PLASTICS POLICY PLAYBOOK

Strategies for a Plastic-Free Ocean

Ocean Conservancy®

TRASH FREE SEAS ALLIANCE®

CONTENTS

GLOSSARY OF KEY TERMS

Acronym/Term	Definition
APEC	Asia-Pacific Economic Cooperation
CAPEX	Capital expenditure
Collection	Collection is defined as the act of on-ground collection and transport of waste to a transfer station or material recovery facility (as applicable) by local government or commercial waste collection service provider
CSR	Corporate social responsibility
DFI	Development finance institution
DFID	The Department for International Development, a United Kingdom government department responsible for administering overseas aid
Eco-modulation	Approach that accounts for an adjustment of charges, taxes or levies on plastic products based on design criteria (e.g., recyclability, reusability or recycled content)
EPS	Expanded polystyrene
Extended producer responsibility (EPR)	Policy approach whereby producers (e.g., raw material manufacturers, convertors, packers or fillers, and brands) are given a significant financial and/or physical responsibility for the end-of-life management of post-consumer products
EU	European Union
FEMSA	Fomento Económico Mexicano, S.A.B. de C.V., the largest independent bottling franchisee for Coca-Cola
Financing gap	Defined as the net deficit between revenues and cost across the plastic value chain
Focus countries	The five countries – China, Indonesia, the Philippines, Thailand and Vietnam – identified in *Stemming the Tide* (2015) to be the largest contributors to ocean plastic and on which this research is focused
GDP	Gross Domestic Product
HDPE	High-density polyethylene, a type of plastic/polymer

Acronym/Term	Definition
Improve economics of collection	Includes increasing the provision of funds to cover collection cost, reducing the supply at collection, improving the quality of input and increasing demand for post-consumer waste from recycling and treatment stages
Independent waste collectors (or informal waste collectors)	Defined in this report as a person or group of people not employed by local government or private sector waste management companies that are engaged in the collection and recovery of reusable or recyclable waste, either directly from the source where no formal collection systems exist, hauler trucks, or landfills and dumpsites, and offered for sale to recyclers directly or through intermediaries to earn a livelihood (Adopted from Solid Waste Management Rules 2016, India)
Informal sector inclusion	Refers to the economic empowerment, social inclusion and livelihood improvement for informal and independent waste collectors
Low-value plastic (LVP)	Plastic waste materials that do not have value in local recycling markets (e.g., grocery bags, thin films, composite plastics). The report considers recyclables made from PET, HDPE and PP as high-value plastics
LDPE	Low density polyethylene, a type of plastic/polymer
Material recovery facility (MRF)	Facility where recyclables are separated from the mixed solid waste stream and then sold to recyclers as feedstock (also referred to as "dirty MRF")
MoU	Memorandum of understanding
NGO	Non-governmental organization
Ocean plastic/ marine plastic	Term used to describe plastic that is found in the ocean/marine environment
OPEX	Operational expenditure
Packaging	Any product to be used for the containment, protection, handling, delivery, storage, transport and presentation of goods. This report refers to plastic packaging with references to industry variances (e.g., food, medical)
PCR	Post-consumer recycled
PET	Polyethylene terephthalate, a type of plastic/polymer

Acronym/Term	Definition
PP	Polypropylene, a type of plastic/polymer
PPP	Public-private partnerships
Private measure	Interventions which are actionable largely by the private sector with minimal government involvement
Producer responsibility organization (PRO)	A for-profit or nonprofit organization authorized or financed collectively or individually by producers to take the responsibility for collecting and managing the end-of-life (i.e., reuse, recycling, recovery and disposal) of waste on its behalf
Problematic and unnecessary single-use plastics (SUP)	The leakage-prone non-recyclable plastic products and packaging manufactured for single-use, primarily falling in the following categories: disposable plastic cutlery, plastic straws, plastic bags, cotton buds and plastic stems, plastic stirrers, expanded polystyrene packaging, PVC packaging, oxo-biodegradables and primary microplastics (adopted from the EU and WRAP definition)
PRN	Packaging recovery note
PS	Polystyrene, a type of plastic/polymer
Public measure	Interventions which are actionable largely through government led policy enforcement
PVC	Polyvinyl Chloride, a type of plastic/polymer
PWM	Plastic waste management
RDF	Refuse-derived fuel
Recycling	Recovery operation by which waste materials are reprocessed into products, materials or substances, either for the original or other purposes, excluding energy recovery and reprocessing to be used as fuels (European Waste Framework Directive definition)
Recyclable	A component is considered recyclable if its post-consumer collection, sorting and recycling is proven to work in practice and at scale (Ellen MacArthur Foundation definition)
Repurposing plastic	A specific part of recycling which involves conversion using melting and binding of post-consumer plastic into durable furniture and building materials, such as bricks and roofing sheets

Acronym/Term	Definition
Ring-fence	Refers to ensuring that a certain sum of money is used only for the specified purpose
rPET	Recycled polyethylene terephthalate
RVM	Reverse vending machine
R&D	Research and development
SME	Small and medium enterprise
SUP	Single-use plastics – see also problematic and unnecessary single-use plastics
SWM	Solid waste management
TPD	Tons per day
TSR	Thermal substitution rate
US $	United States Dollar
Waste value chain	The full range of waste activities, including collection, sorting, recycling and disposal

FOREWORD

The ocean plastic crisis has been decades in the making and is poised to get much worse if dramatic changes are not made. Governments, businesses and the environmental community have been noticing and taking action for decades, but much more is needed to end ocean plastic.

Scientists have been documenting plastic in the ocean since at least the 1970s. In 1986, Ocean Conservancy launched the International Coastal Cleanup, which has since mobilized more than 15 million volunteers to remove some 315 million pounds of trash from beaches and waterways around the world. Roughly a decade later, oceanographer and sailor Captain Charles Moore published his first report on what would eventually be known as the Great Pacific Garbage Patch. In 2002, the Government of Bangladesh became the first country to ban single-use plastic bags after the items were found to clog drainage systems during floods, and similar policies followed suit across the globe. And in 2012, Ocean Conservancy gathered a cohort of companies and NGOs to create the Trash Free Seas Alliance® to better understand and address the growing threat of plastic pollution in our ocean.

What had been missing for a long time was a shared understanding of the "how" and "why" of ocean plastic: How much is there? How is it getting into the ocean? And why? To answer this question, Ocean Conservancy convened leading scientists in the field to spur ground-breaking research that has since defined the global conversation on the issue.

In 2015 Dr. Jenna Jambeck and her colleagues published a groundbreaking paper in the journal *Science* estimating that some 8 million metric tons of plastic enters the ocean from land each year—the equivalent to a garbage truck full of plastic dumping into the ocean every minute. It was a shocking figure; but as importantly, the study began illuminating the "how" and "why" by showing that a majority of plastic entering the ocean was coming from parts

of the world where plastic waste simply had nowhere else to go—either it wasn't being collected or, if it was collected, it wasn't being adequately contained.

Shortly following the *Science* paper, Ocean Conservancy released *Stemming the Tide*, a report examining all the ways governments in these key geographies could prevent plastic from leaking into the ocean, and found that improving waste collection was an important first step to reduce plastic leakage, as well as provide a host of other important benefits. In 2017, we published *The Next Wave*, in which we homed in on overcoming barriers to investment in waste management (including collection) and put forth a series of policy and practice recommendations that have since been adopted by the 21 member economies of the Asia-Pacific Economic Cooperation (APEC) forum.

As we learn more about the ocean plastic crisis, we have been thrilled to see a growing demand and appetite for change, and the possibility of achieving a fully circular economy coming into sight. Governments at all levels all around the world are weighing policy options to address ocean plastic—from taxes to incentives and myriad options in between. Businesses are experimenting with new ways of meeting consumers' changing demands for fewer single-use plastic items while reducing impacts on the environment. And with longstanding recycling markets shocked by major demand shifts in recent years, addressing the problem of plastic waste has never been more urgent. For the first time, the challenges facing the recycling sector are reaching mainstream audiences.

As exciting as this may be, we know it can also be overwhelming. For policymakers and the private sector alike, it can be hard to know what to do next, particularly when you consider geographic differences. What works in some contexts may not work in others.

That's why we convened the talented team at Accenture and a diverse set of knowledgeable experts from the Trash Free Seas Alliance and our partner network to release *Plastics Policy Playbook: Strategies for a Plastic-Free Ocean*. The report identifies four key themes to improve the economics of collection across the value chain:

1) Financing the collection via Extended Producer Responsibility measures
2) Reducing the production and use of problematic single-use plastics
3) Designing for circularity, and
4) Increasing the demand for post-consumer plastics.

It is our hope that this document, rooted in data and research, will serve as a policy playbook for all those looking to be part of a systemic solution to ocean plastic. While this report looks at those target geographies first identified by Dr. Jenna Jambeck and her team as most vulnerable to ocean plastic leakage, we believe it can be a useful primer for other regions, as we are all connected by one ocean.

Certainly, the body of science on ocean plastic is growing, and it is important to remain open to new developments as they become available. This playbook shows there are interventions that can work now and allows decision-makers to make informed choices.

Janis Searles Jones
CEO, Ocean Conservancy

ACKNOWLEDGEMENTS

Ocean Conservancy is a non-profit environmental advocacy group, based in Washington, D.C., United States. The organization works towards science-based solutions to protect the ocean and the wildlife and communities that depend on it. From the Arctic to the Gulf of Mexico, from ocean acidification to ocean plastic, Ocean Conservancy brings people, science and policy together to champion innovative solutions to today's greatest global challenges. Ocean Conservancy founded the Trash Free Seas Alliance in 2012, which unites leaders from industry, conservation and academia to create pragmatic, real-world solutions to combat the problem of marine debris. For more information, visit www.oceanconservancy.org/our-work/trash-free-seas-alliance.

Ocean Conservancy commissioned **Accenture**, a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations, to conduct a study to explore public-private policy measures to improve collection and end ocean plastic. This builds on the Trash Free Seas Alliance's previous reports *Stemming the Tide* (www.oceanconservancy.org/trash-free-seas/take-deep-dive/stemming-the-tide) and *The Next Wave* (www.oceanconservancy.org/wp-content/uploads/2017/05/the-next-wave.pdf). This report has been produced with guidance and support from a steering committee of committed partners from the Trash Free Seas Alliance. Ocean Conservancy is appreciative of their support during the drafting of this report, alongside a wide range of activities that demonstrate their commitment to finding innovative solutions to improve collection and help achieve the ambition of zero plastic in the ocean by 2030. The content of this report was also informed by the many technical advisors and organizations we consulted during its development. Their participation does not necessarily imply their full endorsement of the report's contents or its conclusion. We are greatly thankful for their contributions.

Accenture and Ocean Conservancy would like to recognize the valuable insights of the contributors to this report, as given below.

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EXECUTIVE SUMMARY

We must act now on ocean plastics

Ocean plastic is an urgent, global challenge. If we fail to act, over 250 million tons of plastic will be circulating our ocean by 2025,[1] with widespread environmental, social and economic implications.

The quantity of plastic in the ocean is a symptom of a larger issue that is tied to our linear economic system to take, make and waste. We produce more than 350 million tons of plastic each year, and while many of these plastics offer meaningful benefits to society, an estimated 40% of plastic is used just once and discarded.[2] Without action, the global production of plastic is expected to double in the next ten years.[3] This level of production and consumption has resulted in solid waste management systems that are unable to effectively collect, recycle and dispose of the growing quantity of plastic. Its presence in the ocean is the result.

The legacy of ocean plastic will likely exist for hundreds, if not thousands, of years, and its long-term impact on our planet remains uncertain. What is certain, however, is that the more plastic that ends up in the ocean, the greater the negative impacts will be. The time to act is now.

A policy playbook to achieve zero plastic in the ocean by 2030

This playbook builds on insights from previous reports by Ocean Conservancy's Trash Free Seas Alliance[4] to develop an action-led response focused on the most systemic challenges and the most critical countries.

Stemming the Tide (2015) identified that 80% of the plastic leaking into the ocean was never collected as part of a formal waste management system[5] and 60% currently enters the ocean from five focus countries in Asia—China, Indonesia, the Philippines, Thailand and Vietnam.[6] *The Next Wave* (2017) identified that collection in these focus countries is largely underfunded and a net cost activity for most waste streams. Poor collection infrastructure, coupled with a limited budget for solid waste management and high quantities of materials with low residual economic value, results in a net deficit—a financing gap—between revenues generated and costs incurred across the plastic value chain.[6]

To achieve the **Ocean Conservancy goal of zero plastic in the ocean by 2030**, the economics of collection must improve. While there has been clear progress with widespread policy and private sector commitments to reduce ocean plastic, more effort is needed.

This playbook provides a holistic framework of the most promising public and private sector measures across the value chain to improve the economics of collection, including a set of key principles for success, as well as a roadmap to demonstrate a potential pathway that countries can follow. It targets national government, local government, corporates and non-governmental organizations (NGOs). While the research was conducted on the five focus countries, the outputs are relevant globally where similar waste management challenges exist or will likely exist because of continued economic growth, namely Africa and Latin America.

In practice, this playbook can:

- **Educate key stakeholders** on the menu of options available to improve the economics of collection and reduce ocean plastic
- **Align national or local governments on viable combinations of measures** based on a specific country context
- **Inform evidence-based policy**, sharing the trade-offs and enabling conditions to encourage proactive steps
- **Enable stakeholders to prepare for regulatory landscape** shifts
- **Support the progress of national and local roadmaps,** helping ensure key measures are included and that the principles for success are integrated

A framework of measures across the value chain can improve the economics of collection

This framework of public-private measures[i] is divided into four themes to improve the economics of collection:

I. Finance the collection

Measures that increase the provision of funding to improve waste collection

Extended Producer Responsibility (EPR), implemented using packaging material fees, is the biggest opportunity to improve collection funding. An eco-modulated EPR fee can also incentivize and accelerate the transition away from non-recyclable materials. Financial modeling shows that an EPR fee has the highest potential—up to 75% or more—in closing the value chain financing gap.

[i] Measures focused on collection can apply to all solid waste, of which plastic is a component. Other measures - notably those related to reducing the supply, improving the quality and increasing the demand of post-consumer plastic - are discussed in a context specific to plastics given the focus of this playbook

II. Reduce problematic and unnecessary single-use plastics

Measures that reduce the supply of plastic and reduce the quantity of plastic waste produced by shifting away from the production and use of problematic single-use plastics (SUPs)

Effectively enforced bans on defined problematic and unnecessary single-use plastics will be part of the solution across the focus countries. They can help to reduce the supply of these plastics to the waste management system as well as reduce their per capita consumption in the long-term.

III. Design for circularity

Measures that improve the quality of plastic in the waste stream and reduce dependence on virgin materials by adopting eco-design principles to improve reusability, recyclability and the use of recycled content

Eco-design standards can address challenges around non-recyclable or difficult to recycle plastics. National level policy, combined with private sector commitments, can standardize inputs, improve the quality of plastic entering the recycling stream and drive collection. Designing to reintegrate recycled content in plastic applications has private sector momentum that can be supported by policy.

IV. Develop recycling and treatment markets

Measures that increase the demand for post-consumer plastics, including recycling and sustainable solutions for non-recyclable and non-recoverable waste

Incentives to scale recycling infrastructure, with an initial focus on highly recycled plastics, can complement collection of post-consumer recyclable plastic. Coupled with the development of flexible end-market solutions for non-recyclable plastics, this can increase collection of such plastics and prevent resource loss.

Five guiding principles for success

Five guiding principles must be in place for the measures discussed in this playbook to have a positive impact in reducing ocean plastic:

1. **Combine measures across the value chain:** Real value lies in combining measures along the value chain, by both the public and private sectors, in new and innovative ways.
2. **Engage and invest in the informal sector:** Measures must support the human rights and livelihoods of those on the front line of collection efforts. Dignified employment with improved working conditions and leveraging the expertise of independent waste collectors can drive improvements in collection quantity and efficiency.
3. **Drive consumer awareness and behavior change:** Consumer buy-in is a critical enabler of a successful plastic waste management framework, and focus countries need targeted awareness campaigns to engage key audiences and spark behavioral change.

4. **Inspire political will:** Leaders at the national and local levels should be motivated and empowered to support solutions to reduce ocean plastic waste.

5. **Improve enforcement at a national and local level:** Measures are only as good as the ability to enforce them. Strong national policy requires a clear direction and rule of law. Policy, however, has to be enforced at the local level, which requires improved capacity for action.

A comprehensive roadmap can help achieve zero-plastic flow to the ocean by 2030

There is no single pathway to stemming the flow of plastics into the ocean. Countries must adopt a tailored approach at both the national and local level. The roadmap in this playbook (Figure 1) presents feasible combinations of measures across the four themes that can prevent plastics entering the ocean, represented across a timeline. However, action on all fronts must start now, given some measures will take longer than others to be impactful.

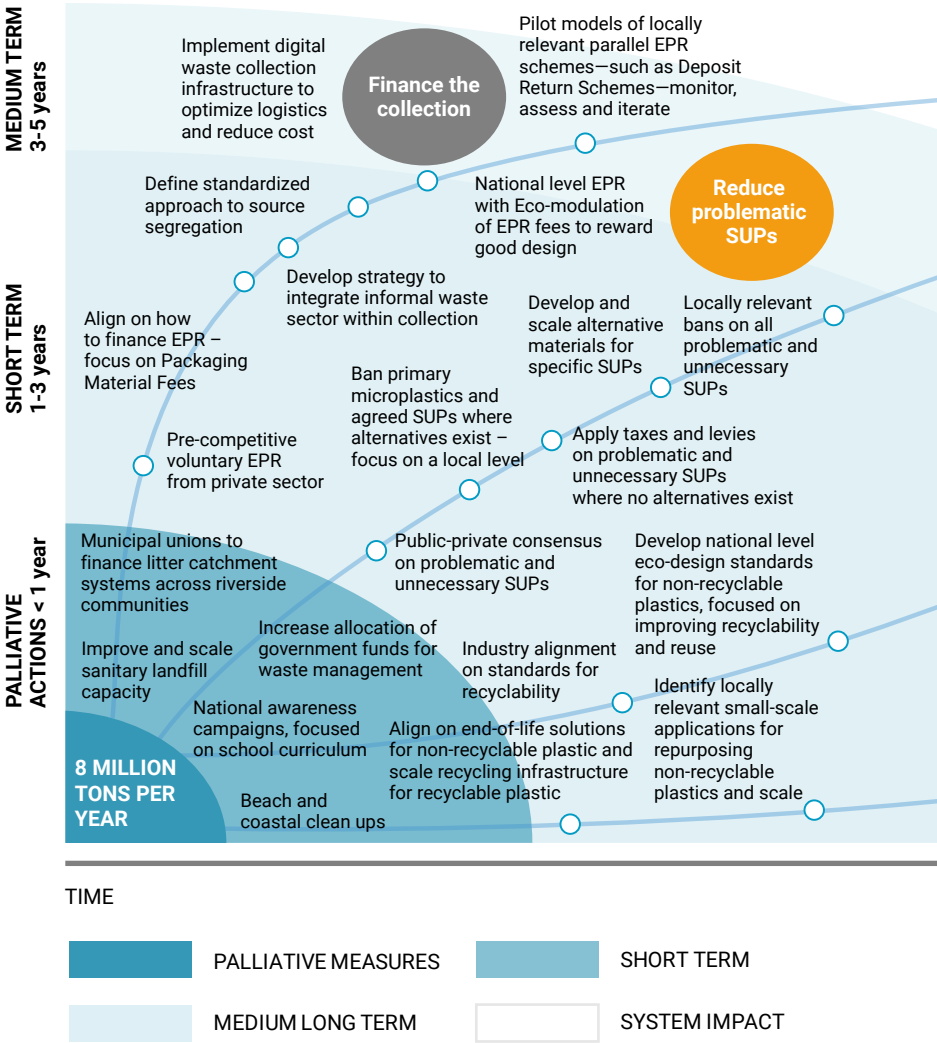
Combining measures can reduce the financing collection gap

With the use of financial modeling, this research found a net financing gap for collection of US $28-$40 per ton to manage plastic waste across the value chain,[ii] resulting in an estimated financing gap of up to US $3 billion per year across focus countries[iii] (see Appendix for details). The model demonstrated that combinations of high potential measures can, to a greater or lesser extent, have an impact on reducing this financing gap (Figure 2).

[ii] Outputs of the model align with other efforts to quantify the financing gap. Please see Appendix for further details

[iii] Calculated based on approximate figure of 77 million tons of plastic waste generated per year across the five focus countries

Figure 1: Roadmap for success across four key themes



SYSTEM IMPACT

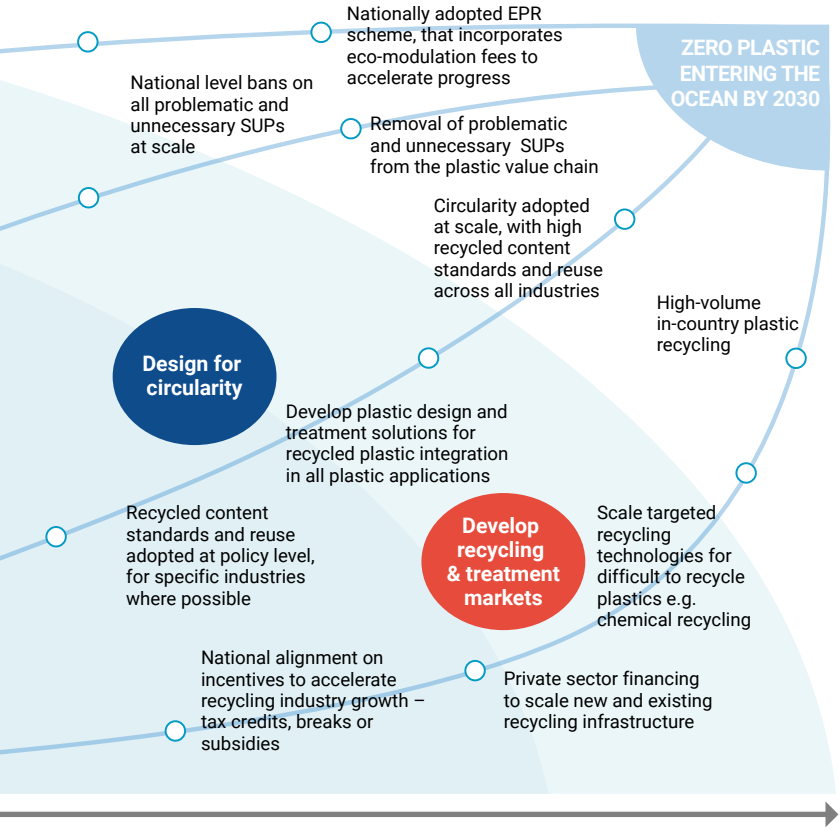
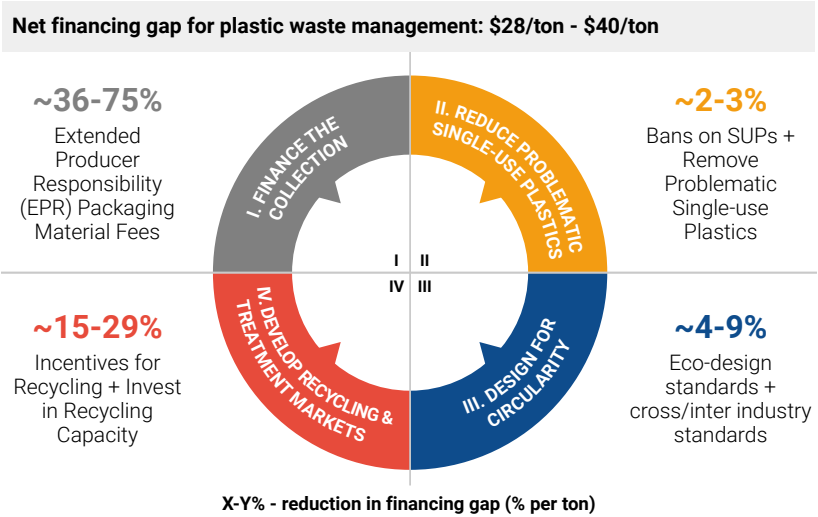


Figure 2: Analysis of changes in net cost/profit of waste value chain activities for plastic waste management[iv]



- Financing gap is defined as the net deficit of revenues and cost combined for each stage of the plastic value chain
- Analysis conducted specifically for the five focus countries; reduction in financing gap calculated by taking $40/ton as baseline
- Financing gap numbers are not additive due to overlapping assumptions

A focus on measures that finance collection has the greatest potential to reduce the financing gap. EPR, implemented through Packaging Material Fees, can have the highest potential in reducing this gap by up to 75% or more. The effectiveness of EPR in reducing the financing gap will depend on the recycling and recovery rates, the fees charged and the appropriate collection and ring-fencing of revenues for specific collection initiatives.

At the same time, combinations of measures across the value chain can improve the economics of collection. Upstream measures that reduce the supply of plastics, such as bans on SUPs, can improve the collection efficiency by reducing the contamination of post-consumer waste streams from problematic and unnecessary single-use plastics. Eco-design standards may potentially improve the quality of waste streams by increasing the amount of recyclable post-consumer plastic

[iv] The financial modelling conducted for this report was designed to focus on the costs and revenues of plastic waste management. This was based on certain considerations based on this research. (Please see appendix for further details.)

waste generated at the collection stage. Downstream measures, focused on scaling recycling capacity for recyclable plastics, and innovative new recycling and treatment solutions for plastics that are not currently recyclable, can support collection and increase the inherent value of plastics for collection by creating additional revenue streams from recycling.

