

# Executive Summary

Where Is the Value in the Chain?

Pathways out of Plastic Pollution



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# Executive Summary

## Plastic Pollution, a Development Challenge Resulting from Multiple Market and Policy Failures

Plastics have been a development driver for decades but have turned into a development problem because of their omnipresence in the environment. Plastics have become ubiquitous in modern life, given their unique properties. In recent decades, however, the downside of plastic consumption to society has become apparent as plastic waste has incurred huge costs to the environment, biodiversity, livelihoods, and human health. In addition, the impacts of plastics on climate change are already considerable and are expected to increase.

Marine litter and plastic pollution have attracted much attention and many commitments from governments and the private sector alike in the past few years. The adoption in March 2022 of a resolution to establish an intergovernmental negotiating committee to develop a legally binding global instrument to end plastic pollution in the world's oceans, rivers, and landscape demonstrates willingness to act. The resolution has received broad support from the private sector.

Policies to curb plastic pollution have had limited success in many developing countries because of various market and policy failures. These failures create a vicious cycle of distorted production patterns and consumer preferences, resulting in the entrenched linear, throwaway plastic value chain model. The challenges range from lack of data with which to properly understand the problem in the first place, to misaligned incentives and financing, to capacity constraints in implementing existing and new policies.

Policy and market failures create bottlenecks and broken links in the plastic value chain and prevent market-based investment and consumption decisions toward plastic circularity:

- There is a lack of incentives to influence decisions of producers and consumers of plastic materials and products before they become waste. Existing policies to address plastic pollution usually focus on waste management, although some countries try to ban or charge for the use of certain plastic products, and extended producer responsibility systems are emerging. While improving waste management systems is fundamental, it is not enough to prevent plastic pollution. Without incentives for upstream reduction of consumption of single-use plastics, the exponential volumes of waste overstretch downstream waste management systems. This risk is even more acute in countries with weak capacity and governance in the solid waste management sector.

- Government interventions are often fragmented and incoherent. This results in limited success of policy instruments, excess burden on public budgets, and the risk of shifting the problem from one place to another rather than solving it comprehensively. An example is an upstream state support to plastic producers (such as subsidizing hydrocarbons used in the petrochemical industry) coexisting with downstream subsidies to waste management; they cancel each other's effects and waste public funds.
- Many governments do not consider the environmental and societal costs of plastics and their alternatives when formulating targets and developing policies. Unlike other pollution problems, the external costs of plastics are generated not only at different stages during production and consumption, but also in multiple places in the postconsumption phase, after the plastic product has become waste. This complexity, exacerbated by multiple interest groups operating along the plastic life cycle, often clouds the decision-making process.

