

Regional Plastics Outlook for Southeast and East Asia



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Foreword

Plastics are pervasive materials in our societies used for a wide range of applications, from food preservation to materials for vehicles, garments and sterile medical devices. While plastics offer numerous benefits, their lifecycle impacts the environment through pollution, as well as climate change and biodiversity loss. Countries around the world have started taking policy action to tackle plastic pollution in recent years. To scale up ambition and better coordinate policy efforts, negotiations began in 2022 to develop an international, legally-binding instrument to end plastic pollution.

Plastic production, use, waste mismanagement and leakage to the environment are not uniformly distributed, globally. Countries in Southeast and East Asia exhibit trends and characteristics that make them both major contributors to plastic pollution and particularly vulnerable to the risks for the environment, human health and wellbeing, as well as economies and livelihoods. In several countries in this region, the development of waste management systems has not been rapid enough to keep up with fast-paced growth in plastics use and waste generation, resulting in releases of plastics to the environment and increasing pollution. Geographical features, such as extensive coastlines, high rainfall and the occurrence of extreme weather events may all contribute to plastics being transported to the oceans via contaminated rivers, contributing to marine debris. Ending plastic pollution is crucial to support the region's ambitions for green growth as well as to safeguard the health of the entire planet.

This Regional Plastics Outlook focuses on Southeast and East Asia, specifically the ASEAN Plus Three (hereafter APT). The Association of Southeast Asian Nations (ASEAN) includes 10 countries: Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic (hereafter Lao PDR), Malaysia, Myanmar, the Philippines, Singapore, Viet Nam and Thailand. The APT extends this grouping to include 3 East Asian countries (referred to as "Plus Three" countries): the People's Republic of China (hereafter China), Japan and Korea.

This Outlook intends to support policy design and implementation in the region. It provides an overview of the dynamics of plastic flows for countries within the region, takes stock of current policies, and highlights gaps that need to be bridged to end plastic pollution. The methodology employed in this Outlook builds on the foundational methodological framework developed in the Global Plastics Outlook publications, to quantify the main mechanisms driving plastic production and use, waste and pollution. Using state-of-the-art environment-economy modelling, this Outlook provides detailed sectoral and regional projections of the plastic lifecycle, including for different polymers and applications, waste generation and treatment, and leakage to aquatic and terrestrial environments.

This Regional Plastics Outlook provides policymakers with a long-term perspective on plastics in the APT. It presents coherent projections on plastics use and waste, as well as their environmental impacts to 2050. Through a series of policy packages, the Outlook demonstrates the environmental benefits and economic consequences of stringent policies tackling plastic pollution. The quantitative analysis in this Outlook is centred around two scenarios: a *Baseline* scenario (showing projections under current policies) and a *High Stringency* scenario (showing projections for stringent policies aligned with the goal of ending plastic pollution in APT). The Outlook also explores an alternative scenario with lower ambition levels, and another alternative scenario with global scope, showing that, while global ambition remains essential to end plastic pollution at the global level, the APT countries have the ability to act decisively today through high stringency policies to end regional plastic leakage and achieve a cleaner, more sustainable future.

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Editorial

Plastics play an important role in our daily lives, from helping to preserve food and insulate buildings to increasing the fuel efficiency of vehicles. At the same time, their rising production and use is leading to large amounts of waste and pollution. Plastic leakage affects not only coastal areas, but also urban centres, rural zones and biodiverse marine habitats.

The Southeast and East Asian region is a major hotspot for plastic pollution, driven by rising waste generation and insufficient – though improving – waste management, as well as a high prevalence of plastic leakage along its densely populated coastlines. The region is now emerging as a global player in the fight against plastic pollution. National action plans, as well as regional policy frameworks such as the ASEAN Regional Action Plan for Combating Marine Debris, are creating momentum for more ambitious and co-ordinated policy responses, and are already making progress in areas like waste segregation at source, recycling and the use of recycled materials in manufacturing.

The OECD's *Regional Plastics Outlook for Southeast and East Asia* provides an evidence base to inform and support policy efforts by countries in the region as well as broader international co-operation. The report focuses on the 10 ASEAN Member States along with Japan, Korea and the People's Republic of China. It finds that current trends in regional plastics use are unsustainable and environmental impacts are escalating. Without stronger policies, plastic waste generation would more than double and plastics leaking into the environment would be two-thirds higher by mid-century. However, our analysis also shows that this outcome could be avoided if countries in the region take ambitious action throughout the plastic lifecycle in the period to 2050: in such a scenario, plastics use in 2050 could drop by 28%, plastic waste by 23% and plastic leakage by more than 95% in the region, compared to a scenario in which no additional policies to tackle plastic pollution are implemented by that year.

This *Outlook* develops a policy roadmap to virtually end plastic pollution in the region, tailored to each country's unique socio-economic conditions. It draws on the OECD's multidisciplinary expertise to support governments in meeting the challenge, allowing Southeast and East Asia to become a global model for ending plastic pollution.



Mathias Cormann

Secretary-General, OECD

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Abbreviations and acronyms

ABS	Acrylonitrile butadiene styrene
ASA	Acrylonitrile styrene acrylate
APT	ASEAN Plus Three (ASEAN Member States and Japan, Korea and China)
ASEAN	Association of Southeast Asian Nations
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
EPR	Extended Producer Responsibility
EU	European Union
EUR	Euro
GDP	Gross domestic product
GHG	Greenhouse gas
Gt	Gigatonnes (billion tonnes)
HDPE	High-density polyethylene
HIC	High-income countries
IGES	Institute for Global Environmental Strategies
LDPE	Low-density polyethylene
LLDPE	Linear low-density polyethylene
LMIC	Lower middle-income countries
MARPOL	International Convention for the Prevention of Pollution from Ships
MSW	Municipal Solid Waste
Mt	Million tonnes
Non-MSW	Non-Municipal Solid Waste
OECD	Organisation for Economic Co-operation and Development
PAYT	Pay-as-you-throw
PET	Polyethylene terephthalate
PP	Polypropylene
PS	Polystyrene
PUR	Polyurethane
PVC	Polyvinyl chloride
SAN	Styrene acrylonitrile
UMIC	Upper middle-income countries
UNEP	United Nations Environment Programme
USD	United States Dollar
WEF	World Economic Forum

Executive summary

Southeast and East Asia, with ASEAN Plus Three (APT) countries at the heart of it, is key in the global fight against plastic pollution

Southeast and East Asia plays a pivotal role in ending plastic pollution. At the heart of this region is the ASEAN Plus Three (APT) grouping of countries, comprising the Member States of the Association of Southeast Asian Nations (ASEAN), along with Japan, Korea and China (jointly labelled as *Plus Three*). These 13 countries vary greatly in geography, socio-economic conditions and capacity to address plastic pollution. ASEAN Member States range from lower middle-income countries (Cambodia, Indonesia, Lao PDR, Myanmar, the Philippines, Viet Nam; referred to as *ASEAN LMIC*) to high- and upper middle-income countries (Brunei Darussalam, Malaysia, Singapore, Thailand; referred to as *ASEAN HIC & UMIC*).

Together, the APT accounts for nearly one-third of global GDP and is central to global plastics value chains. Plastics use in the region has surged almost nine-fold, from 17 million tonnes (Mt) in 1990 to 152 Mt in 2022, with more than half in short-lived applications like packaging. This rapid increase outpaced global trends and the APT now constitutes almost one-third of global plastics use. The diversity of APT countries is reflected in their annual per capita plastics use, which ranges from 32 kg in ASEAN LMIC to 73 kg in China and over 100 kg in Japan, Korea and most ASEAN HIC & UMIC.

The region is a hotspot for plastic pollution, driven by rising waste generation and insufficient – though improving – waste management. The challenge is aggravated by the region's geography, which includes long densely populated coastlines, rivers and archipelagic countries, making plastic leakage to the environment more prevalent. In 2022, the APT accounted for 8.4 Mt of plastic leakage to the environment – over one-third of the global total. ASEAN countries contributed 3.5 Mt, of which three-quarters originated in ASEAN LMIC. China contributed for more than one-half of APT leakage (4.9 Mt).

APT countries are taking action, with encouraging but uneven progress

In response to growing concerns, most APT countries have adopted national action plans on plastic pollution and strengthened regional co-operation. Positive trends are emerging, with the average recycling rate in the APT (12%) already exceeding the global average (10%). Efforts are underway to improve waste segregation at source, recycling and the use of recycled materials in manufacturing.

Despite this progress, mismanaged plastic waste in the region (29% of total plastic waste) remains a major concern, significantly exceeding the amount that is recycled. APT countries differ widely in waste management capabilities, with significant mismanagement shares in ASEAN (ranging from 27% in Thailand to 72% in Indonesia) and China (26%). ASEAN LMIC face substantial challenges, due to sharp increases in waste with inadequate infrastructure for waste management. Informal and unsafe practices, such as open burning and dumping, persist in most ASEAN countries and China, especially in rural areas.

The scope and effectiveness of policies, as well as related infrastructure development, remain uneven across the region. Measures to curb plastics demand vary in stringency but remain underutilised across most countries. Weak enforcement, due to limited local government capacity, financing constraints and fragmented governance, hampers progress.

Current policies can slow, but not reverse, recent trends in regional plastic leakage

Despite recent progress, current policies remain insufficient to end plastic leakage. In a scenario without additional policies (i.e. *Baseline* scenario), plastics use in the APT region is projected to almost double, from 152 Mt in 2022 to 280 Mt by 2050, with ASEAN countries expected to see nearly a tripling in plastics use (reaching 83 Mt in 2050). This increase is mostly driven by economic development in the region. Packaging is expected to remain the largest source of plastics use (32% in 2022 and 2050). Meanwhile, the transport sector is projected to see the most significant growth in plastics use, reflecting sectoral growth in motor vehicle manufacturing and transport services in the region.

While waste management is improving in the region, it is unlikely to keep pace with growing waste volumes. Plastic waste is projected to more than double, from 113 Mt in 2022 to 242 Mt in 2050. Recycling is projected to triple, reaching 45 Mt in 2050 (from 14 Mt in 2022), representing 19% of total waste (vs 12% in 2022). Although the share of mismanaged plastic waste would decrease from 29% in 2022 to 23% in 2050, continued increases in waste generation lead to an increase in the amount of mismanaged waste from 33 Mt in 2022 to 56 Mt in 2050.

Annual plastic leakage to the environment is projected to increase from 8.4 Mt in 2022 to 14.1 Mt in 2050, primarily originating in ASEAN LMIC and China, 5.1 Mt of which will reach rivers, coastal areas and oceans. Once released in the environment, plastics persist and often travel across borders. ASEAN LMIC in particular receive significant amounts of plastics accumulating in coastal areas, from APT high- and upper middle-income countries. This trend is expected to persist through 2050, emphasising the importance of regional co-operation.

Ambitious policies and co-operation can end plastic pollution in the region

Ending plastic pollution is a shared global challenge that requires strong commitment across countries. A *Global High Stringency* scenario, where all countries undertake ambitious action across the plastic lifecycle, offers the largest global environmental benefits at the lowest cost.

However, ambitious action across the plastic lifecycle in the APT region (*High Stringency* scenario) can already deliver significant regional benefits. Compared to the *Baseline* scenario, a *High Stringency* scenario could reduce plastics use in the APT by 28% (from 280 Mt to 201 Mt in the *High Stringency* scenario) and reduce plastic waste by 23% in 2050 (from 242 Mt to 186 Mt). Secondary plastics could meet all growth in plastics demand, allowing primary plastics use to stabilise below 2022 levels. The average recycling rate is projected to grow to 54% while mismanaged waste declines by 97%.

The macroeconomic costs of a near elimination of plastic leakage are modest in the region (0.8% of GDP loss relative to *Baseline* in 2050). However, these costs are unevenly spread. The ASEAN region faces steeper costs as a share of GDP in 2050 than the Plus Three (2.4% vs. 0.3% of GDP on average), with ASEAN LMIC bearing the largest burden (2.8%). The uneven distribution of the costs and the higher burden for ASEAN countries underscores the importance of strengthening regional co-operation to ensure all countries have the necessary capacity and support.

Comprehensive but tailored strategies are essential for policy effectiveness

Ending plastic pollution in the APT requires comprehensive strategies tailored to the socio-economic conditions, infrastructure readiness and institutional capacities.

Access to waste collection and environmentally safe disposal is critical. Gaps in rural and underserved areas drive waste mismanagement and plastic leakage. Some ASEAN countries such as Cambodia and Lao PDR require significant improvements in this area. Waste collection targets, domestic financing instruments, and Extended Producer Responsibility (EPR) schemes (already in place in Japan and Korea for packaging and durable goods, and being rolled out for packaging in six ASEAN countries) can help expand collection systems.

Significantly scaling up recycling requires introducing and improving waste sorting at the household level, significant investments in recycling infrastructure, better incentives for product design for recycling and market incentives for recycled materials. The informal sector, which plays a key role in waste collection and sorting, needs to be better integrated with the formal sector, for example through the recognition of informal workers as service providers in EPR schemes.

Slowing the growth in demand for plastics is vital for the APT region. Doing so requires broadening the scope through policies such as those aimed at problematic plastics (e.g. short-lived and hard-to-recycle plastics), eco-design, recycled content requirements, chemical regulation, material and product innovation, as well as scaling up support and infrastructure for reuse systems.

Clear policy frameworks can build market confidence and unlock finance, as a major scale up of investments is needed for interventions along the lifecycle of plastics. *High Stringency* policies can limit overall waste management investment needs for the APT to USD 1.1 trillion between 2022 and 2050. Investment needs would increase by 18% in ASEAN compared to *Baseline* (reaching USD 211 billion, vs USD 178 billion in *Baseline*), while they would be slightly below *Baseline* levels in Japan, Korea and China.

Effective implementation will require overcoming key challenges such as weak monitoring and enforcement, limited local capacity, and the need to integrate informal workers who play a critical role in the waste sector. Multi-stakeholder engagement, targeted capacity-building, and strengthened regional and international co-operation offer opportunities to enhance policy design and implementation, bridge knowledge gaps, and align policy frameworks and standards across countries. With strong commitment, the region can not only protect its own environment and people but also become a global model for ending plastic pollution.

1

A Regional Plastics Outlook: Rationale and key findings

The chapter underscores the strategic importance of Southeast and East Asia, particularly the Association of Southeast Asian Nations, Japan, Korea and China (referred to as ASEAN Plus Three) – a region that accounts for nearly one-third of global GDP and contributes to over one-third of global plastic leakage – in addressing the global issue of plastic pollution. The Outlook provides the first comprehensive analysis for the region, examining the implications of current and more ambitious policy packages on plastics use, waste and environmental impacts to 2050. The chapter first reviews existing literature on plastics and plastic pollution and identifies key knowledge gaps that the Outlook seeks to address to support evidence-based, region-specific policy pathways to end plastic leakage. The chapter also outlines the methodology used, including a stocktake of existing policies, the collection of country-level data for plastics and the modelling of the plastic lifecycle for both *Baseline* and policy scenarios to 2050. The chapter concludes by highlighting key findings and emphasising the importance of targeted, tailored policy solutions across ASEAN Plus Three countries.

1.1. Introduction

While plastics are beneficial to modern societies and are used in numerous applications, plastic pollution is an urgent global concern, presenting a significant challenge in the transition towards sustainable economies. Widespread presence of plastics on land, in rivers and in oceans, harms biodiversity and creates risks to human health and livelihoods. The lifecycle of plastics is also contributing to emissions of greenhouse gases (GHG) responsible for climate change.

The Southeast and East Asia region is of strategic importance in the fight against plastic pollution. The 10 Member States of the Association of Southeast Asian Nations (ASEAN)¹, together with Japan, Korea and China, are a core part of this region. Together, these 13 countries form the “ASEAN Plus Three” (APT) region which is the focus of this Outlook. The APT accounts for nearly one-third of global GDP (OECD, 2020^[1]) and plays a key role in global manufacturing and trade. Reflecting its economic weight, the region plays an important role in global plastics value chains: it hosts some of the world’s largest producers and consumers of plastic polymers and products, as well as several recycling hubs. Plastics use in the APT region has multiplied nearly ninefold since 1990 (from 17 million tonnes (Mt) to 152 Mt in 2022), far outpacing the global average, and now accounting for about one-third of global plastics use. This is driven by a remarkable population boom (30% increase between 1990 and 2022, leading to a population of 2.3 billion in 2022), rapid urbanisation, rising incomes (180% increase in GDP per capita, reaching USD 19.1 thousand in 2022), and a growing industrial base that demands increasing amounts of plastic inputs across most sectors.

More than half of the plastics used in APT have a lifespan below five years, including 32% going into packaging, that generally becomes waste very quickly. These short-lived plastics account for nearly two-thirds of the plastic waste. Plastic waste has grown from 10 Mt in 1990 to 113 Mt in 2022 in the region, currently accounting for 29% of global plastic waste.

At the same time, the region is marked by significant diversity in terms of economic development, urban expansion, industrial structure, levels of plastics use and waste management capabilities. Yearly per capita use varies significantly, from 32 kg per capita in lower middle-income countries (LMIC) in ASEAN and 73 kg in China to exceeding 100 kg in many high- and upper middle-income countries (HIC & UMIC) in ASEAN, as well as Japan (102 kg) and Korea (106 kg). Similarly, plastic intensity (plastics use per unit of GDP output) ranges from 2.2 tonnes per million USD in Indonesia to 4.9 tonnes per million USD in Thailand. This diversity within the APT extends to manufacturing and trade flows, with some countries being major exporters of plastic products, while others are net importers.

Growth in plastics use and waste has been accompanied by uneven progress in waste management and other policy measures across the APT. Some APT countries (e.g. Japan, Korea, Singapore) have well-developed systems that manage over 95% of municipal solid waste in an environmentally safe manner. In contrast, in many ASEAN countries, the expansion of formal waste collection and treatment systems has not kept pace with the growth in plastics use and waste (driven by rapid economic growth, rising living standards and urbanisation). The disparity within the region reflects differences in infrastructure, access to finance, as well as the complexities of the ongoing formalisation and professionalisation of the informal waste sectors in several ASEAN countries.

The APT region has become a hotspot for plastic pollution, mainly due to escalating waste generation and insufficient, albeit accelerating, improvements in waste management. Currently, the APT region accounts for more than one-third of the mismanaged plastic waste (i.e. waste not formally collected or safely disposed of) globally. Mismanaged plastic waste poses serious risks to human health and is a key driver of plastic leakage and pollution. While improvements in waste management have helped to reduce the share of waste that is mismanaged over time in the APT (from 60% in 1990 to 29% in 2022), absolute amounts of mismanaged waste have been rapidly increasing (driven by growing waste generation), reaching 33 Mt in 2022 (from 6 Mt in 1990). Almost half of the mismanaged waste in the APT occurs in

ASEAN countries, and the other half mostly in China. While this Outlook focuses on leakage as the main metric for plastic pollution, practices such as open burning and waste dumping contribute to a broader range of environmental impacts, as well as human health risks and economic damages.

The unique geographical features of the APT region amplify the speed and scale at which mismanaged plastic waste can reach (i.e. leak to) the environment, in particular rivers and oceans. Many countries in the region, such as the Philippines, Malaysia and Indonesia, have extensive coastlines, densely populated coastal cities and proximity to major river systems, which represent key conduits for plastics to the oceans (Lebreton and Andrady, 2019^[2]). High levels of rainfall and frequent extreme weather events can also accelerate the dispersal of mismanaged plastic waste from land to the ocean.

Although estimates vary, the APT region accounts for a large share of the total plastic waste that reaches the ocean annually (roughly between one-third and one-half of global) (Meijer et al., 2021^[3]; OECD, 2022^[4]). Seven out of the top 10 countries considered as the major contributors to plastic leakage to marine environments are in the APT, and ASEAN countries specifically host almost two-thirds of the top 50 rivers transporting plastics into the oceans (Meijer et al., 2021^[3]). Over time, 65 Mt of plastics had accumulated in the region's ocean, riverine and lake environments in the APT as of 2022 (which represents roughly one-third of global stock of plastics accumulated in aquatic environments).

The growing volume of mismanaged plastic waste is an acute issue for the region. It can threaten coastal ecosystems, as well as the economic activities they sustain such as fisheries and tourism. Mismanaged plastic waste also poses transboundary challenges as plastics travel across borders. The coastlines of the APT countries border some of the richest ocean ecosystems in the world. The ASEAN region is a biodiversity hotspot, home to 18% of the world's fauna and flora species, more than one-third of the world's total mangrove forests and about one-third of coral reefs surface areas (ASEAN Biodiversity Centre, n.d.^[5]; Blanton et al., 2024^[6]; Burke, Selig and Spalding, 2002^[7]).

Plastic pollution, especially in the marine environment, harms many countries in the APT region that rely on the ocean to support livelihoods. The ocean economy represents an important share of the GDP in several APT countries; for instance, it accounts for up to 28% of GDP in Indonesia (Asian Development Bank, 2021^[8]; OECD, 2021^[9]; OECD, 2025^[10]). The economic costs of plastic pollution, not least marine litter, are already substantial. Plastic litter damage to marine economies in the Asia-Pacific region has increased eight-fold since 2008, reaching USD 10.8 billion per year in 2015 (McIlgorm et al., 2022^[11]). This includes costs of damage in marine tourism, the fisheries and aquaculture, marine transport and shipping sectors. Impacts are particularly severe in riverine and coastal ASEAN countries, that face disproportionately high exposure to marine debris while having limited adaptive capacity. Plastics used in agriculture, such as mulch films and irrigation components, also contribute significantly to plastic pollution (FAO, 2021^[12]); this is a relevant issue for the APT region where many economies are heavily reliant on agriculture.

In response to current trends, tackling plastic pollution through better waste management has become a policy priority across the APT, both at the regional and national levels. Nonetheless, plastic waste and environmental impacts are still projected to substantially increase in the coming decades, in the APT region as well as globally. Moreover, plastic pollution is inherently transboundary: rivers as well as ocean currents carry plastics across jurisdictions. This means that countries may suffer the economic and environmental impacts of leakage that originated in neighbouring areas, or outside the APT region. These dynamics underscore the need for international and regional co-ordination, in addition to stringent policies implemented at regional and national levels.

1.2. Literature review

Plastic pollution has emerged as a defining environmental challenge of the 21st century. Over the past decade, a series of influential studies has significantly advanced the understanding of plastic flows and their consequences on the environment, economy and health, as well as policy responses for tackling plastic pollution. This section synthesises findings from existing literature that informed the preparation of this Outlook, including global studies on plastic pollution and specifically on plastic pollution in aquatic environments, modelling efforts with various geographical scope, and national and regional policy reviews.

1.2.1. Understanding and quantifying global plastic flows and pollution

Jambeck et al. (2015^[13]) provided the first global quantification of mismanaged plastic waste and flows to the oceans. Leveraging data on national waste generation and coastal population density, the study linked waste performance and varying stages of economic development across countries. This study drew attention to Asia (including the APT region) as a hotspot for marine plastic pollution, due to the high amounts of plastic waste near coastal areas and limited waste management capacities (in line with the levels of economic development). In particular, China, Indonesia, the Philippines, Viet Nam and Thailand emerged among the top countries contributing to marine plastic debris globally. While there are uncertainties and limitations in the estimates, due to data gaps and methodological assumptions, this early study laid the groundwork for subsequent analysis.

Geyer, Jambeck and Law (2017^[14]) offered a comprehensive model with an overview of historical estimates for plastic flows throughout the lifecycle, at the global level but also with information on selected regions, including the APT. Being the first study to comprehensively quantify global cumulative production by eight industrial use sectors, four geographies and the most critical resins and fibres, the study identified China as the largest producer of synthetic plastic fibres (68% of global production of polypropylene and acrylic fibre output in 2015) and as a major resin producer (28% of global resin production). Nonetheless, the information on the rest of the APT region is limited, since results are grouped with the rest of the world.

Subsequent studies have provided more granular insights across geographic regions and polymers. Ryberg et al. (2019^[15]) expanded on Geyer et al.'s work by mapping plastic flows for 14 polymers and 13 applications across 11 regional groups. The study covers the plastic lifecycle to generate estimates for plastics use, waste and end-of-life fates. Japan and China are analysed individually, while the rest of the APT region is grouped with other Asian countries (excluding India and Central Asia). The material flow analysis reveals marked variation in plastic leakage among the APT countries: for instance, China ranks first globally when assessing plastic leakage (in Mt), exceeding the leakage in the rest of Asia combined (excluding India, Central Asia and Japan). However, the study provides a snapshot of current trends without future projections.

While these studies provide the foundation for modelling efforts on plastics and plastic pollution, they are too coarse to fully account for the significant heterogeneity within the APT region as well as different polymers and stages of the plastic lifecycle. Conversely, the studies that try to achieve all three, for instance (Ryberg et al., 2019^[15]), provide static analyses without future projections.

1.2.2. Studies on riverine transport and marine pollution

Several studies have focused on refining the understanding of aquatic plastic pollution and the role of rivers in transporting plastic waste to the ocean, both globally and in Asia (Lebreton et al., 2017^[16]; Meijer et al., 2021^[3]; Schmidt, Krauth and Wagner, 2017^[17]). These analyses, ranging from regression-based estimations to high-resolution probabilistic approaches identify thousands of rivers globally as significant plastic leakage pathways, with APT countries emerging as consistent hotspots. Lebreton et al. (2017^[16]) used a hydrological river routing model to trace mismanaged plastic waste transported from land to ocean,

showing that thirteen of the top twenty polluting rivers are in the APT region. Similarly, at a country level, Meijer (2021^[3]) further simulated leakage of macroplastics from over 100,000 river outlets, finding that six of the top ten countries with the most plastic-leaking rivers are in the APT region. Schmidt (2017^[17]) used an empirical regression model based on river discharge and catchment-level mismanaged plastic waste, similarly finding that six of the ten most polluting river catchments are situated within the APT countries.

Lebreton and Andrady (2019^[2]) extended the work of both Jambeck (2015^[13]) and Lebreton (2017^[16]) by integrating their methodologies into a single, spatially explicit, dynamic framework to make high-resolution estimates and projections to 2060 of mismanaged plastic waste using GDP and population as key drivers to assess the role of rivers in the transportation of litter to the ocean. The study identifies China as the largest source of mismanaged plastic waste, with the Philippines, Indonesia, Thailand, Viet Nam also contributing significantly. Meanwhile, the study suggests that Japan and Korea add marginally to mismanaged plastic waste, due to their highly developed waste management systems. Furthermore, they find that watersheds larger than 100 km² transport 91% of total plastic into the ocean, suggesting that rivers are a major pathway for plastic to reach the ocean.

Many riverine models are spatially detailed, offering information on a variety of rivers that are in the APT region. However, since most of these studies emphasise physical transport pathways, they often have specific focus on the stages of riverine transport of plastics (i.e. before they reach the ocean). In addition, most analyses do not distinguish between polymer types in rivers and often only provide snapshots of current trends. The studies that do provide projections (Lebreton and Andrady, 2019^[2]) do so mainly by including aggregate economic indicators (e.g. GDP) or limited policy scenarios. Thus, while these studies highlight APT countries as major contributors to plastic leakage, they do not account for several key details that play into the plastic leakage dynamics in the region.

1.2.3. Future projections and scenario-based policy analysis

More policy-focused studies have emerged in the following years with an increased emphasis on projections (UNEP, 2023^[18]). Borrelle et al. (2020^[19]) developed a comprehensive modelling framework to project future plastic pollution under business-as-usual and policy response scenarios, with long term predictions and country groupings based on income levels. The study found that the total amount of plastic waste that enters oceans could triple by 2040 (relative to 2016) without significant increases in policy stringency. While the study provides predictions with broad geographic coverage, countries are grouped based on income levels, making it difficult to apply the insights to the APT region. Lau et. al (2020^[20]) employed similar country groupings by income level in their scenario-based policy assessment of global plastic pollution to 2040.

The OECD *Global Plastics Outlook* publications (2022^[4]; 2022^[21]) deploy multi-sectoral, multi-regional dynamic computable general equilibrium (CGE) modelling (using the ENV-Linkages), with 14 categories of polymers, endogenous policy interventions, full lifecycle tracking, trade-linked economic flows and 15 regions (including China). It provides an overview of the plastic lifecycle and environmental impacts, with projections and policy scenarios through to 2060. The two volumes of the *OECD Global Plastics Outlook* provide the first comprehensive global assessment of trends in plastics use, waste generation and leakage to the environment as well as policy levers to mitigate the environmental impacts of plastics and projections based on current trends and policy scenarios to 2060. A subsequent OECD report (2024^[22]) discussed the environmental implications and economic consequences of policies in alternative scenarios that vary in which countries act, how stringent policies are and what stages of the plastic lifecycle they cover to end plastic pollution by 2040 globally. Due to the global scope, the previous OECD reports group 13 APT countries into different regions: “Other non-OECD Asia” (which includes the whole of ASEAN countries), “China” and “OECD Asia” (which consists of Japan and Korea).

Additional studies have produced models with regional or country-level specificity and granularity by polymers and plastic applications. The report "Breaking the Plastic Wave" by The Pew Charitable Trust and Systemiq (2020^[23]) provides a comprehensive overview on the lifecycle of plastics, from production to end-of-life fates and environmental impacts. The underlying model integrates plastic material flow modelling and environmental impacts, with macro-regional granularity and policy scenarios. Later work by Systemiq (2023^[24]; 2024^[25]) extends the work of the original model by integrating 15 global policies across different sectors, polymer type and regions and incorporating a regional scenario explorer tool. These reports include details for specific regions (with countries grouped by geography or income levels), although extracting insights for the APT countries beyond China remains challenging.

Pottinger's et al. (2024^[26]) use a machine learning-based model within a Monte Carlo simulation based on historical mass flow data and key socio-economic indicators to forecast future trends in plastic production, use, and waste under various policy scenarios in four regions, one being China. By integrating both regional and polymer-level dynamics into the modelling framework, the study finds that China is projected to account for approximately 34% of global plastic waste generated by 2030, and 10% of total mismanaged plastic waste under the Business-as-Usual scenario. Other APT countries are grouped with the 'Majority of the World' making it difficult to identify pertinent findings for each country in the region.

Houssini et al. (2025^[27]) present a trade-linked global material flow analysis for 2022. As with previous studies, the analysis divides the APT region into China, Japan and groups the rest of APT countries into "Other Asia" along with many other countries in the continent. The study finds that countries in "Other Asia" are the largest importers of plastic waste, globally. Within the region, Malaysia accounts for the highest share of plastic waste imports (24%), receiving a total of 0.35 Mt. It was followed by Viet Nam (21%), Indonesia (13%), and Thailand (12%). Their results on China and Japan are more granular, revealing that the former dominates the global plastics supply chain as the largest producer, consumer, and exporter of final plastic products, while the latter experiences modest results. Cottom et. al (2024^[28]) conduct a dynamic material flow analysis and find that Southeast Asia ranks third and East Asia ranks fifth among world regions by highest per capita levels of leakage of macroplastics into the environment in 2020, distinguishing by leakage source (open burned plastics and debris) and by settlement type (e.g. rural or urban).

Although recent studies incorporate an expansive set of economic and environmental data as well as, policy scenarios, they often rely on archetypal groupings (e.g., income) which obscure country-level insights for the APT region. Studies that adopt a geographic lens tend to analyse China as an individual country, while aggregating the rest of the APT region with broader groups of countries. Consequently, modelling studies offering combined polymer-specific and country-level dynamic projections across the plastic lifecycle are typically limited in their granularity of insights beyond China, Japan, or a few other major economies.

1.2.4. Regional and country level studies in Southeast and East Asia

There are several studies that provide regional insights for selected APT countries or groupings such as the ASEAN. There are some studies exploring the topic of plastic pollution in the Southeast and East Asia, particularly in relation to marine pollution (Omeyer et al., 2022^[29]; Hermawan and Astuti, 2021^[30]) and microplastic pollution (Nakano et al., 2025^[31]; Chen et al., 2021^[32]). The ASEAN has also produced reports outlining the main challenges, present status and potential solutions to marine debris in the region (ASEAN Secretariat, 2021^[33]) and plastics management (Akenji and Bengtsson, 2019^[34]). Furthermore, the ASEAN has also published research in collaboration with the World Bank, focusing on topics such as comparable national and regional tracking systems (ASEAN, 2024^[35]). In addition, a recent study provided a regional assessment of plastic circularity innovations and solid waste management systems in six ASEAN countries (World Bank, 2024^[36]). Other regional studies have included a different set of APT countries, exploring marine microplastics (Isobe et al., 2015^[37]), macroplastics (Walther et al., 2020^[38]) and debris (Kako et al.,

2014^[39]). The limited number of studies that focus on (a subset of) the APT countries, have largely been qualitative, focusing on areas including policy responses to tackle plastic pollution (Akenji et al., 2020^[40]) and identification of gaps in scientific research conducted in the region (Lyons et al., 2020^[41]).

At the national level, Lyons et. al. (2020^[41]) reviewed a total of 371 scientific research papers produced in APT countries, and found that the top countries by number of publications were China (129), followed by Korea (67) and Indonesia (64). Country-level plastic material flow analyses are emerging, focusing on a range of APT countries including China (Luan et al., 2021^[42]; Luan et al., 2021^[42]), Thailand (Kamsook et al., 2022^[43]; Bureecam, Chaisomphob and Sungsomboon, 2018^[44]), Indonesia (Amin, Strik and van Leeuwen, 2022^[45]; Putri, Fujimori and Takaoka, 2018^[46]), the Philippines (Martinico-Perez, Schandl and Tanikawa, 2018^[47]) Viet Nam (Le Dinh, Fujiwara and Phu, 2025^[48]), Korea (Lee et al., 2021^[49]; Choi et al., 2024^[50]) and Japan (Nakatani, Maruyama and Moriguchi, 2020^[51]), with varying degrees of geographical and value-chain coverage, polymer-type granularity and dynamic future projections. Country-based assessments on Indonesia provided by SYSTEMIQ and the Pew Charitable Trusts (2020^[23]) has been adapted by the World Bank to develop national projections and policy scenario analysis, for instance for the purpose of informing the drafting of Indonesia's action plan on plastic pollution (2020^[52]). The World Bank has also conducted country-level research on Viet Nam (2021^[53]), Thailand (2021^[54]), the Philippines (2021^[55]), Malaysia (2021^[56]), with all of them highlighting economic opportunities of better material recovery through improved recycling.

Overall, the available literature recognises the APT as a critical region for tackling plastic pollution, but there is not a comprehensive point of reference with data and insights tailored to the region. Available modelling efforts are largely focused on global or macro-regional levels and usually also do not consider country-specific information on the current status of policies. On the other hand, while there is a wealth of studies for the APT countries, these generally do not comprehensively cover the plastic lifecycle, differences across applications and sectors, environmental impacts, and cross-country impacts in the region. There is a notable gap in granular yet comprehensive analysis that offers tailored insights for the APT countries.

1.3. Scope of the Outlook

Southeast and East Asia, and the APT countries at the heart of it, is a critical geography for understanding and addressing plastic pollution. This Regional Plastics Outlook offers a comprehensive overview on the plastic lifecycle, its economic drivers and environmental impacts in the APT. It provides a set of coherent projections to 2050, as well as policy scenarios. This long-term perspective allows for the evaluation of the potential benefits and economic implications of policy action, taking into account the specific national circumstances and policies of countries in the region.