Conclusion

Achieving zero plastic entering the ocean by 2030 requires the adoption of a framework of measures that increase the provision of financing for collection, reduce the supply of problematic and unnecessary plastics, and improve the quality and increase the demand for high-value, post-consumer plastics. To ensure success, these measures should be incorporated alongside the five principles and should be part of a systemic approach that embeds circular economy principles to maximize resource efficiency, reduce waste and drive end-to-end value.

This playbook provides a menu of options for key stakeholders to consider and adopt, depending on their specific country context. The roadmap presents a pragmatic guide for countries seeking to reduce plastic waste leakage and improve waste collection by adopting a complementary set of actions across the value chain. While this outlines a framework for success, there is no one pathway to reach zero plastic in the ocean. It requires a combination of measures that will vary at the national and local level.

The report's findings are based on the conditions we see today, in which the majority of plastic leaks into the ocean from uncollected waste. It is important to recognize that disruptive trends, new business models and technological advancements may mean that this situation changes in the future. As a result, solving the systemic global challenge of ocean plastic will require a flexible and adaptable approach that quickly leverages innovation and new technology. At the same time, improvements in collection must align with improvements in disposal and recycling infrastructure to ensure that solving one issue does not create another and that higher quantities of collected plastic do not lead to plastic finding new ways to enter the ocean.

The ultimate goal is to transition to a more efficient and less wasteful circular system. And the time for action is now.

CHAPTER 1

INTRODUCTION

The scale of the ocean plastic challenge

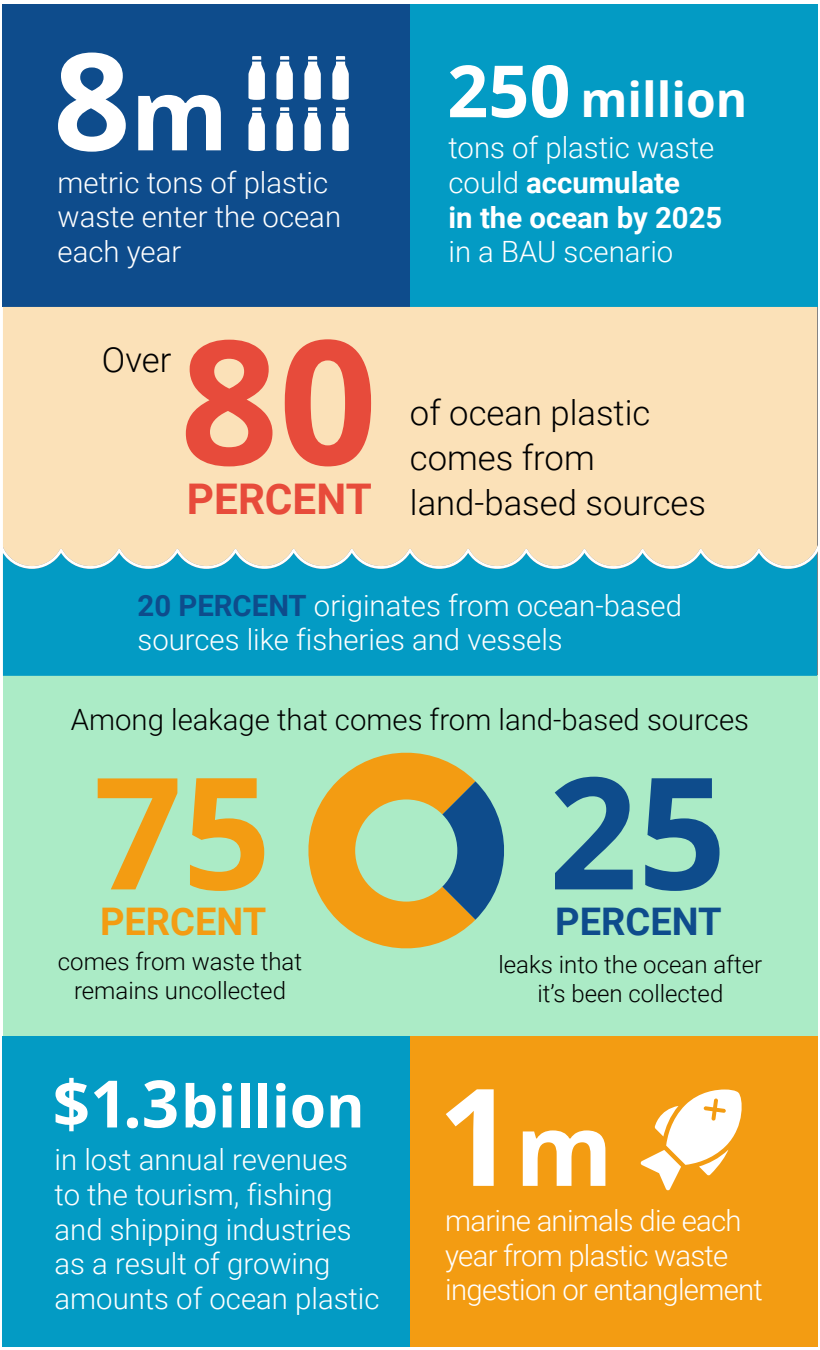
The ocean covers three-quarters of our world and is the world's second largest carbon sink. We are connected to it in myriad ways, not least because half the oxygen available to us has been produced by phytoplankton photosynthesis, meaning that every other breath we take comes from the ocean.[7] But the ocean is under severe stress. Climate change, ocean acidification, over-fishing and pollution are some of the threats facing global ocean ecosystems. Ocean plastic is one of these critical challenges, with significant environmental, social and economic implications.

Today, there are an estimated 150 million metric tons of plastic circulating in our ocean.[8] Each year, an estimated additional eight million metric tons of plastic ends up in the ocean—equivalent to a garbage truck of plastic being added each minute.[6] Plastic in the ocean impacts over 800 different marine species,[9] [10] ranging from mighty whales to microscopic plankton. Seabirds are also at risk, with an estimated 90% of pelagic birds having ingested plastic.[11]

The impact of ocean plastic extends beyond marine life. There is growing research into the effects of plastic exposure on human health. Plastic chokes water channels, leading to flooding, stagnant water and disease.[12] Plastic contamination of the food chain is also a growing risk. A recent study found that we can ingest between 39,000 to 52,000 plastic particles per year in our food—with potential, largely unknown impacts on our immune systems.[13]

Ocean plastic also has direct economic implications. Every ton of ocean plastic costs US $33,000 in reduced environmental value[14]—a loss of US $1.3 billion each year to the tourism, fishing and shipping industries in the Asia-Pacific region alone.[15] In the future, marine debris could trigger a 1-5% decline in economic benefits that humans derive from ocean ecosystems, equating to an annual loss up to US $2.5 trillion in value.[14]

Figure 3: The Ocean plastics challenge - key dimensions



The accumulation of plastic in the ocean is a visible symptom of a more systemic and complex challenge. We produce more than 350 million tons of plastic per year,[16] a 200-fold increase since the 1950s.[17] Global plastic production and consumption is expected to double in the next ten years to help meet demands from economies' growth and stronger purchasing power among consumers. Unabated, this could result in 250 million tons of plastic waste in the ocean by 2025.[6] A failure to develop effective solid waste management systems to cope with the growing quantity of plastic produced in our linear economy has manifested into the marine litter issue.

Today, 40% of plastic is used once and discarded.[2] Of all the plastic waste produced, only 9% has been recycled.[16] This short-term use of plastic is at odds with the durability that has made it such a popular, useful material.

A global shift to a circular economy is driving progress on plastic

Public perception of plastic has undergone a rapid transformation in recent years, thanks to growing awareness and bottom-up engagement. The response is part of a broader global shift, and growing political, societal and economic imperative to solve our environmental crisis. Part of this shift is the transition from a linear to a circular economy, in which we "decouple growth from the use of finite resources by eliminating waste at every stage of the value chain,"[18] ensuring materials and their components can be recovered, reused or recycled to create optimal economic and environmental value.

With a clear shift in policy, financial investment and awareness campaigns, national governments in the focus countries have responded by building on the focused research and Asia Pacific Economic Cooperation (APEC) policy recommendations provided by Ocean Conservancy. Indonesia, for example, launched the National Action Plan on Marine Debris, aiming to reduce 70% of its ocean plastic debris by the end of 2025. The national government also pledged to invest up to US $1 billion a year in cleaning up its rivers and seas. Similarly, Thailand's latest National Waste Management

plan calls for 75% of total solid waste to be properly disposed of or recycled by 2021—a significant increase from the current rate of 49%. The Global Plastics Action Partnership (GPAP), led by the World Economic Forum in collaboration with governments, business and communities, is helping to translate these commitments into action with a focus on Indonesia, Africa and the Pacific.[19]

The private sector, including producers, manufacturers and brand owners, has also demonstrated commitment. Over 400 organizations have signed the Ellen MacArthur Foundation's Global Commitment to eliminate plastic pollution at its source,[20] including many leading multinationals.

Development and financial institutions are also demonstrating a willingness to participate. With the development of Ocean Conservancy's 2017 report, *The Next Wave*, the Trash Free Seas Alliance[v] helped create and launch Circulate Capital—an impact-focused investment management firm dedicated to financing innovation, companies and infrastructure that prevent the flow of plastic waste into the world's ocean while advancing the circular economy. It put forth a series of policy and practice recommendations that were formally endorsed by APEC trade and foreign ministers in their 2016 annual statement, with APEC leaders calling for additional work on waste management. Circulate Capital has recently launched a blended finance partnership with USAID for a 50% guarantee on up to US $35m in loans made by Circulate Capital's Ocean Fund. Bilateral monies, such as the US $800,000 that Denmark provided to Indonesia, will continue to be integral in developing effective solid waste management infrastructure.[21]

This wave of global activity and commitment to more circular systems creates an opportunity to dramatically improve recovery and reuse efforts while rethinking product and service delivery options to reduce waste generation at the source. These efforts combined with improved solid waste management systems are needed to prevent ocean plastic pollution.

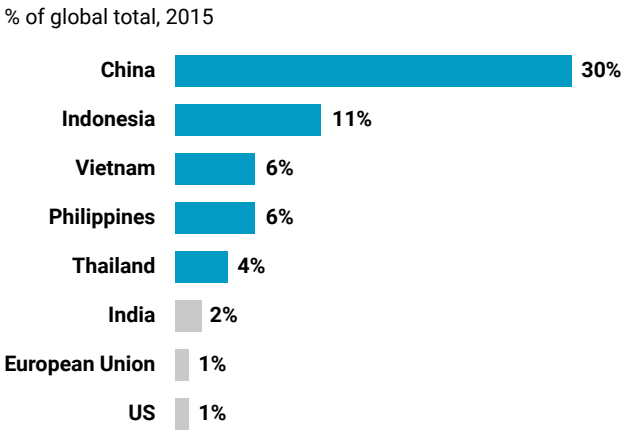
[v] The Trash Free Seas Alliance® unites industry, science and conservation leaders who share a common goal for a healthy ocean free of trash. The Alliance provides a constructive forum focused on identifying opportunities for cross-sector solutions that drive action and foster innovation.

Focus of this playbook

This playbook builds on insights from previous Ocean Conservancy reports, *Stemming the Tide* (2015) and *The Next Wave* (2017), to focus on the most urgent regions and systemic challenges:

1. **Five countries in Asia are believed to be the largest contributors of ocean plastic:** *Stemming the Tide* identified that approximately 60% of ocean plastic comes from just five countries in Asia—China, Indonesia, Vietnam, the Philippines and Thailand.[5] Their disproportionate contribution to ocean plastic is driven by rapid economic development and the demand for safe, disposable products, which has outstripped the capacity of waste management infrastructure to deal with the increased quantity of waste. This challenge has been exacerbated by the growing quantity of plastic waste imports, which grew 171%—up to 2.6 million tons—between 2016 and 2018.[22]

Figure 4: Plastic debris entering ocean[6]



2. **Effective solid waste collection systems are lacking across the five focus countries:** *Stemming the Tide* also identified that 80% of ocean plastic comes from land-based sources, and that 75% comes from waste that was never collected.[5] This is a particularly

acute challenge across the five focus countries, where collection rates are as low as 5% in some rural or island areas.[23]

3. **Collection is a net cost activity and non-recyclable plastics make up a large portion of ocean plastic:** Collection is challenged by an inherent lack of funding from both a capital expenditure (CAPEX) and an operational expenditure (OPEX) perspective. There is insufficient investment in collection infrastructure and low municipal solid waste management budgets fail to cover the operating costs. This is especially true for non-recyclable plastics, such as plastic films, composites and sachets, that typically have a low residual economic value and do not create enough revenue to cover the cost of collection and sorting.[6] This makes collection a net cost activity, which is particularly challenging given that a large portion of ocean plastic is made up of these low-value plastics.[5] While the long-term objective is to make them more recyclable and thus attractive to collect, there is a short-term requirement to increase the provision of funding for their collection.

How to use this playbook

This playbook can be used by governments, corporates and NGOs to support multi-stakeholder initiatives to improve collection. Insights from this playbook can be explored in a number of ways:

1. **By guiding principle:** For any measure to be successful there is a certain set of conditions that have to be true. The five guiding principles in Chapter 2 must be in place to ensure effective implementation of any strategy.

2. **By theme:** Measures can be reviewed across each identified theme and its associated financial impact analysis, including Finance the Collection (Chapter 3), Reduce Problematic and Unnecessary Single-Use Plastics (Chapter 4), Design for Circularity (Chapter 5), and Develop Recycling and Treatment Markets (Chapter 6).

3. **By measure:** The discussion of each measure within the theme chapters includes key barriers and success factors, as well as its applicability in each country.

Figure 5: How to use this playbook

FIVE GUIDING PRINCIPLES

Five guiding principles must be followed for the success of any waste management strategy to improve collection and end ocean plastic leakage;

1. Combine measures across the value chain **2.** Engage and include the informal sector **3.** Drive consumer awareness and behaviour change **4.** Inspire political will **5.** Improve enforcement at national and local level

IMPROVING THE ECONOMICS OF WASTE COLLECTION

There are a selection of high potential public-private measures, across the value chain, that can combine to improve collection. This playbook explores these measures across four themes:

Theme	I. Finance the Collection	II. Reduce Problematic and Unnecessary SUPs	III. Design for Circularity	IV. Develop Recycling and Treatment Markets
Public measures	• Packaging material fee • Deposit return scheme • Plastic credits / Packaging recovery note • Pay as you throw • Municipal collection and MRF • Source segregation • Municipal union	• Taxes and levies on SUPs • Bans on SUPs • Ban on primary microplastics	• Eco-design standards • Recycling content standards	• Incentives for recycling industry • Sustainable conversion and offtake markets • Preferential procurement • Virgin material tax
Private measures	• Pre-competitive voluntary EPR • Blended financial instruments • Digital waste management	• Remove non-recyclable plastics from packaging • Develop alternative materials	• Establish cross/ inter industry standards • Design refillable packaging	• Invest in recycling capacities

Approach

The research methodology covered six key steps:

Step 1: SOURCING

Combining ~45 interviews and desk-based research to collate 180+ public and private sector measures. This was consolidated to 43:

- 28 public sector measures
- 15 private sector measures

Step 2: EVALUATING

Each of the consolidated measures was evaluated and scored against two criteria:

I. Impact: economic, environmental and social

II. Ease of implementation: Financial viability and executability

Step 3: APPLYING

Consolidated measures were assessed based on their applicability within the national context across five focus countries. The criteria for applicability were:

I. Relevance II. Coherence III. Suitability

Step 4: TESTING

Outputs of the evaluation and applicability assessments were tested with local experts during three in-country workshops. Workshops took place in:

I. Philippines II. Indonesia III. India

Step 5: SHORTLISTING

The output was a shortlist of 24 measures across four themes, that are discussed in the playbook. Four themes:

I. Finance the Collection

II. Reduce Problematic Single-use Plastics

III. Design for Circularity

IV. Develop Recycling and Treatment Markets

Step 6: MODELING

Combinations of measures were modeled to assess their impact on reducing the financing gap of collection.

Step 1: Sourcing measures

The first phase used a series of expert interviews and desk-based research to create an extensive list of public and private sector measures to reduce ocean plastic. Over 180 measures were consolidated into a list of 43 measures, which were evaluated in detail, including 28 public sector and 15 private sector measures (Figure 6).

Figure 6: Refined list of 43 measures evaluated

PUBLIC SECTOR MEASURES

1. Advanced Disposal Fees
2. Anti-littering and anti-dumping levies
3. Ban on primary microplastics
4. Ban on SUPs
5. Decentralized repurpose and reuse
6. Deposit return scheme
7. Eco-design standards
8. Eco-labelling standards
9. Government grants and funds
10. Incentives for recycling industry
11. Informal sector inclusion
12. Landfill taxes
13. Municipal bonds
14. Municipal collection points and MRFs
15. Municipal unions
16. Packaging material fees
17. Pay as you throw
18. Plastic credits system
19. Preferential procurement
20. R&D incentives
21. Recycling content standards
22. Regulations on waste impost
23. Sanitary landfills
24. Source segregation
25. Sustainable conversion and offtake markets
26. Takeback obligations
27. Taxes and levies on SUP
28. Virgin material tax

PRIVATE SECTOR MEASURES

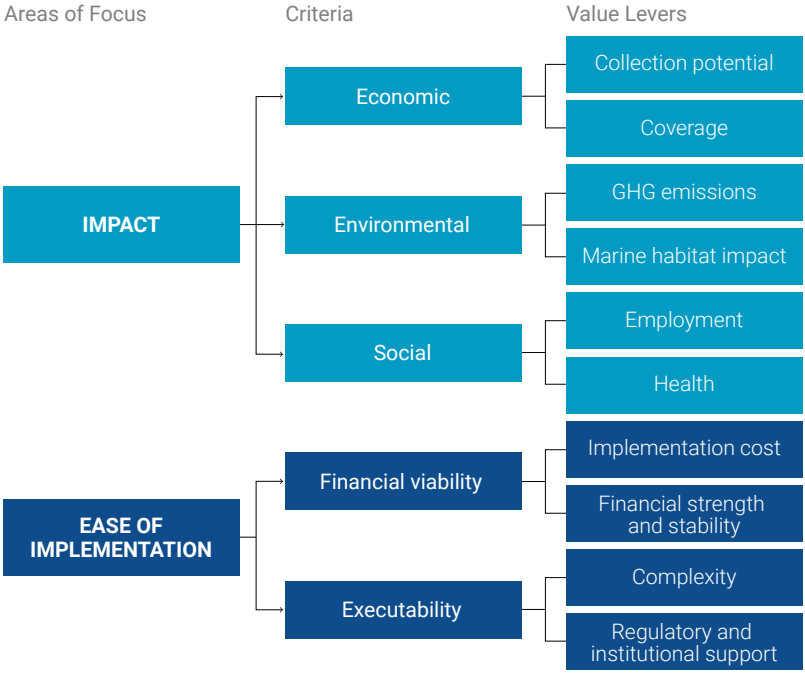
1. Awareness and behaviour change campaigns
2. Blended financing instruments
3. Deploy recyclable packaging
4. Design refillable packaging
5. Develop alternative materials
6. Digital waste management
7. Establish cross/inter industry standards
8. Grow conversion market – RDF
9. Invest in recycling capacity
10. Philanthropic and CSR funding
11. Plastic to roads
12. Pre-competitive voluntary EPR
13. Reduce problematic plastics from packaging
14. Reintegrate recycled plastic
15. Social support to informal sector

Step 2: Evaluating measures

The second step was to evaluate each of the 43 measures at country level, based on:

- **Impact:** What is the potential for this measure to reduce ocean plastics and what other positive (or negative) impacts might it have from an economic, environmental and social perspective?
- **Ease of implementation:** What is the level of complexity for this measure to be implemented and sustained?

Figure 7: Evaluation framework criteria and value levers

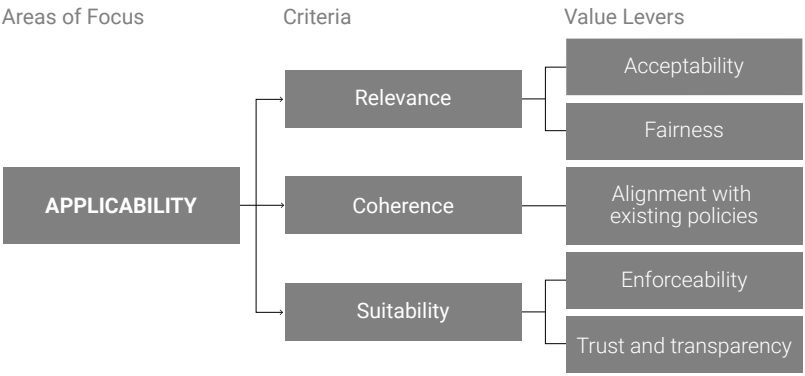


Each individual lever (e.g., impact on Collection Potential) was scored on a scale of 1 to 5, with 1 being no impact and 5 being high. These scores were then aggregated and weighted across the criteria in the framework to show which measures had the greatest potential to succeed. The outcomes were validated through a series of expert interviews and workshops. (For the full list of contributors please see the Appendix.)

Step 3: Applying in focus countries

For insight into the applicability of the measures in the five focus countries, an additional assessment was conducted on the relevance, coherence and suitability of measures at a national level, as they relate to conditions like existing waste management infrastructure or topography.

Figure 8: Applicability assessment criteria and value levers



Step 4: Testing in focus country workshops

Government representatives, private sector leaders, entrepreneurs and NGOs from across Indonesia, the Philippines and India participated in workshops to test the outputs and refine the shortlist to ensure a focus on the most critical measures.

Step 5: Shortlisting

This expert-reviewed and locally verified shortlist represents a systemic set of measures for the public and private sector to focus on in order to significantly reduce ocean plastic in a socially, environmentally and economically effective way. Each measure is defined and discussed in later chapters in terms of potential impact on collection, barriers to progress, success factors and in-country applicability.

Step 6: Analyze and model value chain financial benefits

Finally, a value chain material flow model was developed to explore the potential impact that various combinations of shortlisted measures could have on the profitability of the waste value chain. This analysis is discussed within each theme chapter. Details of the modeling are found in the Appendix.

Limitations

While this playbook is data-driven and evidence-based, it is not a scientific assessment of the feasibility or viability of the measures described. Nor is it a technical assessment of the viability of plastic alternative materials, plastic treatment solutions or other technological measures.

The financial assessment is an attempt to quantify the financial impact of a combination of measures. As it is not a business case, the outputs should not be confused with determining the return on investment or any other assessment of commercial viability. To deliver a true financial analysis, each measure will require a specific value assessment based on appropriate data.

It is also important to recognize that, despite engaging a broad range of experts across multiple geographies, industries, sectors and areas of expertise, positive interview bias and stakeholder agendas were considered during the writing of this report.

CHAPTER 2

FIVE GUIDING PRINCIPLES FOR SUCCESS

Five guiding principles should be followed for an effective solid waste management strategy. These principles are common across focus countries and are widely applicable to other countries dealing with the challenge of plastic waste management. They should be considered pre-requisites for success, and they must be in place for any of the measures discussed in this playbook to have a positive impact on improving collection and reducing ocean plastic. The five guiding principles are:

Principle 1: Combine measures across the value chain

Principle 2: Engage and include the informal sector

Principle 3: Drive consumer awareness and behavior change

Principle 4: Inspire political will

Principle 5: Improve enforcement at national and local levels

Principle 1: Combine measures across the value chain

Measures that are targeted at improving the economics of collection have the potential to meaningfully reduce the financing gap, improve collection and reduce ocean plastic. A focus on collection alone, however, fails to address the systemic challenges of the linear economy, including excessive production, poor product design and a lack of end-of-life solutions. Reducing ocean plastic will require a systemic approach that embeds circular economy principles across the value chain to maximize resource efficiency, reduce waste and drive value.

Upstream interventions can reduce the excessive production of problematic and unnecessary plastic: The quantity of plastic produced, consumed and discarded exceeds the current capacity of collection and waste management infrastructure. It is imperative that, alongside improvements to collection, there is a deliberate effort to reduce, and ideally, to prevent the production of problematic and unnecessary plastics in the first place. This is particularly acute in focus countries, where a proliferation of non-recyclable single-use plastics is contributing to ocean plastic. Leveraging strong policy measures, ranging from taxes to bans on problematic and unnecessary single-use plastics, alongside policy incentives and a focused response from the private sector to design recyclable plastic through an eco-modulated EPR system (bonus/malus system of EPR fees) will translate into meaningful reduction. Upstream interventions can support collection economics by reducing the quantity of non-recyclable plastics at the collection stage and improving the quality of waste streams for recycling.

Downstream markets can support collection: The collection of plastic waste in key focus countries is driven by its inherent economic value. Plastics with established recycling markets like PET and HDPE are largely collected, while others, such as flexible non-recyclable films, are not. As a result, measures that create a downstream market, particularly targeted at plastics not often collected, can create a stable economic value, improving collection

rates and the livelihoods of waste collectors. A downstream market is already well established for some plastics, notably PET and HDPE, both of which have relatively high collection rates compared to other plastics. Solutions that create markets for non-recyclable plastics in the short-term should be scaled to drive demand and encourage their collection. The scaling of recycling infrastructure in focus countries, combined with policy measures that create demand for recycled material, can further improve collection of post-consumer plastic.

