East Asia and Pacific Region: **MARINE PLASTICS SERIES**

Market Study for Vietnam:

PLASTICS CIRCULARITY OPPORTUNITIES AND BARRIERS

WORLD BANK GROUP
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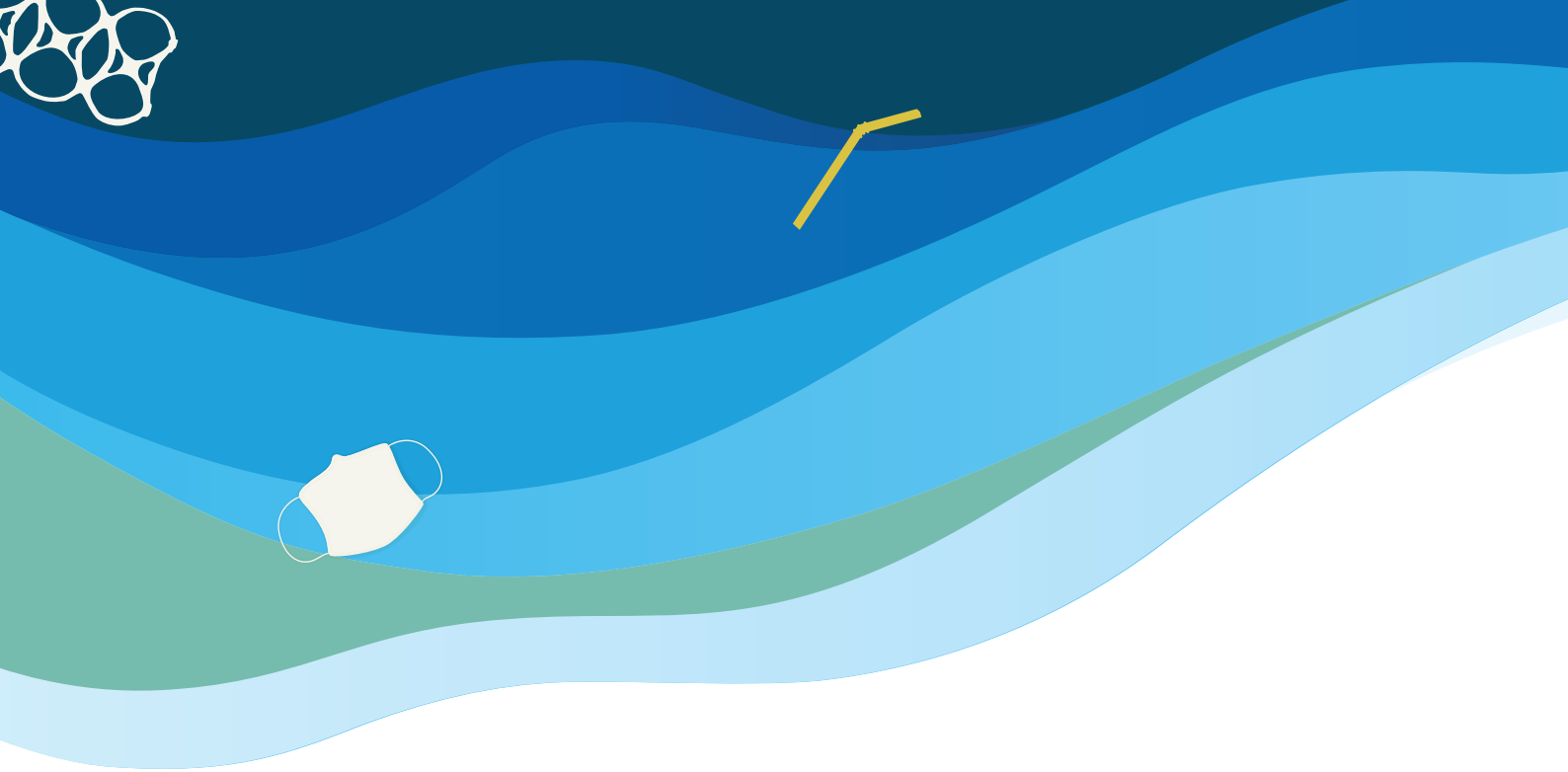

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CONTENTS

FIGURES

TABLES

BOXES

ACKNOWLEDGMENTS

Market Study for Vietnam: Plastics Circularity Opportunities and Barriers is a private sector-focused market assessment of plastics value chains and the recycling market in Vietnam with the overall goal of identifying opportunities and barriers for plastics circularity in the country.

The study was conducted by a GA Circular team comprised of Laura Allen, Ashwin Subramaniam, Tam Nguyen, Samantha Philips, and Thao Pham. The work was managed by a World Bank Group team comprised of Anh Tuong Vu, Navneet Chadha, Ashraf El-Arini, Thu Thi Le Nguyen, and Thuy Cam Duong, under the leadership and guidance of Carolyn Turk, Kyle F. Kelhofer, Mona Sur, and Tuyen D. Nguyen. Delphine Arri, Solvita Klapare, and Mira Nahouli provided peer review. The report was copy-edited by Zubair Qamar and designed by Ha Doan Thanh.

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Other Stakeholders:

CL2B, Expertise France, Global Green Growth Initiative, GreenHub, and World Wildlife Fund (WWF) Vietnam.

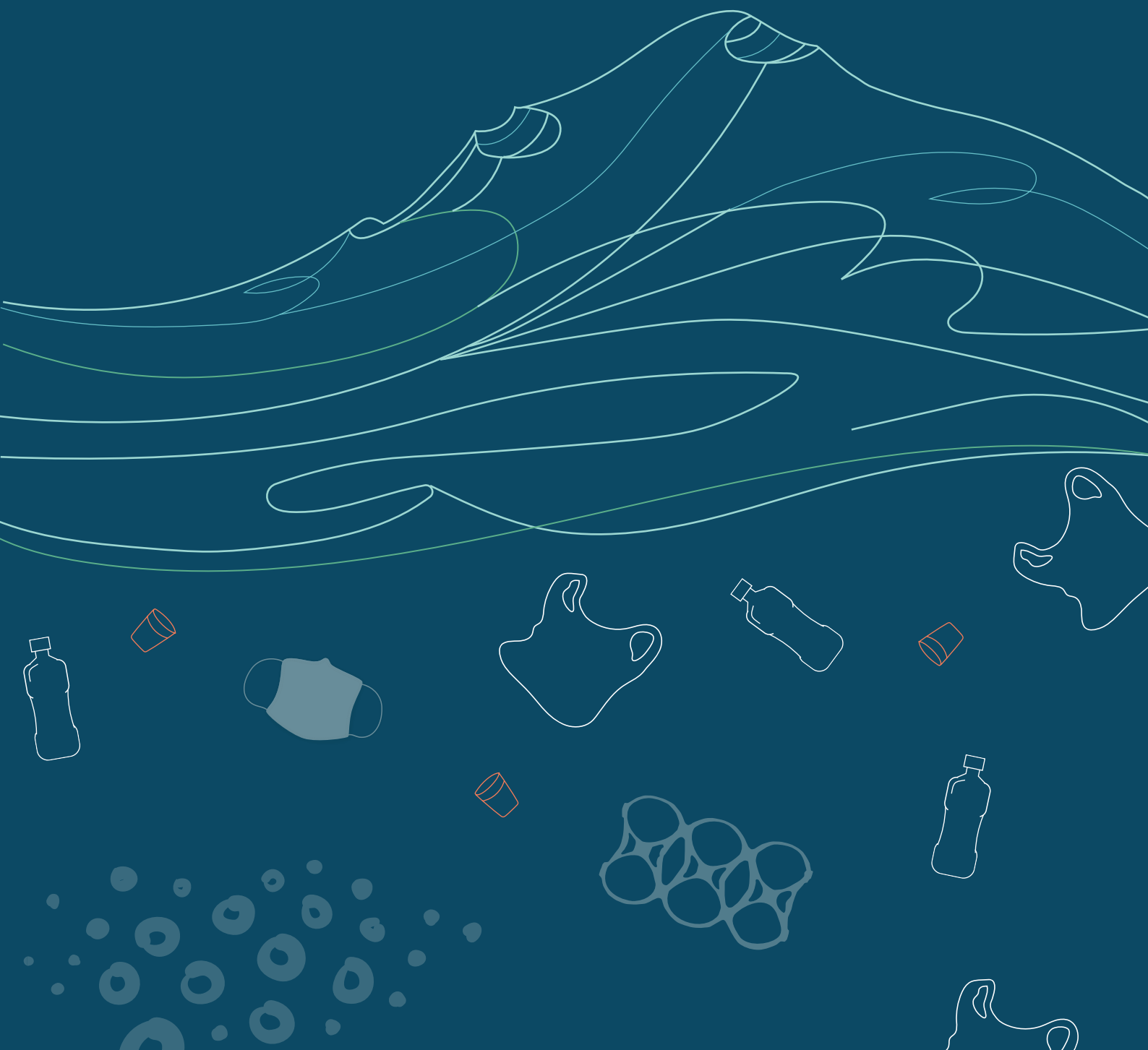
ABBREVIATIONS AND ACRONYMS

TERMINOLOGY	EXPLANATION
Four key resins	Refers to the four plastic resins PET, HDPE, LDPE/LLDPE and PP covered in this study.
Informal Recycling Industry	Refers to Pre-Processor and Recycler Stakeholders that are not part of the formal economy.
Informal sector	Typically refers to stakeholders in the informal collection value chain such as street material pickers, recyclables collectors, and informal junk shops.
Local	Unless specifically mentioned in the context of a local government unit, the term "local" refers to the national level as per industry usage of the term.

ACRONYM	EXPANSION
CAGR	Compound Annual Growth Rate
CAPEX	Capital Expenditure
CFR	Collected for Recycling
EHS	Environmental, Health and Safety
EPR	Extended Producer Responsibility
GPP	Green Public Procurement
HCMC	Ho Chi Minh City
HDPE; rHDPE	High Density Polyethylene; Recycled High Density Polyethylene
IFC	International Finance Corporation, part of the World Bank Group
ISWM	Integrated Solid Waste Management
LEP	Law on Environmental Protection
LLDPE; rLLDPE	Linear Low Density Polyethylene; Recycled Linear Low Density Polyethylene
LDPE; rLDPE	Low Density Polyethylene; Recycled Low Density Polyethylene
MDOPE	Machine-Direction Orientated PE
MFA	Materials Flow Analysis
MOIT	Ministry of Industry and Trade
MONRE	Ministry of Natural Resource and Environment
MSW	Municipal Solid Waste

MVRP	Most Valuable Recycled Product
NGO	Non-Governmental Organization
NDM	New Delivery Model
OPP	Oriented PP
PAYT / SAYR	Pay As You Throw / Save As You Recycle
PBAT	Poly Butylene Adipate Terephthalate
PBS	Poly Butylene Succinate
PCR	Post-Consumer Resin
PET; rPET	Polyethylene Terephthalate; Recycled Polyethylene Terephthalate
POY; rPOY	Partially Oriented Yarn; Recycled Partially Oriented Yarn
PRO	Producer Responsibility Organization
PRO Vietnam	Packaging Recycling Organization Vietnam
PPC Vietnam	Public Private Collaboration Vietnam
PP; rPP	Polypropylene; Recycled Polypropylene
PS	Polystyrene
PSF; rPSF	Polyester Staple Fiber; Recycled Polyester Staple Fiber
PVC	Polyvinyl Chloride
RDF	Refuse Derived Fuel
SME	Small and Medium Enterprise
SWM	Solid Waste Management
TPY	Tonnes Per Year
VASI	Vietnam Administration for Sea and Islands
VAT	Value-Added Tax
VMCPP	Vacuum-Metallized Cast PP
VPA	Vietnam Plastics Association
VPRA	Vietnam Plastic Recyclers Association

EXECUTIVE SUMMARY



EXECUTIVE SUMMARY

Plastics make a vital contribution to the global and Vietnamese economies. Since the 1950s, the use of plastic products has expanded twenty-fold owing to their low cost, various functional properties, durability, and wide range of applications. In 2018, global plastics production reached 359 million tonnes.[1] Plastics are commonly used in a wide range of industries in Vietnam, including packaging, consumer goods, electronics, automotive, aviation, textiles, and agriculture. In 2019, Vietnam's plastics industry produced 8.89 million tonnes of products, and the industry contributed an estimated US$17.5 billion to the national economy, representing 6.7 percent of GDP.[2]

Mismanaged plastic waste has growing economic, environmental, and social consequences

Mismanaged plastic waste from land-based sources, especially in the form of single or short-use packaging, generates significant economic and social costs worldwide, including in Vietnam, by reducing the productivity of vital natural systems and clogging urban infrastructure. Globally, 5 to 13 million tonnes of plastics leak into our oceans each year.[3] Asia contributes to over 80 percent of this estimated marine leakage, with eight of the top ten countries being from this region. Vietnam is estimated by a global study as the fourth highest contributor to marine plastic pollution.[4] Globally, the cost of after-use externalities for plastic packaging, plus the cost associated with greenhouse gas emissions from its production, is conservatively estimated at US$40 billion annually, exceeding the plastic packaging industry's profit pool.[5] US$80-120 billion worth of plastic packaging is lost from the global economy each year due to lack of recycling and sub-optimal value creation where recycling does exist. All this has led to increased global awareness about plastic waste management, and plastic pollution concerns have entered mainstream consumer consciousness in Vietnam.

Public and private sector stakeholders are increasingly active in addressing plastic waste

The Vietnam government has made several public commitments to reduce marine plastic litter through various measures. In 2019, the government launched the National Action Plan for Management of Marine Plastic Litter by 2030 (Resolution No. 1746/QD-TTg). In December 2020, the Prime Minister's office approved the National Plastic Action Partnership (NPAP), a multi-stakeholder platform to reduce plastic pollution, coordinated by the World Economic Forum. An update to the 2014 Law on Environmental Protection (LEP) was passed in the National Assembly in November 2020. The updated law calls for greater accountability for plastic waste from the government, producers, and consumers. Effective January 1, 2022, the updated LEP includes extended producer responsibility (EPR) provisions for

1 Euractiv, "Plastic production on the rise worldwide but slowing in Europe" (2019)
2 Vietnam+, "Plastics industry posts 7.2 percent increase in output in 2019" (2019)
3 Jenna Jambeck, "Plastic waste inputs from land into the ocean" (2015)
4 Jenna Jambeck, "Plastic waste inputs from land into the ocean" (2015)
5 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)

KEY FINDINGS

Vietnam recycled about **33 percent of the key plastic resins** in 2019.

As much as **2.62 million tonnes of plastics are disposed of per year**, that is, not recycled, resulting in the loss of 75 percent of the material value of plastics, which is equivalent to **US$2.2 billion to US$2.9 billion per year**.

Several structural challenges cause a market failure for plastics recycling leading to significant **material value loss every year**

plastic packaging and other wastes. The private sector has also been actively engaged in line with ongoing initiatives such as the Public Private Collaboration (PPC) Vietnam, Packaging Recycling Organization (PRO) Vietnam, and efforts led directly by individual companies. Furthermore, in 2020, Vietnam saw the first major green financing program launched by a local Vietnamese bank, VP Bank, with a credit line extended by the International Finance Corporation (IFC) for US$212.5 million.[6] This program includes eight Green Asset categories, including the category "eco-friendly and/or circular economy adapted products, production, technologies."

Although reuse, refill, and new delivery model aspects of a circular economy for plastics were evaluated, this study primarily focuses on plastics recycling, where most scalable private sector investment opportunities currently exist to address plastic pollution

This study's conclusions indicate that recycling, especially for high-value rigid plastics, is a primary lever for impactful and scalable private sector investment opportunities to divert large quantities of plastic waste away from open dumps, landfills, and the long coastline of Vietnam. Decentralized recycling solutions close to waste generation sources can help drive the transition towards a circular economy by managing waste as a valuable resource, developing a domestic market for secondary materials, and leveraging the informal sector in Vietnam. Refill/reuse and new delivery models were briefly evaluated, but global brands are currently not focusing on these other circular economy models in Vietnam due to challenges such as higher costs, logistics challenges, and local consumer preferences. This report presents policy options that will support the future adoption of reuse and refill models. In addition, the World Bank is conducting analytics that aims at providing a basis to identify the top 10 priority plastic items to be targeted by policies and investments in Vietnam. This is informing advice to the government on policies for addressing the targeted plastic items.

The Vietnam government encourages private sector participation to support its efforts to achieve its ambitious national plastic waste management goals

Much of the nation's recycling happens separately from the municipal solid waste (MSW) management system via upstream diversion, directly by the informal sector comprising pickers, collectors, junk shops, and aggregators, leading to a parallel economy for collection and sale of recyclables. This study defines the current state-of-play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity, and growth drivers and constraints, and recommends necessary actions to be taken by the government.

6 VietReader - VPBank signed a US$100 million loan agreement with IFC to boost funding for SMEs struggling due to COVID (2020)

The study follows a plastic value chain approach to identify key stakeholders in Vietnam who manufacture, use, and recycle plastics, and outlines the market drivers and challenges in scaling up recycling

A detailed mapping of plastic value chains for Polyethylene Terephthalate (PET), High Density Polyethylene (HDPE), Low Density Polyethylene (LDPE), and Polypropylene (PP) resins was conducted through data collection for resin production, imports/exports, usage, collection, recovery, and recycling. This analysis revealed price and demand pressures for most recycled resins, except for food-grade recycled resins, where demand has been growing primarily due to regulatory requirements in the EU and voluntary global brand commitments. The analysis also found substantial gaps in recycling capacities for most resins.

The study involved detailed baseline data collection, analytical work, and engagement with private sector stakeholders across the plastics value chain, government stakeholders, and other experts. These activities led to three key quantitative findings and eight recommended interventions to accelerate plastics recycling in Vietnam.

Key Findings: Collected for Recycling (CFR) Rates and Material Value Loss

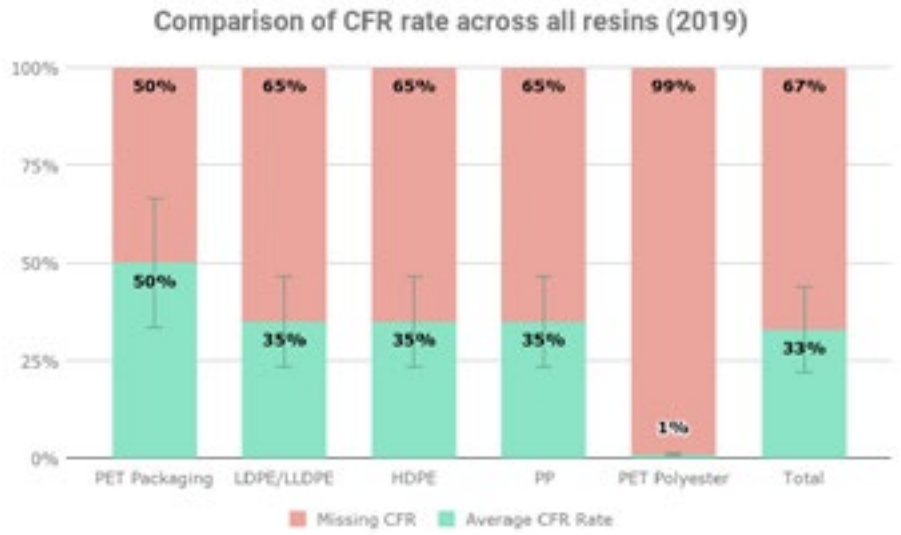
> **Vietnam recycled about 33 percent of the key plastic resins in 2019.**

As much as 3.90 million tonnes per year (TPY) of PET, LDPE, HDPE, and PP are consumed in Vietnam. Of this, 1.28 million TPY (33 percent) gets recycled (see Figure 1 below). PET packaging has the highest collected-for-recycling (CFR) rate of 50 percent amongst all key resins because: (i) the number of end-use applications used by PET packaging is limited as compared to other resins, which simplifies the collection process and facilitates the collection of specific data for PET packaging; (ii) the existing recycling technologies and relatively high capacities for processing PET packaging gives it a "head start" in comparison to the other resins; and (iii) PET packaging, considered itself as a category, has much lower consumption than the other resins. However, recycling rates for individual resins/packaging formats are highly variable, depending on the price of virgin plastic, the end-use for recycled resin, and other market factors.

> **As much as 2.62 million tonnes of plastics are disposed of per year, that is, not recycled, resulting in the loss of 75 percent of the material value of plastics, which is equivalent to US$2.2 billion to US$2.9 billion per year.**

If all the PET, HDPE, LDPE, and PP resins used in Vietnam were to be collected and recycled into the most valuable recycled products, the total material value that could theoretically be unlocked from recycling would equal US$3.4 billion per year. Currently, only 25 percent of the total material value of plastics, or US$872 million per year is unlocked, based on a 33 percent recycling rate and 77 percent value yield from plastic recycling. This results in the loss of US$2.2 billion to US$2.9 billion per year of potential material value from recycling (Figure 2). A significant portion of this market

Figure 1.
ESTIMATED CFR RATES FOR EACH RESIN (2019)



opportunity could potentially be captured through public and private sector investments to improve waste management infrastructure, an enabling environment to improve recycling economics, and other systemic interventions to address market failures.

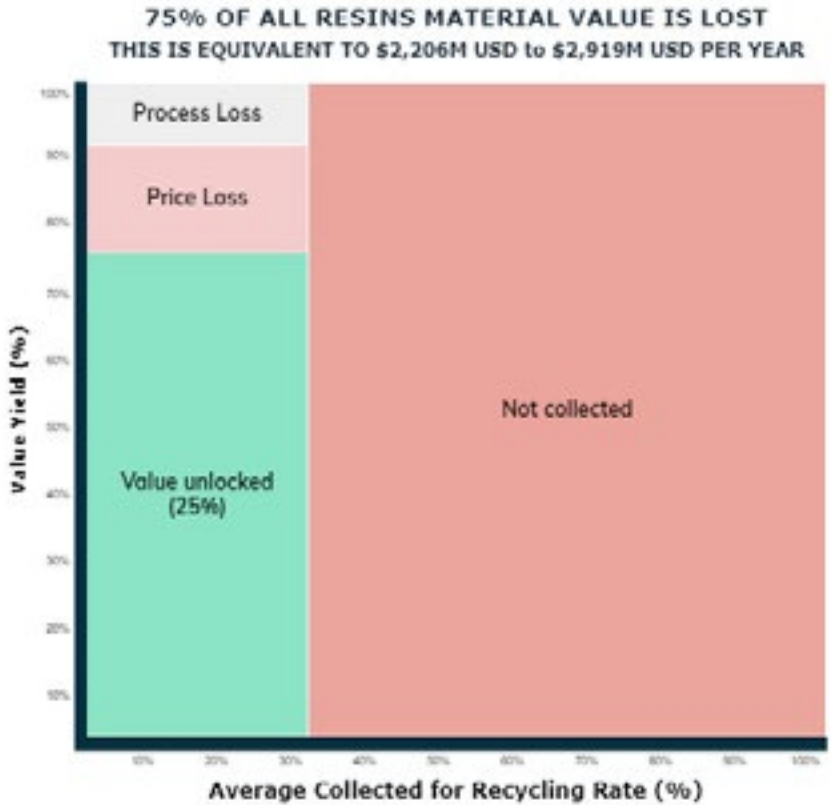
> **Several structural challenges cause a market failure for plastics recycling leading to significant material value loss every year**

A loss of US$2.2-2.9 billion per year is caused by various structural challenges that impact the CFR rates and value yields. Market failures include the strong coupling of virgin and recycled resin prices, lack of sustained local demand for recycled plastics, access to financing for recyclers, especially small and medium enterprises (SMEs), an inconsistent and at-risk supply from the informal sector, heavy reliance on plastic scrap imports, absence of design-for-recycling standards, and a waste management system that prioritizes collection and disposal over recycling. These challenges have surfaced and amplified during the ongoing COVID-19 pandemic, in the form of declined supply to the recycling industry due to changes in consumption patterns and a significant reduction in demand for recycled products due to low oil prices and economic slowdown.

Recommended Interventions and Priority Actions

This study recommends eight thematic interventions and 29 actions to enable Vietnam to unlock additional significant material value through plastic recycling. Each of the recommended interventions has the potential to unlock material value between US$0.8 billion and US$1.8 billion per year. However, these interventions could overlap so that the combined unlockable value would be lower than the sum of the single intervention values. The maximum theoretical unlockable value could be as high as US$2.2 billion to US$2.9 billion per year if certain market and structural failures can be addressed in a cost-effective and timely manner. The primary goal of this material value analysis is to raise public and private sector awareness regarding the lost value that could be captured annually by substantially increasing plastic waste collection rates and supporting/optimizing the domestic recycling industry. Costs for implementing various recommendations will depend on a variety of site-specific factors and have not been estimated in this market study. Similarly, a detailed cost-benefit analysis for each recommendation has not been done but can be carried out through follow-up feasibility studies

Figure 2.
MATERIAL VALUE LOSS ANALYSIS FOR ALL KEY RESINS (DATA BASED ON 2019 VOLUMES)



and policy analysis to enable the authorities to take the recommended public and private sector actions.

The recommended short- and long-term interventions can strengthen the enabling environment, enhance local demand for recycled plastics and help scale up the domestic recycling industry by creating private sector investment opportunities. The interventions are meant to complement solid waste management (SWM) infrastructure and operational improvements in Vietnam that are needed to make MSW management more effective while transiting from the current linear model of end-of-life waste collection and landfill disposal to a circular economy for plastics. Implementing the plastic circularity-focused recommendations can also help improve the capacities and reduce capital expenditures for future non-landfill SWM disposal options (e.g., refuse-derived fuel) by addressing only those wastes that cannot be recovered, recycled, or upcycled to capture value. The eight recommended thematic interventions are explained below.

Enable plastics circularity through timely development of underlying decrees and circulars for the LEP

The latest 2020 revision of the LEP is a general legal framework that addresses all industries, waste types, and various solutions. The articles that are most relevant to plastics circularity in the current LEP are: Articles 53, 54, 55 (Recycled Content and EPR), Article 146 (Green Public Procurement); Articles 149, 150 (Green Financing and Green Bonds), and Articles 75, 76, 77, 78, 79, 80 (Domestic Solid Waste Management). These articles are an improvement on the 2014 LEP. However, it is critical that the decrees and circulars developed for the new LEP are implementable and enforceable with realistic targets. There should be clear delegation to the relevant government agencies and provincial departments, a roadmap of how to achieve the targets successfully, provision of resources and guidance, and capacity building so that the agencies and departments can follow their mandate without ambiguity. Detailed consultations with experts and industry are also critical.

Critical considerations for inclusion in the LEP decrees and circulars include, but are not limited to the following:

- Policies to reduce plastic consumption (e.g., phase-out of unnecessary single-use plastic items) and to accelerate the adoption of reuse systems (e.g., refillable bottles, new delivery, and business models). For low-value single-use plastic items for which there are no suitable alternatives, effective policies could include bans and restrictions on placing the item on the market, fees paid by consumers, producers or importers, and taxes as these policy instruments have a more direct effect on consumer behavior and contribute to quick achievement of substantial results. Additional policy analysis and stakeholder engagement is needed to identify the appropriate policy instrument for each item and a roadmap for adoption.
- Mandatory collection-for-recycling targets should be calibrated based on how recyclable the resins and products are consistent with the local recycling infrastructure. Adding targets for reuse in addition to recycling targets is needed in the draft Decree on EPR as producers are also responsible for reuse in accordance with Article 53, clause 1, item c) of the LEP.
- Modulated fees for different plastic packaging types based on their recyclability with higher fees for lower-value and non-recyclable packaging.
- Mandatory recycled content targets since, there is already sufficient recycling capacity in Vietnam to achieve minimum 20 percent recycled content for PET packaging, PP, HDPE, and LDPE/LLDPE by 2030 based on this study. Related to this, the draft Decree on EPR should include obligations for producers to manufacture products that are easily dismantlable, more durable, repairable, contain less packaging, and other measures that contribute to prevention of waste generation.

Increase waste collection and sorting efficiency of plastics

The informal sector's collection practices are inefficient and relatively expensive compared to imported plastic scrap. In addition, the informal sector works under poor environmental, health, and safety (EHS) conditions posing additional waste supply chain risks for investors. This situation, coupled with insufficient formal MSW collection coverage, underlines the urgent need for an improved integrated solid waste management (SWM) system in Vietnam. This should include improved source segregation and separate collection, increased collection coverage, and properly designed waste disposal sites. To improve scale and economics of recycling projects (especially for low-value mixed plastics), formal collection and sorting efficiency must increase across the plastics value chain from consumer waste disposal to separate collection, transport, and sorting of mixed wastes.

At a minimum, segregation of wet organic and dry recyclable waste at the source is necessary to reduce contamination of waste plastic and improve its market value. Finally, there is a need for more transparent waste supply chains and the provision of opportunities for inclusion of the informal sectors.

Improve access to finance for recycling projects and support capacity building

Local banks should address the mismatch between the financing needs of SME plastic recyclers and existing green finance products by developing simplified financing protocols. The capacity of local banks in evaluating economic and social impacts needs to be built so that they can better assess the pipeline of bankable plastic recycling projects. The State Bank of Vietnam (SBV) and other stakeholders will also need to encourage local banks to create green finance products tailored specifically for managing risks associated with recycling and other plastics circularity projects. There is also an opportunity to increase green financing via smaller ticket size loans for SME recyclers and raising awareness about available options and procedures. Also, recyclers need to be technically supported to meet EHS certifications to qualify for financing options.

Encourage use of recycled content across all major end-use applications

With only an estimated 33 percent of the 3.9 million TPY of plastics resins consumed being recycled, Vietnam lacks a strong secondary market for recycled plastic. Its reliance on export markets for demand has exposed the recycling industry to full brunt of the global price volatility inherent in the recycling business. Use of recycled content needs to be encouraged, starting with incentives, followed by recycled content targets/standards for major plastic use industries. The government could play a leading role by implementing green public procurement (GPP) and labeling recycled plastic products. Recycled content targets should first focus on food-grade and non-food-grade PET since it is more easily recycled and then on non-food-grade since it is more easily recycled for HDPE, LDPE, and PP.

Mandate design-for-recycling standards for all plastics, especially packaging

Packaging constitutes an estimated 35 percent of the revenue generated from all plastics consumed in Vietnam.[7] Without fundamental redesign and innovation, about 30 percent of plastic packaging will never be reused or recycled.[8] This study identified recycling challenges for poorly designed products currently placed on the local market. Therefore, the Ministry of Industry and Trade (MOIT) is strongly encouraged to consult relevant public and private sector stakeholders to collaboratively develop design-for-recycling standards, align industries on voluntary adoption of these standards, and mandate these standards.

Create more data transparency in the plastics market

Relevant, up-to-date data regarding the size of the local recycling market for various resins, including imports/exports and price trends, is not available to private sector actors to facilitate their investment in the Vietnamese market. It would be helpful if the Customs Department formally creates publicly accessible databases of plastics imports/exports, improves the accuracy of data entry, and for MOIT to build a comprehensive list of domestic recyclers. Additionally, the Vietnam Plastics Association (VPA) should encourage greater private sector participation in data sharing to create virgin/recycled resin databases and market reports.

Increase mechanical and chemical recycling capacities and discourage disposal of plastics

The gap between total resins consumed and the estimated existing formal capacity to recycle these resins is equivalent to 2.67 million TPY or 68 percent of total resin consumption. The government should consider offering incentives to increase recycling capacities for polyolefins (PP, PE) and develop a high-quality rPET (recycled PET) resin for food contact applications. The objective is to jump-start innovation in a nascent market. Once the market is established and recycled materials can compete on cost grounds with virgin material, incentives could be decreased or be phased out altogether. Further analysis on effectiveness, efficiency, and impacts of potential incentives would be needed before specific recommendations could be made. Increased landfill tipping fees are needed to discourage the disposal of plastics.

Create industry-specific requirements to help increase plastic waste collection and recycling rates

7 VPA Domestic Plastic Consumption Data 2019

8 Ellen Macarthur Foundation New Plastics Economy: Catalyzing Action

Table 1.
SUMMARY OF THE 12 PRIORITY ACTIONS FOR UNLOCKING LOST MATERIAL VALUE

Priority Actions	Time Period	Lead Stakeholder
Ensure that the responsible agencies have the authority and resources to work with the relevant stakeholders develop necessary decrees and circulars and enforce the LEP	1-2 years	Government
Incentivize reduction of plastics (e.g., phase-outs of unnecessary plastic items) and reuse systems (e.g., refillable bottles, new delivery, and business models)		
Mandate and harmonize source segregation and separate collection standards and targets		
Refine the current green finance framework to provide specific incentives and support for the plastics recycling value chain		
Mandate national design-for-recycling standards for packaging plastics		
Incentivize increase in formal PE/PP recycling capacities; develop higher quality PET recycling		
Develop clear standards for the import of quality scrap plastics to produce pellets, semi-finished and/or finished goods; avoid an outright plastic scrap import ban	3-5 years	
Develop practical processes for financing plastics circularity businesses	1-2 years	Government and private sector
Develop and launch incentives for using recycled content		
Set recycled content targets/standards for major plastic end-use industries		
MOIT/Customs to formally (i) create a publicly accessible database of plastics import/export; (ii) improve the accuracy of data entry; and (iii) build a comprehensive list of recyclers		
Mandate collection targets for the packaging industry, based on industry consultations		

Note: Engineering includes both the automotive and medical industries.

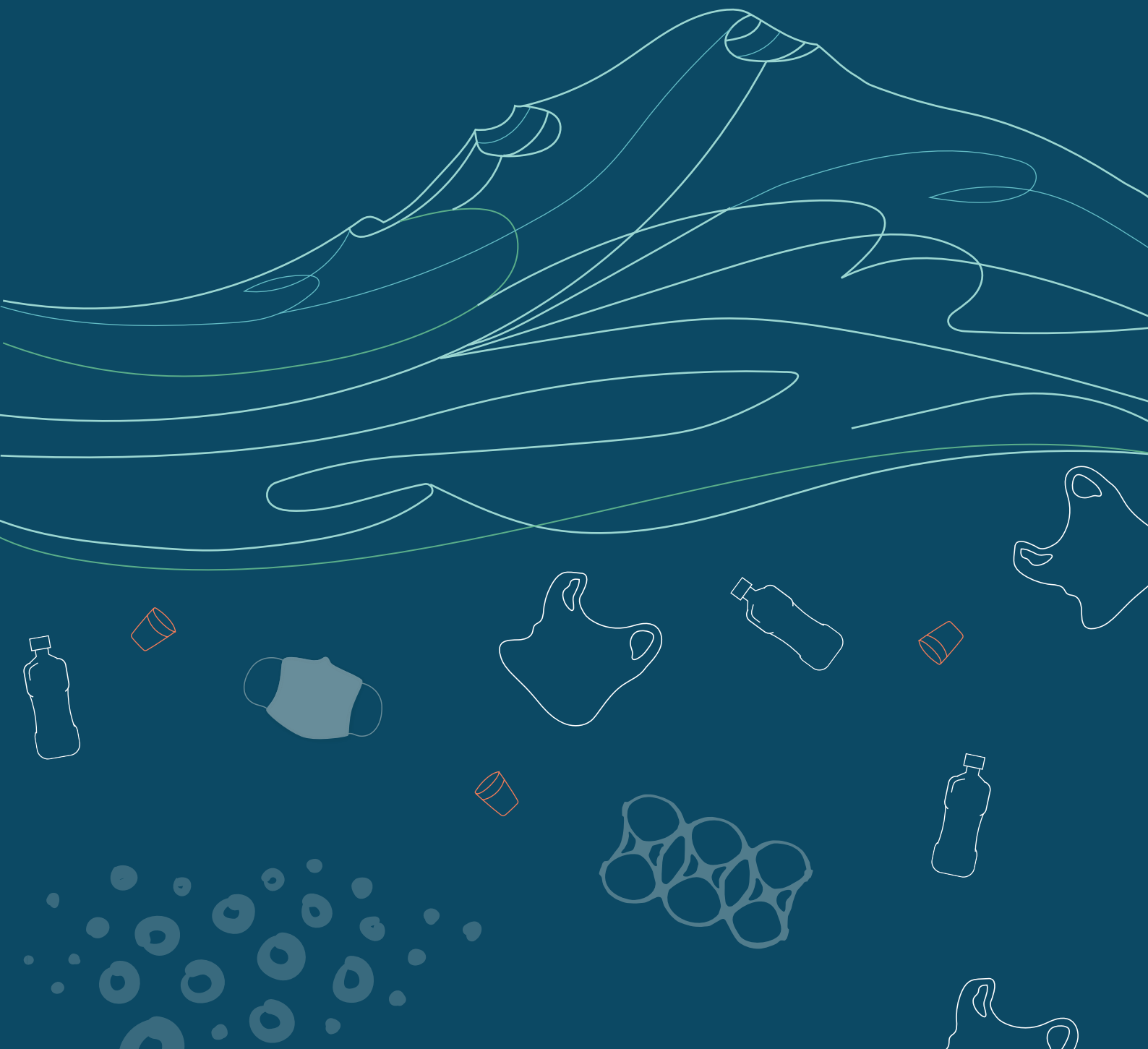
A lack of industry-specific collection/take-back requirements for the major plastic end-use industry of packaging results in the collection of plastics being wholly left to market forces with low collection rates. This is especially true for post-consumer products that are not easily collected and have low market value. Collection targets for the packaging industry need to be mandated after consultations with the industry. Design and implementation of extended producer responsibility economic models and delineation of mandatory collection targets should not be prescriptive but be based on consultations with the packaging industry and considering local conditions. This ensures the funds collected from the industry remain in their hands to make necessary interventions. Also, the targets must encourage eco-modulation within the economic model of the extended producer responsibility to accelerate progress.

Table 1 above lists 12 priority actions from a total of 29 recommended actions for supporting plastics recycling and unlocking lost material value. This selection is based on analysis by the study team and stakeholders' feedback regarding the practicality of implementation during the next five-year period.

Based on the phased implementation of all the recommendations outlined above, a holistic approach is needed to drive circularity and reduce plastic leakage into the marine environment. For example, focusing only on improving waste collection coverage and sorting efficiency of plastics will reduce plastic leakage but will not significantly improve plastics circularity. Similarly, focusing on increasing recycling capacities and demand for recycled plastic will drive the transition to plastics circularity. However, this will not address the fundamental plastic leakage problem because it would not address the underlying challenges of inadequate waste collection and a lack of recyclability of many plastic products.

SECTION 1:

NEED FOR PLASTICS CIRCULARITY



SECTION 1:

NEED FOR PLASTICS CIRCULARITY

1.1 CONTEXT

The Vietnam plastics industry produced 8.89 million tonnes of plastic products and contributed an estimated US$17.5 billion to the national economy in 2019.[9] As of 2019, the country's total virgin resin production capacity was 1.6 million tonnes (595,000 tonnes of PET, 550,000 of PP, 340,000 tonnes of PVC, 102,000 tonnes of PS, and 40,000 tonnes of other resins).[10] Vietnam does not yet have PE resin production capacity and has thus been entirely dependent on imports. For the four key resins for this study (PET, HDPE, LDPE, and PP), Vietnam is a net importer, with 3.3 million tonnes of these resins imported in 2019, equivalent to 75 percent of the total plastic conversion. Due to this dependence on imports, there are plans to increase local virgin resin production capacity by 2.6 million starting from 2021 onwards (1,050,000 for PP, 800,000 for PE, 400,000 for PET, and 350,000 for other resins). Appendix 1 contains a breakdown of the resin producers' capacities and planned expansions as of 2019.

The growth of the plastics industry worldwide, at twenty times growth during the 50 years from 1964 to 2014, has brought wide-ranging benefits to society.[11] However, rapid urbanization and mismanaged plastic waste and litter from land-based sources are causing significant economic loss due to a reduction in the productivity of vital natural systems such as the ocean and coastal areas and through clogging urban infrastructure. Globally, the cost of such after-use externalities for plastic packaging, plus the cost associated with greenhouse gas emissions from its production, is conservatively estimated at US$40 billion annually — exceeding the plastic packaging industry's profit pool.[12]

Specifically for plastic packaging, 95 percent of material value, or US$80 billion to US$120 billion annually, is lost to the global economy after just single use.[13] About 40 to 50 percent of marine plastic pollution is contributed by single-use or short-use consumer packaging. Approximately 5 to 13 million tonnes of plastic waste enter the oceans every year, and there could be about 250 million tonnes of plastics in the world's oceans in less than 10 years.[14] Several countries in East Asia and the Pacific Region are top generators of mismanaged plastic waste with disproportionate impacts on livelihoods of vulnerable coastal communities and tourism, fishing, and shipping industries. Vietnam is estimated to be among the top four countries globally contributing to marine plastic pollution.[15]

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9 Vietnam Plus, "Plastic Industry Posts 7.2 percent increase in output in 2019" (2020)
10 Based on interviews conducted with VPA.
11 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)
12 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)
13 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)
14 Jenna Jambeck, "Plastic waste inputs from land into the ocean"
15 Jenna Jambeck, "Plastic waste inputs from land into the ocean"

This mismanagement of plastic waste is closely correlated with municipal solid waste (MSW) growth in Vietnam. The World Bank estimated the MSW generation in Vietnam in 2018 to be 27 million tonnes.[16] By 2030, the World Bank forecasts MSW generation nationally to reach 54 million tonnes, a 73 percent growth as compared to 2018 levels.[17] In a separate study, plastic waste generation, estimated at 3.7 million tonnes in 2018, is expected to increase to 7.5 million tonnes by 2030.[18] This means a 106 percent growth over the same time period, i.e., 2018 to 2030. Plastic waste generation is thus expected to outpace MSW generation in Vietnam.