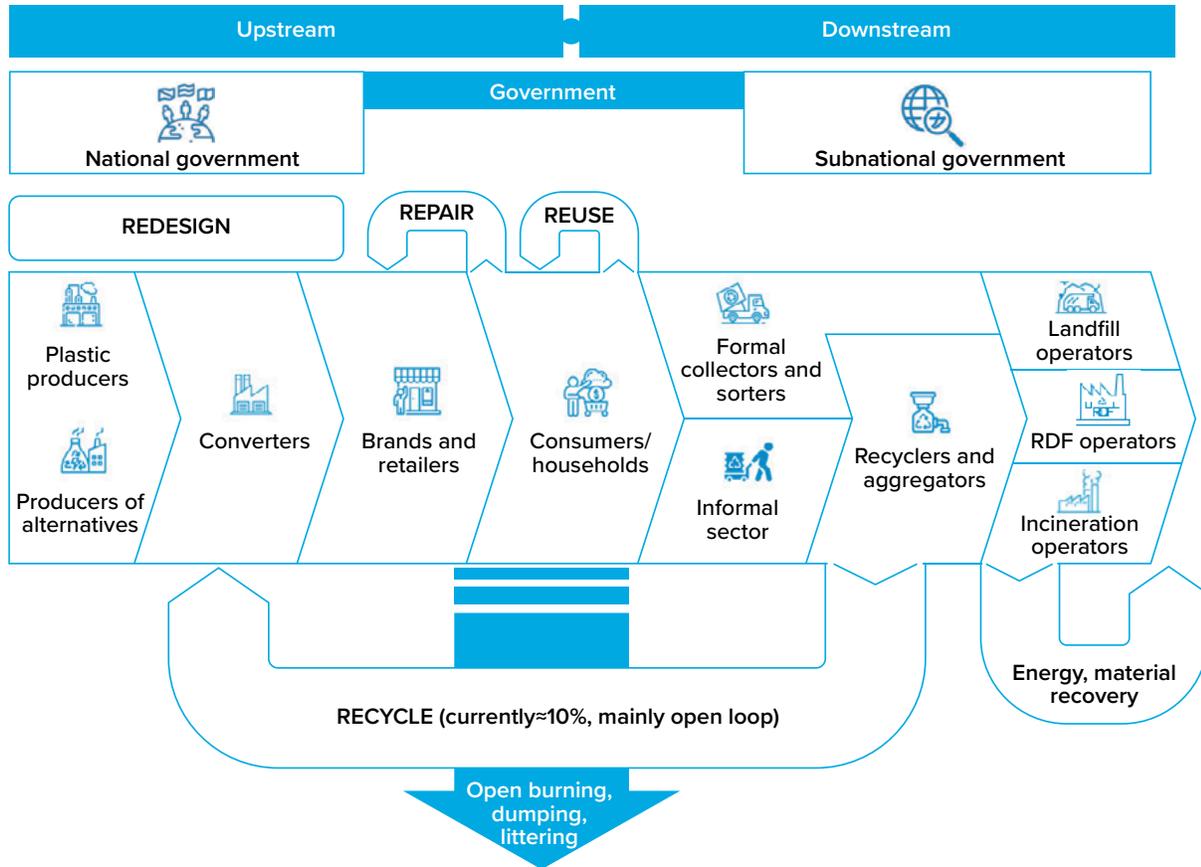
## **Need for Comprehensive Mixes of Coherent Plastic Management Policies**

The Pathways out of Plastic Pollution (3P) analysis highlights that a comprehensive mix of coherent policy instruments is needed to prevent plastic pollution. In other words, policies should align incentives for multiple actors operating in the whole plastic life cycle to jointly contribute to sustainable solutions through voluntary market transactions. For example, taxes, product standards, and behavioral nudges should encourage consumers to request that upstream producers and brands deliver packaging and products that contain no plastic or are made of plastics that can be reused or easily recycled. This is a precondition for unlocking the commercial values in the plastic value chain, which is depicted in figure ES.1.

A comprehensive mix of coherent policies can turn the value chain from linear to circular and reduce the volume of plastic waste. Such policies reduce profits in the linear business models of upstream plastic producers, converters, and consumer goods companies while increasing profits of green business models. This attracts private investors and service providers, which reduces the need for public finance to mitigate plastic pollution. Circular solutions can also have positive effects on the climate and jobs. Upstream fiscal and financial circular policy interventions not only encourage less waste generated but also raise additional revenues that can be used in principle to offset negative impacts on poor and vulnerable households (see figure ES.3 later in this chapter).

The following key principles should guide the pathways out of plastic pollution and be tailored to the needs and capacity of each country.

**FIGURE ES.1 Key Economic Actors Operating in the Plastic Value Chain and Circularity Pathways**



Source: Adapted from World Bank 2022a.

Note: RDF = refuse-derived fuel.

## Develop Strategies and National Action Plans Tailored to Country Context

**Under the forthcoming global legally binding instrument to end plastic pollution, countries may need to develop action plans to manage plastic pollution.**

Such plans should combine traditional solid waste management solutions with those closer to pollution control, including industrial and product policies. Building blocks of national action plans

(figure ES.2) include (a) measuring (collecting data and running baseline diagnostics), (b) setting targets to manage plastic pollution, (c) identifying and assessing technical and behavioral measures to reach the targets, (d) choosing a mix of policy instruments to encourage implementation of these measures, (e) designing, implementing, enforcing, and monitoring policies, as well as providing economic actors with access to alternatives and to finance, and (f) reviewing and evaluating the performance and adapting the policy mix to changing conditions.