Principle 2: Engage and include the informal sector

Waste-picking by independent waste collectors remains a predominant method of waste collection across focus countries and is integral to the existing waste management landscape. This expertise will be critical in improving collection in the future, making their social and economic inclusion an important priority. Based on interview and workshop insights from local informal sector experts, this research identified five models of effective inclusion, which have proven to be successful (Table 1).

In addition, some best practices emerge for national and local governments, private sector and civil society that can be effective in supporting informal sector collaboration (Table 2).

ETHICAL SOURCING OF RECYCLABLES

Hasiru Dala Innovations (HDI), in partnership with a global beauty brand, has undertaken a long-term contract for sourcing 250 tons of recycled PET with stringent specifications at a fixed price to enable fair prices to independent waste collectors and scrap dealers. To cover the additional costs of ethical sourcing, traceability and fair trade, the brand has baked in a premium such that ex-works price is at a 22% premium over comparable domestic prices and a small premium over European-sourced recycled PET.

Table 1: Models and examples of inclusion of informal sector in waste collection

	Model	Case Example	Description
Models for Informal Sector Inclusion — Collection Driven by Public-Private Arrangements	**NGO-Supported Microenterprises**	Saahas, Bangalore	Under a PPP model, independent waste collectors and an NGO enter into a service agreement with local government to provide it with legal collection rights. The role of the NGO is to provide oversight and technical guidance.
	Cooperatives and Collectives	SWaCH, Pune	Under a PPP model, formally registered collectives, such as cooperatives or self-help groups (SHGs) of independent waste collectors, enter into service agreements with local government for collection under concession and management contracting model.
Collection Driven by Private Businesses	**Independent Waste Banks**	Bank Sampah, Indonesia	Independent small traders act as local collection centers wherein consumers maintain passbooks. In lieu of waste deposited, consumers get points which are redeemable in the form of products of daily use such as groceries.
	Franchisee Development	Hasiru Dala, Bangalore	Individual independent waste collectors or small traders act as franchisees of the waste management company. Franchisee owners manage the collection from customer accounts (generally, bulk generators) allocated to it by the waste management company.
	Supplier Development	NEPRA, Hyderabad	Individual independent waste collectors or small traders act as direct suppliers to MRFs. It helps them upgrade to be able to manage more quantities while supporting them with social welfare activities and to improve health and safety.

	Integrating Entity	Role of Government	Role of Informal Sector	Income Sources for Informal Sector
	NGO, local government	Provision of land, utilities, equipment and, in some cases, primary collection	Primary collection, secondary collection and processing	With or without user fee, sale of recyclables, concession fee
	Local government	Provision of land, utilities and equipment		
	Aggregating trader	None. Local government owns primary and secondary collection, and waste bank owners manage a parallel flow of dry waste	Primary collection through drop-off points	Sale of recyclables
	Waste management company		Primary collection through doorstep pick-ups	Commission from user collection fee; sale of recyclables
	Aggregating trader		Primary and secondary collection from various sources	Sale of recyclables

Table 2: Best practices to enable informal sector collaboration

National and Local Government	• Provide occupational identity cards to waste collectors • Align with independent waste collectors' associations through public-private partnerships • Clarify ownership rights on recyclable waste collection • Bring together waste collector livelihood improvement programs with national social security schemes on health and safety, improved working conditions, sanitation and education • Provide working capital to waste collector microenterprises
Private Sector	• Design innovative approaches (e.g. extended producer responsibility) to be socially-inclusive, integrating existing infrastructure (e.g. waste banks and incentivized collection of problematic plastic) • Allocate Corporate Social Responsibility (CSR) funds to NGOs for independent waste collector welfare projects • Provide cooperatives with a foundation for continuous improvement that focuses on working conditions, productivity and basic management systems, considering it an investment in a reliable supply chain • Invest in small operations to help with scale (e.g. helping entrepreneurs establish a formal banking and tracking system and ensuring children are educated, wages are adequate, and that the family has health coverage)
Nonprofits	• Provide technical support to improve earnings through training on better sorting, value addition and responsible waste handling • Support worker collectives, such as cooperatives or self-help group formation • Ensure financial inclusion, workplace safety, rehabilitation and interventions for marginalized groups (e.g. child labor)

Principle 3: Drive consumer awareness and behavior change

Consumer buy-in is a critical enabler of well-implemented plastic waste management solutions. This has been demonstrated in leading European countries, notably Germany and Belgium, where a bottom-up consumer movement is both demanding action by the public and private sectors and supporting innovative schemes with effective source segregation. While the awareness of ocean plastic has undoubtedly become more mainstream across the five focus countries, engaging consumers in collective behavior change remains a challenge. This may be tied to broader macroeconomic factors, which justifiably dictate that a different set of priorities, such as access to food and clean drinking water, take precedence. As a result, there remains an urgent need to develop targeted campaigns that improve the awareness and understanding of local populations to establish what motivates and empowers consumers to be an active part of the solution.

There are a few high-potential levers that can drive consumer engagement:

- **Share the right messages with the right audience:** Awareness creation and behavior change programs require clear and targeted objectives that show the impact and importance of plastic and behavior changes on litter prevention, reduction and source segregation. Awareness campaigns should be targeted to key influencers, including local government or community leaders, policy makers and young people. Empowering people to make active decisions and become part of the solution, as opposed to the problem, can accelerate uptake. While the national government can spearhead consistent messages, the private sector also has an important role to play. In leveraging bigger budgets and a greater marketing capacity or providing support to governments on the content of campaigns or educational programs, the private sector should take an active role in driving consumer engagement. NGOs can also play a valuable role in sharing messages, particularly at the local level. Educational campaigns focused on circular economy principles can be adopted as part of the national curriculum to

embed awareness and ensure buy-in on environmental reform for future generations.

- **Utilize digital media for messaging:** The emergence of digital platforms and increasing digital literacy across focus countries with widespread mobile uptake provides new opportunities to engage consumers on a mass scale with a clear, consistent message for action. Low-tech solutions, such as texting and push notifications, can spread information and awareness on the topic to a more diverse set of people. Furthermore, digital consumer engagement programs can also enable better data collection and early stage digitization of the waste management industry, for example, with consumers posting waste for collection. Budgeting for such projects is essential, and the private sector can leverage higher marketing budgets to support effective outreach.

SWACHHATA APP

The Indian government launched Swachhata App—a mobile application for consumers to post their complaints about their city's waste management. The app has more than 8 million downloads and is used in over 2,750 cities. In one city, Mysore, up to 90% of consumer waste management complaints through the app are resolved by the city.[24]

- **Provide the infrastructure for consumers to participate:** Educating consumers is one element, but campaigns can only be successful when the infrastructure exists to allow consumers to participate in the solution. Reverse vending machines, where consumers return plastic waste to vending machines in return for financial reward, have been widely adopted in Europe and could incentivize the return of specific plastics. High implementation costs may prove a barrier for reverse vending machines in focus countries and, as a result, focus countries can adapt, utilizing existing collection centers as drop-off points. In Indonesia, for example, there are more than 7,000 Bank Sampah, or waste banks, where consumers

deposit their sorted recyclable waste in exchange for credits or cash.[25] A focus on maximizing the efficiency of existing infrastructure could be beneficial in consolidating logistics, driving waste aggregation and reducing CAPEX requirements for new infrastructure. Establishing new waste drop off locations in high traffic areas, such as schools, can engage a wider demographic, particularly in rural or island areas. Consumer engagement must be delivered alongside the relevant infrastructure to ensure people can participate and are not disenfranchised.

Principle 4: Inspire political will

Political leadership is key, both at the national and local level. There are multiple steps that governments can take to support and encourage political will at the local level.

- **Provide a clear national mission:** Support from senior political leadership can galvanize the population and engage leaders at a local level. Ambitious waste reduction targets, widespread and visible public branding, and consistent communication can create momentum, drive public demand for action and ensure accurate, transparent and regular performance reporting. This is particularly important for focus countries, notably those with archipelagoes, where it is a challenge to align largely disparate and decentralized political structures.
- **Develop attractive incentives:** By creating competition between cities, or municipalities, local governments can be motivated to achieve a higher degree of compliance with regulations and improved performance. Motivation can be enhanced when competition is combined with public-facing recognition (see Swachh Survekshan case study), aligning positive waste solutions with political ambitions. Further incentives, such as grant incentives for high-performing municipalities, can drive improved performance on waste management issues.

- **Build a knowledge repository and standardize:** From information exchange and e-learning portals to regular workshops and waste academies, local initiatives can improve knowledge. At the national level, developing standard operating procedures for local governments, targeted at key decision makers and local leaders and mayors, can reduce the technical capability required.

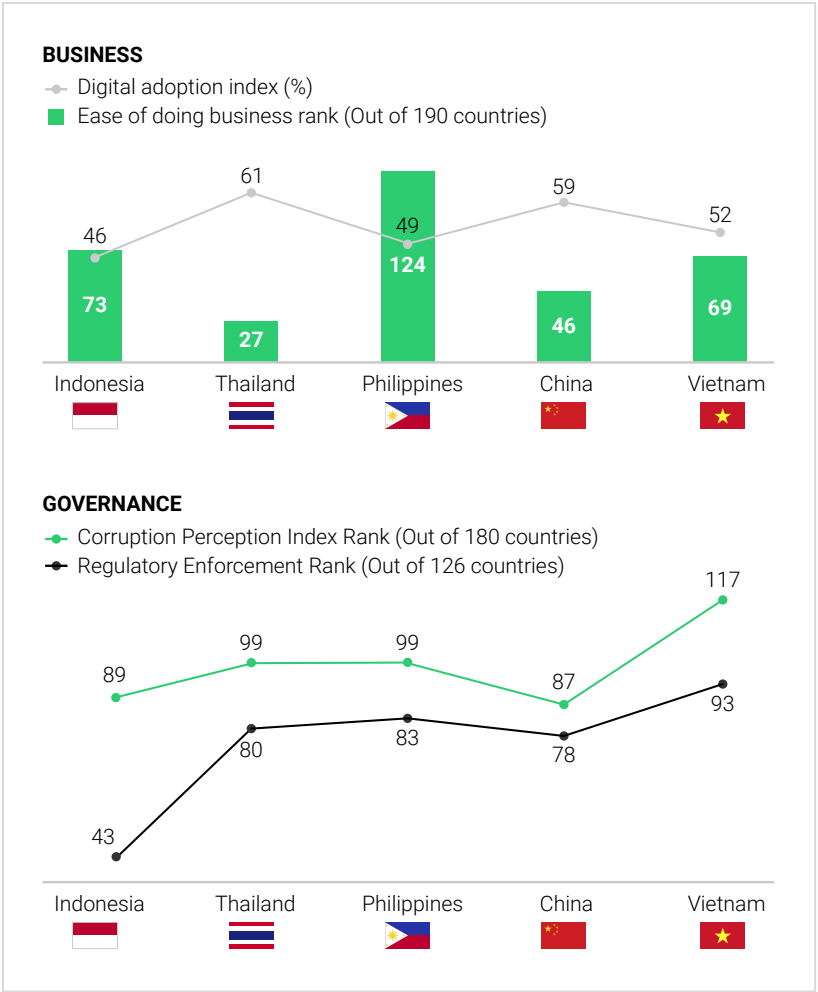
SWACHH SURVEKSHAN AND GARBAGE-FREE CITIES STAR RATING

Swachh Survekshan is an extensive survey in India that ranks cities on the performance of municipal solid waste management and other parameters. In 2019, 6.4 million citizens participated in the survey across more than 4,000 cities.[26] By encouraging healthy competition among cities in the race towards becoming India's cleanest city, rankings have played a key role in mobilizing local political leadership. Another noteworthy step is the development of a rating system based on service-level progress, direct observations (independent audits) and citizens' feedback for cities.[27] The system acts as a single metric to enable a holistic evaluation of the entire SWM value chain. Supported by a robust verification mechanism to ensure transparency and standardization, the protocols have been designed to enable cities to gradually evolve into a model, 7-star city.

Principle 5: Improve enforcement at national and local levels

The ability to equitably implement policy and enforce subsequent regulation is a critical barrier to progress at a regional, national and local level across the five focus countries (Figure 9).

Figure 9: Comparison of countries on enforcement and governance parameters



Sources: World Bank (2016, 2019), Transparency International (2018), World Justice Project (2018)

To improve the capability for implementation across focus countries, two key areas were identified:

1. **Improve national policy:** This research identified a set of guidelines that can support effective implementation of national policy (Figure 10).

Figure 10: Guiding principles to support implementation of national policy

1 **Coherent and integrated** Coherent policy and an integrated framework across national, state and local levels is critical to addressing systemic issues	**2** **Open and adaptable** An open approach, involving continuous public-private dialogue that adapts to market dynamics (e.g., plastic trade, oil prices, packaging trends) and local contexts, where possible	**3** **Ring-fenced funds** New revenue streams should be earmarked for specific activities to improve solid or plastic waste management, or short-term palliative finance solutions
4 **Transparent and traceable** Digitally-enabled operating and monitoring models will reduce scope of corruption and free-riding to enhance overall acceptability of any measure	**5** **Data-driven** Develop processes, governance and funding for data collection measures, mandating data disclosure for producers and brand owners	**6** **Circular economy-focused** Imperative to have a circular economy lens in policymaking, maximizing the inherent value of materials while ensuring the best use based on environmental, social and economic outcomes

2. **Improve local enforcement capabilities:** Improvements in technical capabilities and knowledge at the local level can improve the ability to enforce policy (Figure 11).

Figure 11: Guiding principles to support implementation for local governments

1 **Develop existing infrastructure** Make use of existing infrastructure and systems with a mindset focused on maximizing return on investment vs. investing in new infrastructure with higher costs	**2** **Adapt centralized vs. decentralized approaches** Adapt your approach between decentralized and centralized strategies, depending on local factors (e.g. municipality size, waste quantities and governance structure). A centralized approach, where possible, can enable efficiency by economies of scale	**3** **Public-private partnerships** Develop outcome-based PPP models, such as pay-for-performance structures, that drive controlled competition between service providers to incentivize high productivity
4 **Measure progress** Develop methodologies to track and measure progress (e.g., KPIs on source segregation, door-to-door collection to review progress)	**5** **Informal sector inclusion** Create provisions for social, economic and formal inclusion of independent waste collectors at the local level	**6** **Long-term viability** Operators should strive for financial viability within 2-3 years of starting operations

In addition to these principles, core success factors such as transparency, traceability and pre-competitive collaboration should underpin all responses.

CHAPTER 3

FINANCE THE COLLECTION

Why new pathways to fund plastics collection are required

Municipal solid waste management (MSW) typically represents a negligible share of overall government budgets across Asia. It amounts to about 2% of provincial budgets in Indonesia[23] and around 4.6% of the national budget in the Philippines.[28] Of this allocation, municipalities spend 50-80% on collection[29] with the remainder on disposal and other areas of the value chain.

One-time grants from national governments and urban infrastructure improvement schemes also help finance local collection infrastructure. While this financing ensures basic infrastructure is in place, such as material recovery facilities (MRFs), substantial investment is required to expand coverage, notably to smaller urban localities, rural areas and remote islands. For example, of the 42,000 barangays (sub-municipal units of government) in the Philippines, only 7,680 are served by MRFs—a mere 18% compliance rate with national regulation.[30]

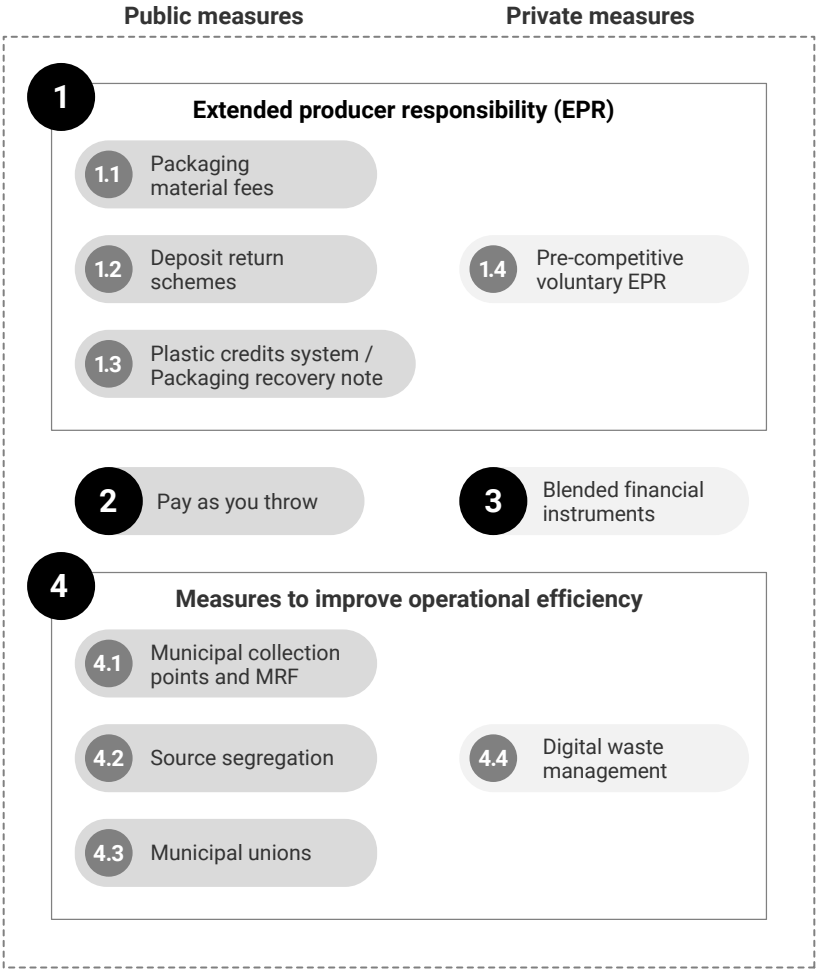
Limited funding often means that existing infrastructure is poorly maintained. In one instance, only 12% of 3R-TPS (Reduce, Reuse, Recycle Tempat Pengolahan Sampah – MRFs) were fully functioning across Java, Sumatra and Kalimantan.[31] Traditionally, operational expenditure (OPEX) of collection has inherently been a net cost activity, which reduces maintenance because labor, fuel and associated costs are not recovered by the value of the collected materials.[32] Thus, end markets for collected materials can also play a role in reducing the OPEX challenge.

With collection chronically underfunded, new financing measures are required to improve investment in capital expenditure and provide sustainable financing to cover operational costs.

Shortlisted measures

This playbook provides an overview of ten shortlisted measures that are critical to improving the financing of collection, and they focus on extended producer responsibility (EPR), pay-as-you throw, blended financial instruments and enabling measures that drive operational efficiencies (Figure 12).

Figure 12: Shortlisted measures for finance the collection



1 Extended producer responsibility

Traditionally, the operational burden of waste management has been with local government. However, the urgency of the plastic waste challenge across the focus countries demands the adoption of bolder measures that engage the private sector. EPR is one such measure and, with over 65 models of packaging EPR currently in operation, it is gaining momentum. Around 400 EPR models exist across various product categories, including packaging, 70% of which have been implemented since 2001.[33] The focus of this momentum, however, has been largely limited to developed economies. This presents an opportunity for the five focus countries, and wider set of developing economies, to design innovative systems that leapfrog the challenges of EPR in developed economies. EPR is viable for a wide variety of materials, including plastic in products other than packaging, glass, paper, aluminum and other recyclable materials. Given the focus of this report on ocean plastics and the fact that EPR is typically implemented on waste streams separately (e.g., packaging, electronics, end-of-life vehicles), only plastic packaging is discussed in greater detail. However, the findings are still applicable for EPR more widely.

> **Each country should adopt elements from other EPR programs to best suit their own local needs and regulatory framework.**

Figure 13: Design parameters for a national level EPR framework and leading examples

DESIGN PARAMETER	EPR CONSIDERATIONS FOR FIVE FOCUS COUNTRIES
Individual or collective schemes	• Unlike in an individual scheme, multiple producers join in collective mechanisms to fulfil EPR targets • Collective schemes have been the preferred mode of implementation, with a few countries offering an option of individual schemes in parallel
Financial responsibility vs. operational responsibility	• Under financial responsibility PROs pay fees to municipalities, which remain in charge of waste management operations • Based on local municipality operational capacity and accounting for the role of local government, producers can take operational responsibility by organizing waste management operations themselves
PRO competition and effective contracting	• Insufficient evidence for monopoly versus competitive PRO: Single PRO makes enforcement and monitoring easier while also avoiding the problem of free-ridership. On the other hand competition among PROs can bring cost efficiency • Single industry led PRO in the start-up phase along with competitive tendering process for waste management contracts, with flexibility to introduce competition will be required
Cost coverage by producers	• EPR fee can vary for each product type: fees for each product category must reflect the true cost of collection adjusted for revenues earned from its sale to recyclers • In addition, producer fees can also be contributed to activities such as information and awareness creation, waste prevention actions, auditing costs etc.
Coverage of SMEs and unbranded packaging	• Policymakers of countries in focus need to address the potential free-riding from SMEs and end-of-life management of unbranded packaging • Separate mechanism for SMEs that makes it easier and cost-effective for them to comply will be needed; making EPR targets for large producers brand-neutral could help manage unbranded packaging
Voluntary versus mandatory scheme	• Governments may establish an EPR program through a voluntary agreement with the industry instead of imposing legislation and mandatory requirement • Voluntary schemes should be used for creating proof of concept, and are eventually transitioned to mandatory schemes

Examples of existing EPR schemes			
Belgian Fost Plus	**German Green Dot**	**Lithuanian DRS**	**Plastic credits UK PRN**
Collective + individual scheme	Collective scheme	Collective scheme	Collective + individual scheme
Financial responsibility—PRO pays packaging related costs to municipality	Operational responsibility—contracts with local waste management companies	Operational responsibility—given to a non-profit (USAD) established by beverage industry	Operational responsibility—no financial compensation for municipalities for collection
Single PRO (fostplus for household and val-i-pac for industrial)	Monopoly till 2003; currently 9 PROs operational	Monopoly—USAD provides operational support, RVMs are provided by TOMRA	22 PROs operational in UK (as of 2014)
Up to 100% cost coverage for target plastic collection—based on quality of collected material	Full cost coverage for target plastic collection	USAD pays handling fees and throughput fee per container to store and TOMRA	Full cost coverage—split between convertors, packers/fillers, sellers, importers
No separate mechanism; penalties on non-compliance	No separate mechanism; free-riding increased since introduction of multiple PROs	Unbranded collection; no separate mechanism for SME	Modulated targets for SMEs based on annual turnover
Mandatory scheme	Mandatory scheme	Mandatory scheme	Mandatory scheme

1.1 Packaging material fees

Description: Producers pay fees depending on the amount of packaging material put on the market or their plastic recycling/recovery targets. Pooled fees are used to fund packaging waste management activities through a producer responsibility organization (PRO).

Packaging material fees enable upfront coverage of the cost of collection, as well as the cost of recycling and treatment, depending on the operating model. Currently, many developing economies are spending less than 0.5% of Gross National Income (GNI) on solid waste management as compared to the best practice of spending 1% of GNI.[34] Packaging material fees could provide an additional source of funding for financing waste management over and above government spending. For example, Indonesia produced and imported 4.5 million tons of plastic in 2015.[35] Assuming 40% of this is plastic packaging[23] and using a Belgian-style EPR fee of €0.096/kg[36]—an amount converted after taking into account Indonesia's purchasing power parity of 3.4 in 2018)[37]—this could provide €173 million (US $191 million) in revenues for waste management.[vii] Although no official sources for waste management budgets are available for the five focus countries, estimates for Indonesia suggest that US $500-1,400 million in revenue can be generated per year based on available data.[22]

Challenges: Viable for a wide variety of plastic products, packaging material fees have been implemented in many European countries, as well as in Japan and South Korea.[38] Effective implementation of a similar measure in the five focus countries would require addressing key challenges. These include a lack of institutional capacity for proper enforcement, administration and governance challenges, the potential free-riding by certain segments of industry (e.g., SMEs, producers of unbranded packaging) and the role of the informal sector.[39] Ensuring that these challenges are addressed requires identifying the right mix of operational elements.

[vii] Packaging material fees vary on a country-by-country basis. In this instance, the Belgian fees were used as a benchmark because it has the lowest scheme cost to business per capita among packaging material fee models.

There are two widely adopted options to implement EPR using packaging material fees:

Option 1: Producers, importers and brand owners pool financial contributions—proportionately based on the weight and type of plastic packaging put in the market—into a fund that is managed by a single PRO. In some cases, producers, importers, brands and retailers are given the flexibility to either meet their obligations individually while having a separate reporting obligation to a designated agency, or collectively contribute to the designated fund managed by the PRO.

Option 2: Producers, importers and brand owners contract individually with implementation agencies, generally multiple PROs. This approach allows the impact to be determined more directly by the producers and can enable a more quantifiable return of investments and potentially lower compliance cost.