This Outlook contributes to the existing literature in several ways:

1. It presents current and granular estimates for the lifecycle of plastics, including use, waste, end-of-life fates and environmental impacts, reconciling many strands of published data sources for the APT region.
2. It provides qualitative reviews and evaluations of current policy status, implementation and effectiveness across all 13 APT countries.
3. It presents forward-looking projections to 2050, based on a dynamic modelling framework that links economic flows to plastic flows.
4. It applies tailored policy scenarios to the APT region to generate specific, regionally relevant policy insights.

By examining trends, policies and potential future pathways, this Outlook aims to guide both domestic and regional strategies to end plastic pollution. It can also support future discussions on implementation of an international legally-binding treaty on plastic pollution.

1.4. Methodology

This Outlook provides an integrated assessment that combines quantitative modelling with qualitative policy analysis. The modelling approach builds on the comprehensive methodology developed for the OECD Global Plastics Outlook publications (2022^[4]; 2022^[21]) and refined in the subsequent report with alternative policy scenarios (OECD, 2024^[22]). The modelling framework is summarised in Annex 1.A. Alongside quantitative modelling, this Outlook includes a policy inventory and assessment across the plastic lifecycle for all 13 APT countries.

1.4.1. Data compilation

This Outlook uses an extension of the existing OECD modelling framework to enable a more granular representation of the APT region. By comparison, previous OECD modelling efforts provide data and insights for 15 macro-regions. Despite significant progress in recent years, data gaps persist in the region and remain a source of uncertainty in the projections.

The database for this Outlook was developed through collection and reconciliation of national-level data for economic activity, plastics use, waste generation and end-of-life fates for all 13 APT countries, complemented by a review of the existing literature and expert input. The database spans the history of the large-scale industrial production of plastics from 1950 to the present day.

The added value of the database is the compilation of plastic indicators in a coherent framework. This information was then integrated in an economic model, which ensures that all data sources are integrated into a consistent framework and allows for analysis of the economic drivers and environmental effects of plastics. To this end, the OECD ENV-Linkages model (Chateau, Dellink and Lanzi, 2014^[57]), based on the Global Trade Analysis Project (GTAP) database (Aguiar et al, 2019^[58]), has been revised and expanded to link data on plastics in volumes to the economic flows in the model (as described in (Bibas et al., 2022^[59])). ENV-Linkages splits plastic production into primary plastics and secondary plastics technologies and maps plastics use by polymer and application to the model sectors. The data, methodology and main assumptions used for each step and each country are summarised in Annex 1.B.

1.4.2. The quantitative modelling approach

Plastics are used in a wide range of applications, including packaging, construction, and transport. Polymers with different structural or chemical attributes are often combined or "compounded" with supplementary additives to improve function and utility for unique/diverse applications (OECD, 2022^[4]). Modelling all the interactions between plastics and the economic system, as well as the environmental consequences, while taking this diversity into account, requires a detailed and consistent modelling framework. The modelling of economic flows, plastics use, plastic waste and environmental impacts involves several steps and tools. The full details of the modelling are provided in OECD (2022^[60]). Key steps include:

- **Economic and plastic flows modelling:** The OECD's computable general equilibrium (CGE) model ENV-Linkages (Chateau, Dellink and Lanzi, 2014^[57]) is used as the basis. In this model, sectoral and economic projections are used to project the evolution of plastic production and use over time. These are linked to waste generation, using average product lifespan data, and further broken down by end-of-life fate (i.e. recycled, incinerated, landfilled, mismanaged or littered). Calculation of waste treatment fates includes an assessment of recycling losses, i.e. plastics that

are collected for recycling, but end up incinerated or landfilled. Trade in plastic products (in economic values) and trade in plastic waste (in physical volumes) are also taken into account.

- **Environmental impact projections:** The model generates projections for environmental impacts including leakage of (macro)plastics to the environment and emissions of greenhouse gases (GHG). Specifically, plastic leakage is attributed to the region where it enters the environment and stems from three distinct sources: (i) leakage of mismanaged waste, (ii) leakage of littered items and (iii) leakage from marine activities. This Outlook does not provide detailed estimates and projections on microplastic leakage for the APT; these are discussed in Chapter 2, based on previous estimates available in (OECD, 2022^[4]; OECD, 2022^[21]). The model details leakage specifically going to aquatic environments, based on a probabilistic model developed by Lebreton (explained in the Global Plastics Outlook, adapted from (Borrelle et al., 2020^[19]) and (Meijer et al., 2021^[3])) that estimates the likelihood of mismanaged plastics entering freshwater and marine systems. This modelling was further enhanced to assess the international transport of plastic pollution in the marine environment (adapted from (Chassignet, Xu and Zavala-Romero, 2021^[61])).

The APT regional modelling provides data and insights for 5 countries and two modelled groups of countries: Indonesia, Thailand, China, Japan and Korea, as well as two groups of ASEAN countries, as summarised in Table 1.1. In other words, two of the ten ASEAN countries are individually modelled, while the remaining eight are aggregated into two composite groupings due to modelling and data constraints. The grouping follows the World Bank income classification, with one group for three high- and upper middle-income countries and another for five lower middle-income countries (World Bank, 2024^[62]). Estimates and projections are also provided for the rest of the world, grouped into ten macro regions and three major economies (USA, Canada and India; see Annex Table 1.A.3 for details). The time horizon for this Outlook is to 2050.

Table 1.1. Details of the regional aggregation of the APT region in the modelling framework

	Modelled country or region	Countries included	Income classification
ASEAN	Thailand		UMIC
	Rest of ASEAN - HIC and UMIC	Brunei Darussalam*, Malaysia**, Singapore*	* HIC ** UMIC
	Indonesia		LMIC
	Rest of ASEAN – LMIC	Cambodia, Lao PDR, Myanmar ² , Philippines, Viet Nam	LMIC
Plus Three	Japan		HIC
	Korea		HIC
	China	includes Hong Kong (China)	UMIC

Notes: A full list of modelled regions is provided in Annex Table 1.A.3. In the visualisation of the results in this Outlook, countries and regions are sometimes further aggregated to improve readability of the information presented.

The modelling and analysis in this Outlook rest on a number of crucial assumptions and there are important limitations. These include the availability and quality of country-level data, limitations to the details of economic and plastic flows that can be captured in the modelling, including socioeconomic drivers, improvements in recycling and waste management systems, the need for international co-operation and finance. Many of these considerations and their implications for the interpretation of the results, have been discussed in previous OECD reports (2022^[4]; 2022^[21]; OECD, 2024^[22]) and are not repeated here.

1.4.3. The qualitative policy analysis

The qualitative policy analysis aims at painting the policy landscape across the APT region, examining the current situation and policy plans for each country. Based on a policy inventory (OECD, 2025^[63]), this Outlook summarises the current policy initiatives by country for four main policy levers (curb production

and demand, design for circularity, enhance recycling and close leakage pathways, respectively). The analysis examines the presence of various policy instruments, the implementation status and the overall level of policy enforcement. The review of the status of current waste management systems and infrastructure in APT countries is outlined in Chapter 2. In total, the assessment provides insights into the policy landscape through 32 policy indicators across the 13 APT countries.

The inventory systematically assesses policy interventions based on national documents (plans, policies, legislation, press releases, reports, presentations, etc.); literature; independent policy assessments and reviews; media articles (investigations, press releases, etc.); conference documents (such as UNCRD's Regional 3R and Circular Economy Forum in Asia and the Pacific); international organisation documents and databases (World Bank, GIZ, etc.); and industrial and grey sources.³ Given the differences in definitions, scope and data availability across countries, potentially all the policies may not be exhaustively covered in this analysis.

The final step in the qualitative policy analysis was the review of the draft inventory and ensuing policy landscape assessment by regional experts, including from government officials from the countries involved, as well as experts from the Institute for Global Environmental Strategies (IGES) and the network from Economic Research Institute for ASEAN and East Asia (ERIA).

1.5. Main insights from the Outlook

1.5.1. Policy action is accelerating in APT, but it remains uneven and significant challenges persist

Rising concerns on plastic pollution have led to a scale up of policy action across the region. The ASEAN Member States signed the ASEAN Framework of Action on Marine Debris and the Bangkok Declaration on Combating Marine Debris (ASEAN, 2019^[64]; ASEAN, 2019^[65]), and later launched the ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States (2021-2025) (ASEAN, 2021^[66]). At the APT level, promoting the development of circular economy action plans, and addressing the issue of marine plastic debris both feature as items for co-operation in the ASEAN Plus Three Cooperation Work Plan 2023-2027 (ASEAN Plus Three, 2022^[67]).

APT countries are adopting national plans, roadmaps and policy measures, laying the groundwork for systemic change. Nine out of thirteen APT countries have developed national plans on plastics or marine litter, while discussions are ongoing in the other four. Many of these plans contain explicit targets to reduce plastic leakage and pollution, including through increasing recycling, phasing out specific plastic products or slowing down waste generation, signalling a shift from fragmented interventions toward more structured approaches.

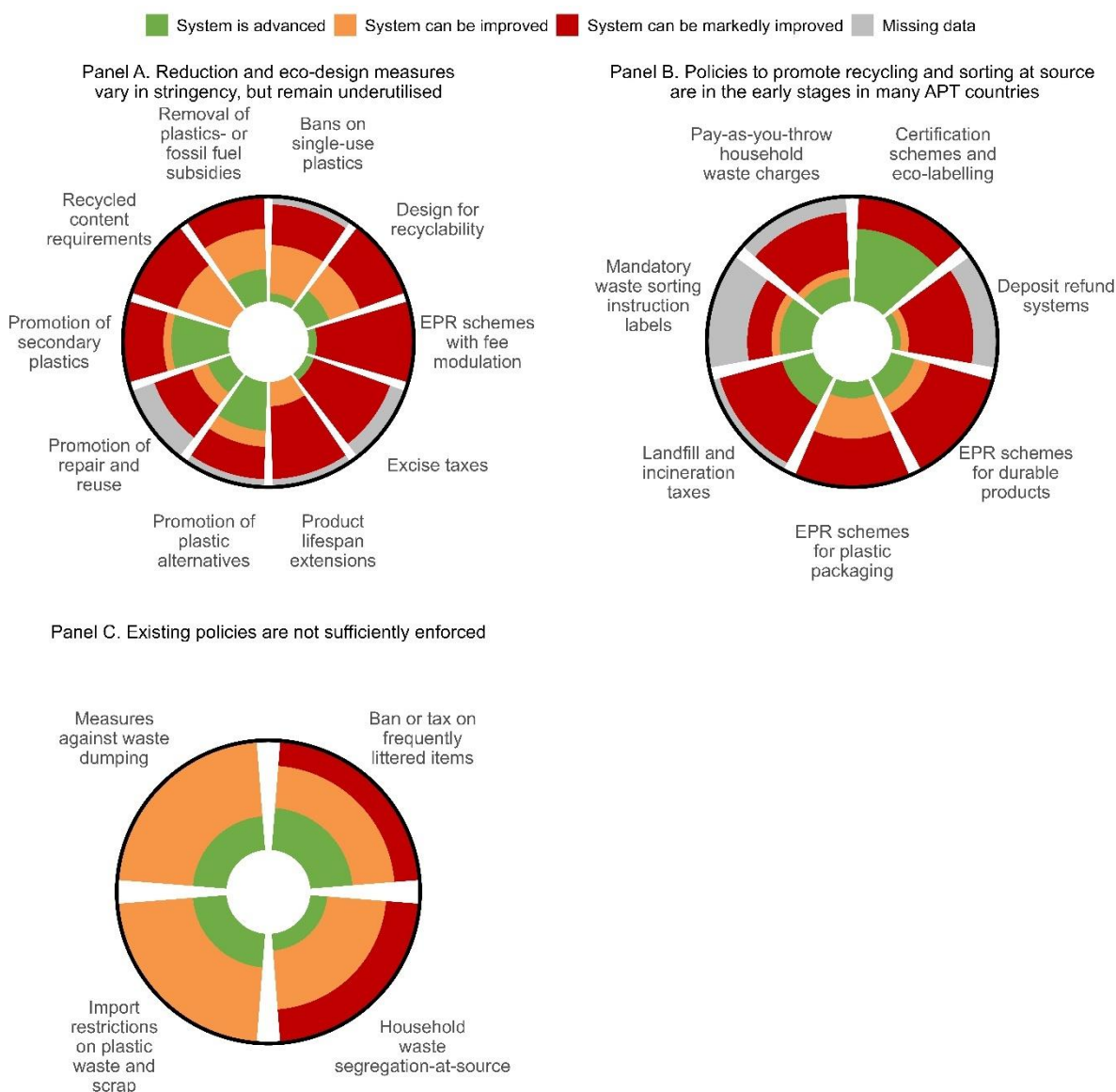
Positive trends are beginning to emerge and encouraging progress can be observed in several areas. Figure 1.1 shows a summary snapshot of the policy landscape in the APT region. The policy landscape shows that policies aimed at closing leakage pathways (i.e. improving waste collection, sorting and management) are present in most countries, although they could be more strictly enforced. Efforts to formalise the informal waste sector, which often forms the backbone of recycling in many ASEAN countries, are slowly advancing in places like Indonesia and Viet Nam. The share of plastic waste that is mismanaged has also been gradually declining, especially where collection systems have expanded more rapidly. As a result, plastic leakage rates (leakage as a share of the total plastic waste) into the environment have started to fall in some countries, indicating that policy measures are starting to have an impact, even if still limited in scope.

While policy action is growing in APT countries, the degree of policy maturity and implementation varies widely across the region, notably for waste management systems and capacities. Countries such as Japan,

Korea and Singapore have well-developed systems that manage over 95% of municipal solid waste and where less than 1% is mismanaged. Meanwhile, despite the improvements in waste collection systems and environmentally safe waste management, 26% of waste in China is still mismanaged, suggesting there are still opportunities for further progress, particularly in rural and remote areas. Most ASEAN countries face severe challenges, with the share of mismanaged waste at 70% on average in ASEAN LMIC. Logistical and geographic challenges play a major role in limiting waste collection in rural and remote areas, especially in archipelagic countries like Indonesia and the Philippines. This disparity reflects differences in infrastructure, access to finance, as well as the complexities of the ongoing transition relating to the formalisation of informal waste sectors in several ASEAN countries.

Figure 1.1. There is scope to increase policy ambition in the APT region

For each policy instrument, the share represents the number of countries (out of the 13 APT countries).



Source: Authors' inventories; see more information in the technical document (OECD, 2025^[63]).

StatLink  <https://stat.link/2jgzv>

Policies aimed at incentivising sorting at source and recycling, as well as outcomes in terms of recycling rates, also reflect wide heterogeneity across the region. Japan and Korea have well-established extended producer responsibility (EPR) schemes for several product groups and employ advanced instruments such as pay-as-you-throw schemes for household waste charges. Several ASEAN countries are rolling out EPR schemes for packaging, including Indonesia, Malaysia, the Philippines, Singapore, Thailand and Viet Nam. Nine APT countries have adopted certification and labelling schemes for plastic products and packaging, including for the presence of recycled content. Overall, the APT region collectively achieved the average recycling rate of 12% in 2022 – above the global average (10%). However, there are wide disparities across APT countries. Recycling output is expanding in ASEAN countries, but it is lagging behind other countries due to infrastructure limitations and geographic challenges that weaken the economic case for recycling. There are persisting challenges in ensuring the quality and safety of recycled plastics, as well as in increasing and sustaining the demand for recycled plastics. Countries with advanced policies such as Japan and Korea can still make significant progress in e.g. reducing recycling losses and improving recycling for hard-to-recycle polymers.

Policies aimed at curbing plastic production and demand, and designing for circularity are still in the early stages, with a heterogeneous picture across the APT. Seven countries have announced or are planning bans on certain single-use plastics, sometimes also introduced at the sub-national or municipal level. Several APT countries including Indonesia, Malaysia, the Philippines, Thailand, China, Japan and Korea, employ (or are starting to employ) policy measures aimed at promoting design for circularity of plastics and plastic products, with a focus on design for recyclability and the use of recycled materials. Most APT countries have some form of regulation on hazardous substances. However, interventions to promote reduction, reuse or longer lifespans of plastic products remain largely untapped across the APT.

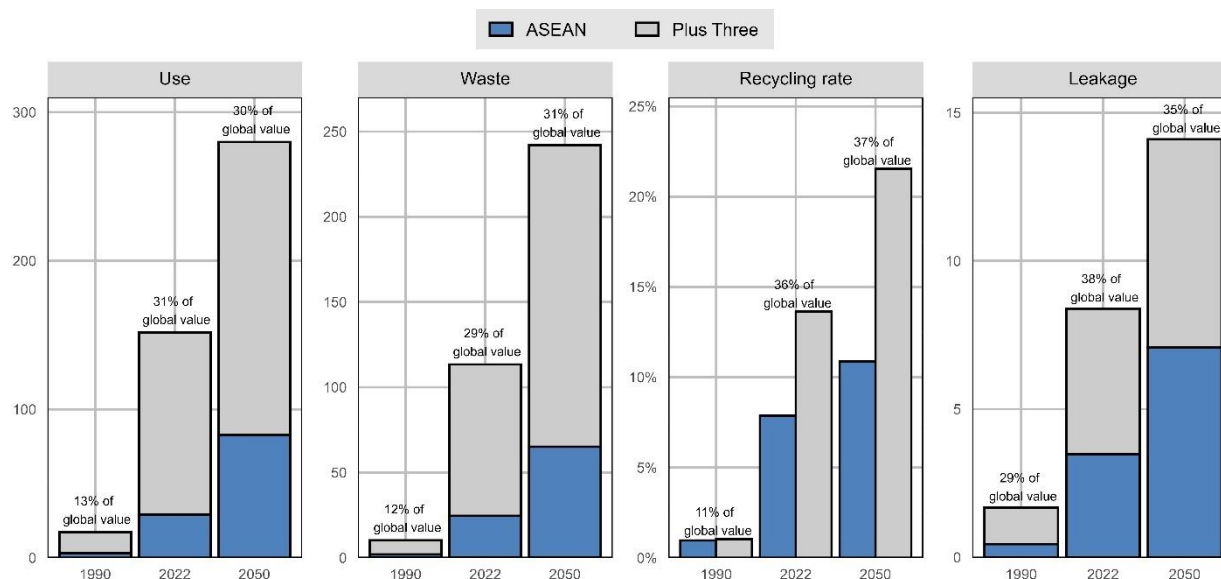
Overall, there is substantial scope for improving the effectiveness of policies. Key challenges across the APT include limited action on mid- and upstream measures such as eco-design and demand reduction. Several key challenges need to be overcome, including lack of institutional capacity and resources. While enforcement is robust in high-income countries like Japan, Korea and Singapore, it is weak or uneven in many other APT countries. In many ASEAN LMIC, there are issues of low coverage of waste collection in rural and peri-urban areas as well as underdeveloped support for the informal waste sector and poor enforcement capacity. Meanwhile, limitations in both data quality and availability remain cross-cutting barriers to effective policy implementation and monitoring across many APT countries.

1.5.2. Despite current policies, plastic pollution will substantially increase by 2050 in the Baseline scenario

Global plastic waste and leakage to the environment are projected to substantially increase in the coming decades unless ambitious policy action is taken (OECD, 2024^[22]; OECD, 2022^[21]). The APT region is not an exception. Despite policy progress, the outlook for plastics in the APT is alarming. Under current policies (*Baseline* scenario), plastics use, waste and pollution are projected to grow. Plastics use is projected to nearly double in the APT between 2022 and 2050, to reach 280 Mt (from 152 Mt in 2022; see Figure 1.2), driven by the continued rise in income and living standards, especially in ASEAN countries where economic development and urbanisation will accelerate. While population growth is expected to slow down across the APT region (albeit not in all ASEAN countries), economic convergence (i.e. faster income growth in ASEAN LMIC) and the expansion of middle-class consumption will sustain strong demand for plastic-intensive goods and services.

Figure 1.2. Plastics have grown rapidly and are projected to continue to grow in the Baseline projection

Mt for use, waste and leakage, percentage for recycling rate



Note: Percentages presented above the bars represent the share in the global value (for recycling, it reflects the amount of recycled plastics in APT over the global amount)

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/hgrx83>

The share of the ASEAN economies in plastics use in the APT is projected to increase (from 19% in 2022 to 30% in 2050), as their economies develop faster than those of the Plus Three. The fastest growth in plastics use is projected in ASEAN LMIC, where rising incomes and expanding urban populations are expected to drive surges in plastics use. In contrast, per capita plastics use in high-income countries such as Japan and Korea is expected to stabilise or even slightly decline. Nonetheless, total waste volumes will double across the region by 2050, driven not least by packaging (from 49 Mt in 2022 to 91 Mt in 2050).

Recycling is expected to continue to improve in several countries, notably Japan (from 14% to 26% between 2022 and 2050), Korea (from 10% to 22%), and China (from 14% to 21%), driven by current policies and rising demand for recycled materials. Current recycling rates are significantly lower in ASEAN LMIC than the rest of the APT, and they are projected to stay behind the APT average. However, even with improvements in recycling rates, the production of secondary plastics is projected to grow more slowly than primary plastics, meaning primary plastic production will continue to account for 88% of plastics demand in the APT in 2050 (compared to 92% in 2022), with modest circularity and environmental gains.

Under current policies, the volume of mismanaged plastic waste could increase over time, particularly in countries with weak waste management infrastructure and enforcement. In recent decades, improvements in waste management have helped to reduce the share of waste that is mismanaged in the APT (from 60% in 1990 to 29% in 2022), but absolute amounts of mismanaged waste have been rapidly increasing due to escalating waste generation levels. In the absence of more ambitious policies, these trends will continue (with mismanaged waste in the APT increasing from 33 Mt in 2022 to 56 Mt in 2050). Growing volume of mismanaged waste heightens environmental and economic risks, especially in lower middle-income countries and poses health threats to vulnerable communities exposed to openly burned waste.

Plastic leakage to the environment is also projected to rise significantly, from 8.4 Mt to 14.1 Mt annually by 2050. The region would account for 35% of global leakage in 2050. Importantly, continued plastic leakage suggests that the accumulation of plastics aquatic environments (rivers, lakes, and oceans) also continue to increase. By mid-century, the total stock of plastics in these environments within the APT region could reach 181 Mt (40% of global total), representing a major global environmental burden. Coastal and riverine areas, especially in ASEAN countries, may bear the disproportionate brunt of environmental and economic damages.

Plastics that leak into the environment persist and often cross borders, accumulating in (neighbouring) countries. ASEAN LMIC in particular frequently receive plastic waste from wealthier APT countries (while relatively little plastics flow in the opposite direction). This pattern is likely to continue through to 2050, highlighting the urgent need for collaborative action across the region.

These trends imply that the APT will remain a hotspot region for plastics: projected plastics use, waste and recycling are projected to grow as fast in the APT as the global average, and thus the share of APT is expected to remain roughly constant at around the third of the global total. For plastic leakage, the faster growth in low- and middle-income countries in the rest of the world, including in non-APT Asia and Africa, imply that the share of the APT in global leakage is projected to decline from 38% in 2022 to 35% in 2050.

1.5.3. Action throughout the plastic lifecycle in the APT in the High Stringency scenario can nearly eliminate plastic leakage in the region by 2050

Action across the lifecycle of plastics is required to mitigate plastic pollution (OECD, 2022^[21]; OECD, 2024^[22]). The ten instruments included in the policy analysis in this Outlook fall into four broad policy levers that represent entry points along the plastic lifecycle: (i) curb production and demand (hereafter curb demand), (ii) design for circularity of plastic products and packaging, (iii) enhance recycling, by improving the separate collection, sorting and recycling of plastic waste, and (iv) close leakage pathways (or, minimise losses into the environment), by strengthening waste collection, sorting and management.

A global approach to ending plastic pollution delivers the largest global benefits at minimal costs, while also reducing the transfer of plastics in aquatic environments from other regions (*Global High Stringency scenario*); it is also essential to address global plastic pollution beyond the APT region. However, even if efforts fall short of the ambition required to eliminate plastic leakage in the rest of the world, ambitious policy across the plastic lifecycle in the APT region (*High Stringency scenario*) can already deliver substantial regional benefits without compromising the region's competitiveness.

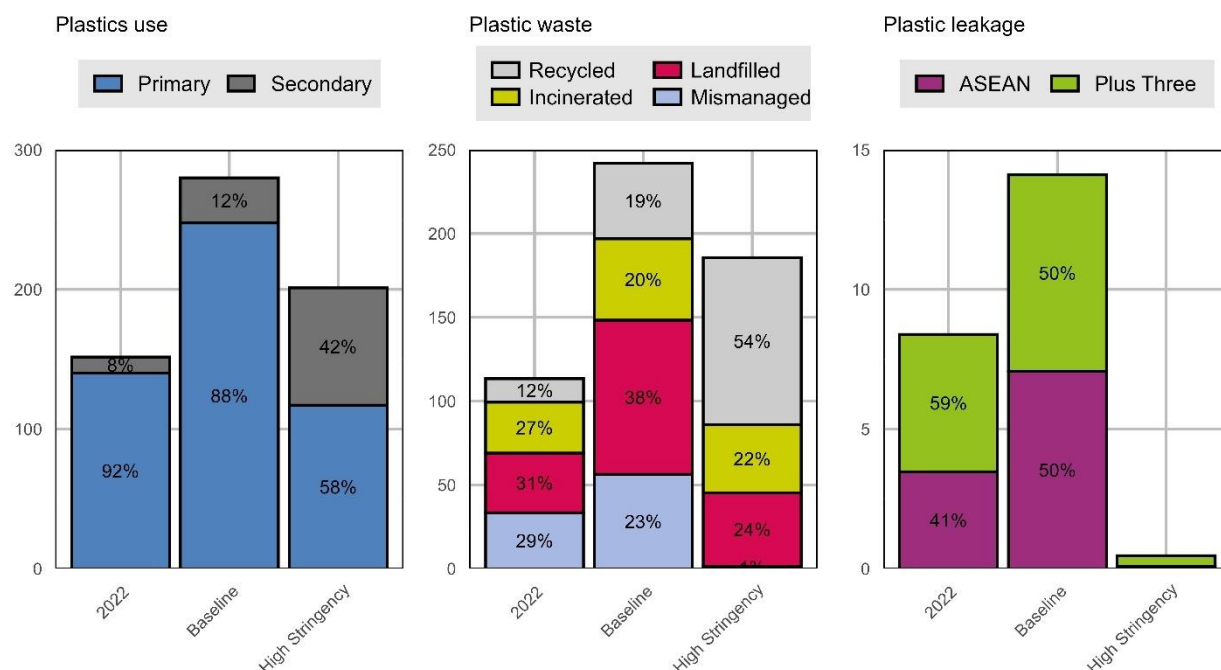
An ambitious policy mix targeting all four policy levers can limit total plastics use in 2050 to 201 Mt in the APT region (compared to 280 Mt in the *Baseline* scenario). Perhaps more importantly, all the growth in plastics demand above 2022 levels can be met through secondary plastic production in this scenario, thereby preventing the environmental burdens associated with primary production from escalating further. As a direct result of the reduction in plastics use, plastic waste is projected to decrease to 186 Mt (compared to 242 Mt in the *Baseline* scenario).

As also outlined in previous OECD reports (2024^[22]; 2022^[21]), policies to slow down plastics demand and waste generation (including extending product lifespans through eco-design and reuse, and targeting the most problematic plastics via phaseouts, bans or taxes) are critical to mitigate plastic pollution and contain the costs of the transition. As these interventions may lead to material substitutions, careful analysis are useful to compare the environmental, health and economic impacts of substitutes and alternatives.

In the *High Stringency* scenario, recycling is projected to become the dominant waste treatment option, boosting the average recycling rate in the APT region to 54% (relative to 19% in the *Baseline* scenario). In line with the waste hierarchy, incineration volumes are not hugely affected, but landfilling volumes can be reduced as recycling rates are boosted. Furthermore, mismanaged waste in the APT region is reduced to near zero levels,⁴ which is a prerequisite for eliminating plastic leakage (Figure 1.3).

Figure 1.3. An ambitious regional policy package can eliminate plastic leakage in the APT region

Mt for use, waste and leakage



Note: Scales differ by panel.

Source: OECD ENV-Linkages model.

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Comparing plastic leakage rates in the APT countries to the global, OECD and non-OECD averages clearly illustrates the position of the APT (Table 1.2). In the *Baseline* scenario, current policies bring down plastic leakage rates in ASEAN more rapidly (from 14.2% in 2022 to 10.9% in 2050) than global (from 5.6% to 5.1%) or non-OECD (from 9.5% to 7.6%) averages.⁵ Yet it is also indicative of the uneven progress and the persisting challenge in ending plastic leakage, especially in ASEAN LMIC (from 17.8% on average to 13.2%). In the *High Stringency* scenario, the differences in the leakage rate across APT countries are much smaller (ranging from 0.1% to 0.3% across countries), as all APT countries aim to eliminate plastic leakage.

Table 1.2. The share of plastic waste in the APT that leaks to the environment is reduced to near zero in the *High Stringency* scenario

Share of plastic waste that leaks to the environment.

	2022	Baseline in 2050	High Stringency in 2050	Reduction in volume
Thailand	6.8%	1.4%	0.2%	0.1 Mt
Rest of ASEAN – HIC & UMIC	12.0%	7.9%	0.1%	0.8 Mt
Indonesia	18.3%	17.1%	0.2%	3.1 Mt
Rest of ASEAN – LMIC	17.4%	10.7%	0.2%	3.0 Mt
Japan	0.3%	0.2%	0.2%	0.01 Mt
Korea	0.3%	0.2%	0.2%	<0.01 Mt
China	6.4%	4.4%	0.3%	6.6 Mt
ASEAN average	14.2%	10.9%	0.2%	7.0 Mt
APT average	7.4%	5.8%	0.3%	13.6 Mt
OECD average	1.1%	0.5%	0.2%	0.9 Mt
Non-OECD average	9.5%	7.6%	3.5%	23.3 Mt
Global average	5.6%	5.1%	2.3%	24.2 Mt

Note: The reduction in volume shows the difference between the projected levels in the *High Stringency* and *Baseline* scenarios in 2050. Leakage rates are not assumed to be eliminated for countries outside the APT in this scenario; rather a moderate reduction is projected outside the APT. Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

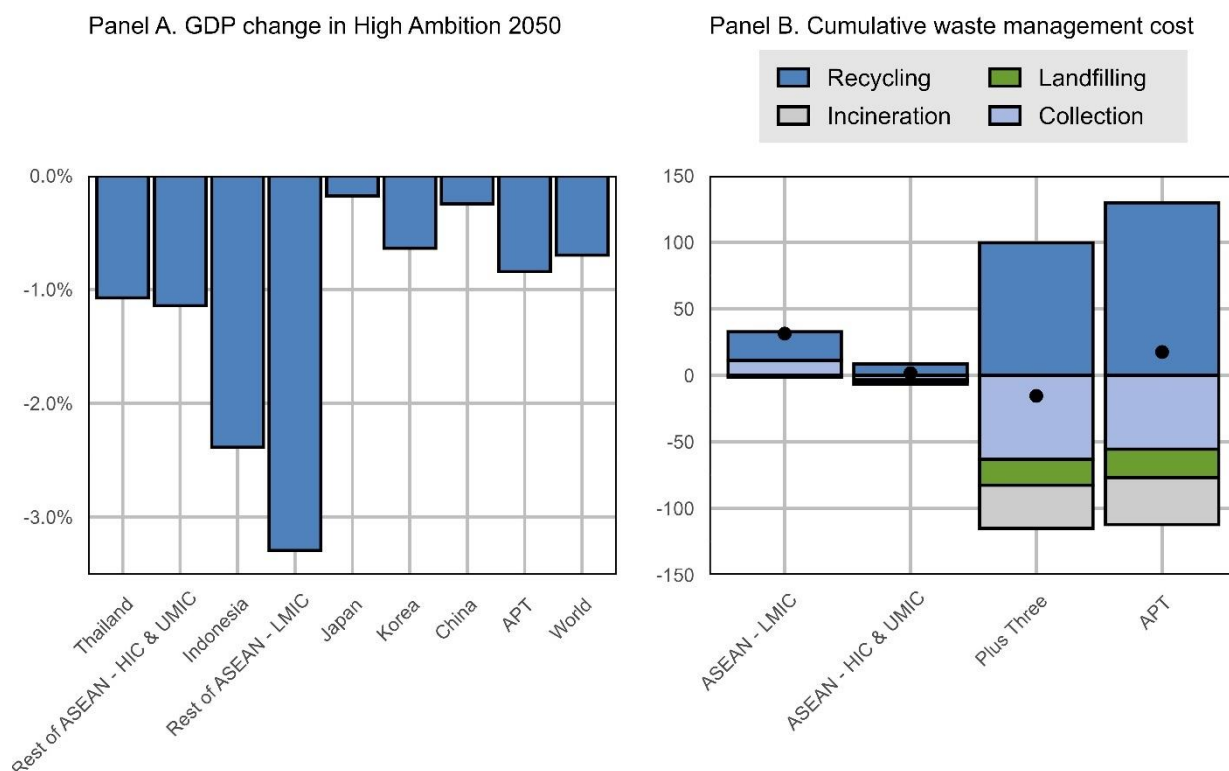
1.5.4. The costs of the *High Stringency* scenario are modest overall, but represent a higher share of GDP for ASEAN LMIC

The macroeconomic costs of the *High Stringency* scenario remain modest at 0.8% of GDP in 2050 for the APT region as a whole (Figure 1.4).⁶ However, these costs are unequally borne: ASEAN LMIC are confronted with a loss in GDP of almost 3% of Baseline GDP in 2050. These countries require a more extensive and larger overhaul of their economic system and plastic lifecycle than ASEAN HIC & UMIC. These losses should, however, be seen in the context of relatively fast Baseline GDP growth, and exclude a valuation of the benefits of policy action in the form of reduced damages from plastic pollution. Such benefits are especially strong in the more vulnerable, developing countries (Agnelli and Tortora, 2022^[68]).

Eliminating plastic leakage in the APT will require significant investments in waste management amounting to around USD 1.1 trillion between 2022 and 2050. For the APT as a whole, these investments are very similar in the *High Stringency* and *Baseline* scenarios, as additional costs for recycling are almost fully compensated by reduced costs for the other treatment categories. Specifically, the costs of collection are lower in the policy scenario as less waste is generated, while costs for landfilling and incineration are reduced as a larger share of waste is recycled. In other words, the policy scenario induces a shift in costs between treatment categories rather than a mere expansion. A strategic realignment of investments into waste management is required, prioritising recycling over other management options, and eliminating mismanaged waste by increasing waste collection, sorting and litter collection. Only in the countries with currently relatively low collection rates and high mismanaged waste shares do the costs of collection increase beyond the *Baseline*. This is because in these regions a much larger share of a smaller total waste stream will be collected and sorted.