As countries recognize the urgency to address the problems associated with the growth of the plastics industry and mismanagement of plastic waste, they have begun to transition towards a circular economy. A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems. This is different from the current economic system of a linear economy where material and fuel resources are used to make products, which are then consumed and thrown away (i.e., take-make-waste). The definition of circular economy used for this study is the one developed by the Ellen MacArthur Foundation and widely adopted by governments and major private sector organizations in the global plastics value chain.[19]

"A circular economy is an industrial system that is restorative or regenerative by intention and design. It replaces the 'end-of-life' concept with restoration, shifts towards the use of renewable energy, eliminates the use of toxic chemicals, which impair reuse, and aims for the elimination of waste through the superior design of materials, products, systems, and, within this, business models."

An elaborated definition of the circular economy and that of other relevant terms can be found in Appendix 2.

The Vietnam government started to work towards a circular economy and address plastic waste over the past few years with firm political commitments. The commitments include but are not limited to the following initiatives:

- The goal of the Resolution No. 36-NQ/TW, issued in 2018, is "preventing, controlling, and significantly reducing pollution of the marine environment, and becoming a regional leader in minimizing ocean plastic waste." Last year's (2020) theme of Vietnam's Seas and Islands Week was "renovating for the sustainable development of Vietnam's maritime economy". Its purpose was to implement plans at different administrative levels (ministries, departments, and localities) to finalize the government's Resolution No. 26 / NQ-CP (issued in 2020[20]) for implementing the Resolution No. 36-NQ/TW.[21]
- Resolution No. 1746/QD-TTg, issued in 2019, promulgates the National Action Plan for Management of Marine Plastic Litter by 2030.[22] The National Action Plan contains tasks and solutions needed to reduce marine plastic litter by 75 percent by 2030. These tasks include planning and implementing programs to highlight the impacts of single-use plastics on the oceans, promoting marine plastic litter collection programs that process and classify the waste collected, and encouraging recycling amongst organizations and individuals.[23]
- To achieve its goal to reduce marine plastic litter by 75 percent, Vietnam has partnered with the World Economic Forum to launch the National Plastic Action Partnership (NPAP), which is an action platform to tackle plastic waste. A national action roadmap that consists of tangible action plans to reduce marine plastic litter and specifies the responsible actors, is expected to be published by the Vietnam NPAP later this year (2021).

16 World Bank, "Solid and Industrial Hazardous Waste Management Assessment" (2018)

17 Ibid.

18 GA Circular report commissioned by the World Economic Forum, "Radically Reducing Plastic Leakage in Vietnam: Action Roadmap" (Manuscript submitted for publication).

19 Ellen MacArthur Foundation Global Commitment

20 LuatVietnam, "Resolution No.26/NQ-CP dated March 05, 2020 of the Government promulgating the Government's overall plan and five-year plan to implement Resolution No. 36-NQ/TW of October 22,2018, of the eight plenum of the Party Central Committee, the XIIth Congress, on the Strategy on sustainable development of Vietnam's marine economy through 2030, with a vision toward 2045" (2020)

21 Thai Binh Province Portal, "Sustainable development of Vietnam's maritime economy" (2020)

22 Royal Norwegian Embassy, UNDP and VASI, "National Action Plan for Management of Marine Plastic Litter by 2030" (2020).

23 Ibid.

- Although there are no concrete plans yet to eliminate single-use plastic products, the Vietnam government has announced its resolve to make the country single-use plastic-free by 2025.[24]
- Directive No. 27/CT-TTg, issued in 2018, pertains to the urgent measures needed to strengthen the management of imported scrap.[25]
- In 2019, the Vietnam government added the establishment of a circular economy as a national objective to the existing Directive No.13 on Sustainable Development.[26]

The government revised the Law of Environmental Protection (LEP) in 2020. The LEP revision supports establishing a circular economy in the country as one of the objectives. Circularity strategies will be enacted that could improve solid waste management by clarifying what consumers and producers would be accountable for, such as implementing an Extended Producer Responsibility scheme.[27] The law will lead to enhanced transparency across several areas, including mandatory environmental impact reporting by selected companies and the development of quality and recycling standards for many material types, including plastics.

The government is approaching the country's well-equipped private sector to play a key role in contributing towards the transition to a circular economy for plastics. The sector could participate through innovations in product design, business models (e.g., reuse/refill), enhanced recycling technologies, and innovative financing mechanisms. Many leading global brands and multinational retailers using plastics have already made voluntary public commitments to transition to fully reusable, recyclable, or compostable packaging by 2025. Plastic resin producers like Indorama Ventures[28], the leading global PET resin producer, and LyondellBasell[29], one of the world's largest PP resin producers, are increasingly investing in plastic recycling. Resin producers in the region, such as PTTGC in Thailand[30] and PETRONAS in Malaysia[31], are also considering investing in plastic recycling due to the growing demand for recycled resins. However, so far, resin producers in Vietnam have not publicly shared any plans to invest in plastic recycling facilities, although one plastic convertor (Duy Tan) has developed a rPET bottle-to-bottle food-grade recycling facility (to be commissioned) to develop 100,000 tons of plastic recycling capacity by 2025.[32]

The infrastructure of SWM, its operational costs, and positive impacts from the diversion of waste plastics from landfills and open dumps to recycling would be very much connected to an optimal municipal SWM system, as is the case in developed economies like the European Union and Japan. In Vietnam, however, much of the recycling is done separately from the SWM system via upstream diversion. It is done directly by the informal sector comprising pickers, collectors, junk shops, and aggregators creating a parallel economy for recyclables collection. Many valuable plastics like PET bottles that remain in the SWM stream are picked out casually at various points of SWM flow, such as from pushcarts and at transfer stations and dumpsites. This study describes the current state of play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity, and growth drivers and constraints. The study also identifies barriers and opportunities for other circularity models such as reuse and new delivery models.

24 Tuoi Tre News, "Vietnam aiming for nationwide eradication of single-use plastics by 2025: PM" (2019)

25 Presentation by Nguyen Thanh Yen, Deputy Director of Waste Management Department in the Vietnam Environment Administration. (2019)

26 Vietnam Business Council for Sustainable Development and United States Business Council for Sustainable Development, "Vietnam Materials Marketplace" (2019)

27 IUCN, "Extended Producer Responsibility: an approach to improving solid waste management in Viet Nam" (2020)

28 Indorama - Recycling business

29 LyondellBasell - Press release

30 PTTGC Thailand - Press release

31 Plastic Energy & PETRONAS - Press Release

32 Based on interviews with Duy Tan.

This study focuses on understanding the material value plastic recycling currently generates, the additional untapped material value that it could generate and the conditions needed to encourage the use of recycled plastics in the domestic market.

Photo: Al.geba - Shutterstock

1.2 STUDY OBJECTIVES

The primary objectives of this study are to:

- Engage the private sector players in the Vietnam plastics value chain and comprehend the market drivers and challenges in scaling up circular economy approaches, specifically focused on recycling
- Define the current state-of-play for the local waste plastics recycling industry, including demand and supply volumes, market opportunity, growth drivers, and constraints
- Review local regulations and benchmarks with applicable best practices to identify opportunities as well as gaps that could be limiting broader adoption of plastics circularity
- Based on the private-sector focused plastics value chain and recycling market analysis, summarize key findings, and recommend priority actions.

1.3 FRAMING THE OBJECTIVES

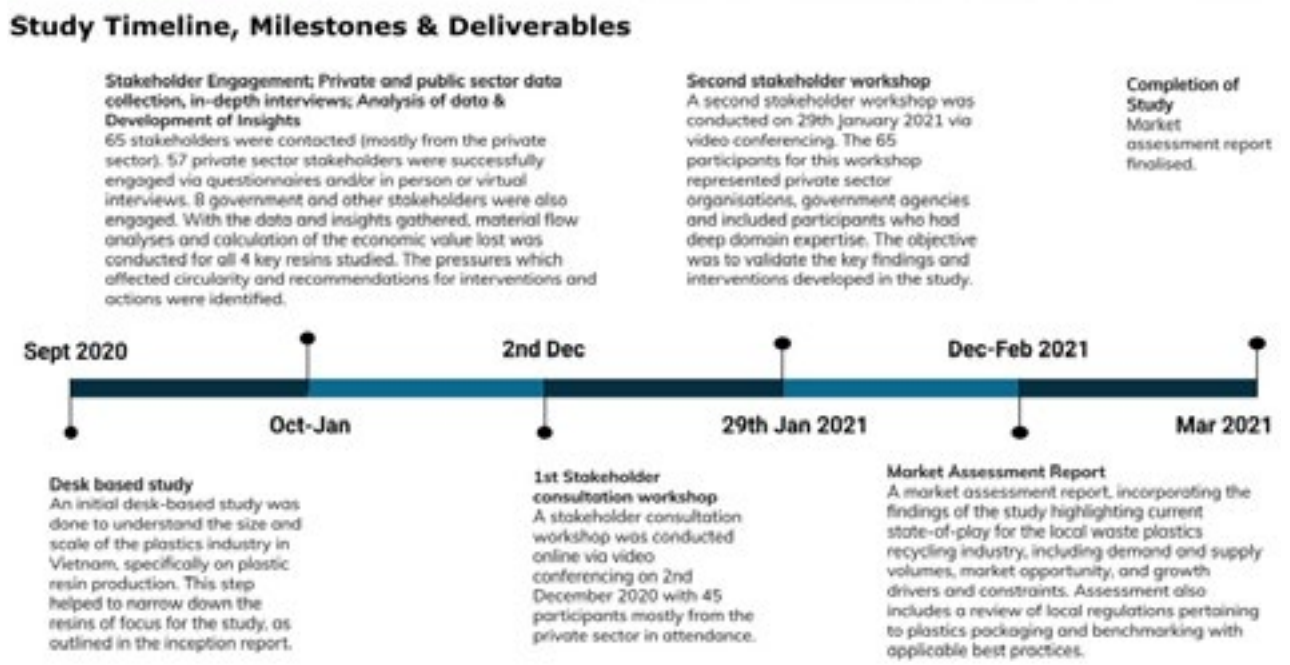
The following problem statements have been created in line with the project objectives and are addressed in specific sections:

1. What is plastics circularity in the context of Vietnam? (addressed in Sections 1.5 and 1.6)
2. What is the existing plastics value chain across production, collection, recycling, wastage, imports, and exports in Vietnam? (addressed in Section 2).
3. What factors and barriers affect plastics reuse, recovery, or recycling across the value chains for different resins and the size of the addressable opportunity? (addressed in Sections 2 and 3)
4. What are the existing policies and regulatory environments impacting plastics circularity in Vietnam? (addressed in Section 3)
5. What policy and private sector interventions are needed to enable plastics recycling in Vietnam and how much material value can be unlocked through these interventions? (addressed in Section 4)

1.4 STUDY METHODOLOGY

This study was conducted from September 2020 to March 2021 in a time-phased manner with milestones and deliverables specified as shown in Figure 3 below:

Figure 3.
TIMELINE OF THE STUDY



Note: Timeline not to scale.

Initially, a desk-based study was conducted to comprehend the size and scale of the plastics industry in Vietnam, specifically regarding plastic resin production and imports/exports of virgin resins. The documents reviewed included publicly available reports and presentations prepared by the Vietnam Plastics Association (VPA), annual reports/ sustainability reports of major petrochemical and resin manufacturing companies and plastic converters in the country. The reviews helped in narrowing down the choice of focal resins for the study, as outlined in the inception report, and the development of value chain for each selected resin.

As many as 65 in-depth interviews of representatives of various key private and public sector organizations were conducted from October 2020 to January 2021. Key data points along the value chain, including resin production, collected-for-recycling (CFR) rates, and recycled products, were gathered from these interviews. Additionally, viewpoints were collected on plastics circularity and the interventions needed to increase the circularity. The information generated enabled the study team to prepare the first version of the material flow analysis (MFA) and develop insights for each resin type that was later used to enrich different aspects of the study.

The first stakeholder consultation workshop was organized on December 2, 2020, in partnership with VPA, to introduce the project to key public and private stakeholders. Presentations were made on the models being used (the material flow and material value loss analysis), the draft material flow analysis for each of the selected resins and the key stakeholders selected for the study.

An updated version of MFA was prepared for each resin type selected for the study based on data and suggestions received through in-depth interviews and the first consultation workshop. The data sources used in the study included personal interviews, government databases, the public domain, Vietnam Plastics Association (VPA), Vietnam Customs, UN Comtrade, recyclers, convertors, brands, and Vietnam Plastic Recyclers Association (VPRA). The data was used as a reference and for cross-checking against verified

capacities of formal recyclers, estimating recycling capacities of other formal and informal recyclers and craft villages, and a comparison with the CFR rates determined for Vietnam under previous GA Circular studies. The MFA for each resin and resin price data were used to analyze the economic impact of recycling in terms of value unlocked and the potential maximum value that could be unlocked. A detailed explanation of the tools for the material flow analysis and the material value loss analysis is provided in Section 2.1.

The MFA and material value analyses were finalized and presented during the second stakeholders' virtual consultation workshop organized on January 29, 2021. The objective of this workshop was to discuss and validate the key findings and interventions recommended in the study to refine the findings and recommendations further. Various participants represented private sector and public sector organizations, who provided valuable inputs.

In summary, the study was conducted using the following sources and tools:

- Publicly available reports and presentations by relevant private sector organizations and government departments and agencies
- In-depth interviews of 58 private sector stakeholders (see Appendix 3A for a list of stakeholders)
- In-depth interviews of seven public sector stakeholders, such as government and NGO stakeholders (see Appendix 3B for a list of stakeholders)
- Two rounds of in-depth stakeholder consultation workshops with more than 80 participants from private, public, and non-governmental agencies (see Appendix 3C for the list of participants)
- Material flow analyses and material value analyses of the major plastic resin types custom-developed for this study and benchmarked against global examples of similar analyses
- Quantitative and qualitative data from various private sector stakeholders, government departments/agencies, and global plastic resin market pricing providers

1.5 SCOPE OF THE STUDY

This study is a private sector-focused market assessment of plastics value chains and the recycling market in Vietnam with the overall goal of identifying the opportunities and barriers for plastics recycling and plastics circularity in the country. The focus is on the recycling aspect of the circular economy for plastics as a lever to divert plastic wastes away from landfills and the open environment and to increase the re-introduction of plastics into the economy. Reduction at source and refill/reuse aspects of the circular economy for plastics have been investigated. However, as the primary focus of the study was on identifying scalable private sector investment opportunities in Vietnam, which are primarily in plastic recycling, greater focus has been placed on plastic recycling.

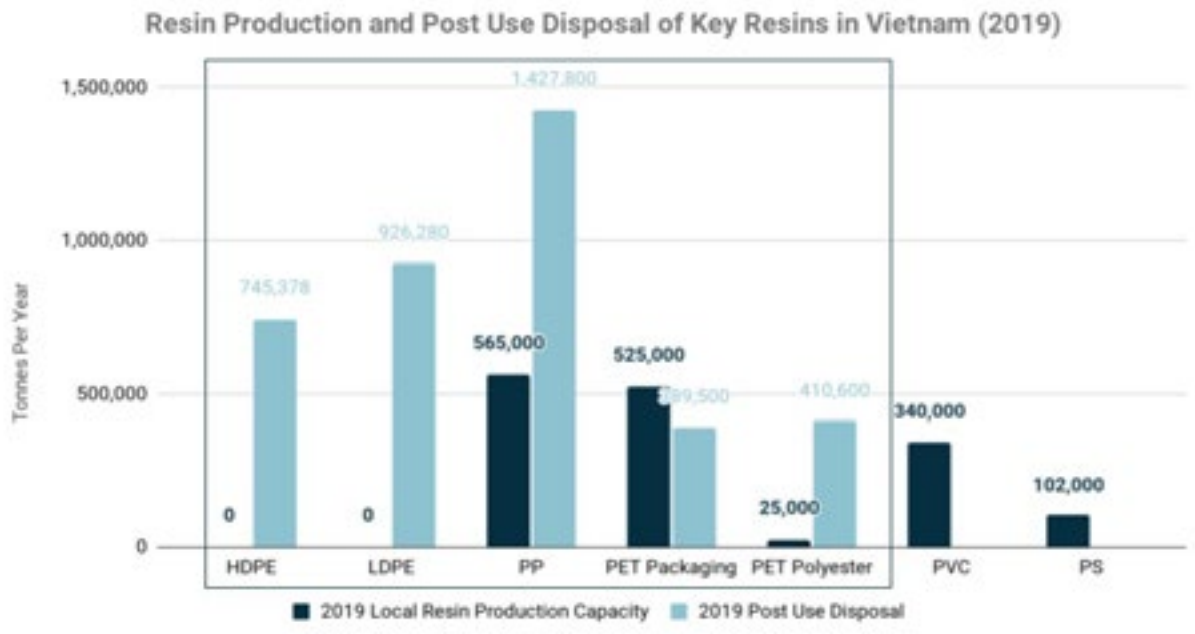
The interventions and actions recommended in the study to increase plastics recycling and plastics circularity in Vietnam will help implement the National Action Plan for Management of Marine Plastic Litter by 2030. They can also help implement articles and develop underlying policy instruments (e.g., decrees and circulars) under the Law on Environmental Protection (LEP) by providing a robust baseline for each resin and actionable recommendations for the private sector and the government to implement.

Resin Selection

The four resins chosen for this study are HDPE, LDPE, PP, and PET (split into PET Packaging and PET Polyester). This is based on 2019 data provided by the plastics industry. As shown in Figure 4 below, PP, LDPE/LLDPE, HDPE, PET Packaging, and PET Polyester are the most widely and commonly consumed resins in Vietnam.

PVC and PS are not included in this study for several reasons. PVC is widely used in the building and construction industry to make siding and window frames, flooring, roofing, insulation for electrical cables, and water and sewage pipes. PVC for construction applications has an awfully long application lifetime (between 10-20 years) as compared to single- or short-use products made from HDPE, LDPE, PP, and PET. Also, as usage of PVC plastic is primarily confined to the building and construction industry, it is expected that PVC is treated as construction and demolition (C&D) waste and, therefore, likely to be better managed, unlike HDPE, LDPE, PP, and PET, which are widely disposed of as part of municipal solid waste. Thus, PVC is not a significant contributor

Figure 4.
BREAKDOWN OF RESIN PRODUCTION AND POST-USE DISPOSAL (TONNES PER YEAR, 2019)



Source: VPA and GA Circular Modelling.

Notes: Post use disposal amounts consider the imports and exports of resins and semi-finished products, in addition to lifespans. As of 2019, there was no local resin production of HDPE and LDPE.

to marine debris. While PS products with single-use applications such as Styrofoam food boxes and single-use plastic cups are contributors to marine debris, PS applications may be regulated in Vietnam as part of the potential single-use plastics ban, announced in 2019, for implementation by 2025[33] and there is wide global recognition of the need to phase out the use of PS due to its poor recycling outcomes and contamination of the polyolefin recycling system, as it cannot be removed during the float-sink separation process.[34] Furthermore, PS products are not as widely used in Vietnam, with consumption levels below that of PET, HDPE, LDPE, and PP.

33 The Prime Minister, Nguyen Xuan Phuc, announced in 2019 Vietnam's target to be free of single use plastics by 2025. Source: Tuoi Tre News, "Vietnam aiming for nationwide eradication of single-use plastics by 2025: PM" (2019). In August 2020, Directive No 33/CT-TTg by the Prime Minister, which is on strengthening management, reuse, recycling, treatment and reduction of plastic waste, assigns MONRE to "Research and propose a production and consumption restriction mechanism and a roadmap to ban the production and consumption of a number of disposable plastic products".

34 Ellen MacArthur Foundation - The New Plastics Economy: Catalyzing Action (2017)

Table 2.
BREAKDOWN OF VIETNAM'S PLASTICS END USE INDUSTRIES BASED ON REVENUE

VPA Domestic Plastic Consumption (%)		
Industry	**2018**	**2019**
Packaging	38%	35%
Construction	23%	24%
Household appliances	30%	22%
Engineering (technical)	9%	19%

Note: Engineering includes both the automotive and medical industries.

Industry Applications

A breakdown of the end-use industries is beneficial to determine consumption behavior and factors that would affect the amount of plastic available for collection for recycling. For example, plastics used in the construction industry would typically be collected as industrial waste and do not flow through the municipal solid waste system. Additionally, regulations pertaining to waste management differ between the industries and products. Hence, this study considers relevant policy perspectives for the key industries where plastics consumption is concentrated.

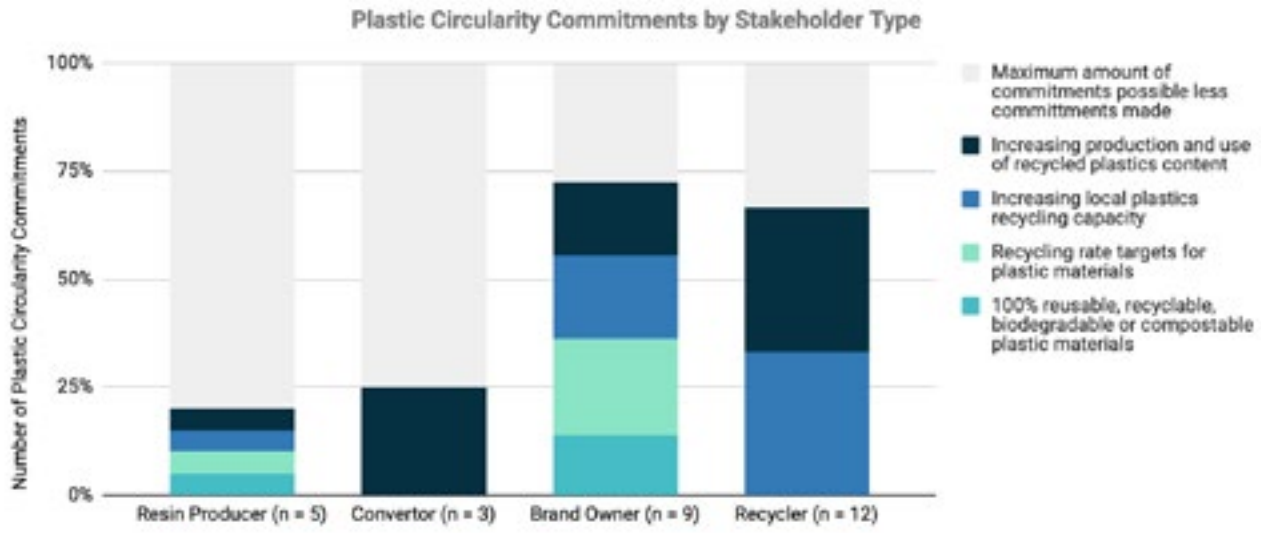
As noted in Table 2 above, the Vietnam Plastics Association estimates the 2019 breakdown per 'industry', based on revenue, to be 35 percent packaging, 24 percent construction, 22 percent, household appliances, and 19 percent engineering (including both automotive and medical industries).

The breakdown provided by VPA does not follow a traditional industry breakdown, i.e., electricals and electronics have not been considered as their own industry and instead are understood to be within the household appliances 'industry.'

Based on this data, packaging, construction, electronics, and automotive have been chosen for the policy assessment section of the study. Additionally, based on data analysis of PET polyester and discussions with VPA, the filament industry has been selected for the policy analysis. Resins consumed across all end-use industries in Vietnam have been assessed in the material flow and economic analyses sections of the study,


Photo: www.unplash.com

Figure 5.
PLASTICS CIRCULARITY COMMITMENTS BY STAKEHOLDER TYPE



Note: Stakeholders have been ordered from left to right following the plastics value chain.

1.6 CIRCULARITY COMMITMENTS OF STAKEHOLDERS IN THE PLASTICS VALUE CHAIN

Plastics value chain stakeholders in Vietnam have responded to the increasing public and civil society awareness of the environmental impacts of mismanaged plastics in various ways. For example, global brand owners and packaging producers have set up a voluntary industry-led Producer Responsibility Organization called Packaging Recycling Organization (PRO) Vietnam to increase waste collection rates and engage with the government on EPR development. The study team has reviewed the various public circularity commitments made by key stakeholders in Vietnam's plastics value chain, which can be classified into the following four categories:

- Increasing use of recycled plastics content
- Increasing local plastics recycling capacity
- Moving towards 100 percent reusable, recyclable, biodegradable, or compostable plastics materials
- Recycling rate (i.e., collection for recycling rate) targets for plastics materials

While this review does not analyze the scale or efficacy of the commitments, it is still useful in showing the direction the industry is heading in and different types of stakeholder commitments.

As seen in Figure 5 above, brand owners have the highest proportion of commitments made, as they are the most consumer-facing stakeholders, which means they have the most significant incentive to make commitments to win over consumers. Recyclers have the second highest proportion of commitments as recycling is their primary business. It is, however, important to note that commitment no. 3 (Moving towards 100 percent reusable, recyclable, biodegradable, or compostable plastic materials) and commitment no. 4 (Recycling rate targets for plastic materials) are not applicable to their industry and are not included in the calculation of the percentage of circularity commitments.

This review shows that brand owners and recyclers are the most primed to affect change, followed by converters and resin producers, for any future private sector engagement in plastics circularity in Vietnam. Although resin producers currently have the lowest proportion of circularity commitments made, they could play a key role. They currently produce more than 1 million tonnes of virgin resins and are developing an additional 2.6 million tonnes of capacity. Thus, improving their plastics circularity commitments and investments will significantly impact plastics circularity in the country.

1.7 STUDY LIMITATIONS AND OPPORTUNITIES FOR FUTURE WORK

This study was conducted consistent with established objectives and scope but was constrained by the availability of data in certain cases. Therefore, these limitations are opportunities to build on this study for any future work, as highlighted in Table 3 below.

Table 3.
STUDY LIMITATIONS AND SUGGESTED ACTIONS TO ADDRESS GAPS

Topic	Details	Opportunities for Future Work based on Topics Identified
Resin focus and extent of breakdown in MFAs	As outlined in section 1.5, the four resins chosen to focus for this study are PET (including both PET Packaging and PET Polyester), PP, LDPE, and HDPE. Therefore, the MFAs have been conducted for these four key resins only. The objective of these MFAs is to provide a directional estimate of recycling rates for these resins, and they are not intended to account for every ton of plastic produced, consumed, or recycled in Vietnam. While multi-material flexibles (e.g., sachets) form a part of the packaging mix in Vietnam, they are not yet commercially collected for recycling at a scale unlike rigids and mono-material flexibles. As scalable private sector investment solutions for recycling these multilayer, multi-material flexibles have not yet been commercialized in the context of Vietnam or Southeast Asia, a breakdown of the key resins into multilayer, multi-material flexibles and a dedicated assessment of material value analysis for this category of flexibles was out of scope. Determination of breakdown between landfill, energy recovery, and leakage is not part of the study's scope. Similarly, detailed calorific value assessment of sachets and energy recovery pathways of flexibles is also out of the study's scope.	An annual review of the MFAs for the four resins will provide the Vietnam plastics industry a thorough understanding of the progress towards circularity. Given that a vast majority of multi-material flexibles are currently not being collected for energy recovery or recycling, a detailed MFA for multi-material flexibles similar to the one done at a resin-level in this study is not expected to yield significant benefits unless various interventions concerning multi-material flexible packaging (Section 4) have been specifically addressed. Breakdown between landfill, energy recovery, and leakage rates will provide an understanding of the extent of shift away from landfill and leakage.
HS Code Data for Import and Export of Resins and Plastic Products	Imports/exports of resins and semi-finished products are based on government data (from Vietnam Customs). They have been triangulated against industry data, UN Comtrade (global trade), and other data sources. However, there are inherent challenges with the accuracy of data reported via the universal HS Codes. The amount of resin/ semi-finish product/ product recorded in government data is often not in weight units (of tonnes or kg) and is often recorded as the number of pieces/items.	Action can be taken to implement standardizations in customs data reporting where the quantity of material imported/exported is recorded in one single unit (e.g., tonnes or kg). Refer to action 19 under section 4.3 (F).

Topic	Details	Opportunities for Future Work based on Topics Identified
Imports/ exports of resin and finished products	The data for PET, PE, PP resin production, and imports is representative as these data sets have been received from all major industry sources/resin producers. Plastic recycling is relatively fragmented with a few medium to large recyclers and many small (formal and informal) recyclers. The medium to large recyclers who agreed to participate in this study have been interviewed and a best possible estimate of the smaller recyclers was calculated through interviews with some of the small recyclers, provision of estimates by VPRA, desktop research and responses received from recyclers. Imports/exports of finished products made from PET, PP, HDPE, and LDPE/LLDPE are not accounted for due to the unavailability of data and significant uncertainties in attempting to calculate the plastic weightage within finished products. Detailed efforts were made with VPA to gather raw data on finished product imports/exports and to determine the plastic component for the finished product (and surrounding packaging) imports/exports. However, major data availability limitations exist in addition to significant uncertainties in determining the plastic composition of finished product import/exports. Based on stakeholder interviews, Vietnam is a net exporter of finished products. The implication of this is that actual consumption and post-use disposal is likely to be slightly lower and assessments of material value loss would be a slight overstatement. While the MFA consumption and disposal are believed to be a slight overstatement due to the inability to account for finished products, this study still provides a clear understanding of the current realities (e.g., estimated plastic consumption and disposal amounts, lack of recycled product demand, lack of recycling capacity) to consider when developing effective policies/regulations, and so forth. Further data collection of finished product consumption is not critical to develop effective policies/regulations.	Attempts to determine finished product consumption will be challenging as: (i) there are thousands of brand owners across all industries who would need to share data to make it a representative data set (ii)brand owners place a high degree of confidentiality on such data and (iii) even if such data were to be available, calculating the tonnages of plastics within finished products is complex and has a high degree of uncertainty. Therefore, efforts to determine finished product consumption is a 5 to 10-year goal to be achieved through a mandatory plastic reporting framework (refer to action 29 in Section 4.3 (H)).
Lifespan of plastic products	Resin disposal in future/past years have been calculated according to the modeling that this study has developed based on regional industry data sources for industry use applications and lifespan.	Future studies could develop lifespan modeling specific to the Vietnam plastics industry; however, this is estimated to have minimal impact (<5%) on the final post-use disposal figure.

Topic	Details	Opportunities for Future Work based on Topics Identified
Profitability analysis for recycling of plastic resins	The material value analyses carried out under this study are not meant to be a profitability or economic analysis for recycling each type of resin. A profitability analysis would shed light on additional benefits that activities or incentives in the plastics value chain would bring compared to the additional costs incurred by those same activities or incentives. Such profitability analysis would also be particularly relevant to address the very low CFR rates, especially for non-PET, which would be the main driver for unlocking value. From a business-case perspective, it will show the net value considering costs and profit margins. Recyclers engaged during this study were reluctant to share price-sensitive information or detailed operational costs.	The study team recommends profitability analysis for recycling economics on a case-by-case basis as part of in-depth, pre-feasibility studies by investors in the waste management or recycling sectors
Assessment of SWM costs	A systematic assessment of national-level SWM infrastructure, operational costs of SWM, and identifying the linkages between the informal sector and SWM, is not within the scope of this study. Where available, secondary research or past GA Circular work in Vietnam and other online sources on the informal sector has been used to identify the role of the informal sector in recyclables collection and address challenges to recognize and better integrate the informal sector.	A detailed evaluation of SWM infrastructure and its costs in the context of plastic circularity could be addressed in subsequent work as a follow-up to this market assessment.
Impact of COVID-19 on recycling landscape	All data used in the MFA as part of this study are for 2019 as it was the latest complete data set available as of September 2020 when this study commenced. Hence, it does not reflect the significant changes in the recycling landscape due to COVID-19. The COVID-19 pandemic has caused severe setbacks to the ongoing global movement to tackle plastic waste, with recyclers across several countries, including Vietnam, showing on average of a 50 percent drop in demand for their products, 21 percent drop in sales prices and many recyclers and businesses across the plastics value chain at the risk of insolvency. This study was started after the peak of the COVID-19 pandemic in Vietnam, and it was observed to cause disruptions across the businesses of almost all the recycling value chain businesses that were engaged. Some stakeholders were not available to be engaged for this study due to the ongoing disruptions caused by COVID-19 to businesses, especially recycling value chain businesses. Additionally, due to travel restrictions, some interviews were conducted virtually. As the pandemic and its impact are still evolving, the material value analysis done in this study does not reflect the business impact of COVID-19 on the plastics recycling sector. However, insights regarding the impacts of COVID-19, particularly regarding the economic downturn and low oil/virgin plastic prices now and projected into the future, have been included.	It is recommended to refer to studies conducted on the impact of COVID-19 on the recycling sector[35] and the waste management sector[36] while considering investments in these sectors in Vietnam

35 GA Circular & Circulate Capital - Safeguarding the Plastic Recycling Value Chain (2020)

36 IFC - COVID-19's Impact on the Waste Sector (2020)

1.8 Other studies on plastic waste management in Vietnam

A study titled "National Guidance for Plastic Pollution Hot Spotting and Shaping Action: Hotspot Results for Vietnam" was jointly conducted by IUCN and UNEP in 2019/20 that included a material flow exercise focused on all seven plastic resins in Vietnam. The study's objective was to determine plastic pollution hotspots for Vietnam, focusing on the following five hotspot categories: plastic polymer, plastic application, sector, region, and plastic value chain.

There are differences in objectives and methodologies of the IUCN/UNEP study and this current study that lead to different MFA results. The similarity between the two MFAs is that both studies include MFAs for the key resins, PET, HDPE, PP, and LDPE/LLDPE, and factor in resin and semi-finished product imports/exports. The current study builds on IUCN/UNEP's MFA approach for Vietnam by working closely with VPA. The purpose is to validate resin production and imports and exports, factoring in lifespan for plastic consumption amounts and leveraging a significant number of VPRA and recycler interviews and data collection. This study did not include finished product imports and exports due to concerns regarding data reliability. In-depth consideration of recycler data, including incorporating recycling capacities and actual utilization and factoring in-process losses and net exports of semi-finished products, has been key to this study. This greater level of detail on recycler data is needed to develop an understanding of the specific barriers and opportunities for plastic recycling, including investments. The outcome of the IUCN/UNEP study focused on identifying plastic pollution hotspots. Appendix 4 contains detailed information on the similarities and methodological differences between the IUCN/UNEP study and the current study.

The WWF Vietnam, together with Cyclos, Intectus GmbH, and the Industrial University of Ho Chi Minh City, recently conducted a study titled "Assessing the implementation of an EPR system for packaging waste in Vietnam." This study intended to include material flow analysis to inform EPR recommendations, but the analysis component has not been completed yet due to Covid-19.

SECTION 2:

VIETNAM LOST 75 PERCENT OF THE MATERIAL VALUE OF PET, PP, HDPE, AND LDPE PLASTICS CONSUMED IN 2019

SECTION 2:

VIETNAM LOST 75 PERCENT OF THE MATERIAL VALUE OF PET, PP, HDPE, AND LDPE PLASTICS CONSUMED IN 2019

Section 2.1 introduces the two tools used to assess Vietnam's current plastics circularity situation for each resin - material flow analysis (MFA) and material value loss analysis. Section 2.2 analyzes each resin in detail using the two tools. It also highlights the findings relevant to increasing circularity. Section 2.3 provides a summary of the MFA and material value analysis of all the focus resins.

2.1 TOOLS USED TO ASSESS PLASTICS CIRCULARITY

Material flow analysis (MFA)

The MFA conducted for each resin as a part of this study covers the amount of resin, travelling through each stage of the value chain from resin production to disposal, and finally to post-consumption destinations. It helps visualize how much of the resins flow across the various stages and enables an understanding of the factors affecting circularity at each stage.

The MFA, as highlighted in Figure 6 above, can be analyzed in three sections from left to right: production, disposal, and post-consumption. The MFA starts with the amount of resin produced. Imports and exports of this resin and the semi-finished products the resins are made into are assumed to add up to the total amount of plastic products consumed locally.[37] The total amount of plastic products consumed locally represents 100 percent of what could be recycled for that resin.

At the disposal stage, the plastic products were either collected for recycling or disposed of at the landfill (used for energy recovery or leaked into the environment). The lifespan of the plastic products was also taken into consideration by removing the products that were produced in 2019 but would be disposed of in future years, including the products that were produced before 2019 and disposed of in 2019. This was calculated as follows:

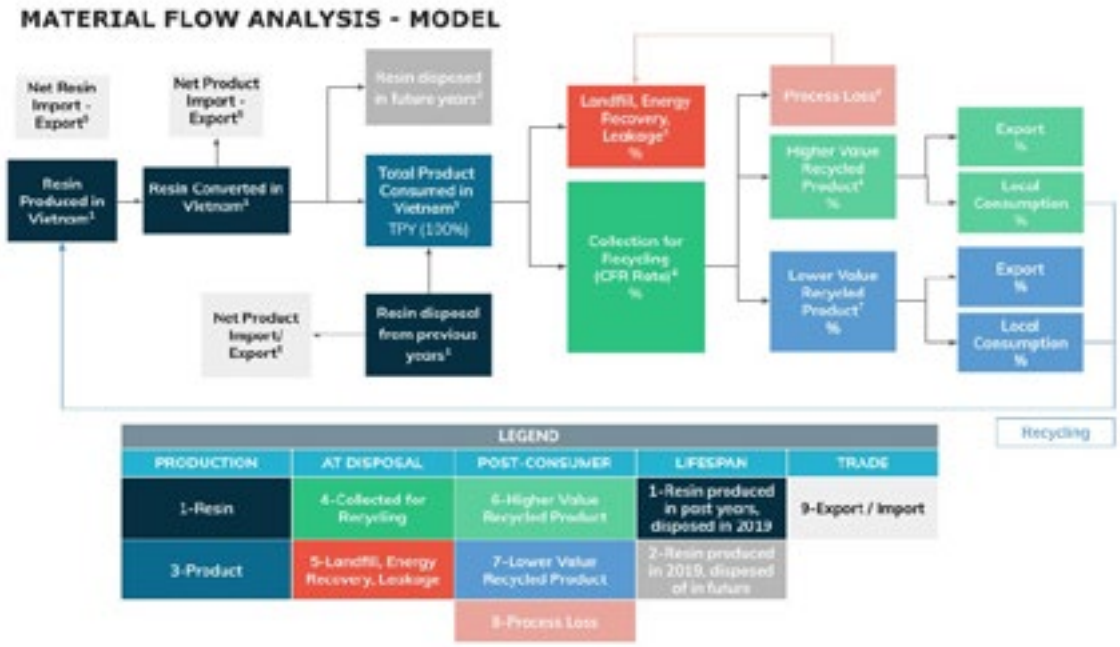
First, the proportion of the materials disposed of in year zero (year of manufacture) until the end of lifespan was determined by estimating the typical lifespan of plastic products for each end-use application and the proportion of end-use applications for each resin (see Appendix 5 for details).

Second, using the normal distribution curve, showing the average lifespan (see Appendix 5) and estimated historical production numbers of the key resins in Vietnam,[38] the quantity of plastic products disposed of in 2019 but produced before 2019 was calculated. This was done by multiplying the quantity of resin consumed in each year with the corresponding proportion of products estimated

37 Further details of the HS codes used in the calculations can be found in Appendix 6A.

38 Estimated using growth rates calculated from the data gathered during a recent World Bank study and provided by the Plastics Institute of Vietnam (PIT) as a proxy as corresponding data was unavailable for Vietnam

Figure 6.
THE MATERIAL FLOW ANALYSIS (MFA) APPROACH USED FOR EACH RESIN



to be disposed of in 2019. The figures for each year were then summed up to arrive at a final number for what is estimated to be disposed of in 2019. Lastly, the proportion of materials that were produced in 2019 but are estimated to be disposed of in future years was removed to arrive at a final figure for the total amount of resins disposed of in 2019 as final products.

The CFR rate, process losses, and subsequent recycling products are shown in the last section on the right (post-consumer/recycling). The CFR rate denotes the tonnes or percentage of a particular resin collected through the country's informal and formal collection sectors. This is then sold to processors and/or recyclers within the country or exported. The CFR rate already factors in removing contaminants and other plastics and materials, which are not the resin of focus. The term "collected-for-recycling" is used for two reasons.

First, given imports and exports of the material for recycling, the CFR rate denotes local collection, which is sold to processors/recyclers but not necessarily within the country. A country can have a CFR rate of 75 percent even though none of the material is recycled locally due to the absence of a robust local recycling industry.

