those regions, and subsequent reductions in environmental impacts.

Finally, plastics-related greenhouse gas emissions are lower in the *Moderate Alignment* scenario than in the *Baseline* or *Uncoordinated Action* scenarios, but still well above 2020 levels, with especially emissions associated with end-of-life waste management increasing above 2020 levels (Figure 9).

Figure 9: **Plastics-related GHG emissions depend on the stringency of upstream and downstream action**

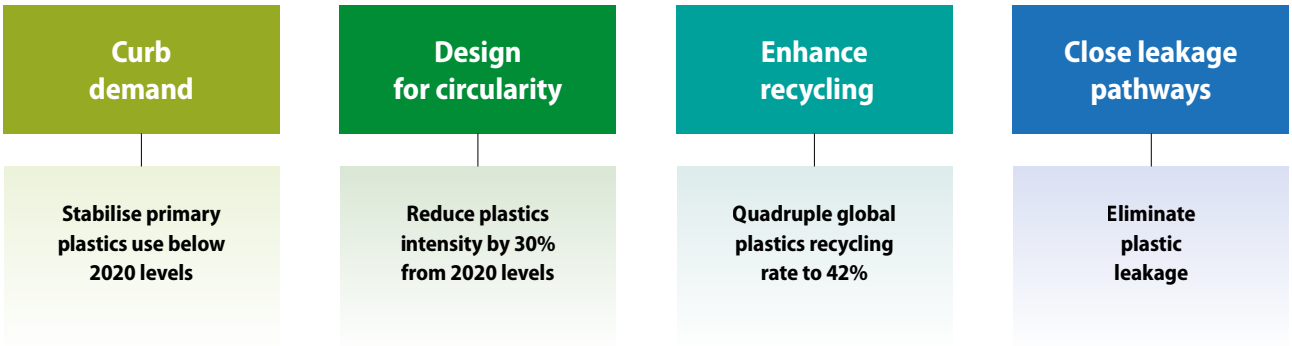
Plastics-related GHG emissions in Gt CO_2e



Source: OECD ENV-Linkages model.

6 Ambitious, globally co-ordinated action can chart a viable path to eliminating plastic leakage by 2040

The ***Global Ambition*** scenario can serve as a strategic guide to chart a path towards the elimination of plastic pollution by mid-century. This comprehensive and co-ordinated approach entails a global ramp up of policy action across the plastics lifecycle, in line with a common target to end (macro)plastic leakage by 2040.



The comprehensive mix of ambitious policies implemented in the *Global Ambition* scenario could prevent 115 Mt (more than 95%) of mismanaged waste in 2040 compared to *Baseline*. The scenario would enable an almost immediate decrease in plastic leakage levels and a near-elimination by 2040.

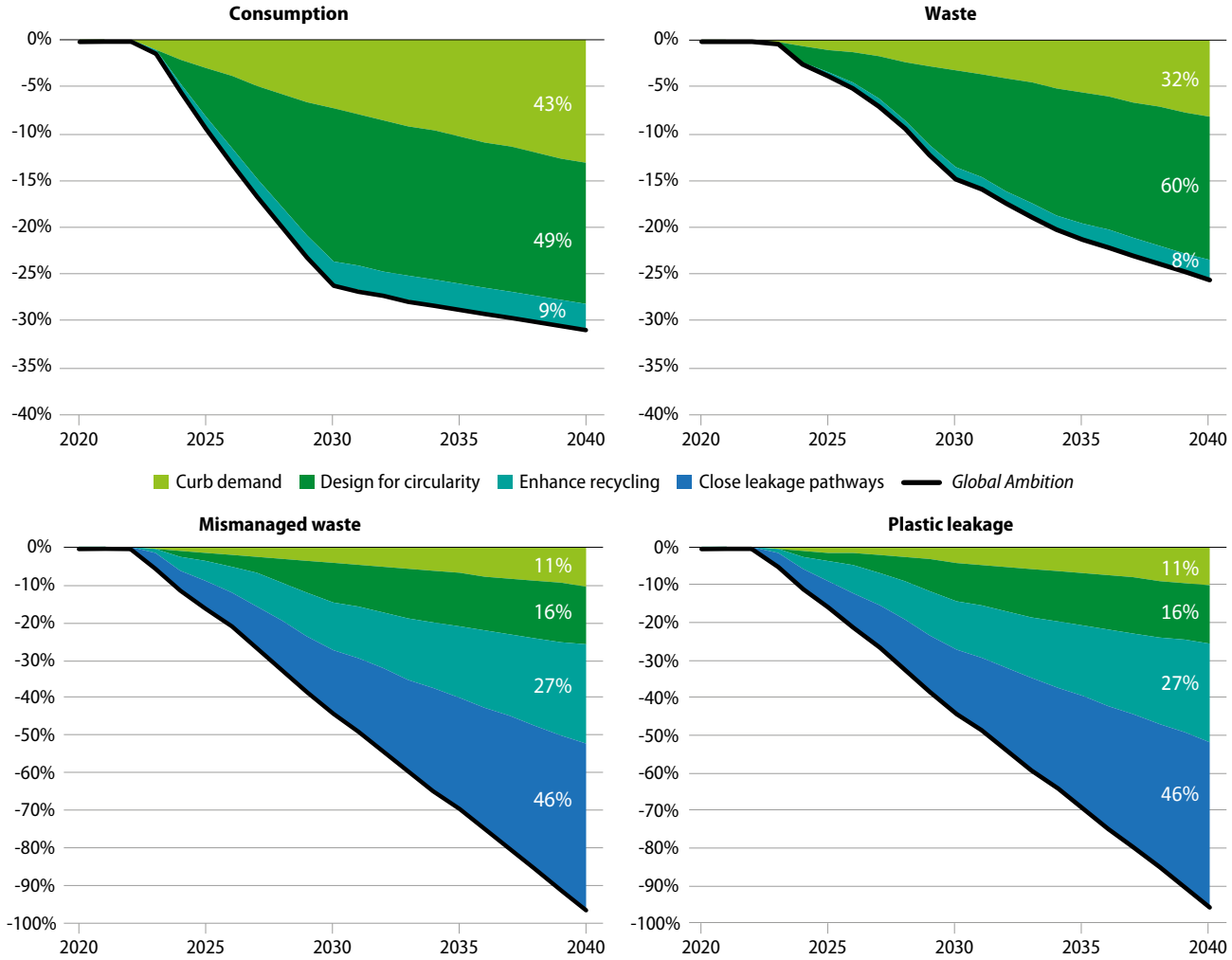
An ambitious scale-up of interventions downstream in the plastics lifecycle, including to achieve adequate waste collection and disposal in all countries, is needed and will be crucial to enable all countries to have appropriate waste management systems in place by 2040 and halt plastic leakage. While most developed countries already have pervasive municipal waste collection and treatment, this is not the case in a large share of developing countries. An urgent expansion of waste collection system is a crucial prerequisite to reduce mismanaged waste, as waste that is not collected is mostly mismanaged and may end up in natural environments or be burned informally, leading to serious adverse consequences for human health and natural ecosystems. At the same time, a scale-up of waste treatment infrastructure is required around the world, including in both OECD and non-OECD countries, to support recycling. The *Global Ambition* scenario would achieve an almost total elimination of mismanaged waste and plastic leakage by 2040 (see Figure 10). In countries with an advanced waste management system, plastic leakage is already steadily reduced in the *Baseline*, but in other regions the policy package overcomes a significant *Baseline* growth in the amounts of plastics that leak to the environment annually (Figure 12). The *Global Ambition* delivers substantial reductions in mismanaged waste also compared to *Uncoordinated Action* and *Moderate Alignment*.