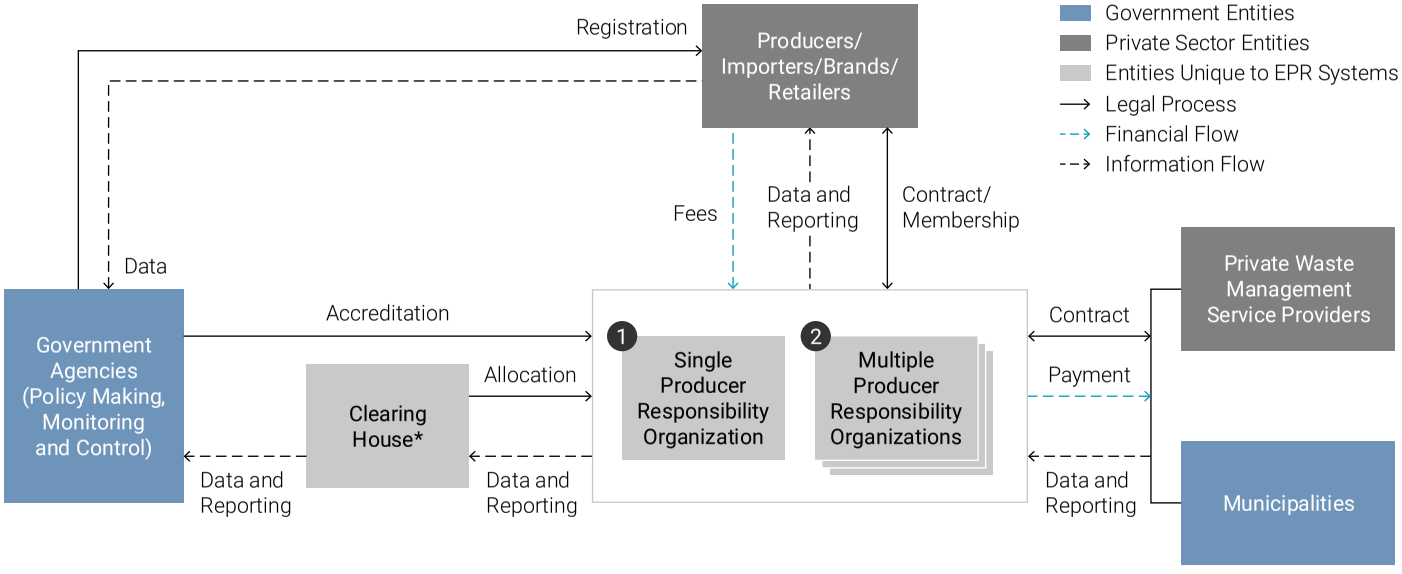
Although there is no empirical evidence suggesting either option to be better in all cases, a single PRO in the start-up phase, along with a timely competitive tendering process for offering waste collection contracts, will help reduce the problem of free-riding, while allowing for easier regulatory oversight.[40] [41] [42] In the long-run, however, flexibility to encourage and introduce competition may be required, should the benefits of a single PRO no longer outweigh the costs.[33]

Conditions for success: In designing either of these approaches, the following best practices should be considered:

- **Aligning EPR with upstream policy to drive change:** Incorporating circular thinking at the design stage will give countries a head start in their transition towards a circular plastics system. Eco-modulation of packaging fees, determined by reusability, recyclability and the amount of recycled content for example, can incentivize changes in product material and design.[43] [44]
- **Target-based approach:** Overall recycling and recovery targets, with the possibility of specific material targets for producers (either individual or PROs) and penalties for non-compliance will enable easier administration and better compliance.

Figure 14: Implementation options for packaging material fee

PACKAGING MATERIAL FEES



*Required only in case of multiple PROs

- **Ring-fenced EPR fees:** Fees for each product category (e.g., packaging, electronics) must reflect the true cost of collection adjusted for revenues earned from its sales to recyclers. Thus, packaging material fees should fund the collection and treatment of packaging waste and not be seen as a blanket funding mechanism for all types of municipal solid waste. Collected fees could be directed towards funding major recycling costs, including capital expenditure, operating expenses, public education and other continuous improvement programs like technology development and scaling for cost efficiency.
- **Clearly defined framework for PROs:** Ecosystems of PROs in the five focus countries are still evolving. Policymakers in the region govern PROs using the existing landscape of local players, ensuring a wide geographic coverage of collection, treatment and proper disposal. Design parameters to consider include level of competition among PROs, distribution of collection responsibility (household vs. industrial/commercial packaging waste) and PRO operating model (for-profit vs. nonprofit).
- **Competitive tendering process:** Contracts for collection, either with local government or private waste management companies, should be based on a competitive tendering process and include payment components based on performance. Local governments could either participate in the collection system or just play the role of accrediting and facilitating the operation of PROs within their geographies.
- **Timely reporting and transparency:** Digitization of the value chain to capture data on quantity and types of packaging could improve transparency and traceability. It can also help reduce inefficiencies and allow room for course correction to strengthen the program. PROs could channel funds received through packaging material fees towards building a platform for data logging, compliance monitoring and performance benchmarking.

PACKAGING MATERIAL FEES IN FRANCE

In 1992, France introduced a packaging material fee model for household packaging waste, which today, remains the largest EPR scheme in France. Danone pioneered the EPR concept with the creation of Eco-Emballages (now known as CITEO). It eventually evolved into a mandatory national-scale EPR model for packaging waste. In 2016, the scheme channeled €654 million for the collection of 4.9 million tons of household packaging waste.[45] This reduced the financial burden on municipalities by about 52%, while also achieving recycling rates of 67.1% in 2016. The aim is to achieve 75% recycling rates by 2022.[46]

The scheme charges a basic fee based on the weight, type of packaging material (e.g. plastic, paper, glass, cardboard) and the number of packaging units. It also incorporates an eco-modulation of fees based on a bonus/malus system (as shown below) depending on specific design criteria.

BONUS		
Awareness Bonus	Up to 21%	Based on packing sorting instructions, availability of Triman logo to ensure segregation of waste and awareness creation actions through advertising, etc.
Recyclability Bonus	Up to 24%	Based on reduction in packaging, improvement in recyclability, sortable plastic packaging and plastic packaging with existing recycling channels
Total bonus = awareness bonus + recyclability bonus = min 0% - max 24%		

MALUS	
Packaging without recycling channel	Up to 100%
Packaging with elements reducing recyclability	Up to 100%

1.2 Deposit return scheme

Description: Refundable fee levied on an individual product at the point of purchase. The entire fee, or a portion of it, is refundable when the used product is returned to the point of sale or at a specified drop-off site.

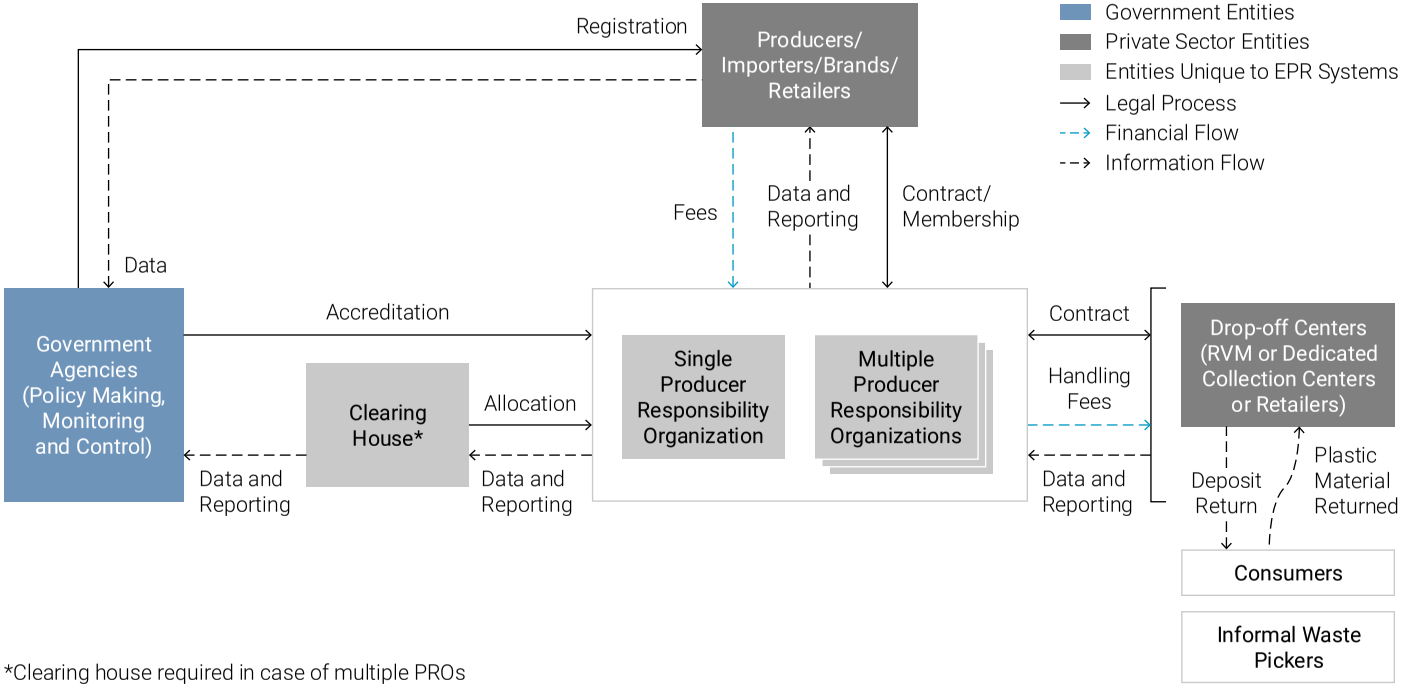
A deposit return scheme (DRS) has demonstrated it can be successful for post-consumer beverage containers, including PET bottles, aluminum cans, glass bottles and more. The return rates reach over 80% in many European countries.[47] In Europe, supermarkets have reverse vending machines (RVMs) that enable high rates of bottle collection at centralized and popular destinations. These take-back systems can segregate plastic bottles from waste, providing quality feedstock for recycling. A well-designed system can enable full circularity, particularly for PET, as recycled material can be reintegrated back into a company's own supply chain. By providing quality feedstock for recycling, this type of system has the potential to reduce the processing cost and market price for food-grade rPET pellets, which currently commands a 25-30% premium over rPET flakes,[48] largely due to their higher processing cost.

Challenges: Given the unorganized and decentralized nature of consumer good sales and distribution, managing take-back will have high cost implications in developing markets and small retailers may not have the capacity, or will, to manage returns. The increase in the upfront retail price for consumers, particularly in low income markets, is another potential barrier. An alteration in material flows due to DRS could also impact the livelihoods of independent waste collectors who currently depend on collecting high-value plastic waste as a source of income. Similarly, DRS can remove valuable materials from waste streams and affect net system costs for other EPR systems, meaning thoughtful consideration should be given to design of DRS if it co-exists with other EPR schemes like DRS for beverage bottles or EPR for other materials. The governance structure of such a model and transparency in the management of uncollected funds also needs to be considered.

Conditions for success: There are several relevant design considerations. With the relatively low capability of SMEs to plan and execute their own DRS, preference should be given to collective

Figure 15: Implementation approach for DRS schemes

DEPOSIT RETURN SCHEME



*Clearing house required in case of multiple PROs
**Option of individual compliance scheme can also be offered. This is not shown in the diagram

DRS systems that are managed at a national level. Governance should include the private sector, either individually or collectively. For example, the Lithuanian DRS is operated by a nonprofit established by the Lithuanian Association of Brewers, the Association of Lithuanian Trade Enterprises and the Lithuanian Natural Mineral Water Manufacturers' Association.[49] Also, large producers, importers and brand owners could be given the flexibility to run their own DRS. However; considerations should ensure that producer responsibility is met for all types of plastic—not just high-value plastic. Given the unorganized and fragmented nature of retail distribution, either brand neutral collection or alternative mechanisms for packaging by SMEs will be required. Retailers with sales above a certain threshold should be made part of the shared obligation in managing collection and returns, along with standalone collection or drop-off centers.

The amount of the upfront deposit and the portion returned to the consumer will require careful consideration given the lower disposable incomes in the five focus countries. In principle, the deposit need not be necessarily claimed by the original consumer, as the incentive to collect and return the item is effectively transferred to the agents with the lowest opportunity cost of time.[50] In an ideal market, the refundable deposit should be sufficient to meet the opportunity cost of time for independent waste collectors. Integrating independent waste collectors in the collection and return system presents an opportunity to explore socially inclusive DRS while also ensuring a stable source of income through deposit returns. Refunds can also be in-kind. For example, Nestlé's voluntary DRS refunded one packet of Maggi noodles for depositing ten empty packets at certain retail outlets in India.[51] In Germany, retailers and the beverage industry bear the entire cost of operations and, in return, are allowed to keep any unclaimed deposits. For several other countries, the centralized non-profit operating DRS takes back any money left from unclaimed deposits.[41]

Material ownership is another key design parameter. A DRS focused on plastics that are high-earning for the informal sector, such as PET, can impact earning potential. Evolving a waste bank model into a credible network of drop-off centers and building return infrastructure above them could be one approach to designing a socially-inclusive

DRS. Another approach could be to target returns through organized waste collector groups, through the formation of co-operatives or microenterprises.[52] Innovation to apply DRS beyond PET bottles to a wider range of packaging types should also be explored.

1.3 Plastic credits system

Description: Producers meet their obligations by purchasing recycling certificates issued by accredited re-processors or recyclers based on the amount of plastic waste recycled.

A plastic credits system has existed in the UK since 2007. In this mechanism, producers meet their obligations by purchasing recycling certificates, or Packaging Recovery Notes (PRNs), from accredited recyclers. The mechanism covers all recyclable materials like paper, aluminum and glass. The price of plastic credits is determined by the relative supply and demand of the credits. The system is designed as a marginal cost system that adds the necessary financial incentive to facilitate additional recycling when the supply falls short of target demand. The scheme offers flexibility in terms of splitting obligation between raw material manufacturers, converters, packers/fillers, sellers and importer and thus, distributes responsibility within the supply chain.

Another plastic credits scheme could be credits that represent a certain amount of plastic recovered from the environment, either collected or recycled. Innovative crediting platforms, such as Plastic Bank, exist in focus countries but remain voluntary and small-scale.

Challenges: Although a market-driven mechanism, PRNs have seen relatively limited success. Companies and recyclers could meet their targets at the same cost, irrespective of whether the material was sourced from households or commercial/industrial (C&I) facilities or whether the plastic was recycled domestically or exported. As a result, the system favored low-cost solutions for collection of C&I waste and an overdependence on plastic waste exports at the expense of developing domestic recycling. In 2018, export accounted for around 63% of PRNs or packaging export recovery notes (PERNs).[53] As a result, the PRN prices soared by up

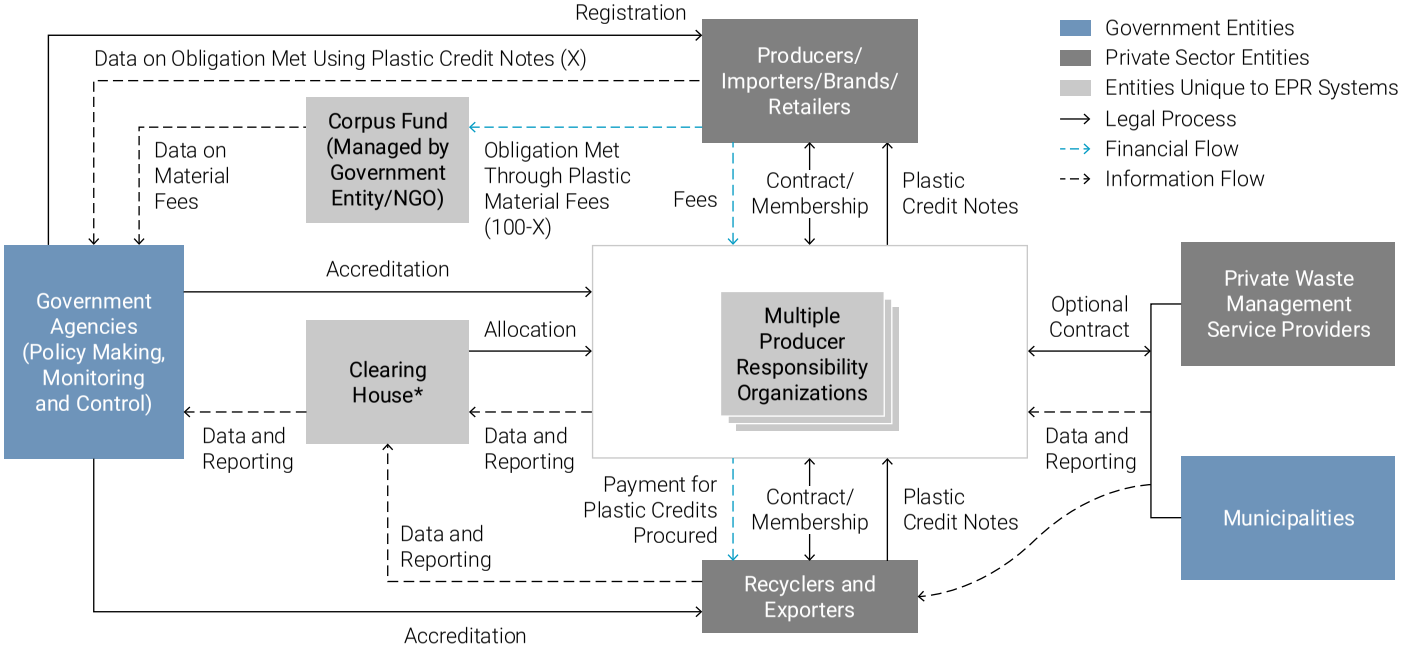
to 150%[54] following China's National Sword Policy, which banned the import of many scrap plastics, because of inelastic demand from producers and a shortage of supply.

As implemented, this scheme fails to cover the full cost of plastic waste management and does not provide financial compensation to local municipalities for collection and recycling.[42] However, these challenges can be attributed to regulation design and are addressable. In an ideal scenario, plastic credits can be expected to exploit market forces and allow for value chain inefficiencies to correct themselves. For example, by directing a flow of funds to where it is needed most, costs can be minimized. The resulting volatility in plastic credit prices has unintended consequences, such as a limited opportunity for planned investment by recyclers.

Conditions for success: At a design level, a combination of plastic credits along with plastic material fees could help address some of the challenges with respect to volatile credit prices. For instance, producers could be charged a material fee for every ton of plastic put in the market for which plastic credits could not be procured.[55] Such a model would protect producers from exorbitant credit prices due to market uncertainties, as well as create a strategic pool of funds (e.g., corpus fund from the packaging material fees) to catalyze investments required in the value chain. In addition, governments could cap export plastic credits or set minimum targets for domestic plastic credits. Setting standards on the amount of money collected through compliance schemes to be reinvested into recycling infrastructure, collection and awareness campaigns could also help.[56] Another challenge posed by an open market system is excessive competition among PROs, recyclers and treatment agencies. Design mechanisms that result in moderation of competition, such as stringent requirements for accreditation, or limits on the number of accreditations in a given duration of time and for a given geography could help avoid that situation. The need for regulatory bandwidth to monitor such a platform requires the identification of appropriate regulating organizations.

Figure 16: Implementation approach for plastic credits system

PLASTIC CREDIT SYSTEMS



Option of individual compliance scheme can also be offered. This is not shown in the diagram

1.4 Pre-competitive voluntary EPR

Description: Inter- or cross-industry players join efforts to implement a voluntary and non-regulated extended producer responsibility (EPR) scheme.

Voluntary EPR can provide data-driven evidence to guide policymaking. Many such initiatives are underway in Southeast Asia—from the Packaging Recycling Organization Vietnam (PRO Vietnam) launched in 2019, to the Philippines Alliance for Recycling and Materials Sustainability (PARMS). These show the existence of multiple alliances of local subsidiaries and domestic companies.

Challenges: Buy-in from local governments and lack of clarity on potential shifts in the regulatory landscape remain key barriers. Free-riding by disinterested companies and changes in the organizational priorities of interested companies are additional risks. Multinationals, in their public commitments, have shown interest in making packaging more sustainable. Comparatively, only a few domestic companies have committed.

Conditions for success: The public sector should pursue collaborative EPR schemes with industry bodies before legislating a national EPR policy. Such efforts would more clearly inform the national government on the industry position and acceptance. Voluntary EPR should serve as a pathway and provide the proof of concept for a more impactful and comprehensive national EPR legislation, ensuring compliance by all companies.

2 Pay-as-you-throw

Description: A policy instrument, typically used at the local level, whereby households are charged a fee for waste collection. These could be a flat monthly fee, an amount based on the frequency of waste collection, or an amount calculated per the measure of the generated waste (e.g., weight, number of bins, etc.).

PAYT can play a fundamental role in financing waste management. First and foremost, the measure encourages reduction in waste

generation. Secondly, if designed properly, PAYT can help drive source segregation through appropriate modulation of fees for mixed waste versus segregated waste, where a penalty could be charged on households or institutions for non-segregated waste. PAYT in the U.S. has resulted in a 15-50% reduction in household waste generation and has also helped reach 30-80% waste segregation levels.[57] [58] Thirdly, the measure helps instill a service payment relationship that drives accountability on the part of waste management service providers. And lastly, PAYT can contribute to financing activities not funded by other sources, such as primary collection of municipal solid waste.

Challenges: The lower ability to pay among consumers in developing economies and a general lack of compliance has prevented PAYT from being a reliable revenue source. The measure also presents perverse risks, which could lead to more illegal disposal to avoid fees. There are only few locations where PAYT's enforcement has been effective. It is a complicated process to design an appropriate tariff that is both socially affordable and acceptable in lower-income economies while also being effective in meaningfully reducing the financing gap for collection. The risk of non-compliance is high, particularly in economically weaker neighborhoods or where informal sector penetration is also high.

Conditions for success: Local governments could optimize approaches to improve PAYT compliance and increase subsequent revenues. To increase revenues, for example, local governments can cross-subsidize losses on household collections with improved collection of fees from bulk or institutional generators and well-to-do localities with higher quantities of waste generation and a better ability to pay. To improve compliance, local governments can include user collection fees within existing household bills, such as electricity or water bills, to consolidate the payments and improve compliance rates.[38]

3 Blended financing instruments

Description: Use of public, private or philanthropic capital to spur investment in projects aimed at improving waste management in developing countries.

The in-country workshops identified the crucial role development finance (i.e., contributions by multilateral/bilateral funding, private investment, CSR and philanthropic funding) can play in providing catalytic funding and management support when targeted at leakage hotspots or areas lacking government funding. Development funding is already a popular tool today. Indonesia and Vietnam received a total of US $2 billion[59] and US $3.9 billion,[60] respectively, as official development assistances (ODA) in 2015.

Challenges: Risks in waste management projects like operations and maintenance risk, demand risk, force majeure and risks due to inefficient governance have led to limited private sector investments to date. Development finance, as a result, remains limited. For example, the UK's Department for International Development (DFID) spent only 0.32% of its overall spending in 2017 on waste management projects.[61] An increase in development finance spending for pilots can help de-risk wider investment.

Conditions for success: Where proactive interest is shown by local governments, development financing projects show good results (see Nepal and The West Bank case study). Evidence of these successes should be socialized to drive further participation and engage local leaders. Moreover, participating leaders can be rewarded with other forms of financing, such as government grants, as an additional incentive to support. Targeting development funding at leakage hotspots can provide catalytic capital for setting up robust collection systems, with little or no cost to the local government, as part of the transition towards sustainable waste collection services. In addition to development funding, the higher risk appetite for philanthropic support and corporate social responsibility (CSR) funds could be crucial.

OUTPUT-BASED AID FOR SOLID WASTE MANAGEMENT: NEPAL AND THE WEST BANK

In Nepal, a World Bank results-based financing project of US $4.3 million increased user fee collection and improved waste collection services in five municipalities, benefiting 800,000 residents.[62] In the West Bank, a grant of US $8.2 million to increase access to MSW services and improve financial sustainability benefited 840,000 residents. The subsidy is designed to decrease over time, as services and user collection fees increases. The West Bank and Nepal projects have demonstrated that output-based aid approaches that engage local government and service providers are flexible enough to be applied in fragile and conflict-affected situations (FCS) and can jump-start SWM services. The financing can also enable the transition to self-sustaining systems in the longer run.

4 Measures to improve operational efficiency

This research identified several public and private sector measures that are essential in developing an effective collection system within national and local policy frameworks. Many of these measures are already a part of the existing regulations. However, some are undervalued in terms of their potential impact. The most impactful ones are discussed in detail below.

4.1 Municipal collection and MRF

Description: Requirements to set up dedicated collection points or recovery facilities by municipalities at a sub-district or city level where waste can be separated for further recycling or treatment.

Material recovery facilities can support collection by sorting waste into different recyclable streams and ensuring that value from collected recyclables is captured. These centers generate a significant portion of their revenue from tipping fees from local municipalities

and through the sale of recyclable streams to downstream recyclers. This is a challenge for the focus countries, where municipalities generally lack the budget for waste management, and much of the valuable commodity stream is often removed by independent waste collectors before it reaches a MRF. The collection and processing of recyclables at the MRF level is largely a net cost activity, even in countries where the informal sector is absent.

Challenges: Inadequate quantity of valuable waste collected, especially as independent waste collectors take out high-value recyclables from the waste streams. Additionally, the low inherent value of recyclables reaching the MRF due to contamination and lack of end-market demand make operations unsustainable.