Second, given that recycling yield does not equal 100 percent and varies by resin type due to "process loss," the CFR rate is not equal to the share of after-use plastics sold from the recycling process. While there is contamination like dirt, other plastics, and metals that is removed during the sorting and cleaning process, this contamination is not included in the MFA for each resin. Therefore, the CFR rate of PET is determined after contaminants like dirt metals and other plastics (sleeves and caps from other materials such as HDPE and PP) have been removed.

Material Value Loss Analysis

Analysis of the plastic material value loss assesses the value loss when the resins are not recycled into the most valuable recycled product (MVRP) under the weighted-average best possible recycling scenario for that particular resin, or when the resins are not recycled at all. For example, when disposed of in a landfill. The analysis of this material value loss is conducted by the above-mentioned MFA tool that has been used for each resin.

Figure 7 graphically represents the calculation approach used to calculate the material value unlocked. This is based on first calculating the following two key values: First, the collection for recycling (CFR) rate, represented by the x-axis, and second, the value yield (product of volume yield and price yield), represented by the y-axis. The value unlocked through recycling is represented by the size of the green boxes. All

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areas outside of the green boxes represent the lost recycling value. Red arrows represent the pressures that lower the value unlocked, i.e., pressures through lower CFR rate and lower value yield.

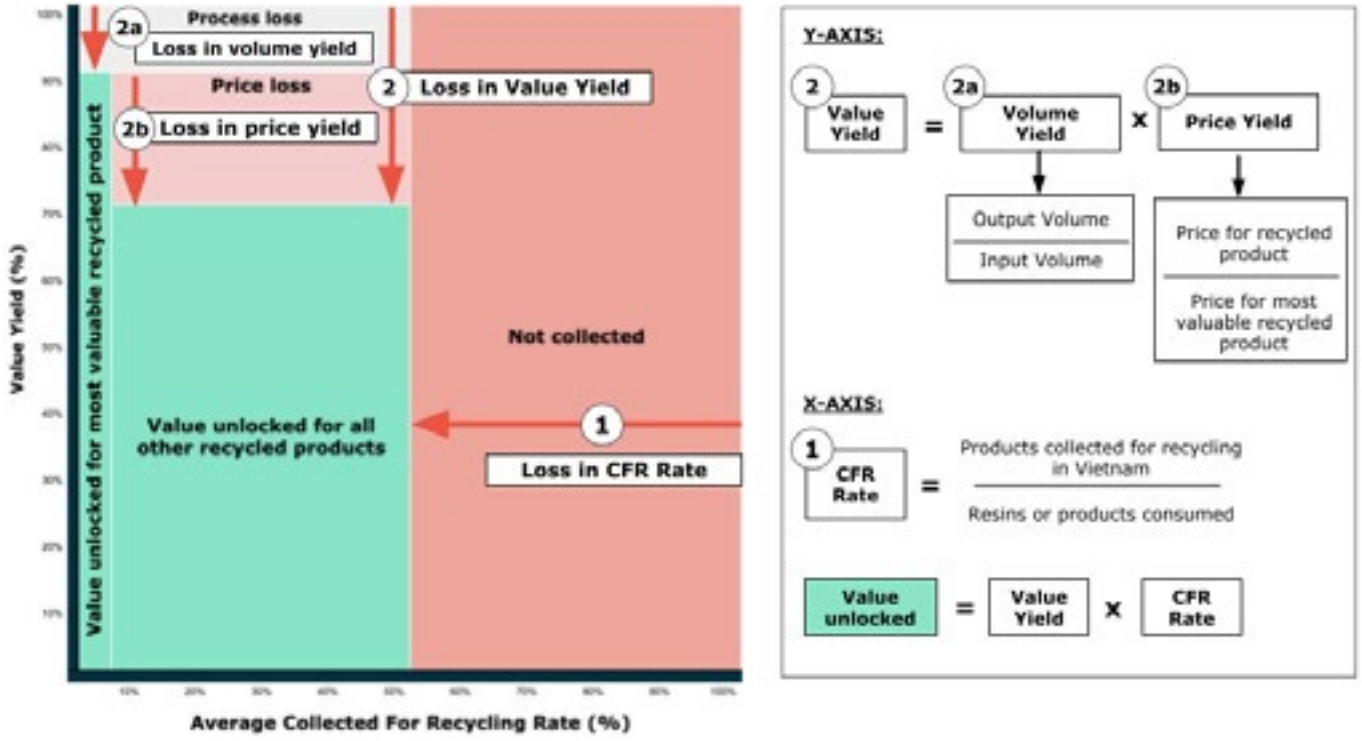
The graphical representation illustrated in Figure 7 was benchmarked and developed based on the methodology used by the Ellen MacArthur Foundation to assess the material value lost from single-use plastic packaging applications globally.[39] The method has been modified for this study to illustrate both process loss and price loss per resin. The material value analysis method depicted in Figure 7 does not include the costs that could be saved from not having to collect and dispose of the non-recycled resins as waste under the MSW collection system, or the cost of setting up and operationalizing municipal solid waste management infrastructure to support the transition towards plastics circularity. This analysis, therefore, is meant for showing the potential benefits from plastics recycling but not the "net" opportunity. This is in line with the methodology used by the Ellen MacArthur Foundation, which does not factor in upfront investment costs, operational costs for circular approaches towards solid waste management, or cost savings through reduction in collection and disposal of plastic waste.

Even though 100 percent rates for CFR and value yield are not practically possible, the 100 percent rate has been used for both axes only for illustrative purposes as targets are typically set based on 100 percent of market inputs/material. To further explain the use of the 100 percent figure, the national government's target is "to collect and treat up to 100 percent of daily life solid waste in urban centers, 90 percent of which will be recycled, reused, energy recovered or used for organic fertilizer production" as part of the Vietnam National Strategy for Integrated Solid Waste Management to 2025, with a vision to 2050.[40]

39 Ellen Macarthur Foundation New Plastics Economy: Rethinking the Future of Plastics (2016)

40 Asem Connect, "National Strategy for integrated solid waste management to 2025, vision to 2050" (2017)

Figure 7.
METHODOLOGY OVERVIEW OF HOW THE MATERIAL VALUE LOSS IS CALCULATED

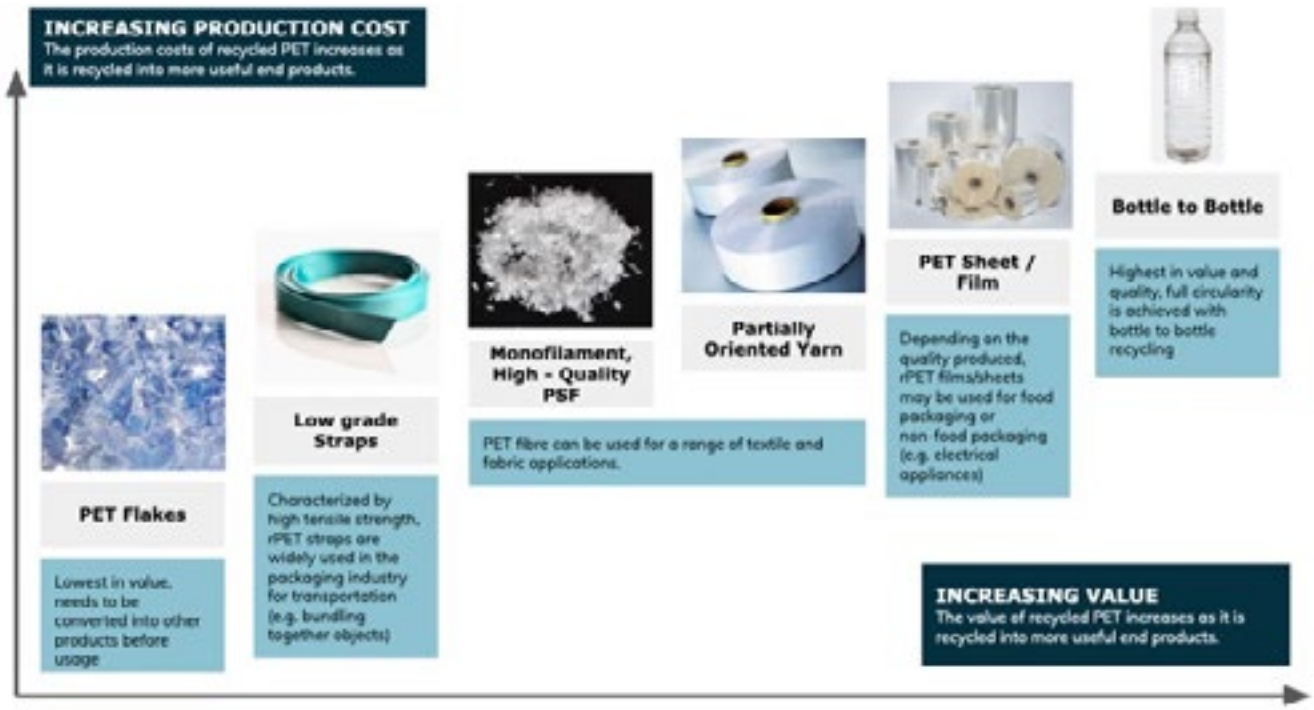


The following criteria were applied to ensure reliable and consistent prices for recycled products: (a) prices should be representative of the industry;[41] (b) prices should be available for various categories of end products; (c) prices should be available for at least three months within 2019 so that the average of the three months can be calculated with the objective of avoiding price anomalies that often occur during just one month of pricing. Currently, there are no independent, industry-level price information sources available for recycled products in Vietnam. Therefore, local prices have been used for recycled products where available from two independent recyclers and have also been benchmarked with regional and global prices. The rationale is that many recycled products compete in the global market and, therefore, global pricing provides an accurate picture of the market opportunity.

The term MVRP for each resin refers to the recycled product with the highest value in the global recycled plastics market out of all the possible options that the resin can be recycled into. For this calculation, MVRP considers a weighted average of the various possible recycled products. The proportions of each type of recycled product represent a best-case scenario of maximum value unlocked for the resin. This is because it is not realistic to expect 100 percent of resins to be recycled into the recycled product with the highest value (e.g., food-grade PET for post-consumer PET packaging). See Figure 8 below for an example of the least valuable to most valuable recycled products from PET.

41 To be representative of the industry, the source of prices must be any of the following: (i) industry association, (ii) independent market pricing provider; or (iii) from 2 or more independent recyclers.

Figure 8.
EXAMPLE OF BREAKDOWN OF THE VALUE OF RECYCLED PRODUCTS FROM PET



Note: Bottle-to-bottle rPET resin is the most valuable recycled product.

2.2 RESINS IN FOCUS

This section analyzes each of the key resins using the two tools explained above. Detailed breakdowns of the data can be found in the appendices, as follows. For detailed breakdowns of resin producer capacities, actual resin production, and additional planned resin capacity, refer to Appendix 1. For detailed breakdowns of the recycling capacities in addition to actual utilization, see Appendix 8. For a detailed breakdown of the data sources and key assumptions for material value loss analysis calculations for each resin, please see Appendix 7.

PET

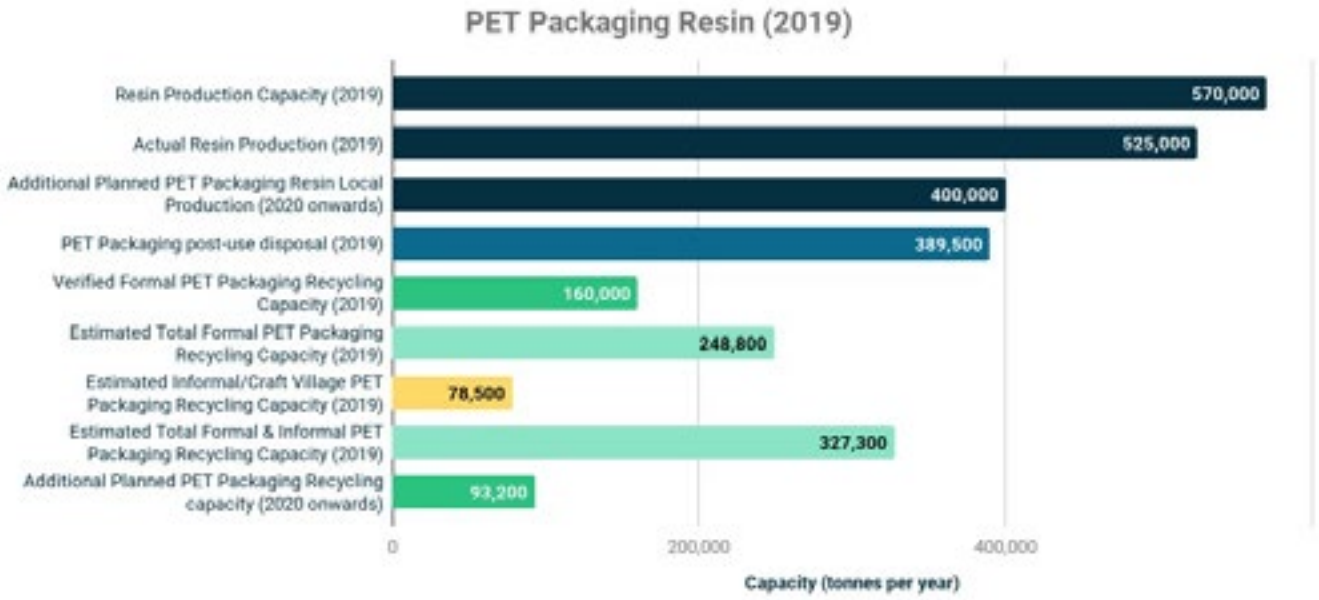
General characteristics of PET

PET is clear, tough, and has good gas and moisture barrier properties. It is widely used in manufacturing plastic bottles for drinks, food jars, oven-safe film and microwaveable food trays, textiles, monofilament, carpets, strapping, films, and engineering moldings. PET is the most recycled plastic. Cleaned and recycled PET flakes and pellets are in high demand globally to manufacture beverage bottles and spinning fiber for carpet yarns and textiles. PET can be recycled into any of the following end products: rFiber for carpet, fleece jackets, comforter fill, bags, and so forth using recycled polyester staple fiber (rPSF) and recycled partially oriented yarn (rPOY). Other examples are food-grade use of rPET for producing beverage bottles and food containers and non-food-grade rPET for making films, sheets, and strapping.

Major pet packaging, polyester producers, and recyclers in Vietnam

Figures 9 and 10 below show the respective amounts of virgin PET capacity and production and recycled PET capacity for PET Packaging and PET Polyester for the major producers and large recyclers reviewed.

Figure 9.
PET PACKAGING RESIN PRODUCTION AND RECYCLING CAPACITIES (TONNES PER YEAR, 2019)



Note: While key stakeholders are represented, this may not be an exhaustive list of all PET producers and recyclers in Vietnam. The data for formal PET recycling is representative as this study team has received inputs from key formal PET recyclers which is considered to represent upwards of 64 percent of formal PET recycling capacity. Estimates regarding the remaining formal recyclers and regarding informal recyclers are based on inputs from formal PET recyclers and VPRA and are thus considered representative. The data for resin production is considered representative as insights on the resin producers were provided by VPA.

Figure 10.
PET POLYESTER RESIN PRODUCTION AND RECYCLING CAPACITIES (TONNES PER YEAR, 2019)

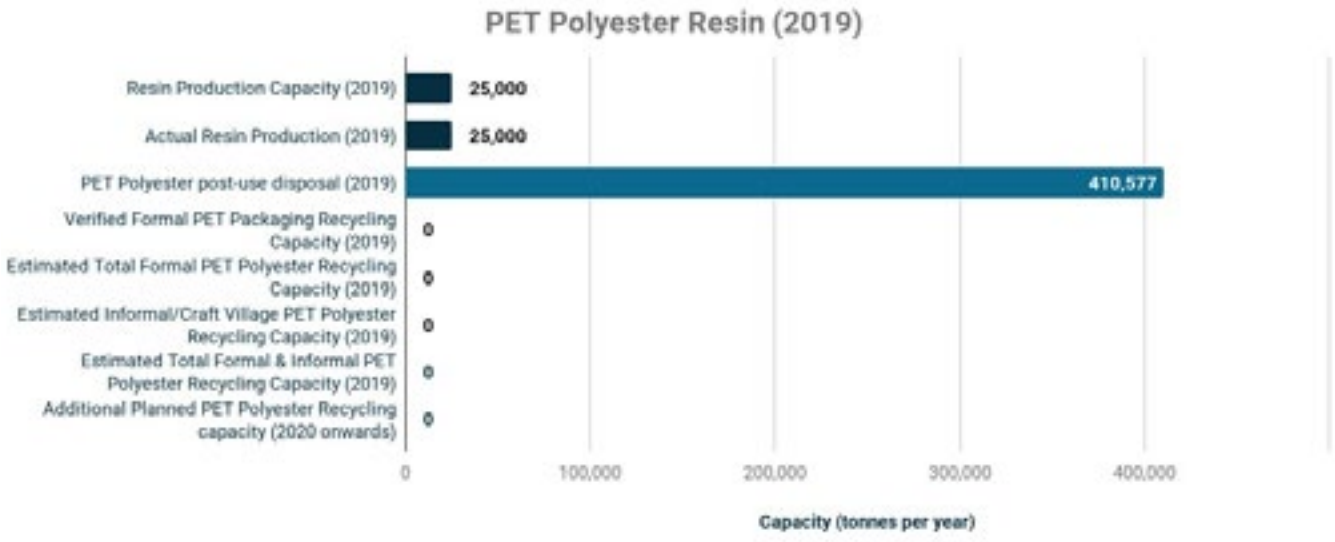


Figure 11.

MATERIAL FLOW ANALYSIS (MFA) FOR PET PACKAGING AND PET POLYESTER (2019)

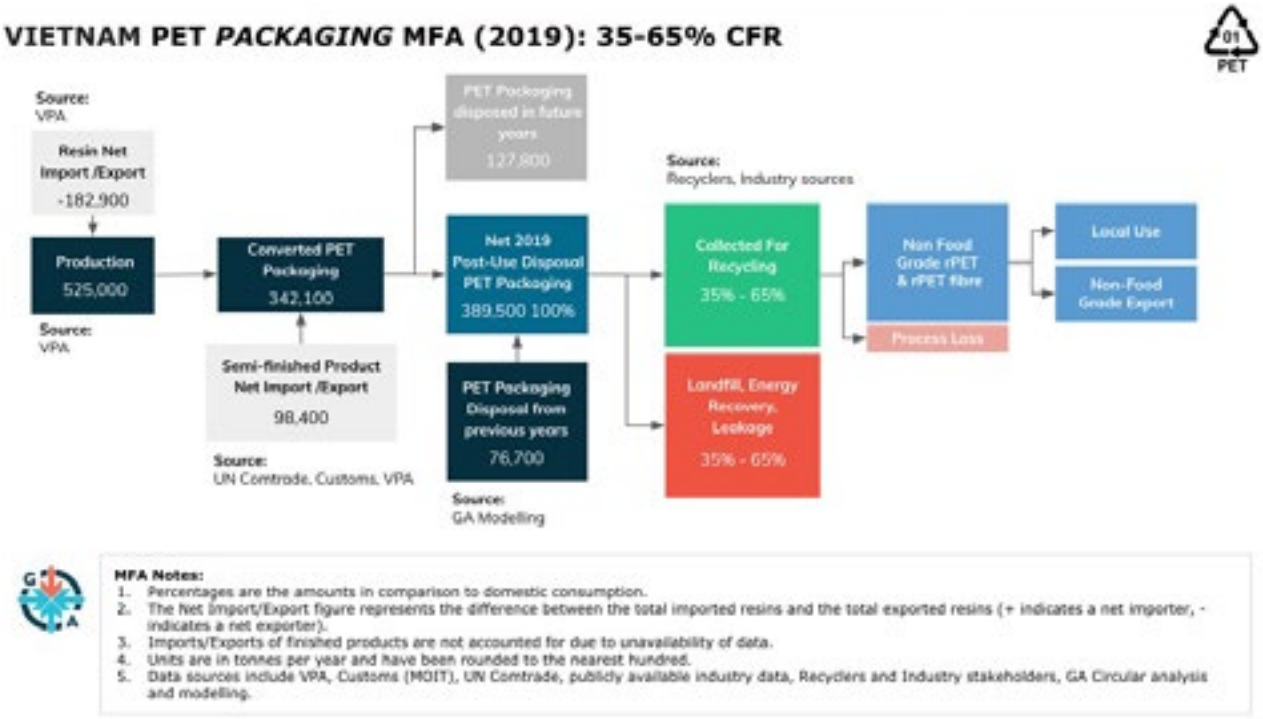
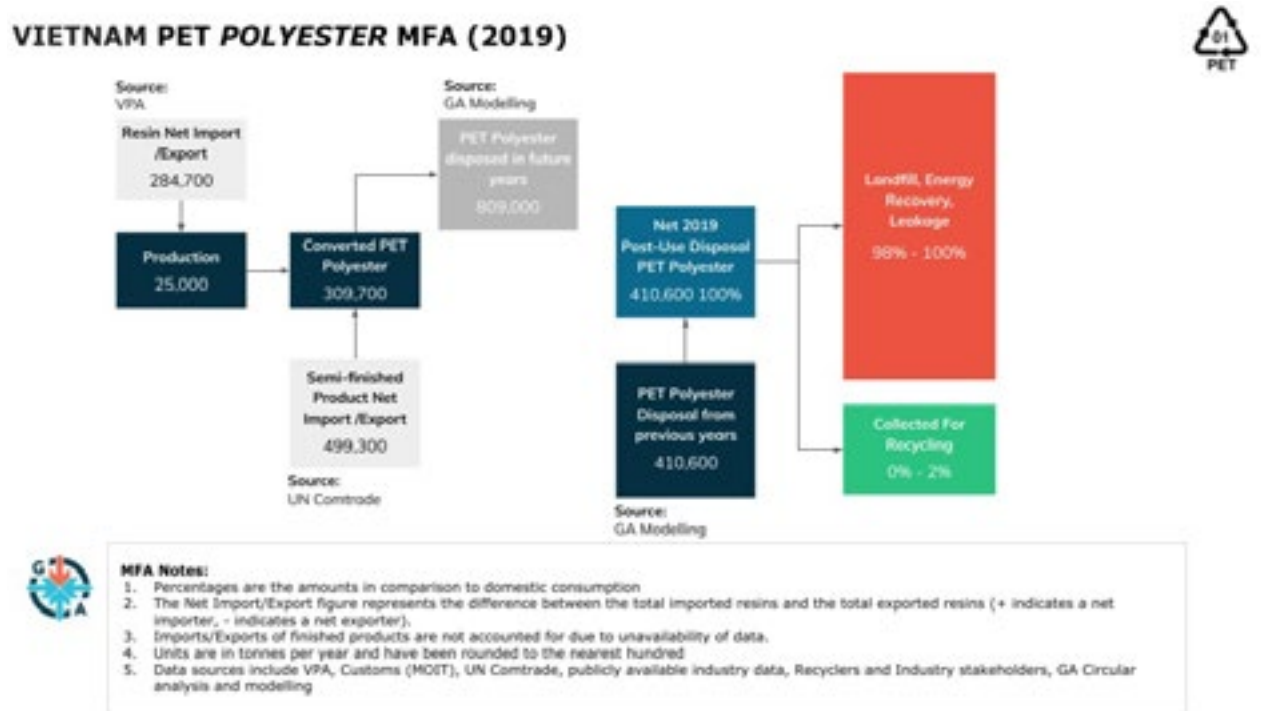


Figure 12.

MATERIAL FLOW ANALYSIS OF PET POLYESTER RESIN (BASED ON 2019 VOLUMES)



The following are four key messages from the MFAs of PET packaging and polyester (Figure 11 and 12 above) in Vietnam:

The CFR rate for PET packaging (including bottles, sheets, and films) is estimated to be a median of 50 percent (based on the mid-point average of the 35 to 65 percent range). The wide range accounts for: (i) the uncertainty in practically estimating the CFR rate in Vietnam; and (ii) the variability in the CFR rate throughout the year. This CFR range is estimated based on the information obtained through interviews of local stakeholders (recyclers, VPRA) and triangulated against verified capacities of formal recyclers and estimates of recycling capacities for other formal and informal recyclers and craft villages. The variability in the CFR rate throughout the year is due to informal waste collectors, aggregators, and recyclers responding to fluctuations in recycled resin prices and other market forces. As rPET prices drop, these stakeholders slow down plastic waste collection and aggregation because recycling becomes less profitable. When rPET prices rise, the collection increases again as these stakeholders take advantage of the higher prices. The recycling rate also varies significantly between end-use applications. The recycling rate for PET beverage bottles is estimated to be 45 to 65 percent. In contrast, for other PET packaging applications (sheets, films, oil bottle applications, cosmetic applications, and so forth), it is estimated to be much lower, between 30 to 40 percent.

There is currently no production of certified food-grade recycled PET in Vietnam. This is a significant untapped business opportunity as food-grade rPET for bottle applications has the highest value in the market and is a circular economy solution as opposed to PET bottle recycling into textiles or other end-use products that eventually get landfilled. Furthermore, food-grade rPET is more resistant to drops in prices for virgin PET because demand for food-grade rPET is increasing due to sustainability commitments of global food and beverage brands and recycled content regulations in export markets such as the EU. As of early 2021, Duy Tan Plastics is planning to start the first FDA-approved food-grade bottle-to-bottle recycling facility in Vietnam (see Box 1 in Section 3 for details). Stakeholders in the value chain have acknowledged the increasing demand for post-consumer PET bottles due to premiums paid by Duy Tan to meet the rPET demands of its clients.

Only a minimal amount of PET polyester used in textiles and fiber applications is estimated to be recycled (zero to two percent).[42] One of the main reasons is the various blended products that polyester fiber turns into—for example, blended with nylon or cotton—makes mechanical recycling infeasible because the polyester content cannot be separated. Technologies for recycling blended polyester products (i.e., chemical recycling technologies) are still in relatively early stages of development globally and are not available in Vietnam.

A significant amount of textile consumed in Vietnam (via both resins and semi-finished products), specific to PET polyester, is imported. Hence, due to the unavailability of data for finished products, the final post-use disposal PET estimate above likely overestimates polyester textiles consumption as Vietnam is believed to be a net exporter of finished product textiles.

Material value loss analysis for PET

The material value loss for PET has been broken down into two parts: PET packaging and PET polyester. Figure 13 below represents the value unlocked for PET packaging, based on the above MFA for PET packaging. The CFR is 50 percent (35 to 65 percent), and the value yield is 78 percent, resulting in 39 percent (27 to 51 percent) of the material value being unlocked. Therefore, 61 percent (49 to 73 percent) of the material value of PET packaging is lost. This is equivalent to US$183 million to US$270 million of the material value lost per year (see Appendix 7 for further information regarding the values and calculations).

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42 Based on interviews with VPRA and plastic recyclers, there are no known PET Polyester recyclers in Vietnam, and neither is there any known additional planned PET Polyester recycling plans.

Figure 13.
MATERIAL VALUE LOSS ANALYSIS OF PET PACKAGING (2019)

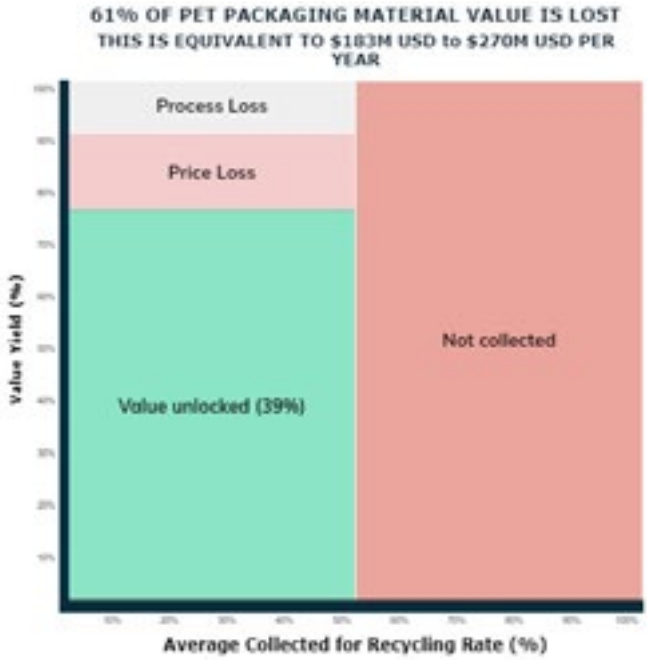
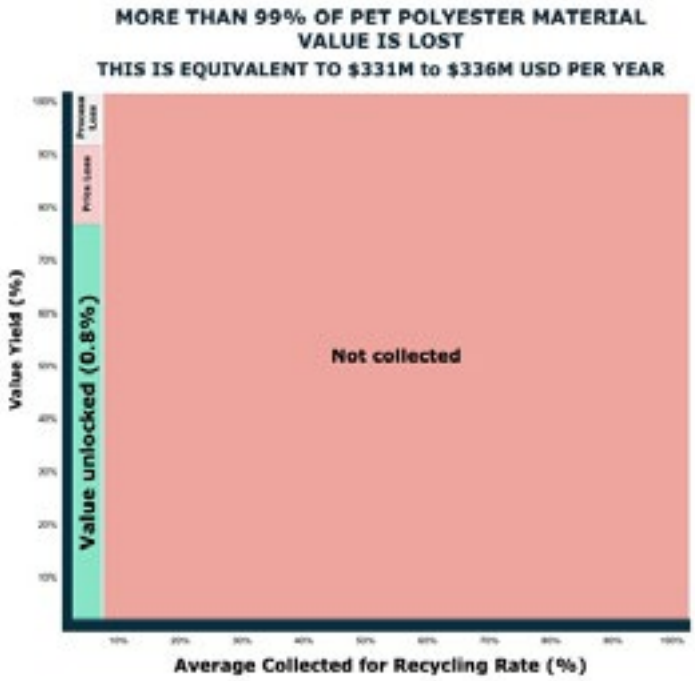


Figure 14 below represents the value unlocked for PET polyester based on the above MFA for PET polyester. The CFR is one percent (zero to two percent, assuming at least some small-scale textile recycling, although industry sources and the authors are unaware of any PET polyester recycling) while the value yield is 78 percent. Together, the CFR and value yield unlock just one percent (zero to two percent) of material value, mainly due to the low CFR. Thus, 99 percent (98 to 100 percent) of the material value of PET polyester is lost. This is equivalent to US$331 million to US$336 million of material value lost per year. (See Appendix 7 for further information on values and calculations).

Figure 14.
MATERIAL VALUE LOSS ANALYSIS OF PET POLYESTER (2019)



PP

General Characteristics of PP

PP is a tough, rigid, and crystalline thermoplastic produced from propene (or propylene) monomers. It has good barrier properties like high strength, good surface finish and low cost make that make PP ideal for several packaging applications. PP is among the cheapest plastics available today. It is widely used in packaging applications (for both rigid and flexible packaging), in automotive applications (such as battery cases and trays, bumpers, fender liners, interior trim, instrumental panels, and door trims), and in fibers and fabrics (strapping, filament, and staple fibers). PP can be recycled into rPP for packaging applications and rPP for industrial applications such as for automotive, electronics, and furniture industries.

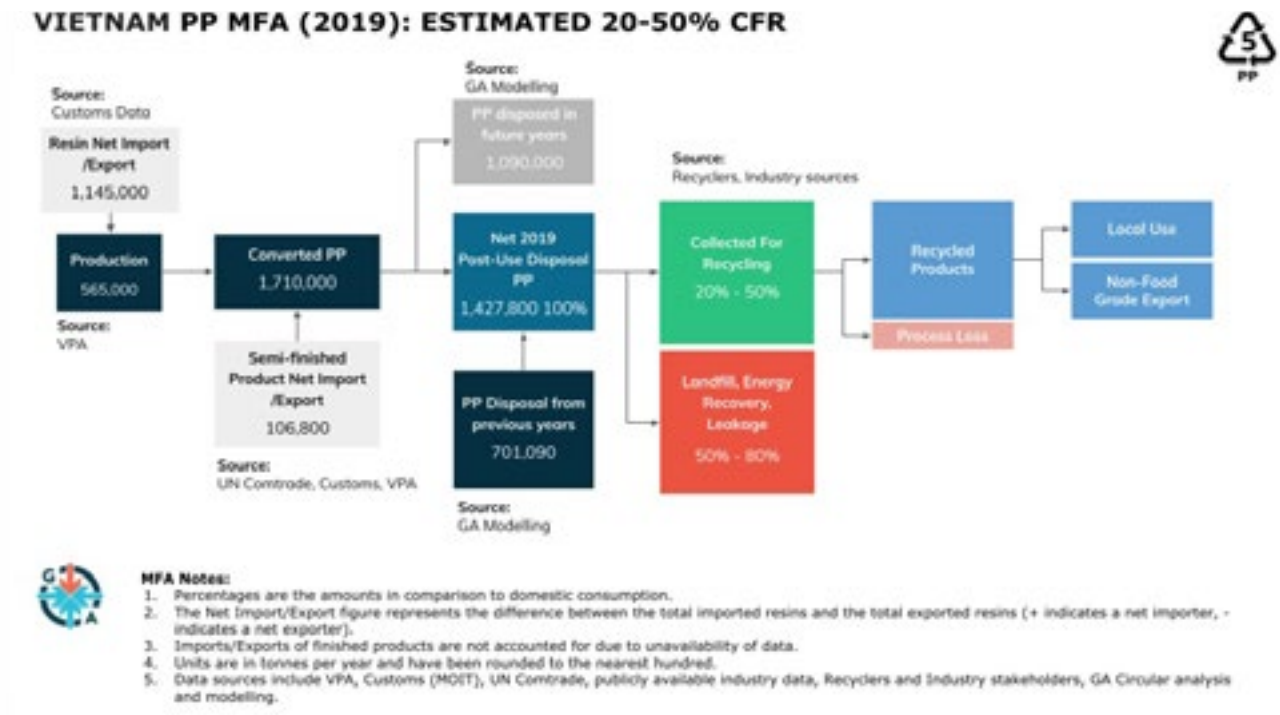
Major PP producers and recyclers in Vietnam

Figure 15 below shows the respective amounts of virgin PP and recycled PP capacity and production (where available) for the major producers and large recyclers reviewed.

Figure 15.
PP RESIN PRODUCTION AND RECYCLING CAPACITIES (TONNES PER YEAR, 2019)

Notes: While key stakeholders are represented in the above, this is not an exhaustive list of all PP producers and recyclers in Vietnam. The data for formal PP recycling is representative as this study team has received inputs from key formal PP recyclers which is considered to represent upwards of 43 percent of formal PP recycling capacity. Estimates regarding the remaining formal recyclers and informal recyclers are based on inputs from formal PP recyclers and are thus considered representative. The data for resin production is considered representative as insights on the resin producers were provided by VPA.

Figure 16.
MATERIAL FLOW ANALYSIS OF PP RESIN (TONNES PER YEAR, 2019)



The following are the key messages from the MFA of PP in Vietnam (Figure 16):

The CFR rate for PP is estimated to be 20 to 50 percent. The wide range accounts for: (i) the uncertainty in practically estimating the CFR rate in the country; and (ii) the variability in the CFR rate throughout the year. This CFR range is estimated based on the information obtained through interviews of local stakeholders (recyclers, VPRA) and triangulated against verified capacities of formal recyclers, estimates of recycling capacities for other formal and informal recyclers and craft villages. The variability in the CFR rate throughout the year is due to informal waste collectors, aggregators, and recyclers responding to fluctuations in recycled resin prices and other market forces. As rPP prices drop, these stakeholders slow down plastic waste collection and aggregation as recycling becomes less profitable. When rPP prices rise, collection increases again as these stakeholders take advantage of the higher prices. The recycling rate also varies significantly between applications. The recycling rate for easily separable and higher value rigid PP products is estimated to be at the higher end, while for other PP applications (e.g., flexible films, composites, and so forth), it is estimated to be much lower.

A high proportion of PP is used to manufacture flexible films and pouches, including food packaging applications. These PP products are contaminated or have prints on them that recyclers are unable to take out. That is why they have lower value yields and remain uncollected (in the absence of an EPR scheme).

PP components that are non-recyclable are those used in composite products in industrial applications (e.g., in electronics and automotive). The composite nature of the products means that an additional step of dismantling and separation is required before it can be recycled. This can require dedicated facilities (e.g., dedicated car bumper recycling facilities), which currently do not exist in Vietnam.

Material value loss analysis for PP

Figure 17 below represents the value unlocked for PP, based on the above MFA for PP. The CFR is 35 percent (20 to 50 percent), and value yield is 75 percent, resulting in 26 percent (15 to 38 percent) of the material value being unlocked. Therefore, 74 percent (62 to 85 percent) of the material value of PP is lost. This is equivalent to US$747 million to US$1,017 million of material value lost per year (see Appendix 7 for further information regarding the values and calculations).

Figure 17.
MATERIAL VALUE LOSS ANALYSIS OF PP RESIN (2019)

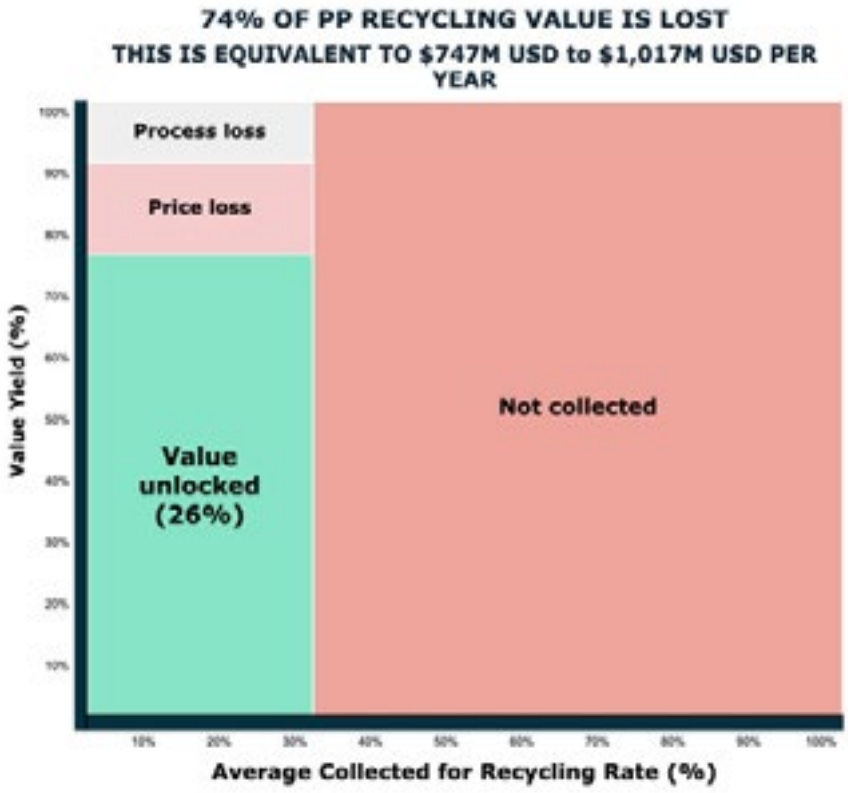



Photo: Paul Prescott - Shutterstock

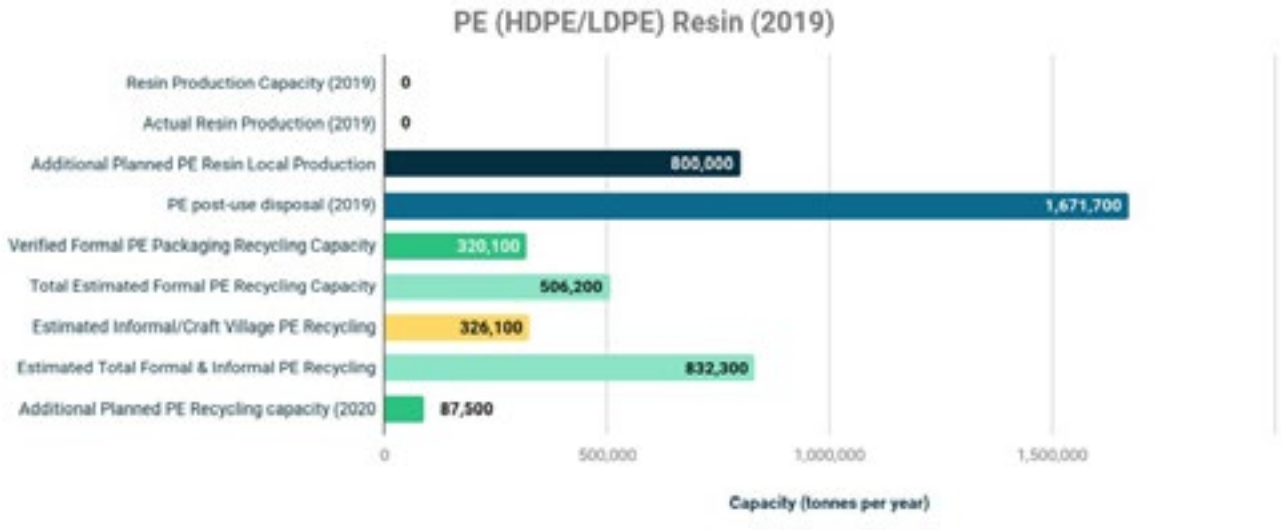
PE (HDPE and LDPE)

The breakdown between HDPE and LDPE/LLDPE resin imports and exports in Vietnam is extremely difficult because PE imports/exports cannot be broken down by VPA into HDPE vs. LDPE/LLDPE.