**The simulations of financial, social, and fiscal impacts of alternative policy instruments on firms, households, and government help avoid mistakes in later implementation.**

Through ex ante simulations of policy impacts, policy makers can understand how economic actors could react to various policy instruments, as a preamble to more detailed policy design. Simulations are beneficial in early stages of strategy development because they provide a broad view of the plastic life cycle and a way to compare possible policies, their interactions, and sequencing. The Plastics Policy Simulator (PPS) was developed under the 3P analysis to meet that objective.

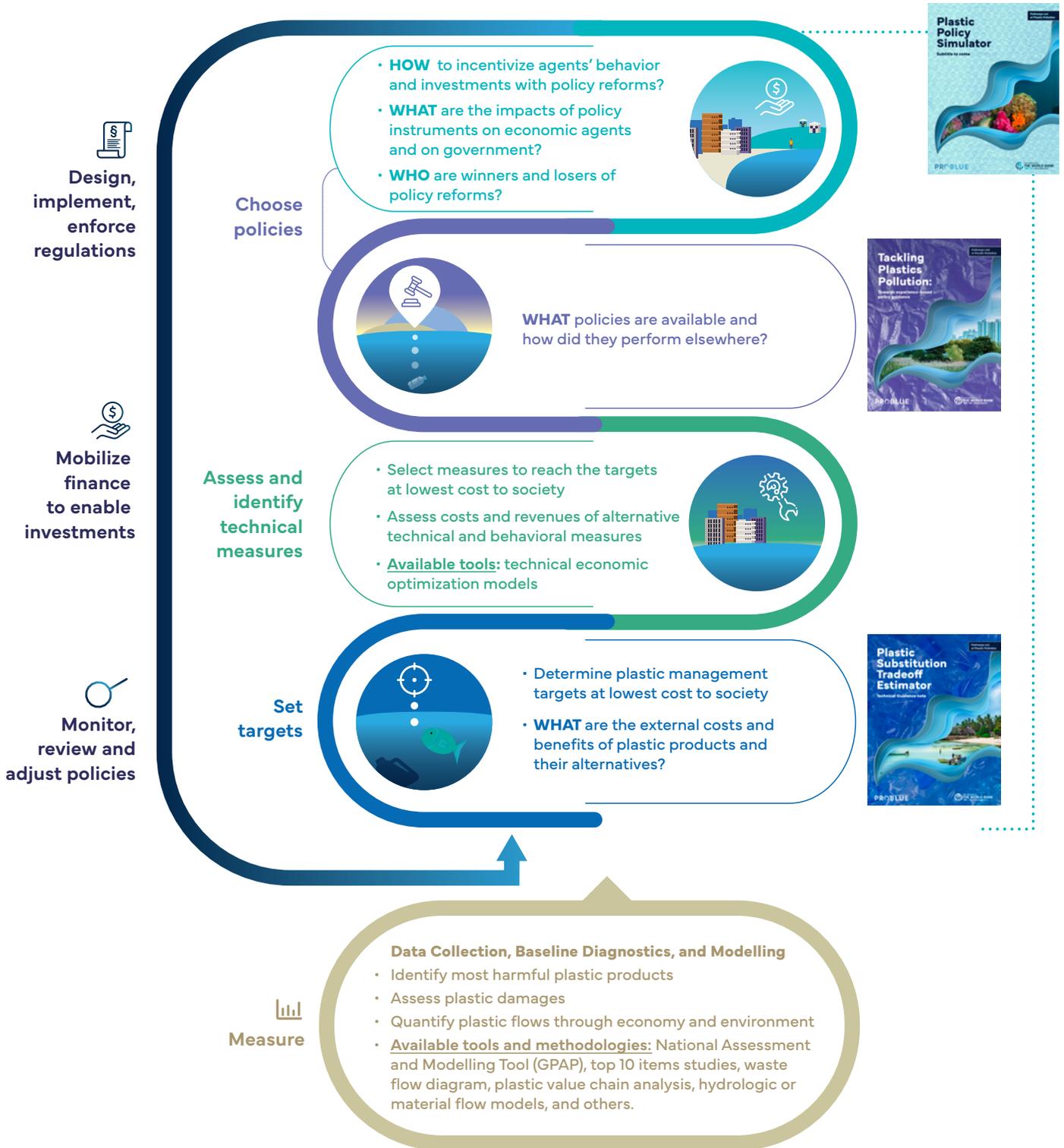
**The 3P models also help assess the climate and employment impacts of policies proposed by various stakeholders at the national level.**