Interventions that curb production and demand and incentivise eco-design are also pivotal, especially to reduce the volume of plastic waste to be collected and treated, as well as to mitigate adverse environmental and health impacts along the lifecycle. Policy measures in the *Global Ambition* scenario would reduce plastics use by one-third (both for packaging and non-packaging applications) compared to *Baseline*. As growth in plastics use is contained, the resulting waste is reduced by one-fourth compared to *Baseline* levels. The prevention of approximately 158 Mt of waste generation by 2040 (from *Baseline* levels) would help to relieve the burden on waste management systems around the globe. Importantly, projected waste generation in non-OECD countries would change from a doubling in the *Baseline* between 2020 and 2040 to 40% increase over the same time frame in the policy scenario. While plastics waste generation would continue to grow in the *Moderate Alignment* scenario without global, stringent upstream policies, in comparison the *Global Ambition* scenario would achieve an additional 68 Mt reduction in waste generation levels by 2040.

Policies that curb demand and foster design for circularity contribute to 27% of the overall reductions in mismanaged waste achieved by 2040, compared to *Baseline* levels. Importantly, the combination of extended lifespans for durable products, facilitated by improved design and

Figure 10: **Comprehensive, lifecycle policy approaches can reduce primary plastics use and nearly eliminate plastic waste mismanagement and plastic leakage by 2040**

Contribution of each policy pillar to reductions in plastic flows, % change from *Baseline*,*Global Ambition* scenario



Source: OECD ENV-Linkages model.

support for reuse and repair, generate reductions in the demand for plastics. More specifically, the reductions are achieved through the combination of the two sets of policies:

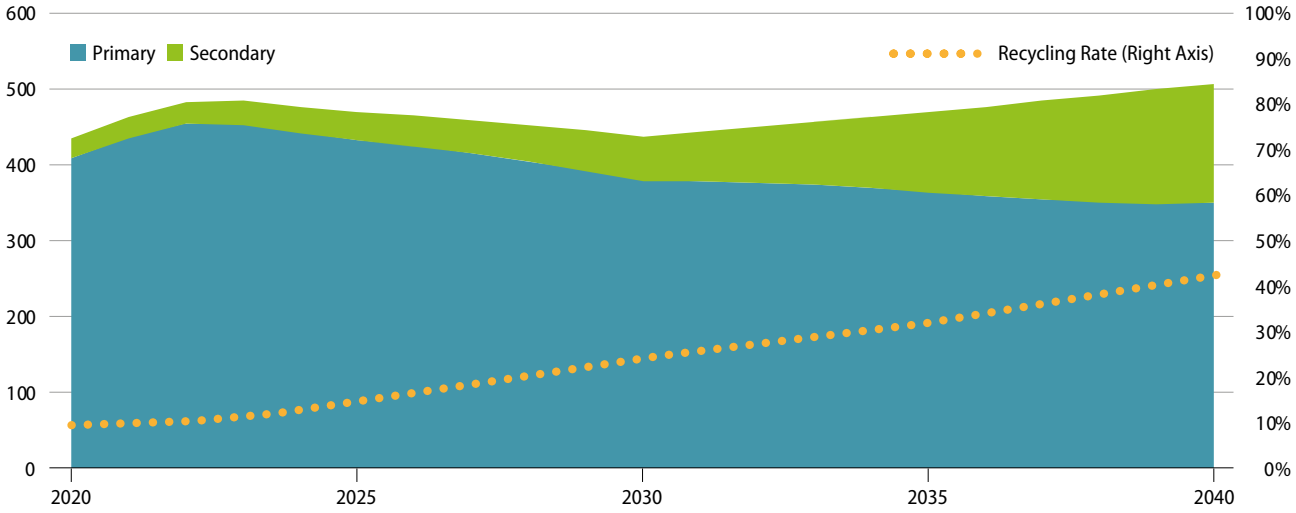
1. Policies that curb plastics production and use would deliver a 95 Mt (i.e., 14%) reduction in primary plastic production from *Baseline* levels in 2040 (Figure 11). Importantly, the pillar would help to reduce the sharp increase in demand for single-use and other short-lived packaging applications projected by 2040 in the absence of additional policies, which would contribute substantially to waste generation.

2. Strong advancement in design for circularity is essential to enable circular solutions all along the plastics lifecycle, such as safe reuse (including repair, refill, refurbishing, etc.) and recycling. By expanding the useful lifespan of products, improved design can reduce plastics demand. Targeted bans or taxes can help shift from avoidable short-lived or problematic plastics to alternatives that are safer and bear lower environmental footprints. Additionally, design criteria can enable substitution to alternative materials, where the shift has the potential to enable environmental or human health benefits. Together with the policies to curb demand, the use of short-lived packaging plastics would fall below *Baseline* by 50 Mt (21%) in 2040, compensating more than half of the *Baseline* growth between 2020 and 2040.

Together, these different pillars facilitate the transition to more circular plastics use: upstream secondary plastics production rises in parallel to the incresed availability of scrap from downstream recycling efforts.

Figure 11: The *Global Ambition* scenario reduces primary plastics production

Global plastics use (primary and secondary, left) and average recycling rate (right), Uncoordinated Action, Mt

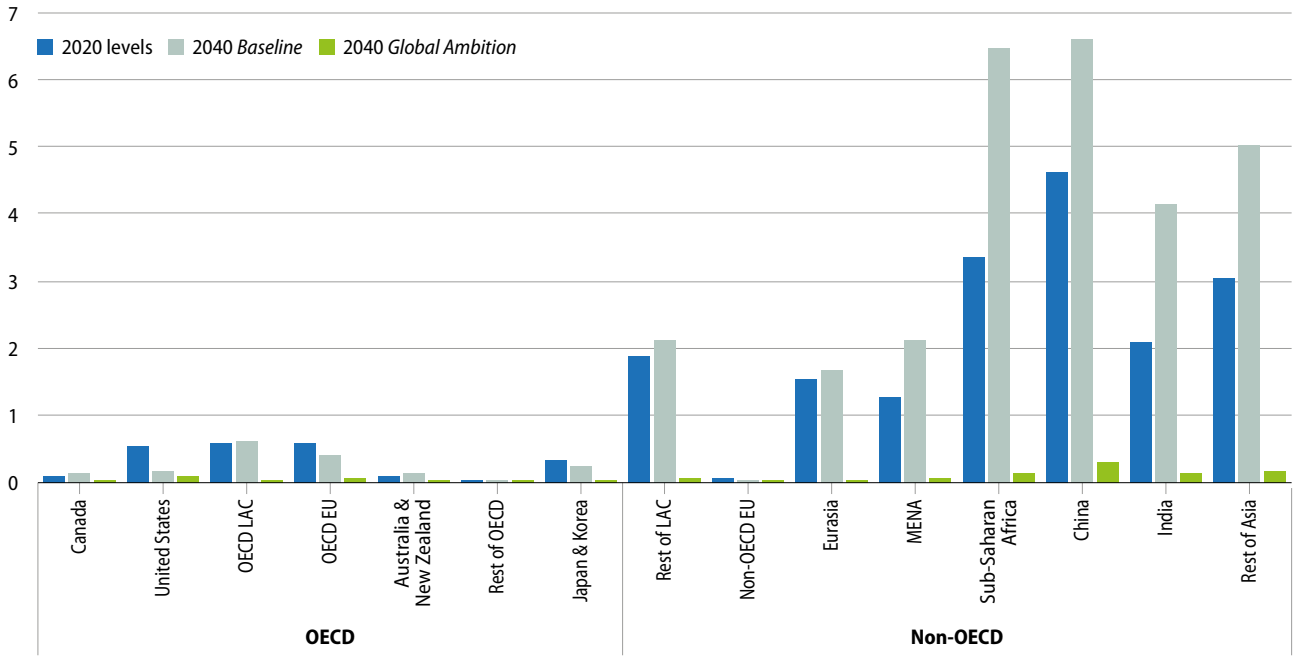


Source: OECD ENV-Linkages model.