PE resin production and estimated recycling capacity in Vietnam

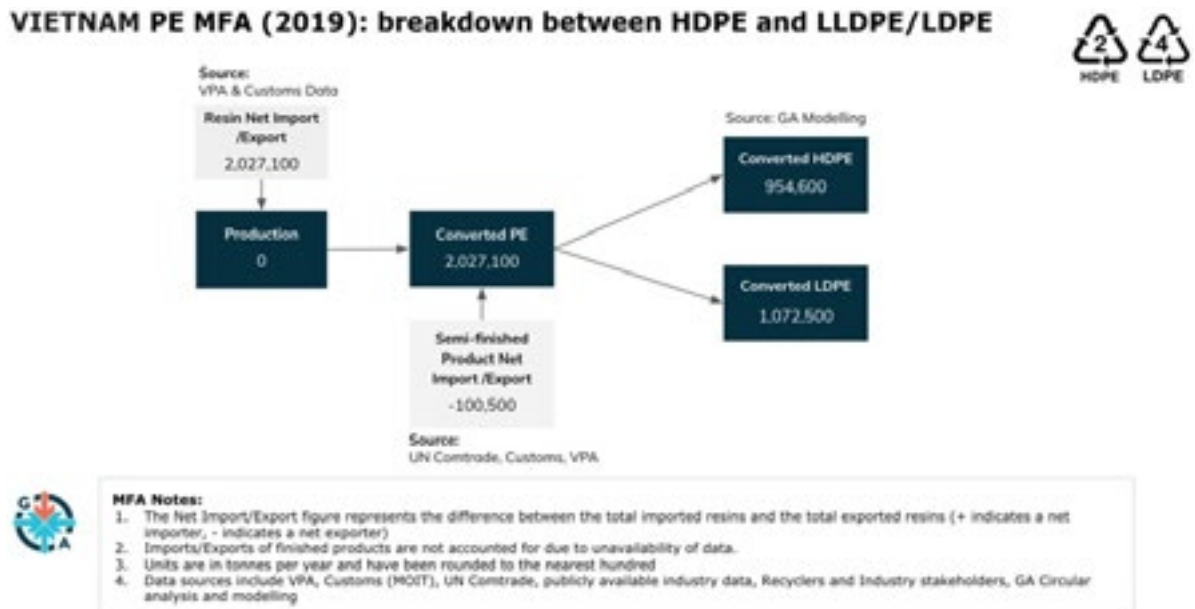
Figure 18 below shows the respective amounts of virgin PE produced and recycled PE capacity and production.

Figure 18.
PE RESIN PRODUCTION AND RECYCLING CAPACITIES (TONNES PER YEAR, 2019)



The MFA (Figure 19 below) accounts for the total PE production and conversion to HDPE/LDPE. The split between HDPE and LDPE resins was modeled, and a specific MFA for each resin was developed. The split used is 47 percent HDPE and 53 percent LLDPE/LDPE.

Figure 19.
PE SPLIT BETWEEN HDPE AND LLDPE/LDPE (TONNES PER YEAR, 2019)



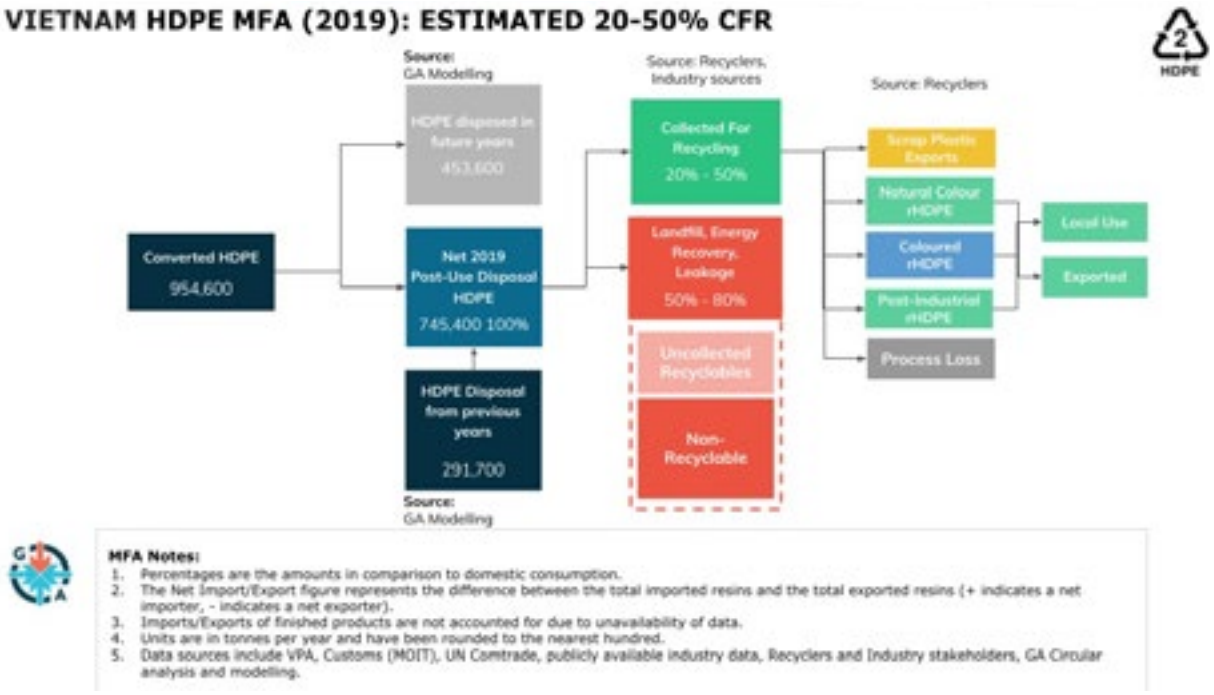
HDPE

General Characteristics of HDPE

HDPE is a thermoplastic polymer produced from the monomer ethylene. It has a high strength-to-density ratio, making it suitable for a wide variety of rigid plastic applications. While it can also be used for film packaging applications (especially where a stronger film is needed), its opacity means that LDPE/LLDPE is preferred in most cases. HDPE is widely used in packaging applications such as shampoo bottles, milk jugs, plastic shopping bags, and toothpaste tubes, in automotive applications such as fuel tanks, inner and outer protective covers, and other industries like benches and tables. HDPE can be recycled into rHDPE for packaging applications (e.g., shampoo bottles and plastic bags) or rHDPE for industrial applications (e.g., automotive and electronics components).

Figure 20.

MATERIAL FLOW ANALYSIS OF HDPE RESIN (TONNES PER YEAR, 2019)



The following are the key messages from the MFA of HDPE (Figure 20):

The CFR rate for HDPE is estimated to be 20 to 50 percent. The wide range accounts for: (i) the uncertainty in practically estimating the CFR rate in Vietnam, and (ii) the variability in the CFR rate throughout the year. This CFR range is estimated, based on the information obtained through interviews of local stakeholders (recyclers, VPRA) and triangulated against verified capacities of formal recyclers, estimates of recycling capacities for other formal and informal recyclers and craft villages. The variability in the CFR rate throughout the year is due to informal waste collectors, aggregators and recyclers responding to recycled resin price fluctuations and other market forces. As rHDPE prices drop, these stakeholders slow down plastic waste collection and aggregation as recycling becomes less profitable. When rHDPE prices rise, collection increases again as these stakeholders take advantage of the higher prices. The recycling rate also varies significantly between applications. The recycling rate for easily separable rigid HDPE (e.g., for shampoo containers) is estimated to be at the higher end while for other HDPE applications (e.g., films, plastic bags, and so forth), it is estimated to be much lower.

Like PP, a high proportion of HDPE is used in film packaging applications, which include food packaging and plastic garbage bags. These HDPE products are contaminated and, therefore, have low value yields and remain uncollected.

HDPE used in composite components/applications (e.g., in electronics and automotive) with other materials, is classified as non-recyclable because it is difficult to readily separate it from other materials in the composites. Unless designed to be dismantled easily, HDPE used in composites will remain unrecyclable and become a waste.

Material value loss analysis for HDPE

Figure 21 below represents the value unlocked for HDPE based on the above MFA for HDPE. The CFR is 35 percent (20 to 50 percent) and value yield is 68 percent, resulting in 24 percent (14 to 34 percent) of the material value being unlocked. Therefore, 76 percent (66 to 86 percent) of the material value of HDPE is lost. This is equivalent to US$472 million to US$618 million of material value lost per year (see Appendix 7 for further information regarding the values and calculations).

Figure 21.
MATERIAL VALUE LOSS ANALYSIS OF HDPE RESIN (2019)

LDPE/LLDPE

General Characteristics of LDPE

LDPE is a thermoplastic polymer produced from the monomer ethylene. The ability to make it in transparent form means it is commonly used in film applications for both packaging and non-packaging applications. Some products that can be made from LDPE are packaging (such as meat and poultry wrapping, dairy products packaging, snacks and sweets packaging, frozen food bags, and baked goods packaging) and non-packaging applications (such as trash bags, film for agriculture, and furniture). LDPE can be recycled into various applications, such as plastic lumber/furniture, trash bags, sheeting, films, and flooring.

The following are the key messages from the MFA of LDPE/LLDPE (Figure 22):

The CFR rate for LDPE/LLDPE is estimated to be 20 to 50 percent. The wide range accounts for: (i) the uncertainty in practically estimating the CFR rate in Vietnam, and (ii) the variability in the CFR rate throughout the year. This CFR range is estimated based on the information obtained through interviews of local key stakeholders (recyclers, VPRA) and triangulated against verified capacities of formal recyclers, estimates of recycling capacities for other formal and informal recyclers, and craft villages. The variability in the CFR rate throughout the year is due to informal waste collectors, aggregators, and recyclers responding to recycled resin price fluctuations and other market forces. As rLDPE prices drop, these stakeholders slow down plastic waste collection and aggregation as recycling becomes less profitable. When rLDPE prices rise, collection increases again as these stakeholders take advantage of higher prices. The recycling rate also varies significantly between applications. The recycling rate for post-industrial LDPE is estimated to be at the higher end, while for post-consumer LDPE applications (e.g., films, plastic bags, composites, and so forth), it is estimated to be much lower.

A high proportion of LDPE is used for flexible films and pouches, which includes food packaging applications. These LDPE products are often contaminated and thus have lower value yields and remain uncollected (in the absence of an EPR scheme). Several recyclers

have also shared through interviews that they have also seen steadily growing demand for rLDPE to produce plastic bags for retail applications. However, once used, these plastic bag products are contaminated and therefore remain uncollected.

LDPE components that are non-recyclable are those used in composite products in industrial applications (e.g., in electronics and automotive). The composite nature of the products means that an additional step of dismantling and separation is required before it can be recycled.

Material value loss analysis for LDPE

Figure 23 below represents the value unlocked for LDPE based on the MFA for LDPE. The CFR is 35 percent (20 to 50 percent), and the value yield is 84 percent, resulting in 29 percent (17 to 42 percent) of the material value being unlocked. Therefore, 71 percent (58 to 83 percent) of the material value of LDPE is lost. This is equivalent to US$473 million to US$678 million of material value lost per year (see Appendix 7 for further information regarding the values and calculations).

Figure 22.
MATERIAL FLOW ANALYSIS OF LDPE/LLDPE RESIN (TONNES PER YEAR, 2019)

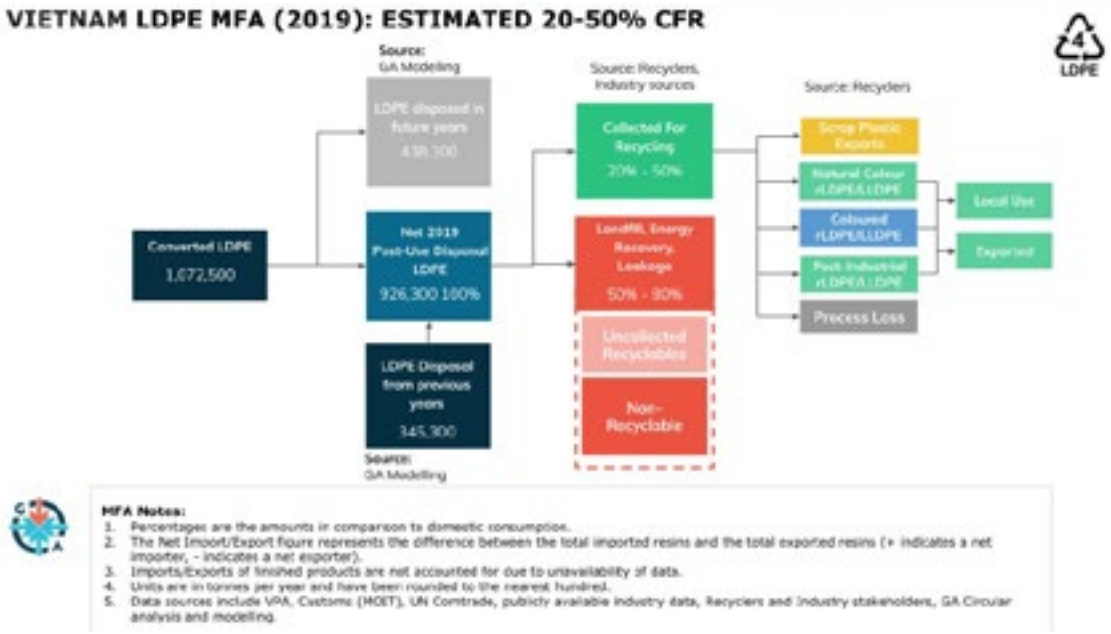
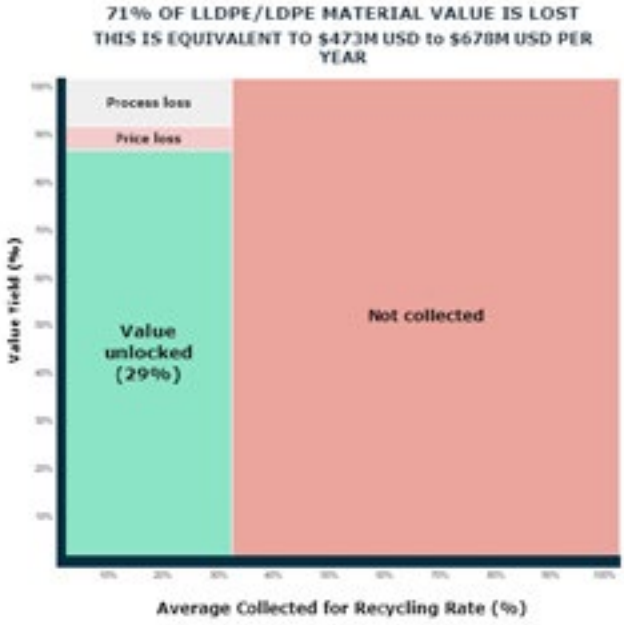


Figure 23.
MATERIAL VALUE LOSS ANALYSIS OF LDPE/LLDPE RESIN (2019)

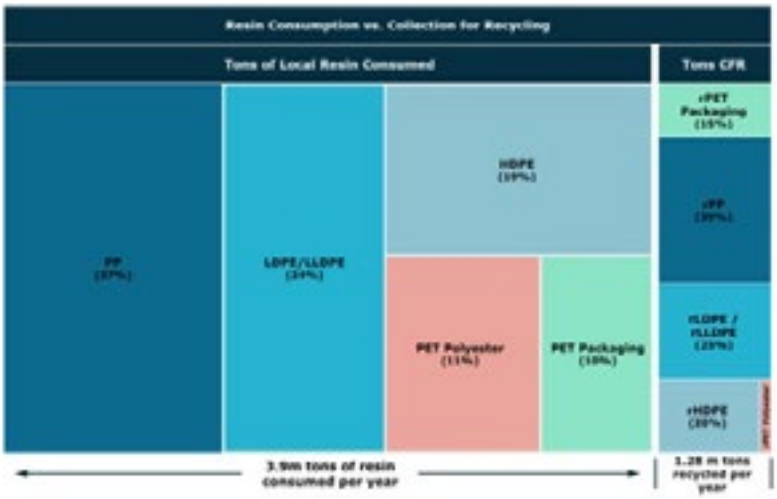


2.3 SUMMARY

Material flow analysis for all resins

The key messages from the comparison of the MFAs between the resins are as follows: 3.90 million TPY of the key resins are consumed in Vietnam. It is estimated that 1.28 million TPY (0.76 million to 1.81 million TPY as range) of this consumption are recycled while the remaining 2.62 million TPY (2.09 million to 3.14 million) are disposed of in sanitary and unsanitary landfills and dumpsites, incinerated, burnt via open burning, or disposed of, littered, or leaked onto land or into waterways (see Figure 24 below).

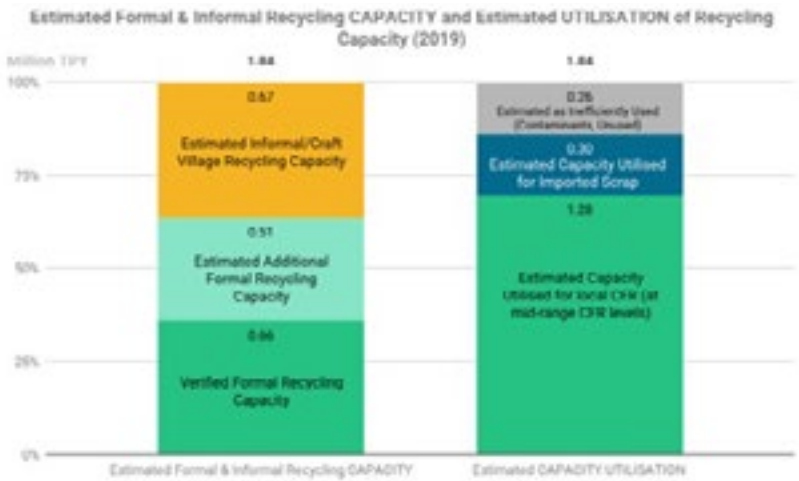
Figure 24.
ESTIMATED TOTAL COLLECTED-FOR-RECYCLING OUT OF TOTAL PLASTIC CONSUMPTION FOR EACH RESIN (TONNES PER YEAR, 2019)



Note: percentages are rounded to the nearest whole percentage. The rounded percentage for rPET polyester Tons CFR is zero percent.

Per Figure 25 below, it is estimated that there is 1.84 million TPY of formal and informal recycling capacity in Vietnam for PET, HDPE, LDPE, and PP, and that 1.28 million TPY of this capacity is utilized for locally sourced post-consumer and post-industrial plastic (i.e., contributing to local CFR rates), while 0.30 million TPY is utilized for imported plastic scrap. The remaining 0.26 million TPY of the capacity is inefficiently used due to contaminants in the feedstock and a lack of utilization (see Appendix 8 for further elaboration).

Figure 25.
ESTIMATED FORMAL AND INFORMAL RECYCLING CAPACITY AND ESTIMATED UTILIZATION OF RECYCLING CAPACITY (2019)



The weighted average of the estimated CFR rates of all the key resins is 33 percent, with the weighted low-range CFR rate at 19 percent and the weighted high range at 46 percent as shown in Figure 26 below. Vietnam has not published any targets for plastic CFR rates which this current CFR rate can be compared with. For context, the global CFR rate for PET packaging is between 55 and 57 percent,[43] which is slightly above Vietnam's PET packaging CFR. Global CFR rates specifically for polyolefins are unavailable. Specific to plastic packaging, the Ellen MacArthur Foundation estimates the CFR rate for all plastic packaging (i.e., packaging made from all types of plastic resins, that is PET, HDPE, PVC, LLDPE/LDPE, PP, PS, and others) to be 14 percent.[44]

PET packaging has the highest CFR rates of all four resins for several reasons. First, the number of end-use applications for PET packaging is limited compared to other materials, simplifying the collection process. Most of the PET usage is for food and beverage packaging. Hence, collectors can easily identify them (e.g., PET plastic bottles). By contrast, the other resins can be used in a wide range of applications such as electronics, automotive, and construction components, which complicates the process of collection and recycling. Second, mechanical recycling technologies and relatively high PET recycling capacities for processing post-consumer PET packaging into various applications already exist in Vietnam, based on demand from global and local end-use markets for recycled PET. Although the recycling capacities are lower than optimal, this gives PET packaging recycling a "head start" compared to recycling for other resins. Third, PET packaging has a much lower annual consumption than the other resins (about 389,500 TPY for PET packaging versus 1,427,800 TPY for PP, 745,400 TPY for HDPE, and 926,300 TPY for LDPE/LLDPE). Therefore, the baseline for calculating CFR is lower.

The CFR rates for PET, PP, HDPE, and LDPE/LLDPE in Vietnam are estimated to be higher than rates in Malaysia, the Philippines, and Thailand due to: (i) Larger concentration of informal recyclers in Vietnam, both within hundreds of craft villages and stand-alone informal recyclers, as compared to other countries.[45] (ii) Vietnam's GDP, which is lower than Malaysia and Thailand, assures a more active informal collection sector in Vietnam.[46] (iii) Relative ease and lower cost of operating a recycling business in Vietnam compared to the Philippines.[47] (iv) Proximity to China which is the largest buyer of recycled pellets and flakes. (v) Vietnam has significantly more formal polyolefin recyclers compared to Thailand.

43 S&P Global Platts - Petrochemicals Special Report (2019)

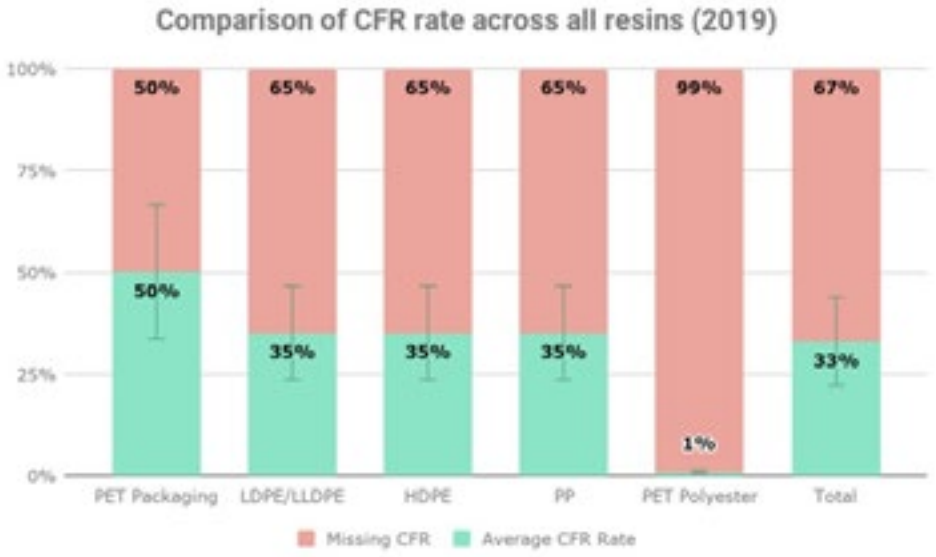
44 Ellen Macarthur Foundation - The New Plastics Economy: Catalysing Action (2017)

45 See appendix 8 for craft villages and informal recycler estimates for Vietnam

46 GA Circular, "Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia" (2019)

47 World Bank - Doing Business 2020 (2020)

Figure 26.
ESTIMATED CFR RATES FOR EACH RESIN



Material value loss analysis for all resins

The net material value lost each year in Vietnam, summarized in Figures 27 and 28 below, underlines the urgency to address plastic circularity and growing environmental pollution. The country currently unlocks US$872 million per year from recycling various plastic resins, which is equivalent to only 25 percent of the possible value from recycling being unlocked. This leads to a loss of approximately US$2.2 billion to US$2.9 billion per year (75 percent of the value). Vietnam has the potential to unlock material value up to US$3.4 billion per year from recycling various plastic resins by providing the right enabling environment that provides incentives for recycling and other systemic interventions. This is the addressable market opportunity for plastics recycling for Vietnam.

Figure 27.
ESTIMATED AVERAGE MATERIAL VALUE UNLOCKED VS. MATERIAL VALUE LOST (2019)

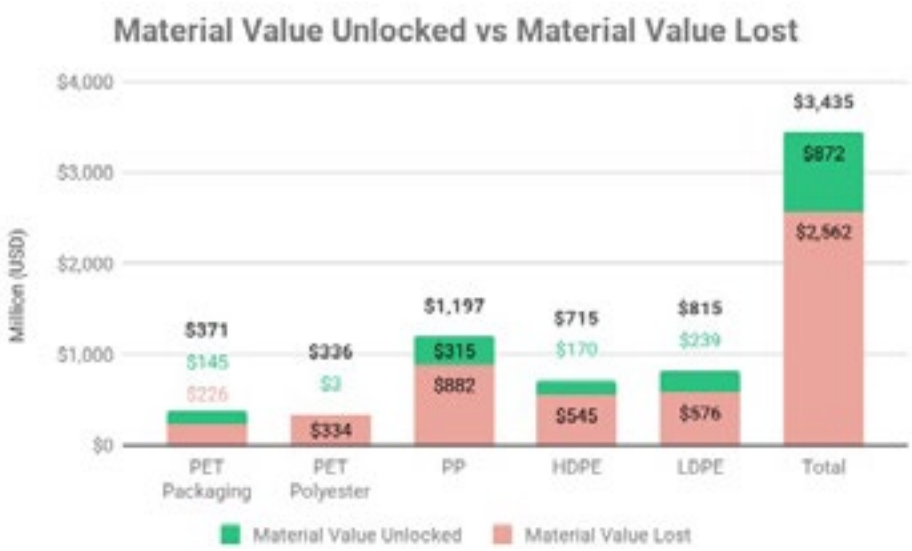
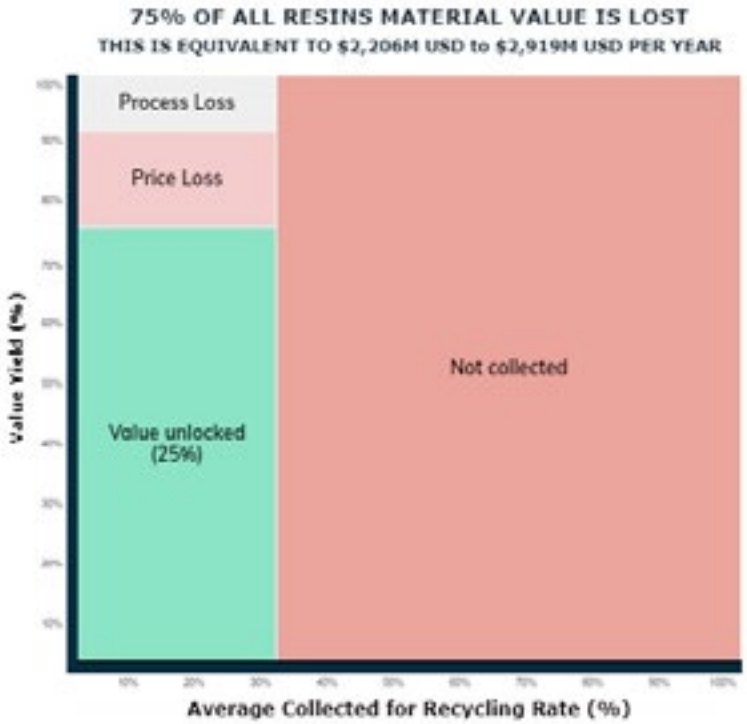
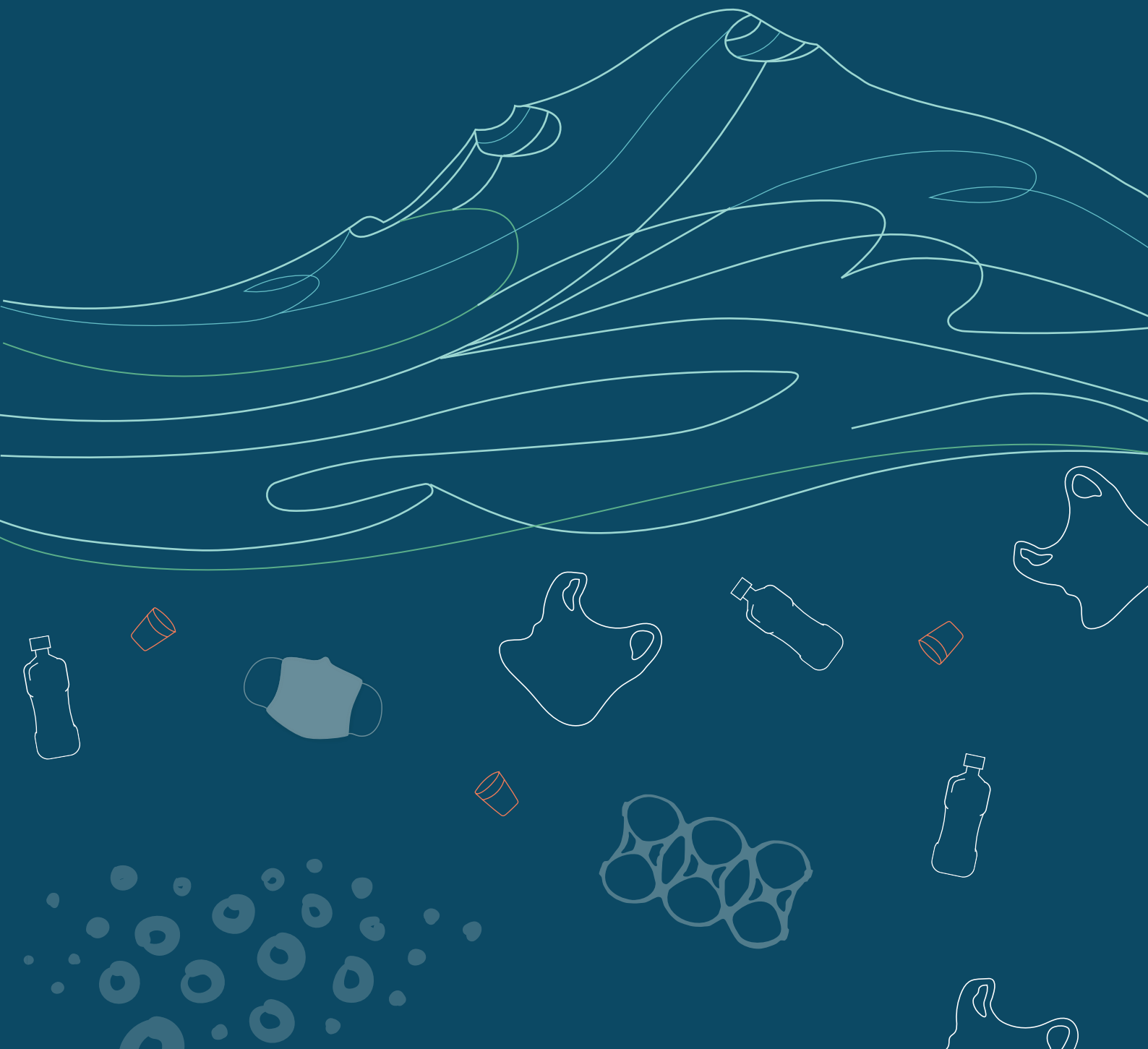


Figure 28.
ESTIMATED MATERIAL VALUE LOSS ANALYSIS FOR ALL KEY RESINS (PET, PP, HDPE, AND LDPE/LLDPE) (2019)



SECTION 3:

REASONS BEHIND THE 75 PERCENT LOSS OF MATERIAL VALUE OF PLASTICS



SECTION 3:

REASONS BEHIND THE 75 PERCENT LOSS OF MATERIAL VALUE OF PLASTICS

As mentioned in the preceding section, 2.62 million TPY (2.09 million to 3.14 million) of the total plastics consumed in Vietnam is not recycled, resulting in the loss of 75 percent of the material value. This section presents two main categories of pressures that cause this material value loss.

3.1 PRESSURES AFFECTING CFR RATE

Fall in virgin resin prices causing switch back to virgin resins, creating price pressures on recycled resins

The prices of recycled plastics are directly affected by fluctuating prices of virgin resins, which in turn are affected by global oil price volatility. Over the last three-year period, most recycled resins have seen a steady drop in global prices since peaking around mid-2018. Based on industry interviews in Southeast Asia, plastics recycling tends to be competitive when the oil prices are above US$70 per barrel, last reached in September 2018. The average price in 2020 was US$39 per barrel and as of October 2020 to January 2021, the price fluctuated between US$40-52 per barrel.

When competing just on price, recyclers in Vietnam report that their recycled products need to be priced between 15-30 percent less than virgin resin-based products to remain competitive. When virgin resin prices fall to equal or below recycled resin prices, manufacturers switch back to virgin resins, as has been the case during the last 12 months.

Public and private sector interventions are critical in driving up demand for recycled plastics, as demonstrated by several efforts in the EU that have accelerated the market value of recycled PET. The members of the European Federation of Bottled Waters, an industry association of bottlers in Europe, pledged publicly in May 2018 to include at least 25 percent of rPET into the production of new bottles by 2025 as an EU average. The European bottlers also pledged specific PET tonnage towards the EU target of using 10 million tonnes of recycled plastics in the EU market.[48] The EU's Single Use Plastics Directive, which entered into force in July 2019, mandates a target of 25 percent rPET usage in bottles by 2025 and 30 percent by 2030.[49] As a direct result of both efforts, the price of food-grade resins such as food-grade rPET has begun a partial decoupling from virgin PET prices from August 2018 onwards (as can be seen in figure 29 below).

48 Reuters, "Europe's bottled water producers seek to increase plastic recycling" (2018)
49 Zero Waste Europe, "Unfolding the Single-use Plastics Directive" (2019)

Figure 29.
EU PRICE COMPARISON OF VIRGIN PET AND RECYCLED PET

Source: Market data
Note: EU prices for virgin plastics and recycled plastics have been used as a proxy for global prices because it is the region that has the greatest price transparency/data availability for virgin prices and recycled prices.

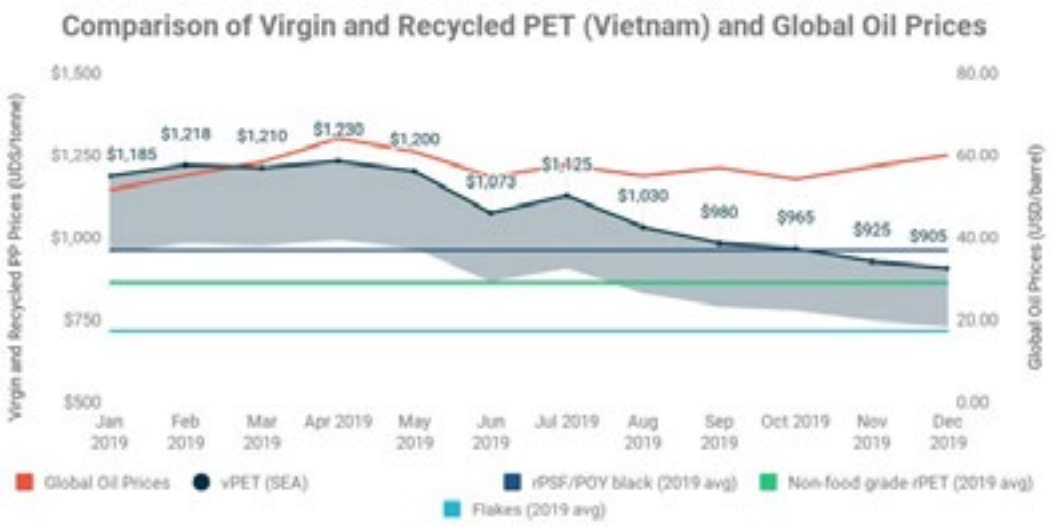
However, as no such specific recycled content targets exist for PP, HDPE, LDPE/LLDPE, the prices for these recycled resins have remained low compared to their virgin resin counterparts and have not seen a significant increase in prices as compared to rPET.

Thus, given the current coupling between virgin plastic prices and recycled plastic prices, the economics of plastics recycling is not sustainable when oil prices are below US$70-80 per barrel. Structural and systemic corrective measures, especially supporting legislation, are needed to ensure the recycling industry remains competitive against virgin plastic prices.

Recyclers in Vietnam will continue to remain fully exposed to global drops in oil and virgin plastics prices without government intervention, thus reducing the CFR rate and increasing the risk of bankruptcy, especially for SMEs. As seen in Figure 30 below, recycled PET struggled to compete in 2019 due to falling virgin resin prices in Vietnam. The shaded grey area indicates a 0 percent to 20 percent reduction in virgin PET prices. The price of rPSF per POY (see figure notes) exceeded the price of virgin PET while non-food grade rPET fell within the 20 percent virgin PET price variance zone. Appendix 10 provides additional data price comparisons between virgin and recycled PP, PET, and LDPE in Europe and Vietnam.


Photo: www.unplash.com

Figure 30.
COMPARISON OF VIRGIN PET AND RECYCLED PET PRICES IN VIETNAM AND GLOBAL OIL PRICES



Source: VPA and virgin resin producers for Virgin Resin Prices and recyclers for recycled resin prices.

Note: Monthly recycled prices are not available, and thus 2019 average recycled sales prices obtained from recyclers in Vietnam have been used for comparison. The grey-colored shaded area indicates between a 0-20 percent reduction against virgin prices.

Based on industry sources for Vietnam, to achieve breakeven status, formal recyclers, who follow applicable environmental, health, and safety (EHS) standards, need virgin prices to be between approximately US$760 to US$1,065 per ton. Meanwhile, to obtain 15 percent profit (as a reference benchmark), the virgin prices would need to be between US$1,246 to US$1,370 per ton. As seen in Table 4 below, the virgin prices for a few of the polymer types (mainly HDPE and LDPE) in 2020 were below the levels required for the recycling industry to make a profit. Thus, enabling policy interventions is critical for the domestic plastic recycling industry to survive and grow.

Table 4.
COMPARISON OF VIRGIN RESIN PRICES IN VIETNAM COMPARED TO PRICES REQUIRED FOR VIABILITY OF PLASTIC RECYCLING BUSINESSES

VIETNAM VIRGIN RESIN PRICE COMPARISON AGAINST PRICES REQUIRED FOR VIABILITY OF PLASTIC RECYCLING BUSINESSES				
	2019 (US$/Ton	2020 (US$/Ton)	Virgin Price that enables recyclers to break even	Virgin price that enables recyclers to obtain 15% profit
PP	$1,077	$921	$799	$1,246
HDPE	$1,019	$921	$939	$1,320
LDPE	$991	$827	$1,065	$1,370
PET	$1,099	$835	$760	$1,295

Sources: Vietnam Plastics Association and resin producers for virgin resin prices in 2019 and 2020.

The EU, UK, India, and several other countries have mandated recycled content targets to create market demand and drive local recycling rates, which should also help reduce the direct impact of low oil prices on recyclers. These mandated requirements acknowledge that voluntary industry initiatives by themselves are not sufficient to scale up recycling significantly. Additionally, today's virgin plastic market prices do not factor in the environmental impact, the cost of plastic waste management, and other negative externalities currently borne by society. Government intervention would thus be essential for addressing this market failure. There are currently no mandated recycled content requirements for plastics in Vietnam.

A lack of sustained local demand for recycled plastics across all key resins

As highlighted in the previous section, the plastics recycling value chain without interventions will continue to face significant pressures from low oil and virgin resin prices. Sustained local demand will be needed from within Vietnam to decouple from those price pressures.

Need to stimulate local demand for recycled content

Currently, there are no recycled content requirements for the packaging industry or other plastic applications in Vietnam. However, the latest update in the LEP approved in November 2020 addresses several policy areas, including recycled content targets and Extended Producer Responsibility (EPR). Articles within the LEP framework on plastics require further actions: First, delegation is needed because government agencies are currently unclear who has responsibility. Second, as the LEP will become effective January 1st, 2022, the decrees and circulars must be fully developed by this date for the relevant agency to enforce each article of the LEP. Third, the underlying policies should include clear recycled content minimum targets.

Critical need for the creation of detailed targets within the decrees and circulars for the new LEP

The key articles related to recycled plastic content and EPR under the new LEP are 53, 54, and 55, as highlighted in Table 5 below. The articles are an improvement on the 2014 LEP. However, the decrees and circulars must be implementable and have clear and realistic targets.