The PPS estimates direct greenhouse gas emissions across the whole plastic life cycle in the business-as-usual scenario with alternative policy reform packages. The results indicate that a circular comprehensive policy package could mitigate climate change by keeping greenhouse gas emissions at current levels, compared with a significant increase in the absence of any policy action. These policy reforms also have the potential to shift employment from low-skilled jobs in waste management to more productive and knowledge- and technology-intensive jobs across the plastic value chain. Furthermore, substituting single-use plastics with locally produced alternatives could have similar positive effects on employment, as also demonstrated by the Plastic Substitution Tradeoff Estimator.

**Setting targets should be informed by the full social costs of plastics and their alternatives.**

An estimation of the tradeoffs and footprint of the various products is recommended to identify the costs and benefits of single-use plastics and possible substitutes. Decision-makers can use the Plastic Substitution Tradeoff Estimator to understand this better.

**FIGURE ES.2 Building Blocks of Plastic Pollution Management**



Source: World Bank.

Note: GPAP = Global Plastic Action Partnership.

## Combine Policy Instruments in a Coherent Way

Policy coherence is about (a) fostering synergies across the plastic value chain, (b) managing tradeoffs, and (c) aligning objectives of critical actors. The following elements of a comprehensive and coherent policy package are essential:

### **Preventing plastic pollution requires the creation of sustainable markets.**

Markets emerge when economic actors get together driven by individual self-interests to cooperate. Circular-economy markets do not emerge spontaneously because of several market failures. Thus, markets need to be enabled by a comprehensive set of coherent policy instruments. These policy instruments combine upstream emission control policies, new product policies, incentives to change consumer behavior, and incentives for the private sector to invest and innovate along the whole plastic life cycle to prevent leakage to the environment and improve solid waste management practices. A wide range of instruments can be tailored to specific conditions, whether regulatory (for example, bans, standards, input thresholds, or limits), economic (for example, taxes and fees, subsidies, extended producer responsibility, and deposit-refund schemes), or behavioral (for example, awareness-raising campaigns, consumer education, environmental labeling, or “nudges” such as making single-use plastic products less accessible to retail customers).

Tailoring policy interventions to manage political economy issues between winners and losers among economic actors is a crucial condition for sustainable market creation. Not every sector or firm gains equally from introducing policies against plastic pollution, and policies have different distributions of impacts. Some companies operating upstream in the plastic value chain (plastic producers, converters, some consumer goods companies, and retailers) may experience a decrease in revenues and profit margins because of circular measures. Waste management companies, recycling businesses, and waste pickers in the informal sector, on the other hand, could profit from circular policies that move profit centers to the downstream part of the value chain. New centers of value and profit could also be created around design, new materials, reuse services, and delivery models.

### **In any suite of policy instruments, upstream incentives for producers and consumers are essential for circularity.**

Upstream policy interventions make product substitution, reuse, repair, and recycling commercially viable. They incentivize more sustainable materials, products, and business models. Product standards and fiscal incentives to design products for greater durability and easier repair and recycling increase demand and profit margins of circular activities. Upstream instruments, such as

extended producer responsibility fees, can also be designed to provide revenues to improve solid waste management systems (for example, to ensure sustainable cost recovery of collection and sorting). This in turn can attract commercially driven private investments, induce innovation, and create productive jobs in circular plastic economic activities, such as sorting, closed-loop recycling, and material recovery.

The suite of policy instruments must be coherent, since fragmented and misaligned plastics policies create confusing incentives that aggravate the plastic pollution problem while wasting public funds. An example is subsidizing hydrocarbons used to produce virgin plastics and subsidizing waste management systems. Identifying multiple policy instruments that coherently address different market and policy failures supports sustainable outcomes, with economic actors finding it commercially and privately attractive to switch to circular, environmentally sustainable production and consumption patterns.