While the combination of policies to curb demand and to foster eco-design and reuse would contribute to the one-third reduction in overall plastics demand, policies to enhance recycling and the use of recycled (secondary) plastic materials are crucial to accelerate the shift from primary to secondary plastics in production processes. Despite the effectiveness of the policy package for restraining plastic waste generation, the resulting levels of plastic waste are high enough to facilitate scrap use in secondary plastics production, provided international markets for scrap are facilitated and recycling losses are reduced. As a result, while annual plastic production is projected to grow modestly from 2020 levels (from 435 Mt to 508 Mt), the policy package ensures that secondary plastics can accommodate the additional demand. As a result, demand for primary plastics would be lower than in 2020.

Figure 12: The *Global Ambition* scenario nearly eliminates plastic leakage in all regions

Plastic leakage to the environment in 2020 and 2040 in Mt, *Baseline* and *Global Ambition* scenarios



Note: LAC = Latin America and the Caribbean, MENA = Middle East and North Africa.

Source: OECD ENV-Linkages model.

A reduction in plastic lifecycle GHG emissions is essential for achieving ambitious climate objectives.

7 Global Ambition by 2040 would reduce environmental pressures considerably

The *Global Ambition* scenario illustrates a viable pathway to achieve ample global benefits for present and future generations.

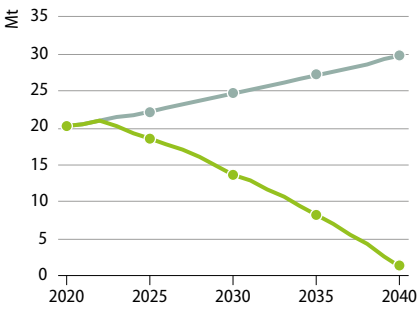
Compared to *Baseline*, by 2040 the *Global Ambition* scenario results in:

-96%
change in plastic leakage levels

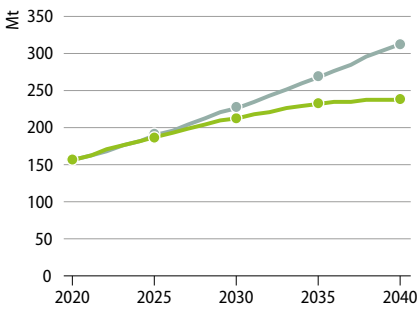
Avoided 75 Mt
of plastics accumulating in rivers and oceans

-41%
in plastics lifecycle GHG emissions levels

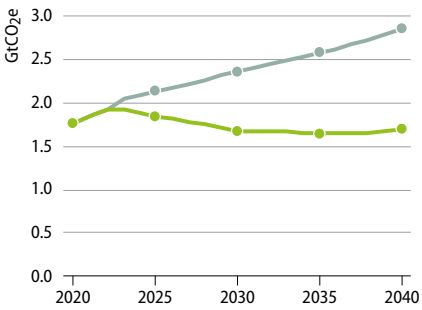
Plastic leakage



Accumulated stocks in rivers and oceans



Plastics-related GHG Emissions



Baseline *Global Ambition*

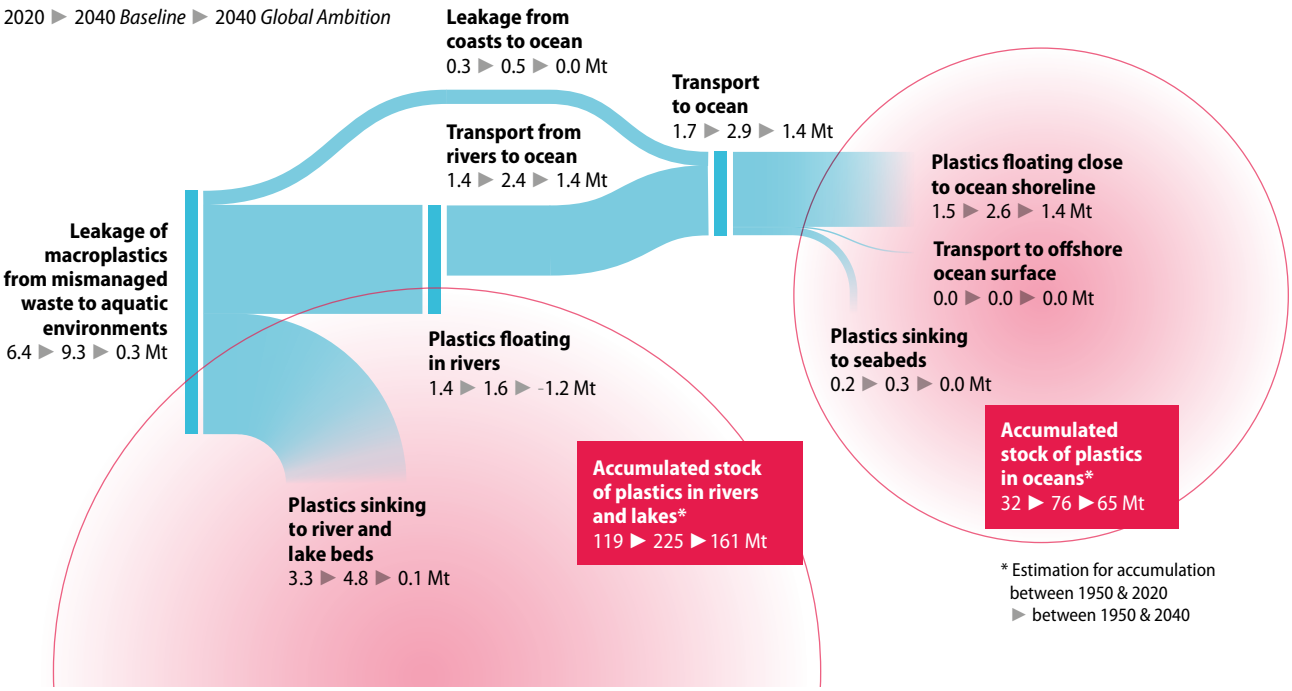
The comprehensive mix of upstream and downstream policies envisioned in the *Global Ambition* scenario holds promise of ample global benefits for ecosystems and human health. Plastics in the environment may carry hazardous chemicals to wildlife and humans. Plastics in the environment, including microplastics, may disrupt aquatic ecosystems, act as vectors for invasive species, and affect fisheries and tourism. The combination of waste prevention measures and improvements in waste collection and management delivers an almost immediate fall in the leakage of plastics to the environment and a near elimination by 2040.

Plastic pollution represents a multifaceted challenge with a wide range of adverse impacts that go beyond the visible presence of plastics in the environment. Importantly, the plastics lifecycle is closely linked to climate change, due to the fossil-based origins of most plastics and the domination of fossil-based primary plastics on current production and use. As discussed in (OECD, 2022[3]), a reduction in plastic lifecycle GHG emissions is essential for achieving ambitious climate scenarios, including net-zero emissions scenarios. Implementing the *Global Ambition* scenario could achieve a 41% reduction in plastics-related GHG emission levels (1.7 $GtCO_2e$ in 2040 versus 2.8 $GtCO_2e$ in *Baseline*) and prevent significant increases compared to 2020 levels. The scenario is likely to also deliver considerable benefits for human health, including the mitigation of adverse human health impacts generated by improper waste disposal practices, such as air pollution from open pit burning.