Photo: www.unplash.com

Table5.
KEY ARTICLES RELATED TO PLASTICS CIRCULARITY (RECYCLED CONTENT AND EPR)

Article	Key elements of each article	Critical components for the decrees and circulars (list is not exhaustive)
Article 53: Environmental protection responsibilities related to production, business, and service industries	• This article discusses treatment of various waste types. However, most of the article is focused on wastewater treatment with no clear guidelines for plastic waste management. It requires targeted industries to collect, classify, store, reuse, recycle, and treat various wastes.	• Mandatory targets for Collection-for-Recycling rate. The targets should be calibrated based on how recyclable the resins and products are and how developed the recycling infrastructure is. • Modulated fees (i.e., eco-modulation) for different plastic packaging (and other packaging) types. The fee should be lower for more recyclable packaging and higher for lower-value and non-recyclable packaging. • Mandatory recycled content targets. The setting of specific recycled content targets and milestones for these targets should consider, at minimum, installed recycling capacity, quality requirements, local SWM infrastructure, and cost-benefit analysis of the recycling targets. It is recommended that any recycled content rate targets are set at a resin-level or an end-use application level.
Article 54: Responsibility for recycling by producers and importers	• This article states the responsibility of organizations that manufacture or import products and packages with recycling value must recycle according to the compulsory recycling rates and specifications. • The article allows for the contribution to the Vietnam Environment Protection Fund or the responsible party to manage their own recycling program. It will require industries to submit recycling plans and annual recycling results.	
Article 55: Responsibilities for collection and treatment of waste by producers and importers	• Organizations that manufacture or import products and packages containing toxic substances, which are difficult to recycle or cause difficulties for collection and treatment, must financially support activities in the Vietnam Environment Protection Fund. • Organizations mentioned in this article are required to make financial contributions to the Vietnam Environment Protection Fund, and the financial contribution is calculated by the volume or unit of product or packaging sold. • The article states that the activities supported by the Vietnam Environment Protection Fund include: (i) collection, transportation, and treatment of solid waste generated from households and individuals; (ii) research and development of technology, techniques, and initiatives for solid waste treatment, and (iii) collect, transport, and treat plant protection chemical packages.	


Photo: Miquelito - Shutterstock

Creation of government requirement for sustained demand for recycled content

Vietnam's government is a major procurer of goods and services, which provides a strategic opportunity to build sustained local demand for sustainable products, including recycled plastics. However, previous efforts for a green public procurement framework under the previous 2014 update to the LEP had several issues: (i) The criteria for purchasing was equivalent to Vietnam's Green Label Criteria, which has few existing product categories and certified products to select from; (ii) lack of a clear implementation plan; and (iii) conflicts with existing regulations, namely the legislation of public procurement, Law on Public Investment as these laws do not list environmental or sustainable products as criteria for evaluating the tenderer.

Under the latest 2020 update to the LEP, green public procurement guidance remains unclear. The article (146) is limited to two brief clauses. Clause 1 focuses on the procurement of Vietnam green label products. Vietnam green label is a label certified by a competent authority of Vietnam for a product or service-friendly environment. However, there is no clear guidance on selection criteria of products or which government authority is responsible. Clause 2 prioritizes the implementation of green procurement for investment projects and tasks using the state budget according to the government's regulations. However, it does not mention what those regulations are.

This, therefore, highlights the need to ensure that the relevant underlying decrees and circulars have a clear and structured framework for successful GPP implementation under article 146 of the LEP.

Implementation of recycled content targets for key resins

Mandatory recycled content targets provide a significant opportunity to generate sustained demand for a more resilient recycling industry in Vietnam. With regards to the ability of national recyclers to fulfill recycled content targets as of 2019, there is already sufficient recycling capacity in the country to enable the implementation of recycled content targets of a minimum 20 percent for PET packaging, PP, HDPE and LDPE/LLDPE in 2030, as can be seen in Appendix 11. However, further investments need to be made into existing and/or new plants to increase food-grade recycled content production. While food-grade applications present an opportunity to stimulate local demand, there has yet to be clear regulation regarding its usage in Vietnam. Duy Tan is currently leading Food-grade rPET opportunities as they begin plans to seek US FDA food-grade certification.

Although there is currently sufficient capacity to achieve these recycled content targets, most plastic products in Vietnam do not contain recycled content because recycled content targets are now voluntary. Thus, mandating recycled content targets would ensure a steady local demand for recycled content, which would help to drive CFR rates in Vietnam.

The following are examples of enabling policies from benchmark countries that stimulate local demand while reducing the recycling industry's exposure to price volatility (see Appendix 13 for details):

Box 1.

ENABLING POLICIES FOR PLASTICS CIRCULARITY FROM BENCHMARK COUNTRIES

PACKAGING:

The EU Single-Use Plastics Directive specifically requires all PET plastic bottles to meet a 25 percent recycled content target by 2025 and 30 percent recycled content target by 2030.

The UK recently announced that the tax on plastic packaging containing less than 30 percent recycled content will come into force in April 2022 and be set at £200 per tonne.

GENERAL:

The EU has implemented a €0.80 per kg tax covering every kg of non-recycled plastics produced in the EU. The EU Strategy for Plastics in the Circular Economy has outlined plans for future targeted sectoral interventions to uptake recycled plastic content, such as in the construction and automotive sectors.

Under the EU Strategy for Plastics in the Circular Economy, the European Commission calls on stakeholders to come forward with voluntary pledges to boost the uptake of recycled plastics. The objective is to ensure that by 2025 10 million tonnes of recycled plastics find their way into new products on the EU market.

The EU is integrating recycled content in Ecolabel and Green Public Procurement criteria. The French government initiative Objective to Recycle Plastics (ORPLAST) and Italy's new rules on public procurement are two good examples of what could be achieved at the national level. The ORPLAST project of the Environment Agency (ADEME) in France supports 33 industry projects for the reincorporation of recycled plastics by helping manufacturers to research and invest in the use of recycled material. The project also combines a grant to fill the gap between the price of fossil plastics and the price of recycled ones.

Maharashtra state in India will require all manufacturers of industrial plastics to use 25 percent recycled content.

EPR tools, such as mandating recycled content targets, are key to decoupling recycled plastic demand from fluctuating virgin plastic prices. Such mandates are needed to create the enabling environment for investments into plastics circularity. However, mandating recycled content is not without its challenges. Appendix 11.1 illustrates challenges that need to be overcome for recycled content targets to be effective.

Small and inaccessible financing options for the plastic recycling industry

Over the past two decades, the petrochemical industry has received a range of tax and non-tax incentives for projects, such as tax incentives, pricing support, or land use rights.[50] In comparison, the Vietnam government currently has no specific incentives to support the plastic recycling industry directly. From a private sector financing perspective, while there is momentum towards financing the development of a circular economy, challenges remain specifically in the ability of such financing options to meet the needs of plastic recyclers.

The government's current incentives are not targeting plastic recycling

Over 90 percent of the formal recyclers consulted for this study said there is no clear financial support or incentives for plastics recycling currently provided for by the government. The remaining 10 percent were aware that the Vietnam Environment Protection Fund (VEPF) could be a source of financial support. The VEPF was established in 2001 and is the only green fund managed by the government via the Ministry of Natural Resources and Environment (MONRE). The fund provides financial support for programs, projects, and activities on natural and biodiversity conservation, prevention, and remedy of national significant impact environmental issues. The fund has provided soft loans of VNĐ2,650 billion (US$115 million) for 275 projects related to wastewater

50 The specificity of these incentives is not clearly stated and are on a case-by-case basis and decided at a provincial level as shared by representatives from the VPA.

treatment, treatment of household solid waste and hazardous waste, and renewable energy.[51] Specific to plastic recycling, Decision No.11/QD-HDQL of 28 December 2018 lists selection criteria for preferential loans for products/sectors, including solid waste recycling and activities of waste treatment facilities (domestic, industrial, and hazardous waste). However, none of the plastic recyclers interviewed have applied for VEPF funding due to lack of awareness (only 10 percent were aware) and the perceived lack of clarity for the VEPF application process.[52]

As there are no investment incentives specifically targeting plastic recycling, there is a lack of understanding of available government financing support amongst plastic recyclers. Recyclers shared the difficulty in starting a formal recycling business. They stated the need for incentives during the start-up phase of their operations to allow for a more 'level-playing' field, especially with the informal recycling sector. The recyclers see themselves operating businesses supporting Vietnam's National Action Plan for Management of Marine Plastic Litter by 2030, specifically the 75 percent reduction target of marine plastics, and therefore need incentives from the government.

To move towards higher plastic CFR rates, incentives for plastic recycling need to be on par or higher than those for the virgin plastics industry. Incentives could include tax exemptions for new businesses, the exemption for import duties on machinery, and additional deductions for labor expenses. While such incentives are a step in the right direction and can especially encourage the growth of new businesses, they can have limited effectiveness in financially supporting the struggling recyclers to maintain or grow their business. As in renewable energy, the idea behind incentive for recycled or reused materials is to encourage innovation to support a stable market. Once the market is established and recycled materials can compete on cost grounds with virgin material, incentives could be decreased or phased out.[53] This is especially relevant when the recycled plastics industry is under intense competition with virgin plastics due to low oil prices (as outlined in Section 3.1.1).

Commercial bank financing is not accessible to most recyclers

Recyclers can apply for either standard bank loans or green financing.

Standard bank loans: Many plastic recyclers in Vietnam report having a high rejection rate for standard bank loans as they are severely undercapitalized. There are three reasons for the rejection. First, plastic recyclers are typically small-scale family businesses and do not have enough collateral assets, such as property or land, that many commercial banks require to guarantee loans. Second, the recyclers lack transparent financial records for proof of income and operating costs as many of their transactions are cash-based. Recyclers who purchase feedstock from the informal sector cannot receive proper receipts with the value-added tax (VAT) invoices (also known as red invoices). Consequently, such transactions would not be reflected on their tax returns. Third, the recyclers are unable to separate their recycling versus non-recycling income streams as many of them also operate as traders to ensure the overall financial viability of their business. Finally, financing of plastic recycling projects by local commercial banks (and via foreign direct investment) is constrained by inability of local players, especially SMEs to meet applicable EHS standards.

This suggests the need for the government to provide a loan guarantee program that could enable plastic recycling and plastics circularity businesses, especially small and medium-sized enterprises (SMEs), which do not have collateral to obtain loans from banks.

Green financing: Specific to green financing, green loans are now being provided, at minimum, by Vietnam Prosperity Joint Stock Commercial Bank (VPBank), HSBC and some other local commercial banks. In January 2020, the IFC provided a financing package worth US$212.5 million to VPBank to expand its lending to SMEs and boost financing, especially for climate-friendly projects. This was one of Vietnam's first green loan transactions and provided an opportunity for VPBank to pioneer green finance in Vietnam, including in the circular economy transition. In July 2020, HSBC signed a green credit agreement with Duy Tan Plastics Corporation. Appendix 12 contains further details about VPBank, and Box 2 below provides an example of a recent green loan for a domestic plastic recycler.

51 Viet Nam Environment Protection Fund - Introduction

52 Despite the presence of a loan application guide on the VEPF website, recyclers interviewed noted the lack of clarity for the VEPF application process.

53 Green Alliance - Completing the Circle, Creating Effective UK Markets for Recovered Resources (2018)

Box 2.

DUY TAN PLASTICS RECEIVES FIRST GREEN LOAN FROM HSBC VIETNAM

In July 2020, HSBC Vietnam signed a green credit agreement with Duy Tan Plastics Corporation to finance the first stage of Duy Tan's plastics recycling facility with a loan of US$60 million. This made it the first green loan that HSBC has arranged for a company in Vietnam.[54] With a planned capacity of up to 100,000 TPY by 2025, the factory would be Vietnam's first bottle-to-bottle recycling facility. The facility would be focused on producing PET bottles and adjust the line and capacity for HDPE output depending on client demands.

To secure a green credit line from HSBC, Duy Tan's project had to meet the strict credit approval and management process of HSBC's Asia Pacific Sustainable Loans Committee. In addition, it had to meet the high standards of the international Green Loan Principles jointly issued by Loan Market Association and Asia Pacific Loan Market Association that cover four core components: the use of proceeds, project selection and evaluation, management of proceeds, and reporting.

54 Vietnam Investment Review, Vietnam rolls out first green financing package for duy tan plastics recycling, 2020

Despite this positive progress, challenges remain for green financing options to meet the needs of plastic recyclers, especially SMEs. These challenges include:

- *Stringent requirements for green loans:* While stringent requirements are necessary, the requirements for green loans are greater than standard bank loans (see Appendix 12.2 for the requirements for the VPbank green loans). Therefore, many recyclers (especially SMEs) are unable to meet the requirements.
- *Lack of awareness amongst recyclers about green loans:* More than 75 percent of the recyclers interviewed as part of this study reported a lack of knowledge about any available green financing options. Specific to VPBank, VPBank reported that only one plastic recycler had applied for the loan thus far (and this recycler's application was not approved due to lack of clear profit and loss statements.
- *Smaller loan needs.* Small to medium recyclers who are interested in financial assistance are generally in need of much smaller-sized loans (US$10,000 to US$500,000) for various purposes, ranging from increasing headcount, loan repayments, improving their recycling technologies or expanding their capacity. Meanwhile, banks generally prefer the provision of large-sized loans to larger and healthy businesses.

Apart from the government loan guarantee program highlighted above, these green financing challenges suggest an opportunity to increase green financing of plastic recyclers and plastic circularity businesses. What is needed is greater communication/awareness about the green loans and capacity building/training of plastic recyclers to meet the loan requirements and adjust the loan sizes.

> "We didn't know of these green financing programs. Even then, we see these large financing programs only benefiting the already cash-rich companies."
>
> *Recycling stakeholder from Hanoi, Vietnam*

Examples of enabling policies from benchmark countries

The following are examples of enabling policies from benchmark countries that support the recycling industry (further details are in Appendix 13):

- Under the EU Strategy for Plastics in the Circular Economy, more than €5.5 billion has been allocated to improved waste management across Europe. This is expected to create 5.8 million TPY of additional waste recycling capacity. An example of this is the over €1.5 million to support the Walloon Region of Belgium for the ERDF Technopoly Recyclage project implementing an innovative process for recycling rigid plastic waste at the landfill itself.

- Under the EU's Horizon 2020 funding, more than €250 million has been allocated for research and development linked to plastics in the circular economy. An additional €100 million by 2020 has been assigned to financing priority actions, including the development of smarter and more recyclable plastics materials, more efficient recycling processes and the removal of hazardous substances and contaminants from recycled plastics.
- Under the European Fund for Strategic Investments, a €7.5 million loan has been given to GreenFiber International SA to finance a recycling and circular economy project to create 280 full-time jobs and over 50,000 tonnes of waste collected and processed per year.
- Japan follows a policy of the mainstreaming of ESG/ Sustainable Development Goals (SDG) financing. Under this policy, which covers circular economy and climate change, several guidelines have been developed, for example, on company assessment and information disclosure. A high-level panel on ESG finance comprising top business leaders has also been set up.

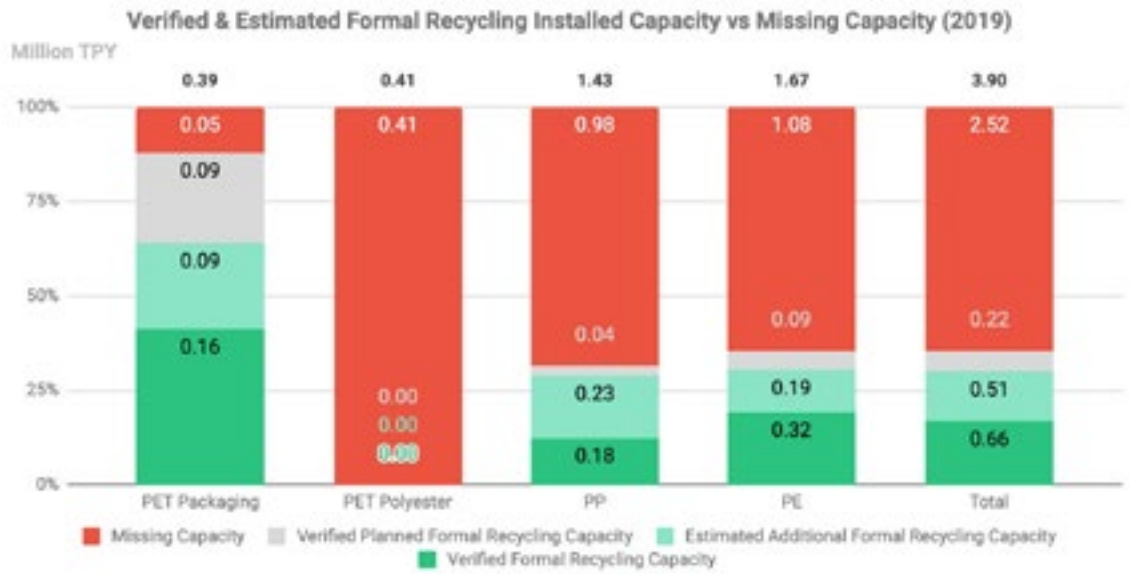
Gap in recycling capacities and need for advanced recycling facilities

The gap between total resins consumed across the key resins and estimated existing formal capacity for these resins is equivalent to 2.73 million TPY or 70 percent.[55] This gap is most pronounced for PET Polyester (100 percent gap), followed by PP (71 percent gap) and PE (70 percent gap). The gap for PET Packaging is the lowest (36 percent gap). This gap will be slightly reduced with additional capacity due to come online between 2020 and 2025. Based on interviews with formal recyclers, planned investments in additional recycling capacity totals 0.22 million TPY of which 0.09 million TPY is for PET packaging (see figure 31 below). Even when accounting for the informal industry and planned expansions, the missing capacity is still significant at 49 percent of resins consumed.[56]

55 This value is based on a 100 percent recycling rate that is used for illustrative purposes as targets for recycling and material value extraction are set based on 100 percent of market inputs / material.

56 For more information regarding informal recyclers installed capacity estimations please refer to Appendix 8.

Figure 31.
ESTIMATED MISSING CAPACITY VS. INSTALLED CAPACITY FOR RECYCLING OF KEY RESINS IN VIETNAM (2019)



Notes: Please refer to Appendix 8D for details of verified and estimated formal recycling capacity.

A lack of local demand for recycled plastics, especially for high-value end-use applications, leads to poorer margins and eventually results in a significant gap for investments into more advanced recycling facilities. Many of the recyclers interviewed for this study have outdated equipment and still rely on manual labor, even where automation can bring about cost savings and better long-term profitability. In addition, many recyclers lack proper occupational safety equipment and wastewater treatment facilities.

EPR mechanisms (such as those proposed under the 2020 Law of Environmental Protection) for each industry would help clarify the responsibilities of all key stakeholders in the plastic value chain, set binding targets for waste collection and recycling or recovery. They can also provide the enabling environment for investments in increased recycling capacities. In some countries with remarkably high recycling rates, for example, most separate collection and treatment costs for packaging waste are financed through contributions paid by the producers.[57] In the absence of an EPR policy, industries are not obliged to encourage investments into local recycling capacities, consequently resulting in lower CFR rates, especially for low-value wastes that are not collected.

The following, in Box 3, are examples of enabling policies from benchmark countries that support the increase in recycling capacity and implementation of EPR (details are provided in Appendix 13):

57 European Commission, "EU Strategy for Plastics in the Circular Economy" (2018)

Box 3.

ENABLING POLICIES FOR RECYCLING AND EPR FROM BENCHMARK COUNTRIES

PACKAGING:

The EU's Single Use Plastics Directive requires all EU member states to recycle at least 55 percent of all plastics packaging by 2030. Single-use plastic drink bottles specifically have an even higher targeted CFR rate of 77 percent by 2025 and 90 percent by 2029.

Understanding that setting targets alone is not enough, the EU Single Use Plastics Directive also requires EU member states to implement Extended Producer Responsibility (EPR) schemes, covering the costs of collection, transport, and treatment, cleanup litter and awareness-raising measures for food containers, packets and wrappers, cups for beverages, beverage containers with a capacity of up to three liters, lightweight plastic carrier bags and fishing gear, all by 31 December 2024.

Many EU member states already have such EPR schemes for packaging in place for over twenty years, allowing the EU to reach a 42 percent CFR rate for plastic packaging as of 2017.

India's draft 2019 National Resource Efficiency Policy sets targets for packaging recycling, including 100 percent recycling rate for PET packaging by 2025 and 75 percent recycling and reuse rate for other plastics by 2030. Additionally, the Uniform Framework for EPR in India 2020 outlines options for packaging producers in India to set up EPR via either a fee-based model or a PRO model.

ELECTRONICS:

The EU's Waste Electrical and Electronic Equipment (WEEE) Directive 2012/19/EU provides for the creation of collection schemes where consumers return their WEEE free of charge.

Under Japan's Home Appliance Recycling Law, covering electronics products, manufacturers are required to take back home appliances, which they have manufactured or imported from retailers and recycle them. The law assigns responsibilities for each stakeholder across the product's life cycle. It compels stakeholders such as retailers and manufacturers to provide collection infrastructure like drop-off sites and take-back services. For stakeholders who do not have the ability to provide collection systems, such as households, recycling fees are mandatory to help fund the collection system.

CONSTRUCTION:

Singapore's BCA Green Mark Scheme encourages the use of sustainable materials in construction and the provision of recyclables collection infrastructure.

TEXTILE:

The EU's First Circular Economy Package (2018) requires member states to ensure that textiles are collected separately by 2025.

Inconsistent and at-risk supply from the informal sector

Like many of its Southeast Asian neighbors, Vietnam relies heavily on the informal sector to collect recyclable materials, including plastics. Previous research by the study team found the CFR rate for PET bottles to be 62 percent in Ho Chi Minh City and 39 percent in Hanoi. According to an estimate, 90 percent of these PET bottles, collected for recycling, are handled by the informal sector.[58] Based on stakeholder interviews, the situation is similar for other plastics, particularly post-consumer plastics, and other packaging materials. Taking Ho Chi Minh City as an example of an urban area in Vietnam, the informal sector is an integral part of the solid waste management (SWM) system.[59] Reportedly, the informal waste collector workforce comprises 6,200 people, i.e., 2,000 street material pickers and 4,200 independent waste pickers.[60]

The informal sector plays a significant role in waste collection and sorting in the absence of scalable formal avenues of collecting resins for recycling (e.g., source segregation of recyclables, dedicated materials recovery facilities for recyclables). This creates a parallel but inefficient system of recyclables collection, alongside formal MSW collection, with materials collected by informal and formal collectors sold through a fragmented network of junk shops to waste aggregators and recyclers. In addition, the informal sector typically collects and sorts wastes under poor working conditions with its underlying EHS risks.

The heavy reliance on the informal sector poses a challenge for recyclers as there is high volatility in the volume and pricing of the informal trade. It is common practice for the informal sector to curb operations when buying prices drop for recycled plastics. For that reason, recyclers have consistently pointed out that access to stable and sufficient feedstock (in terms of quality, prices, and volumes) is a major challenge.

Past studies conducted by this study team in Vietnam and other Southeast Asian countries in 2017 and 2018 revealed that falling prices of recyclables and the increasing cost of living have made collecting recyclables challenging for the informal workers.[61] If recyclables collection was being prioritized and handled by the formal waste collection system, the CFR rates would be expected to increase as cities develop. However, this is not the case across Southeast Asia as collection is still highly dependent on the informal sector. As a result, CFR rates are typically lower in more developed cities such as Kuala Lumpur and Bangkok as seen in the graph below. Therefore, continued reliance on the informal sector in the cities of Vietnam could possibly cause a decline in CFR rate as GDP per capita grows in the coming decade.

The impact of heavy reliance on the informal sector in Vietnam has been visible during the ongoing COVID-19 pandemic. During the lockdown, informal waste collectors and aggregators were not allowed to work as they are not considered essential services. Even after the end of lockdowns, only 50 to 70 percent of recyclers are operating. The reasons for this are reduced demand for recycled resins, low sales prices, deficiency in feedstock availability, and a lack of workers due to social distancing restrictions placed on them.[62]

58 GA Circular, "Full Circle: Accelerating the Circular Economy for Post-Consumer PET Bottles in Southeast Asia" (2019)

59 USAID, "Behavior Change in Local Systems to Mitigate Ocean Plastic Pollution" (2020)

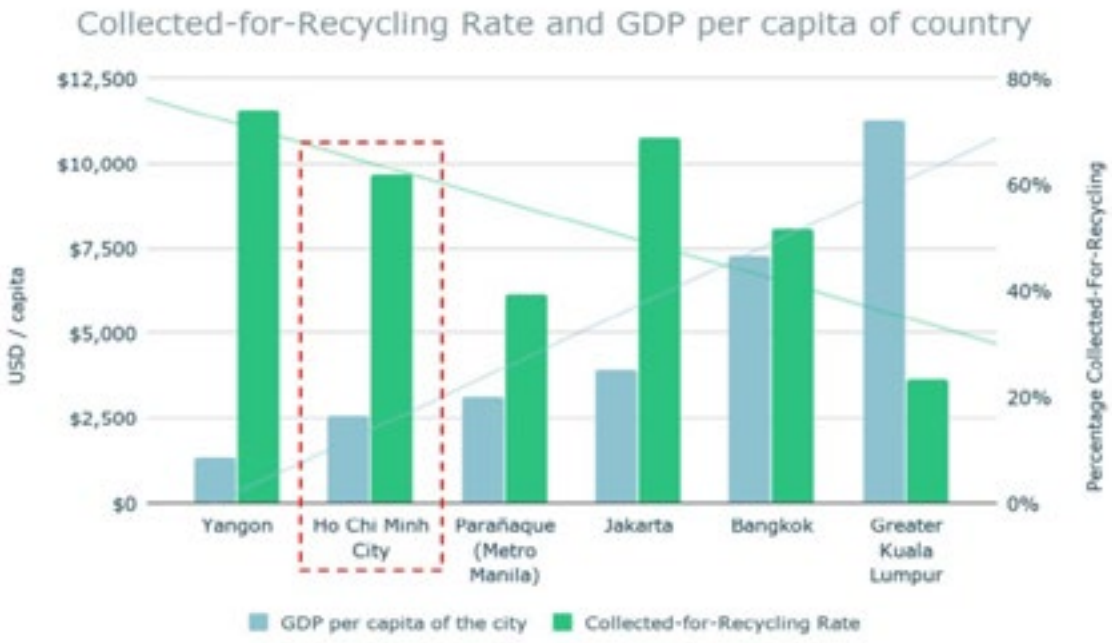
60 A study done by ENDA places the number of informal waste pickers/collectors. Street waste pickers are defined as individuals who collect recyclables on the street and/or purchase them from households while independent waste collectors refers to individuals who collect domestic waste from households, transport waste to transfer stations and remove recyclable material including plastics for recycling.

61 GA Circular, "Full Circle: Accelerating The Circular Economy For Post-consumer Pet Bottles In Southeast Asia" (2019)

62 GA Circular & Circulate Capital - Safeguarding the Plastic Recycling Value Chain (2020)

> "The supply from the informal collection sector can stop anytime when there is no demand."
>
> *Recycler stakeholder in Vietnam*

Figure 32.
GDP PER CAPITA AND CFR RATES FOR SELECTED CITIES IN SOUTHEAST ASIA



Source: GA Circular Research

The CFR rate for various plastics could decline over the next decade in Vietnam unless necessary steps are taken for the greater formalization of collection for plastics, coupled with better integration of the informal sector. This decline, along with expected tighter controls on imported scrap plastic by 2025, will pose serious feedstock challenges for recyclers.

An example of the enabling policy comes from a benchmark country, India, that supports recognition and integration of the informal sector, evident in its 2020 document, "Guidelines for Uniform Framework for Extended Producers' Responsibility under Plastic Waste Management Rules 2016." Accordingly, the guiding principles promote enhancing the circularity of plastics by incentivizing source separation recycling programs such as providing direct and indirect support for improving the working conditions and incomes of informal recyclers. The principles call for formalization and further strengthening of informal sector stakeholders like waste pickers, junk shops, and aggregators for proper implementation of the EPR model. Under the guidelines, waste management agencies are required to engage with informal waste pickers and create an opportunity for them to participate in the formalized waste management systems that ensure adequate environmental, health, and safe working conditions, occupational recognition, respect, and dignity, fair business models, auditing of waste management operations, communication, education, and inclusion initiatives for waste workers, and other activities for integration of the informal sector into the formal sector.

MSW system prioritizing collection and landfill disposal over recycling

MSW generation in Vietnam is expected to grow rapidly from 26 million TPY in 2018 to 38 million TPY by 2030 – a 45 percent increase. Plastic waste generation is anticipated to grow by 103 percent between 2018 and 2030 while the proportion of plastics in MSW is expected to increase from 14 to 20 percent as the country continues to urbanize.[63] Furthermore, e-waste, C&D waste, and food waste will emerge as new issues to be resolved.

The existing MSW system in Vietnam is designed to collect and dispose of waste mostly into landfills (most of which are not sanitary) and some into incinerators or compost facilities with little to no formal recycling. Although Vietnam's National Strategy on Integrated Solid Waste Management to 2025 sets targets for waste separation, collection, and recycling, there has

63 GA Circular report commissioned by the World Economic Forum for the National Plastic Action Partnership (NPAP), "Radically Reducing Plastic Leakage in Vietnam: Action Roadmap" (Manuscript submitted for publication)

been little to no implementation of separate collection and recycling of plastics and other recyclables. Taking Ho Chi Minh City as an example, as of 2020, there was no formal, separate collection of waste, and 69 percent of the waste collected continues to be sent to landfills, with the remaining 31 percent being sent to compost and incineration facilities.[64] Also, there is no further sorting of collected waste at transfer stations for recycling purposes.

The updated LEP passed in November 2020 contains several articles to address formalization of collection services and enhanced "3R" (Reduce, Reuse, and Recycle) efforts by the public and the private sector. However, most stakeholders interviewed for this study believe it will take many years before widespread implementation becomes effective.

The MSW infrastructure in Vietnam is currently not designed to promote circularity, because there are no targets for municipalities to divert waste away from landfills and increase recycling (although there are national targets to reduce landfilling to 80% by 2025). Without waste segregation at the source, the quality of plastics collected through the MSW system (as opposed to the high-value plastics collected by the informal sector) is low because they are mixed and contaminated with organic and other general wastes. The lack of Integrated Solid Waste Management (ISWM) system is a major obstacle to scaling up plastics recycling because only small quantities of plastics are extracted, thus reducing the CFR rate, especially for non-PET resins. As previously also noted in a 2018 World Bank analysis of Vietnam's SWM sector (Box 4 below), implementing ISWM in the country is challenging given that MSW fees collected by municipal authorities typically cover less than 60 percent of the total waste management cost, and in some municipalities, only 20 to 30 percent of the cost. A well-designed, mandatory EPR system and its proper implementation as envisioned in the latest LEP revision will help in reducing this funding gap by shifting the cost responsibility for end-of-life collection and recovery of plastic packaging to producers and importers.

64 Based on GA Circular comms with Ms Lam of CITENCO HCMC on 13th May 2020 as part of the Vietnam National Plastic Action Partnership study.

Box 4.
WORLD BANK SOLID WASTE MANAGEMENT STUDY FOR VIETNAM (2018)

This plastic circularity market study complements an earlier World Bank analysis of the solid waste management (SWM) sector in Vietnam,[65] which provided key recommendations to inform the implementation of the National SWM Strategy. The 2018 report reviewed the quantity, composition, and projected growth of solid waste generation in three cities (Hanoi, Haiphong, and Phu Tho) and extrapolated it to provide national-level estimates. It also analyzed different waste management scenarios, including the required investments and operational costs and corresponding impacts on tariffs and affordability. This box includes key findings and recommendations from that SWM study relevant to promoting plastics circularity in Vietnam.

This study finds that Vietnam's rapid urbanization will continue to pressure the already strained SWM infrastructure and services. To achieve its ambitious National Strategy targets, Vietnam will need to adopt a phased approach towards a modern, integrated, and sustainable solid waste management system at affordable cost. This will require carefully coordinated changes across technical, environmental, financial, socio-cultural, institutional, regulatory, and educational aspects.

The study further emphasized the need for basic infrastructure improvements to the collection and transport system, including moving towards containerization of collection, enabling modernization and optimization of the SWM system. Separating wet (organic) and dry (plastic) wastes at the source would facilitate better recycling schemes while diverting wastes away from landfilling. The study also evaluated various end-of-pipe waste treatment options and their associated costs.

The study estimated total investment costs for introducing modern solid waste systems in Vietnam by 2030 to be about US$13 billion. In addition, operational costs are estimated to be about US$2.2 billion annually or US$20 (VND 470,000) per person per year. Actual waste fees charged in many small cities and rural areas are much lower than this, equivalent to only 79,500 VND per person per year. Typically, operators such as URENCOs, derive less than 20 percent of their income from waste fees, with the balance paid by local administration subsidies. Large or long-term investments in SWM facilities and systems are hampered by this reliance on subsidies and associated lack of proper financial mechanisms, such as long-term financial planning, savings for future investments and re-investments, and return of investments. As noted in this market study, there are opportunities to capture lost material value and generate revenue if valuable plastic streams can be properly segregated and recovered for recycling.

While the government has developed comprehensive SWM laws and regulations, including the recently adopted revision to the Law on Environmental Protection, further reforms are needed, including a practical roadmap for monitoring, and achieving results. There is also a need for dedicated waste management planning, upskilling human resources, and enhanced control and enforcement.

65 World Bank, 2018. Solid and Industrial Hazardous Waste Management Assessment Options and Action Area to Implement the National Strategy.

Box 5 below includes examples of enabling policies from benchmark countries that support the transition to a circular MSW system (details given in Appendix 13):

Box 5.

ENABLING POLICIES FROM BENCHMARK COUNTRIES FOR A CIRCULAR MSW SYSTEM

PACKAGING:

The EU's First Circular Economy Action Plan (2018) sets a common EU target for recycling 65 percent of the municipal waste by 2035; a binding landfill target to reduce landfill to maximum of 10 percent of municipal waste by 2035; a ban on the landfilling of separately collected waste; separate collection obligations are strengthened beyond recyclables and extended to hazardous household waste (by end 2022), bio-waste (by end 2023), and textiles (by end 2025). The action plan recognizes that if the waste segregation is not done at the source, it would be difficult to expect producers to implement EPR, especially for low-value plastics.

The EU Landfill Directive aims to phase out landfilling for recyclable materials by 2025. The EU Strategy for Plastics in the Circular Economy encourages EU member states as well as regional and local authorities in the EU to internalize the environmental costs of landfilling and incineration through high or gradually rising fees, taxes, or other economic instruments.

In India, the draft 2019 National Resource Efficiency Policy sets targets for a ban on the disposal of recyclable waste, including plastics, to landfills by 2025. India's Plastic Waste Management Rules 2016 encourages urban local bodies to recover energy from low-grade plastics through cement kilns, waste-to-energy plants, or waste-to-oil plants. In response, the Indian cement industry has been increasingly substituting coal or other fossil fuels in cement kilns with Refuse Derived Fuel (RDF) containing non-recyclable plastics, with a goal to reach a Thermal Substitution Rate of coal to RDF of 25 percent by 2025 and 30 percent by 2030.

CONSTRUCTION:

Japan's Construction Material Recycling Law requires contractors to sort out and recycle wastes generated in the demolition work of a building.

In the EU, landfill bans are recommended as part of the Construction and Demolition Waste Management Protocol.

GENERAL:

In 2019, the Shanghai Municipal People's Government introduced a compulsory waste segregation policy for its 26 million inhabitants. Residents are required to segregate waste into four categories, namely wet waste, recyclable waste, residual waste, and hazardous waste, with strict enforcement of fines (RMB 200 for individuals and RMB 20,000 for companies who fail to segregate waste).[66] As a result, the amount of separated hazardous waste, recyclable waste, and household food waste collected have all increased significantly, per Figure 33 below.[67] Previously, approximately 40 percent of the city's waste was sent to landfills but with increased waste segregation at source and increased recycling the waste landfilled , has decreased by 20 percent due to the new regulations.[68]

66 Green Initiatives, "One Year of Waste Segregation in Shanghai: Success or Failure?" (2020)

67 Note that these figures are large because before implementation of the waste policy waste data was almost non-existent in Vietnam; hence current data are compared to figures with a low base rate.

68 Green Initiatives, "One Year of Waste Segregation in Shanghai: Success or Failure?" (2020)

Figure 33.
INCREASE IN THE WASTE COLLECTED IN SHANGHAI AFTER IMPLEMENTATION OF THE COMPULSORY WASTE SEGREGATION POLICY

Source: Shanghai Municipal People's Government.

Lack of plastic packaging market data and recycling value chain data

The VPA and the VPRA, via their members and the customs department and MOIT, are responsible for maintaining data sets on Vietnam's production, exports, and imports of virgin resins.

Even though packaging is a significant end-use industry for all the major plastic types, a detailed breakdown of the amounts of packaging that Vietnamese producers place in the market each year is not available. Specifically, Vietnam lacks independent and authoritative sources of up-to-date price and market information on recycled plastics, especially at the processor and recycler stages of the value chain. The volumes (tonnage) and prices of post-consumer resins moving through the value chain are unclear, thus hindering market liquidity and investments into recycling capacity. This puts negative pressure on the CFR rate in three ways. First, it creates a challenge for selling the recycled products without causing a significant fluctuation in prices. Second, it makes the entry of new players into the recycling market harder. Third, it becomes challenging for existing recyclers to build a strong case to grow their business capacities.

Participants in the market, such as local authorities, waste management companies, recyclers, and re-processors, need information on weekly and monthly pricing trends, size of contracts, and current conditions in the markets for recovered materials to enable them to make appropriate interventions. The following examples of enabling policies are from benchmark countries that support market data for recycled products and detailed production data for packaging (see details in Appendix 13):

Countries in the EU, Japan, and Singapore have all mandated producers of packaging and packaged products to collect data on the types and amounts of packaging they place on the market each year. Thereafter, they are required to report the packaging data to either a relevant industry-led responsible producer organization or the government as the first step towards more sustainable packaging waste management. This reporting lays the foundation for reporting aspects of an Extended Producer Responsibility (EPR) framework for managing packaging waste.

As EPR frameworks were implemented and demand for recycled plastics started to grow in the EU and parts of North America, market intelligence firms such as IHS Markit, ICIS, S&P Platts, and Wood Mackenzie started offering market data services for recycled products in these regions.

The Plastics Institute of Thailand (PIT), a specialized government-led institute under the Ministry of Industry, maintains an extensive database on virgin resin production, exports, imports, and consumption in Thailand. PIT also provides regular market intelligence and monthly price charts for virgin resins.

3.2 Pressures impacting both value yield and CFR rate

Low quality of recyclables due to a lack of design-for-recycling standards

Plastic recyclers interviewed for this study reported a contamination rate of up to 30 percent of the feedstock they receive from Vietnam. This includes contaminants due to poor segregation practices and poor packaging design. Below are a few examples of products with poor design-for-recycling standards that PET, PP, and HDPE recyclers in Vietnam usually receive.

Figure 34.
EXAMPLES OF DESIGN-FOR-RECYCLING CHALLENGES FOR PACKAGING IN VIETNAM

Notes: Left to right: Colored PET bottle with PVC label; Drink cup with PP base, PET top, and PE straw. Printed HDPE body with aluminum top; bottle with full body labels and pumps with metal springs.

Some of the problems stemming from the design of the products mentioned by recyclers in Vietnam are shown in Table 6 below.

Table 6.
CONTAMINATION AND DESIGN CHALLENGES AND THEIR IMPACT ON RECYCLING

Problem	Description	Impact on recycling
Colored plastics	When plastics are colored, it affects the value of the recycled products as the color of these plastics cannot be reverted to their "natural" color.	Recyclers either keep the same color or turn it black depending on what customers require. These choices mean that value is lost as recycled resins that are colored are less valuable than their natural color counterparts. Hence, this reduces the value yield of recycling. In some cases, colored plastics are unable to be recycled at all (e.g., colored PET bottles cannot be recycled into polyester staple fiber). Therefore, it reduces the CFR rates because colored plastics act as a contaminant.

Problem	Description	Impact on recycling
Calcium Carbonate (CaCO3)	Fillers/additives such as $CaCO_3$ alter the density of HDPE flakes and affect its separation during the float-sink separation process and make the recycled resin's characteristics (e.g., intrinsic viscosity, color) more difficult to control.	Losses due to contamination during the float-sink separation processes increase from a normal 5 percent to up to 20 percent. Hence, this reduces the CFR rate for HDPE. As the physical characteristics are harder to control, the quality of the end-product falls, which reduces its value yield.
PVC labels	When PVC labels enter a thermo-chemical recycling process, hydrogen chloride, a strong corrosive acid, is produced, damaging the internals of the recycling equipment. Therefore, recyclers must invest in sorting equipment to ensure that PVC labels do not make their way into their recycling operations.	This reduces the CFR rate and value yield as labels increase the contamination of the post-consumer materials.
Composite or multilayer materials	Mechanical recycling equipment is only able to recycle a specific resin type at a time. For example, a PET recycler is only able to process feedstock which only includes PET.	This limits the CFR rate as it reduces the amount of materials that can be collected for recycling.
Light weighting	Lightweight packaging reduces the cost of production and transportation.	Informal collectors have a marginal utility based on the weight of units collected. Lighter products result in lower marginal utility and less attractiveness for the informal sector to collect the packaging, limiting the CFR rate.