Conditions for success: There are two priorities for local collection infrastructure: First, expansion of the geographical coverage of new collection centers and MRFs must target areas with high waste generation or where there is limited existing infrastructure. In Tier I and Tier II cities, availability of land is a major challenge, and local leadership is needed to proactively explore options while keeping in mind long-term capacity limitations of existing infrastructure.

Second, improving the operational economics of MRFs is necessary. A well designed EPR system, wherein each material type pays for its net OPEX deficit (i.e., share of cost to collect minus the recovered value of materials through sale) can help improve the operational economics of MRFs. Tipping fees for MRFs, financed through PAYT, can also be explored wherever applicable. In addition to financing the operations, working with independent waste collectors to ensure that valuable waste streams reach MRF will be critical. Enabling source segregation of waste into wet and dry streams can reduce overall operational expenses because such waste can be sorted by clean MRFs.

CIVIL SOCIETY ORGANIZATIONS IMPROVING WASTE MANAGEMENT IN HIGH-RISK COMMUNITIES

In 2013, Tacloban in the Philippines (population of 242,000) was heavily damaged by Typhoon Haiyan. Three years later, the local government was struggling with an ever-growing dumpsite and heavy bill of US $1.5 million annually for waste collection, which was only enough to reach 30% of households. Mother Earth Foundation, a member of the Global Alliance for Incinerator Alternatives, introduced a new waste management system in 2017, focusing on decentralized and source separated collection of food scraps, recyclables, and residual waste. The new system produced striking results. Even though the pilot only covered 40% of the city, Tacloban managed to reduce its landfill-bound waste by 31% and save about US $413,000 in its annual budget. Tacloban's waste collection is now available to all households in the city, without increased costs. For more information visit www.zerowasteworld.org.

4.2 Source segregation

Description: Rules to govern quality of garbage collection at the household or institutional level, which mandates or incentivizes waste stream separation at the source of generation.

Source segregation can play a vital role in improving the economics of waste management. It reduces the upstream sorting cost and ensures that the recyclers downstream receive clean feedstock, thus improving their ability to better capture the value from post-consumer material streams.[63] Our research suggests 100% segregation levels can provide net value chain benefits of up to US $9.14/ton by avoiding sorting costs and improving the recyclability of feedstock.[viii]

[viii] Includes increasing collection costs, avoiding wet-dry segregation cost and improving sorting efficiency and recyclable feedstock. It does not include the cost of enabling waste segregation through awareness or incentive programs.

Challenges: Historically dominant socio-cultural barriers, lack of awareness and lack of collection infrastructure to support segregated waste are the three challenges to efficient source segregation.

Conditions for success: Source segregation requires community mobilization and system preparedness. This demands local leadership, clear and effective communication to educate communities, appropriate infrastructure to handle segregated waste and trained collectors. The research identified three approaches that are usually adopted to improve segregation, especially for household waste:

- **Incentives for segregation:** Households are rewarded or charged less for segregating organic waste. For example, an incentive-based source segregation model was adopted in Guiyang, China, resulting in a comprehensive net benefit of 18.3 CNY/ton (or US $2.64/ton) after one year of operation.[64]
- **Penalties for non-compliance:** Source segregation is mandated by local authorities, and households are either penalized for non-compliance or refused service by the waste management service provider. In Bangalore, India, the Bruhat Bengaluru Mahanagara Palike (BBMP) has mandated segregation at source since 2017, with fines imposed on violators. It was able to reach 35% segregation level within a year.[65]
- **System-designed segregation:** One way to increase adoption at the household level is to modulate the frequency of collection for wet and dry waste. However, such mechanisms should not reduce the collection to levels that encourage illegal dumping. In Goa, India, Margao Municipal Council collects dry waste every Tuesday and Friday, whereas wet waste is collected every day.[66]

WASTE MANAGEMENT IN INDIA'S CLEANEST CITY IN 2018 – INDORE

Indore was recognized as India's cleanest city in the Swachh Surveshkan 2018 survey. Key highlights of Indore's solid waste management system include:

Waste collection and transportation: 100% of the households and residential complexes are managed by a door-to-door collection service in which tippers transfer the waste to any of the eight collective compacting stations in the city before it is transferred to a central processing facility. Bulk generators are serviced by separate bulk collection systems, which transfer the waste to processing facilities directly. Bulk generators are also required to manage wet waste within their premises by composting and other methods. All vehicles used in the collection and transportation system are monitored by a GPS-enabled tracking system.

Waste segregation: 100% segregation levels have been achieved. Domestic waste is separated into three collection bins—wet, dry and hazardous domestic waste. Separate compactors for wet and dry waste are deployed for waste collection from bulk generators.

Citizen awareness: Social media, street plays, wall paintings, radio advertising, community festivals and print media were all used to spread awareness. An independent mobile application (311 App) was set up for service delivery requests, and to register and track complaints.

4.3 Municipal unions

Description: Collective structures established by neighboring municipalities in collaboration to handle waste management activities, including facilities setup and operations (e.g., inter-municipality agreement on shared setup and operations of trash racks for riverside municipalities).

In rural and remote areas where waste generation is low, typically around 0.2 to 1.2 TPD,[22] [67] and costs are steep, waste management operations fail to benefit from economies of scale through improved quantities and efficiencies. In addition, budgets are a critical challenge. In Indonesia, for example, less than 2% of the provincial or district budget is allocated for MSW management. Their budget ranges between US $2-5 per capita per year as compared to US $10-12 per capita per year in large cities like Jakarta.[22] To overcome such challenges, neighboring municipalities could establish collective waste infrastructure, like a collective MRF, to manage waste between neighboring municipalities. Such inter-municipality agreements become particularly relevant for riverside communities, where cleaning waste often leads to leakages into the river from upstream communities that then have to be managed by downstream municipalities through catchment systems.

Challenges: There is a general lack of capacity and political will at the local level, weak inter-municipality coordination, no clear roadmap and a general lack of budget.

Conditions for success: Sharing successes alongside preliminary support from NGOs can trigger interest, mobilize action and provide necessary technical assistance. Innovative approaches to recognize success, for example publicly rewarding local municipalities for best practice, would likely resonate with key local leaders, especially given the politicized nature of local-level interventions. Additionally, coordination among riverside municipalities requires clearly defined roles, responsibilities and cost-sharing for managing setup and operations of catchment systems based on their location.

4.4 Digital waste management

Description: Leveraging digital technologies like IoT and data analytics to improve efficiency and scale waste management resources.

Digital solutions can also enable scale and efficiency. For example, in Germany, optical sorting equipment and more efficient processes in large MRFs (capacity ~100,000 tons/year) helped reduce system costs by over 50%.[42] The research found that digital solutions could be particularly impactful for:

1. **Waste stream transparency:** Digital platform-enabled data collection and reporting of plastic waste movement across players in the value chain could be an enabler of additional measures, such as EPR.
2. **Waste collection and sorting:** GPS-enabled tracking of collection vehicles can reduce illegal dumping and transportation costs and automate sorting in MRFs to ensure high-quality waste streams.

Challenges: The lack of basic infrastructure across the five focus countries means that the application of digital technologies is currently limited.

Conditions for success: Currently, there are a few pockets of successes for using digital technologies, including the Internet and mobile devices, to raise awareness or communicate key messages for plastic collection measures.[68] However, the use of digital technology for independent waste collectors and waste stream transparency needs further exploration.

GRINGGO: USING ARTIFICIAL INTELLIGENCE FOR SMARTER WASTE COLLECTION

Gringgo Indonesia Foundation has built an Artificial Intelligence (AI) based image recognition tool that would help improve plastic collection and recycling rates by classifying post-consumer materials based on their recyclability and monetary value in the recycling market. The tool gives independent waste collectors the ability to track their collections and productivity boosting their earnings potential. Their first pilot, in the village of Sanur Kaja in Bali, improved the recycling rates by 35% in the region within a year. The foundation has been named one of the 20 grantees of the Google AI Impact Challenge, receiving $500,000 of funding from Google.[69]

Financial assessment

Policymakers and the private sector can unlock financial benefits by implementing certain measures in combination, where actions from both stakeholders can be complemented to deliver accelerated impact. For interventions targeted at collection, this playbook modeled two clusters:

1. **Expanding collection using MRFs and user fees:** A traditional approach to scaling was modeled according to an as-is view of waste management collection systems along with user-based collection fees for urban households.
2. **Socially inclusive EPR:** Packaging material fees were modeled as the measure to reach desired recycling targets, along with procuring materials from the informal sector.

Table 3: Financial analysis for measures in finance the collection theme

Scaling traditional collection systems through MRFs along with PAYT for urban cities can reduce a value chain financing gap by 11-50%

Cluster 1: Expanding collection using MRFs and user fees

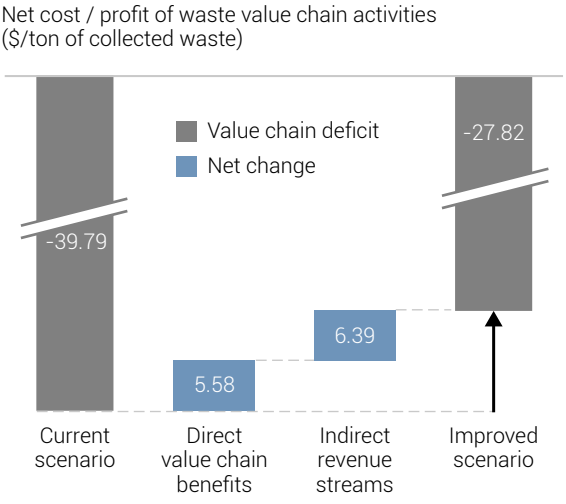
Measures: Municipal collection points and MRFs, PAYT

Financing benefit: 11-50% reduction in value chain financing gap

Description

Improvement in waste collection by scaling MRFs, alongside a higher compliance of PAYT instruments for urban localities. Value chain benefits come from reduced waste generation, increased segregation levels (due to PAYT) and increased collection and recycling of high-value waste

Impact on reducing the value chain financing gap



Socially inclusive EPR can close up to 75% of the value chain financing gap; most of the additional benefits coming from private sector-enabled collection of non-recyclables

Cluster 2: Socially inclusive EPR

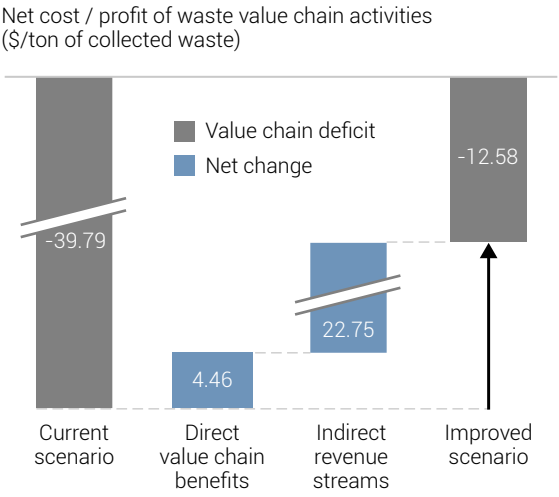
Measures: EPR (packaging material fees), informal sector inclusion

Financing benefit: 36-75% reduction in value chain financing gap

Description

Packaging material fees based on a full net costs model of EPR, with a focus on procurement of plastic waste through already established formal collection systems, as well as through the informal sector where formal collection service is unavailable. The increased collection of plastic waste drives value chain benefits by increased recycling and reduced disposal or litter management costs.

Impact on reducing the value chain financing gap

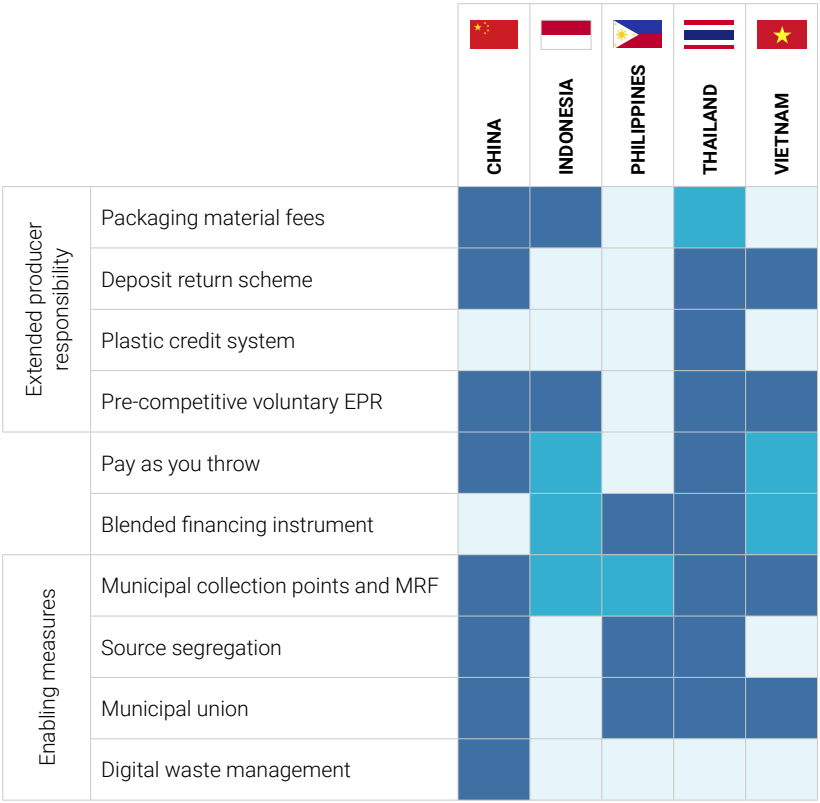


Note: This chart represents an average case. The net cost benefit range is given for both conservative and optimistic scenarios.

Source: Accenture Research; modeling details, methodology and assumptions are provided in the Appendix.

Focus country assessment

Figure 17: Applicability assessment of shortlisted measures in finance the collection



Color	Category	Description
	Reset focus	Lacked focus or faced challenges with transformational change required
	Advance and accelerate	Lacked focus or faced challenges, but given low level of effort, could generate quick win
	Sustain efforts	Already shown intent and progress, and there is need to sustain the momentum

This assessment is based on the current situation and reflects the efforts required by a country for success based on the existing focus and suitability for the specific geography. Details on the criteria used for this assessment are provided in the Appendix.

EPR is already being explored in a majority of the five focus countries

Discussions on a national EPR framework are already underway in China and Indonesia. In China, for example, a relevant EPR policy framework will be in place by 2020, with implementation in 2025.[70] Indonesia is exploring EPR, along with recycled content standards, as a possible approach to cut packaging waste 30% by 2025.[71] In the Philippines, there is a push for EPR regulations for packaging waste.[27] However, this is still in the initial stages of discussion. In Thailand, EPR for packaging has been largely driven as a voluntary corporate social responsibility (CSR) program to promote cooperation among stakeholders; it has already achieved a packaging recovery rate of one ton/day.[72] Wider national regulation is needed to drive accelerated impact. Vietnam has EPR for e-waste but has not seen much traction for packaging waste.[73]

Across the focus countries, pre-competitive voluntary EPR is positively regarded by the private sector in the as-is scenario,[74] given the opportunity for ensuring greater control over implementation and greater transparency among stakeholders. The private sector should sustain voluntary efforts for evidence generation while countries should focus on systemic changes by driving accountability through stronger enforcement. The research has identified the potential for a national EPR framework that includes packaging material fees, deposit return scheme and plastic credits system. Plastic credits may face challenges in the focus countries, given the high degree of regulatory capacity, market maturity and data availability required to enforce and sustain a successful model. Considering the relatively higher ease of implementation and availability of successful examples globally, packaging material fees should be explored as an option for the five focus countries.

Successful deposit return scheme pilots exist in China, Indonesia and Thailand. For example, in Beijing reverse vending machines (RVM) are stationed at subway platforms and help consumers pay for subway tickets in return for recyclable PET bottles.[75] This innovative model, at a small scale, demonstrates the possibility of integrating DRS as a part of a national EPR framework. National DRS should, however, take into consideration the broader challenges previously discussed

in detail for each measure. Exploring existing and successful models for other materials, or by consolidating returns at high footfall locations, are key considerations to managing reverse logistics challenges, which can also be relevant for archipelago geographies.

PAYT can provide significant financing but enforcement may be challenging given the socio-economic conditions

In Vietnam, PAYT is in operation and is reducing the financing gap. Households pay about US $0.9/month in urban areas and US $0.7/month in rural areas, which is 0.5% of average household expenditure, to cover waste collection. While this financing is valuable, the fee covers less than 60%, and as low as 20-30% in some municipalities, of total operating costs for collection.[73] Given that such a system is already in place, efforts should be driven towards increasing collection revenues and compliance. PAYT at the household level is generally less applicable outside of Thailand and China, where the government's ability to enforce and consumer willingness to pay is relatively higher. However, the acceptance of PAYT remains dependent on specific local socio-economic conditions.

Countries need to accelerate scaling material recovery facilities and focus on source segregation of waste

Among the enablers, there is a need to focus on scaling MRFs in Indonesia and the Philippines, where strong national policy for collection in each city or municipality exists. To date, enforcement of this policy has been a challenge. In the Philippines, just 21% of planned barangay MRFs have been setup, while in Indonesia, implementation is lagging with only 595 TPS-3R (Reduce, Reuse, Recycle Tempat Pengolahan Sampah – MRFs) facilities set up by 2015, even though plans call for 47,329 by 2020.[30] Vietnam needs to sustain efforts to scale local collection efforts driven by private companies with a renewed focus on source segregation.[73] The creation of municipal unions, particularly in rural areas with low waste generation, is a viable measure that can increase efficiency and viability of collection, especially where local budget allocation on SWM is relatively very low.

Digital platforms for awareness creation and waste data collection are a viable opportunity

Using digital waste management technologies for collection and sorting at scale is a futuristic opportunity for Indonesia, the Philippines, Vietnam and Thailand, given the low digital maturity in the countries. However, there is consensus and strong potential for leveraging digital resources, such as mobile and social media, for creating awareness and uploading waste for collection in these countries.

CHAPTER 4

REDUCE PROBLEMATIC AND UNNECESSARY SINGLE-USE PLASTICS

Why we need to reduce the use of problematic and unnecessary single-use plastics

While measures targeted at waste collection can reduce ocean plastic leakage, there is also a need to reduce the amount of plastic in the system, specifically problematic and unnecessary single-use plastic products and packaging that have been found to be large contributors to ocean litter. Several studies, including The Marine Debris Hotspot Assessment in Indonesia by The World Bank and the Japan Agency for Marine Science and Technology, have identified certain types of single-use plastics, such as plastic bags, to be widely found in ocean litter.[76] [77]

Ocean Conservancy's annual *International Coastal Cleanup (ICC) report* similarly captures the top ten items[ix] found on beaches and waterways.

An upstream focus should explore opportunities to reduce the production of a defined set of problematic and unnecessary plastic products and packaging, which frequently end up in the ocean and are non-recyclable and/or not recycled at scale. The goal is to reduce their consumption per capita in the long-term, while aligning alternatives to consumer convenience and preferences.

> **A critical first step to action is the establishment of a clear definition of 'problematic and unnecessary single-use plastic.' The definition must be agreed upon across the public and private sector and should clearly define applicable plastic items to ensure that viable and environmentally sound alternatives are available at scale**

The Ellen MacArthur Foundation Global Commitment, with more than 400 signatories,[78] has provided criteria for identifying problematic and unnecessary plastics, specifically for the packaging sector.[79]

[ix] The top 10 items collected were 1. Cigarette butts 2. Food wrappers 3. Straws, stirrers 4. Forks, knives, spoons 5. Plastic beverage bottles 6. Plastic bottle caps 7. Plastic grocery bags 8. Other plastic bags 9. Plastic lids and 10. Plastic cups, plates

In this report, problematic and unnecessary plastics refer to the items in the table below, as defined by the EU and WRAP,[80 81] which is also consistent with the Ellen MacArthur Foundation criteria:

Problematic formats (which end up frequently in the ocean) and/or materials not currently recycled at scale

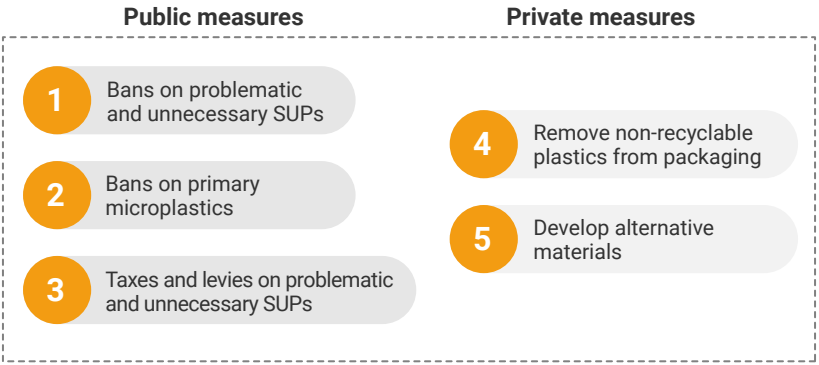
- Plastic grocery bags
- Plastic straws and stirrers
- Plastic cups and lids
- Disposable plastic cutlery
- EPS food containers
- Oxo-biodegradable
- PVC packaging
- Primary microplastics

These plastics are frequently littered, have a low residual economic value within current systems and are therefore not collected and recycled at scale. Collection rates for these plastics are often less than 5%.[5 76]

Shortlisted measures

As an outcome of our evaluation, we identified five measures that are critical in reducing the quantity of problematic and unnecessary single-use plastic products and packaging in the value chain (Figure 18).

Figure 18: Shortlisted measures for reducing problematic and unnecessary SUPs



1 Bans on problematic and unnecessary single-use plastics

Description: Ban on manufacturing, distribution and import of defined problematic and unnecessary single-use plastic products and packaging. The policy is usually directive in nature at the national level and administered or enforced at the city level.

Bans on SUPs have the potential to remove highly problematic and unnecessary plastic products and packaging from the waste stream. In doing so, bans can remove the need to collect some low-value plastic applications, thereby lowering overall collection costs, while reducing the likelihood of items becoming ocean plastic in the focus countries.

Challenges: Traditionally, bans have been considered an ineffective policy tool with weak enforcement, acceptance and adaptability in local communities. Bans that impinge on personal convenience are likely to meet widespread resistance, and safety concerns of alternative products are the key barriers.

Conditions for success: Bans work best where there is a strong local political will and clarity. Critical success factors for effective implementation of bans include:

- **Clear definition of problematic and unnecessary single-use plastics:** Defining the banned items, along with the point of banning (i.e., at manufacturing, sale, transport, import, etc.) helps to avoid confusion. For example, Tamil Nadu in India clearly defined bans on nine SUP categories to reduce ambiguity and accelerate adoption.
- **Enforceability and monitoring at scale:** Local government engagement is needed to ensure enforceability and local support. For example, enforcement of bans on the distribution or sale of plastic bags in Mumbai was successful because the local government mobilized a 125-member "blue squad" for monitoring and enforcing penalties for non-compliance.

- **Judicial support:** Enforcement of bans is also strengthened when there is legislative support. For example, the Madras High Court was consulted and laid out guidelines for legal implementation which avoided stay orders when local plastic manufacturers appealed in courts.
- **Access to alternatives:** Bans are usually found to be more acceptable if suitable alternatives exist. For example, the Tamil Nadu government listed suitable locally available alternatives for all nine SUP products banned.

BANS ON THE USE OF PROBLEMATIC AND UNNECESSARY SUPS IN BALI, INDONESIA

On July 9, 2019, the Bali provincial government rolled out a regulation to ban plastic bags, straws and EPS packaging in an attempt to reduce plastic leakage in the ocean. The regulation was supported by the Indonesia's Supreme Court, which ruled against a challenge by Indonesian Plastic Recyclers Association. The ruling has potentially paved the way for other local governments to enforce bans in their regions.

Public-private dialogue will also support effective implementation. The public sector should engage upstream with leading producers, distributors, retailers and users of such plastics and ensure transparency on upcoming bans—well in advance of implementation. This is critical in keeping the solution market-focused and ensuring acceptance and adaptability within communities.

2 Bans on primary microplastics

Description: Prohibition on the use of plastic fragments or particles less than 5mm in size (pre-production plastic pellets not included), which are purposefully manufactured for uses in cosmetic products and toiletries, vector drugs and air-blasting technologies.

Bans on primary microplastics will enable limited direct improvement on land-based plastic waste management but are important as microplastics contribute an estimated 2-5% of ocean plastic.[82] They cause concerns about their accumulation in sea creatures and subsequent human ingestion, with growing research focused on understanding the potential impact of microplastics on human health.

Challenges: Bans on primary microplastics are largely subject to similar considerations as other interventionist bans, including the requirement for strong governance and enforcement capabilities, widespread consumer support, engagement with the private sector and the availability of viable alternatives. Microplastics are less visible and integral to society as some other problematic plastics and, as a result, the inherent challenges of ensuring consumer buy-in for bans may be less of a barrier. Currently only eight countries have national level laws or regulations controlling the use of primary microplastics.[83]

Conditions for success: The research indicates that bans on primary microplastics are more widely accepted among various stakeholders. Effectiveness would require engagement with the private sector, including SMEs, to ensure that products containing microplastics, as well as the industrial processes that use them, are identified; that alternative products are developed; and that enough time is given in advance to allow for change.