The scenario achieves very significant reductions of accumulated plastics in aquatic environments compared to *Baseline* levels, preventing up to 64 Mt in rivers and up to 11 Mt in oceans from being added to existing stocks. All major trajectories of plastics in aquatic environments are significantly reduced (Figure 9). Nonetheless, accumulated stocks of macroplastics in rivers and oceans will be significantly higher than in 2020 (161 versus 225 Mt in rivers and 65 versus 76 Mt in oceans, i.e., 226 Mt of total accumulation between 2020 and 2040 instead of 301 Mt under *Baseline*). This is despite the urgent and ambitious global action, as plastic leakage between 2020 and 2040 continue to build up in aquatic environments. By 2040, plastics continue to be transported from rivers to oceans while the input to rivers from terrestrial environments is largely eliminated. Thus, some flows, in particular plastics floating in rivers, can become negative, indicating that more plastics flow from rivers into oceans that that enter the rivers.

Figure 13: **The *Global Ambition* scenario reduces all aquatic plastic flows, but accumulated plastics increase significantly until 2040**

Plastic leakage to aquatic environments in million tonnes (Mt) in 2020 and 2040 in the *Baseline* and *Global Ambition* scenarios



Source: OECD ENV-Linkages model.

Microplastics are associated with a range of environmental problems and can have significant effects on human health, including acting as a potential carrier of hazardous chemicals.

BOX 4: **Strategies to halt microplastic leakage to the environment will also be required**

Microplastic pollution is an emerging threat to ecosystem and human health. Owing to their small size, microplastics are particularly likely to be ingested by aquatic species, and they have been found in the digestive tracts of several aquatic and terrestrial species. Microplastics are associated with a range of environmental problems and can have significant effects on human health, including acting as a potential carrier of hazardous chemicals.

Microplastic leakage is projected to worsen in all regions

Macroplastic leakage per capita tends to decrease in middle and high income countries, not least because waste management systems improve. In contrast, microplastic leakage continues to increase with rising income levels, although some saturation occurs at higher levels of income (OECD, 2022[3]). Interventions to address the emission and leakage of microplastics are generally less advanced, as this form of pollution occurs all along the lifecycle of products and policy action remains limited currently by the lack of detailed understanding of the effectiveness of possible interventions. The Global Plastics Outlook (2022[3]) Baseline scenario projects that all countries would witness a rising trajectory for microplastic leakage in the coming decades, from 2.7 Mt in 2020 to 4.1 Mt in 2040.

A scaling up of policies specifically targeting microplastic leakage will be required, and further research is needed to evaluate their cost-effectiveness.

Due to data and information limitations, the *Global Ambition* scenario includes only a limited set of policies specifically targeting microplastic leakage, such as bans on microplastics intentionally added to some products. The majority of microplastic leakage reductions in the scenario stem from reductions in overall plastics use or expected improvements in end-of-pipe capture (e.g., via wastewater and stormwater collection and treatment), but this has not been included in the modelling analysis. While the reduction of macroplastic leakage could mitigate the generation of microplastics from the degradation of existing pollution, microplastic leakage will persist (OECD, 2022[3]).

In the future, policies that can specifically mitigate the leakage of microplastics will need to form an important part of the policy mix, to ensure effective mitigation of microplastic pollution. Possible approaches and policy measures may include (OECD, 2021[10]):

- Bans or restrictions on intentionally added microplastics;
- Eco-design criteria to minimise the tendency of products to generate microplastics;
- Behavioural change to uptake best practices by consumers (e.g., eco-driving) as well as industry (e.g., in the handling of pre-production pellets);
- End-of-pipe approaches, such as improved wastewater, stormwater and road runoff management and treatment, to retain the emitted microplastics before these enter the environment; and
- Standards or best-available techniques to advance the implementation of technologies and processes that prevent the release of microplastics to the environment (e.g., industrial, commercial and domestic filters).
- Clean-up of existing plastics, i.e. removal of legacy plastics, can also contribute to reducing microplastics in the environment.

Further research is necessary to evaluate the cost-effectiveness of possible mitigation options and inform the choice of policy interventions.

8 Co-ordinated approaches can limit the costs of action

The macroeconomic consequences of the ambitious package of policies envisioned in the *Global Ambition* scenario are limited to 0.5% of global GDP by 2040.

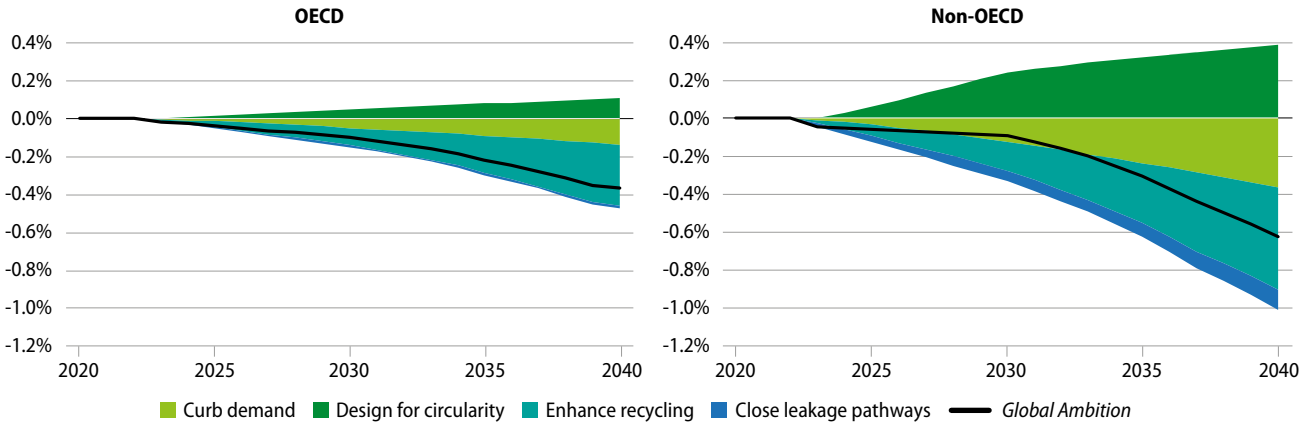
The macroeconomic costs presented in this section only concern costs that could be included in the modelling framework, i.e., the expected costs of implementing the envisioned policy instruments. However, substantial economic benefits would result from the reduced pressures on the environment, climate and human health along the plastics lifecycle, including reduced adverse impacts for ecosystems, climate change, human health and livelihoods. Even if these economic benefits have not been included within the scope, it is expected that these would largely offset the quantified costs (OECD, 2022[3]).

There are significant differences in the macroeconomic impacts of the *Global Ambition* scenario, across its policy pillars. Policies to enhance recycling are the largest contributors to macroeconomic costs. Policies to design for circularity are at the other end of the spectrum. These include some policies that can bring both economic and environmental benefits, as they focus more on improving the economic efficiency of plastics use (i.e., reducing the plastics intensity of the economy). These measures are not profitable in the *Baseline*, where plastics remain cheap, but they become cost-effective when combined with policies that increase the costs of primary plastics use (e.g., plastic taxes contained in the Curb demand pillar). Overall, the costs are substantially higher in non-OECD countries (0.62% GDP loss from *Baseline* in 2040) than in OECD countries (0.37%) (Figure 14).

Even if a reduced ambition in the lifecycle coverage of plastics policies could lead to lower macroeconomic consequences of the policy packages, this could translate into lower environmental benefits as well as additional economic costs if the policy package is unbalanced (Figure 15). *Uncoordinated Action* represents the former case: as the level of policy stringency and international co-ordination is lower, both costs (in the narrow sense of GDP impacts excluding avoided costs of inaction) and benefits are substantially reduced. The *Moderate Alignment* scenario leads to the largest macroeconomic costs of all scenarios, especially in non-OECD countries. In this scenario, non-OECD countries focus on downstream action, and thus combine ambitious targets for recycling and plastic waste management with large volumes of plastic waste being generated. For OECD countries, both the level of ambition and the macroeconomic costs are comparable to the *Global Ambition* scenario.