In Ho Chi Minh City, informal waste collectors and junkshops generally do not sell colored and clear PET bottles separately, unlike other Southeast Asian markets. The two categories (colored and clear) of PET bottles are typically mixed and sold at one price, resulting in informal collectors collecting both. The separation of colored and clear PET only becomes clear at the recycler stage where workers manually sort through and separate the PET bottles from bales.

Contamination due to a lack of source segregation and poor design-for-recycling lower both the volume yield and price yield, lowering the value yield. Implementing design-for-recycling standards to increase value yield includes but is not limited to the following:

- Switch from multi-material products to mono-material products as the latter products are easier to recycle mechanically. This is possible for the following two cases, i.e., multi-material plastics, particularly sachets and multi-layer packaging, and multi-material household plastic goods.
- Redesign (or remove) dyes, plastic pigments, additives, and glues.
- Moderate the use of calcium carbonate and other fillers.
- Eliminate problematic polymers and packaging formats.
- Improve labeling to enable consumers, collectors, and recyclers to identify and divert the materials towards recycling accurately.

The following examples of enabling policies, in Box 6, are from benchmark countries that support design-for-circu- larity (see details in Appendix 13):

Box 6.

ENABLING DESIGN-FOR-CIRCULARITY POLICIES FROM BENCHMARK COUNTRIES

PACKAGING:

The EU Strategy for Plastics in the Circular Economy requires all plastics packaging placed on the EU market to be reusable or recyclable by 2030. The EU Commission is also initiating work on new harmonized rules to ensure that by 2030 all plastics packaging placed on the EU market can be reused or recycled cost-effectively.

AUTOMOTIVE:

As part of the EU's End-of-Life Vehicles (ELV) Directive, automobiles should be designed to facilitate proper dismantling and allow components and materials to be reused, recycled, and/or recovered. Japan's Automobile Recycling Law sets out roles and responsibilities for each key stakeholder in recycling ELV. Vehicle owners are required to pay a 'Recycling Fee' annually, which helps fund the collection and recycling of ELV.

ELECTRONICS:

The EU Eco-design Directive, as part of the Circular Electronics Initiative, requires that devices be built for energy efficiency and durability, reparability, upgradability, maintenance, reuse, and recycling.

ALL INDUSTRIES:

The EU Strategy for Plastics in the Circular Economy encourages the industry to take concrete steps to improve dialogue and cooperation across the value chain, particularly on material and product design aspects.

Persistent challenges in the sustained implementation of source segregation

There have been several trials for source segregation across various districts in Vietnam. However, significant challenges remain in formalizing and scaling source segregation efforts. For example, stakeholders interviewed told that past "3R" or source segregation pilots were unsuccessful partly due to a lack of proper sorting and separate collection infrastructure, where segregated waste is mixed up again when collected by municipal waste collectors. Thus, benefits to implementing source segregation at household level are maximized if these efforts are combined with investments to increase capacity to sort, collect and process separated waste.

The economic and technological feasibility of plastic recycling heavily depends on the quality of feedstock. The lower the level of contaminants present in feedstock, the higher the feasibility of plastic recycling. This is a significant barrier in cities with poor waste management systems (e.g., with no source segregation). Even in districts with source segregation efforts, a lack of consumer awareness or knowledge of separating plastics products leads to low separation rates.

Below are some of the notable trials conducted by the private and public sector in Vietnam that are either ongoing or have already concluded:

- *Expertise France and IRD (2020-2022):* An ongoing HCMC pilot focuses on enhancing plastic packaging collection, sorting, and recycling and will also target improvements in waste sorting at source by consumers.
- *URENCO and Unilever (2020):* Pilot program to build awareness on waste segregation in Hanoi across three wards included 4,500 households. Specific results were not available for this study.
- *IUCN and PRO Vietnam (2020):* IUCN has led source segregation initiative in Cu Lao Cham Island since 2010. As part of the PRO Vietnam partnership, 50-60kg of low-value plastics are collected per day at the island and used to produce high-value products as part of the ReForm project.

- *CITENCO (2018):* A pilot project in HCMC across 1,120 households in Tan Phu district produced nearly 410 kg of plastic waste.
- *JICA (2006-2009):* Implementation support for a 3R Initiative in Hanoi included over 18,000 households and nearly 73,000 people.

Inability to capitalize on growing global demand for recycled content in packaging

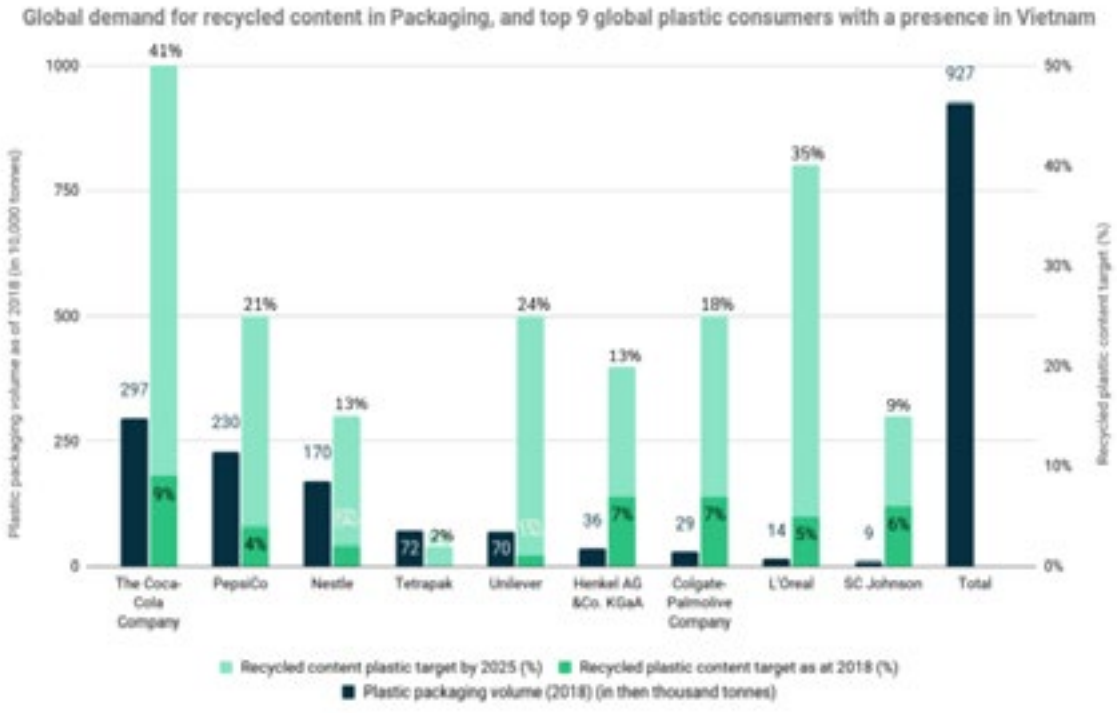
A global 2020 petrochemicals industry assessment by S&P Global Platts shows that despite unfavorable economics, global recycled plastics volumes reached nearly 20 million tonnes in 2020, eight percent of total virgin demand.[69] This is up from just under 18 million tonnes in 2019, or seven percent of total virgin demand. By 2030, up to almost one-third of the plastics demand could be covered by production, based on previously used plastics rather than virgin plastics. This estimate is based on a high-adoption scenario for recycled plastics, based on a substantial increase in mechanical recycling capacity, rapid commercialization of pyrolysis technology, and oil prices at around $75 per barrel.[70] Given that packaging is the largest end-use industry, global commitments by leading brand owners to increase recycled content usage in their packaging are slowly spurring demand for food-grade recycled resins, which command higher margins amongst recycled products.

Figure 35 shows the 2025 recycled plastic content targets for brands with a major presence in Vietnam and are participating in the New Plastics Economy Global Commitment, led by the Ellen Macarthur Foundation. The total plastic packaging volume used by these nine companies globally amounted to about 9.3 million tonnes in 2018. Just 0.4 million tonnes were recycled content, based on their recycled plastic content usage as of 2018. The global recycled plastic resin usage by these nine companies collectively would have to increase by another 1.5 million tonnes, i.e., 275 percent higher than the volume of recycled resin usage in 2018, to meet the total 2025 recycled plastic content targets.

69 S&P Global Platts, " Global Petrochemical Trends H1" (2020)

70 McKinsey & Company, "How plastics waste recycling could transform the chemical industry" (2018)

Figure 35.
2025 RECYCLED PLASTIC CONTENT TARGETS FOR 9 GLOBAL BRANDS WITH A PRESENCE IN VIETNAM



Source: Ellen Macarthur Foundation New Plastics Economy Global Commitment 2019 Progress Report.

Food contact packaging applications require the highest quality of post-consumer resin. Thus, their production incurs high operational costs per ton. For example, the production of food-grade rPET involves processes such as solid-polymerization, which increases the intrinsic viscosity of waste PET back to virgin levels. Large capital expenditure (CAPEX) investments are required to enable the processes. In contrast, recycling of waste PET into rPET fiber through extrusion lowers the intrinsic viscosity of the resin, which results in lower quality material. Based on interviews with a leading plastic manufacturer in Vietnam, who is building a new food-grade rPET recycling line, consistently growing demand from brand owners in the packaging industry is a major factor to proceed with CAPEX investment decisions.

Challenges impeding Vietnamese recyclers from capitalizing on the growing global demand for recycled plastic content

Despite this backdrop of growing global demand, most suppliers of recycled resins in Vietnam are small to medium enterprises (SMEs) challenged by a lack of scale, management systems, process technologies to produce food-grade quality products, and informal supply networks that work on cash terms and are not integrated. For example, some recyclers shared they are unable to take on orders to supply large brands due to cash flow constraints as they cannot match the payment terms of buyers (30-60 days) against a cash-on-delivery supply terms of the local informal sector. Additionally, competition from the low cost of virgin plastics, contaminated feedstock, a lack of volume, and a lack of design-for-recycling standards prevents recyclers from capitalizing on global demand and maximize their margins, thus keeping local CFR rate low and recyclers' value yield reduced. This, in turn, locks in smaller-scale recyclers from making CAPEX investments such as in advanced recycling technologies required for high quality, food-contact recycled plastics.

Heavy reliance on plastic scrap imports and recyclers' fear of upcoming import restrictions

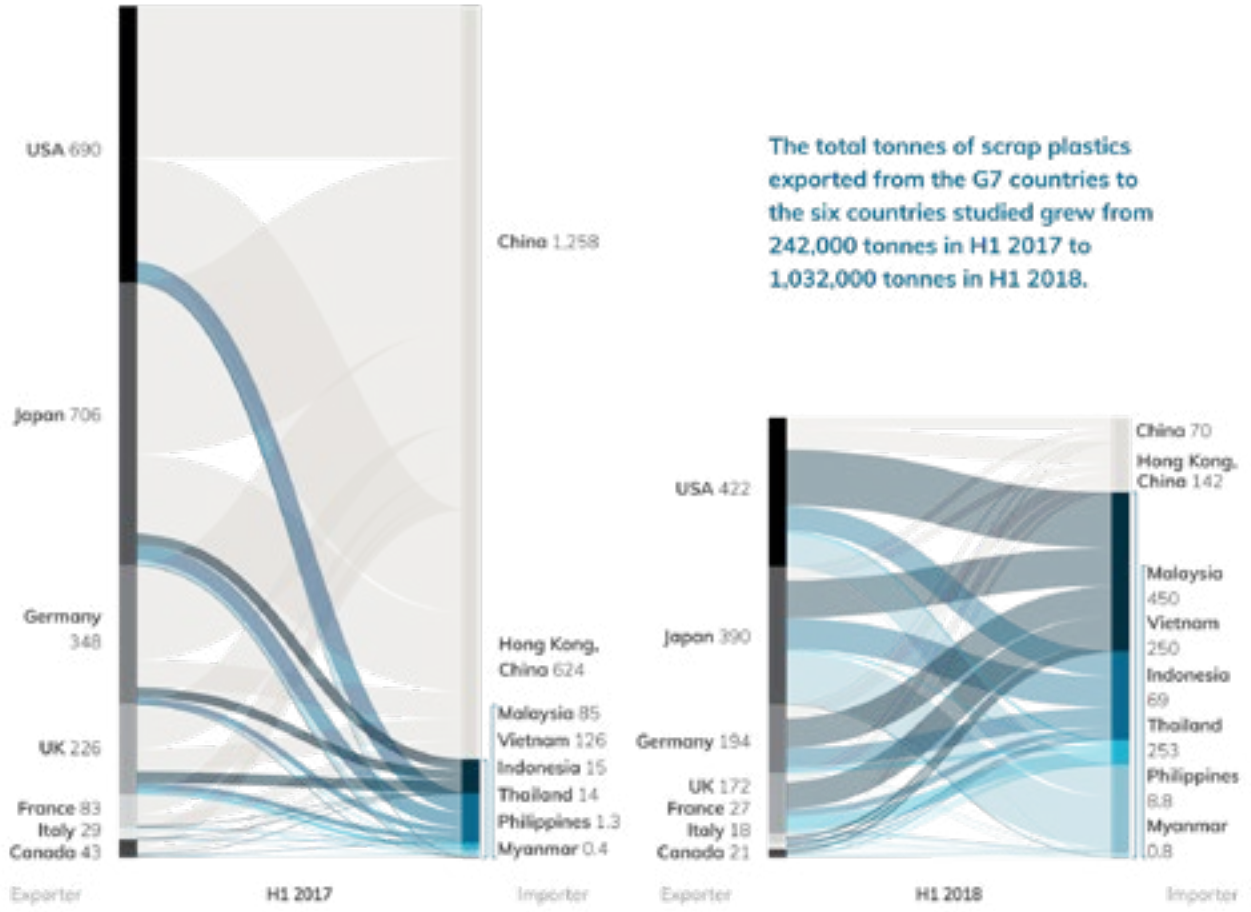
Given the various challenges faced by plastic recyclers in procuring high-quality, large, and consistent volumes of feedstock of post-use plastics from within Vietnam, many recyclers still prefer imported plastic scrap. This is because imports can better meet their quality and price requirements and come from suppliers who can provide proper invoices with VAT for business expenses and traceability purposes. Out of 13 recyclers interviewed who provided data on their source of materials, five recyclers (~40 percent) procured more than 90 percent of their feedstock from importers.

Vietnam is one of the largest plastic scrap importers globally. As China announced a ban on most types of plastic waste imports in 2017 under the National Sword Policy, the flow of plastic scrap was diverted to other countries in Southeast Asia (see Figure 36 below). From January to November 2017, Vietnam increased PE and PET plastics imports by more than 166 percent and 137 percent year-on-year, respectively. By November 2017, it became the largest importer of scrap plastics, marked 'mixed/other.'[71]

71 VN Express, "Vietnam in danger of becoming a dump as China says no to trash" (2018)

> "Our company's expertise is in producing recycled plastic pellets. According to Decree No.40/2019/ND-CP, if recyclers want to import scrap plastic, we need to produce specific semi-finished or finished products after 2024, which will be our biggest challenge. We will not be able to compete with other plastic manufacturers because they have a clear specialization."
>
> *Recycling stakeholder from Vietnam*

Figure 36.
SHIFT IN THE FLOW OF SCRAP PLASTICS AS A RESULT OF CHINA'S NATIONAL SWORD POLICY



Source: GA Analysis based on UN Comtrade data.

Note: All figures in thousand tonnes per year.

Thus, overwhelmed by the abrupt volume of scrap plastics increase and the potential threat of waste dumping into its borders, Vietnam imposed a temporary ban on imports of scrap plastics in 2018. The Vietnam government also said it would not grant new licenses for waste imports amid the port congestion due to illegal import activities.[72] Recyclers stated in interviews that during this period, many of their peers became insolvent as they did not have access to imported feedstock, and there was insufficient local feedstock available to replace this immediate gap.`

In 2019, Vietnam took long-term steps to cut back on imports with the announcement of Decree No.40/2019/ND-CP that would take effect by 2025. The decree is still being amended, but based on interviews with recyclers, these import restrictions are expected to irreversibly disrupt the recycling value chain due to two major proposed restrictions in the decree's current version: (i) Only 80 percent of feedstock is allowed to be imported by each recycler; and (ii) imported feedstock is only allowed to be produced into semi-finished or finished goods and not into flakes or pellets. Recyclers have stated that the latter restriction is highly unfair because they would be unable to compete with experienced manufacturers and converters who produce semi-finished or finished goods that would create widespread damage to the recycling industry.

72 Online Newspaper of the Government of the Socialist Republic of Vietnam, "Government will no longer grant licenses for waste imports" (2018)

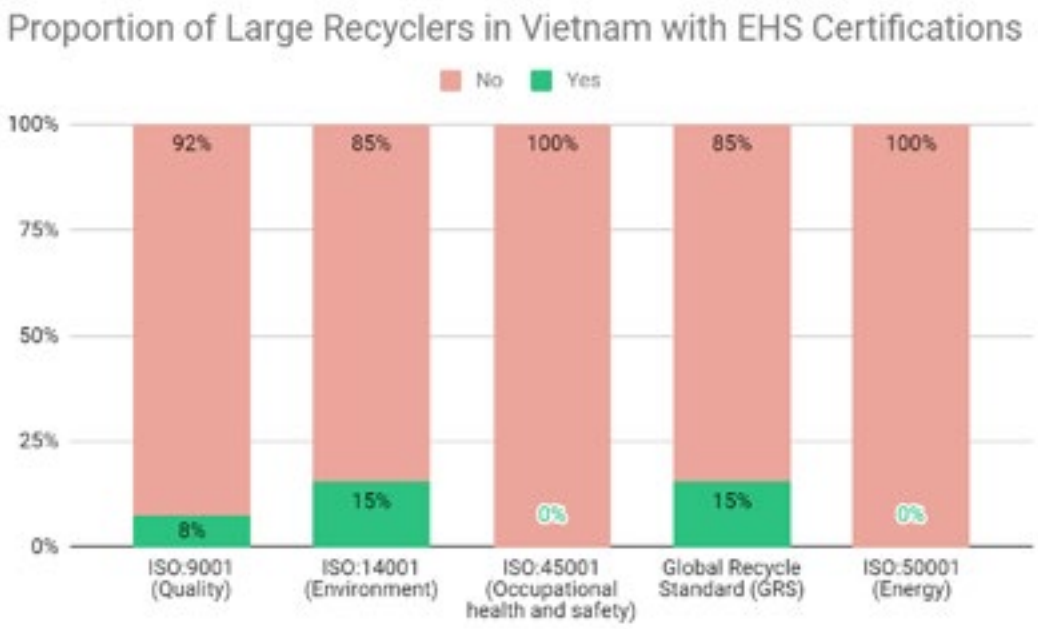
> "We don't have time and money to work on such EHS certifications. It's also unfair since many informal recyclers don't have proper paperwork."
>
> *Recycling stakeholder from Vietnam*

Lack of quality and EHS certifications among recyclers

Based on in-depth interviews with formal plastic recyclers in Vietnam, only eight percent have global quality standards while 15 percent have international environmental standards, as measured by the relevant ISO:9001 and ISO:14001 certifications, respectively. However, none of the local recyclers meet ISO 45001 requirements for occupational health and safety management systems, and only 15 percent are compliant with Global Recycled Standards (GRS) for recycled plastics produced, per Figure 37 below. As a regional benchmark, plastic recycling plants of Indorama Ventures in Thailand and Heng Hiap Industries in Malaysia meet all the above-mentioned international standards. In addition, Indorama Ventures also has the ISO:50001 certificate for Energy Management Systems.

The formal recyclers report unfair competition from the informal recycling industry, which avoids costs for local taxes and compliance with environmental and minimum wage regulations. This provides informal recyclers a competitive advantage because they can afford higher buying prices and lower selling prices, forcing formal recyclers to follow suit, lowering their profit margins. Consequently, implementing the various international EHS standards is seen as an expensive investment by the formal recyclers and thus not prioritized. See Box 7 below for further insights regarding craft villages.

Figure 37.
ENVIRONMENTAL, HEALTH, AND SAFETY (EHS) CERTIFICATIONS OF A SAMPLE OF LARGE RECYCLERS IN VIETNAM (N = 13)



"We are just trying to run our business; we do not have time or money to have all the proper paperwork."

Informal recycling stakeholder from Vietnam

Consumer goods companies that have made commitments to use recycled plastics are increasingly looking for suppliers of recycled products to meet third-party certified standards for recycled content, chain of custody, social and environmental practices, and contamination standards. This requires recyclers to go beyond quality certifications (i.e., beyond ISO:9001) and have third-party certifications that verify the recycled content of their products (both finished and intermediate) and verify responsible social, environmental, and chemical practices in their production. The objectives of these Chain of Custody (CoC) standards and certifications are to define requirements to ensure accurate content claims, good working conditions, no child labor, recognition of the workers' right to collective bargaining, and that harmful environmental and chemical impacts are minimized in the value chain and production process.[73]

The relatively high proportion of the formal recyclers in Vietnam not having all the ISO:9001, ISO:14001, ISO:45001, and GRS standards means the smaller recyclers are even more unlikely to achieve these standards. Recyclers are therefore unable to maximize price yields and thus value yields.

73 CoC certification management system certifies an unbroken chain of organizations legally owning the material throughout the supply chain, from the certified recycler output into the final product.

Box 7.

INSIGHTS FROM CRAFT RECYCLING VILLAGES (INFORMAL RECYCLERS)

A survey by the Policy and Strategy Institute of the Ministry of Industry and Trade (MOIT) estimates that there are more than 100 craft villages in Vietnam. With over 80 percent being metal recycling villages, the remaining 20 percent is split between paper and plastic recycling villages.[74] The majority (90 percent) of these craft villages generally operate on a household scale.[75] The total informal recycling capacity in Vietnam, including those of the craft villages, is estimated by the VPRA to be anywhere between 0.9 million TPY to 1.61 million TPY (see Appendix 8). Access to finance is the main challenge that informal recyclers face in formalizing and expanding their operations. With many of these informal recyclers being "home-run" operations, very few have any local permits, documentation, or local EHS certifications legally required for operations hence unable to qualify for funding.

74 Shared by Mr. Hoang Duc Vuong from VPA with GA Circular.
75 Ibid.

3.3 Challenges faced by reuse/refill and new product delivery models

Reuse and new delivery models (NDMs) are among the strategies employed globally to reduce plastic consumption. Reuse refers to the replacement of single-use plastic products with reusable items owned by the consumer.[76] An example of reuse would be consumers bringing their drink containers when purchasing beverages. NDM refers to services and businesses that provide a utility that was previously provided by single-use plastic products in a new way that utilizes less material and reduces consumption or increases circularity.[77] An example of an NDM would be a reusable and returnable shared cup system, such as AYA Cup in Vietnam, where consumers receive their drinks in a reusable cup and can return that cup to any participating store or outlet.

As a part of the NPAP Vietnam study, commissioned by the World Economic Forum, the following key challenges were identified with reuse and NDMs:

- NDMs in Vietnam tend to be branded and perceived as a premium concept that is only viable for the higher-income demographic. There is currently no mainstream adoption of any NDMs in Vietnam.
- Existing regulations pertaining to plastics lack focus on the elimination of avoidable plastic packaging. Public commitments by the government to eliminate single use plastics by 2025 will require immediate support through regulation for them to be attainable.
- There is little to no incentivization for NDMs or zero-packaging solutions. Therefore, policies and incentives that encourage innovation and entrepreneurship in these areas are required to promote and enable mainstream adoption of reuse and NDMs. Examples of incentives include tax breaks or even grants or special interest rate loans for businesses investing in these NDMs or zero packaging business models.

Interviews with brand owners for this study revealed many more challenges, including the following:

- Hygiene and customer complaints. Delivering safe and hygienic products is the key application of packaging. As part of this study, a brand owner shared that 99 percent of the quality complaints are related to reusable bottles. This includes complaints regarding safety issues, both real and perceived. Brand owners/companies thus need to ensure the quality of their products and inform the consumers about the safety of reusable models.
- Carbon footprint for transportation. Reuse makes sense only in locations nearby the production/distribution plant. Out of this radius, the cost, and the carbon dioxide impact of recovering bottles for reuse are superior to the expected economic and environmental benefits. The reusable model only works in the proximity of significant consumption areas such as cities (at least until transportation methods start using renewable energy sources).
- Challenging return on investments. From the perspective of brand owners, return and reuse models require significant investments in transportation and processes for washing and sterilizing. The economics of such models remain challenging in the absence of widespread adoption of such models across all major demographics in Vietnam.
- Consumer perception of reuse models. In the post-COVID-19 era, consumer adoption of reuse and NDMs is expected to remain a major challenge. To remain competitive, brand owners must follow consumer trends and their research has shown that the Vietnamese consumers are not yet ready for reuse models and regard it as a step backward in terms of convenience.

76 The Pew Charitable Trusts, "Breaking the Plastic Wave" (2020)

77 Ibid.

"The role of packaging is to protect the product. The moment we compromise on safety and hygiene, we are making an extremely dangerous choice."

Brand owner from Vietnam

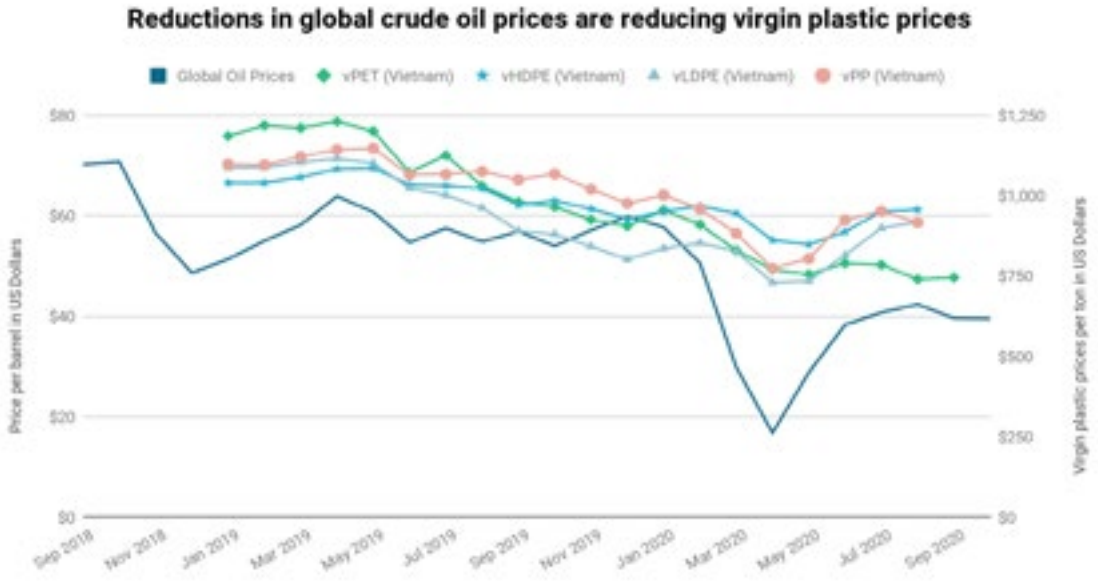
3.4 Negative impacts of COVID-19 on plastics recycling industry

While an assessment of the impacts of COVID-19 on recycled plastics in 2020 was not covered in this study, some initial insights, including the following, were gained during the study on the short-term and expected long-term impacts of the pandemic on the recycling industry in Vietnam.

Significant reductions in demand due to low oil prices and economic slowdown

Oil prices have not been at sustainable levels for the recycling industry (i.e., at above US$70 per barrel) since September 2018. Virgin resin prices in Vietnam fell across 2019 due to reductions in global oil prices. The fall in the prices increased even further from March to May 2020 (see Figure 38 below), as the oil prices hit their lowest point of US$18 per barrel – the lowest oil price seen in more than 15 years.

Figure 38.
CORRELATION BETWEEN GLOBAL OIL PRICES AND VIRGIN RESIN PRICES IN VIETNAM



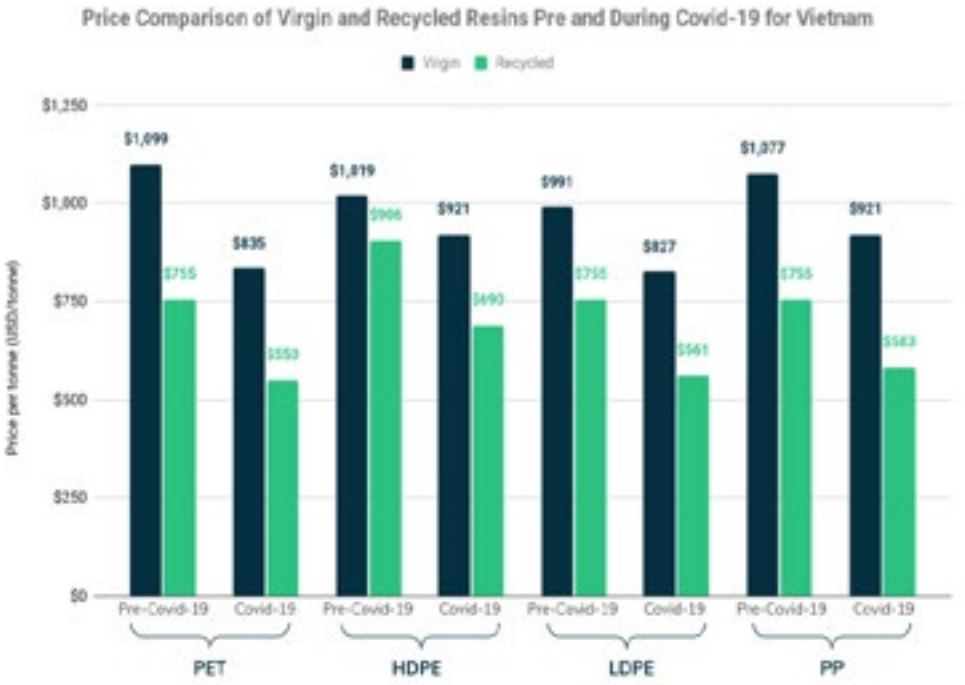
Sources: International Monetary Fund and U.S Energy Information Administration (Global Crude Oil Prices), Vietnam Plastics Association and An Phat Holdings (Virgin resin prices).

The virgin resin prices in Vietnam were on average 16 percent lower in 2020 than those in 2019. These falling virgin prices have put significant downwards pressure on recycler sales prices and have led the manufacturers to switch from recycled plastics to virgin plastics. Between pre-COVID-19 and during COVID-19 periods, recyclers across five Asian countries (Thailand, Vietnam, Indonesia, Philippines, and India) reported an average drop of 50 percent in demand for their products and a 21 percent drop in sales prices. Vietnam experienced the most severe drop, with local recyclers reporting an 84 percent demand reduction across all resins (PET, HDPE, LDPE, and PP) and a 25 percent drop in sales prices.[78]

As seen in Figure 39 below, the depressed virgin resin prices between pre-COVID-19 to during COVID-19 periods have caused plastic recyclers in Vietnam to decrease their prices further.

78 GA Circular & Circulate Capital - Safeguarding the Plastic Recycling Value Chain (2020)

Figure 39.
PRICES OF VIRGIN RESINS AND RECYCLED RESINS IN PRE-COVID-19 AND DURING COVID-19 PERIOD



Source: GA Circular interviews with formal (registered) recyclers in Hanoi and Ho Chi Minh City.

Note: Pre-COVID-19 refers to the entire duration of 2019. Prices displayed are, therefore, the yearly average for 2019. COVID-19 period for virgin resins refers to January to August 2020 period; the prices shown are hus an average of those months. COVID-19 period for recycled resins refers to the months of May to June 2020. The prices shown are therefore an average of those months.

Decline in plastic waste feedstock due to changes in consumption patterns

COVID-19 has changed consumption patterns of consumers in Vietnam as the country went through lockdowns. The pandemic has affected the amount of time people spend outside of their homes. A study by Nielsen Vietnam has revealed that 40 percent of the Vietnamese respondents spend more time watching TV at home, 25 percent have increased their online shopping, and 62 percent said that they are more likely to dine at home and use food delivery options even after the pandemic winds down.[79] As a result, the food delivery industry in Vietnam has boomed with the pandemic. For example, Loship, a local food delivery company, reported an 80 percent surge in the number of orders in mid-March 2020, even before social distancing requirements were announced.[80] Although these numbers suggest a higher availability of feedstock, it has been widely reported that contaminated items from takeaway bags to containers, bottles, and cups made up more than 80 percent of the plastic waste. This has caused a decline in post-consumer feedstock available for formal and informal collectors.

Significant proportion of the recycling industry at risk of closures

During the official nationwide lockdown from April 1st to April 23rd,[81] plastic recyclers were not allowed to operate because they were not considered essential services. This adversely affected the recycling industry in terms of significant movement restrictions and closures. The pandemic also disrupted the economics of the recycling industry with little or no sales, and a lack of demand and supply in the market as the import and export of scrap and recycled plastics were also halted during the mandatory lockdown.

79 The Nielsen Company (US), "How has COVID-19 impacted Vietnamese Consumers?" (2020)

80 Vietnam Insider, "Vietnam's food delivery market in a post-pandemic world: Where local players stand a chance" (2020)

81 Xuan Quynh Nguyen and Nguyen Dieu Tu Uyen, "Vietnam order 15-day nationwide isolation from April 1" (2020)

"Even though the domestic lockdown has ended, orders are still very weak from our overseas customers where most of our business is. We are concerned that with oil prices and virgin resin pricing being low for the foreseeable future, orders may not pick up".

Recycler stakeholder in Vietnam

Recyclers typically need to operate at 70 percent capacity for recycling to make sense. As Vietnam emerged from the lockdown, only 50 to 70 percent of recyclers were operating, and that too at only 20 to 50 percent of their installed capacity,[82] with little upcoming demand. Only 30 to 50 percent of recyclers in the Southeast Asia region, including Vietnam, are expected to continue operations with limited impact, while 40 to 60 percent are at risk of permanent closure or bankruptcy.

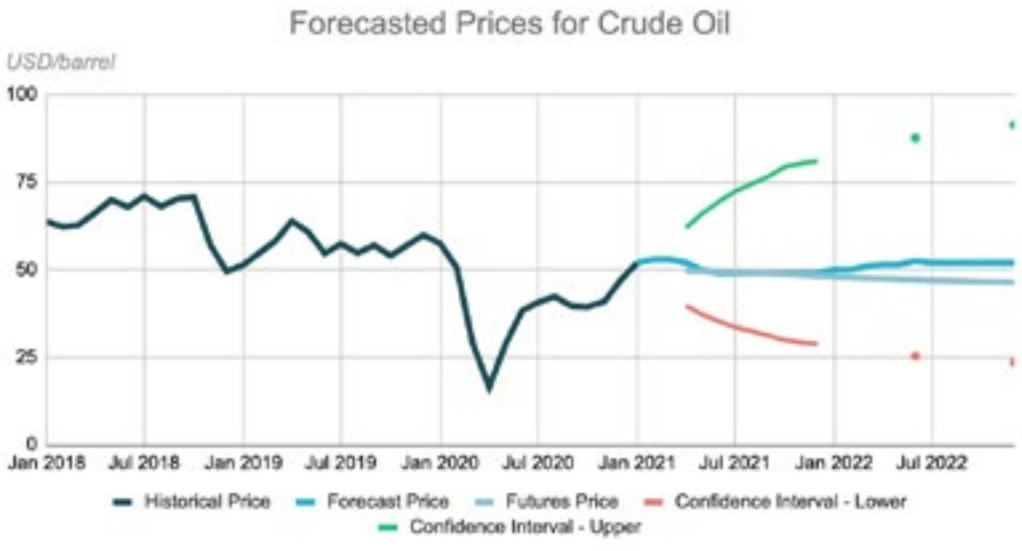
82 GA Circular & Circulate Capital - Safeguarding the Plastic Recycling Value Chain (2020)

Challenging recycling economics because of low oil price projections

Between July 2020 to January 2021, oil prices hovered between US$39 to US$52 per barrel.[83] Throughout 2021, prices are projected to reach only US$49 to US$53 per barrel. Recyclers in Vietnam who are already cash-strapped and struggling as of Q3/Q4 2020 face the grim prospect of a long trail of low oil prices for the next 18 months or longer, as shown in Figure 40 below.

83 Federal Reserve Bank of St. Louis, "Global price of WTI CRUDE." (2021)

Figure 40.
HISTORICAL AND FORECASTED CRUDE OIL PRICES, FUTURES PRICE AT 95% CONFIDENCE INTERVALS



Source: Based on the best case of West Texas Intermediate (WTI) prices by US Energy Information Administration (EIA). U.S. Energy Information Administration, "Short-Term Energy Outlook" (2021).

3.5 Tightening regulations for transboundary movement and trading of scrap and recycled plastics

With the increased spotlight on plastic waste as an issue in the region, new developments regarding regulations on the import of recycled and scrap plastics have emerged, both internationally and locally. The following two key international developments have already affected the demand and prices of recycled resins. In addition, the scheduled implementation of local regulations is projected to affect the demand and prices of recycled resins in the future.

Two key international developments

First, in addition to the National Sword Policy of 2018, banning the import of waste plastics, China, a major consumer of recycled plastics, has been tightening the enforcement of existing regulations regarding imports of recycled plastics pellets. The stricter regulations, which came into force from 1st September 2020, specify that imports of recycled plastic pellets need to be in "uniform color, size, and packaging." Although it is generally understood that this means pellets cannot be mixed when being imported to China, many stakeholders are still trying to confirm what this requirement exactly means. Violations of this rule will result in a fine of more than RMB 500,000 (US$74,500). Due to the hefty fines related to this new regulation, recyclers have reduced the volume of exports to China, waiting to see how the Chinese authorities implement this regulation.

Second, the Basel Convention, a near-universal treaty that regulates the transboundary movements of hazardous wastes and other wastes and of which Vietnam is a signatory, has adopted amendments to Annexes II, VIII, and IX to the Convention. These amendments deal with the transboundary movement of plastic waste that came into force on January 1st, 2021 and aims at making global trade in plastic waste more transparent and better regulated. Thus far, only Hong Kong, China has updated its guidelines to comply with the Basel Convention Plastic Waste Amendments. Under the new controls in Hong Kong, certain types of plastic waste, listed in the Waste Disposal Ordinance of Hong Kong, China (WDO) and Basel Convention, will not require import permits if it is almost free from contaminants. That is, not more than 0.5 percent, and is destined for recycling in an environmentally sound manner. The exporters who are not listed will be subject to the control of permit/consent and will require notification for trans-shipment.

These two developments in the international movement of scrap plastics and recycled plastics mean that, at least for the time being, overseas supply of scrap for recycled plastics will be depressed as recyclers wait to see how the new regulations come into play and certain terms such as "almost free from contamination" are defined (see Appendix 14 for details).

Local developments

As highlighted in Section 3, starting 2025, importing scrap plastics into Vietnam would be more restricted. In anticipation, the government has already stopped issuing new licenses for importing scrap plastics and has started to crack down on the illegal importation of waste.[84] The implication is that post-December 2024, recyclers will be limited to the use of scrap feedstock imported only from more developed countries, which has traditionally been of higher quality than the locally procured feedstock. Recyclers will also be required to produce semi-finished or finished goods only, not flakes or pellets.

3.6 Insignificant bioplastics consumption

In Vietnam, bioplastics are primarily used in single-use applications for packaging and/or food contact applications such as beverage cups, straws, cutlery, tea bags, and carry bags. Bioplastics are typically not suitable for more durable applications such as automotive parts because of the nature of the end product's long-term use and lifespan. An Phat Bioplastics, a subsidiary of An Phat Holdings (APH), and BASF are the two known major bioplastic manufacturers in Vietnam, with An Phat Bioplastics considered as the pioneer for 'green' products in the country.

Vietnam does not have a large-scale industrial composting infrastructure network for processing organic materials from municipal or commercial waste because many composting plants have been closed over a few years due to the production of low-quality, unsalable compost.[85] The majority of bioplastics consumed in Vietnam are sent directly

84 Reuters, "Vietnam to limit waste imports as shipments build up at port" (2018)

85 Two compost facilities closed in Hanoi and one facility in Phu Tho closed either due to equipment failure or unsalable compost products. Similarly, a compost facility in Hai Phong that produces compost from mixed municipal waste also has unsalable compost products due to low quality because of high contamination from plastics, metals, glass, and so forth. Source: World Bank, "Solid and industrial hazardous waste management assessment" (2018)

to landfills with no composting intervention.[86] To biodegrade, bioplastics such as PLA and PBS require specific industrial composting conditions (~60 °C, in the presence of oxygen and moisture) and the presence of organic substrate such as a mixture of soil and sludge. These conditions are challenging to replicate in sanitary landfills and are absent in unsanitary landfills. Given the absence of industrial composting facilities in Vietnam, most bioplastics consumed in the country do not biodegrade in the post-consumer stage.