Other forms of microplastics, typically known as secondary microplastics, like microfibers released from synthetic garments and fibers from tire abrasion, are also contributing factors to ocean plastic. Their quantities and impact on the marine environment are also being studied. Increasing production of synthetic clothing in the fashion industry, as well as the clear dependence on tires for transportation, may mean that efforts to reduce microplastics in these forms are more challenging. In this case, short-term tactical measures that focus of reducing leakage, such as washing machine filter systems that catch microfibers, can be explored for reducing overall leakage.

3 Taxes and levies on problematic and unnecessary single-use plastics

Description: Taxes and/or levies imposed on manufacturers, retailers or consumers for use of specific types of single-use plastic elements, including but not limited to, plastic bags, straws, cups and polystyrene food packaging.

Taxes and levies are a market-led measure that can disincentivize usage of specific plastic products. Common examples include an additional tax on plastic bags at the point of sale, such as in the UK where a 5 pence tax was levied on single-use polythene bags. Similar measures have been linked to reductions in the total quantity of targeted plastics; however, their impact is widely debated, particularly when considering the alternative options available.

Challenges: Macro-economic challenges in focus countries reduce the viability of passing additional charges onto consumers. Indeed, retailers may also resist this approach. For example, a pilot program in 23 cities in Indonesia imposed a US $0.01 tax on plastic bags that led to a 40% reduction in consumption, but retailers refused to continue beyond the trial period.[84]

Conditions for success: A focus on taxation upstream, targeted at producers or sellers of problematic and unnecessary plastics, may be valuable in driving a meaningful shift in reducing their quantity. Unlike EPR, where the objective is to finance collection and recycling, the primary purpose of this measure is to disincentivize production and reduce consumption of specific plastic products. Revenues generated through taxes could provide funding for some waste management costs. The Indonesian Finance Ministry, for example, proposed an excise on plastic bags that was expected to both reduce consumption while also generating 500 billion rupiah (US $34.5 million) in revenue, with a potential to increase waste management spending at the local level by 3%.[84 76] Taxes and levies could be a precursor to outright bans by creating favorable market incentives that facilitate the transition by disincentivizing consumption of specific plastics prior to their removal.

To drive meaningful impact through taxation of problematic and unnecessary single-use plastics, it is crucial to engage in a public-private dialogue to determine the rate of taxation, establish an effective tax collection process with a clearly defined point of taxation and ring-fence the collected tax revenues for waste management activities.

4 Remove non-recyclable plastics from packaging

Description: Efforts to reduce the use of plastic resins that are not economically recycled at scale (e.g., EPS) and/or interfere with the recycling of other materials (e.g., PVC) in packaging and to reduce other unnecessary packaging that is unlikely to be recycled and/or that does not bring additional value to the product or its protection.

The removal of problematic and unnecessary resins from packaging can have an indirect impact on the economics of collection and associated benefits from the efficiency of recycling. In reducing the amount of problematic and unnecessary material in the value chain, it can simplify and improve collection and segregation.

Challenges: Recycling of PVC with PET is challenging because both have very similar densities and, therefore, they are difficult to separate using float-sink separation techniques which can be used to sort post-consumer recyclable waste. In Indonesia, less than 1% of PVC is recycled; it also interferes in the recycling process of PET.[85] Plastic packaging products made or mixed with PS and EPS, although technically recyclable, are not economically viable to collect and recycle due to the high transportation cost (low weight to volume ratio) involved and small quantities that prevent economies of scale.[86]

PS and EPS are being recycled widely in the Philippines. Combined with programs on collection, sorting and consumer awareness, this effort is enabled by a strong commitment from the industry, including collaboration with the Polystyrene Packaging Council of the Philippines. However, the economic viability of its recycling in other geographies is still unknown. The net costs for such materials and formats, which are

technically recyclable but uneconomical or costly to do so, can also be financed as higher fees for such materials in an EPR system.

Conditions for success: The private sector can lead the removal of non-recyclable plastics from packaging, and government can act as facilitators for discussion, pilot tests in collaboration with industry leaders and provide incentives or penalties on agreed problematic plastics. In Thailand, for example, a brand consortium of Boon Rawd Trading, Sermsuk Plc, Thai Drink, Nestle Thai, and Carabao Group led the efforts to remove the cap seal from water and beverage bottles. The Pollution Control Department subsequently engaged after onboarding all the bottled water sector players, including more than 2,000 SME operators.[87]

5 Develop alternative materials

Description: Develop the use of alternative materials to problematic and unnecessary plastics with materials that are reusable and recyclable and/or invest in new plastic materials that are practically biodegradable or compostable.

Alternative materials can play an important role in solving the ocean plastic challenge, specifically in replacing problematic and unnecessary single-use plastics. Materials that are reusable, recyclable with established collection and recycling, or that are practically biodegradable or compostable should be explored.

Challenges: A lack of consensus on the most effective plastic alternatives exists in terms of their properties and impact. In some cases, biodegradable and compostable plastic alternatives can pose similar problems for the environment as conventional plastic. They may be biodegradable and/or compostable only under specific conditions and may break into smaller fragments more quickly causing a microliter problem.[88] Alternative materials may also have negative consequences. For example, aluminum cans may reduce ocean plastic and be reused or recycled; however, they might have significantly higher associated greenhouse gas emissions from production, transportation and processing. New materials that

compromise consumer safety and, especially in the five focus countries, incur an additional cost, may be rejected by consumers for economic reasons. A detailed Life Cycle Assessment (LCA) comparison with existing materials should therefore be a precursor to any new material introduction and should be used to help understand decision tradeoffs when considering alternatives.

Conditions for success: Innovating alternative materials can improve brand recognition and be used as a platform for cross-industry collaboration and the crowdsourcing of viable solutions for specific challenges publicly (see NextGen Cup Challenge case study). Multinational collaboration to find solutions may be needed, either in the form of material research and development or specific supply chain innovations like utilizing local dispensing systems, thereby reducing material wastage. In evaluating alternative materials, end of use options must be considered to ensure that products and materials can be handled in a way to optimize use and impact.

OPENIDEO NEXTGEN CUP CHALLENGE

OpenIDEO partnered with Closed Loop Partners and the NextGen Consortium, alongside partners including Starbucks, McDonald's, The Coca-Cola Company and WWF, to launch the NextGen Cup Challenge. The challenge asked for ideas to create a next generation fiber cup—a sustainable and eco-friendly replacement for hard-to-recycle plastics such as cups, sleeves and lids. Earth Cup was one of the winners, with their home compostable 100% paper cup, mono-material, without polyethylene for hot and cold drinks and ice cream. The cup has the same food contact certification as polyethylene alternatives.

Financial assessment

Financial benefits can be unlocked by implementing measures in combination with actions from both the public and private sectors to deliver accelerated impact. For interventions targeted at single-use plastics, this analysis modeled two potential clusters of measures, based on evidence of success, to reduce problematic, unnecessary single-use plastics.

1. **Bans on production and sale of problematic single-use plastic products and packaging:** An interventionist approach that bans defined plastic applications in line with conditions for success.
2. **Consumption levies and alternative material development:** Market-led approach, using taxes to disincentivize consumption of problematic and unnecessary plastic while creating potential revenues for waste management.

Table 4: Financial analysis for measures in reduce problematic and unnecessary SUPs theme

Banning problematic and unnecessary single-use plastic can reduce value chain financing deficit by 3%

Cluster 1: Bans on production and sale of problematic and unnecessary SUPs, along with the replacement of PS in plastic packaging with economically recyclable plastic

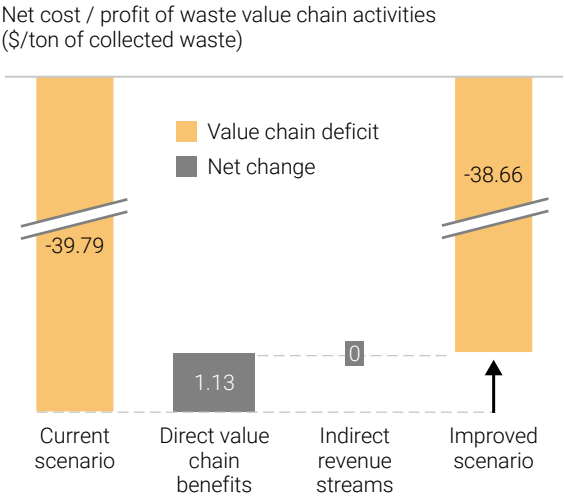
Measures: Bans on problematic and unnecessary SUPs, remove non-recyclable plastics from packaging

Financing benefit: 2-3% reduction in value chain financing gap

Description

Bans on problematic SUPs (i.e., all the materials defined above) may reduce the amount of uncollected plastic in the system, thus avoiding the need to collect, sort and/or dispose of such waste. These interventionist actions have a limited impact on improving the waste management financing gap.

Impact on reducing the value chain financing gap



A combination of levies on problematic SUPs, along with scaling of alternatives, can help bridge 10% of value chain financing gap

Cluster 2: Consumption levies to disincentivize the use of plastic bags, with a focus on developing alternative materials for other problematic and unnecessary SUPs

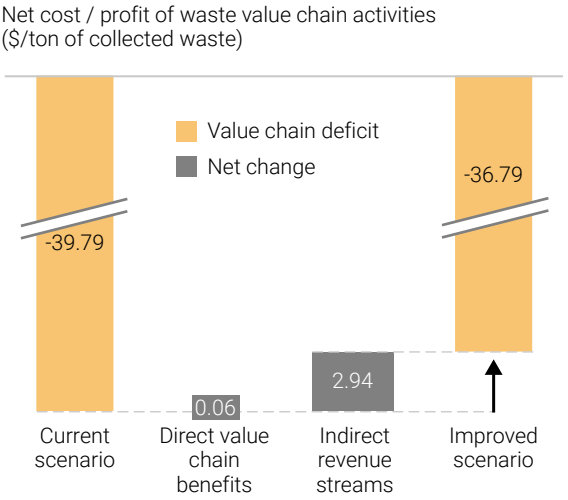
Measures: Taxes and levies on problematic and unnecessary SUPs; develop alternative materials

Financing benefit: 6-10% reduction in value chain financing gap

Description

Consumption levies, such as a US $0.014/bag, on plastic bags along with introduction of reusable bags like cloth bags or cassava bags, can reduce the quantity of waste to be collected as well as provide sources of financing for managing other plastic waste.

Impact on reducing the value chain financing gap

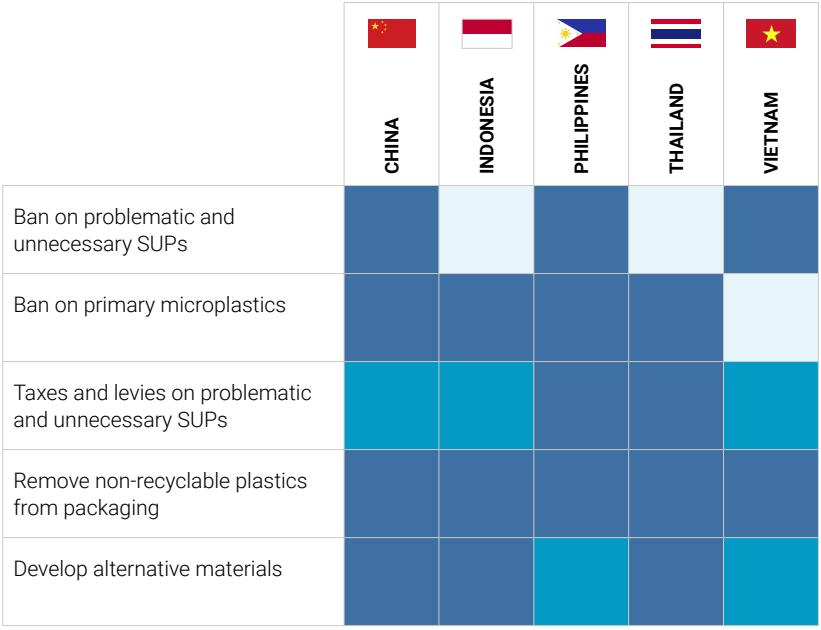


Note: This chart represents an average case. The net cost benefit range is given for both conservative and optimistic scenarios

Source: Accenture Research; modeling methodology and assumptions are provided in the Appendix.

Focus country assessments

Figure 19: Applicability assessment of shortlisted measures in reduce problematic and unnecessary SUPs



Color	Category	Description
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	Sustain efforts	Already shown intent and progress, and there is need to sustain the momentum

This assessment is based on the current situation and reflects the efforts required by a country for success based on the existing focus and suitability for the specific geography. Details on the criteria used for this assessment are provided in the Appendix.

Bans or taxation on problematic and unnecessary single-use plastics may work in countries with strong governance and are generally more acceptable in islands and tourist destinations

In China, a nationwide ban on plastic bags has reduced consumption by 60-80%. In the Philippines and Vietnam, strong public support—73% of voters in the Philippines want candidates to support bans on single-use plastics[89]—and voluntary action at a local or city level demonstrate the willingness to phase out problematic and unnecessary SUPs. The Philippines recently filed a Senate bill calling for a total ban of all single-use plastics. This strong policy must be combined with local level enforcement to be a success. In Indonesia, there is no consensus around SUPs yet. National-level policies to levy excises on plastic bags have failed in the past. To date, 23 cities have tried implementing taxes on plastic bags, but only 3-4 have imposed bans.[90] However, some mayors and governors are driving action to gradually phase out use of SUPs, especially in islands or locations with high tourism.[91] Bans on primary microplastic have generally seen acceptance in the five focus countries.

Alternative materials are broadly a challenge for the focus countries

Barriers around technological maturity, cost and scale exist. However, a clear consensus on viable alternatives, supported by government incentives, could lead to the acceleration of local material production facilities. Thailand is a good example of having emerged as a leader in the regional bioplastics industry. It was spurred by clear financial incentives, notably an uncapped 8-year income tax exemption for companies undertaking R&D in bio plastics[92] and large-scale investment from the public and private sector.

CHAPTER 5

DESIGN FOR CIRCULARITY

Why we need to design better materials and products

In the journey towards a circular plastics economy, there is an urgent need to transform product design. Design is particularly relevant for packaging, considering the high quantity of usage and complex design requirements. According to the New Plastics Economy Research by the Ellen MacArthur Foundation, about 30% of plastic packaging by weight cannot be recycled without fundamental redesign, while only 20% is economically suitable for reuse.[93]

Shortlisted measures

This analysis shortlisted two public sector and two private sector measures (Figure 20).

Figure 20: Shortlisted measures for design for circularity

1 Eco-design standards

Description: Policy measures setting plastic packaging material and design standards to improve recyclability and minimize overall environmental footprint.

Eco-design standards could address challenges around low-value plastics. National policy frameworks can improve the recyclability of plastic entering the system.

Challenges: Eco-design standards can apply to various aspects of a packaging system including the size, shape, material composition,

aesthetics and functionality. The research identified four immediate areas of challenge: small volume and format packaging which is difficult economically to collect and sort with available labor and technology; non-recyclable multi-material and multi-layered packaging, design and branding (e.g., shapes, colorants, labels, etc.) influencing end-market demand or sorting capability; and packaging using materials which are often technically recyclable, but not economically viable to collect, sort and recycle because of their low volumes.

Conditions for success: Private sector voluntary initiatives are more likely to drive progress around eco-design in the short-term by driving momentum in the market. For instance, several multinational companies including Danone, Nestlé and PepsiCo have committed to making 100% of their packaging recyclable, reusable, compostable or biodegradable by 2025.[78] Governments can support this commitment by working with the private sector to enable policies that encourage non-committed companies to follow. Incentives in the form of eco-modulated EPR fees can help accelerate such a move.

2 Recycled content standards

Description: Requiring a certain level of recycled material to be used in plastic applications. Potential incentives or penalties could be levied on the producers and importers of plastic products to meet their recycled content levels.

Globally in 2016, recycled PET (rPET) made up to 15%, and recycled PE and PP around 3%, of plastic production.[32] Approximately 75% of the rPET is currently consumed by the fiber industry.[94] The growth of recycled plastics stalled in recent years, which was largely attributable to an oversupply of virgin PET.[94] Since the cost of post-consumer plastic collection for recycling and processing has not changed for recyclers, prices for rPET have not been able to follow suit, thus widening the price gap between virgin and recycled plastic.[95]

Recycled content standards can have three key benefits:

- Balance the market price variance between virgin and recycled plastic
- Create stable downstream demand for recycled material among brand-owners and packaging makers, and longer term certainty for recyclers and material processors
- Establish demand and create a pull through the system, keeping plastics in longer production cycles and improving collection rates

Challenges: As of August 2019, recycled content standards will have to be exempted for food packaging (except for PET packaging) and medical grade packaging due to lack of a safe recycling pathway to reintegrate recycled plastic in these quality sensitive applications. Reintegrating recycled plastic in other less sensitive plastic applications, such as rigid non-food containers, fibers and automobiles, presents an opportunity. As advanced recycling technologies progress, it will allow recycled plastic to be incorporated into a wider variety of applications. In developing recycled content standards, it will be important to understand the environmental and economic tradeoffs associated with advanced recycling. Given inelastic demand in mandatory programs, and volatile supply of recycled plastic, a short-term demand-supply mismatch presents potential risk of high compliance costs. The low cost of virgin material is also a challenge.

Conditions for success: The research suggested that two implementation approaches exist. First, an incentive-based approach where recycled content standards are used as an eco-modulation instrument in EPR fees, in which producers with higher recycled content pay lower producer responsibility fees. The discounted fees could indirectly serve as an instrument to bridge the price gap between virgin and recycled plastic and incentivize producers to shift to the latter.

A second approach could be a mandatory scheme that sets the minimum target for recycled content and couples it with a tax on non-compliance. The UK, for example, has proposed a target of 30% recycled content, and a virgin material tax for all plastics not

meeting the standard. An alternative could be using a virgin material tax as a protection against the high compliance cost of a mandatory scheme—due to volatile recycled material prices as a result of demand-supply mismatch. For instance, producers could be charged a virgin material tax only for the amount of plastic for which recycled content obligations could not be met. The funds collected through such taxes could potentially be used to develop infrastructure to correct for market imbalances in the future.

Taxation can create a sufficient market incentive and certainty for recyclers to scale production, thereby increasing collection and making recycled polymers more cost comparable. An analysis by IHS Market found that the critical price point to make a buyer indifferent between purchasing rPET and virgin PET is to ensure a spread (prices of virgin PET—price of curbside baled PET) of no more than US $1.1/kg between the market price for virgin PET and the curbside-baled PET,[95] which could be used as a potential benchmark to form an appropriate virgin material tax rate.

Recycled content standards should go hand-in-hand with an increase in domestic recycling capacity to improve domestic waste collection and create localized supply chains. Standards dictating the amount of recycled material procured domestically versus imports by producers will also support this. Additionally, recycled content standards should be structured on an item basis, in which each item has a certain percentage of recycled content, or portfolio basis in which the manufacturer maintains a minimum level across the portfolio. To reduce the risk of fraud, the registration of accredited post-consumer recycled content suppliers, as well as regular audits of facilities, is needed.

Many consumer goods companies have already committed to increasing the recycled content in their packaging to an average of 25% by 2025. Compare this number to today's average of 2%.[96] Development of environmentally-friendly chemical recycling technologies in the long-run can help accelerate progress and impact if they target plastics that are non-recyclable today.[97] [98] Additionally, improved segregation of waste during collection by using deposit

return schemes, for example, could enable bottle-to-bottle or like-for-like use of recycled plastic.

COCA-COLA FEMSA – REINTEGRATING POST-CONSUMER RECYCLED MATERIAL

Cola-Cola FEMSA launched bottles made from 100% recycled resin for all their PET bottles for the Ciel water brand in 2017. With an ambition to reach 25% post-consumer recycled content across all plastic packaging by 2025, the company has already integrated 21% of recycled PET in all their PET products.[97]

3 Establish cross/inter industry standards

Description: Voluntarily develop and agree on common standards, cross and/or inter industry, for plastics materials and packaging to improve recyclability.

A large portion of design characteristics relate to brand differentiation, rather than function, and exist due to a lack of standards around design. This limits the effectiveness of recycling. For example, differences in PET bottle types among brands can inhibit the recycling process, while millions of PET bottles cannot be recycled because of their color or the non-availability of end-markets for recycled material.

Challenges: For the private sector, moving towards voluntary cross/inter-industry packaging standards incurs significant upfront cost in R&D, manufacturing, quality and logistics, and progress is dependent on transparency and collaboration between competitors.

Conditions for success: An alignment on standards at an industry level can improve recyclability and drive economies of scale at the recycling stage. Furthermore, it could eventually bring easier and cheaper access to recycled material to support plastic commitments. An interesting example is the Thailand Pollution Control department, which successfully collaborated with beverages brands to remove plastic cap seals from bottles. The collaboration benefitted both

industry and the government and was converted to a national mandate for bottling producers. Cross-industry agreement, incorporating resin producers, packaging makers, recyclers and brand owners, can facilitate the scaling of recycling capacities by increasing the quantity of recyclables and rationalizing recycling technology and processes. The government can support this by scaling successful industry-led standards to a wider set of players.

4 Design refillable packaging

Description: Design packaging for a minimum number of trips or rotations in a reuse system.

According to the Ellen MacArthur Foundation, 20% of plastic packaging has a potential for reuse, while a 25%-50% cost savings could be realized through reuse and refill as a result of raw material cost recovery.

Challenges: Although savings on raw material can be a potential incentive, the costs of reverse logistics, especially in archipelago geographies, and clean-up and refurbishing costs generally translate into higher systemic costs than recycling. Product and consumer safety concern is also a challenge.

Conditions for success: Refillable packaging is attractive, as it can reduce dependence on virgin material consumption and incentivize the private sector to switch from linear to circular plastic business model design. New product delivery models and reverse logistics models involving collection, cleaning and refill should be explored. It would require new capabilities around reverse logistics and multi-stakeholder engagement (manufacturers, brand-owners, logistics providers, retailers, and consumers).

PT AQUA INDONESIA (DANONE INDONESIA) – CIRCULAR WATER BOTTLE

Indonesian water brand AQUA (Danone Indonesia) has designed and implemented a circular packaging system for a 19L water bottle. Since 1983, this reliable and recyclable bottle delivers close to 70% of total company water volume across all locations in Indonesia, including remote islands such as the Gili Islands. Supported by a strong reverse logistics system, the bottle is collected, cleaned, refilled and re-delivered to customers across Indonesia, enabling 20-40 life cycles for each bottle. When the bottle reaches its end-of-life, it is crushed and recycled into new 19L bottle. As of today, recycled content in each new bottle ranges from 40%-60%.

Financial assessment

There are two key design levers relevant for policy makers, resin and packaging manufacturers and brand owners to improve collection and reduce marine plastic. This analysis modeled one for each design lever:

1. **Upstream redesign:** Making plastics more recyclable and/or reusable by redesigning the material and product format
2. **Recycled content integration:** Increasing the amount of recycled plastic (PCR) in products across the value chain

Table 5: Financial analysis for measures in design for circularity theme

Upstream design interventions can reduce the value chain financing deficit by 10%, with most benefits coming from making specific formats suitable for recycling

Cluster 1: Mandatory/voluntary eco-design standards to improve recyclability of specific types of packaging

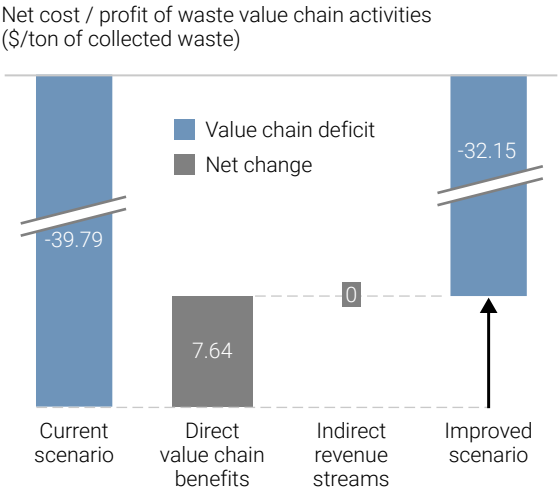
Measures: Eco-design standards, cross/inter industry standards

Financing benefit: 4-9% reduction in value chain financing gap

Description

Design standards for making plastic inputs suitable for recycling by replacing resins with limited circular potential, problematic additives with recyclable resins and material innovation for formats like non-recyclable multi-material packaging to be more recyclable. This drives value chain benefits by reducing the amount of non-recyclable plastic in waste.

Impact on reducing the value chain financing gap



Increasing demand for PCR through recycled content standards has a potential to reduce the existing value chain financing gap by up to 34%

Cluster 2: Recycled content standards with production and packaging taxes

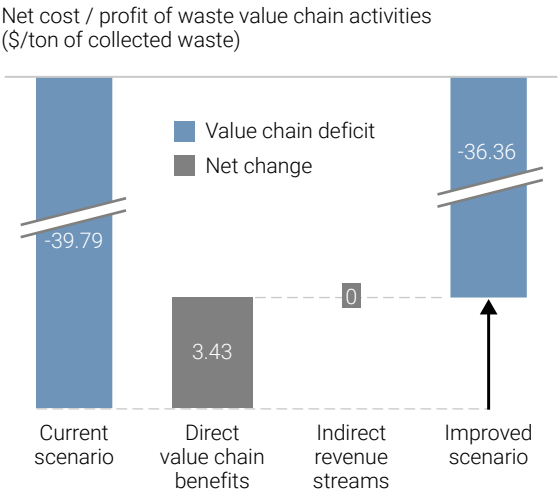
Measures: Recycled content standards, virgin material tax

Financing benefit: 19-34% reduction in value chain financing gap

Description

Recycled content standards defined for applicable plastic products, along with virgin material taxes to penalize and disincentivize non-compliance of standards. This drives value chain benefits by improving downstream recycling and creating a stable demand.