Figure 1.4. The overall costs of ambitious policies are modest, but concentrated in lower middle-income countries in the region

Percentage change from Baseline 2050 for GDP, USD bln for waste management costs



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

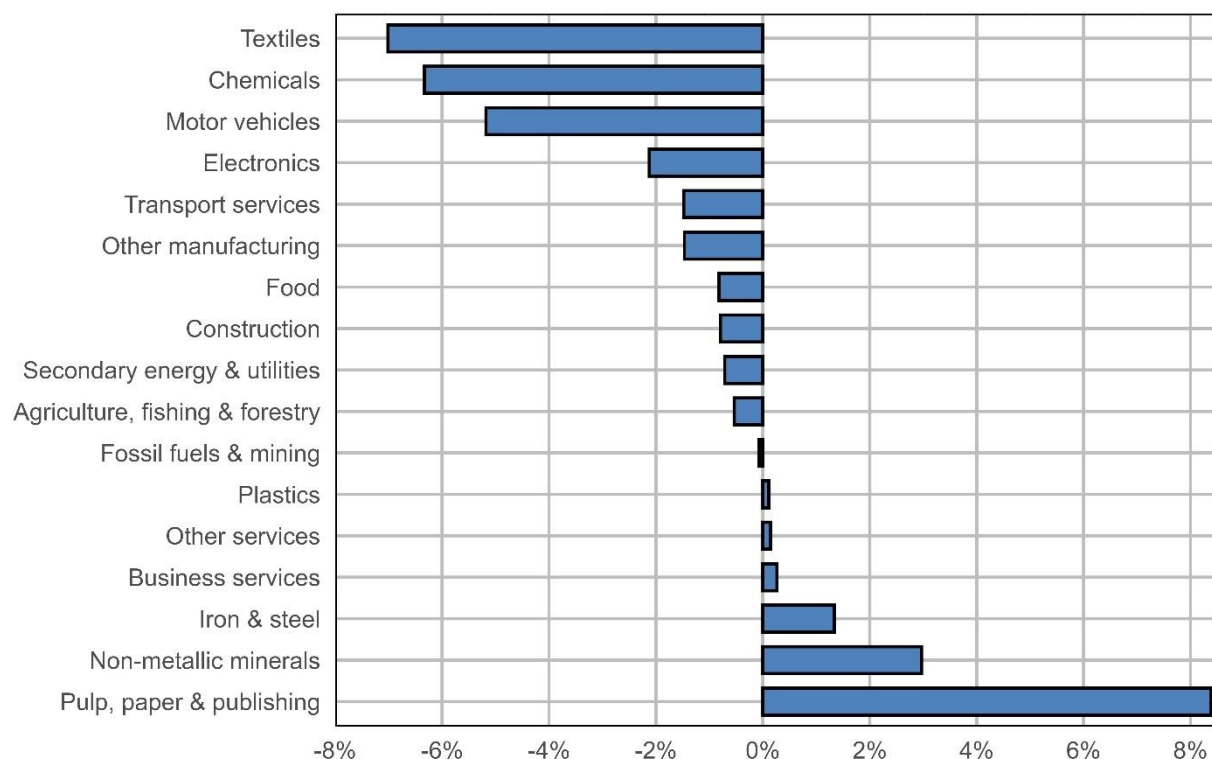
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At the sectoral level in APT, plastics-intensive sectors, including chemicals, textiles and motor vehicles are most severely affected by ambitious policies, as they are confronted with significant cost increases due to e.g. the plastic tax that is imposed to curb plastics demand (Figure 1.5). The effect on plastic production itself is limited in the absence of explicit policies in the instrument mix to limit plastic production; and further diminished by the possibility for producers to turn to the global market to maintain production levels. The main effect on plastic production is a shift from primary production to secondary production (not shown in this chart). The substitution away from plastic products in the *High Stringency* scenario benefits alternative material sectors, including the pulp, paper, and publishing sector, the non-metallic minerals sector and iron and steel manufacturing. These substitute-providing sectors stand to benefit from shifts in demand driven by the policy lever on designing for circularity.

Furthermore, changes in international trade patterns can either worsen or alleviate the economic consequences of reduced plastic production, and what drives trade results is how the impacts of the policy package compare to the impacts on foreign competitors. The country-specific reliance on the plastics sector or on sectors that produce substitutes for plastics is therefore one of the important determinants of the macroeconomic impacts.

Figure 1.5. The *High Stringency* policies constrain plastics-related industrial sectors and boost substitute-producing sectors

Sectoral output change in 2050 in the APT region in the *High Stringency* scenario with respect to *Baseline*



Source: OECD ENV-Linkages model.

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1.5.5. The *Differentiated Ambition* scenario delivers worse environmental outcomes and leads to higher waste management costs

An alternative scenario, *Differentiated Ambition*, assumes that high- and upper middle-income countries in the region (Brunei Darussalam, Malaysia and Singapore, Thailand, and Japan, Korea and China) implement more stringent policies than the lower middle-income countries (Indonesia, Cambodia, Lao PDR, Myanmar, the Philippines and Viet Nam). In addition, this scenario assumes more stringent policies downstream in the lifecycle (i.e. to enhance recycling and close leakage pathways) than mid- and upstream (i.e. to curb demand and design for circularity). The scenario thus explores the environmental and economic implications of less ambitious policies in the APT region than what is assumed in the *High Stringency* scenario. In the *Differentiated Ambition* scenario, high- and upper middle-income APT countries adopt (i) low stringency for policy levers to curb demand and design for circularity, and (ii) high stringency for levers to enhance recycling and close leakage pathways. In contrast, lower middle-income APT countries (i) adopt low stringency for levers to enhance recycling and close leakage pathways, and (ii) maintain current policies (*Baseline*) for the other two policy levers.

In the *Differentiated Ambition* scenario, plastics use in the APT region is substantially above 2022 levels, and only moderately below *Baseline* 2050 levels, leading to levels of plastics use of 260 Mt in 2050. This figure is significantly above the 201 Mt projected under the *High Stringency* scenario, with the gap widening over time as lower ambition policies prove insufficient to curb demand. On average, plastics use in 2050 is about 7% lower than the *Baseline*, with country-level reductions ranging from 5.5% in Indonesia to 12% in Japan. Generally, high- and upper middle-income countries achieve greater reductions than lower middle-income countries, as the former adopt additional policies to curb demand while the latter maintain current policies.

A key bottleneck to eliminating plastic pollution in this scenario is the continued increase in total plastic waste (229 Mt in 2050, versus 186 Mt for the *High Stringency* scenario), which makes it harder to adequately collect, sort and treat all plastic waste. Although both *High Stringency* and *Differentiated Ambition* scenarios result in significant improvements in the average recycling rates in the APT region (54% and 49%, respectively), the amount of mismanaged waste diverges, with mismanaged waste projected to amount to 18 Mt by 2050 in the APT region in the *Differentiated Ambition* scenario (vs. 1.5 Mt in the *High Stringency* scenario and 33 Mt in 2022), despite the emphasis on downstream policies. The biggest contributions come from countries with large waste volumes and significant shares of mismanaged waste, notably China (low mismanaged waste share but very high volumes of waste) and the lower middle-income ASEAN countries (which have significant mismanaged waste shares).

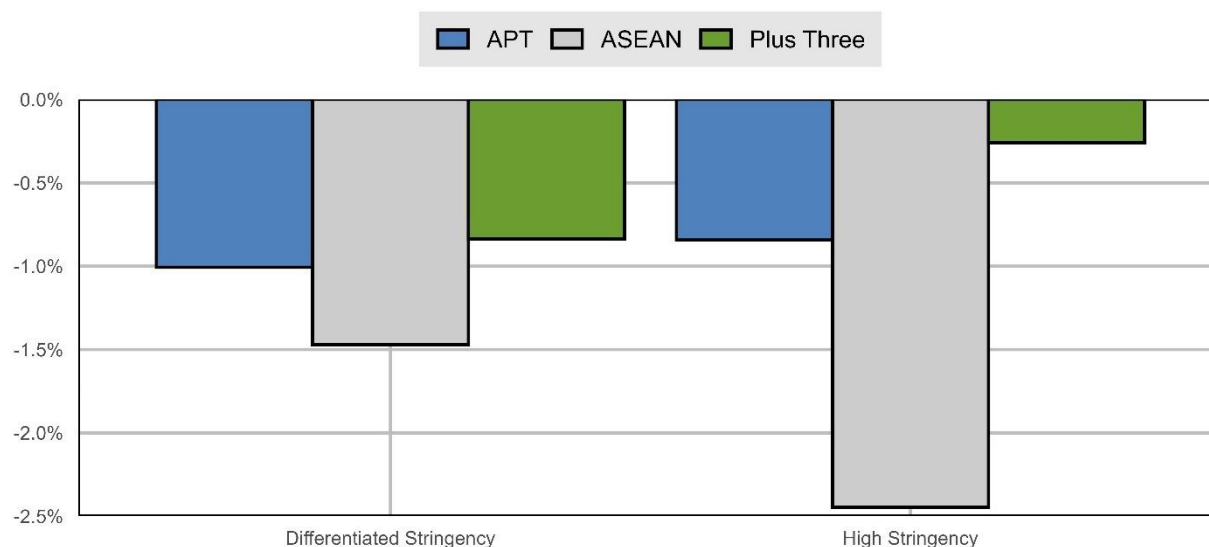
Unlike in the *High Stringency* scenario in which plastic leakage is almost eliminated, annual plastic leakage in the APT region amounts to 4.6 Mt by 2050 in the *Differentiated Ambition* scenario, i.e. a stream of plastics continues to flow into the environment, a significant portion of which ends up in rivers, lakes and oceans, resulting in worse environmental and human health outcomes within the region.

The macroeconomic costs of the *Differentiated Ambition* scenario in the APT region are somewhat higher than in the *High Stringency* scenario. Thus, choosing a high ambition level for action to end plastic pollution does not only make environmental sense, but is also economically more efficient. At the country levels, the picture is more nuanced, however. Specifically, it is costly for the ASEAN LMIC with high *Baseline* mismanaged waste shares to achieve high recycling rates (as in the *High Stringency* scenario), and lower ambition levels in the *Differentiated Ambition* scenario imply smaller and thus less costly adjustments. In contrast, the Plus Three countries can benefit from improvements in their competitive position under the more stringent policy scenario, driven not least by the positive economic effects of the eco-design policies. For the APT as a whole, the more balanced policy package across the plastic lifecycle in the *High Stringency* scenario protects the competitive position of regional producers better than the *Differentiated Ambition* policy scenario.

The differentiated costs of ambitious policies in the APT region point to a need for regional and international co-operation to support the countries facing the difficulty in financing, which also bear the biggest environmental burdens. Nonetheless, competitiveness concerns should not deter the APT region from increasing their domestic ambition on plastics policies, as long as they adopt a whole-of-lifecycle approach to tackling plastic pollution.

Figure 1.6. Ambitious policies across the plastic lifecycle result in lower macroeconomic costs than differentiated policies for the APT region as a whole, but costs are higher for the ASEAN countries

Deviation from Baseline in 2050



Source: OECD ENV-Linkages model.

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1.5.6. A High Stringency scenario in the APT can end plastic leakage regionally, but a Global High Stringency scenario is essential to protect shared global commons

A key insight from the scenarios presented above is that the APT holds the ability to reduce plastic pollution generated within the region. In the *High Stringency* scenario, APT countries can virtually eliminate mismanaged plastic waste and plastic leakage to the environment, achieving large regional benefits.

Moreover, variations in policy ambition outside the APT have limited economic impacts on the APT. Stringent policies to tackle plastic pollution implemented in countries outside the APT result in a negative impact on their economies compared to the scenarios with laxer policies. This also reduces demand for goods and services from the APT region, affecting the Plus Three countries in particular. However, as the macroeconomic differences are rather small, the analysis of different policy scenarios suggests that a “go-high-alone” strategy in the APT region in the *High Stringency* scenario can deliver large environmental gains at economic costs that are as modest as in the other scenarios. This hinges especially on the balancing of downstream policies with equally stringent mid- and upstream policies to ensure that both waste volumes are reduced and the remaining volumes properly managed.

At the same time, global ambition is preferable as it would deliver the largest environmental benefits, in the APT and globally. While regional action can already go a long way, policies in the rest of the world are needed to protect the global commons. One example is ocean pollution and transboundary flows of plastics in aquatic environments. Freshwater systems and oceans are interconnected, meaning that aquatic plastic pollution originating in one country can contribute to the environmental burden of neighbouring ones. The *Global High Stringency* scenario reduces both regional and non-APT sources of leakage to aquatic environments in the APT, leading to the smallest increase between 2022 and 2050 across all scenarios. Yet, even in the *Global High Stringency* scenario, the stock of plastics accumulated in aquatic environments in the APT increases through to 2050 from 65 Mt in 2022 to 120 Mt in the APT region (slightly less than 121 Mt in the *High Stringency* scenario and significantly lower than 181 Mt in the *Baseline*). In broader terms, these transboundary dynamics underscore the interconnected nature of marine and

freshwater ecosystems and the need for global cooperation to fully protect aquatic ecosystems that underpin biodiversity, food security and climate regulation.

Overall, global ambition is needed to end plastic pollution comprehensively, especially for the protection of global shared commons like the oceans and a clean and healthy environment. However, the APT region does not have to wait: adverse economic impacts from having higher policy ambition relative to the rest of the world would be modest, while delivering significant environmental gains.

1.5.7. Effective policy to end plastic pollution requires tailored but comprehensive policy roadmaps, regional and international co-operation, and strengthening data, capacity and enforcement systems

The APT region is at a crossroads for ending plastic pollution. Plastics pollute the environment, damage key ocean-based sectors and contribute to health hazards. The region, rich in innovation and manufacturing potential, can seize the opportunity to lead in circular economy solutions. A transition to a high-ambition, whole-of-lifecycle policy approach offers a path towards nearly eliminating plastic leakage, while delivering broad socio-economic and environmental benefits. While there is already policy momentum, eliminating plastic leakage requires major policy efforts to overcome the persisting gaps between ambition and implementation. There is no one-size-fits-all solution given the diversity of the countries in the APT region: policy design must be attuned to infrastructure readiness, institutional capacity, socio-economic and policy context of each country.

Slowing down plastics use and plastic waste generation at the source is essential, especially as plastics use in the APT region is projected to grow due to population and economic expansion under current policies. The *High Stringency* scenario entails cutting plastic waste by 23% in the APT region relative to *Baseline* in 2050, ranging from about a 30% reduction compared to *Baseline* in ASEAN LMIC (Indonesia, Cambodia, Lao PDR, the Philippines, Viet Nam, Myanmar) to a 15-16% reduction in Japan and Korea.

While the scale and depth of implementation challenges vary across the APT, all countries can explore untapped opportunities to curb plastics demand and promote eco-design. Targeted interventions such as bans, taxes for problematic plastic applications, as well as eco-design standards are essential. While local governments have taken the lead in many ASEAN countries, enforcement of bans remains weak due to low awareness, insufficient monitoring capacity, and limited access to affordable alternatives. Reuse systems offer an impactful strategy for cutting waste from single-use plastics and reducing the need for virgin plastics, but these systems remain small-scale in the APT region due to limited infrastructure, policy support and consumer readiness. Awareness campaigns, infrastructure development, regulatory frameworks that promote standardisation (e.g. for reuse) and international coordination can all help to maximise effectiveness of these interventions. Moreover, regulating chemicals in plastics is also vital for ensuring safe circularity: strengthening national legislation can help ensure that plastics can be safely reused, recycled or phased out. All these interventions require close coordination between national and local governments for effective design and monitoring, as well as the engagement of scientific and technical institutions.

Improvements in waste management are integral to ending plastic pollution. Although the *High Stringency* scenario could nearly eliminate mismanaged plastic waste, it would require significant improvements, particularly in ASEAN LMIC (in which on average 70% of plastic waste is currently mismanaged). Gaps in infrastructure, especially in rural and underserved areas, are filled by unsafe practices such as open dumping and burning, especially in ASEAN LMIC. Waste collection targets and EPR systems offer powerful policy options. EPR can help to fund and expand infrastructure: although countries in the APT region increasingly adopt EPR schemes, challenges with enforcement, tracking and stakeholder engagement can hinder their effectiveness.

A *High Stringency* scenario hinges on increasing recycling rates to 54% by 2050, ranging from 42-44% in ASEAN to 57% in China and above 60% in Japan and Korea. Currently, recycling rates in ASEAN countries

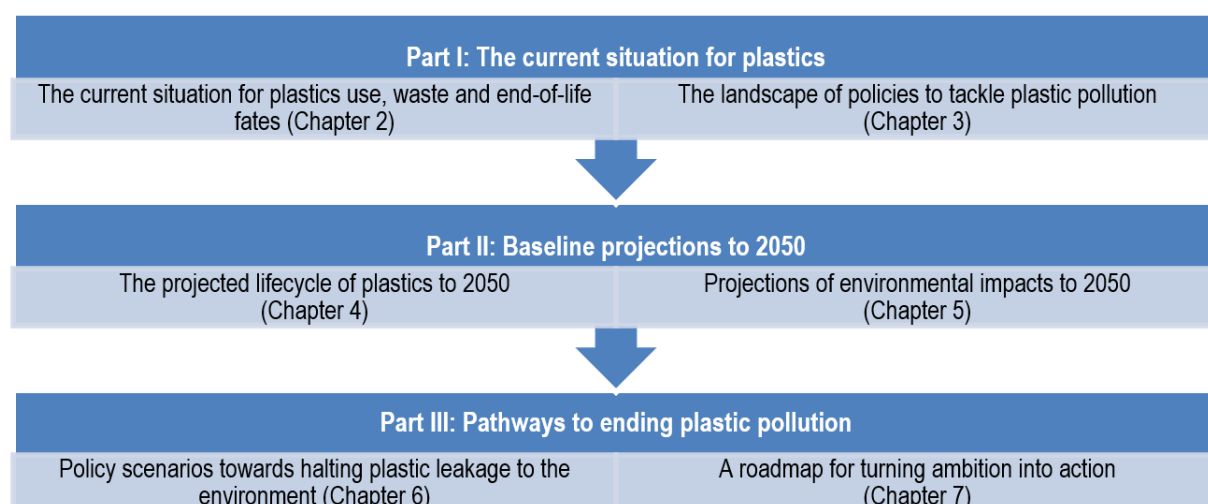
remain below 13% (with an average of 8%), constrained by limited infrastructure, weak incentives and low public awareness. Continued increase in plastics use (and thus plastic waste) will exert intensified pressures on waste management systems. Scaling up recycling requires parallel investments in sorting, cleaning and processing capacity, integration of informal workers, and development of domestic or regional markets for recycled plastics. Achieving high recycling rates for all polymers, as expected in the *High Stringency* scenario, may also require technological breakthroughs and reliable scrap material supply, across the APT region.

Policy momentum is already growing in the APT, but success hinges on overcoming cross-cutting implementation and enforcement challenges. These include weak monitoring and enforcement, insufficient data collection for tracking progress, limited local capacity, financing gaps and the need to integrate and professionalise informal workers. Strengthening collaboration between national governments, local authorities, academic institutions and stakeholders is essential for building a harmonized and evidence-based monitoring and reporting system to monitor progress on national action plans and targets. Regional co-operation plays a key role in supporting capacity-building through training, knowledge exchange and the development of shared monitoring tools, as well as to align national frameworks with regional and international best practices.

1.6. Structure of the remainder of the Outlook

The roadmap below describes the flow of this Outlook. Part I aims to fill the gaps in data availability, analyses the current situation and understanding the lifecycle and maps current policy landscape in the APT region. Part II quantifies the evolution of the plastics flows across the lifecycle to 2050 in APT countries in the absence of new policies, including projected plastics use, their socioeconomic drivers, end-of-life fates, socioeconomic and environmental consequences. Part III then charts different pathways for tackling plastic leakage in the APT region. It first focuses on analysing the environmental and economic impacts of a *High Stringency* policy scenario, as well as of alternative scenarios varying in the geographical scope and policy stringency and stages of the plastic lifecycle they cover. The Outlook concludes with a roadmap for turning ambition into action by identifying key barriers that must be overcome to accelerate the policy momentum in the APT region.

Figure 1.7. Roadmap of the Outlook



Annex 1.A. Overview of the modelling approach

The core of the analysis is based on simulations using the OECD's multi-sectoral, multi-regional dynamic computable general equilibrium (CGE) model ENV-Linkages (Chateau, Dellink and Lanzi, 2014^[57]). For this Outlook, ENV-Linkages has been extended to include plastics for 14 polymer categories as well as both primary and secondary (recycled) plastic production explained a technical document (Bibas et al., 2022^[59]).

A strength of CGE models such as ENV-Linkages is that they embed the drivers of sectoral and regional plastics use, such as demand patterns, production modes (including recycling activities) and trade specialisation, into a consistent framework. Projections of plastics use already exist in the published literature but in these studies the projected volumes of plastics follow aggregate economic growth and/or population growth trends, without considering sectoral details. In contrast, the modelling approach used in this Outlook, based on a CGE model, provides a more accurate link between plastics use and economic activities as well as a more detailed understanding of the consequences of policy action. It considers plastics not only as a final good for consumption, but, above all, as a production input for each sector, thereby taking into account the complexity of the interactions across sectors and regions and along the plastic lifecycle (Annex Table 1.A.1).

The ENV-Linkages modelling framework is also used to calculate plastic waste flows. The generation of waste is strongly related to the use of plastics and depends on the average lifespan of each plastic product. The lifespan can be very short, as for packaging, or can span several decades, as for products used in construction (Geyer, Jambeck and Law, 2017^[14]). International trade in plastic waste is also modelled, i.e., where plastic waste produced in one country is treated in another.

The ENV-Linkages model has also been enhanced to distinguish the end-of-life fates of plastics, which heavily depend on the waste management capacities and regulations of the location where plastic waste is generated and handled. Four end-of-life fates are modelled: waste can be recycled, incinerated, landfilled (in sanitary landfilling), or mismanaged (which includes uncollected litter). Specifically:

- **Recycled:** waste that is collected for recycling, processed, and used for the production of secondary plastics. This waste stream excludes the residues from recycling processes that are disposed of using the other waste management categories.
- **Incinerated:** waste that is incinerated in a state-of-the art industrial facility, either with or without energy recovery.
- **Landfilled:** waste that is disposed of on the land, in a controlled way and according to state-of-the art sanitary, environmental and safety requirements.
- **Mismanaged:** all other waste. This category includes waste that is collected and subsequently burned in open pits, dumped in water or disposed of in dumpsites and unsanitary landfills. It also includes waste that is not captured by waste collection, including e.g. road markings. This category also includes uncollected litter, i.e. waste that results from littering by individuals or from fly-tipping, and that is not collected via street sweepings or other clean-up actions. It does not include collected litter that is disposed of through one of the other categories.

Annex Table 1.A.1. Mapping of plastics use by application to economic sectors

Input sectors	Applications	Output sectors	Polymers*
Plastic products	Building & Construction	Construction	ABS, ASA, SAN; Bioplastics; HDPE; LDPE, LLDPE; PP; PS; PUR; PVC; Other
	Consumer & Institutional products	Accommodation and food service activities; Air transport; Education; Health; Insurance; Lumber; Non-metallic minerals; Business services; Other manufacturing; Public services; Land transport; Pulp, paper and publishing; Real estate; Textile; Water transport	ABS, ASA, SAN; Bioplastics; HDPE; LDPE, LLDPE; PP; PS; PUR; PVC; Other
	Electrical/Electronic	Electrical equipment; electronics	ABS, ASA, SAN; Bioplastics; HDPE; LDPE, LLDPE; PP; PS; PUR; PVC; Other
	Industrial/Machinery	Fabricated metal products; iron and steel; nonferrous metal; Machinery and equipment	HDPE; LDPE, LLDPE; PP; PUR
	Packaging	Food products; Chemical products	Bioplastics; HDPE; LDPE, LLDPE; PET; PP; PS; PUR; PVC; Other
	Personal care products	Chemical products	HDPE; PET
	Transportation - other	Motor vehicles; Public services; Other transport equipment	ABS, ASA, SAN; Bioplastics; Fibres; HDPE; LDPE, LLDPE; PP; PUR; PVC; Other
	Other	Other sectors	Other
Chemicals	Marine coatings	Other manufacturing, other transport equipment	Marine coatings
	Road markings	Construction	Road markings
	Textile sector - clothing	Textiles	Bioplastics; fibres
	Textile sector - other	Textiles	Fibres
	Transportation - tyres	Plastic products	Elastomers (tyres)

Note: ABS = acrylonitrile butadiene styrene; ASA = acrylonitrile styrene acrylate; HDPE = high-density polyethylene; LDPE = low-density polyethylene; LLDPE = linear low-density polyethylene; PET = polyethylene terephthalate; PP = polypropylene; PS = polystyrene; PUR = polyurethane; PVC = polyvinyl chloride; SAN = styrene acrylonitrile.

Source: OECD ENV-Linkages model.

Regional leakage of macroplastics to the environment is calculated using the methodology described in (OECD, 2022^[60]). Specifically, macroplastic leakage stems from three distinct sources: (i) leakage of mismanaged waste, (ii) leakage of littered items and (iii) leakage from marine activities. The former two sources of leakage respond to changes in waste management systems, while the latter is proportional to marine economic activities (and is thus similar across scenarios). Thus, leakage is attributed to the region where it enters the environment; the final destination may be different as leaked plastics are transported over land and especially through rivers and oceans. Finally, note that providing projections of microplastic leakage and projections of the regional production of plastics extend beyond the scope of the current analysis, although the modelling framework does account for global projections of plastic production.

The sectoral and regional aggregations are presented in Annex Table 1.A.2 and Annex Table 1.A.3.

Annex Table 1.A.2. ENV-Linkages sectoral aggregation used for this outlook

Agriculture, fisheries and forestry	Manufacturing
Paddy rice	Food products
Wheat and meslin	Textiles
Other grains	Wood products
Vegetables and fruits	Chemicals
Oil seeds	Basic pharmaceuticals
Sugar cane and sugar beet	Primary rubber and plastic products
Fibres plant	Secondary plastic products
Other crops	Pulp, paper and publishing products
Cattle and raw milk	Non-metallic minerals
Other animal products	Fabricated metal products
Fisheries	Electronics
Forestry	Electrical equipment
	Motor vehicles
Non-manufacturing Industries	Other transport equipment
Coal extraction	Other machinery and equipment
Crude oil extraction	Other manufacturing including recycling
Natural gas extraction	Iron and steel
Other mining	Non-ferrous metals
Petroleum and coal products	Services
Gas distribution	Land transport
Water collection and distribution	Air transport
Construction	Water transport
Electricity transmission and distribution	Insurance
Electricity generation (8 technologies)	Trade services
<i>Electricity generation: Nuclear electricity; Hydro (and Geothermal); Solar; Wind; Coal-powered electricity; Gas-powered electricity; Oil-powered electricity; Other (combustible renewable, waste, etc.).</i>	Business services n.e.s. (not elsewhere specified)
	Real estate activities
	Accommodation and food service activities
	Public administration and defence
	Education
	Human health and social work

Annex Table 1.A.3. ENV-Linkages regional aggregation used for this outlook

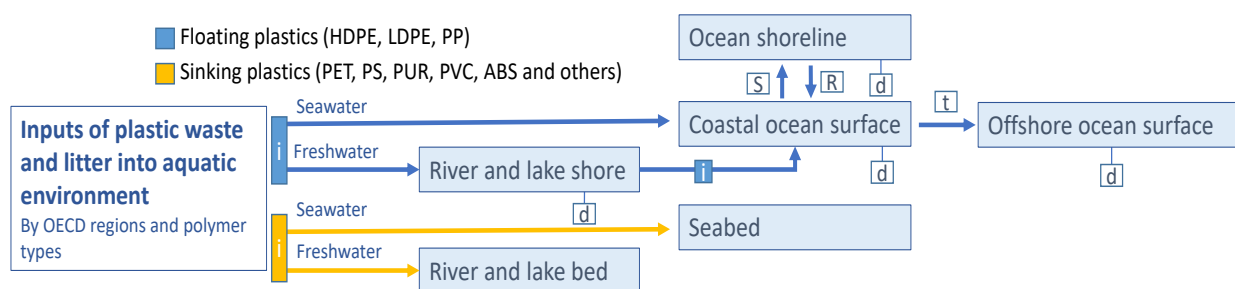
Macro regions		ENV-Linkages countries and regions	Most important comprising countries and territories
APT	ASEAN	Indonesia	Indonesia
		Thailand	Thailand
		ASEAN HIC & UMIC (High- and Upper Middle-Income countries)	Malaysia, Singapore, Brunei Darussalam
		ASEAN LMIC (Lower Middle-Income countries)	Cambodia, Lao PDR, Philippines, Viet Nam, Myanmar
	Plus Three	China	People's Rep. of China, Hong Kong (China)
		Japan	Japan
		Korea	Korea
Non-APT	OECD America	Canada	Canada
		USA	United States of America
		OECD Latin America	Chile, Colombia, Costa Rica, Mexico
	OECD Europe	OECD EU	Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden
		Rest of OECD	Iceland, Israel, Norway, Switzerland, Türkiye, United Kingdom
	OECD Oceania	Australia and New Zealand	Australia, New Zealand
	Other America	Rest of Latin America (LAC)	Non-OECD Latin American and Caribbean countries
	Eurasia	Non-OECD EU	Bulgaria, Croatia, Cyprus, Malta, Romania
		Eurasia	Non-OECD European and Caspian countries, including Russian Federation
	Middle East and Africa	Middle East and North Africa	Algeria, Bahrain, Egypt, Iraq, Islamic Rep. of Iran, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Tunisia, United Arab Emirates, Syrian Arab Rep., Western Sahara, Yemen
		Sub-Saharan Africa	Sub-Saharan Africa
	Non-OECD Asia	India	India
		Rest of Asia-Pacific	Rest of Asia-Pacific

Source: Own elaboration.

The projections on the leakage of waste plastics to aquatic environments are made by L. Lebreton, employing a methodology that estimates the amount of plastic waste entering aquatic environments (by region). As explained in more detail in (OECD, 2022^[21]), the methodology employs results from a previous study by Borrelle et al. (2020^[19]) which estimated leakage of mismanaged plastic waste into rivers, lakes, and the ocean at a global scale. The model computes the probability of releases of plastics (from mismanaged plastic waste produced in a certain region or country) to reach an aquatic environment (rivers, lakes, and oceans).

The model also assesses the mobility of plastics in aquatic environments as well as degradation. The whole-ocean plastic mass budget model presented in (Lebreton and Andrady, 2019^[2]) is expanded to a simplified representation of the global aquatic environment. The model differentiates between annual inputs in freshwater and the ocean, allowing floating plastic waste to circulate from one compartment to the other over time. The model also differentiates inputs by polymer types using the OECD ENV-Linkages model estimates and waste projections presented in this Outlook. The likely fate of emitted plastics is determined depending on their density. Additionally, the degradation rates vary across polymers based on laboratory results (Gerritse et al., 2020^[69]). The general model framework is presented in Annex Figure 1.A.1. The methodology is explained in more detail in (OECD, 2022^[21]).

Annex Figure 1.A.1. Mass balance budget model for plastic in global aquatic environments



Note: Mass inputs by modelled region, characterised by polymer types, are accumulated from 1951 to 2060 into the plastic fate model. Plastics with a density higher than water sink and accumulate in riverbed, lakebed and seabed. Floating plastics (density lower than water) are transported between different aquatic compartments and are allowed to degrade into microplastics over time from contact with sunlight. The region-specific parameter 'i' is the ratio between plastics remaining in freshwater and the plastics entering the marine environment. The parameters 's' and 'r' represent the fraction of stranding and release from the global shoreline. The parameter 't' is the fraction of floating plastic circulating from the coastal to the offshore ocean. Finally, 'd' is the mass fraction degrading into microplastics annually and varies with polymer types.

Source: (OECD, 2022^[21]).

Annex 1.B. Methodology for data collection

Methodology and data sources

The literature on plastic production and use is limited at the national level. A key gap is the limited information on the disaggregation by polymer and by application and on flows of secondary plastics. Moreover, the scope and volumes covered by the various studies differ. For example, most of the studies only consider plastics resin and only four polymers: LDPE/LLDPE, HDPE, PET and PP.

There is also a lack of information on the management of waste across the world, and especially the management of individual waste streams such as plastics. Definitions, available data, measurement methodologies and framework conditions differ widely between countries. Most of the studies focus on municipal plastic waste only. Recycling can also refer to different concepts: quantities that are collected for recycling, material sent for reprocessing, or material ultimately available for use as a secondary plastic. Furthermore, reported recycling rates may give an overly optimistic view of the current status as they focus on polymers such as PET and applications such as packaging, for which recycling is already established, while not taking into account the other polymers. As an example, recycling rates of hard-to-recycle plastics such as fibres are rarely reported. Countries with poor waste management infrastructure also have the weakest published data, making it challenging to assess the amount of mismanaged waste. This results in an incomplete view of the current management of plastic waste for these APT countries.

In line with the Global Plastics Outlook (OECD, 2022^[4]; OECD, 2022^[21]), the Regional Plastics Outlook aims at understanding the drivers of plastics use and the impacts on the environment for these 13 Asian countries to find the best way to reduce the environmental pressures of plastic production, waste generation and management. The goal is to provide a comprehensive overview of the entire lifecycle of plastics. The database collects and reconciles data for the full lifecycle of plastics across 13 Asian countries: production, use, waste generation and waste management, including waste that is mismanaged or leaked to the environment.

Annex Table 1.B.1. Summary of sources

Category	Variable	Source
Economic flows	Primary and secondary economic split	Details on the plastic production flow with the split between domestic virgin resin, net export, and recycled resin are given for: Viet Nam (Regional Knowledge Centre for Marine Plastic Debris, n.d. ^[70]), Thailand (Kamsook et al., 2022 ^[43]), Philippines (Regional Knowledge Centre for Marine Plastic Debris, n.d. ^[70]), Indonesia (Ministry of Environment and Forestry, n.d. ^[71]), (Ikbal Alexander, Maria Marghareta Widhia Putri, 2022 ^[72]), Singapore (KWR, 2021 ^[73]) Data from the Global Plastics Outlook are used for: China, Japan, and Korea
Production	Production by application and polymer	Details on the volume of plastic production by polymer and by application (resin only) are given by World Bank Studies for: Viet Nam (World Bank, 2021 ^[53]), Thailand (World Bank, 2021 ^[74]), Philippines (World Bank, 2021 ^[55]), and Malaysia (World Bank, 2021 ^[56]) Data from the Global Plastics Outlook are used for: China, Japan, and Korea
Use	Use by application and polymer	Volume of plastics use (resin only) by polymer and by application is given by: Local sources for: Indonesia (Ministry of Environment and Forestry, n.d. ^[71]), Singapore (KWR, 2021 ^[73]) World Bank Studies for: Viet Nam (World Bank, 2021 ^[53]), Thailand (World Bank, 2021 ^[54]), Philippines (World Bank, 2021 ^[55]), Malaysia (World Bank, 2021 ^[56]) Data from the Global Plastics Outlook are used for: China, Japan, and Korea

Category	Variable	Source
Waste	Waste by application and polymer	Details on plastics waste volume by application and polymer (resin and municipal solid waste only) are given by: World Bank Studies for: Viet Nam (World Bank, 2021 ^[75]), Thailand (World Bank, 2021 ^[74]), Philippines (World Bank, 2021 ^[76]), Malaysia (World Bank, 2021 ^[77]) Data from the Global Plastics Outlook for: China, Japan, and Korea Local study for Singapore (Cady.K, Ong.I, 2021 ^[78])
Waste management	Waste management end-of-life fates	Plastics waste flow+ information on waste treatment (municipal solid waste only) are given by: Local studies for: Viet Nam (OECD, 2022 ^[79]), Thailand (Chulalongkorn University, 2022 ^[80]) (Bureecam, Chaisomphob and Sungsomboon, 2018 ^[44]) (Akenji et al., 2019 ^[81]) (Vicheanteab, Juckrit & Thushari, Indika, 2020 ^[82]), (UN, 2017 ^[83]), Philippines (Regional Knowledge Centre for Marine Plastic Debris, n.d. ^[70]), Malaysia (Khawanah Research Institute, n.d. ^[84]), Indonesia : (World Economic Forum, 2020 ^[52]) (Ministry of Environment and Forestry, n.d. ^[71]) (Ministry of Environment & Water (KASA), n.d. ^[85]), Singapore (Cady.K, Ong.I, 2021 ^[78]) Study for Thailand, Philippines, Malaysia, and Philippines: (Akenji et al., 2019 ^[81]) World Bank Studies for: Viet Nam (World Bank, 2021 ^[75]), Thailand (World Bank, 2021 ^[55]), Philippines (World Bank, 2021 ^[76]), Malaysia (World Bank, 2021 ^[77]) Data from the Global Plastics Outlook are used for: China, Japan, and Korea

Waste management sources and time coverage

The waste generated is further broken down by waste treatment, i.e. collected for recycling, incinerated, landfilled, mismanaged and littered, and uncounted waste.