The following are two main criteria that need to be fulfilled for bioplastics to be a viable and sustainable alternative to plastics derived from fossil resources:

- Supporting policies and standards that include (a) policies which prohibit the use of plastics from fossil resources; (b) policies that encourage the widespread adoption of bioplastics in single-use applications; and (c) standards that govern the manufacturing and distribution of bioplastics and which also prevent non-biodegradable, such as oxo-degradable, plastics from flooding the market.
- Post-consumer stage infrastructure that includes separation, collection, and recycling infrastructure in the post-consumer stage of bioplastics.

Only the first criterion of supporting policies and standards has received some attention from government agencies in Vietnam. However, the criterion has not been optimally addressed thus far because the adoption of these biodegradable alternatives is voluntary, and there is no legal binding to mandate this change across the nation. An example of such policies that encourage the use of biodegradable alternatives is the environmental tax levied on non-biodegradable plastic bags. Non-biodegradable plastic bags are subjected to an environmental tax of VND 40,000 (US$1.70) per kilogram, which was increased to VND 50,000 (US$2.10) as of January 1st, 2019.[87] Biodegradable plastic bags are not subject to this tax.

Although bioplastics currently remain a small portion of plastic resins consumed in Vietnam, the share of bioplastics is expected to grow with the country moving away from non-environmentally friendly single-use plastic products.[88] The government's focus on addressing marine plastic litter is increasing. This is evident from the National Action Plan for Management of Marine Plastic Litter by 2030 and their goals of removing single-use plastic products from supermarkets and convenience stores by 2021. The entire nation is expected to be free of single-use plastics by 2025.

Bioplastics production in Vietnam is expected to increase, with some companies announcing expansion plans.[89] Thus, bioplastics may have a more critical role in sustainable packaging sourcing decisions for major brand owners in the future. However, even if all the necessary supporting policies and standards were in place in Vietnam, bioplastics can only realistically be used as an alternative for single-use applications when source segregation and separate municipal and commercial waste collection are done in combination with the industrial composting of organic waste. Additional information on bioplastics and their categories is provided in Appendix 15.

3.7 Managing plastic waste through refuse-derived fuel co-processing

Refuse-derived fuel (RDF) is the fuel produced from industrial, commercial, and municipal waste via the process of shredding, screening, dehydration, and other unit operations.[90] The waste is separated into combustible and non-combustible components, with the combustible components being turned into fuel briquettes. RDF mainly consists of non-recyclable plastics, paper, cardboard, and other combustible wastes.

RDF can be used as fuel in dedicated waste-to-energy plants or for co-processing at existing cement kilns.[91] Under certain circumstances, this can be a viable method to manage combustible plastic waste, particularly 'unrecyclable' plastic waste such as multi-layer flexible plastics, pouches, and

86 In Municipalities, such as Hanoi, HCMC and Danang, approximately 15.5 percent of collected waste is sent to compost facilities with 69 percent sent to landfills while for other provinces approximately 16 percent of collected waste is sent to composting facilities with 71 percent of waste sent to landfills. Source: NPAP Vietnam study.

87 Vietnam News, "Loopholes and evasion limit success of plastic bag tax" (2018)

88 Tuoi Tre News, "Vietnam aiming for nation-wide eradication of single-use plastics by 2025: PM" (2019)

89 GA Circular comms with An Phat Holdings, the main bioplastic producer in Vietnam, has revealed that they plan to expand their production for local consumption with the factory expected to start operations in 2021 with the aim of 40 percent of produce being for the local market.

90 UNESCAP, "Nationally Appropriate MItigation Action (NAMA) programme for solid waste sector in Viet Nam" (2016)

91 World Bank,"Solid and industrial hazardous waste management assessment" (2018)

sachets. Although there is no known widespread application of this co-processing technology in Vietnam[92] except for ongoing and planned pilot projects,[93] there are opportunities for sourcing RDF feedstock as indicated below:

- *Plastic waste from global FMCG brands and other waste generators:* FMCG brands and other waste generators (e.g., cities) can directly ship plastic waste to cement kilns in their vicinity willing to accept such wastes for co-processing as is being done in India, Philippines, and Thailand. Nestlé and Republic Cement, the leading construction solutions providers in the Philippines, recently widened their partnership to manage plastic waste through their co-processing initiative.
- *Plastic waste from offsetting services:* The TonToTon in Vietnam helps companies offset their plastic footprint by collecting the same amount of plastic that they produce from the open environment, hence diverting non-recyclable, ocean-bound plastic.[94] The removal of non-recyclable plastic from the open environment not only helps in alleviating pollution but could also provide feedstock for RDF use.

Co-processing of low-value and difficult to recycle plastics for use in RDF is not a long-term, circular solution. It allows for near-term diversion of problematic plastics away from landfills, open dumpsites, and waterways until longer-term circularity solutions become commercially available (e.g., chemical recycling technologies for plastic-to-plastic conversion). Enabling policies and interventions to support the scale-up of RDF co-processing are elaborated in Section 4.

92 UNESCAP, "Nationally Appropriate MItigation Action (NAMA) programme for solid waste sector in Viet Nam" (2016)

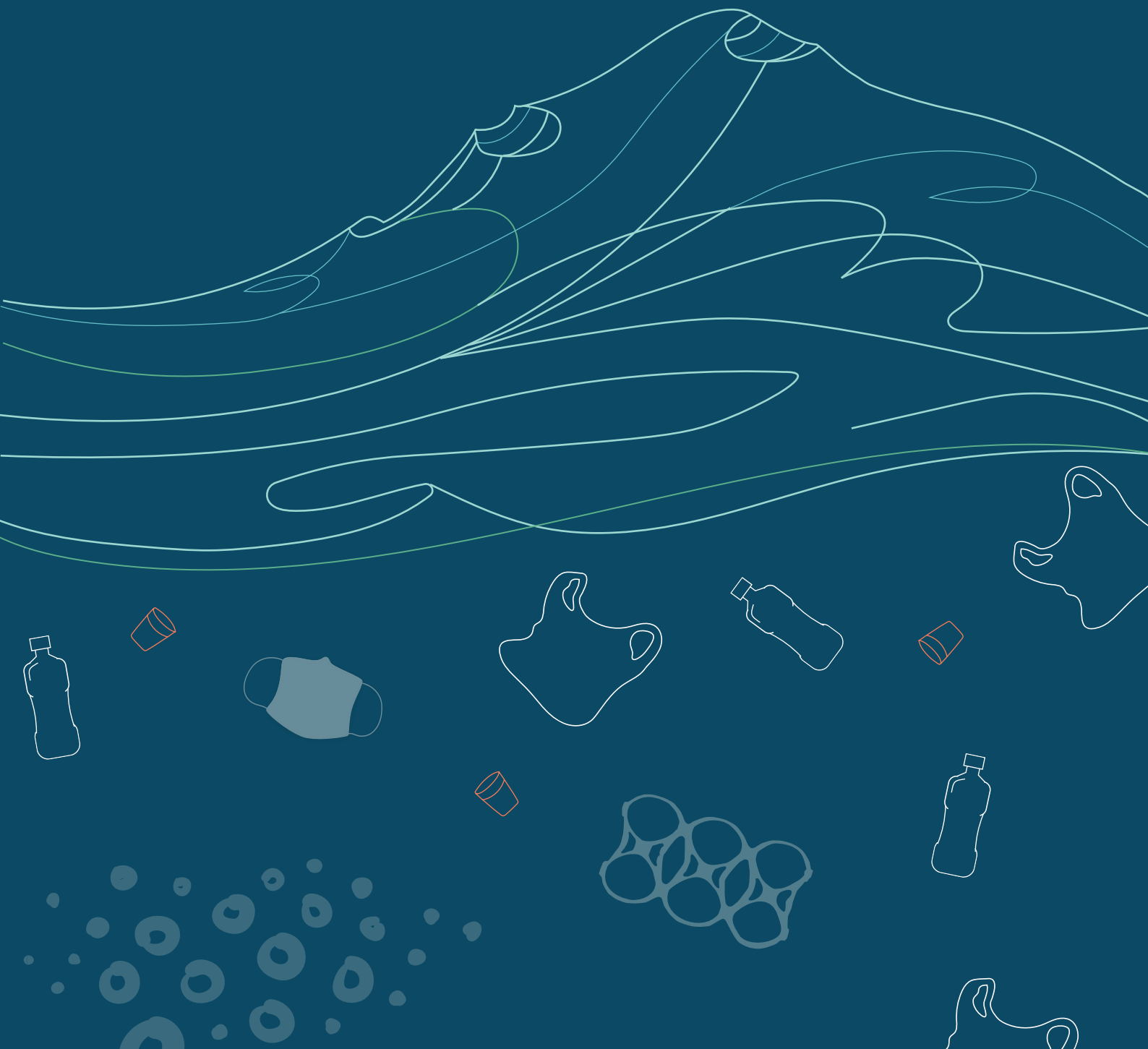
93 INSEE Ecocycle Vietnam that provides industrial waste treatment co-processing in cement kiln technology has a pilot project where they work with an organization that provides them with sorted household waste.

94 TONTOTON, "What is plastic neutralization?" (2020)

Photo: www.unplash.com

SECTION 4:

INTERVENTIONS TO UNLOCK ADDITIONAL MATERIAL VALUE



SECTION 4:

INTERVENTIONS TO UNLOCK ADDITIONAL MATERIAL VALUE

As explained in the preceding section, various pressures impact the CFR rate and value yield for plastics recycling in Vietnam, resulting in a loss of 75 percent of the material value. This is equivalent to US$2.2 billion to US$2.9 billion per year. This section contains a broad set of recommended interventions to stem this loss by laying a strong foundation for the recycling industry, strengthening the demand for recycled products, and transforming Vietnam's plastics recycling industry into a globally competitive and resilient industry.

Section 4.1 provides an overview of two categories of interventions needed to increase the material value unlocked. Sections 4.2 and 4.3 describe detailed actions needed under each of these two categories. Section 4.4 summarizes the recommended interventions in terms of their potential to unlock material value and outlines a roadmap for priority actions to be taken.

4.1 Overview

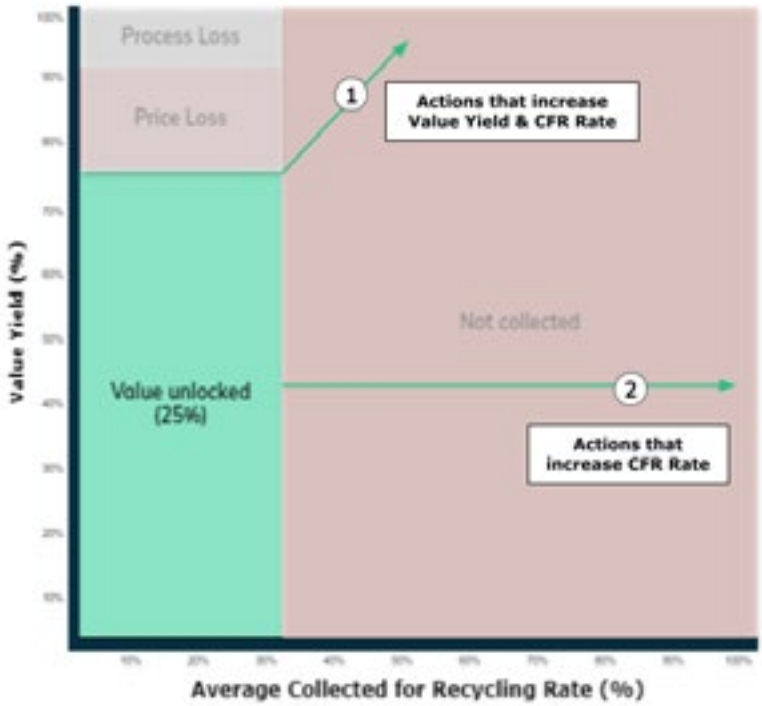
As illustrated in Figure 41 below, the following categories of interventions are needed to increase the material value unlocked via the circularity of plastics in Vietnam:

Interventions aimed at increasing value yield and CFR rate: These interventions cut across the waste management and recycling value chains. As the actions for increasing value yield are primarily driven by economics and value creation, it is important to prioritize these actions to create incentives that lead to increased recycling. Enabling the value chain actors to understand and recognize the value of recycling is a basic step towards improving circularity.

All actions recommended below aim to increase both CFR rate and value yield to a certain extent, and most of them are interdependent. However, for this study, they have been explained separately under the two categories mentioned above.

Many of the recommended actions require cost estimation for the infrastructure needed along with barriers. However, such estimation is out of the scope of this study. Therefore, before the recommendations of this study are accepted for implementation, a CAPEX and OPEX cost estimation will be required for infrastructure along with barriers for each of the actions.

Figure 41.
TWO ACTION CATEGORIES TO UNLOCK ADDITIONAL MATERIAL VALUE BY RECYCLING



For convenience, in the prioritization of the recommended actions in terms of timing, they have been placed under the following three clusters:

- *Lay the foundation:* Actions under this cluster set the necessary foundation for plastics circularity in Vietnam. The suggested time to implement actions in this cluster is one to two years.
- *Strengthen the demand:* Actions under this cluster are high impact, aimed at creating the demand for recycled products by strengthening the CFR rate and value yield. The suggested period to implement the actions is three to five years.
- *Maximize the value:* Actions under this cluster help unlock the maximum possible value from plastics recycling and help build a resilient recycling industry. The suggested period to implement the actions in this cluster is more than five years.

4.2 Interventions recommended for increasing both value yield and CFR rate

A. Enable plastics circularity through timely development of the underlying decrees and circulars for the LEP

The revised LEP, adopted on November 17th, 2020, will be effective on January 1st, 2022. Stakeholders who participated in this study have ranked the development of decrees and circulars for the LEP articles as a high priority and incentives to phase out the plastics and develop the new reuse and delivery models. This intervention is focused on the production and disposal stages of the plastics lifecycle.

Table 7.
ACTIONS AND RATIONALE FOR INTERVENTION A: ENABLE PLASTICS CIRCULARITY THROUGH TIMELY DEVELOPMENT OF THE UNDERLYING POLICY INSTRUMENTS FOR THE LEP

Cluster & timing	Action		Rationale
Lay the foundation (1-2 years)	1	Ensure the responsible agencies have the authority and resources to work with the relevant stakeholders to develop the underlying policy instruments (decrees and circulars) and enforce the LEP.	The issues raised during stakeholder interviews include a lack of clear delineation of responsibilities, a lack of resources, and enforcement of the LEP, updated in 2014. Therefore, the new LEP's underlying policy instruments (decrees and circulars) must be followed by the responsible government agencies. They should have the necessary resources for this purpose. This is important because multiple agencies and stakeholders have expressed that there is no clear delineation of responsibilities between agencies and that the agencies are lacking resources to, for example, consult experts or hold consultation sessions with industries. Should this situation persist, the development of decrees and circulars may be delayed or may lack the detail and industry alignment needed to implement them successfully. The articles most relevant to plastics circularity are: a. Recycled Content & EPR: articles 53, 54, 55 b. Green Public Procurement: article 146 c. Green Financing & Green Bonds: articles 149, 150 d. Domestic Solid Waste Management: article 75, 76, 77, 78, 79, 80
	2	Provide incentives for reduction of plastics (e.g., phase-outs of unnecessary plastic items) and reuse systems (e.g., refillable bottles, new delivery, and business models)	Based on the research previously conducted under the National Plastic Action Partnership (NPAP), commissioned by the World Economic Forum in 2020, the scenarios modeled suggest that 22 to 35 percent of the plastics, generated via the MSW stream, can be eliminated through: a. Reducing plastic consumption via elimination, reuse, and new delivery models: 13 to 26 percent of plastic consumption can be avoided, leading to an equivalent of one million tonnes of plastic reduction in 2030. b. Substituting plastics with suitable alternative materials like paper, coated paper, and compostable stuff, meaning a further nine percent of plastic consumption can be avoided in 2030, which is equivalent to 0.65 million tonnes plastic reduction in 2030.[95] A recent announcement by the government to ban single-use plastics by 2025[96] has raised questions regarding what products would be included in this ban and what material alternatives to plastics would be available locally. This uncertainty is captured in the NPAP analysis, whereby the 13 percent avoidance is based on a more realistic scenario of a minimal single-use plastic ban. In contrast, the 26 percent avoidance is based on a more ambitious scenario of a larger number of single-use plastic bans.

95 Results were based on a comprehensive analysis of 16 different product applications and assessing popular substitutions currently available in the market (following the methodology from Breaking the Plastic Wave report). Methodology source: The Pew Charitable Trusts and SYSTEMIQ, "Breaking the Plastic Wave" (2020)

96 Vietnam News, "Government aims to set an example in reducing plastic waste" (2020)

Cluster & timing	Action		Rationale
Lay the foundation (1-2 years)	2	Provide incentives for reduction of plastics (e.g., phase-outs of unnecessary plastic items) and reuse systems (e.g.,refillable bottles, new delivery, and business models) (continued)	To introduce a phase-out on a national scale, policy makers should ensure that there are suitable alternative products at an acceptable price point that meet the needs of different demographics in Vietnam and that challenges facing reuse and new delivery models are overcome (per the challenges highlighted in Section 3). Currently, the articles within the LEP do not prioritize reuse or new delivery models and are more focused on waste management and recycling. The only mention of 'reuse' is one word within Article 53, as this article is mostly focused on waste management responsibilities of producers, businesses, and service establishments. The government should develop enabling policies and incentives that support plastic reuse and new delivery business models, emphasizing discouraging the use of plastics in the first place. Examples of actions needed include: a. Regulatory limits, including policy options and regulations that limit the manufacture of excess packaging, hard-to-recycle packaging, and which drive businesses to reduce and/or substitute for packaging. These policy options should ideally comprise a mix of taxes, bans, and extended producer responsibility directives to incentivize product innovation, and eco-modulation principles should be added to EPR schemes. These actions will encourage brand owners to increase investment in these new business models. b. Policy options that support the development of infrastructure to support reuse models or alternative materials (such as composting facilities for biodegradable plastics) and cause reduced flow of plastics into the environment c. Policy options that direct funding for innovation in new materials and reduced packaging design, as well as scaling recovery systems for alternative materials such as paper, glass, and metal, and improved logistics/system design for viable reuse models d. Support startups using new business models and the growth of the ecosystem. e. Encourage financial institutions to lend and/or invest in these businesses. Please see the soon-to-be-published NPAP Vietnam report "Radically Reducing Plastic Leakage in Vietnam: Action Roadmap" for further recommendations regarding enabling reduction and reuse models in Vietnam.

B. Increase waste collection and sorting efficiency of plastics

With relatively low CFR rates across all the four key plastics resins evaluated, sorting efficiency needs to increase across the post-consumer plastics value chain, covering the stages of consumer waste disposal, separate collection, transport, and sorting of materials from mixed sources. The recommended actions outlined below are key strategies for implementing an Integrated Solid Waste Management (ISWM) system.

Table 8.
ACTIONS AND RATIONALE FOR INTERVENTION "B: INCREASE WASTE COLLECTION AND SORTING EFFICIENCY OF PLASTICS"

Cluster & timing	Action		Rationale
Lay the foundation (1-2 years)	3	Increase waste collection coverage and initiate actions to phase out dumpsites	As of 2018, the weighted national MSW collection coverage was 75 percent, based on the government reported values of 62 percent MSW collection coverage in rural areas and 88 percent in urban areas. Based on the NPAP for Vietnam, this lack of formal MSW collection coverage is estimated to contribute to more than half of the MSW generated plastic leakage,[97] illustrating why increases in MSW collection coverage is critical. The next highest source of MSW-generated plastic leakage is from dumpsites and engineered landfills. Thus, increases in MSW collection coverage must be coupled with expansion in safe disposal sites. Otherwise, plastic leakage rates will not change significantly as the location of plastic leakage will move from the point of generation to the point of disposal. Current collection by the informal sector is expensive (as compared to imported plastic scrap), and volumes fluctuate depending on market prices, which adversely impacts recycling economics and potential private sector investment. This coupled with the leakage due to a lack of formal MSW collection coverage illustrates the urgent need for an improved ISWM system, including collection coverage, source segregation and separate collection, recycling pathways, and safe disposal sites. In a revised 2017 strategy, the government announced revised MSW collection coverage targets of 90 percent rural and 100 percent urban collection coverage by 2025. However, stakeholders have voiced concern about the targets not being realistic.[98] Achieving increased MSW collection coverage requires policy and economic actions including, but not limited to: a. Increased funding and allocation of budgets for increased collection coverage and proper waste disposal sites b. Phase out of dumpsites c. Stricter enforcement of leakage control measures at engineered landfills Additionally, EPR instruments are critical as plastic waste in a BAU scenario (i.e., without reduction, reuse, and new delivery models) is projected to grow faster than MSW.

97 This is after accounting for some informal sector collection of plastics in non-MSW collection coverage areas.

98 World Bank. "Solid and Industrial Waste Management Assessment: Options and Action Area To Implement The National Strategy" (2018)

Cluster & timing	Action		Rationale
Lay the foundation (1-2 years)	4	Mandate and harmonize standards and targets for source segregation and separate collection	As outlined in Section 3 on the various interconnected pressures, the plastics recycling value chain has consistently reported having challenges of sourcing good quality and consistent post-consumer feedstock with low contamination rates. At a minimum, source-segregation of MSW between wet (organic) and dry (inorganic) waste will significantly reduce contamination of plastics as organic waste is typically the main component of solid waste, especially in emerging economies. The separate collection also ensures higher operational efficiencies for waste collectors. Harmonized nationwide standards and targets for source-segregation and separate collection can reduce the cost of collection for recyclers and increase value yield if properly enforced. While it may not be feasible to expand nationally, the authorities could start with key cities with significant MSW volumes, such as Ho Chi Minh City or Hanoi. There have been several pilot programs for source segregation across Vietnam (as highlighted in Section 3), but none have managed sustained success and scale. For these programs to achieve long-term success, there must be full support by the local Department of Natural Resources (DONRE) and by the People's Committee to enforce efforts of these public-private pilots. An example of neighboring success is from Depok, Indonesia, where the local authorities have achieved long-term success since 2012 by having more than 100,000 households segregate their waste.[99] Another key aspect of this action would be to develop a harmonized data reporting system to receive waste management and recycling data from every province and municipality. Based on previous research for the NPAP, basic waste management data (waste collected, waste generated) was not available when data requests were made to a sample of six of the 63 DONRE offices across Vietnam.
	5	Ensure alignment between public and private sector awareness and behavior change campaigns	Awareness and behavior change campaigns focusing on litter prevention, source segregation (e.g., dry vs. wet waste), and recycling are critical to the success of plastics circularity. Getting buy-in across consumers, businesses, and leaders at a national and local level is necessary to enable the success of any behavior change campaign. Waste management and recycling solutions are more effective when behavior change by consumers is complemented by strong political support by legislators and regulatory enforcement. There has been strong political momentum in Vietnam on the part of the central government to mitigate plastic waste. Local and international NGOs and businesses have also propelled strong grassroots efforts to raise awareness and advocate for source segregation. However, more efforts are needed at the provincial and district levels to ensure alignment on the messaging, engage consumers, and improve waste segregation enforcement. Additionally, households need assurance that source segregation is successfully implemented from the point of collection to transportation to processing. It is common for source-segregated waste to get mixed again during the transportation or processing stages. Voluntary EPR organizations and other consumer-facing industries that use plastics can partner with the provincial and district level adminis-trations to identify behaviors to be addressed, levers for changing the behaviors , and ensuring that communications should be backed up with SWM infrastructure that enables citizens to participate in the solutions.

99 The Jakarta Post, "Depok: The front line in Indonesia's fight against waste" (2017)

Cluster & timing	Action		Rationale
Strengthen the demand (3-5 years)	6	Provide opportunities for informal sector inclusion and increase transparency of recyclables collection	The informal sector plays an outsized role in the collection of plastics scrap and recycling in Vietnam. This is due to the absence of any scalable formal avenues of collection of resins for recycling (e.g., source segregation of recyclables). The informal sector is on the frontlines of collecting scrap material and is often exposed to unsafe, unhygienic working conditions, with low compensation for their efforts. As pointed out in Section 3, given the various challenges faced by plastic recyclers in Vietnam in procuring high-quality, large, and consistent volume of feedstock of post-consumer plastics from domestic sources, many recyclers still prefer imported plastic scrap since imports can better meet their quality requirements and satisfy traceability and proper invoicing needs. In addition, the demand for transparently sourced recyclables is expected to increase as brands increase their commitments to use recycled content. This trend and upcoming import restrictions (Decree No.40/2019/ND-CP and the updated Basel Convention, as highlighted in Section 3) provide a major opportunity to develop better sources for local feedstock and increase inclusion of the informal sector as part of this transparency, and through increasing informal-formal sector linkages. Waste and recycling markets can only be optimized through an integrated system. Thus, viable models must be inclusive of the informal sector and leverage their expertise. The informal sector can be included through any of the five best case practices for informal sector inclusion, identified by The Ocean Conservancy: (a) NGO-supported micro-enterprises; (b) Cooperatives and collectives; (c) Franchisee development; (d) Supplier development; (e) Independent waste banks.[100] The support for the informal waste management sector should be strengthened by registering informal waste workers officially, providing them with ID cards, and investing in capacity building to strengthen their ability to collect waste more efficiently. As an example, GIZ supported a project to integrate the informal waste collectors in Iloilo City. The workers received capacity building training to enhance their skills and eventually formed an association, Uswag Calajunan Livelihood Association (UCLA), to organize their work better and enhance their recognition.[101]

100 Ocean Conservancy - Plastics Policy Playbook (2019)

101 Paul et al. - Integration of the informal sector into municipal solid waste management in the Philippines – What does it need? (2012)

Cluster & timing	Action		Rationale
Strengthen the demand (3-5 years)	6	Provide opportunities for informal sector inclusion and increase transparency of recyclables collection (continued)	The establishment of cooperatives and SMEs should be supported. An example of such a co-op is SWaCH, India's first wholly owned cooperative of self-employed waste collectors and other urban poor. It is an autonomous enterprise that provides front-end waste management services to the citizens of the city of Pune in western India. The cooperative covers over 70 percent of the city, ensuring daily segregated waste collection from citizens' doorsteps while generating sustainable livelihoods for one of the poorest and most marginalized sections of society.[102] The promotion of the welfare and living standards of informal waste pickers programs by local governments could include initiatives such as annual health check-ups, life insurance, and annual bonuses for collecting more than a certain amount. The private companies managing waste collection could be encouraged to meet the informal waste pickers who work in their districts to discuss solutions (e.g., access to training, health benefits and safety equipment) for improving the working conditions and how to enable them to divert waste from landfills more effectively, thereby also reducing landfill fees for the private companies and saving them money.[103] An example of this is Hasiru Dala Innovations, a private waste collection company in Bengaluru, India. The organization works actively with 3,000 waste-pickers in the city to provide benefits such as social security, health insurance, and access to micro-finance to empower them to raise their standard of living. Another key need is to increase the transparency of the waste plastics supply chain in Vietnam by tracing the flow of materials through the informal collectors, junk shops, aggregators, and recyclers via digital mapping tools and platforms. This would potentially lead to higher prices for scrap plastic and enable more efficient routing of transport logistics for aggregators and recyclers.

102 SWaCH - Website
103 UNESCAP - "Closing the Loop" Sai Mai District, Bangkok Case Study (2018)

Cluster & timing	Action		Rationale
Strengthen the demand (3-5 years)	7	Implement pay-as-you-throw (PAYT) waste collection model to encourage separation at source	PAYT is a usage-pricing model in which users are charged based on how much waste they throw away. This gives incentives to individual households to reduce the amount of waste disposed of. Faced with a direct form of unit pricing for the waste they produce, households are motivated to source-segregate or recycle as much of their waste as possible so that they can save from paying the fees associated with the PAYT system. With this method, waste disposal resembles other utilities more closely, where the customer pays the amount for the services provided. Article 79 of the LEP sets the legal framework relating to expenses for collection, transportation, and domestic solid waste management treatment. Three key components need to be in place for effective implementation of a PAYT/Save As You Recycle (SAYR) scheme: (a) user identification system; (b) measuring the volume of waste generated; (c) provision of a publicly acceptable charging scheme. To ensure proper implementation of any PAYT model, it will be crucial to consult with the relevant People's Committee before launching any new waste disposal fee model. This will better enable the opinions of waste producers to be heard and accounted for. This will ensure the cooperation of households and bulk waste generators and discourage these participants from disposing of waste via informal channels. Additionally, enforcement and penalties for any illegal disposal will be critical. An example of exemplary enforcement of source segregation is the city of Depok, Indonesia, which redeployed police, fined those individuals who illegally disposed of their waste, and took them to court. The court cases were covered by the media, which ensured strong adherence to the rules.[104] There are several low-tech, short-term as well as technology-enabled, longer-term strategies in addressing PAYT solutions. For example, in Seoul, the waste disposal service fee is charged through the sale of low-tech, color-coded bags designated for the collection of different types of waste. The users are required to separate their waste into the right color-coded bags, which allows the waste collectors to easily identify and reject bags filled with the wrong type of waste. The bags are priced according to their colors (i.e., waste type) and sizes (volume). Technology has also played a leading part in the success of the source-segregation scheme in the city. Seoul has 6,000 automated bins equipped with scales and a Radio Frequency Identification (RFID) system that weighs food waste as it is deposited and charges residents using an ID card. The pay-as-you-recycle machines have reduced food waste in the city by 47,000 tonnes in the last six years.[105] Some of the smart technologies that are already available in the market in the Southeast Asia region include[106]: a. PAYT (Pay-As-You-Throw)/SAYR (Save-As-You-Reduce) using color-coded bags or RFID tracking systems b. Bin-fill wireless sensor technologies c. Collection route optimization software

104 GA Circular, "Driving Solutions for Post-Consumer Flexible Packaging in Asia." (2017)

105 World Economic Forum, "South Korea's organic waste recycling "(2019)

106 National Environment Agency, "Solid Waste Management Technology Roadmap" (2014)

C. Improve access to finance for recycling projects and support capacity building

As stated in Section 3, over 90 percent of formal recyclers contacted for this study in Vietnam have stated that no clear financial support or incentives for plastics recycling are provided by the government or by the private sector. It is critical to address access to finance needs and build local capacity, especially for SMEs to scale up the domestic recycling market.

Table 9.
ACTIONS AND RATIONALE FOR INTERVENTION "C: IMPROVE ACCESS TO FINANCE AND CAPACITY BUILDING"

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	8	Refine the green finance framework to evaluate and offer appropriate incentives to support the plastics recycling value chain	The State Bank of Vietnam (SBV) has taken several actions to support Vietnam's national green growth initiatives. In 2015, the SBV issued a directive on promoting green credit growth and environmental and social risk management in lending activities and an action plan for the banking sector to implement the National Green Growth Strategy. SBV's 2018 approval of a scheme for green bank development (No.1604/QD-NHNN) aims to further encourage and incentivize credit flows into green projects, especially those aligned with Vietnam's national goals for sustainable development. Since 2018, the following, among others, milestones were reached for financing related to the green economy:[107] a. Decree 95/2018 /ND-CP on government debt instruments on June 30, 2018 (Government of Vietnam, 2018) b. Decree 163/2018/ND-CP on corporate bond issuance dated December 4, 2018, including green bonds (Government of Vietnam, 2018) c. Decision 1731/2018/QD-NHNN to set the Action Plan of the banking sector towards the 2030 agenda and Vietnam SDGs (State Bank of Vietnam, 2018) Despite the progress, many of the private banks operating in Vietnam have yet to create financial products in the market to enable the private sector, especially SMEs, to unlock growth in the green economy, particularly plastic recycling. There are a few private banks that have active green financing programs, including but not limited to HSBC (an international bank in Vietnam), BIDV (a large Vietnamese bank with green credit line from WB), VPBank (a Vietnamese bank with an active credit line from IFC), and HD bank (a Vietnamese bank). The SBV, along with multi-lateral or bi-lateral development partners, should offer incentives to promote green banking. Banks should be incentivized through de-risking activities. In addition, Decision 1731/2018/QD-NHNN should be updated to align support for the National Action Plan to Reduce Marine Plastic Litter by 2030 with specific articles to support the plastic recycling value chain.

107 IFC, "Country Progress Report, Vietnam" (2019)

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	9	Develop practical processes for financing plastics circularity businesses	Recyclers interviewed for this study, when made aware of existing green finance options in Vietnam, stated, first, a mismatch between their financing needs versus the available options and second, found the documentation aspects of the application process to be overwhelming and out of reach (as highlighted earlier in Section 3). An appropriate financial model such as Risk Sharing Facility may be further explored, enabling plastic recycling and plastics circularity businesses, especially SMEs that do not have collateral to obtain loans from banks. There is also an opportunity to increase green financing of plastic recyclers and plastic circularity businesses through greater communications/awareness about the green loans and capacity building/training of plastic recyclers to meet the loan requirements and adjust the loan sizes. Additionally, it is recommended that the SBV and VPBank Green Framework: a. Revise the Green Asset Categories to add a specific category for plastics circularity to bring more focus and resources to this growing area of concern. Currently, plastics fall under 'eco-friendly and/or circular economy adapted products, production technologies. b. Include specific impact indicators for plastics circularity, such as tonnes of recycled plastic products produced; tonnes of energy and CO_2e saved by replacing virgin plastics with recycled plastics. c. Ensure that an experienced plastics recycling consultant is part of the application evaluation team. Or, at minimum, ensure that the evaluation team benefits from consultation to assess plastics circularity projects.
Strengthen the demand (3-5 years)	10	Build recyclers capacities to meet quality and EHS standards	As highlighted in Section 3, most recyclers in Vietnam do not have certifications for quality and EHS standards. Based on meetings with lenders and investors, this is a barrier against access to funding, and based on interviews with leading brands, it is a barrier in making purchase agreements. In summary, the recyclers need support to build their capacity in the following areas: a. Ensuring that information on lending programs and investment interests is reaching the intended recipients, such as through partnering with the VPA and the VPRA, which have a sizeable database of plastics recyclers. b. Identifying and securing necessary business licenses and permits. This can be done, for example, by the government (MOIT and MONRE), development partners, and/or banks collaborating to host workshops and provide guidance for recyclers to understand requirements to secure the necessary national licenses, permits, and standards and providing resources to help secure them.

Cluster & Timing	Action		Rationale
Strengthen the demand (3-5 years)	10	Build recyclers capacities to meet quality and EHS standards (continued)	c. Training programs and resources on applying and fulfilling international quality and EHS standards. d. Investments into more advanced machinery for productivity and quality improvement. e. Investments to increase the capacity of high-demand resins - e.g., transitioning to food-grade products. Capacity building can go beyond financial loans, investments, or training programs to meet other recycler needs. This includes infrastructure support by providing dedicated business parks with common wastewater treatment facilities and zoning of recyclers to reduce their investment costs and increase margins (for example, similar to efforts in Hong Kong to develop a public-private Eco-Park focused on plastics recycling).
Strengthen the demand (3-5 years)	11	Assess emissions mitigation potential in plastics circularity to unlock climate financing	Climate financing refers to funds targeted for GHG mitigation and adaptation, which may be drawn from public, private, and alternative sources of financing. It includes US$100 billion per year, pledged by developed countries under the Copenhagen Accords of 2009 and many other sources of funding that contribute to mitigating climate change.[108] Currently, low-carbon materials and dematerialization strategies are seldom considered for climate financing. The significant mitigation potential of the circular economy is thus overlooked. Therefore, most of the climate-financed projects across the world, including those in Vietnam, are focused on renewable energy and energy efficiency. However, there is growing evidence on how a circular economy, including plastic circularity, can contribute to climate change mitigation.[109] It must, however, be acknowledged that the application of the circular economy concept is still in its infancy. Robust and granular evidence is lacking to delineate and quantify the circular economy's climate mitigation potential.[110] National-level research is urgently needed in Vietnam to deepen understanding of the mechanisms that could enable the circular economy to realize its full potential in addressing climate change. Some climate finance options are being researched, including the potential for circular economy programs focusing on plastics to generate any GHG reductions that could qualify as tradeable carbon credits under Article 6 the Paris Agreement.

108 Circle Economy, " 5 questions to understand why the circular economy contributes to climate change mitigation" (2017)
109 Circle Economy, " 5 actions to mobilise climate finance for the circular economy" (2017)
110 Ibid.

D. Encourage the use of recycled content across all major end-use applications

With an estimated only 33 percent of the 3.90 million TPY of plastics resins consumed being recycled in Vietnam, the country lacks a strong secondary market for recycled plastics. Additionally, Vietnam's reliance on exporting recycled plastics has exposed the recycling industry to the full brunt of the global price volatility inherent in the recycling business. Setting recycled content targets enables the growth of a robust domestic market for recycled plastics by increasing the demand for post-consumer resin.

Table 10.
ACTIONS AND RATIONALE FOR INTERVENTION D: ENCOURAGE USE OF RECYCLED CONTENT ACROSS ALL MAJOR END-USE APPLICATIONS

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	12	Develop and offer incentives for using recycled content	Brand owners in Vietnam have expressed concerns about mandatory recycled content targets based on the expectation that prices of recycled resins would increase due to the demand created by this regulation. While mandatory recycled content targets are important, a clear set of incentives should be offered as the first step for companies to use recycled content before a timeline for specific targets is mandated. For example, the government can stimulate demand by mitigating some of the infrastructure costs of incorporating post-consumer resin (PCR) into plastic products by introducing tax benefits for plastic products that contain PCR content above a certain percentage (e.g., above 10 percent PCR). That way, brand owners and the rest of the value chain stakeholders would be encouraged to include PCR content in their products. As a benchmark, the Treasury of the United Kingdom levies lower value-added tax (VAT) on products or businesses that incorporate a minimum proportion of recycled, reused, or remanufactured material. Reducing VAT for recycled content or reuse and repair activities is in line with the previous select committee recommendations in the UK, e.g., in 2014, the UK government's Environmental Audit Committee recommended that the government should "introduce differential VAT rates based on lifecycle analysis of the environmental impact or recycled content of products, and tax allowances for businesses that repair goods or promote reuse."[111] If incentives for recycled content within Vietnam are not possible due to budget constraints (especially in light of spending during the COVID-19 pandemic), it is recommended to consider intervention no. 16 below (tax plastic applications without minimum recycled content) as an alternative for this intervention, as intervention no. 16 causes the motivation for making the use of recycled content more attractive but does not require the outlay of limited government funds.

111 Green Alliance, "Completing the Circle Creating Effective UK markets for recovered resources" (2018)

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	13	Set recycled content targets/ standards for major plastic use industries	Packaging, electronics, and textile applications use a large proportion of mono-material and multi-material plastics that should be focused on for achieving recycled content targets. Implementing national standards for recycled products can also promote consumer acceptance as consumers feel confident about product performance and safety. While work still needs to be done to clarify the usage of recycled content in food packaging, other non-food contact packaging applications, electronics and textiles are ideal end-use applications for recycled content to be included. As seen in Section 3, based on the analysis of known and estimated formal recycling capacity as of 2019, recycled content targets of 20 percent for PET packaging, PP, HDPE and LDPE/ LLDPE are feasible, even at 2030 consumption levels. The setting of specific recycled content targets and milestones for meeting them should take into consideration, at minimum, the installed recycling capacity, quality requirements, local SWM infrastructure, and cost-benefit analysis of the recycling targets. It is recommended that any recycled content rate targets are set at a resin-level or an end-use application level. For example, the recycled content target rate for PET bottles could be made higher as several consumer goods companies are already aiming for 25 to 50 percent recycled content rate targets for PET bottles by 2030, and also because the CFR rate for PET packaging is higher than that of other applications of PET. Recycled content targets can be as effective as the CFR rate targets as they stimulate the local secondary market for recycled products.
	14	Implement GPP for recycled plastic products	As discussed in Section 3, GPP has the potential to create market demand for recycled products. For example, as outlined in the EU's "Green Public Procurement Manual on Plastic Waste Prevention," governments may specify that packaging, bought or used by the government, must contain at least 75 percent recycled content. This could increase the demand for recycled plastic. Vietnam's current framework for GPP faces several issues under Article 146 in the new LEP update that will require detailed development of the decrees and circulars, especially for areas that will cover recycled plastic products. Before a structured framework can be finalized, recycled content standards will need to be established with the industry, and alignment on the Vietnam green label program criteria[112] and Law on Procurement will need to be examined. It is critical that these inconsistencies are resolved, and specific targets are set for different end-use applications so that the market for recycled plastics through GPP could be established.

112 MONRE, "14 Criteria of the Vietnam Green Label Announced" (2014)

Cluster & Timing	Action		Rationale
Maximize value (> 5 years)	15	Explore option of taxing plastic packaging, placed in market without minimum recycled content	Once recycled content targets are set and other actions under "Lay the Foundation" cluster in this table have been implemented, virgin material taxes should be levied on plastic products that do not clear the recycled content targets. This will help in stabilizing demand and ensure that the entire industry is progressively increasing recycled content usage. For example, the UK's plastic packaging tax will result in an additional tax of £200/tonne for plastic products, which do not have at least 30 percent PCR content when the rule comes into force in 2022. Similarly, the European Commission has proposed a €0.80/kg tax for all non-recycled plastic produced in the EU, generating an estimated €5.9 billion/year towards the EU budget. These taxes could be first targeted for products where the inclusion of recycled content is already established or where there are less barriers to accomplish it. For example, non-food contact packaging and textiles can already be targeted for recycled content usage, whereas more time might be needed for recycled content in food contact packaging.