**A comprehensive approach must include improving solid waste management systems.**

Improving solid waste management includes three key steps: (a) establishing waste collection services and ending illegal dumping to protect public health, (b) improving waste treatment and disposal to provide environmental protection, and (c) implementing systems and incentives to enable the transition to sustainable resource management that follows the waste hierarchy principles. Moving up the waste management hierarchy from uncontrolled dumping to safe disposal to energy recovery and recycling is expensive, because it requires investments in improved infrastructure and results in higher operational costs for collection, sorting, and waste treatment. However, focusing only on improving solid waste management will not result in a sustainable reduction of plastic pollution in the long term, as shown in this report. It can also significantly increase the financing burden for public budgets and households. Upstream measures, such as standards, taxes, and fees on hard-to-recycle, single-use plastic products, can be designed to convert these fiscal liabilities in waste management into private sector assets by creating enabling conditions for commercially viable investments in circular business models. Upstream policy measures also minimize waste volumes in the long term, thereby reducing the downstream costs for waste management.

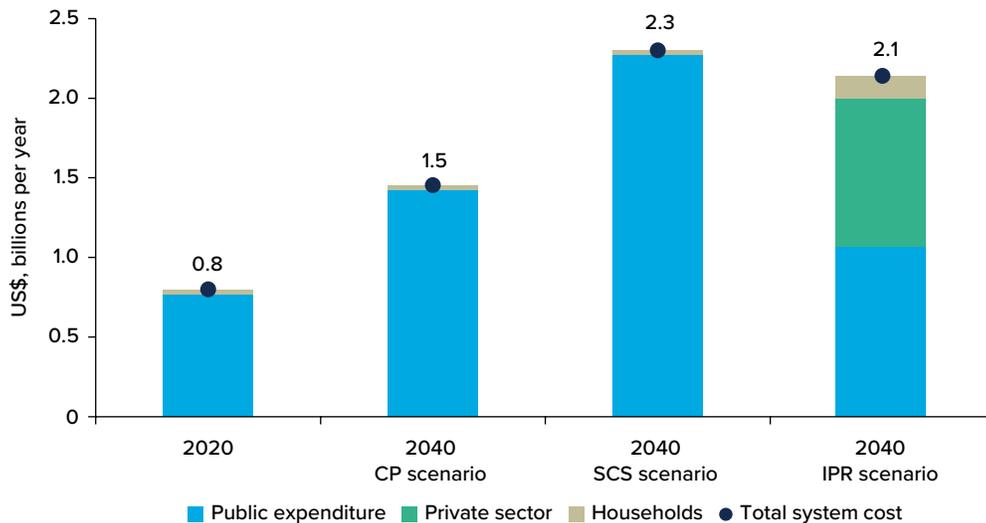
Figure ES.3 illustrates that for Indonesia, the continuation of current policies would almost double the cost of solid waste management (SWM) while increasing plastic pollution by nearly 75 percent. Traditional ways of addressing the problem through public financing of downstream waste management systems (collection, sorting, and landfilling) would almost triple the SWM costs (to US\$2.3 billion per year in 2040) and put an enormous strain on public budgets while still not

reversing the trends of increasing plastic pollution. A comprehensive mix of integrated (coherent) upstream and downstream plastic management policies would reduce plastic pollution by 70 per cent below 2021 levels at a lower total system cost (US\$2.1 billion per year) than traditional counterfactual policies because upstream product taxes, standards, and bans would reduce the volume of plastic waste that SWM systems must handle. This would also attract commercial private financing to downstream sorting and recycling activities, reducing the pressure on public budgets.

**Comprehensive policy packages can only be implemented step by step, and sequencing matters.**

Although best results are achieved when combining policy instruments, transitioning to a comprehensive approach will take time, especially in countries with weaker institutions and capacity. A journey toward a circular economy requires sequencing, starting with quick-win regulations (for example, fighting littering and preventing the most harmful and problematic plastic products from entering the economy). This report stresses that even if policy coverage is not comprehensive, it is important to ensure that fragmented policy instruments are also coherent and complementary to prevent conflicting incentives faced by economic agents.

**FIGURE ES.3 Total Plastic Waste Management System Cost and Financing Sources in Indonesia under Different Policy Scenarios**



Source: Adapted from World Bank 2022a.