The sources of end-of-life fate shares vary from 2004 to 2020 across countries (Annex Table 1.B.2). In this analysis, mismanaged waste includes open dumping and unaccounted waste treatments for all income levels apart from low- and lower middle-income countries, for which also unspecified landfilling, waterway treatment and other categories are included based on country level data for MSW.

Annex Table 1.B.2. Data sources on waste management

Countries	Measurement	Year
Brunei Darussalam	other	2005
Brunei Darussalam	sanitary_landfill	2014
Brunei Darussalam	unaccounted	NA
Cambodia	other	2004
Cambodia	other	2010
Cambodia	unaccounted	NA
China	incineration	2014
China	landfill_unspecified	2014
China	open dump	2014
China	other	2014
Japan	controlled_landfill	2015
Japan	incineration	2015
Japan	other	2015
Japan	other	2015
Japan	recycling	2015
Korea	incineration	2014
Korea	landfill_unspecified	2014
Korea	recycling	2014
Lao PDR	controlled_landfill	2015
Lao PDR	open dump	2015
Lao PDR	other	2015
Lao PDR	recycling	2015

Countries	Measurement	Year
Malaysia	landfill_unspecified	2017
Malaysia	other	2014
Malaysia	recycling	2016
Malaysia	sanitary_landfill	2017
Myanmar	other	2010
Myanmar	unaccounted	NA
Philippines	other	2013
Philippines	recycling	2014
Philippines	unaccounted	NA
Singapore	incineration	2015
Singapore	landfill_unspecified	2015
Singapore	other	2017
Singapore	recycling	2015
Thailand	incineration	2012
Thailand	landfill_unspecified	2012
Thailand	open dump	2012
Thailand	other	2012
Thailand	recycling	2012
Viet Nam	other	2010
Viet Nam	recycling	2014
China	All waste management	2019

Source: World Bank, What a Waste Global Database for all countries except China, OECD Global Plastics Outlook Database for China. <https://datacatalog.worldbank.org/search/dataset/0039597>, <https://doi.org/10.1787/c0821f81-en>.

Finally, data sources on plastics supply (and demand) are given in Annex Table 1.B.3.

Annex Table 1.B.3. Data sources on domestic supply and demand of plastics

Country	Polymers included in the scope	Year	Sources
China	LDPE, LLDPE + HDPE + PP + PS + PVC + PET + PUR + Fibers + Road marking coatings + Marine coatings + Elastomers (tyres) + Bioplastics + ABS, ASA, SAN + Other	2019	OECD (2022 ^[21])
Japan & Korea	LDPE, LLDPE + HDPE + PP + PS + PVC + PET + PUR + Fibers + Road marking coatings + Bioplastics + ABS, ASA, SAN + Other	2019	OECD (2022 ^[21])
Thailand	LDPE/LLDPE + HDPE + PP + PET	2018	World Bank
Indonesia	HDPE + PP + PET + PVC + PS	2019	Ministry of Industry
Malaysia	LDPE/LLDPE + HDPE + PP + PET + PVC + PS	2019	World Bank
Viet Nam	LDPE/LLDPE + HDPE + PP + PET + PVC + PS	2019	World Bank
Singapore	Not precised	2019	The National Environment Agency of Singapore
Philippines	LDPE/LLDPE + HDPE + PP + PET	2019	World Bank

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Notes

¹ The ASEAN Member States are Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, Singapore, Thailand and Viet Nam.

² In the underlying economic database used for the analysis, Myanmar is grouped with Timor-Leste. It was not possible to exclude Timor-Leste, but the size of its economy (measured as GDP) represents 3% of the size of Myanmar (<https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=MM-TL>, World Bank national accounts data and OECD National Accounts data files), so the distortion is very limited.

³ Further information on plans, roadmaps and policy instruments deployed by the ten ASEAN member states is also available in the OECD Country Notes on marine plastic pollution: <https://www.oecd.org/ocean/topics/ocean-pollution/>.

⁴ The amount does not fall to zero as some plastic waste streams, e.g. uncollected litter, evade collection systems.

⁵ For comparison, in 2022, the APT had a higher leakage rate (7.7%) than the global average (5.7%), but smaller than the non-OECD average (9.7%), reflecting that the APT contains a mixture of countries with relatively high (e.g. Indonesia) and countries with relatively low (Japan and Korea) leakage shares. The ASEAN countries (15.5%), and especially Indonesia (23.3%) are clearly above the average of non-OECD countries, illustrating that it is a hotspot for plastic leakage.

⁶ For a proper cost-benefit analysis, these macroeconomic costs would have to be compared with the environmental benefits that result from the reduced pressures on the environment. However, as not all these benefits can be valued and made comparable to the economic costs, the analysis here presents the *gross* economic cost, i.e. the change in GDP, without correcting for environmental benefits. Nonetheless, the environmental benefits are likely to outweigh these costs (OECD, 2022^[21]; OECD, 2022^[41]).

Part I The current situation for plastics

2 The current situation for plastics use, waste and end-of-life fates

This chapter provides a detailed overview of plastics use, trade, waste generation and management, and environmental impacts in the ASEAN Plus Three (APT) region for 2022. Throughout production, use and disposal, the lifecycle of plastics is intertwined with the economy and the environment in a multitude of ways. Understanding these complex interactions is critical for identifying challenges and formulating effective policies. The chapter explores variations in plastics use patterns across APT countries and relevant sectors, emphasising the dominance of short-lived products like packaging in waste. It complements the quantitative analysis with a qualitative analysis of the performance of waste collection and treatment systems.

Key insights

- Plastics use in Southeast and East Asia has soared in recent years. Specifically, for the ASEAN Plus Three (APT) countries plastics use increased from 17 million tonnes (Mt) in 1990 to 152 Mt in 2022, with a significant shift in regional dynamics over the last three decades, with fast growth in China and some of the lower middle-income ASEAN countries, and slower growth especially in Japan. China now accounts for nearly 70% of the region's plastics use, and ASEAN for 19%.
- Packaging and construction are the dominant applications for plastics across APT countries. However, patterns differ widely across countries, reflecting differences in economic development and industrial structure.
- While the APT average plastics use per capita is 67 kg, this ranges from just 29 kg in Indonesia to over 100 kg in Japan and Korea.
- Trade in plastics is a major feature of the APT region, with China as the leading global exporter and ASEAN countries increasingly reliant on imports to meet domestic demand.
- Short-lived plastic products such as packaging and consumer goods constitute more than half of plastic waste generation in the APT region.
- Inadequate waste management systems exacerbate plastic pollution in the region. While Japan, Korea and Singapore collect more than 95% of municipal solid waste collection, collection rates can go below 50% in parts of ASEAN LMIC, with gaps especially in rural and remote areas.
- The average share of waste that is recycled in the APT (19% collected for recycling; 12% actually recycled) is substantially higher than the global average (16% collected; 10% recycled). Recycling systems are more mature in Japan and Korea while in China and the ASEAN plastic recycling relies on an active informal sector that collects and sort high-value materials.
- Despite progress in recycling, mismanaged plastic waste remains widespread across the APT, especially in countries with limited formal waste infrastructure. Open dumping, informal burning and unregulated landfilling persist where viable alternatives are lacking. A large share of plastic waste is mismanaged in ASEAN (56% on average) and to some extent also in China (26%). Compared to the rest of the APT countries, Korea and Japan have higher levels of incinerated plastic waste.
- Putting in place effective systems for safe waste management is a major environmental and health priority. Archipelagic states (e.g. Indonesia with a 72% mismanaged waste rate) face unique logistical and cost barriers to establishing waste management systems across remote islands and coastal communities.
- Plastic waste net imports in ASEAN amount to 1.1 Mt in 2022. These import flows are small compared to the volumes of plastic waste.
- In 2022, plastic leakage to the environment in APT countries reached 8.4 Mt, more than one-third of the global total. Freshwater ecosystems are key pollution hotspots, as well as key conduits to oceans. Marine plastic pollution threatens biodiversity and can generate losses for ocean-dependent sectors, with significant long-term implications.

2.1. Introduction

While plastics are beneficial to modern societies and are used in numerous applications, plastic pollution is an urgent global concern, presenting a significant obstacle to the transition towards sustainable economies. The ASEAN Plus Three (APT) region is of strategic importance in the fight against plastic pollution: it accounts for nearly one-third of global GDP, plays a key role in global manufacturing and trade, and it hosts some of the world's largest producers and consumers of plastic polymers and products, as well as several recycling hubs. This chapter provides a detailed overview of plastics use, trade, waste generation and management, and environmental impacts in the APT region in 2022, including to explore variations within countries in the region.

2.2. Per capita plastics use and intensity are very heterogenous across the APT

Plastics use per capita and plastic intensity relative to GDP vary greatly across APT countries. (Table 2.1). Plastics use per capita provides insights how much individuals rely on plastic products. Plastic intensity (plastics use per unit of GDP output, kg/USD) measures the dependence of the economy on plastic products used in final goods or as input to production.

The average plastics use per capita in 2022 was 67 kg for APT countries. Indonesia shows a low level of plastics use per capita: Indonesia uses on average 29 kg of plastics per person in 2022, while the average person in the Rest of ASEAN – HIC and UMIC (i.e., Brunei Darussalam, Malaysia, Singapore) uses more than four times that amount.

In the APT region, each thousand dollars of value added (i.e. GDP) embed around 3.5 kg of plastic products. The variation in plastic intensity of GDP across countries is more limited than that of plastics use per capita, ranging between 2.2 tonnes per million USD (t/M\$) value added in Indonesia and 4.9 t/M\$ in Thailand. The variation across countries reflects different economic and industrial contexts in the APT region.

Table 2.1. Plastics use per capita varies by a factor 4 and plastic intensity by a factor 2 across APT countries

Estimated for 2022.

Regions	Plastics use per capita (kg/cap)	Plastic intensity (kg/kUSD in PPP)	GDP per capita (kUSD in PPP/cap)
Thailand	84	4.9	17
Rest of ASEAN – HIC & UMIC	132	3.4	39
Indonesia	29	2.2	13
Rest of ASEAN - LMIC	34	4.3	8
Japan	102	2.5	41
Korea	106	2.5	42
China	73	3.8	19
ASEAN average	43	3.3	13
Plus Three average	77	3.5	24
APT average	67	3.5	19
World average	63	3.6	18

Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

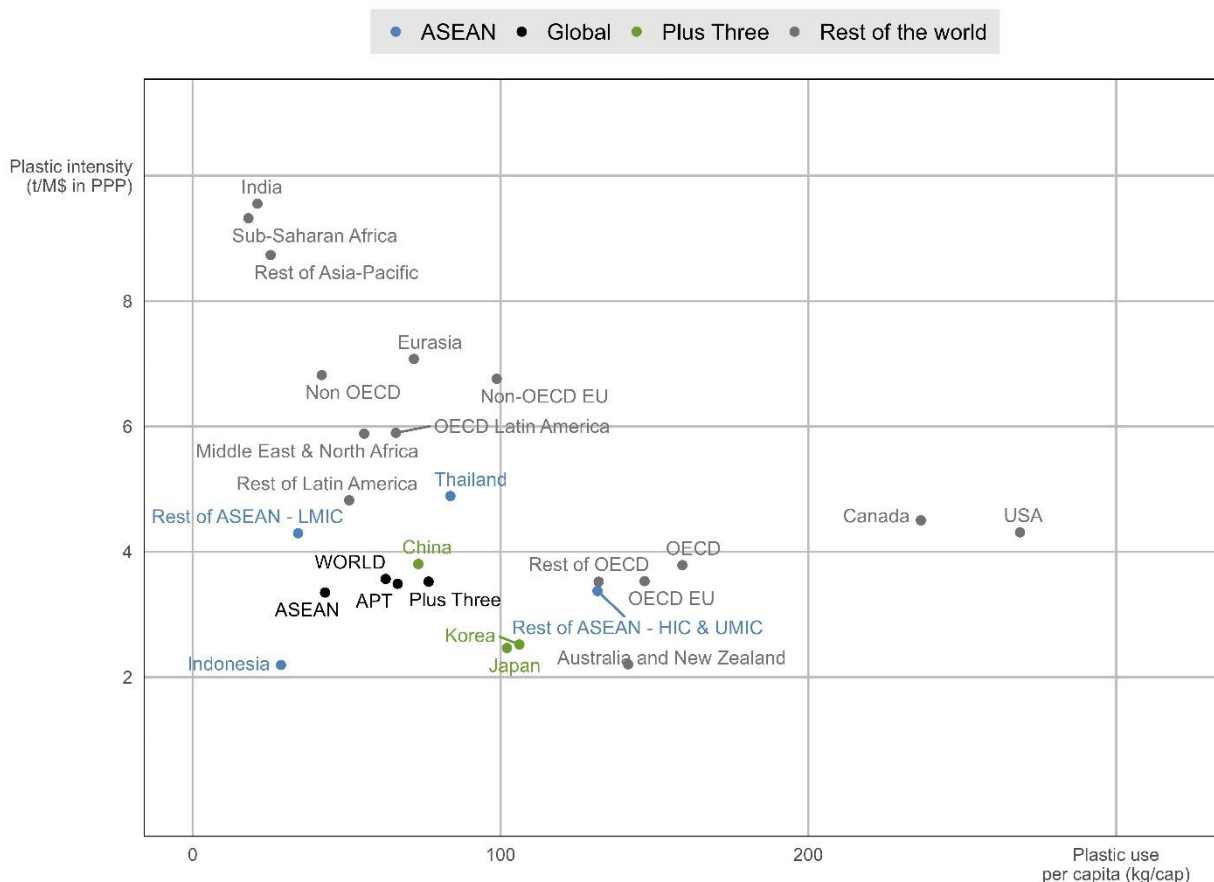
Source: OECD ENV Linkages model.

Globally, plastic intensity and use per capita tend to increase as countries advance in economic development and while the APT region also follows this pattern, APT countries tend to be on the lower end in terms of plastic per capita use. Figure 2.1 presents plastic intensity and plastics use per capita. For instance, for a similar level of plastic intensity, a person in Indonesia on average uses 29 kg of plastics per year, while the OECD Oceania (Australia and New Zealand) average equals almost 150 kg of plastics per person per year.

Plastic intensity and per capita use also vary according to the specialisation patterns of the APT countries. For instance, Thailand and Indonesia are at a similar level of GDP per capita but show different patterns. Thailand shows a high plastic intensity, showing the importance of plastics-using sectors in the country, such as electronics and motor vehicles. In contrast, the reliance of Indonesia to plastics (both in terms of intensity and use per capita) is much lower as this country is less oriented to plastic-intensive sectors (around 5% of the output versus 33% for Thailand).

Figure 2.1. Plastics use per capita and plastic intensity tend to increase as countries advance in their economic development

Plastic intensity vs. plastics use per capita, 2022.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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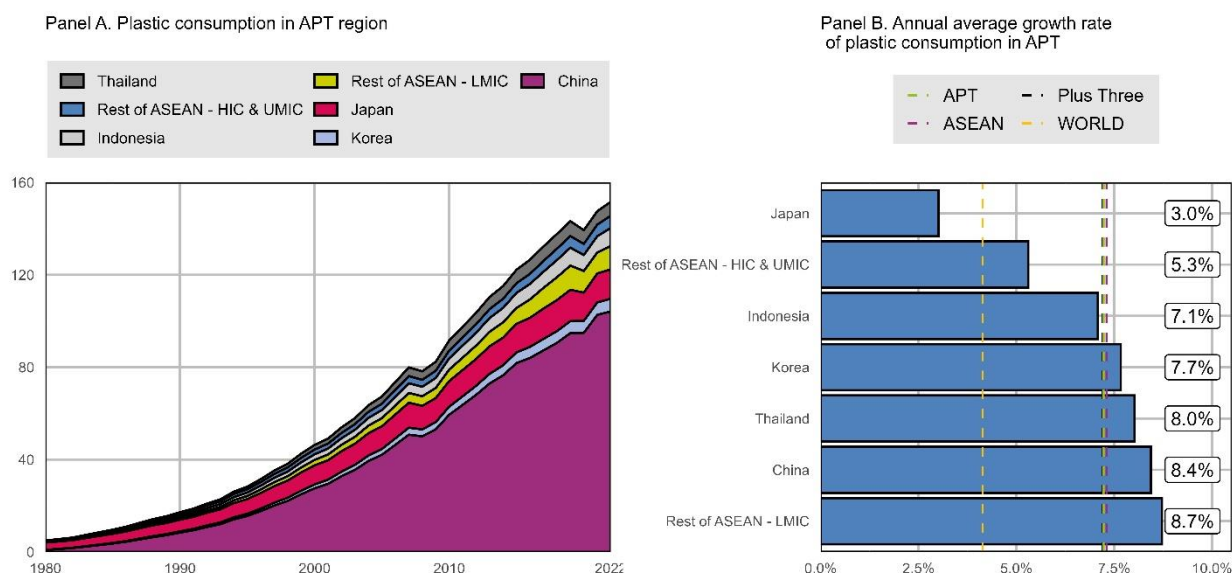
2.3. Total plastics use is growing substantially

2.3.1. Plastics use is growing rapidly, with large heterogeneity among countries

Following the growing population and rising per capita incomes, plastics use in APT countries soared in recent decades, increasing from 17 Mt in 1990 to 152 Mt in 2022 (Figure 2.2). The region currently accounts for one-third of global plastics use (OECD, 2022^[1]). While plastics use in the region declined in 2020 due to the COVID-19 pandemic, it rebounded strongly in 2021.

Figure 2.2. Plastics use has grown nine-fold in the last 3 decades in the APT

Plastics use in Mt, 1980-2022, and annual growth rates in percentages over the same time period.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

StatLink <https://stat.link/fbrazy>

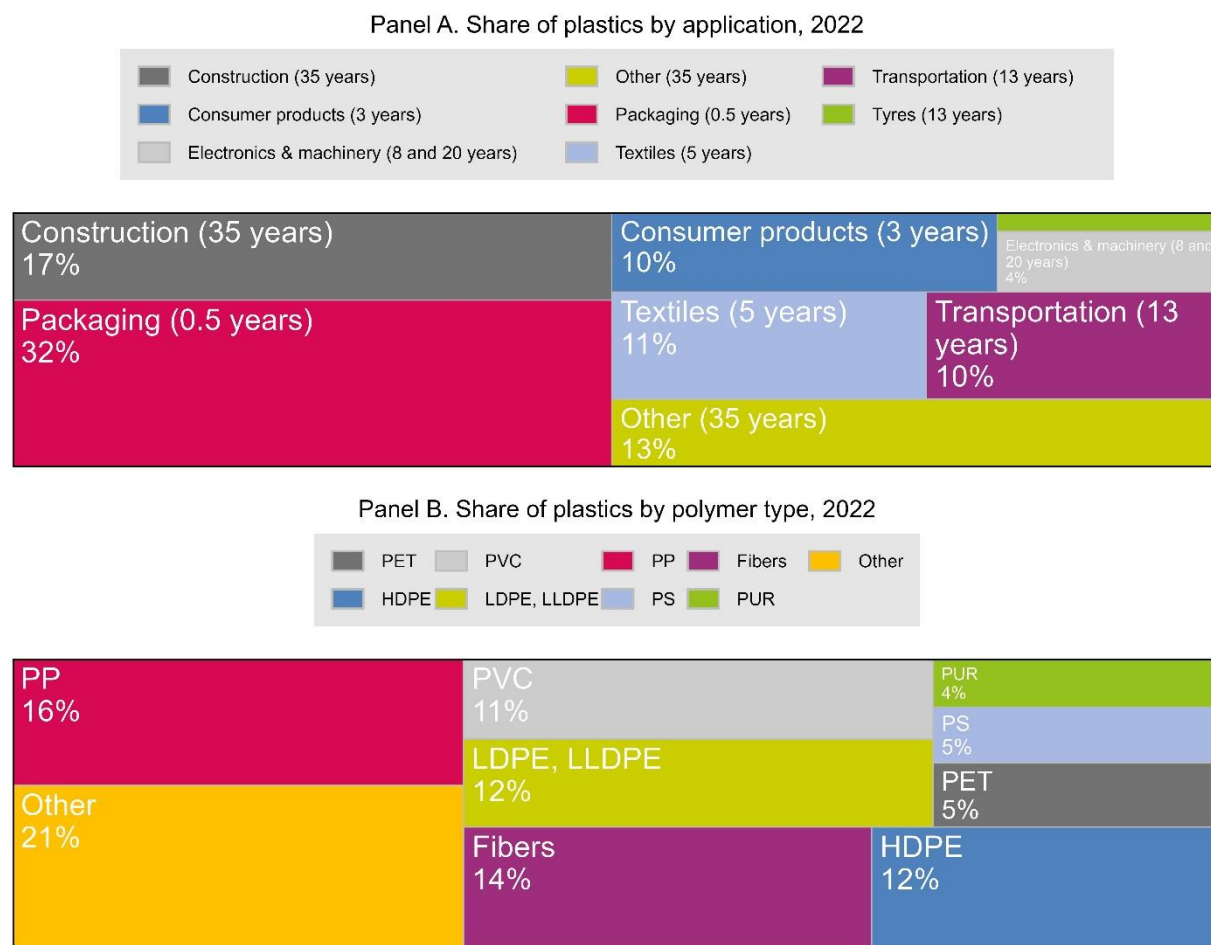
Within the APT region, China represents 69% of plastics use in 2022, the ASEAN countries 19%, and Japan and Korea 12% (Figure 2.2). The relative contribution of individual countries has changed over time. China's share of plastics use in the APT region has steadily increased from 49% of in 1990 to 69% in 2022, while Japan and Korea's shares have declined from 33% in 1990 to 12% in 2022, while the ASEAN countries moved from 18% to 19% over the same period.

2.3.2. Country specificities determine sectoral composition

In APT countries, packaging and construction account for 32% and 17% of total plastics use, respectively (Figure 2.3); the dominance of packaging is in line with global numbers (OECD, 2022^[1]). Other important applications of plastics use include textiles, transportation, household consumer products, electronics and machinery. In terms of polymers, polyethylene polymers (LLDPE, LDPE, HDPE, PET) together comprise 29% of the total. The other main polymers used include PP, Fibres and PVC. Packaging uses mainly PE and PP polymers (72%; numbers not shown in the figure), construction uses mainly PVC polymer (45%) while textiles use mainly fibres (99%).

Figure 2.3. A significant share of plastics is used for packaging and made of polyethylene (PE)

Share of plastics based on weight by application (average lifetimes indicated in brackets) and by polymer, 2022.



Note: In panel A, the years corresponds to the average lifetime of plastics in each application.

HDPE = high-density polyethylene, PET = polyethylene terephthalate, PVC = polyvinyl chloride, LDPE = low-density polyethylene, LLDPE = linear low-density polyethylene, PP = polypropylene, PS = polystyrene, PUR = polyurethane.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/dsn6t9>

Plastics use across sectors varies by country. In Japan and Korea, packaging (30% in Korea and 27% in Japan) and construction (31% in Korea and 35% in Japan) are important users of plastics. (Table 2.2). While plastics play an important role in construction everywhere, building materials demand a larger share of plastics use in Japan and Korea than in other APT countries. The critical role of plastics in this sector presents a challenge in substituting plastics with alternative materials such as metals, wood or glass. China, with its 33% share in packaging, also indicates a substantial use of plastics in consumer goods. However, beyond packaging, plastics use is more evenly distributed across different industries in China, than in e.g. Japan and Korea. In the ASEAN region, high- and upper middle-income countries use plastics predominantly in packaging (43%), reflecting a focus on consumer goods, with less emphasis on industries like construction. Conversely, in lower middle-income ASEAN countries, plastics use is more heavily utilised in the infrastructure and transportation sectors, indicating different developmental priorities.

Table 2.2. Packaging is the main plastics application despite regional differences

Share of plastics use by application

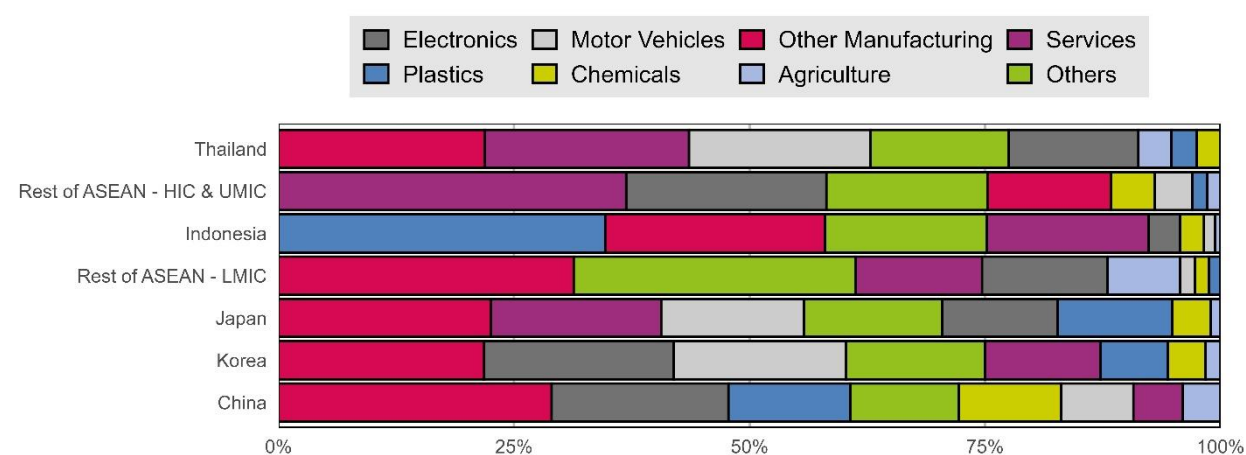
	Thailand	Rest of ASEAN - HIC & UMIC	Indonesia	Rest of ASEAN - LMIC	Japan	Korea	China	World
Packaging	36%	43%	31%	29%	27%	30%	33%	32%
Construction	12%	8%	7%	18%	35%	31%	16%	15%
Other	11%	13%	12%	10%	13%	12%	14%	14%
Transportation	13%	6%	14%	10%	4%	4%	11%	12%
Textiles	13%	16%	17%	15%	8%	8%	10%	10%
Consumer products	7%	8%	11%	12%	9%	10%	10%	10%
Electronics & machinery	6%	4%	5%	4%	4%	4%	4%	4%
Tyres	1%	2%	2%	2%	0%	0%	1%	2%

Source: OECD ENV-Linkages model.

Plastics use by production sector is closely linked to plastics use by application; in some cases, the correspondence is one-on-one (e.g. construction), while in other cases there are multiple sectors associated with the same applications (e.g. packaging). Across most APT countries, manufacturing sectors – associated with a range of different applications and including Electronics, Motor Vehicles, Other Manufacturing – emerge as a prominent consumer of plastics (Figure 2.4). In the ASEAN countries, most of the plastics go to services and manufacturing sectors. In Korea, the electronics sector is the largest consumer of plastics (20%) followed by motor vehicles (18%). The use of plastics in the chemicals sector is mainly driven by China (11% of plastics use in the country); the other APT countries use much less plastics in this sector. Indonesia is exceptional in that it uses a lot of plastics in the plastics sector itself, i.e. transforming polymers for further inputs.

Figure 2.4. Sectoral plastics use differs widely across the APT countries

Share of sectors in total demand for plastics as production inputs, 2017



Note: Demand for plastics includes both primary and secondary plastics. Demand for plastics for final consumption is relatively small (about 4% on average in APT) and excluded from the figure. 'Other manufacturing' contains a variety of smaller sectors, including e.g. food products and metals production.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

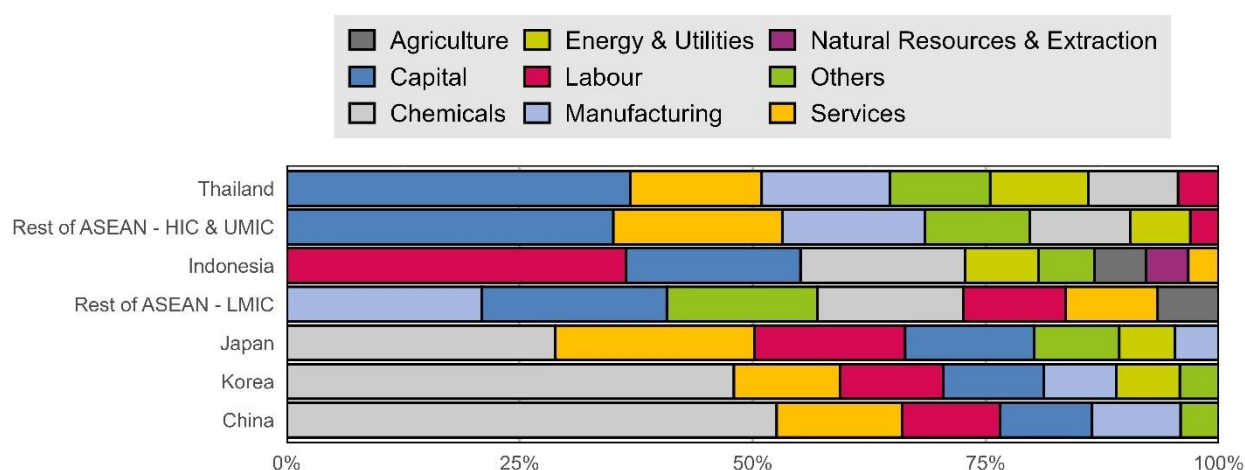
Source: Global Trade Analysis Project (GTAP).

StatLink  <https://stat.link/6sdaoe>

The plastic production sector itself uses a range of different inputs, and these vary across countries as producers use different production methods and produce different varieties of plastics (Figure 2.5). For instance, in China, Japan, and Korea chemicals play a significant role in plastic production – this includes monomers and additives used for polymer production. Thailand and Rest of ASEAN – HIC & UMIC have more capital-intensive production, emphasising advanced production capabilities and substantial investments in plastic production. In contrast, Indonesia shows a larger reliance on labour inputs, while Rest of ASEAN – LMIC show a notable reliance on inputs from manufacturing and agriculture, which indicates the potential of agricultural bioproducts in plastic production.

Figure 2.5. Different APT countries use different production processes to produce plastics

Share of sectoral expenditures to produce plastics by region



Note: The data includes expenditures for both primary and secondary production. Ordered from left to right by sector importance.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: Global Trade Analysis Project (GTAP).

StatLink  <https://stat.link/j15ovu>

2.3.3. Trade in plastics is significant in the APT region

Trade in plastic products is relevant for APT countries for several reasons. First, most of these countries are very open towards international trade. Second, interregional trade is very important for plastics. Third, as plastics may cross borders several times during its lifecycle, a full tracking of plastics that may end up in the environment is complex.

Table 2.3 shows bilateral trade flows to and from APT countries, reconciled for 2017. The trade flows within the APT region reflect the importance of Thailand, Malaysia (part of Rest of ASEAN – HIC & UMIC) and Viet Nam (part of Rest of ASEAN – LMIC), as well as of China. China stands out as a major player in global plastics trade, exporting and importing substantial amounts of plastics from all regions– it exports around USD 10 billion (bln) to other APT countries and USD 42.5 bln to the rest of the world. This is reflective of its important role as both a producer and consumer of plastics in the region. Japan and Korea have notable bilateral plastic trade between each other (USD 673 million and USD 2.7 bln, respectively). The ASEAN countries import more than USD 12 bln from outside ASEAN (and another USD 5 bln from intra-ASEAN trade), while they export a little less than USD 11 bln to countries outside ASEAN (and another USD 5 bln within ASEAN). These flows underscore their dependence on plastic trade, especially imports from China to satisfy domestic demand, especially in the Rest of ASEAN – LMIC, and the importance of intra-ASEAN trade for the plastic value chains. Thailand and the Rest of ASEAN – HIC & UMIC as well as the Plus

Three countries appear as net exporter of plastics, while Indonesia and the Rest of ASEAN – LMIC are net importers.

Table 2.3. APT countries engage in significant trade of plastics

Trade flows from countries (rows) to countries (columns) in million USD in 2017.

	Thailand	Rest of ASEAN - HIC & UMIC	Indonesia	Rest of ASEAN - LMIC	Japan	Korea	China	Rest of the World
Thailand	0	581	221	773	814	113	411	2700
Rest of ASEAN - HIC & UMIC	503	1063	535	405	624	216	588	2479
Indonesia	72	115	0	108	305	33	40	582
Rest of ASEAN - LMIC	82	83	68	212	620	55	39	1207
Japan	971	458	206	1005	0	2720	6450	6115
Korea	197	201	124	933	673	0	4060	4689
China	1036	1357	777	1911	4135	1068	0	42588
Rest of the World	904	1235	304	799	2206	1277	8774	190425

Note: the colours show the intensity in the trade and are split by block (green for intra-ASEAN trade, blue for trade from non-ASEAN countries to ASEAN and red for the trade from ASEAN to non-ASEAN countries).

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: GTAP Circular Economy (CE) database.