As part of this study, recyclers and brand owners were asked to rank their priorities of key interventions to increase the CFR rate and value yield for plastics consumed in Vietnam. Recycled content targets were consistently ranked as the top priority by both brands and recyclers, per Figure 42 below. In addition, mandatory design-for-recycling (which is discussed later in Intervention E) was ranked second by both groups of stakeholders.

Figure 42.
RANKING OF PROPOSED ACTIONS BY RECYCLERS AND BRAND OWNERS IN VIETNAM

Interventions To Increase Plastic Products Locally Collected For Recycling:	Ranking by Recyclers
Recycled content targets for products	1
Mandatory-design-for-recycling standards	2
Advanced disposal or recycling contributions/fees paid by the company that places the product on the market	3
Pay the informal sector collectors more per ton collected	4
Mandatory Deposit Refund Systems	5
Carrying out Green Public Procurement	6
Remove subsidies from oil and gas industries in relation to virgin plastics production	7
Increase in landfill taxes	8

Interventions to increase plastic products locally collected for recycling	Ranking by Brand Owners
Recycled content targets for products	1
Others, please specify (Mandatory Segregated Collection	1
Mandatory-design-for-recycling standards	2
Advanced disposal or recycling contributions/fees paid by the company that places the product on the market	2
Mandatory Deposit Refund Systems	3
Remove subsidies from oil and gas industries in relation to virgin plastics production	4

Source: GA Circular primary research through In-depth interviews with Recyclers and Brand Owners across Vietnam (2020-2021).
Note: Rank 1 = highest priority; Rank 8 = lowest priority.

E. Mandate design-for-recycling standards for all plastics, especially packaging

Packaging constitutes an estimated 35 percent of the revenue generated from all plastics consumed in Vietnam.[113] Without fundamental redesign and innovation, about 30 percent of plastic packaging will never be reused or recycled.[114]

The packaging segments in Vietnam, regarded as hard to recycle due to design limitations, include small-format packaging, such as sachets, tear-offs, lids, and sweet wrappers; multi-material flexible packaging made of several materials stuck together to enhance packaging functionality; uncommon plastic packaging materials of which only relatively low volumes are put on the packaging market, such as polyvinyl chloride (PVC), polystyrene (PS) and expanded polystyrene (EPS), and highly nutrient-contaminated packaging, such as fast-food packaging.[115]

113 VPA Domestic Plastic Consumption Data 2019

114 Ellen Macarthur Foundation New Plastics Economy: Catalyzing Action

115 Ellen MacArthur Foundation, "New Plastics Economy: Catalysing Action" (2017)

Table 11.
ACTIONS AND RATIONALE FOR INTERVENTION "E: MANDATE "DESIGN-FOR-RECYCLING" STANDARDS FOR ALL PLASTICS, ESPECIALLY PACKAGING"

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	16	MOIT to consult with relevant stakeholders to develop design-for-recycling standards	As stated in the Prime Minister's Decision No 889-QD/TTg on National Action Plan on Sustainable Production and Consumption in 2021-2030, MOIT has been assigned to develop and complete policies, regulations, and standards on eco-label, sustainable design, eco-design, design for recycling and reuse; policies to promote the production and consumption of eco-friendly and eco-labeled products; policies on sustainable distribution, trade promotion, and sustainable import and export; policies to develop green industry, environmental industry, and waste recycling industry in the direction of a circular economy. It is strongly encouraged that the private sector, in collaboration with the VPA and VPRA, engages with MOIT to develop design-for-recycling standards while bringing in global best practices.
	17	Align industries on design-for-recycling standards and encourage voluntary adoption of these standards	Stakeholders across the plastics recycling value chain (recyclers, aggregators, and collectors) have consistently reported that several non-packaging plastic products are locked away from ever getting recycled due to poor product design (e.g., use of adhesives instead of screws in industrial plastic products). A number of recyclers have voiced their opinions to producers, requesting design changes but have not been successful as, in Vietnam, there are no guidelines or requirements for reparability/availability of spare parts, modular design, ease-of-disassembly, design-for-recycling, or for declaration of substances that are a problem for recycling. If value is to be unlocked from non-packaging plastic applications, design-for-recycling standards will eventually need to be mandated at some level, starting with voluntary adoption of the standards.

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	17	Align industries on design-for-recycling standards and encourage voluntary adoption of these standards (continued)	The development of voluntary design-for-recycling standards should be led by the industry (VPA, VPRA, Vietnam Chamber of Commerce and Industry, PRO Vietnam, and PPC Vietnam) and supported by the government (MOIT as per Action 16). For example, voluntary standards can be adopted by plastics producers and brand owners. One potential area for further study, specifically on multi-material sachets, will be to explore the technical (e.g., recycling ability), functional (e.g., barrier properties, tensile strength) and economic aspects of replacing complex design, multi-material sachets with mono-material, multi-layers with at least 90 percent of a single monomer by weight, or multi-material but more recyclable blends such as PP and PE blends. For e.g., multi-material sachets made from oriented PP (OPP) and Vacuum-Metallized Cast PP (VMCPP) or from Machine-Direction Orientated PE (MDOPE) and LLDPE have been reported by a few plastics value chain stakeholders in the Southeast Asia region as being easier to recycle.[116] Conducting a national or regional study could provide specific insights on the barriers in moving towards recyclable sachets and other product delivery models for low-income populations.
Strengthen the demand (3-5 years)	18	Mandate national design-for-recycling standards for packaging plastics	National mandates for industrial design standards for high-volume plastic applications such as packaging plastics will eventually create a level-playing field wherein investments and changes towards design-for-recycling become mainstream and there are no free riders. These mandates should take effect only after an acceptable time for the private sector to adjust operations to the national guidelines. Box 8 below provides a best practice example from the EU, which has a voluntary industry-led platform that has developed PET bottle design guidelines to facilitate recycling.

116 Daibochi Presentation (2020)

Box 8.

BEST PRACTICE: EUROPEAN PET BOTTLE PLATFORM (EPBP)

The European PET Bottle Platform is a voluntary, industry-led initiative in the EU that provides PET bottle design guidelines for recycling, evaluates PET bottle packaging solutions and technologies, and facilitates understanding of the effects of new PET bottle innovations on recycling processes. This initiative fully supports a circular economy for the European PET value chain.

The EPBP consists of technical experts in the field of PET production, design, and recycling, whose only objective is the evaluation of new technologies and providing an independent and confidential assessment of their impact on the PET recycling processes across Europe. EPBP has established several test procedures to assess the impact on recycling of new packaging technologies. Products that pass the tests are far less likely to cause problems during recycling.

The objective of the Design for Recycling Guidelines for PET bottles is to encourage packaging designers, converters, and users to integrate specific criteria during the development phase of a new product to facilitate PET recycling. In the context of Vietnam, the SCPO office, along with the relevant stakeholders, can look to the EPBP as a best practice case study to develop these national standards to improve the value yield and CFR rate for plastics in Vietnam.

Design Guidelines

EPBP

Please select a product from below:

Transparent clear / light blue PET bottles

Transparent coloured PET bottles

Opaque PET bottles

	YES Full compatibility – materials that passed the testing protocols with no negative impact OR materials that have not been tested (yet), but are known to be acceptable in PET recycling	CONDITIONAL Limited compatibility – materials that passed the testing protocols if certain conditions are met OR materials that have not been tested (yet), but pose a low risk of interfering with PET recycling	NO Low compatibility – materials that failed the testing protocols OR materials that have not been tested (yet), but pose a high risk of interfering with PET recycling
Material	PET		PLA; PVC; PS; PETG
Size			smaller than 4 cm (when compacted) or larger than 5 liters
Colours	transparent clear; transparent light blue		other transparent colours; opaque; fluorescence; metallic
Barrier	SiOx plasma coating	carbon plasma coating; Nylon-MXD6 in a 3-layer structure with up to 5 wt% Nylon-MXD6 and no tie layers; PGA multilayer ; PTN alloy	Nylon-MXD6 in a 3 layer structure with > 5 wt% Nylon-MXD6 or with tie layers; Nylon-MXD6 in a 5 layer structure; monolayer Nylon-MXD6 blend; EVOH
Additives		UV stabilisers; AA blockers; optical brighteners; oxygen scavengers	bio-/oxo-/photodegradable additives; nanocomposites

Table - Snapshot of example guidelines for optimal PET bottle design by the European PET Bottle Platform

4.3 Interventions to increase CFR rate

A. Create more data transparency in the plastics market

A lack of relevant and up-to-date data in many aspects of plastic consumption, imports/exports, and recycling in Vietnam has been one of the most common challenges expressed by private sector stakeholders. Furthermore, this lack of data transparency and availability also creates a barrier to entry for investors and businesses to expand into plastics recycling.

Table 12.
ACTIONS AND RATIONALE FOR INTERVENTION F: CREATE MORE DATA TRANSPARENCY IN THE PLASTICS MARKET

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	19	MOIT/Customs to formally (i) create a publicly accessible database of plastics import/export; (ii) improve accuracy of data entry; and (iii) build a comprehensive list of recyclers	Import/export data of all goods, including plastics, is owned, and managed by the MOIT and the Customs Department, with inputs from the VPA. The experience in collecting data for this study uncovered several issues that should be urgently addressed by MOIT/ Customs to enable the wider recycling industry to formalize: a. A lack of transparency regarding import/export data of various resins, plastic products, and scrap plastics was raised by almost all stakeholders across the value chain. A publicly accessible dataset of such import/export data is needed. b. Differing data entry protocols (such as usage of different units of measurement, e.g., kilograms and tonnes; units and pieces) and several data entry errors (e.g., the addition of extra digits to quantities received or shipped) were found, which resulted in significant inaccuracies to total resin consumption in Vietnam. The data entry process at the source of entry should be reviewed and updated. c. No public-sector or private-sector organization currently holds a comprehensive list of plastics recyclers in Vietnam. The stakeholders interviewed see this as a significant blind spot to understand formal and informal recycling capacities fully. VPRA's data set is also not complete. A comprehensive list of formal recyclers and estimates of the number of informal recyclers and their capacities should be created and updated annually.
	20	VPA to: (i) encourage greater company participation in data sharing; and (ii) create virgin and recycled resin market databases and reports	While VPA members include resin producers, converters, manufacturers, and recyclers, these were mainly the resin producers and recyclers who provided data and insights needed for this study. Resin producers and recyclers shared monthly price data and only annual volume data. It is recommended that the VPA encourage: (i) greater company participation across the value chain in sharing data; and (ii) create monthly and annual plastic industry datasets and reports containing aggregated virgin and recycled resin prices, production volumes, import/export volumes, end-use industry usage data, industry outlook, and position papers/white papers.

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	20	VPA to: (i) encourage greater company participation in data sharing; and (ii) create virgin and recycled resin market databases and reports (continued)	Benchmarks for such databases and reports would be the British Plastic Federation's Polymer Price Index and Cost Comparisons and the Plastics Institute of Thailand's monthly and annual plastic industry snapshots, which aggregate private-sector and government data on the plastics industry, including key pricing and volume information.
Strengthen the demand (3-5 years)	21	Develop VPRA into a separate association; expand membership and representation	The current VPRA is hosted under the VPA and is still a relatively small association with limited representation and reach. There are still a largely unknown number of formal recyclers who are not part of the industry association, including some who were engaged in this study. VPRA could become a stronger voice for plastics recyclers in Vietnam if it becomes a fully independent association and works on the inclusion of various formal and informal plastics recyclers across Vietnam. A similar parallel can be found in Malaysia where it was not until 2014 that the independent Malaysian Plastics Recyclers Association (MPRA) was spun out of the Malaysian Plastics Manufacturers Association (MPMA) to spur the growth of the plastics recycling industry, enhance data integrity, and to engage directly with government and regulators.[117] The MPRA has been active in recent years, increasing its membership, building datasets, hosting events, and releasing white papers in partnership with the MPMA.

117 Official website of the Malaysia Plastics Recyclers Association

Photo: Shutterstock

B. Increase recycling (mechanical and chemical) capacities and discourage disposal of plastics

As seen in Section 3, the gap between total resins consumed and the estimated existing formal capacity to recycle the same is equivalent to 2.67 million TPY or 68 percent of the equivalent of the same resin consumption. All stakeholders interviewed for this study agreed that it would not be possible to increase the CFR rates in Vietnam without adding additional recycling capacity. This requires several actions which are interlinked with one another and are listed below.

Table 13.
ACTIONS AND RATIONALE FOR INTERVENTION G: INCREASE RECYCLING (MECHANICAL AND CHEMICAL) CAPACITIES & DISCOURAGE DISPOSAL OF PLASTICS

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	22	Incentivize increase in recycling capacities for polyolefins (PP, PE) and develop PET packaging recycling to produce higher-end recycled products	Resins with wide ranging single-use applications such as PP, HDPE, and LDPE/LLDPE have wide gaps for recycling capacity. For example, PP (71 percent gap) and PE (70 percent gap). Thus, these resin types must be prioritized for investments. Evaluate and develop appropriate options to increase domestic recycling capacities such as: a. Offering temporary incentives such as those provided to spur the petrochemical industry in Vietnam. For example, potentially extending a tax exemption for plastics recyclers to at least five years (even smaller formal recyclers note a payback period of at least five years on their CAPEX). b. Drive adoption of necessary EHS practices and standards with technical support, including access to knowledge/information specifically for the material washing process, an essential but expensive process in recycling, to extract the most value. c. Providing infrastructure support using a dedicated industrial park for plastic recycling to streamline operations, improve efficiency and increase economies of scale for recyclers, like current manufacturing and technology parks, such as the Vietnam Singapore Industrial Park.[118] d. In the long-term, establishing a plastic market development program, which pays a pre-arranged value per ton to plastics re-processors and manufacturers using recycled plastics. This program can be financed by the tax collected from plastic applications without minimum recycled content (as per Action 15). While considering incentives, it is also important that plastic recycling projects that add the most value to the final product and that meet EHS standards (e.g., solid state polymerization or adding a hot-wash or cold-wash line) are prioritized over those projects that do not add value or do not meet EHS standards. For example, if the washing step of plastic recycling does not receive specific incentives, it is as good as not promoting recycling as the washing step is a key cost and operational component of any mechanical recycling process.

118 Mitsubishi Group, "Vietnam Singapore Industrial Park" (nil)

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	23	Formalize informal recyclers and reduce unfair competition from illegal recyclers	While informal (or unlicensed) plastic recyclers positively contribute to the CFR rate, they may put formal recyclers at a disadvantage. This is because the informal recyclers do not comply with EHS standards and other requirements (such as paying tax), allowing informal recyclers to avoid the costs associated with compliance. Hence, the informal recyclers have more resources to buy feedstock at higher prices and/or sell their products at lower prices than the formal recyclers. This forces formal (licensed) recyclers to increase their buying prices or risk not having enough supply of post-consumer plastics, or to sell their product at lower sales prices, i.e., unlicensed recyclers jeopardize the business viability of formal recyclers. The competition from informal recyclers in Vietnam is significant. Formal recyclers who have participated in this study have estimated the capacity of informal plastic recyclers to be between 0.9 million to 1.61 million TPY, thus constituting a threat to formal recyclers and an opportunity for increasing formal recycling capacity by way of formalizing the current informal recyclers. There are two steps suggested to improve this situation: › *Step 1:* Providing a pathway to formalization for illegal recyclers (through technical and administrative assistance and development of industrial recycling parks for the informal recyclers to move to) will help provide an incentive for these recyclers to formalize. › *Step 2:* Enforcing actions to shut down recyclers who do not comply with relevant EHS regulations to ensure a level playing field. Step 2 should only be undertaken if a recycler cannot be formalized through best efforts, including provision of technical and administrative assistance/capacity building. An example of similar actions is found in Penang State, Malaysia, where the city council (MBSP) provides temporary licenses to informal recyclers who can comply with the set standards and conditions for them to operate before eventually being licensed and thereby offering a transition pathway. In addition, the Malaysian government has recognized the environmental impact of unlicensed recyclers and since early 2019 and has closed 140 illegal plastic recycling plants that violated the country's Environmental Quality Act 1974.[119]

119 Recycling Today - Malaysia closes illegal plastic recycling facilities (2019)

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	24	Develop clear standards for importing quality scrap plastics to produce pellets, semi-finished and/or finished goods; and avoid an outright plastic scrap import ban.	This action addresses concerns raised by stakeholders surrounding Decree No.40/2019/NQ-CP, which is related to the new import restrictions that would take effect in 2025. Many recyclers have stated that upcoming restrictions should be modulated to ensure that only quality scrap plastics continue to be allowed while access to local feedstock quality improves. Recyclers are strongly opposed to the current version of the decree that requires importers of plastics scraps to convert plastic scrap into semi-finished or finished goods after 2024. This is because: (i) recyclers will not be able to compete with other established plastic manufacturers specializing in producing semi-finished or finished goods; and (ii) clean and high-quality local feedstock is not available in the quantities required. For the latter issue, it is thus critical that EPR and source segregation are implemented before stronger limitations are placed on the importation of plastic feedstock.
Strengthen the demand (3-5 years)	25	Invest in chemical recycling (plastic-to-naphtha/ plastic-to-monomer) capacity for low value plastics	Chemical recycling (pyrolysis) converts waste plastics into cracker feedstocks that could displace naphtha or natural gas liquid (NGL) demand. This type of recycling treats low-value mixed polymer streams and multi-layer plastics that mechanical recycling technologies cannot handle. Outputs of chemical recycling are more resilient to lower oil prices, remaining profitable at US$50/barrel[120] as compared to mechanical recycling (at US$70- US$80/barrel). Technologies that convert plastics back into secondary raw materials or fuels can be considered to fall under two broad categories: (a)plastic-to-plastic (via naphtha or monomer recycling); (b)plastic-to-fuel (PTF).[121] Such technologies are still largely at the pre-commercial stage. The scalability, financial viability, environmental impact assessments, and other risks of chemical recycling have not yet been fully demonstrated, especially in a Southeast Asian context. These technologies are generating interest as a replacement for unsustainable feedstock sources.[122] While harmonized definitions for chemical recycling are still to be developed, even in the EU which leads in the development of these technologies, plastic-to-fuel technologies are considered by the chemical recycling industry to be energy recovery, not recycling; only plastic-to-plastic technologies (such as those that produce naphtha or monomers directly) are considered to fall under existing EU definition of recycling in the EU Waste Framework Directive.[123]

120 McKinsey & Company, "How plastics waste recycling could transform the chemical industry" (2018)
121 BCG, "A Circular Solution to Plastic Waste" (2019)
122 Plastic Recyclers Europe, "Flexible Films Market in Europe, State of Play" (2020)
123 Chemical Recycling Europe, "About Chemical Recycling" (2019)

Cluster & Timing	Action		Rationale
Strengthen the demand (3-5 years)	25	Invest in chemical recycling (plastic-to-naphtha/ plastic-to-monomer) capacity for low value plastics (continued)	Chemical recycling technologies are already beginning to enter Southeast Asian countries such as Indonesia and Malaysia.[124] Chemical recycling (plastic-to-plastic) is especially relevant to PE and PP flexible films in Vietnam and should be encouraged to complement mechanical recycling. One example of a potential chemical recycling solution that can be replicated in Vietnam is Multicycle,[125] an EU project which uses the CreaSolv technology to identify potential chemical recycling solutions for plastics in mixed waste. Recycling capacity investment should not be prioritized in facilities that produce plastic-to-fuel (e.g., plastic-to-diesel) as a primary output as this is not considered circular.
	26	Increase landfill tipping fees and invest in treatment of organic waste	Currently, landfill tipping fees in Vietnam are low, starting from VND 66,000/ton (US$3/ton). Landfilling thus remains economically attractive as a waste disposal option and consequently puts a disincentivizing price pressure on alternative processes that divert plastic waste to energy recovery or recycling. Increased landfill tipping fees can encourage the diversion of recyclables from the landfills and open dumpsites. Increases in the landfill tipping fee need to be considered and modulated on a provincial/municipal basis as some provinces with lower budgets are reliant on open dumpsites, thus increasing landfill tipping fees for such provinces/municipalities could increase the occurrence of illegal dumping. Plastic recycling will be more successful if investments are made in parallel to organic waste treatment such as industrial-scale composting, anaerobic digestion, or mechanical biological treatment (MBT) to create value from organic waste. Segregating organics from the remaining waste stream results in less contaminated plastic feedstock and increases the material value yield. An added benefit is that organic waste treatment facilities have the potential to process biodegradable plastics, currently a small packaging segment with future growth potential. For example, in the Philippines, the Manila Bay Sustainable Development plan includes four large-scale composting facilities as part of its efforts to improve SWM in the area through diversion. The plan encourages the provincial governments to partner with the private sector from feasibility studies to the construction and operation of the composting facilities.

124 Plastics Energy Press Release on Malaysia; Plastics Energy Press Release on Indonesia.

125 Multicycle, "Multicycle" (nil)

C. Create industry-specific requirements to help increase plastic waste collection and recycling rates

One of the main challenges to plastics circularity in Vietnam is a lack of industry-specific collection/take-back requirements for the major end-use industries. This lack of producer responsibility results in the CFR rates being completely left to market forces. Thus, the CFR rates need to be decoupled from this cost pressure on recycled plastics, and industry-specific requirements offer a proven way to do so.

Table 14.
ACTIONS AND RATIONALE FOR INTERVENTION H: CREATE INDUSTRY-SPECIFIC REQUIREMENTS TO HELP INCREASE PLASTIC WASTE COLLECTION AND RECYCLING RATES

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	27	Mandate collection targets for the packaging industry, based on industry consultations	The packaging industry accounts for an estimated 35 percent of the end-usage of plastics in Vietnam.[126] Mandatory collection targets minimize the challenge of free-riders and require the entire obliged industry to participate in increasing CFR rates. The targets should be calibrated based on how recyclable the resins and products are and how developed the recycling infrastructure is. These collection targets will, in effect, be an essential aspect of the decrees and circulars that will be developed for Articles 53, 54, and 55 of the new LEP. Mandating collection targets under an EPR system should not be prescriptive, and the design and implementation of economic models should be based on industry consultations and country-specific factors. Roadmaps for implementing an industry-run EPR system or public fund/government-run EPR system should be explored and assessed in further detail to inform the implementation of the draft Decree on EPR under the LEP. It is recommended that the targets encourage eco-modulation within the economic model of the EPR to accelerate progress. For example, in developing the economic model for the EPR system, the industry should be required to pay a higher fee to enable collection for lower-value, non-recyclable plastics (such as multi-material, multi-layer flexible packaging) as compared to higher value, recyclable plastics (such as rigid PET, HDPE, and PP bottles and containers).
	28	Support co-processing of low-value plastics for use in RDF as an interim measure	RDF co-processing provides a potential solution to managing unrecyclable plastic wastes in Vietnam, such as multi-layer flexible plastics like pouches and sachets via energy recovery. Brand owners and other plastic waste generators (including cities) have the opportunity to work directly with cement kilns to co-process post-consumer plastic waste, as practiced in other countries (e.g., the collaboration between Nestlé and Republic Cement in the Philippines).[127] In some cases, brands can leverage plastic offsetting services to procure feedstock of low-value plastics to provide to co-processors. For example, there is a pilot between INSEE Ecocycle and TonToTon in Ho Chi Min City to process low-value plastics certified to be ocean-bound from Phu Quoc Island in Vietnam.[128]

126 Based on 2019 revenue data by the VPA.
127 Republic Cement and Nestle Philippines press release
128 TontoTon, "What is plastic neutralization?" (nil)

Cluster & Timing	Action		Rationale
Lay the foundation (1-2 years)	28	Support co-processing of low-value plastics for use in RDF as an interim measure (continued)	As mentioned in Section 3, the co-processing of low-value plastics for use in RDF is not a long-term, circular solution. It allows for the near-term diversion of low-value plastics away from landfills, open dumpsites, and waterways. At the same time, longer-term circularity solutions are being developed (e.g., chemical recycling for plastic to plastic processing of low-value multi-layer plastics that cannot be recycled via current mechanical recycling technology). Prioritizing RDF without focusing on reducing/reuse/new delivery models (Action 2) and design-for-recycling (Actions 16-18) would have the effect of locking in a linear solution over more circular solutions. Thus, to enable both reductions in plastic leakage and increased plastics circularity, it is critical that this intervention (Action 25) is accompanied by equal or greater focus and progress in Actions 2 and 16-18 and other circularity interventions for low-value plastics.
Strengthen the demand (3-5 years)	29	Mandate reporting framework for plastic products	There is a need for product-level data in Vietnam where producers and retailers declare the quantities of plastic products (e.g., packaging and electronics) they introduce into the market, based on polymers used, volumes, and end-use sectors. This allows for an accurate understanding of plastic products placed on the market and target setting for policymakers. For example, Singapore will require all companies putting packaging into the country to annually declare the plastic resin types and tonnages from 2022 onwards. Accurate reporting of consumption of resins and plastic packaging products will be used to set EPR targets for the local industry.

4.4 Summary of interventions

Increases in CFR rates and value yields are possible by implementing the interventions mentioned above.

Each intervention by itself has the potential to increase the recycling value unlocked by between US$0.8 billion to US$1.8 billion per year. However, these interventions can overlap so that the combined unlocked value would be lower than the sum of the single intervention values. This analysis only shows the potential benefit of each intervention to unlock material value because the costs for implementing each intervention have not been estimated under this market study. Thus, a detailed cost-benefit analysis for each intervention has not been performed. Figure 43 and Table 15 below summarize the interventions and their effect on increasing CFR rate and value yields.

Photo: Shutterstock

Figure 43.
RECOMMENDED INTERVENTIONS AND THEIR IMPACT ON INCREASING CFR RATE AND VALUE YIELD

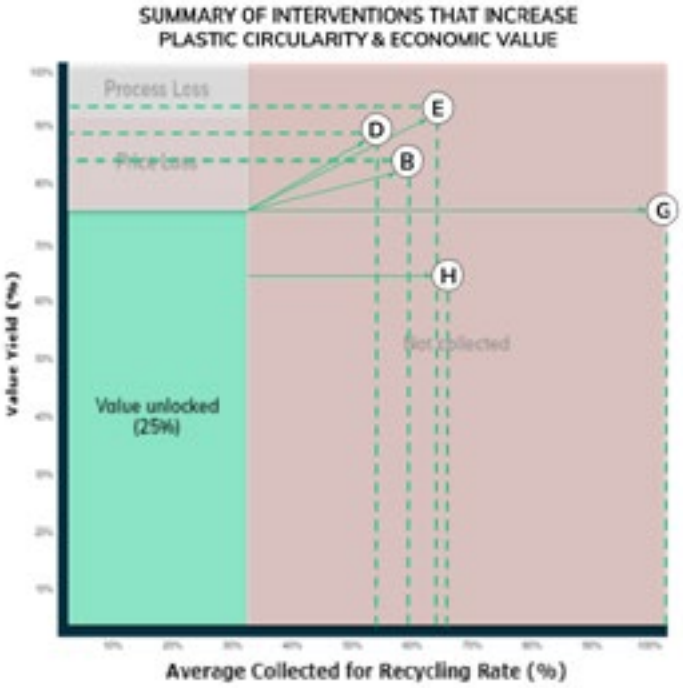


Table 15.
RECOMMENDED INTERVENTIONS AND THEIR IMPACT ON INCREASING CFR RATE AND VALUE YIELDS

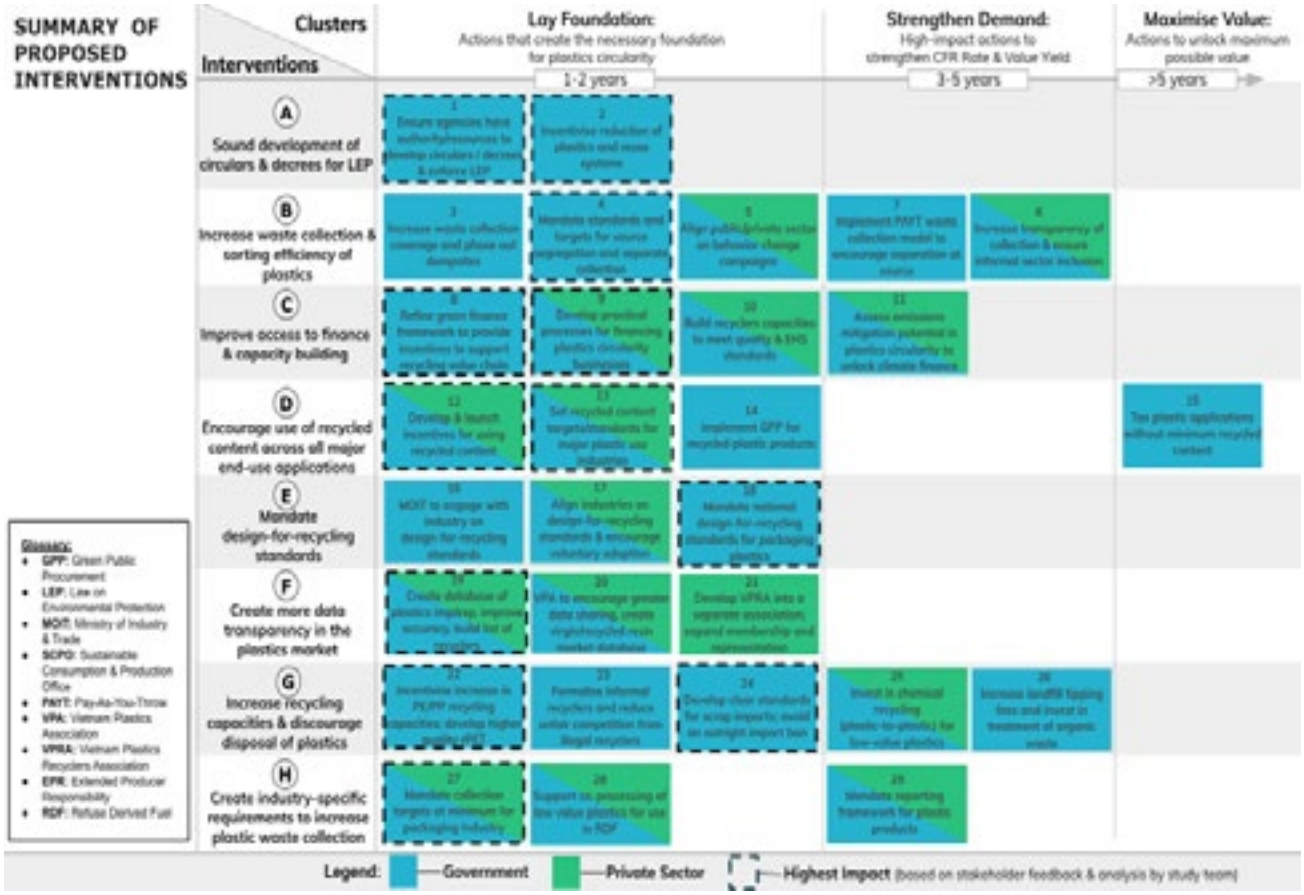
SUMMARY OF INTERVENTIONS	INCREASE IN VALUE YIELD	INCREASE IN CFR RATE	MATERIAL VALUE UNLOCKED
1. Interventions that increase CFR rate and value yield			
A. Enable plastics circularity through sound development of the underlying policy (circulars and decrees) for the LEP	-	-	-
B. Increase waste collection and sorting efficiency of plastics	8%	27%	US$0.9 billion
C. Improve access to finance and capacity building	-	-	-
D. Encourage use of recycled content across all major end-use applications	11%	22%	US$0.8 billion
E. Mandate "design for recycling" standards for plastics, especially for packaging	17%	30%	US$1.1 billion
2. Interventions that increase CFR rate			
A. Create more data transparency in the plastics market	-	-	-
B. Increase recycling (mechanical and chemical) capacities and discourage disposal of plastics	-	67%	US$1.8 billion
C. Create industry-specific requirements to help increase plastic waste collection and recycling rates	-	31%	US$0.8 billion

Intervention's "A" (build out and enforce plastics circularity in LEP), "C" (improve access to finance and capacity building) and "A" (create more data transparency in the plastics market) both in Section 4 did not have specific value yields and CFR rates increases listed in the above table as these three interventions are more qualitative in nature and calculation of their direct impact on value yields and CFR rates was not possible. These three interventions are critical and serve as the foundation to support the more specific interventions listed in the table above. Please see Appendix 16 for the detailed assumptions and calculations of the material value unlocked through these interventions. Additionally, please see Appendix 17 for a summary and classification of all recommendations from the supply and demand of plastics.

4.5 Next steps

Figure 44 below summarizes all the actions by interventions and clusters based on the clustering of actions shown above. It also highlights who (i.e., government or private sector or both) is mainly responsible for undertaking each action.

Figure 44.
SUMMARY OF ALL STUDY INTERVENTIONS AND ASSOCIATED ACTIONS



Priority actions for unlocking lost material value

Based on analysis by the study team and stakeholder feedback in terms of practicality of implementation in the next one to five years, 12 priority actions have been identified in Table 16 below to unlock material value and support the growth of the domestic recycling industry.

Some of these actions will require a further feasibility study (i.e., policy analysis, cost-benefit analysis, and sensitivity analysis) to evaluate and recommend specific approaches to implement/operationalize these actions and help guide specific policies, targets, and directives.

Table 16.
SUMMARY OF THE 12 PRIORITY ACTIONS FOR UNLOCKING LOST MATERIAL VALUE

Action No.	Priority Actions Based on Stakeholder Feedback	Time Horizon	Lead Stakeholder
1	Ensure that responsible agencies have the authority and resources to work with the relevant stakeholders to develop the underlying policy instruments (decrees and circulars) and enforce the LEP	1-2 years	Government
2	Incentivize reduction of plastics (e.g., phase-outs of unnecessary plastic items) and reuse systems (e.g., refillable bottles, new delivery, and business models)		
4	Mandate and harmonize source segregation and separate collection standards and targets		
8	Refine the current green finance framework to provide specific incentives and support for the plastics recycling value chain		
18	Mandate national design-for-recycling standards for packaging plastics		
22	Incentivize increase in formal PE/PP recycling capacities; develop higher quality PET recycling		
24	Develop clear standards for the import of quality scrap plastics to produce pellets, semi-finished and/or finished goods; and avoid an outright plastic scrap import ban	3-5 years	
9	Develop practical processes for financing plastics circularity businesses	1-2 years	Government and private sector
12	Develop and launch incentives for using recycled content		
13	Set recycled content targets/standards for major plastic end-use industries		
19	Formally (i) create a publicly accessible database of plastics import/export; (ii) improve the accuracy of data entry; and (iii) build a comprehensive list of recyclers		
27	Mandate collection targets for the packaging industry based on industry consultations		

Summary of private sector financing and/or investment opportunities

Table 17 below illustrates the key private sector financing and/or investment opportunities, based on the current market situation (i.e., growing demand for food-grade and high-quality non-food grade recycled content by large brands, particularly in the packaging sector) and the current policies in place in Vietnam.

Table 17.
SUMMARY OF PRIVATE SECTOR FINANCING AND/OR INVESTMENT OPPORTUNITIES

Horizon	Private Sector Financing/Investment Opportunities
Short-term (1-2 years)	PET bottle-to-bottle recycling facilities for food-grade applications: As highlighted in Box 2 in Section 3, Duy Tan's US$60 million bottle-to-bottle facility is underway. However, there are still significant opportunities to upgrade existing PET recyclers to meet the growing demand from brand owners. Equipment upgrades/advancements for existing HDPE, LDPE, and PP recyclers to produce higher quality output (non-food grade) and to expand capacities.
Mid-term (3-5 years)	Food-grade recycling facilities for HDPE, LDPE, and PP. *(Note: this is on a slightly longer horizon than food-grade PET, as setting up the policies and standards for food-grade HDPE, LDPE, and PP will take slightly longer than for PET policies. This is because a significant portion of the feedstock from HDPE, LDPE, and PP comes from non-food grade applications. Also, chemical recycling (plastic-to-plastic) technologies would have to be fully commercialized for food-grade HDPE/LDPE and PP recycling applications.)*

If the Vietnam government implemented the policies recommended in this study after further analysis of the implementation costs and other local considerations, additional private sector financing and investment opportunities would become available, as is evident from the following statements:

Once incentives to reduce plastics and increase reuse systems (Action 2) are offered, investments into businesses that provide refillable or new delivery models would be more attractive. There would be a further focus by private sector stakeholders to develop reuse/refill models to replace sachets.

Once the enabling environment for access to green finance to the plastics recycling value chain becomes easier and recyclers are provided with the capacity to meet local and international standards, banks will be incentivized to lend to these stakeholders (Actions 8-11)

Once recycled content targets are incentivized and mandated, modulated industry targets are set, and fees are charged based on the recyclability of plastics (actions 12, 13, and 27), investments into recyclers would be stimulated further.

Market Study for Vietnam: Plastics Circularity Opportunities and Barriers is a private sector focused market assessment of plastics value chains and the recycling market in Vietnam with the overall goal of identifying the opportunities and barriers for plastics circularity in the country.

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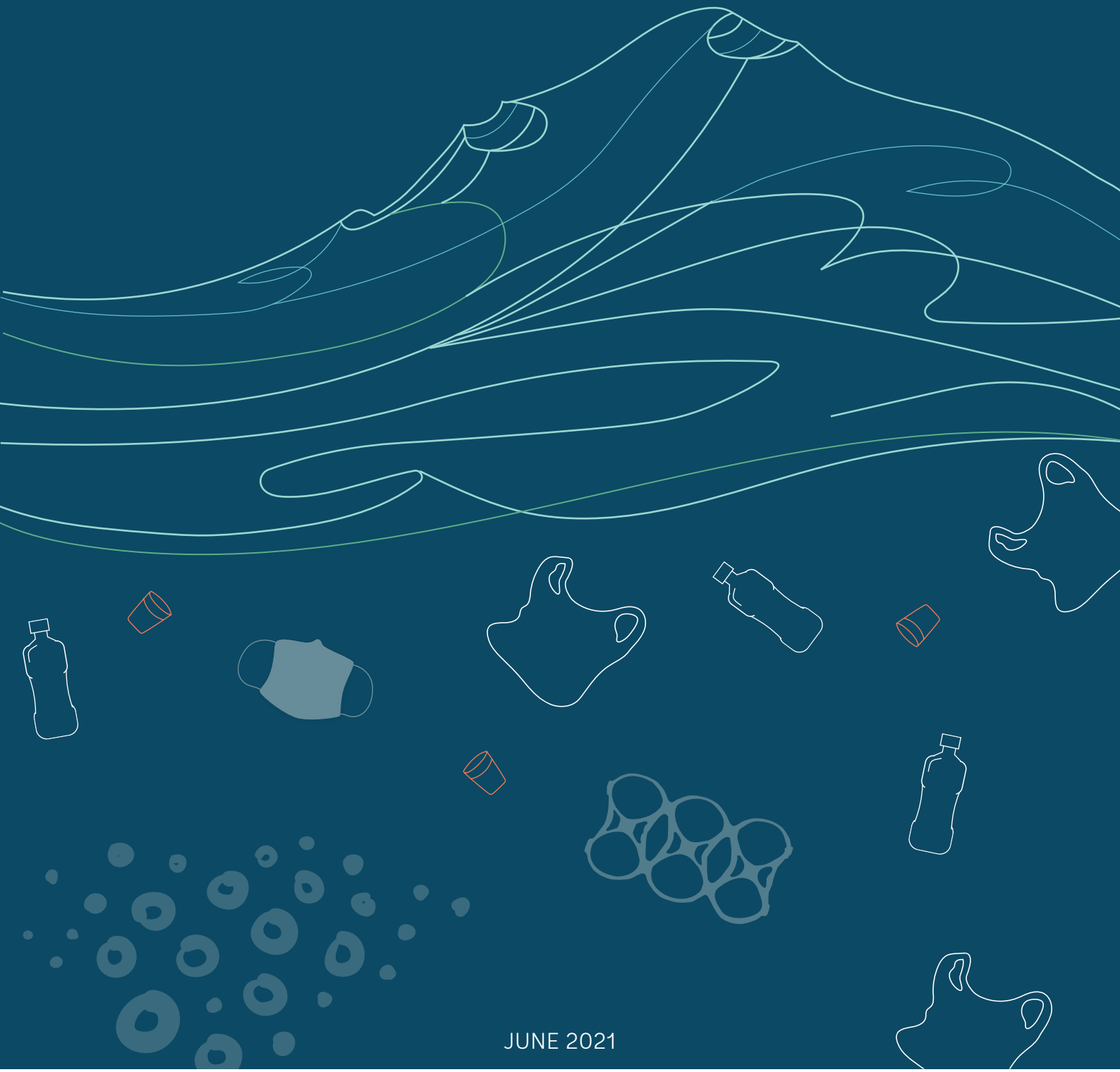

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