Figure 14: **The macroeconomic costs of the *Global Ambition* scenario vary by policy pillar and region**

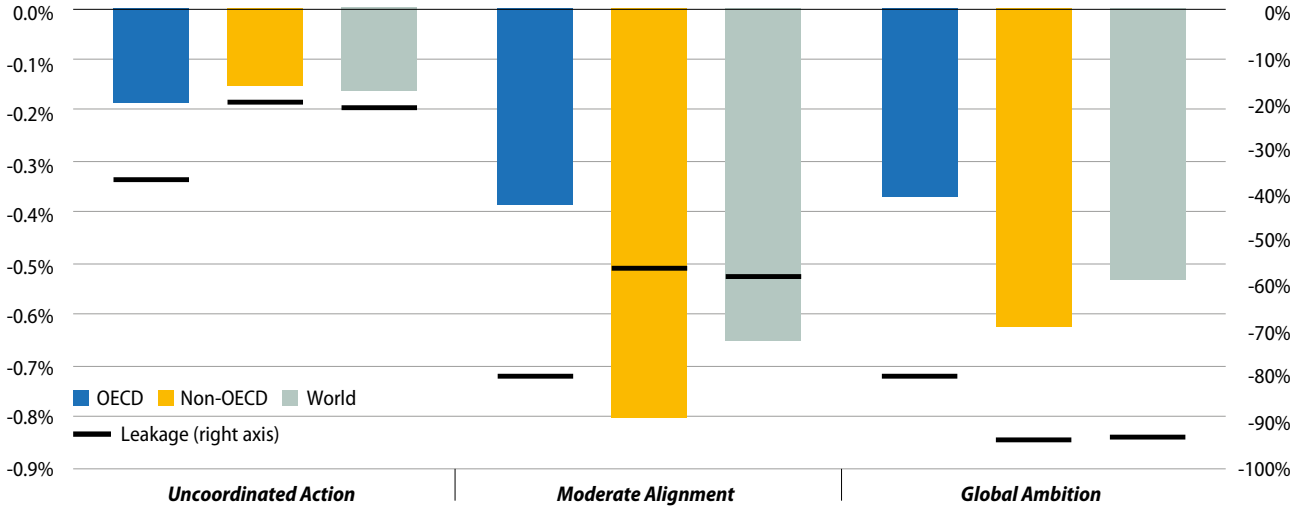
Contribution of each policy pillar to changes in GDP, % change from *Baseline, Global Ambition* scenario



Source: OECD ENV-Linkages model.

Figure 15: **The *Global Ambition* scenario combines strong environmental benefits with limited costs**

Change in GDP (left axis) and leakage (right axis), change from *Baseline*



Note: the lower reduction in leakage in OECD countries compared to non-OECD countries in the Moderate Alignment and Global Ambition scenarios reflects their lower share of mismanaged waste, not a lower ambition level.

Source: OECD ENV-Linkages model.

Enhancing waste collection, sorting and treatment accounts for a substantial portion of the macroeconomic costs of the policy scenarios. In the *Baseline* scenario, OECD countries would jointly invest more than a trillion USD in plastic waste management between 2020 and 2040, and non-OECD countries a similar amount, adding up to 2.1 trillion globally (Figure 16). The policy packages have two distinct effects on these investment needs: on the one hand, the upstream measures can reduce total plastic waste volumes, thereby reducing the costs of collection, sorting and treatment. But on the other hand, the downstream measures imply larger shares of waste (and litter) are collected, and more expensive waste management options are used, not least for recycling. On balance, these net policy-induced changes in plastic waste treatment costs tend to be small in OECD countries, but positive in non-OECD countries (Figure 16).

For OECD countries, where mismanaged waste levels are already largely eliminated in the *Baseline*, the additional costs are concentrated in recycling activities, with additional costs of more than 120 billion (bln) USD over the 2020-2040 period in the more ambitious *Moderate Alignment* and *Global Ambition* scenarios, versus 93 bln USD in the less ambitious *Uncoordinated Action* scenario. These don't reflect a net cost as the upstream measures reduce waste volumes and thus lower (operational) costs of all treatment methods. The effects of combining upstream and downstream measures are clear in the net costs of waste collection, sorting and treatment in non-OECD countries in the *Global Ambition* scenario, which on balance increase by a relatively modest 50 bln USD over *Baseline* levels, reflecting a larger share of a smaller volume of waste.

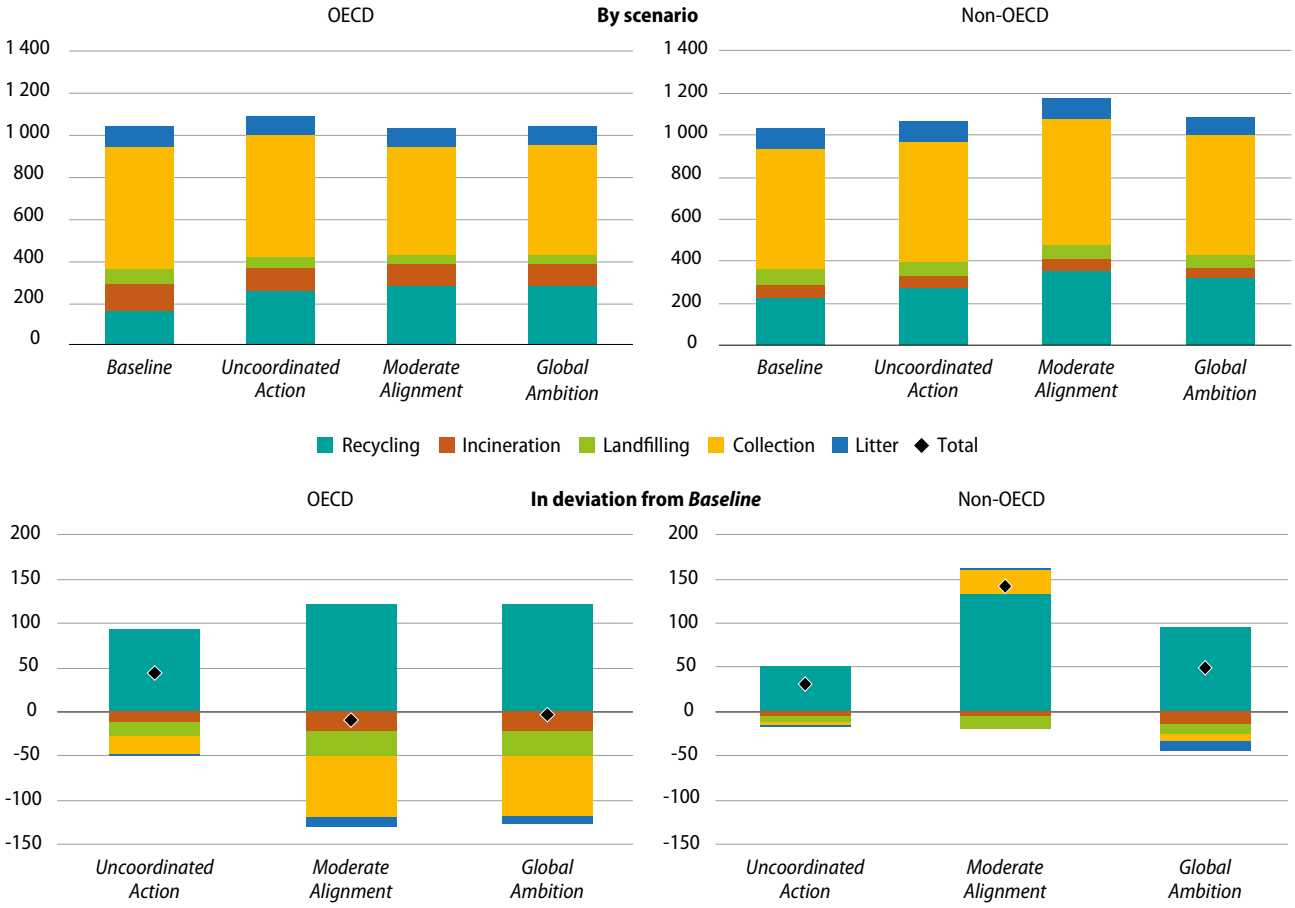
Growth in waste generation in the less ambitious scenarios exacerbates the scale of the problem to be managed and threatens to strain waste collection and management systems, especially in rapidly growing low- and middle-income economies. As plastics use and waste remain unchecked, some countries would face considerably higher costs and investment needs, while leakage would persist. In the *Moderate Alignment* scenario, the required additional costs between 2020 and 2040 in non-OECD countries to establish the waste management systems necessary to set up recycling activities at the scale required would reach USD 164 bln, while the avoided costs of incineration and landfilling is limited to USD 20 bln.