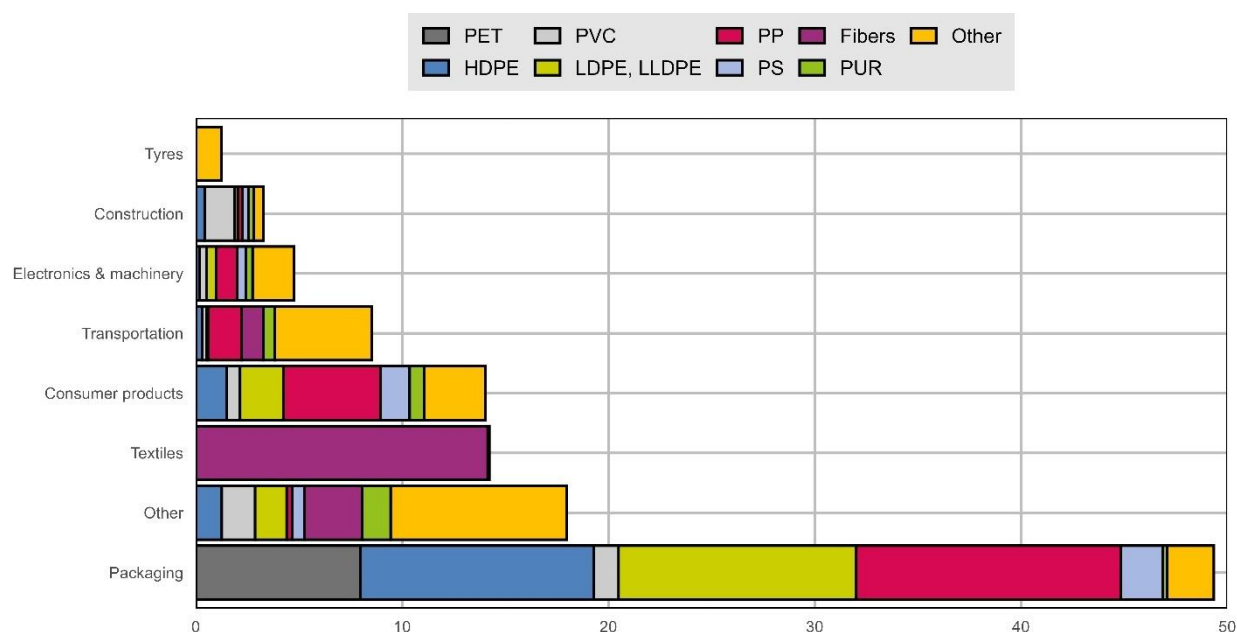
2.4. Short-lived plastic products constitute the largest part of waste

The APT region generated 113 Mt of plastic waste in 2022, with a large share from applications with short lifetimes. Almost 90% of plastics in municipal solid waste (MSW) in APT countries comes from applications with lifespans of less than five years. Packaging (44% of total MSW) has an average lifetime of months and consumer products (12% of total MSW) has an average lifetime of 3 years.

As most plastics are short-lived, the distribution of plastics use across polymers (see Section 2.2) is reflected in the composition of plastic waste: predominant polymers are PE (LLDPE, LDPE, HDPE and PET), PP and PVC. The shares of these polymers become even greater in the end-of-life stage and in use, as – with the exception of PVC – they are often used for applications with short lifetimes (Figure 2.6).¹

Figure 2.6. Nearly two-thirds of plastic waste comes from packaging, textiles and consumer products

Plastic waste by application and polymer in the APT region, 2022



Note: HDPE = high-density polyethylene, PET = polyethylene terephthalate, PVC = polyvinyl chloride, LDPE = low-density polyethylene, LLDPE = linear low-density polyethylene, PP = polypropylene, PS = polystyrene, PUR = polyurethane. Other includes elastomers (tyres), bioplastics, acrylonitrile butadiene styrene, acrylonitrile styrene acrylate, styrene acrylonitrile, road marking coatings.

Sources: OECD ENV-Linkages model.

StatLink  <https://stat.link/xsbptw>

Countries with high per capita plastics use levels tend to also show high levels of per capita plastic waste generation (Table 2.4). Plastic waste per person is especially high in ASEAN – HIC & UMIC. For instance, in Rest of ASEAN – HIC & UMIC, with the largest per capita use of plastics, each person produced on average 128 kg of plastic waste in 2022. Comparatively, in Indonesia and the Rest of ASEAN - LMIC, with significantly lower per capita plastics use, each person produces on average 24 kg and 26 kg of plastic waste respectively. However, depending on the lifetimes of the different applications used in each region, high plastics use per capita does not always correlate with high plastic waste per capita. In Japan and Korea, plastics use is relatively high, compared to other countries in the region, but their plastic waste per capita falls in the middle of the range. This reflects the effect of policies in place addressing the use of plastic products with short lifetimes, leading to a longer total average delay between plastics use and plastic waste (see also the significant share of construction in these countries in Table 2.2).

Table 2.4. Per capita plastic waste generation correlates with per capita plastics use but is influenced by average lifetimes of plastics in use

Countries	Plastic waste per capita in 2022 (kg/cap)
Thailand	76
Rest of ASEAN – HIC & UMIC	128
Indonesia	24
Rest of ASEAN - LMIC	26
Japan	72
Korea	73
China	54
ASEAN average	36
Plus Three average	56
APT average	50
World average	50

Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Sources: See Chapter 1 for a detailed list of sources.

2.5. Substantial gaps in waste management systems exacerbate plastic pollution

2.5.1. Despite significant recycling in the APT, mismanaged plastic waste remains high

The performance of plastic waste management systems depends strongly on local country contexts. Figure 2.7 shows end-of-life fates for plastics across modelled countries and region, and Figure 2.8 gives an overview of the recycling performance, both in terms of the share of waste that is effectively recycled and the recycling outputs in absolute values. Box 2.1 explains how mismanaged waste and recycled plastics are defined in the context of this report, as well as how and why estimates may vary across different data sources and studies.

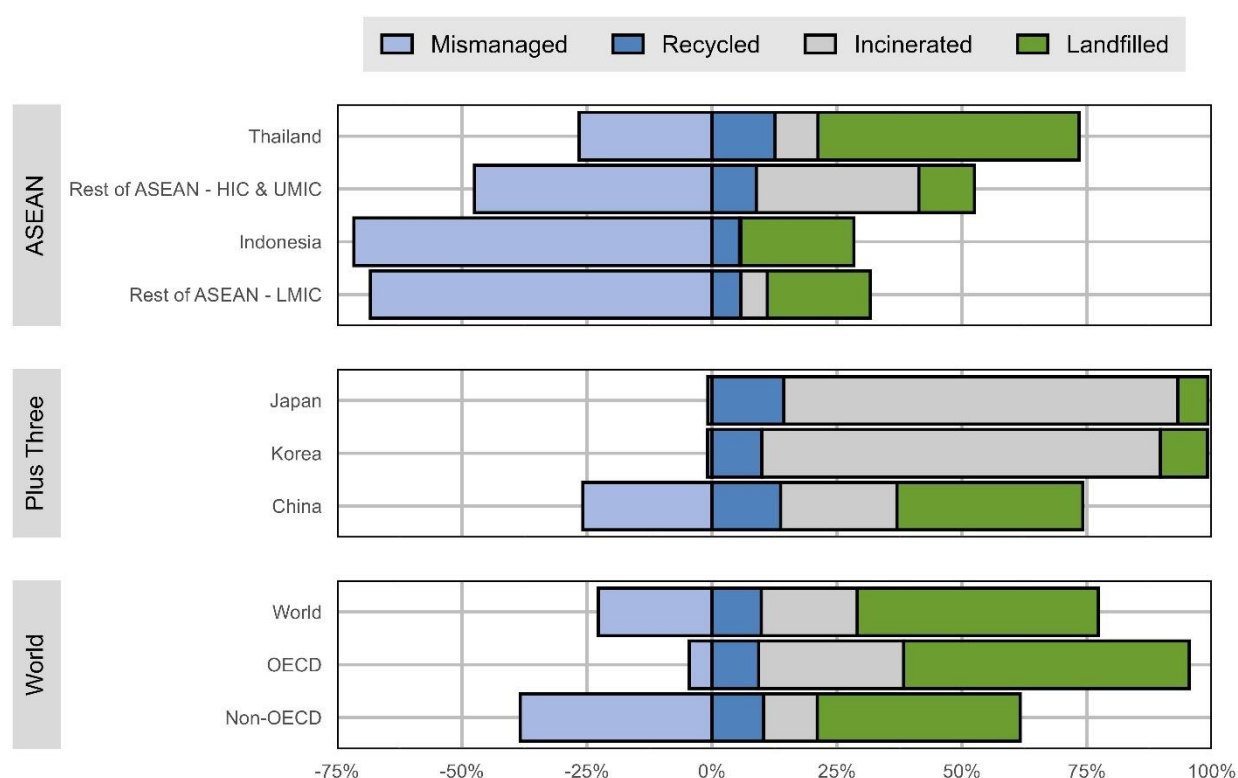
Effective recycling rates range from 6% to 14% (cf. a global average of 10%), but there are important differences. Of the 113 Mt of plastic waste generated in the APT region in 2022, 19% were collected for recycling, and 12% effectively recycled.² The average APT recycling rate has grown quickly from 5% in 2000, surpassing the global average in 2013. The highest recycling rates (i.e., share of waste that is effectively recycled) were achieved in China, Japan and Thailand. Policy drivers of recycling are discussed in the following sections but include extensive separate waste collection systems and extended producer responsibility schemes. In many APT countries, and in particular in ASEAN LMIC, recycling depends on informal waste collection and separation. In addition, it is important to note that there are also significant challenges to plastics recycling currently: not all plastic waste is technically or economically recyclable under current technologies. A significant share of plastics is not designed for recycling, e.g. due to multi-layer compositions, problematic additives or lack of recycling technologies, which limits the theoretical maximum recycling rate to well below 100%.

Despite growing recycling yields, more plastic waste is mismanaged than recycled in all APT countries, except in Japan and Korea. Mismanaged waste includes all waste that is not handled in an environmentally safe manner, including uncollected waste as well as waste that is collected but later handled improperly for instance via open burning, unsanitary landfilling or disposal in dumpsites, or dispersal in the environment. Landfill volumes are high in several APT countries, in particular, sanitary landfilling account for the largest share of end-of-life fates in Thailand (3 Mt or 52% of total waste generated) and in China (28 Mt or 37%). On the other hand, in Japan and Korea sanitary landfilling plays a minor role, while incineration rates are higher than 75%, well above the region average.

The next sections explore drivers of waste management performance in the APT, with information for each of the 13 APT countries on the status of waste collection systems (Section 2.5.2) and waste treatment performance and end-of-life gates (Section 2.5.3). The chapter also discusses the role of informal waste workers (Section 2.5.4) and trends in trade in plastic waste (Section 2.5.5) in the region. Opportunities to improve the policy mix and the effectiveness of policy implementation are only discussed later in this Outlook, in Chapter 7.

Figure 2.7. In most APT countries, more plastic waste is mismanaged than recycled

Share of plastic waste treated by category in 2022.



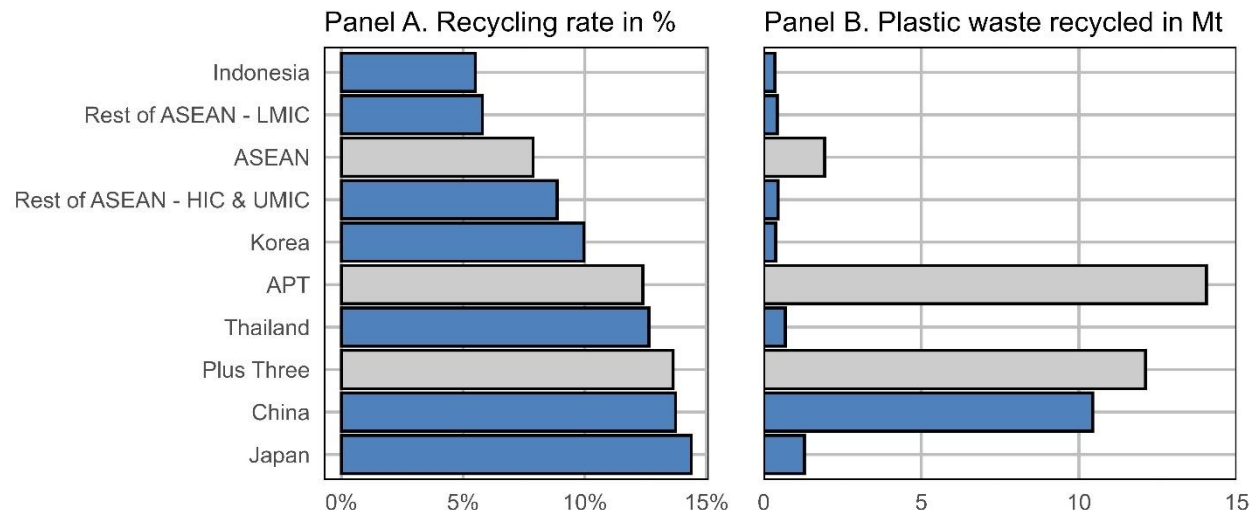
Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/q7daly>

Figure 2.8. Only a small portion of plastic waste is recycled into new plastics

Recycling rates and amounts of plastics effectively recycled in APT region, 2022.



Notes: The recycling rate is computed as Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/jera0d>

Box 2.1. Different definitions of mismanaged waste and recycling can yield varying estimates

The term *mismanaged waste* is used in different ways across studies. Typically, plastic waste “mismanagement” encompasses several waste management outcomes, including uncontrolled landfills, waste dumping, open burning, littering and eventual leakage into the environment (Edelson, Håbesland and Traldi, 2021^[2]). Common to most definitions is the idea that mismanaged plastics are those not handled through an environmentally safe manner. However, there may be differences in whether the term focuses strictly on waste that escapes formal systems (littering and open dumping) or also collection inefficiencies and disposal in non-sanitary landfills.

Differences in definitions, assumptions, as well as data sources and categorisations, can lead to substantial differences in mismanaged waste. A comparative analysis by Edelson et al. (2021^[2]) finds that estimates for the same country can diverge by more than 25–75 percentage points across studies, highlighting the importance of clear methodologies when comparing mismanaged waste figures. In the literature reviewed for this report, estimated mismanagement in China varies from 26% in 2016 (Borrelle et al., 2020^[3]) to 70% in 2015 (Lebreton and Andrady, 2019^[4]) and 76% in 2010 (Jambeck et al., 2015^[5]). For Indonesia, estimates vary significantly, including: 25% in 2015 (Lebreton and Andrady, 2019^[4]), 44% in 2023 (SWITCH-Asia, 2025^[6]), 55% in 2016 (Borrelle et al., 2020^[3]), 63% (World Bank, 2021^[7]), 70% (World Economic Forum, 2020^[8]) and over 90% based on (Ramadan and Sembiring, 2023^[9]) of plastic waste generated.

Similarly, differences in plastic recycling rates also arise from varying definitions, data sources and methodologies. Some studies and national statistics report the amount of plastics collected for recycling relative to total waste generated, while others use *output-based* rates that measure the share of plastics processed and effectively recycled into secondary materials (i.e., after accounting for recycling losses). Additional discrepancies may stem from how informal recycling is accounted for, whether energy recovery is included, and the treatment of exported waste. These factors cause substantial variability

in reported rates, making careful attention to these definitional and methodological differences critical when interpreting data and comparing performance across countries and studies.

For the purposes of this Outlook, only plastics that are effectively recycled are counted in the *recycled* end-of-life category. However, there may be inconsistencies where the Outlook references national statistics or targets, e.g. recycling rates that often refer to plastics collected for recycling rather than those effectively recycled.

2.5.2. Expanding the coverage of waste collection is a priority

The data shown in the previous section suggests that APT countries vary widely in their current capacities in ensuring safe plastic waste management, a key factor in reducing plastic leakage and pollution. The Plus Three countries and Singapore are largely at, or moving towards, an advanced stage of waste management, with high rates of municipal and non-municipal waste collection, as well as environmentally safe treatment and substantial plastics recycling rates. On the other hand, in most other APT countries, notably most ASEAN countries but also China, insufficient coverage of waste collection and inadequate waste treatment infrastructure exacerbate plastic leakage. Notable efforts have been made alongside economic development in several APT countries in recent years. Further improvements are needed especially in contexts of rapid growth in waste generation.

Waste management performance and infrastructure can be assessed along two dimensions: collection and end-of-life fates. This section details current performance in the APT for ensuring solid waste collection. Table 2.5 compares the current waste management infrastructure and performance in the APT for two main indicators: the shares of waste that is collected for MSW and for non-MSW (i.e. industrial as well as agricultural waste).

Table 2.5. Current waste collection systems are inadequate in most APT countries

Status of waste collection systems in APT countries, as of end 2023

Population share in APT	Country	Waste collection	
		MSW	Non-MSW
<1%	Brunei Dar.	●	○
1%	Cambodia	●	●
12%	Indonesia	○	○
<1%	Lao PDR	●	●
2%	Malaysia	●	●
2%	Myanmar	○	○
5%	Philippines	○	○
<1%	Singapore	●	●
3%	Thailand	●	○
4%	Viet Nam	●	○
62%	China	●	●
5%	Japan	●	●
2%	Korea	●	●
Legend			
● System is advanced	> 90%	Advanced system; data available	
● System can be improved	70-90%	Developing system; data available	
○ System can be markedly improved	50-70%	System existent; data unavailable	
● System is in infancy or non-existent	< 50%	System lacks wide-scale formal coordination	

Note: Achieving high waste collection rates is paramount to reducing pollution, but by itself it does not guarantee environmentally sound waste management. Without adequate treatment or disposal infrastructure, collected waste may still be mismanaged (i.e. dumped, burned, or leaked into the environment).

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[10]).

The incomplete coverage of MSW and non-MSW collection represents a significant gap in the APT region. A broad and effective waste collection system is a foundational first step to preventing plastic leakage to the environment. Where waste is not collected (or when it is collected but there is no access to treatment options), it usually ends up in the environment through littering or dumping onto land or in waterways or may be open burned, contributing to air pollution (OECD, 2022^[1]).

There is a large untapped potential to strengthen *municipal solid waste (MSW) collection*. There is a wide disparity in MSW collection rates across APT countries. Only five (Malaysia, Singapore, China, Japan, Korea) out of the 13 APT countries currently have waste collection systems that serve more than 90% of the population, while Brunei, Thailand and Viet Nam have solid waste collection systems serving more than 70% of the population. On the other hand, waste collection in Indonesia, Myanmar and the Philippines can be markedly improved (current coverage of 50-70% of the population), while in Cambodia and Lao PDR more than half of the population is not covered by any system of solid waste collection.

Waste collection in rural and remote areas remains an important challenge in many APT countries. Establishing effective waste collection requires adapting to highly diverse local contexts, including population density across urban and rural areas, the heterogeneity of household, commercial and industrial waste streams, and the management of specialised waste such as hazardous and medical waste. The region's varied geographies present additional structural challenges: archipelagic countries like Indonesia and the Philippines need to manage collection across thousands of islands, often in areas with limited transport infrastructure, while remote, mountainous or flood-prone regions in the APT face challenges to year-round service provision. These physical constraints compound institutional and financial challenges and must be taken into account in policy design.

Similarly, *non-municipal solid waste (non-MSW) collection* can also be enhanced. Only Singapore, Japan and Korea operate comprehensive systems for non-MSW collection, while Malaysia and China are developing them. Other APT countries either lack wide-scale formal systems for non-MSW collection, or they have started to implement them but the data on their performance is not available. As non-MSW streams are often substantial in volume and can include hazardous or hard-to-recycle materials, their effective management is critical for reducing pollution and advancing circular economy goals.

2.5.3. Policies and infrastructure for waste treatment remain largely inadequate in many APT countries

This section details current performance in the APT for core areas of intervention to promote waste recycling as a disposal option, provide treatment options for non-recyclable waste (incineration and sanitary landfills), implement pollution prevention measures, as well as improve wastewater treatment. Table 2.6 compares the current waste treatment infrastructure and performance in the APT.

Table 2.6. Current waste infrastructure in APT is insufficient to curb leakage into the environment

End-of-life fates and waste treatment infrastructure status in APT countries, as of end 2023

Population share in APT	Country	Waste treatment infrastructure			
		Sanitary landfilling	Waste incineration	Plastics recycling	Wastewater collection and treatment
<1%	Brunei Dar.	●	●	●	●
1%	Cambodia	●	●	●	●
12%	Indonesia	●	●	○	○
<1%	Lao PDR	●	●	●	●
2%	Malaysia	●	●	○	○
2%	Myanmar	●	●	●	●
5%	Philippines	●	●	○	●
<1%	Singapore	●	●	●	●
3%	Thailand	○	○	○	●
4%	Viet Nam	●	●	○	●
62%	China	●	●	●	○
5%	Japan	●	●	●	●
2%	Korea	●	●	●	●
Legend					
● Advanced	> 90% of waste destined for final disposal goes to sanitary landfills	Broad, effective system	Effective system	> 90%	
● Can be improved	60-90%	Broad system	The system can shift to circularity	60-90%	
○ Can be markedly improved	30-60%	Potentially polluting system	The system lacks scale & coverage	30-60%	
● In infancy or non-existent	< 30%	The system is small or non-existent	System in infancy	< 30%	

Source: Authors' inventories; see more information in the technical document (OECD, 2025_[10]).

There are large opportunities to improve national policies and infrastructure to reduce levels of mismanaged waste. In most ASEAN countries, sanitary landfills remain the exception rather than the norm. Among the APT countries, only five currently have an advanced system where more than 90% of the country's waste destined for landfills is disposed of in sanitary landfills (Brunei, Singapore, China, Japan, Korea). Open dumps, residual containment units and controlled dumping are common alternatives in the region (OECD, 2025_[10]). Yet, sanitary landfilling is an important element of environmentally sound waste management, as it can mitigate pollution and soil or groundwater contamination, assuming appropriate maintenance (Box 2.2). In countries with currently high levels of waste mismanagement, such as due to disposal in dumpsites or burning in open pits, sanitary landfills can play an important role to safely dispose of plastic waste that cannot be recycled (OECD, 2022_[1]; Velis and Cook, 2021_[11]).

Box 2.2. Brunei now manages more than 90% of MSW in sanitary landfills

Brunei's municipal solid waste (MSW) management has evolved significantly over the past decade. While landfilling remains the primary disposal method, the country has made strides in modernising its infrastructure. Historically, Brunei's MSW was disposed of in sites lacking leachate treatment and gas collection systems, leading to environmental concerns such as the release of toxic gases (Shams, Guo and Juani, 2014^[12]) and potential soil and groundwater contamination. In response, the government commissioned the Sungai Paku Engineered Landfill in 2014, spanning 104-hectares. Today, this sanitary landfill facility receives more than 90% of the nation's MSW. However, the landfill is projected to reach its capacity by 2030, underscoring the need for new solutions and a shift to more circular approaches (Akenji et al., 2019^[13]). Brunei plans to build a waste-to-energy incineration facility and to make efforts to reduce per capita waste generation (VietnamPlus, 2023^[14]; Akenji et al., 2019^[13]).

Waste-to-energy (WtE) incineration may need to be considered to treat non-recoverable waste; however, waste-to-energy infrastructure remains largely in its infancy in all ASEAN countries except in Singapore. High capital and operating costs, the high-moisture content of MSW and limited private investment are cited as key obstacles (OECD, 2025^[10]). A considerable volume of plastic waste is still incinerated without energy recovery in the ASEAN, often in low-efficiency facilities (or through open burning), contributing to air pollution and GHG emissions without delivering energy benefits. In contrast, the Plus Three use WtE extensively. In Japan, close to 80% of MSW is incinerated, mostly with energy recovery. Korea also operates WtE plants integrated with district heating networks and employs advanced waste segregation policies to reserve incineration for non-recyclable fractions. China has seen rapid WtE expansions in recent years, particularly in urban centres to reduce dependence on landfilling, although there are concerns over generated GHG emissions and pollution (Liu et al., 2024^[15]).

Modern WtE plants with advanced air pollution control measures and appropriate siting away from the dense populations can help countries shrink landfill amounts and generate energy. However, such infrastructure must be introduced carefully to minimise environmental and health concerns and prevent lock-in effects in the long term. Cost-benefit analyses can prove useful to determine appropriate WtE investments in each local context, accounting for environmental, economic, social and health dimensions. Crucially, WtE development should proceed in parallel with waste reduction policies and the rollout of segregated waste collection for recyclables and organic waste, to ensure that WtE only focuses on non-recyclable waste with high calorific value.

In parallel, Refuse-Derived Fuel (RDF) is gaining ground in APT countries, as a flexible alternative to traditional incineration.³ RDF processes non-recyclable, high-calorific waste (including mixed plastics): it involves shredding, drying and pelletizing municipal solid waste so it can be co-fired in industrial boilers or cement kilns. The Asia-Pacific region is expected to dominate the RDF market due to rapid urbanization, increasing waste generation and government support (Data Insights Market, 2025^[16]). Within ASEAN, early-stage RDF projects are underway in countries like Thailand, Indonesia and the Philippines. This rapid adoption is driven by its lower capital intensity compared to full-scale WtE plants and compatibility with existing industrial facilities. However, there are important concerns that RDF streams rich in plastic waste may contain persistent organic pollutants or toxic additives, raising health and environmental concerns (International Pollutants Elimination Network, 2022^[17]).

The current landscape on recycling policies and performance in the APT region is heterogenous, with large discrepancies between countries with more advanced waste management systems (Japan, Korea) and most ASEAN countries. In APT countries with advanced plastic waste recycling, government-coordinated recycling systems form an integral part of waste management infrastructure. Through segregated collection, material recovery facilities, co-ordination and standardisation, and widespread recycling hubs

with sufficient capacity and innovative technologies, these countries can capture and recycle a substantial amount of plastic waste. This is reflected in the recycling rates for plastics achieved by Japan (14%), China (14%) and Thailand (13%) above the global average (10%). In most other APT countries, plastic recycling is growing but is severely hindered by challenges such as limited, small-scale infrastructure, lack of government coordination to maximise the recyclability of domestic plastic waste, as well as an important reliance of the informal waste sector.⁴

Overall, this review of the current policy landscape and infrastructure in the APT shows that waste management remains dominated by low-tech, environmentally damaging methods, highlighting the urgent need for investments in formal and safe infrastructure that can help to minimise the environmental footprint of residual waste streams. The establishment of effective legal frameworks and capacity to enforce policies to address waste mismanagement is also critical. Recycling systems and infrastructure remain under-developed in most APT countries; the next section reviews the current landscape relating to policies to promote recycling and demand for recycled plastics.

In addition to solid waste management, the development of wastewater collection and treatment infrastructure is also important to reduce pollution from a range of pollutants, including microplastics (see also Section 2.6). Uncollected and untreated wastewater, as well as stormwater and road runoff, are the main pathways to the environment for microplastics coming from road transport, paints or synthetic clothing (OECD, 2021^[18]). Nine out of thirteen APT countries do not have wastewater collection and treatment systems serving at least 60% of the population. In these countries, establishing systems for safe sanitation is a major human health and environmental priority, which can also indirectly help to close one pathway of plastic leakage to the environment. In APT countries at a more advanced level of development, there may be opportunities to prioritise the development of sewerage networks linked to wastewater treatment plants with modern treatment capabilities, or decentralised wastewater treatment systems to serve remote areas (see Box 2.3 for the case example of Japan's Johkasou), to help close one of the leakage pathways for microplastics and other micropollutants in the APT.

Box 2.3. Delivering wastewater treatment in non-sewered areas: Japan's Johkasou system

Johkasou is an advanced, decentralised wastewater treatment system designed to treat both black waters (human waste) and grey waters (domestic wastewater), enabling the safe discharge of treated wastewater into the environment. It plays a critical role in Japan's sanitation strategy for non-sewered areas, where extending centralised sewerage networks would be expensive and technically challenging to construct and maintain. A Johkasou system offers a cost-effective alternative, with lower per capita investment costs than public sewer systems (about USD 8,000 for the installation of a household system) (Japan Water Forum, 2021^[19]). In Japan, it is now mandatory to install a Johkasou system at new or under renovation construction outside of areas served by centralised sewerage systems (ADB, 2021^[20]). The national government and local municipalities provide subsidies to homeowners for the installation (covering 40% or up to 90% of the costs), while owners (households) are responsible for ongoing operation and maintenance (Government of Japan, n.d.^[21]). To ensure effectiveness and environmental compliance, annual inspections are required by law.

Source: (Endo and Koga, 2021^[22]).

2.5.4. Informal waste workers are prevalent in many ASEAN countries and China

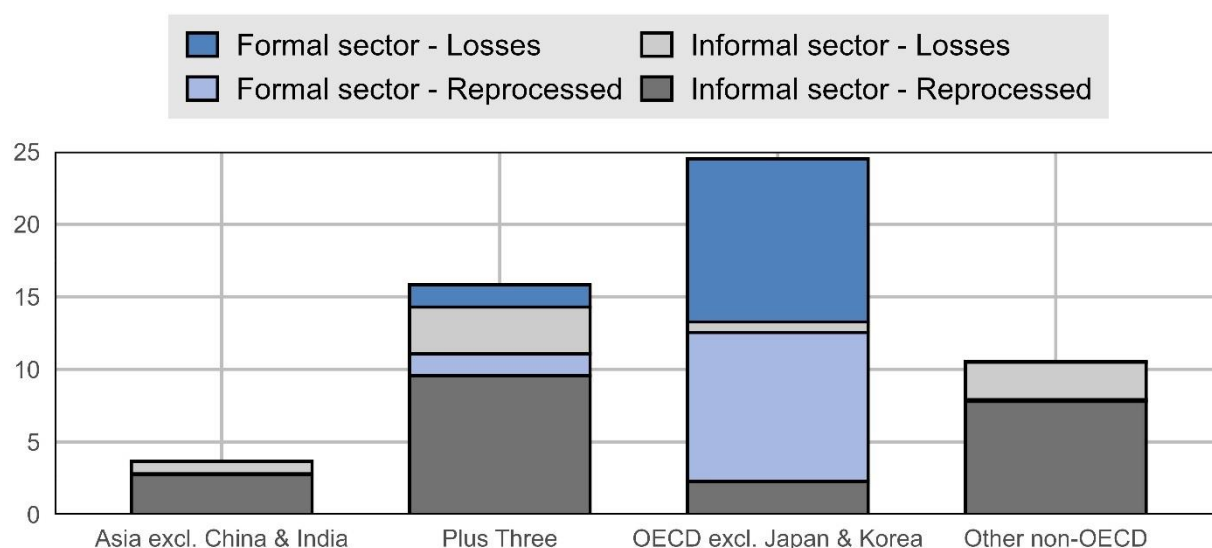
Informal recycling refers to waste recovery activities that are not supported or recognised by the public sector's waste management authorities. Activities range from waste collection and separation (i.e. "waste picking"), to more "downstream" recycling and processing. At least 15 million people worldwide work in the informal waste sector, collecting and recovering recyclable waste materials (Medina, 2008^[23]).

Informal waste workers play a central role in waste collection and recycling in many APT countries. Recycling plastics requires multiple steps, whose organisation varies across countries. While in most high-income countries there are extensive formal waste collection systems with capital-intensive processing for collected waste, this is not the case in many in lower- and middle-income countries, including in the APT region. Informal waste workers form the backbone of plastic waste collection and sorting, particularly for high-value materials such as PET. These workers operate outside government-supported waste management frameworks and typically perform labour-intensive activities such as collecting, separating and transporting recyclable materials.

Informal systems are prevalent across most APT countries, especially lower- and middle-income countries where economic incentives drive the recovery of valuable plastics. By targeting high-value waste directly at the point of disposal, informal workers can achieve low process losses. This is different to formal systems, that often collect contaminated or mixed waste streams that need to be removed (these are known as recycling losses). As such, despite limited resources, informal recyclers can make a significant contribution to plastic recovery rates: in informal waste systems, waste pickers selectively target high-value plastics at the point of collection, reducing the recycling losses later in the process. Figure 2.9 uses information from earlier studies to show amounts of plastic waste collected for recycling and recycling losses for various aggregated regions.

Figure 2.9. Formal and informal recycling volumes and losses differ across regions

Volume of plastic waste collected for recycling in Mt, 2019



Note: Data for individual APT countries is not available, nor an aggregate for ASEAN, which is included in "Asia excl. China & India".

Source: Adapted from OECD Global Plastics Outlook Database (OECD, 2022^[1]); (Cottom, Cook and Velis, 2020^[24]).

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The benefits of the activities of the informal waste sector are accompanied by substantial environmental, social and health concerns. Downstream operations such as the recycling and treatment of waste often use crude and unsafe processes. These may include burning products (such as e-waste) to recover valuable metals, unsafe handling of hazardous waste, and uncontrolled disposal of waste of low value. Such methods, such as discarding, dumping or burning, lead to emissions of toxic substances, environmental pollution, and elevated risks for workers and surrounding communities (see also Box 2.4).

Informal waste workers are also among the most vulnerable populations. Many come from marginalised or vulnerable groups, including migrants, women, the unemployed, children, and people with disabilities. Their work is often poorly paid, precarious and conducted in unsafe conditions, sometimes both working and living directly on dumpsites (Medina, 2008^[23]). Health impacts include exposure to hazardous emissions from open burning (Velis and Cook, 2021^[11]). The occupation is particularly socially precarious as workers are rarely covered by social protection or health insurance. Without legal recognition or social protection, informal workers are exposed to exploitation, lack access to healthcare or worker protections, and face frequent discrimination.

Integrating and professionalising the informal sector into formal waste management systems remains a major policy challenge for many APT countries. This is later discussed in chapter 7 of this Outlook.

Box 2.4. Mismanaged plastic waste generates substantial public health risks

The open burning of MSW, that contains plastics, is common in the APT and is a significant contributor to pollution and health impacts. This practice is particularly widespread in rural and remote areas lacking regular waste collection services and in countries where formal waste treatment infrastructure is limited or non-existent. The open burning of waste typically takes place at the source, near households or business venues, or at non-sanitary landfills, either intentionally or unintentionally. Households often resort to burning as a low-cost method to reduce waste volume or to generate heat, typically without awareness of the associated environmental or health risks (Velis and Cook, 2021^[11]; United Nations Environment Programme, 2024^[25]).

In 2019, an estimated 21% of global MSW, equivalent to 565 Mt, was openly burned, with the bulk of this occurring in the Global South, including across many APT countries (Wiedinmyer, Yokelson and Gullett, 2014^[26]). Mixed plastic waste is a significant contributor to harmful emissions during this process. The combustion of plastics releases a complex mixture of pollutants, including black carbon, a short-lived climate pollutant with high global warming potential. It also emits carbon dioxide, persistent organic pollutants such as polychlorinated dibenzodioxins and dibenzofurans, and heavy metals (Gullett et al., 2009^[27]; Wiedinmyer, Yokelson and Gullett, 2014^[26]).

These pollutants not only contribute to regional climate change and air quality degradation, but also present serious occupational and public health risks. Numerous studies have documented respiratory and cardiovascular impacts, as well as increased cancer risk, among populations exposed to burning sites (Velis and Cook, 2021^[11]; Wiedinmyer, Yokelson and Gullett, 2014^[26]). Vulnerable groups face the greatest risks, including women, children and informal waste workers. The emissions are carried cross-border through the atmosphere and marine channels. Open burning is also a gendered issue because, in many households, particularly in low-income and rural areas, women are primarily responsible for domestic waste management. This places them at disproportionate risk of long-term exposure to harmful emissions, compounding existing gender-based health and social vulnerabilities.

Despite the scale of the issue, public awareness around the risks of open burning remains low, and regulatory responses are inconsistent. Addressing these impacts will require an integrated approach that improves formal waste collection, strengthens environmental enforcement, and ensures inclusive, gender-sensitive public education on safe waste practices.

Sources: (Wiedinmyer, Yokelson and Gullett, 2014^[26]; OECD, 2022^[1]).