Note: 2020 price level. CP = current policies; IPR = integrated policy reforms; SCS = subsidies for collection and sorting.

## Consider the True Cost of Plastics and Alternatives to Society

Phasing out single-use plastics requires considering alternatives and their availability, and substitution choices should be informed by their external costs and benefits compared with the plastic product they would replace. Understanding the true costs of plastics and substitutes allows policy makers to examine tradeoffs between different products.

### **Comparing the full life cycle costs of single-use plastic products and their alternatives enables better decision-making and facilitates agreements on priority goals to be achieved.**

A transparent comparison will also counterbalance possible influences from product manufacturers and other interest groups, promoting their preferred products and materials as least harmful to the environment and society. Choosing between single-use plastic products and their alternatives requires considering all tradeoffs, including on employment and greenhouse gas emissions, and considering possible interventions that would encourage the development of new materials. It is possible to minimize costs of damages by improving product design and selecting more sustainable alternatives. Improving design can lead to reducing external costs of plastic products while maintaining their functionality. When alternatives do not exist, it is possible to choose policy instruments to enable design changes (for example, on weight) to make products reusable, repairable, and recyclable; to influence consumer behaviors; and to create markets for alternatives.

### **When deciding how to substitute plastic items, it is essential to compare the benefits of action (such as avoided damages caused by pollution) to the costs of achieving those benefits and the costs of alternatives.**

Such cost-benefit considerations underpin choices on where to start, how ambitious plastic pollution reduction can be, and whether substitutes to disposable plastic products are appropriate in a country context. Other issues, such as feasibility, costs, food security, hygiene, and other concerns related to substituting plastic products with alternatives, also need to be considered. Policy targets, especially those related to substitution with alternative products and materials, must be tailored to local social, economic, and cultural conditions.

## Filling Knowledge and Methodology Gaps

Pathways out of Plastic Pollution provides new analysis of accumulated experience from policies already applied in countries (World Bank 2022c) and forward-looking decision-making tools

(World Bank 2022a, 2022b) to address key market and policy failures as outlined in this summary. Pathways out of Plastic Pollution is intended to support policy makers and technical experts in their efforts to address plastic pollution by bringing transparency and evidence into often-difficult plastic management dialogues among stakeholders who have limited information, diverging interests, and entrenched habits. It brings insights from the development of two models:

- The Plastics Policy Simulator helps address key market and policy failures, including the upstream-downstream incentive gap as well as policy fragmentation and incoherence.
- The Plastic Substitution Tradeoff Estimator increases the understanding of the external costs and environmental footprint of plastic products and their substitutes or alternatives.

## Uncovering the Value in the Chain: The Plastics Policy Simulator

The PPS offers policy makers a data-driven decision-support model to better understand the likely impacts of various policy instruments and their interactions *before* they are implemented. The model is designed to support policy makers and other stakeholders in government, industry, and civil society in search of mutually agreeable and coherent policy solutions to address plastic pollution. It helps align self-interests of firms and households along the plastic value chain and establish commercially viable markets for circularity and sustainable plastic management businesses. Policy makers can use the PPS to navigate public consultations about complex policy reforms by identifying potential winners and losers, and hence political economy and social concerns to address during implementation.

The PPS traces the flow of the 20 most problematic plastic products from production of virgin resin to waste; identifies the corresponding financial flows among economic actors, households, and the government; and simulates how alternative policy instruments could redirect these material and financial flows within the plastic value chain. Policies can change the relative commercial attractiveness of technical and behavioral plastic management measures to each group of economic actors, thereby shifting the flow of plastic products and profit centers from polluting to circular activities. Because policies naturally interfere and interact with one another, the PPS captures potential synergies and conflicting incentives between different instruments. The PPS also estimates who gains and who loses from alternative designs of policy reforms. It allows users to choose from a wide menu of 24 policy instruments to simulate their impacts implemented individually or jointly, and applied immediately or in a more sequenced fashion, depending on their country's capacity and political reality.

The PPS estimates the impact of different policy scenarios on

- Volumes and types of plastic and plastic products that are reduced, reused, collected, recycled, landfilled, imported, and exported, and those that are burned or dumped into the environment;
- Fiscal revenues and expenditures of national and subnational governments;
- Financial flows affecting firms and households;
- Greenhouse gas emissions; and
- Direct employment.