Finally, technical uncertainties could complicate the viability of over-reliance on downstream measures and inflate the economic costs. Technological constraints, including the time needed to establish sanitary landfills or recycling facilities, may impede a rapid deployment. Additionally, as the scenario assumes rapid recycling expansion across all regions, concerns emerge regarding the availability of sufficient scrap materials, and the functioning of international scrap markets, to sustain this ambitious recycling effort.

In conclusion, prioritising downstream policy interventions could contain mismanaged waste, but the approach is likely to fall short in tackling the root drivers of plastic pollution, not least due to the significantly higher investment needs in the absence of sufficient waste reductions and the possible technical constraints. There is considerable uncertainty around the possible viability and cost-effectiveness of a downstream-oriented strategy. Downstream-focused strategies in low- and middle- income countries hinge on assumptions that nations that currently lack robust waste management collection and management systems can swiftly implement the necessary policies and investments. A common understanding of the need for lifecycle approaches is likely to be the most cost-effective strategy to achieve the global goal of eliminating plastic pollution.

Figure 16: **Focusing on downstream policies increases waste management costs**

Cumulative waste management costs for 2020-2040 by region and treatment category, USD bln



Source: OECD ENV-Linkages model.

9 Slower global action could reduce macroeconomic costs, but at the expense of substantially lower environmental and climate benefits

The ***Delayed Ambition*** scenario models the same policy package as the ***Global Ambition*** scenario but over a longer timeframe, aligned with a 2060 target for the elimination of plastic leakage.[4]

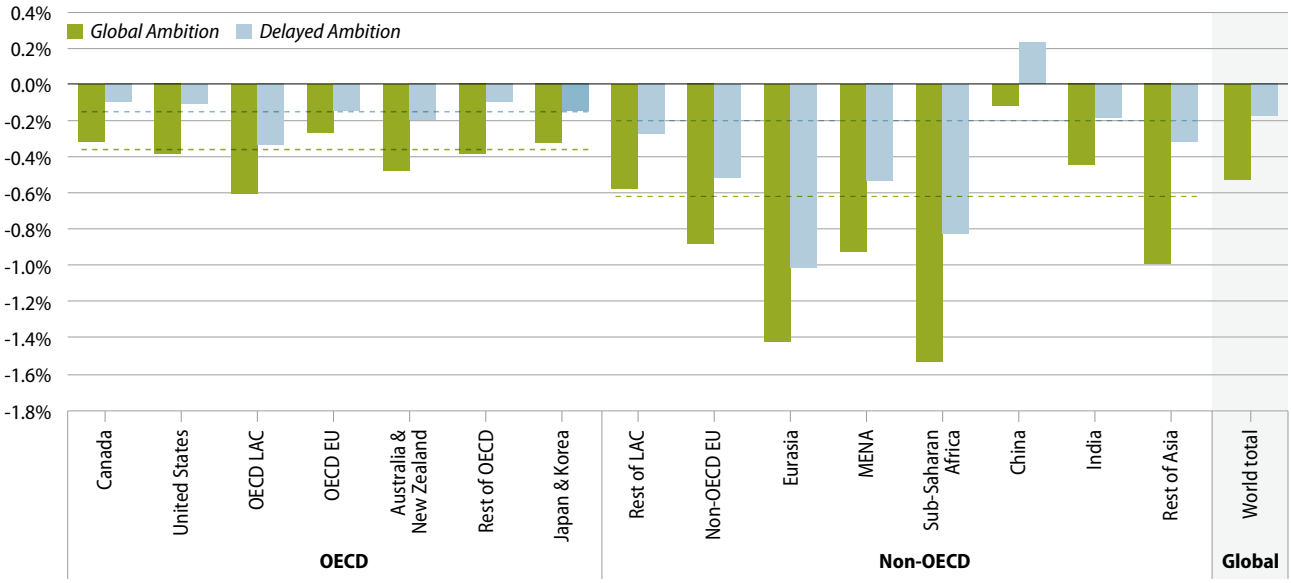
Curb demand	Design for circularity	Enhance recycling	Close leakage pathways
Stabilise primary plastics use below 2030 levels by 2060	Reduce plastics intensity by 30% from 2020 levels by 2060	Increase global plastics recycling rate to 58% by 2060	Eliminate plastic leakage by 2060

Delayed action (aligned with a 2060 target) would have short term economic benefits but longer term societal and environmental repercussions.

Implementing the *Global Ambition* scenario over a longer timeframe, pushing the target for the elimination of plastic leakage to 2060 (*Delayed Ambition*), could limit macroeconomic costs to 2040 to 0.2% of global GDP compared to 0.5% for *Global Ambition* (Figure 17), whereas longer-term costs would be very similar. The economies

Figure 17: **Slower ambition can limit transitional macroeconomic costs**

Impact on GDP in percentage change from *Baseline*, 2040



Notes: The dashed lines represent average impact on GDP for OECD (left) and non-OECD (right) countries. LAC = Latin America and the Caribbean, MENA = Middle East and North Africa.

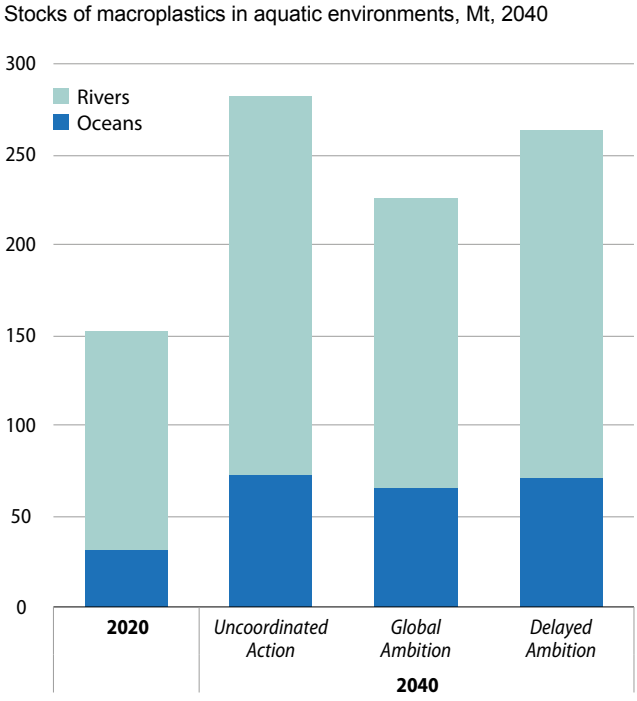
Source: OECD ENV-Linkages model.