2.5.5. Trade in plastic waste is significant in some APT countries

The regulatory environments that govern markets for secondary plastics have undergone important transformations (OECD, 2022^[1]). Since 2013, China has imposed several drastic restrictions on imported plastic waste to increase quality, reduce leakage of plastic waste and promote the recycling of domestically collected waste.⁵ The “Green Fence” policy began in 2013 and banned imports of mixed plastic waste that contained more than 1.5% contamination with non-recyclables. Since 2017, the “National Sword” policy has tightened this restriction to 0.5% contamination (Wang et al., 2020^[28]; Brooks, Wang and Jambeck, 2018^[29]). As these new levels are challenging to meet, the policy effectively banned most waste imports in China, resulting in a decline from an estimated 11.2 Mt in 2012 to 0.35 Mt in 2020. These and subsequent import restrictions have shifted trade away from China to new markets, while simultaneously decreasing international plastic waste trade volumes and increasing the need for domestic recycling capacities. Between 2014 and 2020, the global share of plastic waste exported declined by an estimated 58%, from 15.5 Mt in 2014 to 6.5 Mt in 2020 (Brown, Laubinger and Börkey, 2025^[30]).

Modifications in international law, such as the amendments to the Basel Convention and the OECD Decision on Transboundary Movements of Waste, are expected to reinforce these trends and lead to further onshoring of waste plastic recycling in advanced economies. (Brown, Laubinger and Börkey, 2025^[30]) show evidence that while the introduction of additional controls on traded plastic waste and scrap seems to have contributed to reducing the trade volume, some OECD countries continue to export most of their plastic waste and scrap to non-OECD countries, particularly to several Southeast Asian countries. Malaysia was the largest export destination (0.6 Mt), and Viet Nam and Indonesia each received more than 0.2 Mt in 2023. These values however remain small compared to the overall domestic production of waste (and scrap for recycling).

These policy changes also affect several other countries importing plastic waste, including in the APT region. In response to the growing pressures from imported plastic waste on customs offices and domestic treatment, several emerging export destinations have set their own restrictions and bans. Viet Nam, Malaysia, and Thailand all implemented import restrictions over the course of 2018 as imports substantially rose from early 2017 to mid-2018, respectively by 203%, 440%, and even 1141%. This led to decreases in exports to these countries in the second half of 2018 (Wang et al., 2020^[28]). Exports to Malaysia and Viet Nam continued to rise again in 2019, representing an estimated overall increase of 500% and 221%, respectively, between 2016 and end of 2019.⁶

In 2022, the APT region imported about 890 kt of plastic waste (Table 2.7). The ASEAN net imports are even higher at 1,138 kt. For some countries plastic waste imports represent a significant share of total domestically held plastic waste. Within the APT region, this share is highest for Rest of ASEAN – HIC & UMIC, where imports equal 15% of the plastic waste generated domestically (777 kt vs 5.2 Mt).

Table 2.7. Plastic waste net imports are relatively modest compared to waste generation

Countries	Waste net imports in 2022 (kt)	Waste generation in 2022 (Mt)
Thailand	16.5	5.4
Rest of ASEAN – HIC & UMIC	777.2	5.2
Indonesia	176.0	6.5
Rest of ASEAN - LMIC	167.8	7.5
Japan	-842.1	9
Korea	144.0	3.8
China	450.2	76.1
ASEAN total	1137.5	24.5
Plus Three total	-247.9	88.9
APT total	889.6	113.4

Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Sources: See Chapter 1 for a detailed list of sources.

2.6. Plastic leakage to the environment is substantial

Plastic pollution is a pervasive issue, globally as in the APT. This Outlook focuses on the quantification of the leakage of macroplastics, i.e. recognisable items such as littered products and packaging, including from marine activities such as lost fishing gear. In 2022, plastic leakage to the environment in APT countries reached 8.4 Mt, equivalent to more than one-third of global, which is estimated at 22.1 Mt.

While not discussed in detail in this Regional Outlook, microplastic leakage is also an important part of plastic pollution, in the APT and globally. Microplastics are generally smaller than 5 mm in diameter (OECD, 2021^[18]). It is estimated that APT countries contribute to one-third of total microplastic leakage occurring annually (2.7 Mt in 2019). However, estimates of microplastic leakage remain imprecise due to data limitations. Important contributors are the fragmentation of larger plastics during use (e.g. from tyres and road transport, paint wear, the abrasion of shoe soles, losses from construction and demolition activities, textile abrasion, losses from artificial turfs, fishing nets and fishing gear), losses of primary plastic pellets during production or handling, and microbeads intentionally added to products. The size of the plastic items or particles can influence, among other elements, their transport in the environment, where they are deposited and their deposition rates.

Plastics have been accumulating in the aquatic environments since the start of mass industrial production of plastics in the 1950s. As of 2022, 65 Mt of plastics had accumulated in aquatic environments (48 Mt in river and lakes and 16 Mt in oceans) in the APT. The APT accounts for 38% of total leakage to rivers, lakes and oceans globally. Figure 2.10 summarises flows of plastics into and within aquatic environments.

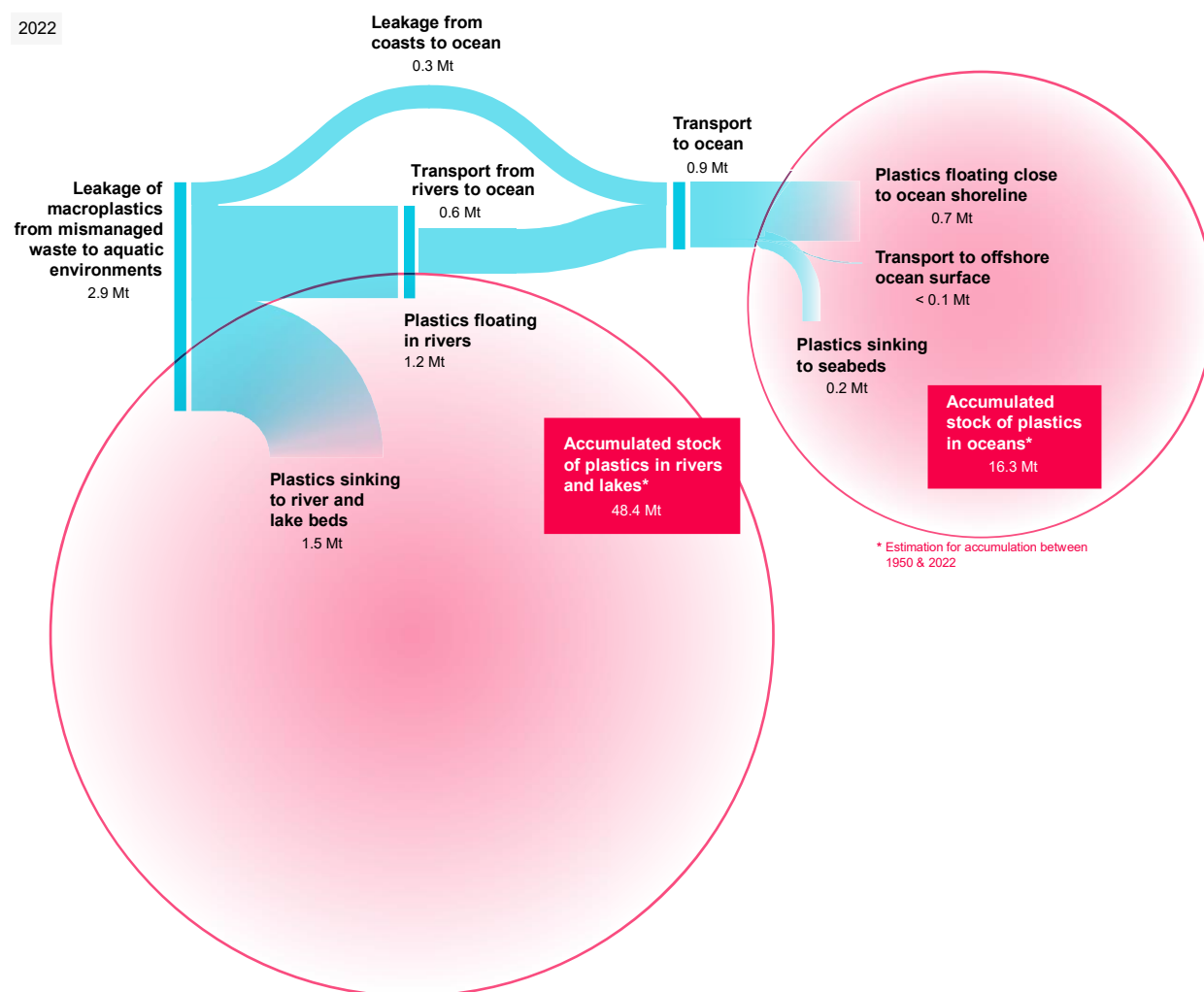
In APT countries, freshwaters are key pollution hotspots. Over 90% of plastics entering aquatic environments in the APT goes into rivers and lakes, and while direct inputs from marine coastal areas only account for 8% of total annual aquatic leakage. Nearly 50% of plastics entering rivers and lakes is denser than water and tends to sink rapidly, while the remainder floats (e.g. packaging with lightweight polymers, or heavier polymers in less dense plastic products that can trap air) and can drift downstream (43% of the total plastic leaked to aquatic environments).

At the same time, marine plastic pollution is a key issue in the APT, due to a combination of factors. Firstly, the region is rich in riverine systems, which are known as key conduits for plastics to reach marine environment, globally. Secondly, the region's dense populations, vast coastlines and frequent extreme weather events can accelerate the movements of mismanaged plastics from land and rivers to oceans. While only 8% of plastics entering aquatic environments in the APT arrive from the coast (compared to the global average of 5%), this figure reaches 14% when excluding China, Japan and Korea, emphasising a more pressing issue of coastal pollution and higher likelihood dispersal in marine environment in Southeast Asia specifically.

Marine plastic pollution threatens biodiversity and leads to economic damages, with significant long-term implications. The slow rate at which plastics move through rivers means that plastics that leak to rivers today will keep on flowing towards the ocean, even decades after the initial leakage. Moreover, part of the stock is slowly broken down to microplastics, which are more likely to be ingested by aquatic species and are more difficult to recover. Marine plastic debris threatens coastal ecosystems, fisheries and tourism in the APT, and poses transboundary challenges as plastics travel across borders. Coastlines in the APT border some of the richest ocean ecosystems in the world. The ASEAN is a biodiversity hotspot, home to 18% of the world's fauna and flora species, more than one-third of the world's total mangrove forests and about one-third of coral reefs surface areas (ASEAN Biodiversity Centre, n.d.^[31]; Blanton et al., 2024^[32]; Burke, Selig and Spalding, 2002^[33]). Plastic pollution, especially in the marine environment, harms the many communities and companies in the APT that rely on the ocean for livelihoods and production.

The economic impact of plastic pollution is already significant, including losses in sectors such as marine tourism, fisheries and aquaculture, as well as marine transportation and shipping. The ocean economy plays a crucial role in several APT countries' GDP, contributing as much as 28% in nations like Indonesia (Asian Development Bank, 2021^[34]; OECD, 2021^[35]). The damage caused by marine litter to marine economies in the Asia-Pacific region has increased eightfold since 2008 and reached USD 10.8 billion annually by 2015 (McIlgorm et al., 2022^[36]). The effects are particularly harsh on riverine and coastal ASEAN nations, which face a disproportionately high vulnerability to marine debris alongside limited capacity to adapt.

Figure 2.10. Flows of plastics in rivers, lakes and oceans pollute the aquatic environment in the APT region



Notes: Limited data and current understanding of flows makes it challenging to model the overall picture, so there are possibilities of imprecisions in the numbers presented.

Source: OECD Global Plastics Outlook Database, <https://doi.org/10.1787/c0821f81-en>.

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Notes

¹ PET, mainly used for packaging, will become waste rapidly after its initial use. By contrast, PVC is mainly used for applications with long lifetimes.

² The difference between both numbers are recycling losses, which are significant in all countries; this can be driven by e.g. poor quality of the waste that is offered for recycling, or by capacity constraints in recycling plants (OECD, 2022^[1]).

³ In this report, refuse-derived fuel is considered part of waste incineration.

⁴ Chapter 7 discusses options to scale up recycling as well as to formalise and professionalise informal waste workers.

⁵ As shown above, China remains a significant trader of plastics products.

⁶ Exports to Türkiye also increased significantly.

3

The landscape of current policies to tackle plastic pollution

This chapter reviews the current policy landscape related to plastics and plastic pollution in the 13 ASEAN Plus Three (APT) countries. It highlights the growing political commitment to the issue, with most APT countries having adopted or drafted national action plans. The chapter provides an overview of the scope and effectiveness of existing policies across the plastic lifecycle, highlighting the variety of advancements and opportunities for improvement across countries and income groups. The analysis underscores opportunities to strengthen institutional capacity and access to finance, to enhance policy effectiveness.

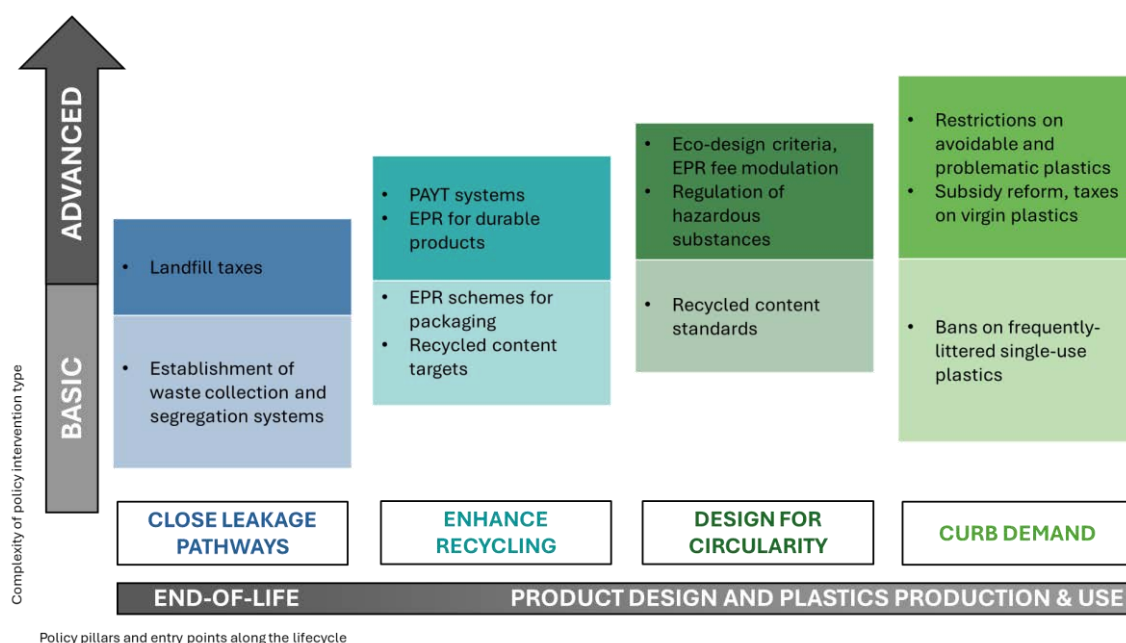
Key insights

- APT countries have acknowledged plastic pollution mitigation as a policy priority. National action plans or roadmaps are present in nine of the thirteen APT countries, and are under discussion in the remaining four. National frameworks outline envisioned policy measures and set quantitative targets, such as for reductions in marine litter or waste generation, and for improvements in recycling rates.
- In the APT, significant progress has been made to improve waste management and recycling, as well as to ban certain single use plastics. However, gaps remain in the coverage and enforcement of policies. There are also wide differences across countries in the region in the status of policies and infrastructure.
- Policies to enhance waste segregation at source and recycling vary widely in scope and depth across the region, but remain nascent in most ASEAN countries. Japan and Korea have well-established extended producer responsibility (EPR) schemes for several product groups and employ advanced instruments such as pay-as-you-throw schemes for household waste charges. Several ASEAN countries (Indonesia, Malaysia, Philippines, Singapore, Thailand and Viet Nam) are rolling out EPR schemes for packaging. Nine APT countries have adopted certification and labelling schemes for plastic products and packaging, including for the presence of recycled content.
- Indonesia, Malaysia, Philippines, Thailand, China, Japan and Korea employ or are starting to employ policy measures to promote circular plastic design, with a focus on design for recyclability and the use of recycled materials. Most APT countries have some form of regulation on hazardous substances. Yet, the promotion of design for longer lifespans, reuse and repair remains rare.
- Policy measures that curb (total or primary) plastics demand are diverse and vary in stringency across in the APT region. The most widespread measures are bans on single-use plastics and other reduction measures, sometimes introduced at the sub-national or municipal level. Incentives such as tax benefits are also being employed, mainly to incentivise businesses to produce or prefer plastic alternatives and secondary plastics.
- Policies such as bans and those against illegal waste dumping can be more strictly enforced. Across the APT, enforcement strength often mirrors institutional capacity: it is robust in countries like Japan, Korea and Singapore, but uneven or weak in many other APT countries. Major bottlenecks include barriers related to local government capacity, financing and multi-level governance.

3.1. Introduction

Previous OECD (2022^[1]; 2024^[2]) reports found that interventions across the plastic lifecycle are required to effectively mitigate plastic pollution. Figure 3.1 shows a high-level policy roadmap for countries to improve plastic circularity and end plastic pollution alongside selected commonly used policy measures, based on information collected for 50 countries (OECD, 2022^[1]). Establishing basic waste management system is often a primary intervention. Several countries have also introduced Extended Producer Responsibility (EPR) schemes for packaging, recycling targets and bans or mandatory charges on plastics particularly prone to polluting the environment (e.g. carrier bags, straws). More advanced measures are less common (especially in non-OECD countries), but include pay-as-you-throw systems for household waste charges, EPR schemes for durable products (e.g. electric and electronic equipment, batteries, textiles), interventions to promote eco-design for longer lifespans, and comprehensive regulation on hazardous substances and problematic plastics.

Figure 3.1. Paths to ending end plastic pollution: examples of policies employed by countries

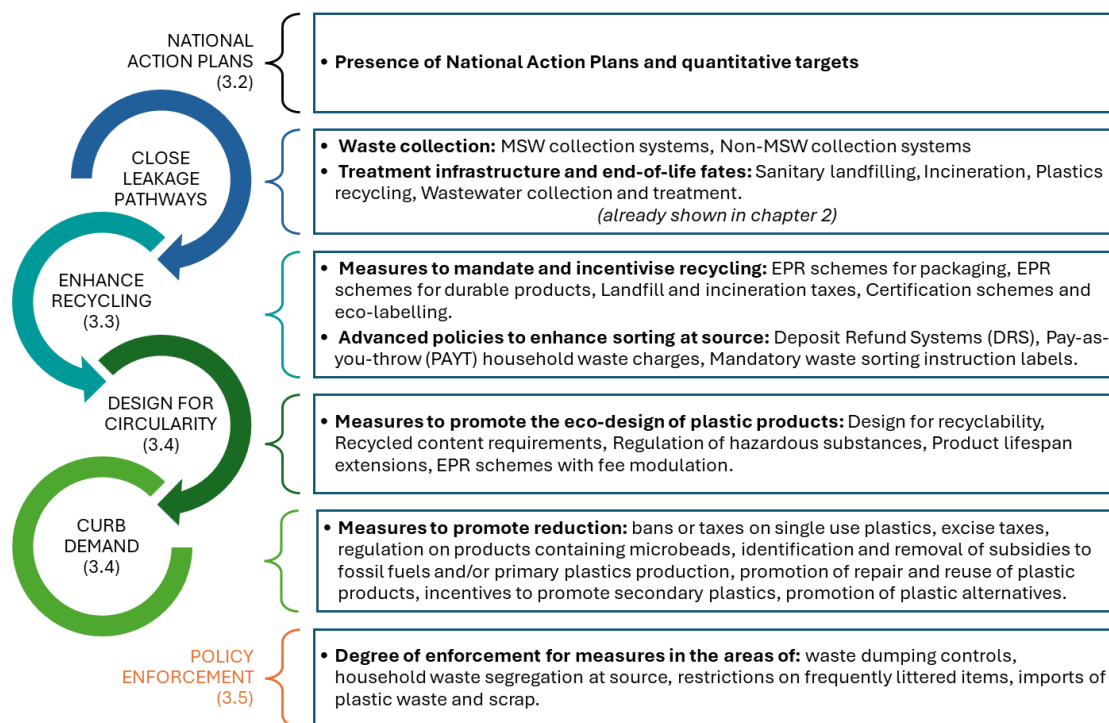


Notes: EPR = Extended Producer Responsibility, PAYT = pay-as-you-throw (systems for household waste charges).

The policy roadmap is informed by policies collected for 50 countries (covering 69% of the global population and 84% of global GDP).

Source: Adapted from the Global Plastics Outlook (OECD, 2022^[1]).

Figure 3.2. Overview of the policy landscape review



Source: Authors' own elaboration.

This chapter presents the review of existing policies across the lifecycle for the 13 APT countries. This is based on the policy inventory exercise developed for this Outlook (OECD, 2025^[3]). The chapter reviews the current overall policy ambition and framework (Section 3.2), current policies across the plastic lifecycle (Sections 3.3 and 3.4) and the strength of policy enforcement (Section 3.5), as summarised in Figure 3.2. Chapter 2 already provided an overview of the current state of waste collection and treatment across the APT, and highlighted the scale of gaps that still need to be bridged. While estimates and projections were produced for the seven modelled entities (countries or country groupings, see the methodology in Chapter 1), this chapter provides information at the national level, for each APT country.

Despite thorough research, given the differences in definitions, classification systems and data collection and availability across APT countries, gaps in the analysis are possible. The information presented in this review should be interpreted with care. Furthermore, the analysis was performed until the end of 2023, any changes after that in national policy frameworks were not considered.

3.2. Most APT countries have developed national plans to tackle plastic pollution

Most APT countries are pursuing objectives relating to waste management and prevention, that play an important role in mitigating plastic pollution. At the ASEAN regional level, for example, a framework for circular economy was adopted to achieve long-term goals of resilient economy, resource efficiency and sustainable and inclusive growth (ASEAN, 2021^[4]). At the APT level, fostering the development of circular economy action plans and tackling marine plastic debris feature as core items for co-operation (ASEAN Plus Three, 2022^[5]).

Nine out of thirteen APT countries have dedicated national action plans on waste management, waste prevention, plastic pollution or marine litter (Table 3.1). The remaining four are in the process of discussing or drafting action plans. All APT countries have set or are drafting targets relating to waste, as shown in Table 3.2 outlining selected national targets from national plans and roadmaps. These include targets to increase the coverage of waste collection, improve the recycling rate, improve access to waste treatment infrastructure and achieve the environmentally safe management of waste. In addition, several APT countries have national targets for reductions in waste generation.

Plastic pollution mitigation has become a policy priority in the APT, both at the regional and national level. The ten ASEAN member states signed the Bangkok Declaration on Combating Marine Debris in ASEAN Region in 2019, and in 2021, the organisation published the ASEAN Regional Action Plan for Combating Marine Debris in the ASEAN Member States (2021-2025) (ASEAN, 2019^[6]; ASEAN, 2019^[7]; ASEAN, 2021^[4]). The majority of APT countries are also part of the Osaka Blue Ocean Vision Implementation Framework for Actions on Marine Plastic Litter, which is in place at the G20 level (IGES, 2024^[8]).

Table 3.1. National action plans status in the APT countries

Country	Status of the national action plan	Reference document
Brunei	National Action Plan for combatting plastic pollution and marine debris (on-going)	Ongoing discussion
Cambodia	National Plastics Action Plan	Ongoing discussion
Indonesia	Indonesia's Plan of Action on Marine Plastic Debris 2017–2025	(The Government of the Republic of Indonesia, 2018 ^[9])
Lao PDR	National Plastic Action Plan	Ongoing discussion
Malaysia	Malaysia's roadmap towards zero -single-use-plastics	(MESTECC Malaysia, 2018 ^[10])
Myanmar	National Action Plan process	Ongoing discussion
Philippines	The National Plan of Action for the Prevention, Reduction and Management of Marine Litter	(DENR Philippines, 2021 ^[11])
Singapore	Singapore's National Action Strategy on Marine Litter	(Ministry of Sustainability and the Environment Singapore, 2022 ^[12])
Thailand	Thailand's Roadmap on Plastic Waste Management 2018–2030 Action Plan on Plastic Waste Management Phase II (2023–2027)	(PCD Thailand, 2023 ^[13])
Viet Nam	National Action Plan for management of marine plastic litter by 2030	(MoNRE Viet Nam, 2020 ^[14])
China	14th Five-Year Plan Action Plan for Plastic Pollution Control (2021–2025)	(The State Council The People's Republic of China, 2021 ^[15])
Japan	National Action Plan for Marine Plastic Litter (2019)	(Government of Japan, 2019 ^[16])
Korea	(Third) National Marine Litter Management Plan (2019–2023); (Third) River and Estuary Litter Management Plan (2021–2025)	(ERIA, 2021 ^[17])

Source: Authors' inventory.

National quantitative targets on plastic pollution are commonplace in the APT and reflect the heterogeneity across countries, as detailed in Table 3.2. Given the differences across these countries in their economic, political and legal systems (Korwatanasakul, 2020^[18]), urbanisation rates (ASEAN, 2022^[19]), waste composition, geography and development levels (United Nations Environment Programme, 2017^[20]), local contexts and priorities vary significantly.

Several APT countries have set plastic-specific targets, that focus on diverse entry points along the lifecycle. Improving plastic waste collection and reducing the risk of leakage to oceans or, more broadly, to the environment is a focus of targets in several APT countries (e.g. Indonesia, Malaysia, Philippines, Thailand, Viet Nam, China). Multiple policy documents include targets for the reduction of plastic waste generation (e.g. Indonesia) and for the phase out or reduction of single-use plastics (e.g. Indonesia, Viet Nam, Japan, Korea). For instance, Indonesia is targeting a 70% reduction of marine plastic debris by 2025 in accordance with its Plan of Action on Marine Plastic Debris 2018-2025 while Viet Nam has committed to eliminating single-use plastics from coastal tourism destinations and protected marine areas by 2030. The Philippines aims at closing plastic leakage pathways completely by 2040, while China aims at controlling plastic leakage to the environment by 2025 with no year-over-year growth. Improving plastic recycling and the use of recycled plastics in manufacturing is also a focus in selected action plans (e.g. Malaysia, Thailand, Viet Nam, Japan, Korea). For instance, Malaysia's Roadmap Towards Zero Single-Use Plastics 2018-2030 and the Plastics Sustainability Roadmap 2021-2030 aim for 100% recyclability of plastic packaging by 2030.

Targets relating to plastics and plastic waste generation also appear in EPR legislation. Japan and Korea have well-established EPR schemes for plastic packaging (and other products) that include mandatory recycling rates. EPR for plastic packaging is in the early stages of implementation in 5 ASEAN countries (Indonesia, Philippines, Singapore, Thailand, Viet Nam), including with selected related targets.¹

While targets vary in terms of focus across the lifecycle and level of stringency, they showcase the region's ambition towards sustainable and circular plastics use, improving waste management and increasing material recovery, set out in national and regional policy documents.

Table 3.2. Plastic waste management and reduction has become a policy priority in the APT

Overview of key national targets in APT countries, as of end 2023

Pop. Share in APT	Country	Plastic Waste Management & Reduction	Waste Management & Reduction	EPR for Packaging
<1%	Brunei	<i>The “National Action Plan to Combat Marine Debris” is under development.</i>	Reduce waste generation from 1.3-1.4 to 1 kg/capita/day by 2035. Increase the recycling rate to 30% by 2035.	Ø
1%	Cambodia	<i>The sub-decree on plastic management is under formal government discussion.</i>	Increase the waste collection coverage to 100% by 2025.	Ø
12%	Indonesia	Reduce leakage of plastic waste to the ocean by 70% by 2025 (compared to the 2018 level). Reduce plastic waste generation by 30% by 2025. Phase out 7 single-use plastic products by 2030.	Manage 100% of MSW by 2025. Reduce MSW generation by 30% in 2025 (compared to 2017 levels).	Reduce waste generated by producers by 30% compared to the 2029 projection. Replace targeted plastics under EPR with packaging composed of 100% recyclable materials and a minimum of 50% recycled content of recycled packaging or products by 2029.
<1%	Lao PDR	<i>The “National Plastics Policy Action Plan” is under development.</i>	Reduce MSW by 30% by 2030 compared to 2015 levels.	Ø
2%	Malaysia	Increase the collected-for-recycling rate to 40% by 2025 and 76% by 2030. Recycle 50% of plastic packaging by 2025 and 100% by 2030. Recycle 15% of post-consumer plastic packaging by 2023 and 25% by 2025. Phase out problematic single-use plastics by 2030.	Increase the household waste recycling rate to 40% by 2025. Increase the scheduled (hazardous) waste recycling rate to 35% by 2025. Increase the proportion of sanitary landfills among operational landfills to 80% by 2030.	Ø
2%	Myanmar	<i>The “National Plastic Action Plan” is under development.</i>	Collect 85% of MSW by 2025 and 100% by 2030. Manage 100% of waste in an environmentally-sound manner by 2030. Separately collect 35% of non-MSW by 2025 and 60% by 2030.	Ø

Pop. Share in APT	Country	Plastic Waste Management & Reduction	Waste Management & Reduction	EPR for Packaging
5%	Philippines	Eliminate plastic leakage to marine environments by 2040.	Ensure that 53% of local government units are served by material recovery facilities by 2028. Increase the proportion of municipalities served by sanitary landfill facilities to 50% by 2028. Each local government unit to divert at least 25% of solid waste away from disposal, through e.g. reuse or recycling, by 2028.	Recover 20% of 4 plastic packaging products by the end of 2023. This rate will increase annually, reaching 80% by the end of 2028.
<1%	Singapore	The "National Action Strategy on Marine Litter" (2022) highlighted ongoing efforts but did not include plastics-related targets. The waste leakage rate is low; targets may be issued later.	Reduce waste sent to landfill per capita per day by 20% by 2026 and 30% by 2030, compared to 2018 levels (360 grams). Attain a 70% overall recycling rate by 2030 (30% domestic and 81% non-domestic).	Implementation rules are planned for issuance in 2025.
3%	Thailand	Divert 5 plastic types from landfill to recycling system by 2027. Reduce plastic waste potentially leaking into the sea by 50% by 2027, compared to the current level (18 kt).	Properly manage 80% of MSW by 2027. Increase the reutilisation rate of recyclable waste to at least 40% by 2027. Reduce waste generation per capita by 10% by 2027, compared to the 2017 level.	A legal framework is in the drafting stage. A voluntary private sector initiative is currently in place.
4%	Viet Nam	Manage 85% of plastic waste by 2025 through reuse, recycling or treatment. Reduce marine plastic litter by 50% by 2025 and 75% by 2030. Phase out single-use plastics by 2030. Phase out products containing microplastics by 2030.	Collect and manage 80% of rural and 90% of urban MSW by 2025, and 90% and 95% of the respective streams by 2030. Collect and safely manage 100% of solid waste by 2050.	Collect 10-22% of plastic packaging (depending on the type). Target recovery rates are set for the first 3 years starting 2024, and will be revised every three years.
▲ ASEAN Countries ▼ 'Plus Three' Countries				
62%	China	Control plastic leakage to the environment, and achieve no year-over-year growth, by 2025. Remove legacy plastic litter from major tourist attractions, key water and rural areas by 2025.	Achieve recirculation of domestic waste by 60% by 2025 and 65% by 2030.	Ø

Pop. Share in APT	Country	Plastic Waste Management & Reduction	Waste Management & Reduction	EPR for Packaging
5%	Japan	Reduce single-use plastics by 25% by 2030 (compared to 2019 levels). Achieve a 60% recycling rate for plastic containers and packaging by 2030. Achieve effective reutilization ¹ of 100% of used plastics by 2035.	Ø	Japan does not have fixed overall recycling targets by packaging types, but it has a custom obligatory recycling rate for participating businesses, derived using a calculation.
2%	Korea	Reduce plastic waste generation by 20% by 2025 (compared to 2021 levels). Increase the mechanical recycling rate for municipal plastic waste from 18% in 2020 to 25% by 2025. Lower the municipal plastic waste 'waste-to-energy' recovery rate from 69% in 2020 to 55% in 2025. Phase out single-use plastics by 2027.	Ø	Producers are mandated to recycle a certain percentage of products and packaging placed on the market. In 2023, mandatory recycling targets for nine synthetic resin packaging products range from 39% to 87%, depending on the material type.

Notes: Additional targets relating to waste or plastics exist; only selected national targets are shown here.

In the rest of this Outlook, recycling rates are intended as the share of plastic waste that is effectively recycled at the end of life; however, it is possible that recycling rate targets mentioned in legislation refer to shares of plastic waste collected for recycling, rather than effectively recycled.

Greyed-out text is for legislation or action plans under discussion, at the time of writing. It is possible that countries have since published national plans, roadmaps or other policy documents with targets.

Ø stands for “no targets applicable”, either because the waste management system is advanced, or because the country does not yet have an EPR system at the time of writing.

MSW stands for municipal solid waste.

1. Japan's effective reutilisation rate includes recycling by mechanical and chemical methods, as well as waste-to-energy recovery. In 2021, the nation recovered 87% of its plastic waste (6.5 Mt): 62% via waste-to-energy recovery, 21% via mechanical recycling and 4% via chemical recycling (PWMI, 2022^[21]).

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3]).

3.3. There are large policy opportunities to promote segregated collection and recycling, and contribute to closing leakage pathways

Several APT countries are working towards establishing and improving broad, effective formal systems for waste collection. Chapter 2 provided an overview of the current state of waste collection and treatment across the APT, and highlighted the diversity and scale of gaps that need to be bridged across the region. As discussed in Section 3.2, most APT countries have adopted waste management strategies and plastic pollution action plans, including targets for waste collection, recycling and marine litter reduction.

Beyond achieving basic waste collection and environmentally safe treatment, countries can aim to improve segregated waste collection and increase plastic recycling rates via targeted policy measures such as policies to incentivise households to sort at source and waste operators to favour recycling, as well as policies to create demand for recycled plastics. EPR schemes, landfill and incineration taxes, recycling targets (often implemented via EPR), certifications and labelling schemes, or recycled content mandates, can help to make recycling mandatory or the more economically attractive option for waste handlers or to promote recycled content in product manufacturing.

Overall, policies to promote waste sorting at source and recycling of plastic waste remain in the early implementation stages in most APT countries. The following sub-sections summarise the current policy framework, focusing on:

- Measures to mandate and incentivise recycling: EPR schemes for plastic packaging, EPR schemes for durable products, landfill and incineration taxes, and national eco-labelling schemes (Section 3.3.1) and
- Other measures to enhance sorting at source, including some that are considered more advanced and generally present only in more mature waste management systems: deposit refund systems (DRS), pay-as-you-throw (PAYT) household waste charges and mandatory waste sorting instruction labels on products (Section 3.3.2).

3.3.1. Measures to mandate and incentivise recycling are emerging

The review of the policy landscape reveals that the APT region has started implementing various measures to boost recycling in the region (Table 3.3).

EPR schemes for plastic packaging are gradually being deployed across the APT region to help countries scale up recycling. By assigning the responsibility for the end-of-life management of products or packaging to producers, EPR systems can boost collection and recycling in the region. Japan and Korea have well-established EPR schemes for plastic packaging. Four ASEAN countries (Indonesia, Philippines, Singapore, Viet Nam) are in the early stages of implementation of plastic packaging EPR schemes, while one is discussing its introduction (Thailand)². Effective EPR requires clear legal frameworks, well-functioning producer responsibility organizations (PROs), reliable data and reporting systems, and strong government oversight. In emerging economies, success also depends on capacity building, stakeholder engagement, and ensuring financial sustainability (OECD, 2024^[22]).