Impact on reducing the value chain financing gap

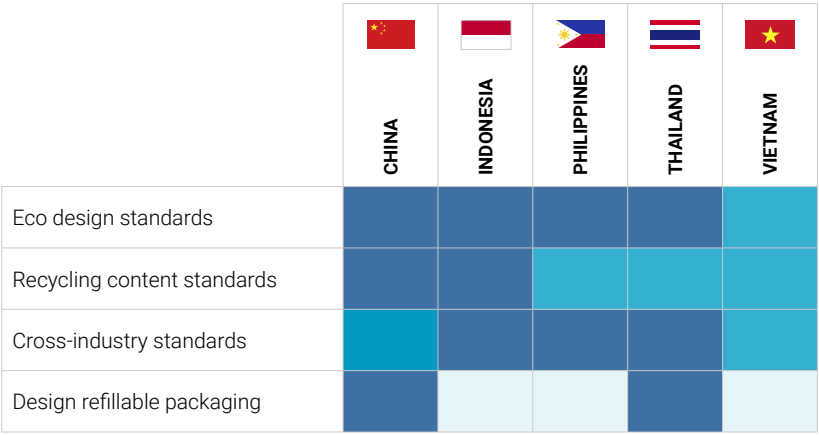


Note: This chart represents an average case. The net cost benefit range is given for both conservative and optimistic scenarios

Source: Accenture Research; modeling methodology and assumptions are provided in the Appendix.

Focus country assessments

Figure 21: Applicability assessment of shortlisted measures in design for circularity



Color	Category	Description
	Reset focus	Lacked focus or faced challenges with transformational change required
	Advance and accelerate	Lacked focus or faced challenges, but given low level of effort, could generate quick win
	Sustain efforts	Already shown intent and progress, and there is need to sustain the momentum

This assessment is based on the current situation and reflects the efforts required by a country for success based on the existing focus and suitability for the specific geography. Details on the criteria used for this assessment are provided in the Appendix.

Incentives for recycled content standards are an opportunity for all five focus countries

China's National Sword policy could catalyze the demand for recycled plastic content. China's recycling infrastructure, with close to 50 certified private sector industrial parks dedicated to recycling activities, can also meet a growing demand for recycled content in the country. In Indonesia, recycled content standards are currently being discussed as an approach to reduce plastic waste by 30% by 2025.[71] The lack of available recycling capacity at scale in other countries may make recycled content standards a longer-term play.

Eco-design standards and cross-industry standards are easier to adopt in countries with high domestic production

Eco-design has been adopted in some form, especially for the electronics industry, in all the focus countries except Vietnam. These standards are easier to enforce in countries with high quantities of domestic production, given the challenges of enforcing standards on imported plastics. Clear consensus on design standards to improve recyclability is needed from government and the plastic industry, along with clear communication targeting SMEs, which may lack awareness and capability.

Refillable packaging could be challenging for countries with archipelago geographies

High reverse logistics cost, especially in archipelago geographies due to transport via waterways, could make design for refillable packaging economically challenging. Socially inclusive return systems by engaging informal sector in reverse logistics present an opportunity.

CHAPTER 6

DEVELOP RECYCLING AND TREATMENT MARKETS

Why we need to create downstream markets to incentivize collection

About 75% of all waste is mismanaged across the focus countries.[6] Mismanaged waste is at risk of leaking into the ocean. It also represents a loss of embedded resources and economic value.

> **The majority of existing solutions are focused on the supply side rather than demand—a key gap in the current approach to ending ocean plastic.**

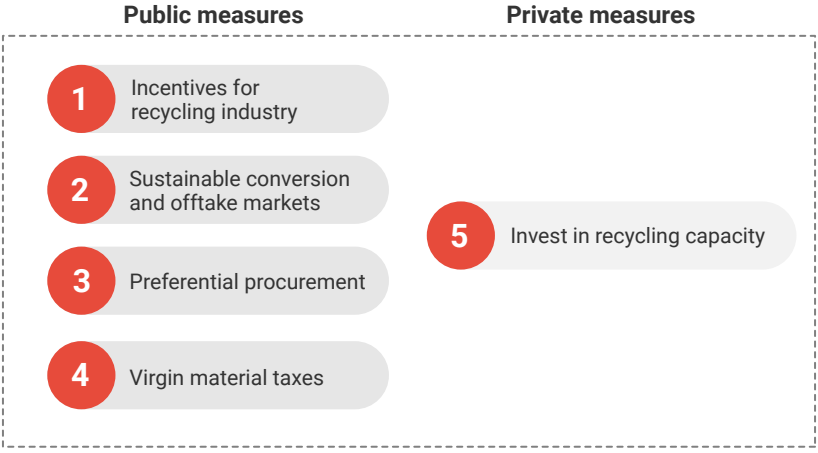
Established downstream recycling and treatment markets can create a "pull" effect on collection, with a stable demand improving the economics of collection. Evidence of this is visible for highly recycled plastics today. For example, established recycling markets for PET and HDPE bottles ensure about a 90% retrieval rate in the Philippines.[98] While measures like recycled content standards can ensure consistent demand from recyclers and EPR and eco-design standards can improve the supply of quality feedstock, recycling markets need to be scaled to meet demand.

Solutions for recyclable plastics should scale and improve already established industries. The challenges for non-recyclable or hard-to-recycle plastics are greater, and efforts must be made to look into alternative product delivery mechanisms to change the product and packaging design and/or to identify appropriate technological solutions that develop a downstream market without creating adverse impacts on the environment or local communities.

Shortlisted measures

Five shortlisted measures have been identified to develop and scale plastic recycling and treatment markets (Figure 22).

Figure 22: Shortlisted measures for develop recycling and treatment markets



1 Incentives for recycling industry

Description: Financial instruments such as credits, deductions, tax exemptions, as well as shortened depreciation lifetime, are designed to stimulate growth of the plastic recycling industry.

Financial incentives for recycling can encourage existing players, largely with small and fragmented operations, to become important parts of a local recycling industry. At the same time, incentives to promote tech innovation, specifically focused on CAPEX, should encourage multinationals to develop new recycling infrastructure and technologies at scale.

Challenges: The lack of accessible technology and a high operational cost, impacted by poor quality feedstock, has traditionally hindered downstream plastic solutions. These challenges can be addressed with a specific focus on:

- **CAPEX:** Building capacity by offering lower interest loans, duty exemption on imported capital equipment, technology innovation and the provision of land
- **OPEX:** Improving the profitability of recycling operations through VAT benefits, tax holidays, tax credits on raw material supplies and other benefits

Current recycling capacity in the focus countries is low. In Indonesia, it is only 13% of the country's total plastic consumption. Recycling is dominated by unregistered SMEs, creating an opaque system that prevents locating and channeling collected plastic. However, there is a high potential for incentives to stimulate industry growth.

Conditions for success: Incentive-based public measures, such as tax exemptions or tax benefits, could encourage existing players to become part of a more transparent, formalized system. This may have other benefits, too. Recyclers in our research found unregistered entities to be unreliable, often deferring on payments to the feedstock providers and resulting in adverse upstream impacts on collection.[99] Onboarding existing informal recyclers can expand current infrastructure, while private sector financing can scale investment in leading technology solutions that improve efficiency.

2 Sustainable offtake and conversion markets

Description: Incentives in the form of subsidies, tax exemptions for intake of low-value, non-recyclable plastic to stimulate their sustainable end-of-life treatment markets.

The priority should be on upstream modifications to remove non-recyclable plastics or to redesign them to be reusable or recyclable in local markets. However, in the short-term, alternative treatment approaches can be explored to avoid immediate wastage and resource loss. These can include conversion technologies, such as using plastic waste to replace coal in powering cement kilns, which is currently being mandated in India, or repurposing of plastic waste into more durable products like construction materials, railroad ties, and durable furniture. India's use of multi-layered

plastic packaging as an alternative fuel to coal is not inherently circular and poses documented environmental risks. However, it is a conversion technology that leverages existing infrastructure, making it less capital-intensive than other conversion options considered. Moreover it does not create a long-term dependence on plastic waste, thus providing flexibility to support future recycling and long-term innovation to remove non-recyclable plastics.[100 101 102 103]

Challenges: None of these approaches are truly circular. Moreover, conversion technologies have traditionally been associated with negative environmental impact, including but not limited to, higher levels of pollution and non-optimal use of raw materials. Most conversion technologies also have a high CAPEX requirement and rely on the continuous supply of feedstock (i.e. post-consumer plastic) for operational sustainability. They hinder the long-term transition to more efficient solutions like reuse or recycling. Repurposing of plastic into more durable products is also limited in its ability to scale by the limited market for these durable products.

Conditions for success: Repurposing plastic into durable furniture, railroad ties, roofing sheets, bricks and more was found to be more widely acceptable among conversion options. Governments and private sector players have started—and should continue—to act around these key areas. The plastic repurposing market would benefit from preferential procurement of locally relevant repurposed products for its success (as discussed in the preferential procurement measure). Careful consideration is also needed to ensure the treatment option exclusively uses non-recyclable plastic and does not impact waste streams that independent waste collectors depend on. A clear national government direction on feasible technologies, along with a vision for reuse and recyclability, will help strike a balance between short and long-term priorities.

3 Preferential procurement

Description: Mandates on public sector organizations for supporting or procuring recycled and repurposed plastic in their procurement contracts for products and services.

Preferential procurement of environmentally-friendly repurposed plastic products can create a demand for collection and second life for post-consumer, non-recyclable plastic. Preferential procurement of such products could help create demand for plastic repurposing markets to scale.[99]

Challenges: End-of-life management of repurposed plastic goods should be ensured. Additionally, the quality and longevity of goods made with repurposed, post-consumer plastic waste, as compared to other materials, needs to be carefully evaluated for specific applications.

Conditions for success: This measure is relevant especially for rural areas and low-income municipalities where plastic waste leakage is a problem and access to basic public amenities is scarce. Procurement policies also present an opportunity to continue public engagement and awareness, which can amplify the impact of other strategies.

ENVIROTECH WASTE RECYCLING INC – MANUFACTURING FURNITURE FROM NON-RECYCLABLE PLASTIC

Based in the Philippines, Envirotech Waste Recycling Inc (EWRI) coverts difficult-to-recycle plastic into chairs, tables, park benches and other types of furniture. It has two plants—one in Davao City and one in Candaleria—each with a capacity of 600-720 tons/year of plastic waste. For the feedstock, the company uses plastic inputs comprising 90% difficult-to-recycle plastics (e.g., multi-layered plastic, plastic films, etc.) and the remaining 10% is made from high value plastic like PET or HDPE. They work in partnership with the local municipality or waste management company, which provides the land and factory equipment while EWRI provides the technology, operations and service. In return, the municipality gets the production.[104]

4 Virgin material taxes

Description: Taxes imposed on either resin manufacturers, packaging manufacturers, brand owners or importers on production or plastic packaging elements which are either unrecyclable or contain undesirable content.

Virgin material taxes can disincentivize the production of certain packaging types or increase the competitiveness of PCR by reducing the price gap between virgin and recycled polymers.

Challenges: Taxes are challenging to implement in countries where the market is made up of decentralized SMEs. In 2014, Indonesia had 57.9 million SMEs which contributed around 59% of the country's GDP.[105] Additionally, there is an inflationary risk if taxes lead to higher prices—an issue in countries with high portions of the population below the poverty line. Furthermore, a shift to other materials as a result of virgin material taxes may have unintended consequences, such as higher greenhouse gas emissions or more waste, which should be avoided.

Conditions for success: There is merit in exploring this in combination with recycled content standards (see recycled content standards measure). Tax on upstream plastic resin producers could be easier to enforce and less challenging to administer, while also helping to increase the price of virgin material at the source.

5 Invest in recycling capacity

Description: Financial investment made by corporates to enable the development and scaling of the recycling industry, either in physical infrastructure or through R&D.

The private sector can play an active role in infrastructure development to scale capacity in recycling plastics, such as PET, as well as advancing technologies to scale and facilitate recycling of difficult-to-recycle plastics.

Challenges: The uncertainty of upcoming technologies is a barrier for further R&D investments. Additionally, the high upfront CAPEX costs for most technologies, risk of poor quality feedstock and unreliable quantity of waste collected for recycling are major operational challenges.

Conditions for success: Clear national government direction on feasible technologies for the short-term and a strategic vision for the long-term will help accelerate technology development. Supporting measures like recycled content standards can ensure stable demand for recyclers, whereas operational best practices like long-term contracts with waste collectors can help secure a stable input of recyclables. For example, NEPRA Resource Management Pvt Ltd, an Indian waste management company, has built a reliable dry waste supply chain offering fair and transparent prices and a consistent supply of segregated waste to recyclers. It generated monthly revenue of US $769,000 in September 2018[106] and now handles more than 50 tons of dry waste per day.

Financial assessment

Two key levers are available to scale downstream markets and reduce the financing gap:

1. **Capture value from recyclables:** Scale recycling capacity to increase value capture from recyclables
2. **Repurpose non-recyclables:** Explore plastic repurposing and treatment options for all difficult-to-recycle plastic waste

This analysis modeled two potential clusters, one for each of the levers discussed above:

Table 6: Financial analysis of measures in develop recycling and treatment markets theme

Fiscal stimulus to scale recycling capacity can bridge value chain financing deficit by 29%

Cluster 1: Incentivizing recycling through tax-based fiscal stimulus

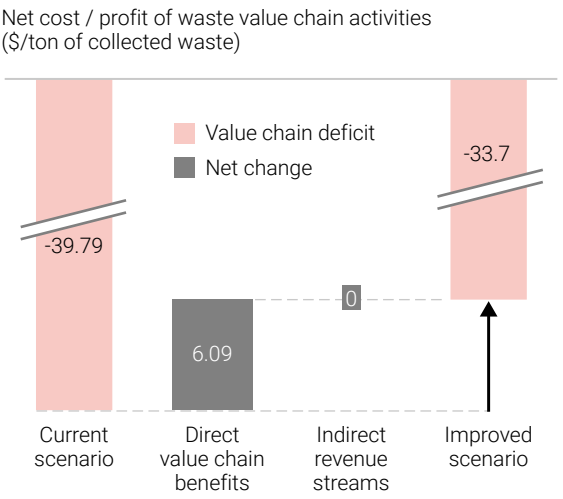
Measures: Incentives for recycling, invest in recycling capacity

Financing benefit: 15-29% reduction in value chain financing gap

Description

Scaling recycling for high-value plastics by incentivizing recycling through fiscal incentives like reduction of VAT amongst others. This helps drive value chain benefits by increasing recycling and improving the profitability of recycling operations

Impact on reducing the value chain financing gap



Repurposing low-value, difficult-to-recycle plastic that is supported through preferential procurement can help bridge 18% of value chain financing gap

Cluster 2: Preferential procurement of repurposed plastic materials and exploring treatment of difficult-to-recycle plastic waste

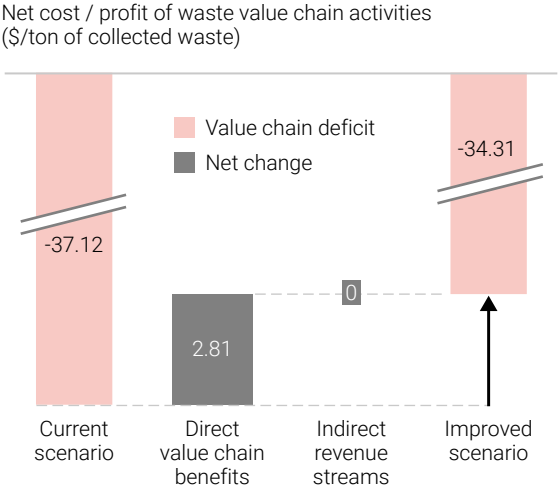
Measures: Sustainable treatment and offtake markets, preferential procurement

Financing benefit: 5-18% reduction in value chain financing gap

Description

Scale plastic repurposing technologies like converting low-value, difficult-to-recycle plastic (e.g., multi-layered plastic, sachets etc.) to furniture, supported by preferential procurement at the local level helps drive value chain benefits by reducing the disposal and litter management cost of otherwise uncollected plastic waste

Impact on reducing the value chain financing gap

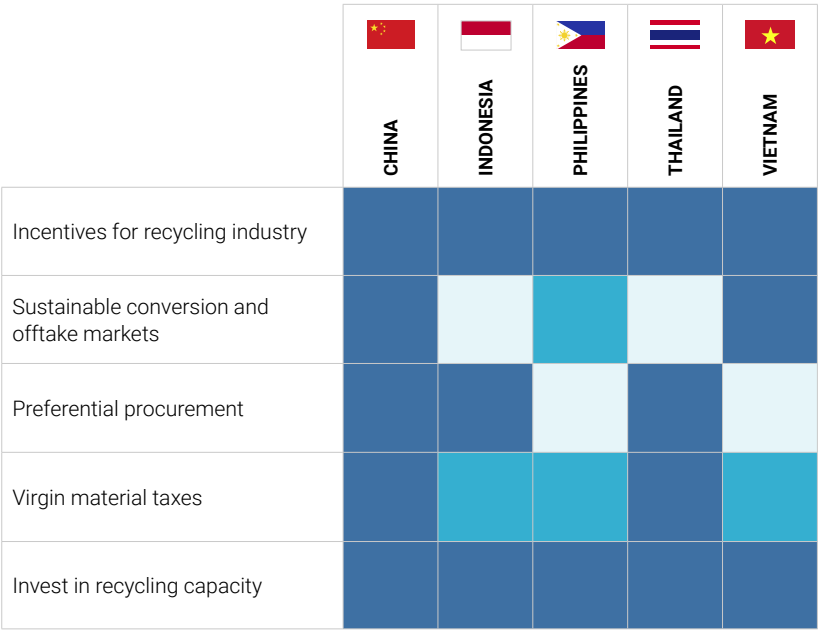


Note: This chart represents an average case. The net cost benefit range is given for conservative and optimistic scenarios

Source: Accenture Research, modeling methodology and assumptions are provided in Appendix

Focus country assessments

Figure 23: Applicability assessment of shortlisted measures in develop recycling and treatment markets



Color	Category	Description
	Reset focus	Lacked focus or faced challenges with transformational change required
	Advance and accelerate	Lacked focus or faced challenges, but given low level of effort, could generate quick win
	Sustain efforts	Already shown intent and progress, and there is need to sustain the momentum

This assessment is based on the current situation and reflects the efforts required by a country for success based on the existing focus and suitability for the specific geography. Details on the criteria used for this assessment are provided in the Appendix.

Scaling of recycling capacity should be actively pursued across focus countries

Progress has been made across focus countries and this can be scaled, with a potential to drive improved collection and develop effective recycling industries.

Sustainable offtake and conversion markets for non-recyclable plastic is viable in the short term

Difficult-to-recycle plastic can be used as alternative fuel in cement kilns and will be part of the solution in China and Vietnam. This is driven by their large cement production capacities. China and Vietnam are the world's largest and fifth largest cement producers, respectively. The use of difficult-to-recycle plastic in cement kilns should remain a short-term option and should be limited to packaging formats where no viable economically or environmentally sound alternative exist.

Preferential procurement policies to purchase repurposed plastic have potential

This is particularly true in China, Indonesia and Thailand due to relatively high public expenditure budgets at a local level. The Philippines and Vietnam could incentivize repurposing of difficult-to-recycle plastic through preferential procurement policies. Considerations to address corruption at a local level would improve the applicability of these measures across all countries.

Virgin material taxes require strong governance and may be a challenge

Virgin material taxes are economic instruments that will require strong governance to ensure compliance. This presents a challenge, especially in Indonesia, the Philippines and Vietnam. In Indonesia, there has been heavy pushback from proponents of developing the nation's manufacturing industry.

CHAPTER 7

ROADMAP AND CALL TO ACTION

Roadmap

This playbook explored a number of conditions that can support the successful transition to end ocean plastic leakage. The roadmap, which was discussed in the executive summary of this report, is an agnostic, illustrative country overview of these key measures. While it should not be followed as an alternative to existing national roadmaps, the sequencing of measures is a realistic representation of a pathway moving towards eliminating plastics entering the ocean. It is imperative to ensure that no measure is implemented in isolation, as there is a critical need for systemic action at every stage of the value chain. Building on this visual roadmap, this report concludes with a more detailed roadmap that incorporates key measures and enablers for success (Table 7). This roadmap can be used by national government, local government, corporates and NGOs as a checklist to support an effective pathway for success.

Table 7: Detailed roadmap of measures and considerations for success

A roadmap to improve collection and stop plastics from entering the ocean

Palliative measures: Short-term solutions to reduce leakage and capture plastic pollution before it reaches the ocean		
Measure		**Factors for consideration to enable success**
Short-term	Install and scale litter catchment systems e.g. trash racks, traps in rivers	• Obtain data on the high-volume areas of leakage • Allocate government grants and funds to fund solutions • Establish municipal unions among riverside municipalities to help finance solutions within litter-catchment areas
	Develop sanitary landfills	• Scale sanitary landfills as an intermediary measure to prevent leakage of plastic post-collection
	Coastal clean ups and marine debris removal schemes	• Partner with beach cleanup programs (e.g., Ocean Conservancy's International Coastal Cleanup) to scale • Create downstream markets for collected ocean plastics
	Awareness and behavior change campaigns	• Target high-risk groups (e.g., communities near waterways, coastal tourism, local leaders) • Engage experts to create educational content • Target campaigns to improve wet and dry waste segregation at the source • Include circular economy in the national curriculum

Financing the collection: Direct and indirect financing measures alongside efforts to improve the operational capacity of collection infrastructure, to reduce the financing gap and increase the quantity and quality of collected plastics		
Measure		**Factors for consideration to enable success**
Short-term	Pre-competitive voluntary EPR	• Commit to bold collection targets for end-of-life plastic • Align on the governance certification cross or inter-industry
	Design, develop and roll-out relevant EPR	• Target awareness and education on EPR • Determine most viable financing measures (e.g., packaging material fees, DRS) • Pilot small-scale solutions, integrating the informal sector • Share results (e.g., cost benefits) where possible to support national and international progress
	Ensure local level compliance with national regulations to drive operational efficiency	• Improve enforcement of existing waste management laws (e.g., using the principles in this playbook) • Expand operations and set up more collection centers • Map dysfunctional collection centers and upgrade them • Coordinate municipal unions in areas with low waste quantity • Celebrate and reward success of leading municipalities (e.g., grant funding based on performance)
	Prioritize Informal sector inclusion	• Provide informal sector players with access to social welfare programs (e.g., provision of ID, education) • Formally recognize informal sector with empowering roles (e.g., local waste management advisory boards) • Target junk shop integration to enable scale • Scale, and support independent waste collectors
	Develop blended financing instruments	• Identify organizations to manage ring-fenced finance • Identify catalytic funding to incentivize further investment • Incorporate financing solutions (e.g., EPR to cover OPEX)
Long-term	Digital waste management	• Explore low-tech enablers (e.g., use of mobile for consumers to upload their waste or share awareness campaigns) • Explore digital solutions for collection (e.g., optimizing logistics, improving sorting capabilities)

Reducing problematic and unnecessary single-use plastics: Reduce the quantity of frequently littered and often uncollected, high leakage ocean plastics from the value chain through upstream intervention to reduce its production or find viable alternatives		
Measure		**Factors for consideration to enable success**
Short-term	Bans on primary microplastics	• Public-private collaboration to ensure readiness for bans • Engage with small-scale SMEs to ensure readiness
	Bans on problematic and unnecessary SUPs	• Public-private alignment and consensus on problematic and unnecessary SUPs • Implement bans where a viable alternative is available • Develop strong national policy that is consistent to align enforcement at the local level • Implement bans at a local level, engaging key stakeholders (e.g., local government, local retailers and community) • Ensure minimal impact on the convenience, health, safety and product protection for consumers
	Taxes and levies on problematic and unnecessary SUPs	• Identify problematic and unnecessary SUPs where no viable alternative exists; tax non-recyclable plastics at producer level • Explore effective method to improve collection of tax
	Develop alternative materials	• Incentivize research on alternative materials to determine the most viable options, if applicable (e.g., LCA of alternatives) • Ensure downstream infrastructure for alternatives (e.g., industrial composting facilities), if adopted as part of the solution
Long-term	Remove non-recyclable plastics and packaging	• Mandate for end-of-life solutions for plastics in legislation • Innovate new business models and systems for plastics that can enable the removal of plastics at scale

Design for circularity: Support collection and improve recycling efficiency of downstream solutions through improved recyclability of plastics and increased quantities of recycled content		
Measure		**Factors for consideration to enable success**
Short-term	Establish cross/ inter industry packaging standards	• Develop pre-competitive standards on non-recyclable or difficult-to-recycle plastics • Align on standardized packaging design and criteria • Develop criteria to define what is recyclable and what is not • Embed sustainability as part of product innovation
	Eco-design standards	• Develop standards on defined problematic plastics (e.g., small volume or format; multi-material or multi-layered plastics; non-recyclable design and branding, shapes, colorants, labels etc.) Packaging not economically viable to collect, sort and recycle due to low volumes (e.g., PVC, EPS, PS) • Align eco-design principles with eco-modulation and EPR
	Recycled content standards	• Commit to recycled content standards • Develop in-country recycling facilities that prioritize recyclable plastics (PET and HDPE) • Explore emerging recycling technologies (e.g., chemical recycling) to make non-recyclable plastics recyclable
	Preferential procurement	• Buy upcycled or repurposed plastic products using preferential procurement (e.g., roofing sheets or bricks for temporary housing)
Long-term	Design circular packaging	• Design circular packaging alongside new circular business models focused on reuse and refill • Ensure relevant infrastructure to support new models

Develop recycling and treatment markets: Develop infrastructure to effectively recycle plastics at scale and, in doing so, provide an effective pull and demand on resources at the collection stage to further incentivize collection at scale		
Measure		**Factors for consideration to enable success**
Short-term	Incentives for recycling industry	• Align on incentives (e.g., credits vs. subsidies) • Grow innovation hubs focused on recycling solutions • Subsidize recycling CAPEX to cover cost of technology • Align recycling incentives with eco-design standards • Partner with retailers, governments, recyclers and others to implement in-country recycling solutions
	Invest in recycling capacity	• Define recycled content standards • Enforce source segregation of dry, uncontaminated waste • Develop longer-term contracts for material inputs for recyclers • Explore inter/cross industry opportunities based on existing recycling infrastructure (e.g., PET into PET or PET into recycled rPET fiber)
	Sustainable conversion and offtake markets	• Develop sustainable solutions for difficult-to-recycle plastic (e.g., bricks, sheets and furniture), supported by locally relevant preferential procurement • Assess solutions with regard to environmental, social and economic considerations • Share leading practices and learn from successful solutions • Develop recycling technologies for plastics that are currently non-recyclable

Call to action

This playbook has provided a framework of the most promising public and private measures to improve collection, including key principles for success and a roadmap. In doing so, it has contributed to the collective knowledge base of key stakeholders across focus countries and the world and has helped create a platform that can support action to end ocean plastic. While it is clear there is a lot to do, there are a set of actions that each stakeholder can take forward to solve this challenge. The table below (Table 8) is a call to action, focused on the most urgent and most feasible short-term actions that each of our target audience stakeholders—national government, local government, corporates and non-governmental organizations (NGOs) can adopt.