The PPS can support policy makers in combining policy instruments in a coherent way, prioritizing and sequencing their implementation. It will support the transition to more circular solutions and can be used as an “umbrella” tool at different stages of the policy process, providing a big picture of the possible options before they are designed and implemented. It does not replace detailed policy design.

## **Choosing between Plastic Products and Their Alternatives: The Plastic Substitution Tradeoff Estimator**

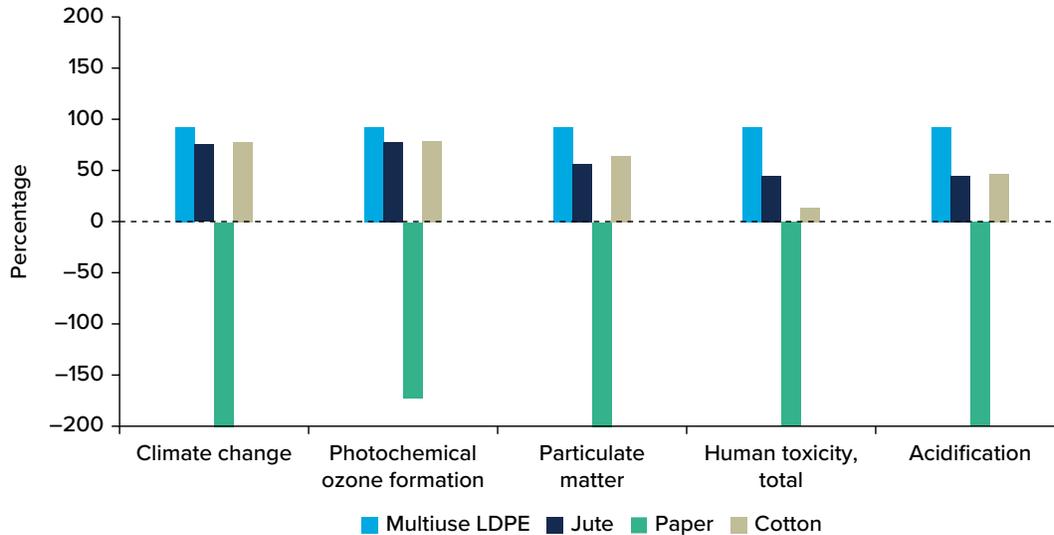
The Plastic Substitution Tradeoff Estimator helps decision-makers understand the true societal and environmental costs of plastics and their alternatives. It provides decision-makers with answers to critical policy questions on the external costs and benefits of phasing out certain single-use plastic products given available substitutes. This benefit reduces uncertainty and increases transparency of decision-making about plastics policy targets.

The model compares 10 plastic products and their alternatives and examines tradeoffs. In terms of tradeoffs, it considers greenhouse gas emissions and employment effects to support target setting for reduction and substitution. It considers the entire plastic product life cycle and ascertains which life cycle stage has the largest external costs; it takes into consideration a total of 30 potential environmental impact variables for 10 plastic products and their alternatives. The impacts range from global warming potential to flood risks caused by clogged drains, and they capture local circumstances by accounting for the distance that plastic products and their alternatives travel and for differences in plastic flows, end-of-life fate, and population density. Selected examples of tradeoffs between different impacts in figure ES.4 show that the choice between single-use plastic products and their alternatives is not always straightforward.

The model combines monetary valuation techniques with nonmonetary, quantitative, and

qualitative assessments and compares single-use plastic products and their alternatives, either side by side or in scenarios that cover several products.

**FIGURE ES.4 Example of Selected Tradeoffs Identified through Comparison of Single-Use Plastic Shopping Bags and Their Alternatives**



Source: Adapted from World Bank 2022b.

Note: A positive percentage represents an improvement compared to the base product (single-use LDPE shopping bag in this case). The opposite applies to a negative percentage. Over 200% is not reflected in this figure. LDPE = low-density polyethylene.

The Estimator was piloted in five countries that represent diverse conditions and geographies to help contextualize possible plastic management choices.

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