The use of economic instruments such as landfill taxes (and incineration taxes) could help steer away plastic waste from landfilling (and incineration) and to encourage the shift to recycling in APT. Usually, landfill costs, constituted of gate fees plus any landfill taxes, remain low and insufficient to serve as a compelling incentive to divert waste from landfills or incineration facilities nationally. Taking Cambodia as an example, the absence of landfill taxes presents a missed opportunity to internalise environmental externalities of landfilling and influence the behaviour of waste handlers, but also to generate valuable revenue that could be used to upgrade and maintain waste management infrastructure (Perrin et al., 2018^[23]; UNDP, 2021^[24]). In Thailand too, the landfill gate fees remain low, thus discouraging investments

in energy recovery and recycling (World Bank Group, 2021^[25]). The introduction or reform of landfill (and incineration) taxes could help to strengthen price signals for economic actors in favour of recycling, provided that it goes hand-in-hand with the necessary improvements in segregated waste collection and recycling infrastructure.

Nine APT countries (Indonesia, Malaysia, Philippines, Singapore, Thailand, Viet Nam, China, Japan and Korea) have eco-labelling schemes for plastic products and packaging currently in place. These aim at promoting sustainable production and consumption, supporting market recognition of environmentally friendly products and compliance with policy measures with material or product requirements (e.g. recycled content requirements) and providing information to consumers. Most of these schemes are national and government-regulated. For plastic products and packaging, schemes often set technical standards for the presence of recycled content, the ease of recyclability, the use of compostable materials, the adoption of resource-efficient production processes and a manufacturing free of hazardous substances. In most of these countries, certification and eco-labelling schemes support compliance with environmental criteria in green public procurement. However, these schemes are usually not harmonised across countries in the region.

Table 3.3. Incentives for recycling can be significantly strengthened

Status of selected policies to enhance recycling in APT countries, as of end 2023

Population share in APT	Country	EPR schemes for plastic packaging	EPR schemes for durable products	Landfill and incineration taxes	Certification schemes and eco-labelling
<1%	Brunei Dar.	●	●	●	●
1%	Cambodia	●	●	○	●
12%	Indonesia	●	●	●	●
<1%	Lao PDR	●	●	○	●
2%	Malaysia	●	●	○	●
2%	Myanmar	●	●	N/A	●
5%	Philippines	●	●	○	●
<1%	Singapore	●	●	●	●
3%	Thailand	●	●	○	●
4%	Viet Nam	● (2024)	● (2024)	●	●
62%	China	●	●	●	●
5%	Japan	●	●	●	●
2%	Korea	●	●	●	●

Legend

- : A national policy or program (NPP) is currently in place
- : A NPP is in the early stages of implementation
- : A NPP is under formal government debate or drafting
- : An ineffective policy is in place
- : A NPP does not exist; may be stated in a national action plan

Note: 1: While not captured in this review exercise as of end 2023, Malaysia's EPR system for plastic packaging is also under development and planned for implementation at the time of writing. China has started promoting EPR in 2016 and aims to implement EPR schemes, particularly focusing on packaging.

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3]).

3.3.2. Advanced policies to enhance sorting at source remain largely untapped

The use of more advanced policies to enhance sorting at source examined in this review, i.e. PAYT household waste fees, deposit refund systems and mandatory waste sorting instruction labels, remains largely untapped in most APT countries (Table 3.4).

Among APT countries, only Korea has a DRS in place, but this is planned for implementation in Singapore. A DRS requires consumers to pay a deposit on the item at the point of sale, which is refunded when the packaging is returned. As such, a DRS provides consumers with an economic incentive to return a product or product packaging in a high-quality condition to appropriate collection points. The introduction of DRS could be considered to improve the quantity and quality of collected recyclables such as plastic beverage containers, either for recycling or reuse. DRS are employed in several OECD and non-OECD countries to ensure high collection rates and the quality of specific end-of-life products, currently mostly for beverage packaging (Laubinger et al., 2022^[26]).

Korea implemented a nation-wide DRS applying to four packaging materials (including plastic packaging) in 1992, which was abolished due to low effectiveness in driving recycling and replaced with a mandatory EPR framework in 2002 (Government of Korea, 2017^[27]; ERIA, 2022^[28]). Traditional DRS remains active for refillable glass bottles (e.g. alcoholic and soft drinks) with high return rates, but not plastic ones, even though collection rates remain high. Additionally, Korea introduced since 2022 a deposit programme for disposable (plastic) cups, that is being piloted in Sejong and Jeju for large franchise outlets with KRW 300 deposits (Ministry of Environment Korea, 2022^[29]). Korea also announced in 2022 DRS for fishing gear that is being implemented. In this system, fishermen pay a deposit when purchasing gear and receive a refund upon return of used equipment, incentivizing recovery of abandoned, lost or discarded fishing gear and its safe disposal (G20MPL, 2024^[30]).

PAYT is generally considered an advanced policy measure that bears significant upfront implementation costs and that requires an effective policy mix, citizen information campaigns and strong enforcement mechanisms to ensure effectiveness. PAYT systems are a scheme for household waste charges where fees are modulated according to the amount of residual waste generated, with the purpose of incentivising households to enhance separate waste collection and reduce the generation of mixed waste. The introduction of legislative frameworks for PAYT systems at the national level and the formulation of support for municipalities can enable the gradual implementation of PAYT, possibly starting from metropolitan areas with already effective systems in place for segregated waste collection. PAYT systems could enable a better implementation of the polluter pays principle, generate significant incentives to improve sorting at source for higher recycling, and ultimately also reduce local waste management costs (OECD, 2024^[31]).

Four APT countries have PAYT legislation in place (Thailand, Japan, Korea) or in the early implementation stage (Viet Nam). Korea was the first country to adopt a nation-wide PAYT system in 1995, in the form of a volume-based scheme with pre-paid bags for residual waste and charges for the collection of bulky waste (Box 3.1) The scheme has contributed to an increase in packaging collected for recycling from 15% to 50% in the 1994-2004 period, a rate that later increased to 73% (OECD, 2006^[32]; Lee, 2024^[33]).

Table 3.4. ASEAN countries do not yet employ more advanced policies for better sorting at source

Status of selected policies to enhance recycling in APT countries, as of end 2023

Population share in APT	Country	Deposit refund systems	Pay-as-You-Throw household waste charges	Mandatory waste sorting instruction labels
<1%	Brunei Dar.	●	●	N/A
1%	Cambodia	●	●	N/A
12%	Indonesia	●	●	●
<1%	Lao PDR	N/A	N/A	N/A
2%	Malaysia	●	●	●
2%	Myanmar	N/A	N/A	N/A
5%	Philippines	●	●	●
<1%	Singapore	● (2025)	● ¹	●
3%	Thailand	●	●	● ²
4%	Viet Nam	N/A	● (2025)	N/A
62%	China	●	●	●
5%	Japan	●	●	●
2%	Korea	● ³	●	●

Legend

- A national policy or programme (NPP) is currently in place
- An NPP is in the early stages of implementation
- An NPP is under formal government debate or drafting
- An NPP does not exist, it may be stated in a national action plan

Notes:

1. Singapore only charges volume-based fees to enterprises, not households (NEA Singapore, 2021^[34]).
 2. A national policy mandating all recyclable plastic products or packaging to carry a recycling mark is planned in Thailand, with regulations expected to be developed in 2023 and the national standard adoption promulgation in 2024 (PCD Thailand, 2023^[13]).
 3. In Korea, a long-standing deposit refund system was abolished and integrated into Extended Producer Responsibility schemes in 2002 for certain packaging types (Government of Korea, 2017^[27]; ERIA, 2022^[28]). Korea introduced in 2022 a DRS for disposable (plastic) cups, being piloted in Sejong and Jeju. The country also has a deposit refund system for fishing gear in place since 2025.
- Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3]).

Regulation on mandatory waste sorting instruction labels was identified in four APT countries (Indonesia, China, Japan and Korea). For instance, Indonesia's legislation on this matter supports progress towards its waste sorting and recycling objectives set out in its EPR program. Current regulation mandates that all plastic food packaging must display a food-grade logo and a recycling code specifying the type of raw plastic material used (e.g. 01 PET, 02 PE-HD, 03 PVC) and indicating whether it is recyclable (Mol Indonesia, 2010^[35]).³

Box 3.1. Advanced policy measures can ensure high waste collection and segregation

Pay-as-you throw systems in Korea

Since 1995, Korea has implemented a PAYT system for municipal solid waste, to incentivise waste segregation at source. Households and businesses must pre-purchase government-collection scheme colour-coded garbage bags for residual waste. Recyclables are collected in separate bins, without additional charges. Depending on the population density, waste is collected via dedicated collection points or curbside pickup. Bulky items are disposed of separately. Municipalities enforce compliance through strict fines for improper disposal, and the system also encourages community monitoring, where residents can report violations (Belcher, 2022^[36]).

This policy has been credited with a significant decrease in per capita solid waste generation (from 1.3 kg/day in 1994 to 0.97 kg/day in 2015), and the achievement of high rates of waste collected for recycling (above 80%) (SEA circular project, 2020^[37]). However, the system faced a notable challenge in 2018 when a decline in the value of recyclable materials, coupled with China's ban on waste imports, led to a temporary crisis where recycling companies halted collection, resulting in waste accumulation in urban areas (Ko et al., 2020^[38]).

While businesses bear the total cost of business-generated waste, for household waste the cost is shared between waste generators, local and regional governments, central government, and producers under the EPR scheme. Households either fully or partially pay the waste collection costs. The regional or central government supplement up to half of the capital costs of waste treatment facilities owned by local governments. Producers under the EPR are responsible for all expenses related to the disposal and recycling of their mandated waste. Local governments bear the rest of the costs (World Bank Group, 2022^[39]).

Licensing and data reporting requirements for industrial waste in Singapore

In Singapore, only licensed General Waste Collectors are authorised to collect waste from commercial and industrial premises. To obtain and renew annual licences, they must comply with stringent reporting requirements set by the National Environmental Agency. General Waste Collectors are required to submit detailed data on their waste collection and disposal activities, including information such as collection frequencies, waste origin, types and weight per collection, disposal locations.

These reports are typically submitted quarterly through the Waste and Recycling Data Submission Services under the Waste & Resource Management System. Failure to comply with these reporting obligations can result in penalties, including fines and license revocation (NEA Singapore, 2020^[40]).

3.4. Reduction and eco-design measures vary in use across the APT region, but remain largely underutilised overall

Upstream and midstream measures are critical to slow down plastics demand, reduce waste generation and mitigate plastic pollution. They act via two main channels: i) limiting the demand for (primary) plastics and ii) improving the environmental-friendly design of plastic products and packaging. A mix of steering policies, e.g. legislation, infrastructure improvements and economic instruments, and of enabling policies, e.g. investments in technology, data and communication, or voluntary commitments, are being pursued to accomplish advanced plastics circularity goals. Among the policies examined, instruments such as bans, tax incentives, technological investments and voluntary standards are popular. The intensity and choice of these measures vary widely across APT countries.

The following sub-sections summarise the current policy framework relating to upstream and midstream measures for plastic pollution mitigation in APT countries, focusing on:

- Measures to improve design for circularity, including design for recyclability, recycled content requirements, regulation of hazardous substances, product lifespan extensions, EPR schemes with fee modulation (Section 3.4.1);
- Measures to curb plastics demand, including bans or taxes on single use plastics, excise taxes, regulation on cosmetic products containing microbeads, identification and removal of subsidies to fossil fuels and/or primary plastic production, promotion of repair and reuse of plastic products, incentives to promote secondary plastics, promotion of plastic alternatives (Section 3.4.2).

Opportunities to improve the policy framework to curb demand and promote eco-design are further explored in Chapter 7 of this Outlook.

3.4.1. Stronger policies can be adopted to promote design for circularity

Given the policy landscape for recycled content incorporation and design for recyclability, further policy in the APT can pave the way for a more circular lifecycle of plastics. Table 3.5 shows the region's policies and efforts towards improving the eco-design of plastics and plastic products.

Three APT countries have started introducing policies to mandate or incentivise design for recyclability and recycled content in products. In Indonesia, the EPR implementation policy mandates that by 2030, industrial producers are to replace seven types of single-use plastics (SUPs) with products and packaging made from 100% recyclable materials and composed of a minimum of 50% recycled content of recycled packaging or products. The enforcement mechanism exists in the form that those SUPs will be banned from use in 2030, and non-compliant producers can be sanctioned (MoEF Indonesia, 2020^[41]). In addition, there is a range of enabling policies already in place, such as technical standards and certification schemes for recyclability and recycled content (see certification schemes and eco-labelling in Section 3.3.1). Most APT countries rely on manufacturers' voluntary adoption of green standards to enhance the design of new plastic products. One additional example of enabling interventions is the lifting of bans on the use of recycled materials for food-contact applications provided health and safety standards are met.

Regulation of hazardous substances in plastics is present in at least nine out of 13 APT countries. These regulations vary in scope and strength but generally aim to align with international efforts to reduce the presence of harmful chemicals in consumer products and packaging. Commonly regulated substances include some phthalates (often found in flexible plastic products like toys and food packaging), bisphenol A (limited in many jurisdictions, particularly in products for children), heavy metals and brominated flame retardants. However, many other substances used in plastics remain less consistently regulated, particularly for newer or less understood substances as well as intentionally added microplastics (the latter is also discussed in the next section).

Measures to promote product design for longer lifespans, repair or repairability, as well as more advanced measures such as EPR schemes with fees modulated on product design criteria, remain largely underutilised in the APT region. Only Korea uses EPR with fee modulation to enhance plastic recycling: the higher the recyclability rating of a product, the less the fee for a producer for disposal of that product – up to 50% less. This incentivises the import, production and use of recyclable plastic-containing products.

Table 3.5. The promotion of recycled content and recyclability is emerging in the APT, but there are large opportunities for higher circularity in the plastic lifecycle

Status of selected policies to promote design for circularity in APT countries, as of end 2023

Pop. share in APT	Country	Design for recyclability	Recycled content requirements	Regulation of hazardous substances	Product lifespan extensions	EPR schemes with fee modulation
<1%	Brunei Dar.	●	●	●	●	●
1%	Cambodia	●	●	N/A	●	●
12%	Indonesia	●	●	●	N/A	●
<1%	Lao PDR	●	●	N/A	●	●
2%	Malaysia	●	●	●	●	●
2%	Myanmar	●	●	N/A	●	●
5%	Philippines	●	●	●	●	●
<1%	Singapore	●	●	●	●	●
3%	Thailand	●	●	●	●	●
4%	Viet Nam	●	●	●	●	●
62%	China	●	●	●	●	●
5%	Japan	●	●	●	●	●
2%	Korea	●	●	●	●	●

Legend

- One or more national policies or programmes (NPPs) are in place
- Voluntary or enabling NPPs are in place
- A steering policy is planned
- No NPP currently exist

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3]).

3.4.2. Bans on single-use plastics and fiscal incentives are emerging

APT countries are pursuing policies relevant to their local context to curb plastics demand, but there are commonalities. Table 3.6 compares the countries' measures towards this goal.

Table 3.6. The choice of reduction policies varies across APT countries

Status of selected policies to curb (primary) plastics demand in APT countries, as of end 2023

Pop. share in APT	Country	Bans on single-use plastics	Excise taxes	Regulation on microplastics in products	Removal of plastics- or fossil-fuel subsidies	Promotion of repair and reuse	Promotion of secondary plastics	Promotion of plastic alternatives
<1%	Brunei Dar.	N/A	● ¹	●	IND	N/A	●	●
1%	Cambodia	●	●	N/A	NS	●	●	●
12%	Indonesia	PH (2030)	●	N/A	Dol	N/A	●	●
<1%	Lao PDR	●	●	N/A	NS	●	●	●
2%	Malaysia	PH (2030)	●	●	IND	●	●	●
2%	Myanmar	●	●	N/A	NS	●	●	●
5%	Philippines	●	●	●	IND	N/A	●	●
<1%	Singapore	●	●	●	NS	●	●	●
3%	Thailand	NSE ²	●	●	IND	●	●	●
4%	Viet Nam	PH (2030)	●	P (2030)	IND	●	●	N/A
62%	China	REDUCT	N/A	●	Dol	●	●	●
5%	Japan	REDUCT	N/A	●	Dol	●	●	●
2%	Korea	PH (2027)	●	●	Dol	●	●	●

Legend

●: One or more national policies or programmes (NPP) are in place
 ●: NPP(s) in place are enabling policies only, not steering
 ●: NPP(s) is in the early stages of implementation
 ●: NPP(s) is under formal government debate or drafting
 ●: NPP does not exist

P/P/H (YEAR): A (P)haseout is (P)lanned, effective (YEAR)
 REDUCT: The country has a SUPs reduction plan instead.
 NS: No subsidies identified
 NSE: Not strictly enforced
 IND: Subsidies indirectly benefit domestic primary plastics production/demand
 Dol: Subsidies directly or indirectly benefit primary plastics production/demand

Notes:

1. Brunei Darussalam's \$5/kg excise duty applies to raw plastic materials covered under HS codes 39.01 to 39.14 and select plastic products under HS code 39.23. This excise duty has however been temporarily suspended (Global Plastics Policy Centre, 2024^[42]).

2. Enforcement of bans remains an issue, for instance in the case Thailand's ban on four SUPs.

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3]).

Eight APT countries have, have had, or are considering measures to curb plastics use, varying from planned reductions and phase-outs to a ban in place. Thailand has a ban on four types of single-use plastics in place, however there are enforcement gaps (Bangkok Post Editorial, 2022^[43]). Viet Nam aims to entirely prohibit the production and import of single-use plastics and non-biodegradable plastic packaging by 2030 (Government of Viet Nam, 2022^[44]). As listed in Table 3.2, Japan aims at achieving a cumulative 25% reduction in single-use plastics by 2030 with respect to the 2019 value (MoE Japan, 2019^[45]). Brunei Darussalam employed a 5% excise duty on plastic items, including products in all primary forms, plastic bags and disposal food containers, to reduce plastic waste and pollution; however, the policy was temporarily suspended in 2023 due to insufficient evidence of effectiveness (Global Plastics Policy Centre, 2024^[46]).

Some APT countries offer incentives measures to promote plastic substitutes and recycled plastics, mainly in the form of tax benefits. For example, Cambodia has a tax exemption in place for businesses importing

or producing biodegradable or bio-based plastic bags and a tax incentive in place for SMEs producing recycled or bio-based plastic goods for the first 3-5 years of their operations (Seavmey, 2023^[47]; Akenji et al., 2019^[48]). Malaysia's Investment Development Authority provides "Pioneer Status or Investment Tax Allowance", a tax incentive, to businesses recycling wastes generated locally in Malaysia through high-value-added activities and green technology use (EPU Malaysia, 2021^[49]). Thailand is providing duty exemption to businesses importing raw materials and machinery for producing eco-friendly polymers and products made from those polymers (PCD Thailand, 2023^[13]).

Some APT governments are also promoting technological innovations to move away from virgin plastics. For example, Korea is investing in bioplastics technologies and has patents for production (MoTIE RoK, 2022^[50]), Japan is investing in new resin development among other initiatives (Government of Japan, 2021^[51]), and Thailand is researching compostable plastics made of polylactic acid (PCD Thailand, 2023^[13]).

The rest of the reduction policies are not widespread in APT. Policies to promote repair and reuse remain rare in the APT region. Three countries (Thailand, China, Korea) have planned bans on microbeads in cosmetic products, to mitigate pollution from microplastics intentionally added to products. None of the APT countries with direct or indirect subsidies for virgin plastic manufacturers mentioned considering removing them in their national plastics action plans.

3.5. Weak enforcement hinders policy effectiveness in closing leakage pathways

Policy enforcement and effective implementation are key concerns. This section provides an overview of the current status of enforcement of policies for plastic pollution mitigation, by examining the presence and enforcement of four measures critical to closing leakage pathways: regulation to end anti-waste dumping, measures for household waste segregation at source, bans or taxes on frequently littered plastic items, and controls on imports of plastic waste and scrap. These four policy measures are explained in Table 3.7.

Table 3.7. Examined policy intervention areas critical to closing leakage pathways

Policy	General Aim
Regulation and controls on waste dumping and littering	Reduce littering, burying, burning, dumping, or discharging of waste on land or in waterways via the use of penalties for the offenders, such as fines and imprisonment for citizens, businesses and waste operators.
Measures for household waste sorting at source	Mandate and improve sorting at source of recyclables, mixed (wet/dry), hazardous and other waste stream. Improving sorting at source is critical to move towards higher recycling and material recovery at the end-of-life.
Bans or taxes on frequently littered items	Reduce the circulation and leakage to the environment of frequently littered (plastic) items by targeting their import, production and consumption, e.g. through bans or taxes.
Plastic waste and scrap import regulations	Control the import of plastic waste and scrap, e.g. via bans or via quality requirements to prevent harmful effects locally and to ensure imported waste supports the recycling sector's needs.

Source: Authors' inventories in (OECD, 2025^[3])

While many APT countries have introduced policies to tackle plastic pollution, such as bans and controls, their enforcement varies significantly. Weak policy enforcement is a common issue in the ASEAN, particularly in LMIC. In China too, despite robust national policies, enforcement at the local level faces several hurdles, including due to issues such as insufficient professional knowledge among implementers, lack of public awareness and overlapping responsibilities among government departments (Ren and Zuo, 2024^[52]). Table 3.8 provides a review of the current state of policy enforcement in APT for four selected measures. Singapore, Japan and Korea show relatively strong enforcement across multiple dimensions,

with clear bans and controls (as well as functioning EPR schemes) in place. On the other hand, several ASEAN countries have policies in place but show gaps in enforcement (often marked as NSE, Not Sufficiently Enforced). This reflects challenges such as limited capacity, lack of monitoring systems or weak regulatory compliance.

For instance, in Lao PDR, plastic waste import is permitted under the conditions that it is clean, classified as non-hazardous, at least 80% recyclable as a product, and in the form of plastic sheets, bars or bags (MoE Japan, 2022^[53]). However, given the insufficient resources to effectively enforce waste quality laws at the border (JICA, 2021^[54]), after the implementation of the plastic waste import ban in China, exports to Lao PDR have surged, from 7,8 kt in 2018 to 100 kt in 2019 alone. The unknown quality of this waste is a key concern, as are the possible environmental and health risks resulting from processing or mismanagement. In response, the government suspended the creation of new recycling plants in the country. The import of this waste into Lao PDR is however still projected to grow (World Bank, 2022^[55]). Such enforcement challenges limit the region's ability to move towards circularity for plastics.

The information presented in the table underscores the need for strengthened institutional capacity, clearer mandates for enforcement bodies and public accountability mechanisms to ensure that existing policies translate into real reductions in plastic pollution. Policy coherence across ministries and improved monitoring frameworks will be essential to support long-term implementation.

Table 3.8. Existing policies are not sufficiently enforced in many APT countries

Status of selected national policies, as of end 2023

Pop. share in APT	Country	Measures against waste dumping (both land and waterways)	Household waste segregation-at- source	Ban or tax on frequently littered items (e.g. plastic bags)	Import restrictions	
					Plastic waste	Plastic scrap
<1%	Brunei Dar.	YES	NO	YES ¹	BAN ²	
1%	Cambodia	NSE	NSE	NSE	BAN	CONTROL
12%	Indonesia	NSE	NSE	PH (2030)	CONTROL	
<1%	Lao PDR	NSE	NSE	NO	CONTROL (NSE)	
2%	Malaysia	NSE	NSE	PH (2025)	CONTROL	
2%	Myanmar	NSE	NO	NO	CONTROL	
5%	Philippines	NSE	NSE	NO	CONTROL	
<1%	Singapore	YES	NO ³	YES ⁴	CONTROL	
3%	Thailand	NSE	NSE	NSE	BAN	BAN (2025)
4%	Viet Nam	NSE	NSE	INE	CONTROL	
62%	China	NSE	NO	YES	BAN	CONTROL
5%	Japan	YES	YES	YES	CONTROL	
2%	Korea	YES	YES	YES	CONTROL	
Legend						
YES: A national policy (NP) exists and is strictly enforced			BAN: A national ban on plastic waste or scrap imports is in place.			
NSE: NP is not strictly enforced		INE: NP is deemed ineffective	CONTROL: A control policy is in place. Imports are not banned.			
PH (YEAR): A phaseout policy is in progress; total ban by (YEAR)			NO: A national policy is currently not in place			

Notes: 1. Brunei Darussalam's \$5/kg excise duty applies to raw plastic materials covered under HS codes 39.01 to 39.14 and select plastic products under HS code 39.23. This excise duty has however been temporarily suspended (Global Plastics Policy Centre, 2024^[46]).

2. Plastic waste import is administratively prohibited in Brunei Darussalam; legislation is under discussion (MoE Japan, 2022^[53]).

3. Mandatory food waste separation started in 2024, but a policy mandating the segregation of other wastes is not in place (MoEWR Singapore, 2019^[56]).

4. The disposable carrier bag charge covers two-thirds of supermarkets; other stores are exempt (NEA Singapore, 2023^[57]).

Source: Authors' inventories; see more information in the technical document (OECD, 2025^[3])

Overall, the policy review carried out for this Outlook builds a case for strengthening the region's policy framework related to plastics on several fronts, by addressing: waste management infrastructure, data collection, sustainable financing, legislative framework, multi-level government coordination, national enforcement capabilities and capacity. The policy review also sheds light on the need to implement enabling policies in combination with steering policy interventions to effectively accomplish targets set out in national plans, and ultimately mitigate environmental impacts from plastics. Opportunities to improve policy frameworks and policy implementation, including monitoring and enforcement, are discussed in more details in Chapter 7.

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Notes

¹ The current state of EPR legislation in the APT region is discussed in Section 3.3.

² Malaysia is also gradually introducing mandatory EPR systems for plastic packaging, following a voluntary EPR phase from 2023 to 2025. However, this was not captured in the inventory produced for this Outlook, that concluded in end of 2023.

³ In addition, Indonesia's Roadmap to Waste Reduction by Producers, aiming for a 30% reduction in waste by 2029, obliges producers to use packaging with labels showing that they can be composted, recycled or reused, and to develop waste reduction plans (MoEF Indonesia, 2019_[58]).

Part II Baseline projections to 2050

4 The projected lifecycle of plastics to 2050

This chapter comprehensively assesses projected trends in plastics use, waste generation and end-of-life fates in the ASEAN Plus Three (APT) region through 2050, under current policies (*Baseline* scenario). It explores key socio-economic drivers, the evolution of plastics use and the share of primary and secondary plastics, the role of expected improvements in waste management systems and highlights differences across APT countries. The chapter lays the basis for assessing environmental impacts under current policies and provides a reference for assessing future policy scenarios in subsequent chapters.

Key insights

- Under current policies (*Baseline* scenario), plastics use in the ASEAN Plus Three (APT) region is projected to increase by 85%, from 152 Mt in 2022 to 280 Mt in 2050. On average, ASEAN countries will see greater growth in plastics use (from 29 Mt in 2022 to 83 Mt in 2050) compared to Plus Three countries (from 122 Mt in 2022 to 197 Mt in 2050). This is primarily driven by underlying economic projections: the APT is expected to experience significant annual GDP growth (2.4% on average) with ASEAN countries outpacing the Plus Three. Driven by fast economic development, plastics use is projected to grow fastest in the lower middle-income ASEAN countries, while Japan and Korea see relatively minimal increases.
- Beyond economic growth, changes in economic structures also influence plastics use. In particular, a shift from manufacturing towards business-related and industrial services – which on average use less plastics than manufacturing – is also projected to contribute to a relative decoupling of plastics use from economic growth, especially in the Plus Three.
- The production and use of secondary plastics is projected to increase even in absence of more ambitious policies. However, the share of secondary plastics (12% in 2050, up from 8% in 2022) remains small compared to primary plastics. The ASEAN countries more than quadruple their secondary production volumes, but in absolute volumes as in shares of production this is still significantly below the Plus Three.
- Packaging is projected to remain the largest application (a constant 32% in both 2022 and 2050) as it is linked to many different sectors, while transport has the fastest growth (rising from 10% of total use in 2022 to 13% in 2050), due to strong projected sectoral growth in motor vehicle manufacturing and transport services.
- Plastic waste is projected to more than double by 2050 (rising from 113 Mt in 2022 to 242 Mt in 2050), with short-lived products, and especially packaging, as the largest driver (from 49 Mt to 91 Mt between 2022 and 2050 for packaging alone). Construction and manufacturing of motor vehicles are the fastest growing sectors driving an increase in plastic waste – and as construction lifetimes are significantly longer than for other applications, this implies a delay in the build-up of plastic waste. Plastic waste increases the fastest in ASEAN countries, in particular lower middle-income ASEAN countries (from 14 Mt in 2022 to 46 Mt in 2050), followed by China, which has the largest increase in absolute terms (from 76 Mt in 2022 to 160 Mt in 2050).
- More plastic waste and better waste management are projected to drive a tripling in recycled plastic waste (from 14 Mt in 2022 to 45 Mt in 2050). Mismanaged plastic waste volumes are projected to rise by 69% (from 33 Mt in 2022 to 56 Mt in 2050). Improved waste management cannot offset the increase in total plastic waste volumes to reduce mismanaged plastic waste volumes in the APT region. Increasing volumes of mismanaged waste call for more policy action.

4.1. Introduction

Chapter 2 provided an overview of trends in plastics use, trade, waste, end-of-life fates and environmental impacts. This chapter comprehensively assesses projected trends in plastics use, waste generation and end-of-life fates in the ASEAN Plus Three (APT) region through 2050, under current policies (*Baseline* scenario). Environmental impacts under current policies are discussed separately in the next chapter.

As explained in Chapter 1, for these projections, the ENV-Linkages model was refined compared to previous OECD analyses (2022^[1]; 2024^[2]) to provide more geographical detail for APT countries, by splitting the ASEAN in 4 modelled regions (Thailand, Rest of ASEAN-HIC&UMIC, Indonesia and Rest of ASEAN-LMIC) and the Plus Three (splitting Japan and Korea, in addition to China, which was already separated in the model). Country-level data for plastic use and end-of-life fates for all 13 APT countries was also integrated to perform the projections.

4.2. Socio-economic trends to 2050 differ widely between APT countries

Chapter 2 highlighted how plastics use is intrinsically linked to economic activity. Thus, in order to understand the evolution of plastics use over time, as well as the associated downstream plastic waste, end-of-life fates and environmental consequences, consistent projections are needed of the socioeconomic drivers of plastics use. These include

- population changes,
- income growth (measured as GDP per capita) – together these make up the scale of economic activity (GDP) and thus plastics use,
- changes in the structure of the economy, as plastic intensity differs widely across sectors, and
- technological developments that allow reducing the physical inputs per unit of production and thus contribute to decoupling economic activity and plastics use.

The following subsections present the projected trends for these drivers in the APT region under current policies, i.e. the *Baseline* scenario.

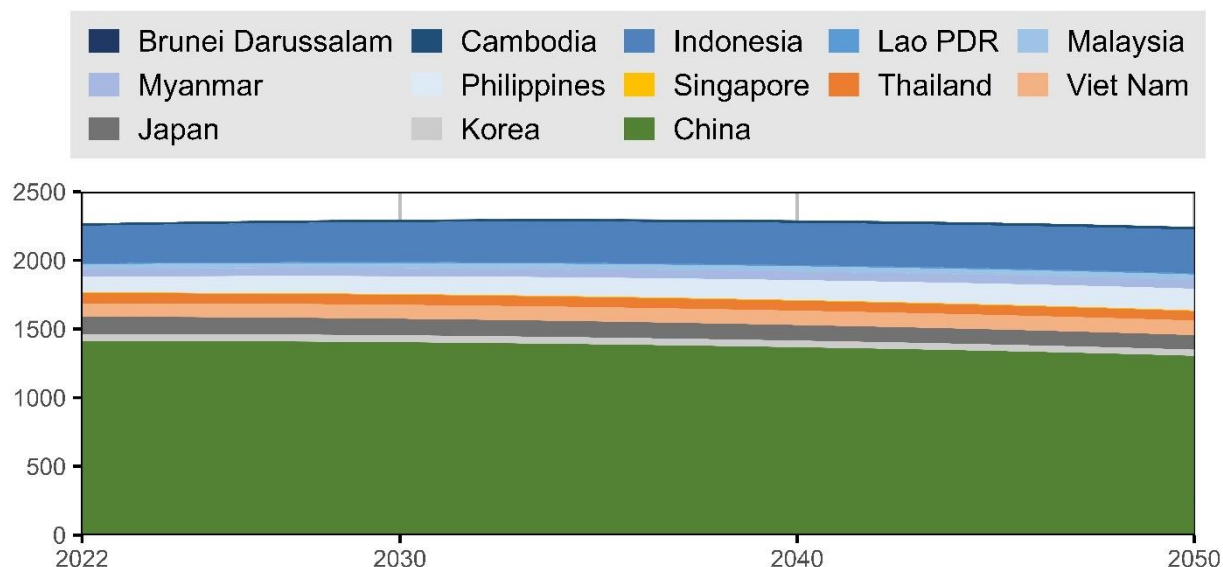
4.2.1. Demographic growth in the APT region is projected to stabilise

The surge in plastics use within the ASEAN Plus Three (APT) region in recent decades is closely linked to various macroeconomic trends, that have been recognised as key drivers of growth in plastic production and use (OECD, 2022^[3]; OECD, 2022^[1]). Looking ahead, socioeconomic trends will continue to shape the evolution of plastics use, and ultimately plastic leakage, in the region.

The total population in the APT region is projected to stabilise in the coming decades, but this masks significant variety in national trends. The APT population is projected to grow until the mid-2030s, peaking at 2.3 billion people, before declining by 2% by 2050 are regressing below 2022 levels (Figure 4.1). As a result, the proportion of APT in the global population is expected to decline from 29% in 2022 to 24% in 2050. Demographic growth rates vary substantially across countries. By the middle of the century, the populations of the Philippines, Lao PDR, Malaysia and Cambodia are projected to increase by more than 20%, while population is expected to decrease by 8% in China, 11% in Korea and 16% in Japan. Although the overall population levels in 2050 are expected to remain similar to 2022 levels, population aging is expected to intensify, particularly in Korea, Singapore and Japan (see Annex Figure 4.A.1 in Annex 4.A).

Figure 4.1. Population in APT countries is projected to stabilise by 2050

Population in millions.



Source: Authors' calculations based on The World Population Prospects: 2017 Revision (UN, 2017^[4]).