4. The ambition for the global plastics recycling rate by 2060 is higher than the ambition for 2040 in the Global Ambition scenario, reflecting that technological barriers to recycling are likely to diminish over time. The target of 58% is aligned with the *Global Plastics Outlook*.

in all countries benefit from a slower implementation of the policies, and a slower restructuring of their waste management systems; reduced ambition levels by 2040 also contribute to keeping macroeconomic impacts small. Furthermore, when the ambition to eliminate plastic leakage is delayed, some countries can reap a temporary competitiveness gain when they have relatively modest targets and significant capacity to enhance recycling. This is due to the assumption that policy stringency is tightened faster for OECD countries first than for non-OECD countries, which causes the rise in production costs to be less for some exporting sectors in Asia (notably China), allowing them to benefit from the consequent temporary increase in competitiveness (OECD, 2022[3]). This, however, is an exceptional case, and in no way set to continue, as all countries would gradually tighten their policies to meet the common global target. This temporary rise in GDP also does not take into account the environmental externalities associated with having a delayed target, namely through missed opportunities to avoid additional plastic leakage and pollution, which would imply higher clean-up costs in the future as well as significant negative effects on well-being through health and environmental damages.

Importantly, delayed action would impose a significantly larger burden on present and future generations (Figure 18; Box 4). Mismanaged waste would fall relatively slowly and 64 Mt of waste would still be mismanaged in 2040. Similarly, levels of plastic leakage would only fall by 1.1% annually at the global level over the 2020-2040 period (versus 13% in *Global Ambition*), meaning that around 16 Mt of plastics would still leak into the environment annually by 2040. As a result of the slower pathway to zero plastic leakage, an additional 38 Mt of macroplastics would accumulate in aquatic environments alone over the 2020-2040 period. As more plastics accumulate in aquatic environments, they tend to degrade into smaller microplastics and become harder, or virtually impossible, to remove and thus the additional aquatic leakage poses more severe environmental consequences. Finally, a slower pathway would also imply an additional 3.9 Gt CO_2-eq. of plastics-related GHG emissions levels between 2020 and 2040, compared to *Global Ambition*.

Figure 18: **Delayed action amplifies plastic pollution in rivers and oceans**



Source: (Lebreton, 2023[5]), based on OECD ENV-Linkages model projections.

BOX 5: **Comparison of Delayed Ambition to Global Ambition, by 2060**

Delaying policy ambition from 2040 to 2060 implies that plastic leakage continues after 2040, leading to a range of negative outcomes between 2040 and 2060: higher waste investment costs to handle larger volumes of waste, more plastic accumulated in rivers and oceans and higher GHG emissions.

By 2060, compared to the ***Global Ambition*** scenario, the ***Delayed Ambition*** scenario would result in:

+ 936 Mt additional plastic wasteover 2020-2060	**+ 297 Mt** additional plastic leakage over 2020-2060	**+ 7.2 Gt CO_2-e** in GHG emissions levels over 2020-2060	**+ 92 Mt** accumulated plastic stocks in rivers and oceans

Source: OECD ENV-Linkages model.

10 Global ambition will require overcoming a number of challenges and strong international co-operation

The policy scenarios also point to several challenges that policymakers and stakeholders will need to overcome, including implementing effective policy instruments to:

1. Curb production and demand, including via improved design (including for safe reuse and repair) and the implementation of reuse systems

The stylised policy package modelled in this report assumes all countries are capable and willing to include taxes (and regulations) on plastics production or use. To accommodate specific country circumstances, taxes could be avoided if other, equally effective instruments are found to incentivise a reduction in plastics use. Furthermore, for significant reductions in plastics demand to be achieved, structural changes may be required. As part of an overall containment of plastics use, the *Global Ambition* scenario would see a dramatic reduction in plastics demand for packaging applications, which is expected to grow by 70% under *Baseline* by 2040. Rethinking product design, including to prolong lifespans or improve recyclability, can present technical and economic barriers. The elimination of selected plastics polymers, additives or applications is a complex endeavour that entails identifying problematic and harmful plastics, avoiding risks of regrettable substitution and encouraging innovation. Governments should consider policy frameworks that incentivise design for circularity as well as the adoption of new business models by businesses.

2. Enhance waste collection, sorting and treatment, especially in several developing countries

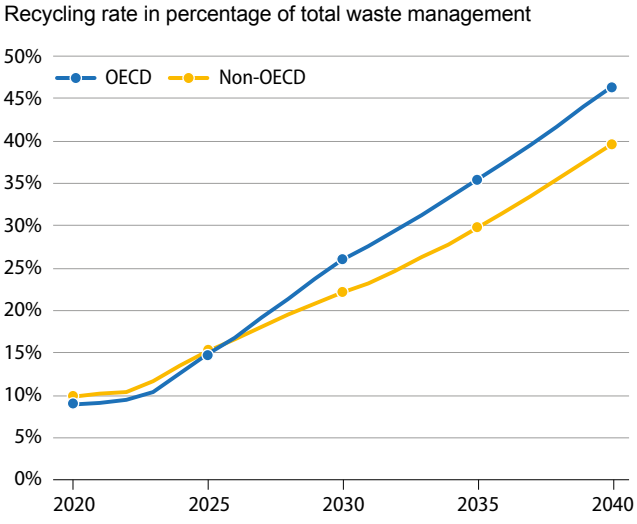
Achieving the ambitions of the policy scenario will require strong improvements in waste collection and sorting, especially in several developing countries. Many low- and middle-income countries tend to have lower use and waste generation rates, compared to developed economies. However, these countries lack well-functioning waste collection and management services, often resorting to informal waste picking and practices like open dumping and burning that exacerbate environmental and human health concerns. Governance challenges as well as the limited financial resources currently hinder the rapid establishment of effective waste management infrastructure.

To support the expansion of efficient collection and sorting systems in all world regions, policies such as EPR schemes and waste collection targets have proven to be effective. Improvements in the collection, sorting and treatment of plastic waste are expected to be part of general enhancements in waste management (that are not necessarily targeting specific materials or waste streams). Restraining demand can play an effective role in keeping the costs of waste collection and treatment contained (see Section 8), but international support will be pivotal.

3. Encourage improvements in recycling

The *Global Ambition* scenario foresees a near-total elimination of mismanaged waste and expects recycling to play a major role, rising rapidly to cover 42% of waste generated in 2040 (Figure 19). This would correspond to a quadrupling of the average global recycling rate (from 9.5% in 2020). Both available recycling technologies and the availability of scrap limit the expansion of the rate of recycling. Achieving the ambitions of the policy scenario will require strong improvements in recycling and reductions of recycling losses. Scaled investments in recycling technologies, combined with upstream interventions (including improved design for recycling), are required to expand the sources of viable feedstock for mechanical recycling.

Figure 19: **The *Global Ambition* scenario projects strong advancements in recycling**



Source: OECD ENV-Linkages model.

As the scenario relies on the assumption that high recycling rates can be attained for all waste streams and polymers (including those that are barely recycled at present) mainly via mechanical recycling technologies,[5] major technical breakthroughs may be required to enable the large-scale switch from primary to secondary plastics for all polymers and a consequential reduction in environmental impacts. Should these substantial technical breakthroughs fail to materialise, meeting the ambitions of the policy package will require heightened ambition on other parts of the policy package, for instance via induced reductions in the use of hard-to-recycle polymers or via stronger overall demand reductions.