Table 8: Call to action for stakeholders

Stakeholder	Actions required
National government	Develop a clear national plan and regulatory framework with targets, strong governance frameworks down to the local level
	Provide clarity to local government and the private sector around areas of uncertainty, notably helping to develop a consensus to phase out or ban unnecessary/problematic SUPs, and on a preferred set of solutions for non-recyclables, focused on scaling recycling technologies and small-scale local solutions
	Adopt public-private measures for improved collection, with a focus on EPR, and identify the most viable solutions by testing locally relevant operating models in pilots
	Develop national awareness campaigns in collaboration with local government, corporates and NGOs, targeted at key stakeholders and embedded into national education curriculums
	Identify opportunities to collect more data, such as on waste types or waste content, that can support collection efforts
Local government	Collaborate with nonprofits and private sector players to leverage technical assistance, particularly for the management and implementation of key measures
	Identify locally fit-for-purpose, cost-effective collection solutions that focus on expanding door-to-door collection, maximizing existing collection centers where possible, or fundamentally redesigning where existing collection centers have failed to succeed

Stakeholder	Actions required
Local government	Adopt palliative actions to address ocean leakage at hotspots, including the installation of trash racks on waterways, clean-ups and the development of sanitary landfills
	Provision of local resources, including land and subsidized utilities, to facilitate waste management operations (e.g., setting up of MRFs)
Private sector (Producers, Importers and Brand Owners)	Scale up voluntary pilot collection efforts alongside voluntary EPR commitments, perhaps led by consortiums/trade groups representing the private sector, as well as alongside local governments to increase collection
	Align on a definition of problematic and unnecessary SUPs to remove and publicly commit to their phase out, support bans and rationalize the plastic material inputs for recycling through design
	Fund and incubate small-scale waste management startups to help develop, scale and improve their efficiency to improve local waste management
	Participate in dialogue with government on design considerations, such as waste and recycled content, and to develop sound policy
	Pilot and scale innovative solutions, combining alternative design and new delivery models within the focus countries
	Commit to financing recycling technology solutions that focus on scaling existing solutions and establishing new solutions for difficult to recycle plastics
NGOs, Multilaterals, Bilateral	Accelerate deployment of blended financing instruments for capital-intensive large-scale projects, while providing catalytic financial support to targeted leakage hotspots and early stage start-ups to make them more investable in the long-term
	Enter into agreements with national and local governments to provide project management, technical capability development and monitoring and evaluation services on large projects
	Partner with the private sector to develop context relevant proof of concepts to de-risk innovative approaches and make them more investable
	Mobilize the public and push for bottom up solutions, while providing technical assistance and integrating plastic waste management as part of broader conservation strategies

APPENDIX

List of measures

Sr. No.	Measure	Description
1	Advanced disposal fees	Non-refundable fees levied on individual products at the point of purchase. The fee is inbuilt in the pricing of the product based on estimated costs of collection and treatment
2	Anti-littering and anti-dumping levies	Taxes and fines imposed on serious litterers with the aim of preventing, eliminating and reducing of illegal dumping and littering
3	Awareness and behavior change campaigns	Initiatives that aim to increase awareness of the plastic waste management ecosystem, including children, consumers and communities
4	Ban on primary microplastics	Prohibition on the use of plastic fragments or particles less than 5mm in size (pre-production plastic pellets not included), which are purposefully manufactured for uses in cosmetic products and toiletries, vector drugs and air-blasting technologies
5	Ban on problematic and unnecessary SUPs	Ban on manufacturing, distribution and import of defined problematic and unnecessary single-use plastic. The policy is usually directive in nature at the national level and administered or enforced at the city level
6	Blended financing instruments	Use of public, private or philanthropic capital to spur investment in projects aimed at improving waste management in developing countries
7	Decentralized repurposing and reuse	Transforming plastic waste or unwanted plastic products into new materials or products
8	Deploy recyclable packaging	Streamlining the use of plastic materials and packaging that are recyclable in practice and at scale (e.g., use of PET instead of PP)
9	Deposit return scheme	Refundable fee levied on an individual product at the point of purchase. The entire fee, or a portion of it, is refundable when the used product is returned to the point of sale or at a specified drop-off site

Sr. No.	Measure	Description
10	Design refillable packaging	Design packaging for a minimum number of trips or rotations in a reuse system
11	Develop alternative materials	Develop the use of alternative materials to problematic and unnecessary plastics with materials that are reusable and recyclable and/or invest in new plastic materials that are practically biodegradable or compostable
12	Digital waste management	Leveraging digital technologies like IoT and data analytics to improve efficiency and scale waste management resources
13	Eco-design standards	Policy measures setting plastic packaging material and design standards to improve recyclability and minimize overall environmental footprint
14	Eco-labelling standards	Standards or guidelines imposed on packaging product labeling in order to inform consumers on packaging content and/or proper disposal methods, with the goal to eventually drive more environmental-friendly consumer-behavior
15	Establish cross/ inter-industry standards	Voluntarily develop and agree on common standards, cross and/or inter industry, for plastics materials and packaging to improve recyclability
16	Government grants and funds	Special funds established by the national government for solid waste management, which are used to provide grants, subsidies or special interest loans to municipalities, private sector and NGOs to scale waste management initiatives
17	Grow conversion market – RDF	Low value plastics waste is converted into RDF, which can then be used by different industries as sources of energy (e.g., RDF co-processing in cement kilns)
18	Incentives for recycling industry	Financial instruments such as credits, deductions, tax exemptions, as well as shortened depreciation lifetime, are designed to stimulate growth of the plastic recycling industry
19	Informal sector inclusion	Set of rules, such as workforce mandates, service fees, work permissions and health insurance, allowing for official recognition and inclusion of independent waste collectors into the formal waste management chain

Sr. No.	Measure	Description
20	Invest in recycling capacity	Financial investment made by corporates to enable the development and scaling of the recycling industry, either in physical infrastructure or through R&D
21	Landfill taxes	Taxes charged by national governments to private or public landfill operators to help drive waste away from landfill towards preferable disposal alternatives, such as composting, recycling, and reuse
22	Municipal bonds	Debt instruments issued by the local or national government to finance capital expenditure for waste management (e.g., construction of recycling plants, MRFs, etc.) that are usually exempt from national and local taxes
23	Municipal collection and MRFs	Requirements to set up dedicated collection points or recovery facilities by municipalities at a sub-district or city level where waste can be separated for further recycling or treatment
24	Municipal unions	Collective structures established by neighbor municipalities in collaboration to handle waste management activities, including facilities set-up and operations (e.g., inter-municipality agreement on shared setup and operations of trash racks for riverside municipalities)
25	Packaging material fees	Producers pay fees depending on the amount of packaging material put on the market or their plastic recycling/recovery targets. Pooled fees are used to fund packaging waste management activities through a producer responsibility organization (PRO)
26	Pay-as-you-throw	A policy instrument, typically used at the local level, whereby households are charged a fee for waste collection. These could be a flat monthly fee, an amount based on the frequency of waste collection, or an amount calculated per the measure of the generated waste (e.g., weight, number of bins, etc.)
27	Philanthropic and CSR funding	Philanthropic financial support or diverting CSR funds to plastic-related NGOs and projects
28	Plastic credit system	Producers meet their obligations by purchasing recycling certificates issued by accredited re-processors or recyclers based on the amount of plastic waste recycled

Sr. No.	Measure	Description
29	Plastic to roads	Plastic to roads technology uses low value plastics waste to build roads entirely (full plastics) or partially (mix with asphalt)
30	Pre-competitive voluntary EPR	Inter or cross industry players join efforts to implement a voluntary and non-regulated extended producer responsibility (EPR) scheme
31	Preferential procurement	Mandates on public sector organizations for supporting or procuring repurposed plastic in their procurement contracts for products and services
32	R&D incentives	Financial incentives, like tax cuts or rebates on R&D expenses, designed to encourage innovation and development of resource-efficient materials and cutting-edge treatment technologies
33	Recycled content standards	Requiring a certain level of recycled material to be used in plastic applications. Potential incentives or penalties could be levied on the producers and importers of plastic products to meet their recycled content levels
34	Remove non-recyclable plastics from packaging	Efforts to reduce the use of plastic resins that are not economically recycled at scale (e.g., EPS) and/or interfere with the recycling of other materials (e.g., PVC) in packaging and to reduce other unnecessary packaging that is unlikely to be recycled and/or that does not bring additional value to the product or its protection.
35	Regulations on waste import	Policies governing waste shipment into the country with the aim of prohibiting the import of solid waste or post-consumer recyclables
36	Reintegrate recycled plastic	Voluntarily commit to increase the content of recycled plastics into the manufacturing of new plastic packaging
37	Sanitary landfills	Policy instrument to provide legal basis and funding for construction, operation and maintenance of sanitary landfills and the conversion of existing open and uncontrolled dump sites into sanitary landfills
38	Social support to informal sector	Initiatives that aim at improving livelihood, work conditions, safety and health of the informal sector and independent waste collectors

Sr. No.	Measure	Description
39	Source segregation	Rules to govern quality of garbage collection at the household or institutional level, which mandates or incentivizes waste stream separation at the source of generation
40	Sustainable offtake and conversion markets	Incentives in the form of subsidies, tax exemptions for intake of low-value, non-recyclable plastic to stimulate their sustainable end-of-life treatment markets
41	Take-back obligations	Mandatory obligations on producer brands to take back their products from end-users at the end of the product's useful life
42	Taxes and levies on problematic and unnecessary SUPs	Taxes and/or levies imposed on manufacturers, retailers or consumers for use of specific types of single-use plastic elements, including but not limited to, plastic bags, straws, cups and polystyrene food packaging
43	Virgin material taxes	Taxes imposed on either resin manufacturers, packaging manufacturers, brand-owners and importers on production or plastic packaging elements which are either difficult-to-recycle or contain undesirable content

Evaluation framework

The evaluation of measures in step two of the six-step process was done based on an assessment of its impact and ease of implementation as shown below. A semi quantitative scoring guide was developed for each value lever to facilitate scoring.

Priority	Criteria	Value Lever	Description
Impact	Economic	Collection potential	What is the volume of plastic waste that the measure is trying to address and will it lead to desired levels of improvements in plastic waste collection?
		Coverage	What is the type of plastic waste collected? Does the measure enable collection of diverse, including low value plastic waste?
	Environmental	GHG emissions	What is the impact of the measure on air pollution levels, particularly GHG emissions?
		Marine habitat impact	To what extent will the measure reduce leakage of harmful plastics in the ocean due to open or illegal dumping of waste?
	Social	Employment	Will the measure create sufficient job opportunities and improve employment conditions in the region?
		Health	Will the measure eliminate or address health and safety concerns in waste management?

Priority	Criteria	Value Lever	Description
Ease of implementation	Financial viability	Implementation cost	What is the total cost of implementation? Is the measure likely to be cost effective?
		Cost recovery	Does the measure provide sufficient financial returns, and does it ensure a sustainable source of financing waste collection?
	Executability	Complexity	How difficult is the measure to understand, implement and enforce?
		Regulatory and institutional support	To what extent is the measure scalable? To what extent is regulatory support required to monitor and control the measure?

The country assessments (i.e., heat maps in theme chapters 3-6) were developed by evaluating measures for their applicability in each of the five focus countries as well as the value levers given below.

Priority	Criteria	Value Lever	Description
Applicability	Coherence	Alignment with existing policies	Is it aligned with existing regulatory frameworks and ongoing discourse on ocean litter priorities?
	Relevance	Acceptability	Is it aligned with the regional economic and social agenda? Is the measure likely to be acceptable to the wider community?
		Fairness	To what extent is the measure perceived to be a fair instrument?
	Suitability	Enforceability	Is the measure enforceable by the government, given the local behavioral, cultural and business context?
		Trust and transparency	To what extent is the measure vulnerable to externalities like corruption and unavailable data?

Financing model assumptions

The financing insights in this report are developed using a static plastic waste value chain model. It analyzes the net value chain financing deficit based on changes in waste composition, volume of waste intake and the associated costs and revenues for handling waste at each stage of the value chain. The difference in revenues and costs combined across the value chain are seen as the net financing profit or deficit. In the waterfall chart, direct value chain benefits represent the net change in revenues and costs across various stages of the value chain, whereas the indirect revenue stream represents contributions in the form of taxes, levies, producer fees etc.

The value chain material and financial flow assumptions were developed based on secondary research from existing reports and interviews with experienced waste industry experts to test the validity of the logic and data inputs. These were validated and tested externally as part of the review process. For all the country-specific assumptions, Indonesia was taken as a benchmark. For modelling the impact of various cluster of measures, we studied the impact of these measures in countries where they have been implemented. We used those as the benchmark to construct the conservative and optimistic scenarios. The high-level numbers generated by the models should be used to better understand the potential value proposition that each measure offers, without explicitly determining the profitability of any one intervention. It should also be noted that the economic impact of measures will vary on a national and local level based on specific local context as well as the adoption of enablers and best practices. The financial insights for clusters should be used as a guideline to support the case for implementation in target countries and globally. However, measures will require a specific financial analysis, based on data from pilots at a local level, to determine viability.

The model estimates US $28-$40 per ton of a financing gap for the plastic waste value chain. Based on the total amount of plastic waste generated in the five focus countries (as shown below), we estimate a US $2-3 billion per year financing gap.

The financial modelling was designed to focus on the costs and revenues of plastic waste management, as opposed to the entire solid waste management system. This was based on three key considerations:

1. **Each material should cover its own cost:** the research determined that a model in which each material pays for its own net costs in the waste value chain was preferred
2. **Cross subsidization is a challenge in focus countries:** Within the existing system across focus countries, the cross-subsidization of revenues from high value materials to cover the costs of other materials is a challenge at the recovery facilities as a large part of the high value materials are removed by informal sector
3. **The focus on plastic:** While a number of the measures discussed in this report can relate to multiple materials, this report discusses them in the context of plastic waste management specifically

While this is the situation today, in the long term, integrated waste management that deals with mixed waste streams should be the target and plastic waste collection should not be treated in isolation, rather it should be part of a holistic solid waste management system. This system should ensure a single waste management system for all waste materials and, by integrating the informal sector, and can allow for cross-subsidization of low value materials with revenues from more valuable waste streams to reduce the overall cost of the system.

Estimates from other sources:

- APEC estimates a US $40 billion per year revenue gap globally for financing the municipal solid waste sector;[107] with global municipal solid waste generating 2 billion tons per year, the financing gap for solid waste management is estimated to be US $20/ton.[38]
- The World Bank estimates that municipalities in low income countries spend US $35/ton[38] or more with limited cost recovery. A high-level cost calculation is shown in the table below.

Table: Estimated solid waste management costs[38]

Process	Open dumping	Collection and disposal	Recycling	Composting
Costs ($/ton)	3 - 10	30 - 75	5 - 30	10 - 40

Countries	Open dumping	Collection and disposal	Recycling	Composting	Cost estimates ($/ton)
China	8.20%	60.20%	–	3%	18 - 47
Indonesia	10%	69%	7%	–	21 - 54
Thailand	53%	27%	19%	–	10 - 31

Estimates of total plastic waste generation in focus countries:

Table: Plastic waste generation in focus countries[6]

Country	Population (millions)	Waste generation rate (kg/ppd)	% Plastic waste	Plastic waste generated (million tons per year)
China	1392.7	1.1	11%	62
Indonesia	267.6	0.52	11%	6
Philippines	106.6	0.5	15%	3
Vietnam	95.5	0.79	13%	4
Thailand	69.4	1.2	12%	4

Detailed assumptions used for assessing the impact of measures (or clusters) on reducing the financing gap are outlined below:

Finance the collection

Cluster 1: Municipal collection points, MRFs and PAYT

This model assumes household waste collection fees of US $12/ton,[73] assuming 0.9$/household/month fees for urban areas and 0.84 kg/capita waste generation, to be applied to the amount of waste collected from the urban population. PAYT policies on average were found to decrease household waste generation by 32% and increase waste segregation levels by 55%.[57] PAYT benefits are applied only to the volume of waste to the amount of collected urban waste. The model assumes no increase in collection in the conservative scenario, and 100% collection in urban and rural areas in the optimistic scenario.

Cluster 2: Packaging material fees and informal sector inclusion

For the optimistic scenario, the model assumes a 60% recycling target for plastic, based on EU Circular Economy targets for 2030 and Plastics Europe's 2030 commitment,[108] [109] and 22.5%, for the conservative scenario, based on the EU's minimum plastic recycling 2016 target.[110] Based on these targets, the flow of material is adjusted such that the MRF procures the plastic both from an established formal collection sector (either municipalities or private waste management companies) and from secondary scrap dealers and independent waste collectors. In the optimistic scenario, the model calculates 60% collection from formal systems and 40% from organized, independent waste collectors. It is assumed that informal sector players collect 50% of the plastic through dumpsites and 50% through door-to-door collection of waste where formal municipal collection systems are not present. In the conservative scenario, the required volume of waste can be procured directly through the existing formal economy. Producers or brand owners are required to pay US $80/ton of EPR fees (average viability gap funding paid to PROs in India)[111] for the amount of plastic waste to be recycled. Of this, US $20/ton of fees is used for providing identity cards, protective equipment, hand

gloves, trainings and more to independent waste collectors based on the amount of plastic they collect.[111]

Remove problematic and unnecessary single-use plastics

Cluster 1: Bans on problematic and unnecessary SUPs and removing non-recyclable plastics from packaging

This model assumes that bans are applied on the production of all plastic bags, plastic cups and straws, which together comprise around 7% of plastic waste. The 4% calculation of plastic bags assumes 1 to 5 trillion plastic bags, with average weight of 5 grams, are consumed each year,[112] and generate about 300 million tons of waste per year;[112] the additional 3% is from plastic cups and straws.[113] Private sector participation in reducing the use of PVC and PS in packaging can further convert 10% of the packaging material by weight into more recyclable plastic waste.[86] In the past, such bans have resulted in 60-100% reduction in use of banned products.[114] In the conservative scenario, the model assumes a 60% adoption rate and a 100% adoption rate for the optimistic scenario.

Cluster 2: Taxes on problematic and unnecessary SUPs and the development of alternative materials

For modeling, consumer levies are applied to plastic bags at the point of purchase, which comprise about 4% of the overall plastic waste. Again, this assumes 1 to 5 trillion plastic bags, with an average weight of 5 grams, are consumed each year,[112] and a global plastic waste generation of about 300 million tons per year.[112] Such levies can only be applied at modern retail stores, which account for about 6% of plastic bag sales in the focus countries.[115] A levy of US $0.014/bag[101] is applied, and an entire tax revenue is assumed to be ring-fenced for plastic waste management. In the past, similar measures have reduced consumption of plastic bags by 40-60%.[114] Additionally, developing alternative materials will reduce the consumption of plastic cups, straws and plates which account for about 3% of plastic waste.[113] Thus, in the conservative scenario, the model assumes a 40% reduction in the use of plastic bags with limited to no reduction in other items like plastic cups, straws and plates.

The optimistic scenario assumes a 60% reduction in the use of plastic bags and completely eliminates the production of plastic cups, straws and plates.

Design for circularity

Cluster 1: Eco-design standards and cross/inter-industry standards

Multi-material packaging, use of uncommon materials like PVC, PS and EPS, and small format packaging account for around 33% of the plastic packaging market that can also be made recyclable.[86] Additionally, about 20% of the overall plastic packaging is suitable for reuse.[87] Based on adoption, it can be taken out of the plastic waste value chain altogether. Due to the lack of data on the direct impact of eco-design policies in any country, the model assumes 50% adoption rate in the conservative scenario and 100% adoption rate for the optimistic scenario. For the best-case scenario, all plastic waste is considered to be recyclable.

Cluster 2: Recycled content standards and virgin material taxes

The model assumes packaging accounts for 40% of the total plastic consumption, of which 75% is assumed to be flexible packaging and 25% as rigid packaging.[22] Food packaging is considered to be about 50% of the flexible packaging.[104] Apart from food packaging, recycled content standards are assumed to be applicable to all types of plastic. The model assumes 30% recycling standards in the conservative scenario and 50% in the optimistic scenario. Plastic consumption for Indonesia is assumed to be around 4.5 million tons/year 17kg/person/year)[22] and the recycled material demand is calculated based on recycled content standards. Virgin material taxes are assumed to play a role in disincentivizing non-compliance of meeting desired targets. The model assumes market prices for recycled pellets will increase by 25% due to an increase in demand.[116] [117]

Develop recycling and treatment markets

Cluster 1: Incentives for recycling, and invest in recycling capacity

For the conservative and optimistic scenarios, the model considers a 50% and 100% adoption rate, respectively. To stimulate the scale of recycling capacity, we assume a fiscal stimulus to reduce VAT on recyclable and recycled material by 5%,[118] thus improving the profitability of recycling. An ambitious 50% recycling target for high-value materials, and 25% recycling overall, is modeled. Collection from formal systems is assumed to remain at current levels and, therefore, any recyclable input required beyond the formally collected waste is met through procurement from organized independent waste collectors.

Cluster 2: Sustainable conversion and offtake markets, and preferential procurement

The model assumes the collected difficult-to-recycle plastic waste will be repurposed into usable furniture, sold at margins of 20-30%, supported by preferential local procurement policies[99] and, alternatively, used as fuel in cement kilns. The model assumes 200kg of coal requirement per ton of cement production,[119] 24% RDF conversion efficiency, and thermal substitution rate of 1% for plastic.[120] Conservative and optimistic scenarios are calculated by varying the amount of plastic used between plastic repurposing and use of difficult-to-recycle plastic as alternative fuel in cement kilns.

Stakeholders consulted

The research was supplemented by interviews with over 40 leading experts from around the world. Findings were also supplemented by three in-country workshops, attended by over 80 local practitioners, providing local insights to guide the outputs. Participation from the listed individuals, across both interviews and workshops, is greatly appreciated.

Interviewees

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Out of scope

As well as outlining what this report aims to achieve, it is important to describe what it does not. First and foremost, it is not a detailed roadmap of solutions to ocean plastics for any given country, locale or region. It is designed to support and augment the work of governments and other actors.

Equally important, it is not a business case of any single or combination of measures. Attempts have been made to quantify the impact that a given measure may have on reducing the funding gap. However, this should not be confused with determining the return on investment or any assessment of commercial viability.

Finally, this report does not claim to be a scientific assessment of the feasibility or viability of any of the solutions described here. Wherever possible, the research has concentrated on measures that are supported by peer-reviewed evidence and clear-use cases. However, no attempt has been made to judge the viability of plastic alternatives, plastic treatment or other technological measures. The research phase of this report engaged a broad range of stakeholders, representing the public, private and nonprofit sectors. This engagement included experts currently working in the countries in scope.

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