4. Enhance municipal litter management

Reducing the volume of litter that remains uncollected is an important pathway to reduce leakage. It is likely impossible to collect all litter, but the policy package assumes a significant increase in litter picking rates and street sweeping in all regions, on top of the improvements assumed in the *Baseline* that stem from increased income levels. The required increases are especially high in Africa and India, where litter collection rates are assumed to go from 65% in *Baseline* to 75% in the policy scenario. Globally, the avoided leakage from improved litter removal is projected to be more than 1.2 Mt by 2040.

5. Encourage research to support the implementation of cost-effective policy measures targeting microplastic leakage.

Microplastic pollution is an emerging threat to ecosystem and human health. Due to data and information limitations, the *Global Ambition* scenario includes only a limited set of policies specifically targeting microplastic leakage, such as bans on microplastics intentionally added to products. The majority of microplastic leakage reductions in the scenario stem from reductions in overall plastics use or expected improvements in end-of-pipe capture (e.g., wastewater treatment). Additionally, reductions in macroplastic leakage could mitigate the generation of microplastics from the degradation of existing pollution. However, policies that can specifically mitigate the leakage of microplastics will also need to form an important part of the policy mix, to ensure effective mitigation of microplastic pollution. Further research is necessary to evaluate the cost-effectiveness of possible mitigation options and inform the choice of policy interventions (see also Box 3).

5. Due to concerns with the feasibility and the environmental impacts of chemical recycling, the scenario analysis assumes that mechanical recycling technologies are the primary type of recycling technology adopted by countries. reflected in this scenario.

6. Ensure strong international co-operation and support

Achieving the elimination of plastic leakage to the environment would incur macroeconomic costs of approximately 0.5% of global GDP by 2040, compared to *Baseline*. While the benefits of the transition to plastic pollution-free economies is likely to benefit all countries, the economic costs are projected to be significantly higher in developing countries, suggesting a strong need for enhanced international co-operation to achieve these benefits.

While more ambitious policy action is needed in all countries to help move from a linear to a circular plastics economy and effectively end plastic pollution, it is important to recognise that a heavier burden is placed on developing countries (including small island developing states). The macroeconomic costs are larger for developing countries than for developed countries in all policy scenarios modelled except *Uncoordinated Action* where the costs are small and roughly equal. However, especially in the *Global Ambition* scenario, macroeconomic costs (as a share of GDP) are increasingly borne by non-OECD countries. For instance, the overall costs of the *Global Ambition* scenario are limited to 0.5% of global GDP (by 2040), but Sub-Saharan Africa is expected to experience the largest macroeconomic impacts, reducing its GDP by 1.5% below the *Baseline* (see Figure 17 in Section 9). These countries often exhibit fast growth in plastics use and waste mismanagement, and concurrently, they can be particularly vulnerable to the detrimental consequences of plastic pollution, especially when they rely heavily on sectors such as fisheries and tourism.

7. Ensure that adequate financing of waste treatment is available, in parallel to support for solutions that may contribute to waste prevention

The burden of policies and investments required falls more heavily on developing countries, especially those that currently have less advanced waste management systems. In the *Baseline* scenario, the largest increases in plastics use are projected to occur in non-OECD economies already characterised by high rates of waste mismanagement and leakage to the environment. In the absence of more stringent policies, this could lead to an increase in waste generation that far outpaces parallel improvements in waste collection and management. For instance, Sub-Saharan Africa and the Middle East and North Africa regions are projected to represent an increasing share of global mismanaged waste over time, as their relatively fast growth of plastics use and waste combines with relatively weak waste management systems. A vast number of countries where substantial increases in waste generation are expected do not yet have the necessary waste collection and treatment systems in place to prevent the mismanagement of waste and the related environmental impacts.

This specific context underscores the critical role of developing countries in the global fight to end plastic pollution. Scaling-up infrastructure investments in developing countries is a key requisite to eliminate plastic leakage globally, in particular to enhance waste management. Investment needs for waste management systems in non-OECD countries would amount to more than USD 1 trillion over a 20-year period in the *Global Ambition* scenario. It is also essential to establish reliable and sustainable revenue streams to pay for the operation of these improved and expanded waste management systems. For instance, the establishment of Extended Producer Responsibility schemes in developed countries has proven to be effective to help cover the cost of separate waste collection, sorting and recycling. Beyond waste collection and management, directing investments towards upstream stages of the plastic value chain is crucial to promote circular consumption patterns and alleviate the burden on waste management systems. Strategies may include supporting solutions to reduce avoidable and problematic plastics, promote

more reuse and repair, as well as fostering eco-design. Strong international co-operation will be required to support the much-required investments and innovation in developing countries, both via public (domestic and international) and private sources of financing, as well as to collaborate on capacity building, governance and technological transfer.

In addition to policy shifts, major redirections of plastics-related investments will be required all over the world. Focusing on waste and recycling only, in the *Baseline* scenario, both OECD and non-OECD countries need to invest more than 1 trillion USD over the 2020-2040 period to deal with increasing plastic waste volumes, for a global total of 2.1 trillion USD. In the policy scenarios, these needs amplify as collection, sorting and recycling waste is more expensive than e.g., using dumpsites, unless sufficient upstream action lowers total waste volumes enough to allow a reorientation of waste management rather than an expansion.

8. Align financial flows with the objectives of the legally binding instrument on plastic pollution and explore options to tap into other sources of finance

The initial financial outlays of improved waste management are very significant, especially in developing countries that rely heavily on informal waste management practices currently. Also given the crucial contribution of developing countries to ending plastic pollution, this requires adequate development financing, including potentially a re-orientation and scale-up of Official Development Assistance (ODA). New approaches to fill the financing gap and mobilise more resources include "(i) supporting initiatives to scale up total resources available to curb plastic pollution in developing countries, including from the private sector; (ii) enhancing global targeting of existing resources and their alignment to country needs and priorities; (iii) adopting international good practices and fostering innovation; and (iv) promoting mutual learning and developing guidance for more effective development co-operation in this area" (Agnelli and Tortora, 2022[11]).

Beyond scaling up recycling and enabling the substitution of primary plastics with secondary plastics, redirections of investments will be required to support upstream solutions, including to implement reuse systems for packaging and products. The alignment of financial flows, from both public and private sources, with the objectives and targets of the legally binding instrument being negotiated is key to enable a comprehensive transition across the entire lifecycle of plastics.

Sub-Saharan Africa and the Middle East and North Africa regions are projected to represent an increasing share of global mismanaged waste over time, as their relatively fast growth of plastics use and waste combines with relatively weak waste management systems.

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Plastic pollution represents a multifaceted challenge with a wide range of adverse impacts that go beyond the visible presence of plastics in the environment. Comprehensive policies that tackle the full lifecycle of plastics are urgently needed to control plastics demand, increase the circularity of plastics, close leakage pathways and bolster recycling rates.

These interim findings of the forthcoming OECD report ***Towards Eliminating Plastic Pollution by 2040: A Policy Scenario Analysis*** examine the environmental and economic implications of various levels of policy ambition across countries in the global fight against plastic pollution. The most ambitious scenario (Global Ambition) identifies a package of policy interventions that could achieve a sustainable and circular plastics economy, charting a path towards the elimination of plastic pollution by 2040. The policy package contained in the scenario targets the full lifecycle of plastics by curbing plastics demand, designing for circularity, closing leakage pathways and enhancing recycling. The report also highlights potential bottlenecks and priorities ahead to achieve these ambitions, for instance in terms of costs, financial support and well-functioning markets for recycled materials. Three additional scenarios examine the environmental (including pollution and GHG emissions) and economic implications (including macroeconomic consequences and waste management costs) of lower levels of ambition and international co-ordination. Overall, the report provides important insights on some of the key issues in ongoing negotiations for an international legal instrument.

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