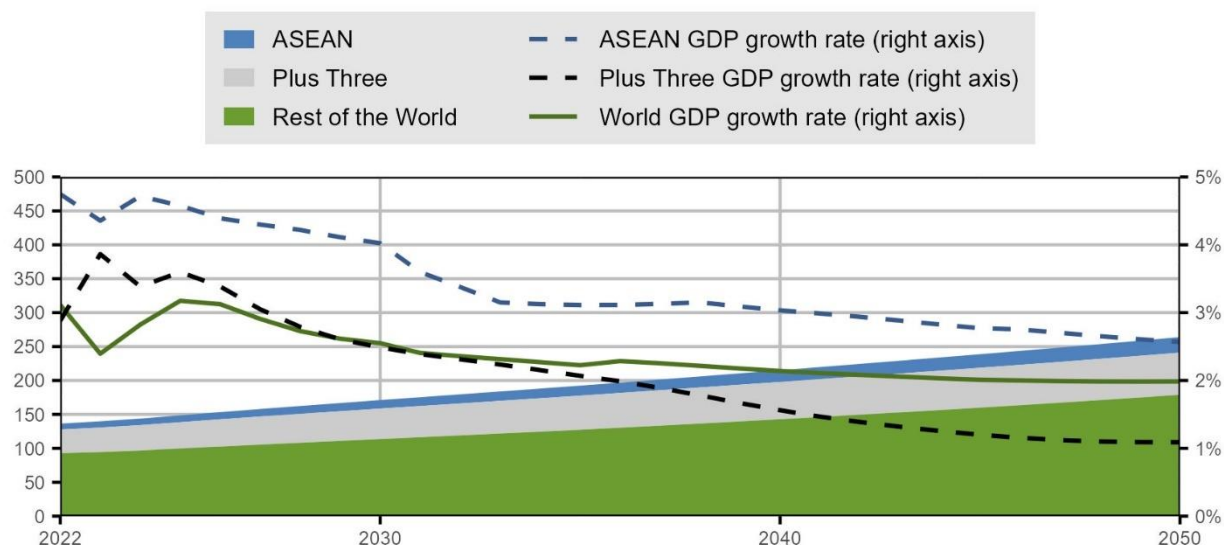
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4.2.2. Economic growth is projected to be higher in ASEAN countries than in the Plus Three

Economic activity is expected to continue growing in the APT region, though at a slowing pace. As income levels gradually converge and China's recent growth boom slows down, the pace of economic growth is expected to decline (Figure 4.2). APT countries are projected to see annual GDP growth of 2.4% annually on average, between 2022 and 2050 (starting above 3% per year and declining to 1.5% by 2050). Growth in ASEAN countries (3.5% on average) is projected to outpace that of the Plus Three (2.1% on average), increasing economic weight of the ASEAN in the global economy, from 6% to 9% of global GDP. Meanwhile, the share of the Plus Three remains roughly constant (25% in 2022 and 24% in 2050).

Figure 4.2. As growth in global GDP slows down, the share of the APT region is projected to grow

Real GDP by aggregate region in USD trillion (2014 PPP), Baseline scenario.



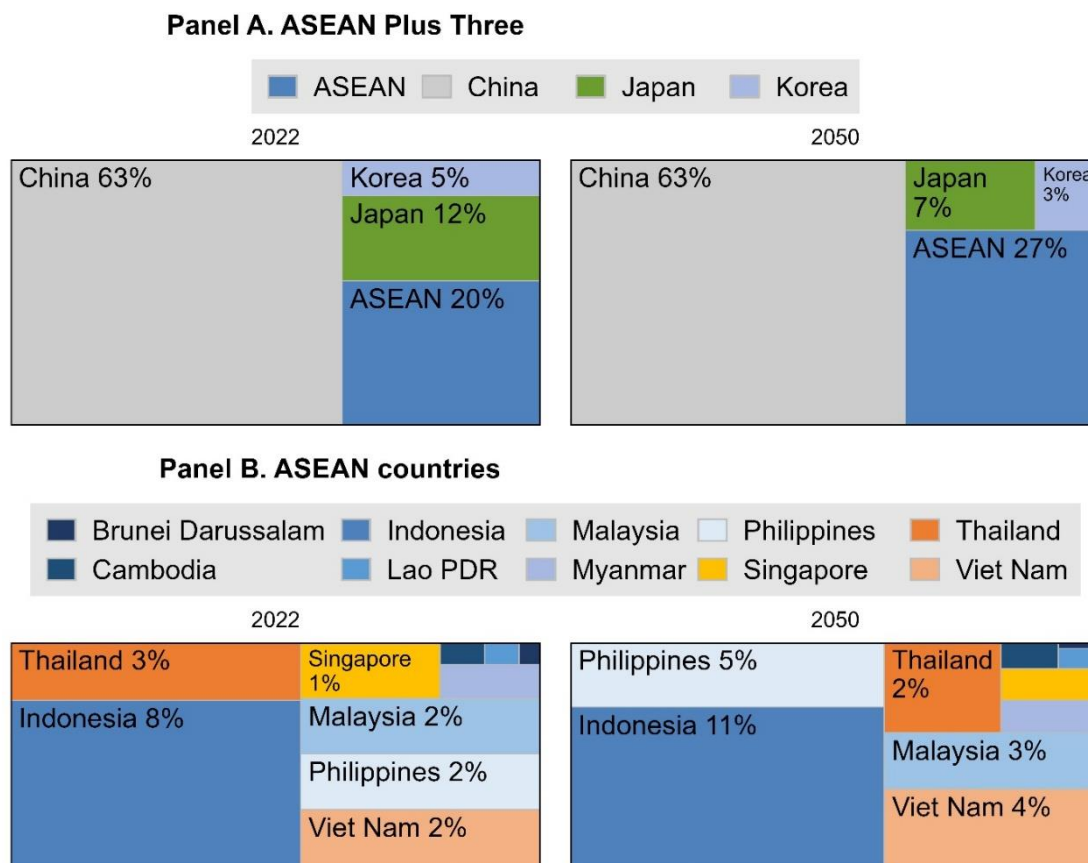
Source: OECD ENV-Linkages model; based on short-term forecasts by OECD Economics (OECD, 2020^[5]) Department and International Monetary Fund (IMF, 2020^[6]).

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Differences in economic growth among APT countries imply a shift in the distribution of GDP in the region over the coming decades (Figure 4.3). Despite rapidly falling GDP growth rates, China is projected to sustain its share in the APT, constant at 63% of the GDP of the overall APT. Meanwhile, the shares of Japan and Korea in the total GDP of the APT are projected to shrink, from 12% and 5% of the region in 2022, to 7% and 3% by 2050. Growth in the importance of the ASEAN signals shifting economic dynamics in the region. The growth is most prominent in Indonesia (from 8% of APT in 2022 to 11% in 2050), Philippines (from 2% to 5%) and Viet Nam (from 2% to 4%).

Figure 4.3. The share of ASEAN countries in GDP in the APT region is projected to rise from 20% to 27%

Share of GDP by region in 2022 and 2050, represented by their area, Baseline scenario



Note: Percentage share is given as ratio to whole APT region, to ease comparison between panels.

Source: OECD ENV-Linkages model; based on short-term forecasts by OECD Economics Department (OECD, 2020^[5]) and International Monetary Fund (IMF, 2020^[6]).

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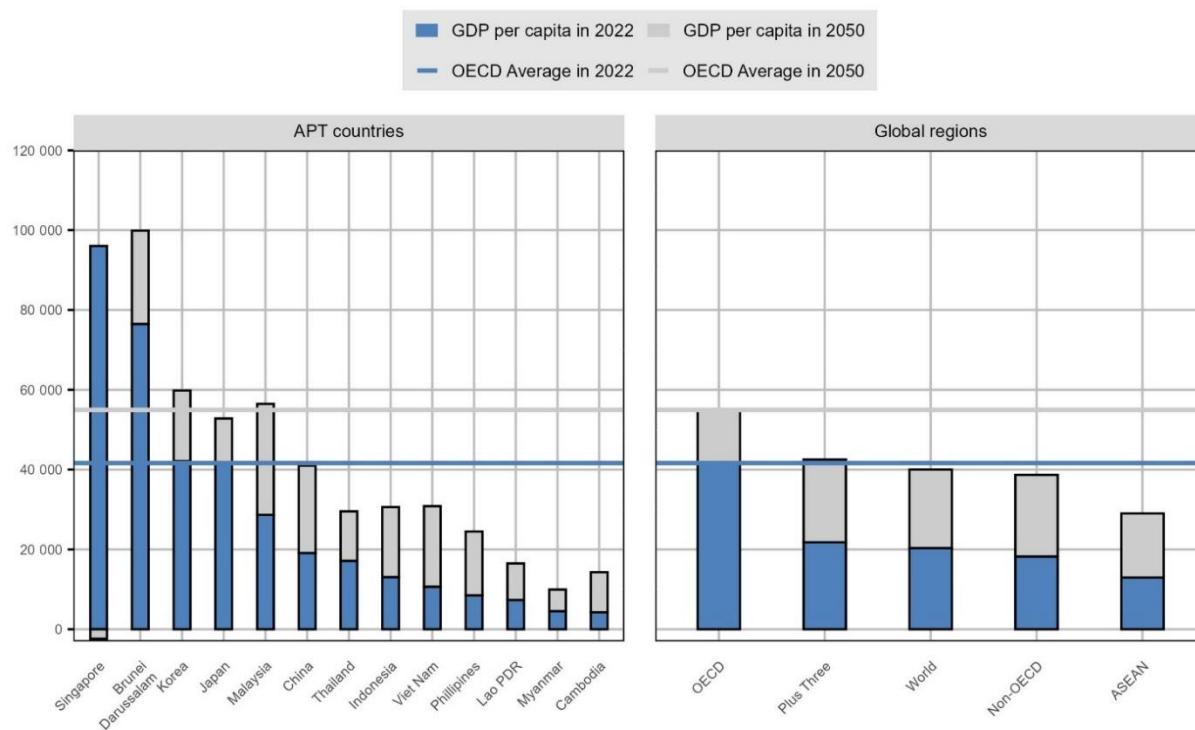
The *Baseline* scenario projects sustained growth of income levels (i.e. GDP per capita) in the APT region, with some convergence across countries. Currently, income levels (or living standards) vary widely across countries in the APT region, with Singapore's GDP per capita exceeding USD 90 000 in 2022, compared to Cambodia's USD 4 300 (see also Chapter 2). By 2050, with the exception of Singapore¹, all APT countries are projected to see income growth, with average income levels reaching USD 37 600 (Figure 4.4), reflecting an average annual growth rate of 2.4%. ASEAN countries as a group are projected to surpass the global average level of GDP per capita by 2050 (USD 28 600 vs. USD 27 600; see Figure 4.4). Despite fast economic growth, GDP per capita in ASEAN countries is still projected to be considerably below the level of the Plus Three countries.

Cambodia is projected to experience the highest relative growth in GDP per capita with a growth rate of 4.4% (reaching USD 14 thousand in 2050) and overtake Myanmar (2.8% growth, reaching USD 10 thousand) in living standards; both remain well below the global average though. Viet Nam (3.9% growth rate; income of USD 30 800) and Philippines (3.9% growth, reaching USD 24 500) also have a significant expansion of their economy. GDP per capita in Brunei Darussalam is expected to continue growing at a moderate rate of – on average – 1.0% per year, overtaking Singapore (which is projected to have very low GDP per capita growth) as the richest country in the APT, reaching almost USD 100 000 per capita by mid-century – well above the OECD average (projected at USD 62 000 in 2050). The

underlying drivers (changes in capital inputs, employment, and labour efficiency) also vary widely across countries (see Annex Figure 4.A.2 in Annex 4.A).

Figure 4.4. Several ASEAN countries are projected to have fast GDP per capita growth

GDP per capita in USD trillion (2014 PPP) per capita, sorted by GDP per capita in 2022, Baseline scenario.



Note: GDP per capita is presented in USD, using 2014 purchasing power parity (PPP). The aggregate growth for Singapore over the period is absent, in parallel with a decrease in labour force (and population).

Source: ENV-Growth model (OECD Environment Directorate) and OECD Economics Department (Guillemette and Turner, 2018^[7]).

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4.2.3. The structure of the APT economies is projected to shift

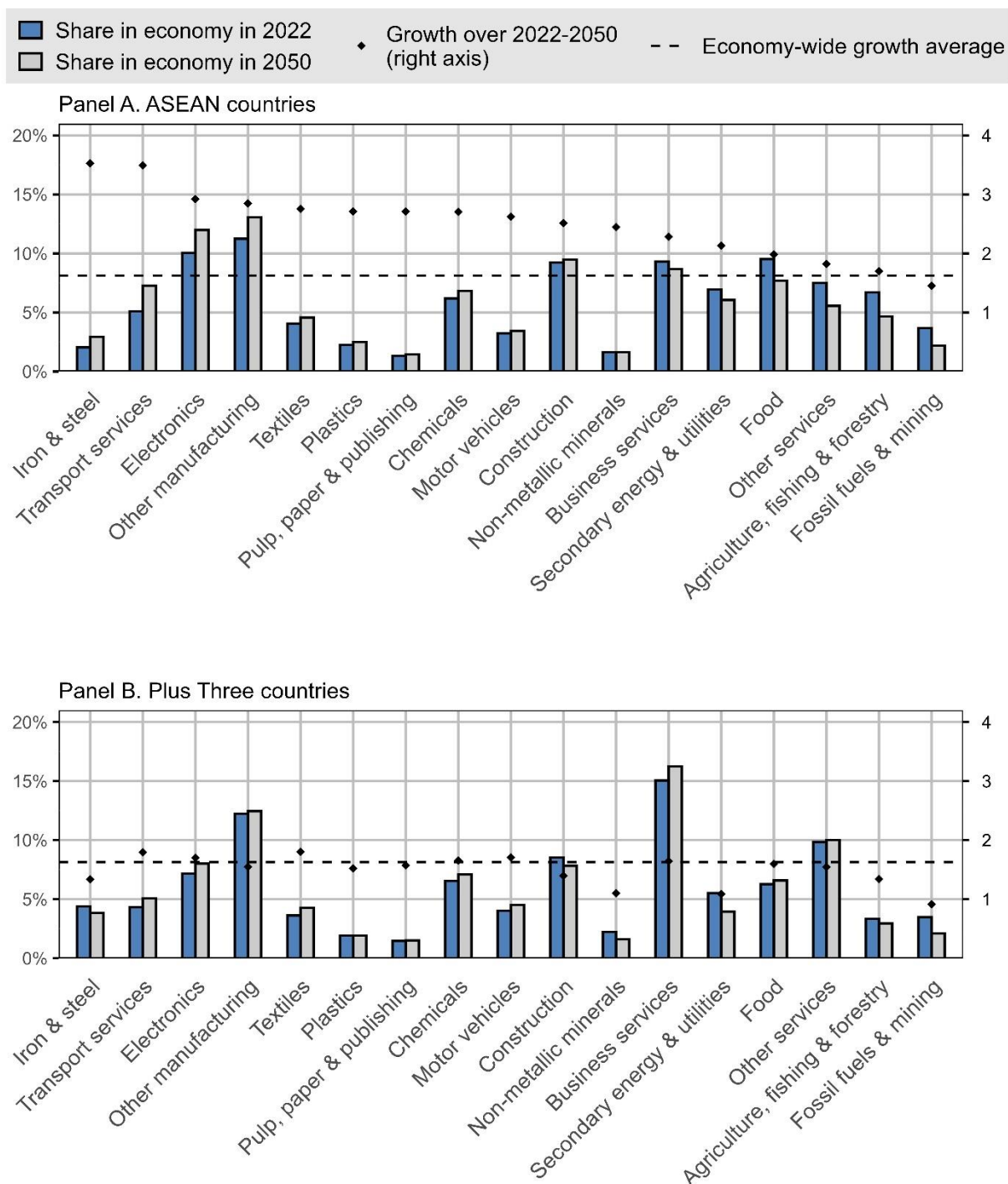
Along with growth, the structure of the APT economies is projected to change, implying that demand for specific plastic applications also shift, leading to a change in the composition of plastics demand across polymers.

The economies of the ASEAN countries have significant shares for both industry and services (Figure 4.5). Growth is projected to be strong in industrial sectors such as iron and steel and electronics, as well as in transport services. The plastics sector itself is also projected to grow faster than the economy-wide average, which is not surprising as many of the more plastic-intensive sectors, such as motor vehicles and construction are at or above the average growth path. As shown in Annex Figure 4.A.3 in Annex 4.A, there is considerable heterogeneity across the economies in ASEAN countries. In Indonesia, the transport services sector is projected to significantly increase its importance becoming the third most important sector by 2050 only behind construction and non-textile manufacturing. In Thailand, manufacturing is also projected to gain in importance although business services and electronics would also play a key role in the economy, contributing to over one-quarter of the economy by the mid-century.

In the Plus Three countries, business-related services are already the largest sector, and its growth continues to outpace the economy-wide average. This implies a shift in the demand for plastics across

different types of applications, as services are more connected to e.g. packaging. The textiles sector, which is key for synthetic fibres, also grows more rapidly.

Figure 4.5. APT countries are shifting towards more service-oriented economies



Source: OECD ENV-Linkages model.

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4.2.4. Efficiency improvements play only a minor role in the evolution of plastics used in manufacturing

The manufacturing sector is the most plastic-intensive in the economy. While the composition of inputs required for manufacturing products varies by country and evolves over time, only small changes are projected between 2022 and 2050 (Table 4.1). The use of plastics in the manufacturing sector is projected to closely follow total production volumes and to remain at around 2% as in 2022. Thus, while there are significant improvements in total factor productivity, these do not tend to extend to reductions in the use of plastics for production.

Table 4.1. Despite more efficient production of manufacturing goods, plastic inputs will tend to remain a constant share of manufacturing inputs

Share of components in production costs of manufacturing goods

		Thailand		Indonesia		China		Japan		Korea	
		2022	2050	2022	2050	2022	2050	2022	2050	2022	2050
Manufacturing output (index 2022=1)		1	1.7	1	2.7	1	1.7	1	0.9	1	1.2
Input composition of production	Capital and resources	19%	22%	16%	16%	11%	12%	19%	19%	19%	20%
	Labour	16%	17%	26%	28%	17%	20%	23%	27%	15%	17%
	Agricultural inputs	7%	7%	10%	12%	7%	9%	2%	3%	3%	4%
	Industrial inputs	41%	37%	27%	24%	44%	39%	33%	29%	42%	38%
	Services inputs	14%	14%	16%	16%	18%	18%	20%	20%	17%	19%
	Plastics	2.2%	2.0%	3.2%	3.1%	2.2%	2.0%	2.1%	1.8%	2.2%	2.0%

Source: OECD ENV-Linkages model.

4.3. Plastics use will almost double by 2050

4.3.1. Economic growth drives an almost doubling of plastics use by 2050

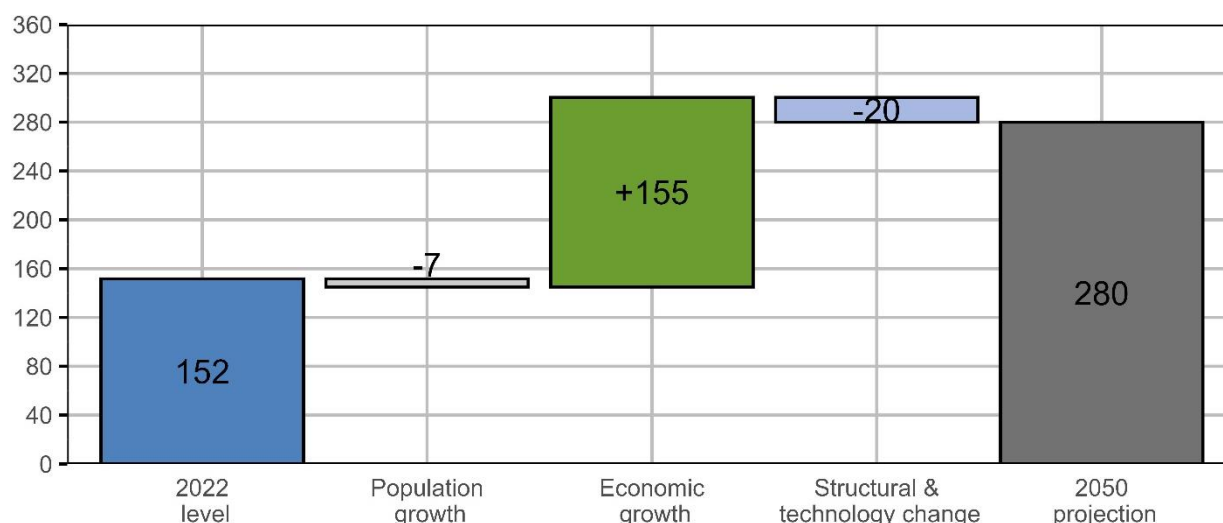
Plastics use is closely tied to economic development and various other socio-economic factors outlined in the previous section. This section presents projections on the use of plastics in the APT region under current policies (the *Baseline* scenario).

As GDP per capita in the APT is projected to more than double by 2050, plastics use is also expected to grow (Figure 4.6). Plastics use in APT countries is projected to rise from 152 Mt in 2022 to 280 Mt by mid-century (85% increase). For comparison, global plastics use is projected to grow at a similar rate from 487 Mt in 2022 to 937 Mt by 2050. As a result, the share of the APT region in global plastics use remains roughly stable: 31% in 2022 and 30% in 2050.

Economic growth is the primary driver of the evolution of plastics use, contributing 155 Mt of additional plastics use, by 2050.² Population growth only has a minor impact, but there are regional differences: demographic declines in the Plus Three, particularly in China, offset the effects of population growth in the ASEAN countries, resulting in a net reduction of 7 Mt (see Section 4.2.1). Furthermore, structural shifts in the APT economies, particularly the growing share of services, reduce plastic intensity of economic activity, i.e. the volume of plastics use per dollar of production. As discussed above, efficiency improvements through technology developments have a negligent effect on the growth of plastics use. Together, structural and technology change avoid 20 Mt of plastics use by 2050.

Figure 4.6. Plastics use in the APT region is projected to almost double, mostly driven by economic growth

Decomposition of the increase of plastics use between 2022 and 2050 in million tonnes (Mt), Baseline scenario



Note:

Population growth represents a projection in which plastics use is assumed to grow at the same speed as population and in which the regional plastics use per capita stays constant at 2022 levels.

Economic growth represents a counterfactual projection in which plastics use is assumed to grow at the same speed as GDP and in which the regional plastic intensity (the amount of plastic per unit of output) stays constant at 2022 levels.

Structural and Technology Change refers to the combined influence of sectoral shifts and technological advancements on reducing global plastics use.

Source: OECD ENV-Linkages model.

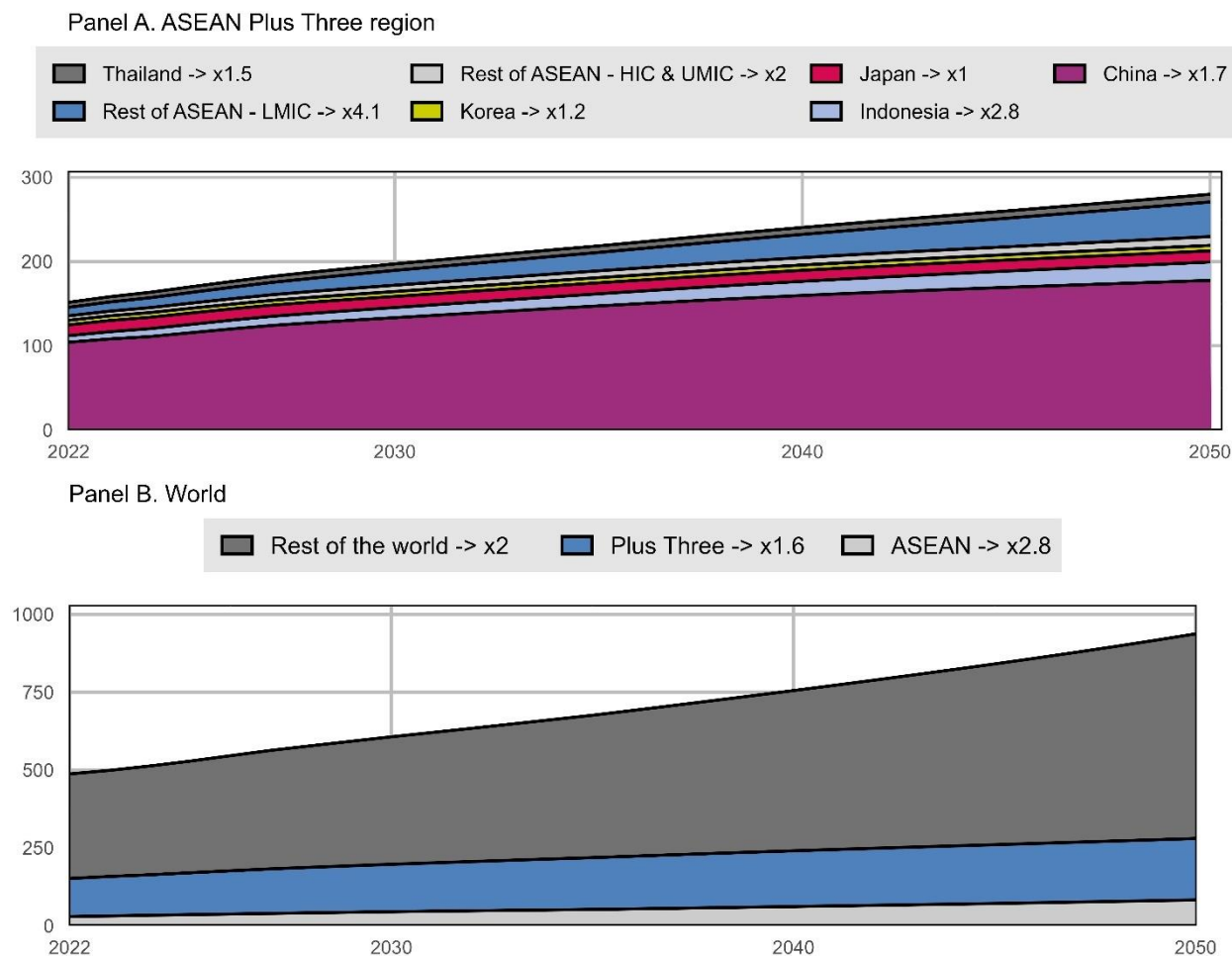
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However, growth rates vary widely across countries (Figure 4.7). Faster growth tends to occur in countries with lower volumes of plastics use currently, reflecting lower income levels and faster growth in economic activity, generally (although country-specific circumstances also play a role). This catch-up dynamic in plastics use across the APT is consistent with underlying economic conditional convergence trends, leading to a more balanced distribution of plastics use across the region.

Growth is projected to be fast in Indonesia (from 7.9 Mt in 2022 to 21.8 Mt in 2050; +180% or x2.8 as indicated in the figure) and especially the rest of ASEAN – LMIC region (from 10.0 Mt in 2022 to 41.1 Mt in 2050; +310%). In contrast, Japan is projected to have the slowest growth of its plastics use (from 12.7 Mt in 2022 to 13.2 Mt in 2050; +3.5%), while Korea increases it from 5.5 Mt in 2022 to 6.5 Mt in 2050 (+18%). China remains the largest consumer of plastics, both in the region and globally. Plastics use in the country is projected to continue to grow significantly to 178 Mt in 2050 (104 Mt in 2022; +70%). In Thailand and the ASEAN-HIC&UMIC region growth in plastics use is moderate, with Thailand going from 6.0 Mt in 2022 to 9.2 Mt in 2050 (+53%), and the ASEAN-HIC&UMIC region going from 5.3 Mt in 2022 to 10.5 Mt in 2050 (+100%).

Figure 4.7. Plastics use is projected to grow faster in ASEAN than in the Plus Three countries

Plastics use in million tonnes (Mt), Baseline scenario



Note: The numbers on the right-hand side of the graph indicate the growth of plastics use from 2022 (dashed line) to 2050 for each region (e.g. x2 means a doubling of plastics use).

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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4.3.2. Primary plastics will continue to dominate

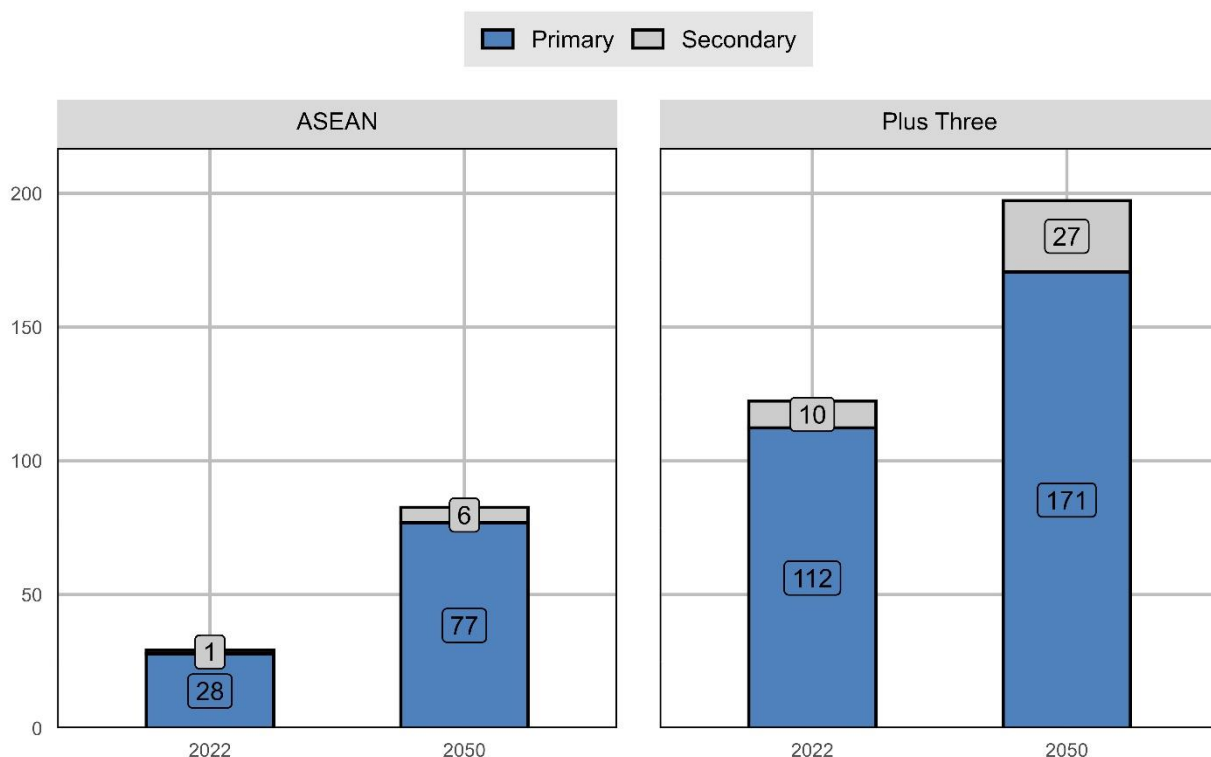
Plastics demand can be met through primary or secondary (recycled) plastic production. In many APT countries, secondary plastics currently make up a small share of total production (8% for APT; cf. Chapter 2). Especially within the ASEAN, secondary production volumes are low, amounting to 1.4 Mt in 2022 (5% of total), versus around 10 Mt in the Plus Three (8% of total; Figure 4.8).

In the coming decades, this share is projected to steadily, but slowly, increase in all APT countries. Secondary plastics are projected to grow by 183% until 2050 (from 11 Mt in 2022 to 32 Mt in 2050) while primary plastics are projected to grow by 77% (from 140 Mt in 2022 to 248 Mt in 2050), with the share of secondary in total production in the APT region increasing from 8% in 2022 to 12% in 2050. This trend highlights the effectiveness of current policies, encouraging the switch to recyclable plastics, as well as increasing income levels, which induce improvements in waste management systems. ASEAN countries, particularly the ASEAN-LMIC region (which includes Indonesia) and Thailand (which is an upper middle-income ASEAN country), are expected to experience the highest increase of secondary plastics in the APT region. As a group, the ASEAN countries more than quadruple their secondary production volumes, but both in absolute volumes and in shares of production this is still significantly below the Plus Three.

Despite the faster growth in secondary production, primary plastics will still represent the dominant share of plastic production in 2050, and in absolute terms the increase in primary plastics is larger than the increase in secondary plastics. Thus, the environmental burden associated with primary plastic production continues to grow significantly in the current policies (*Baseline*) scenario.

Figure 4.8. Primary plastics will still represent the bulk of plastic production in 2050

Primary and secondary plastic production in APT region in million tonnes (Mt), Baseline scenario



Source: OECD ENV-Linkages model.

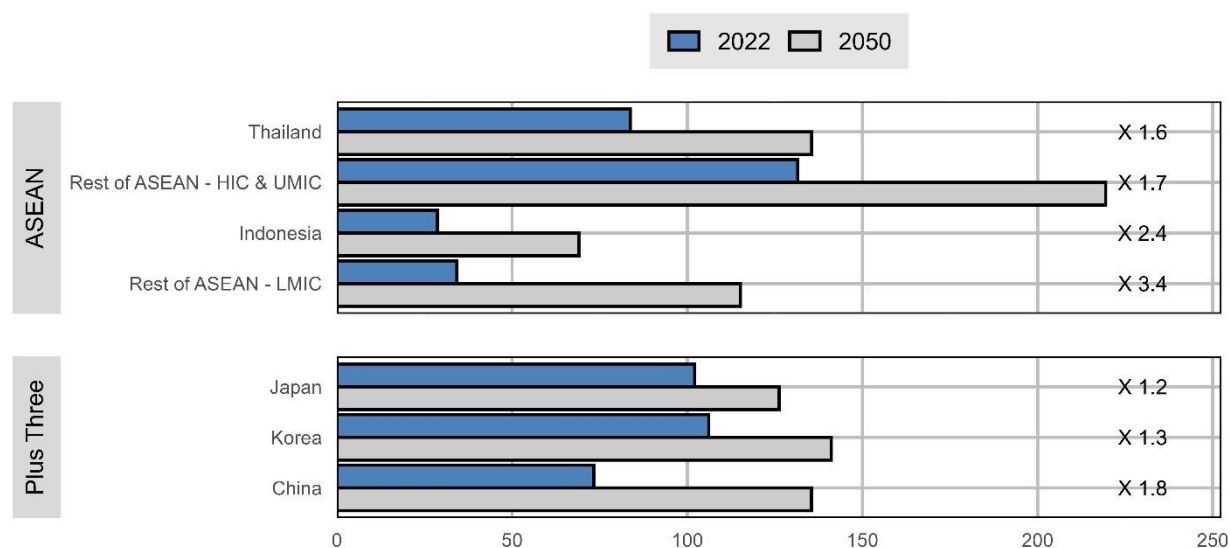
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4.3.3. The region will continue to see rising per capita plastics use

Plastics use per capita is projected to increase in all APT countries (Figure 4.9). Japan (24%) and Korea (33%) experience a small increase by mid-century. Plastics use per capita is projected to more than double by 2050 in Indonesia and rest of ASEAN – LMIC, and almost double in China (85%). In the rest of ASEAN - HIC & UMIC, the 2022 level of per capita plastics use is the highest in the whole APT region (cf. the APT average in 2022 is 67 kg/cap), almost reaching the levels observed in the Plus Three region in 2050.

Figure 4.9. Per capita plastics use will increase in all countries by mid-century

Plastics use per person (kg/capita) and growth factors between 2022 and 2050



Note: The numbers on the right-hand side of the graph indicate the growth of per-capita plastics use from 2022 to 2050 for each region (e.g. x2 means a doubling of plastics use).

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

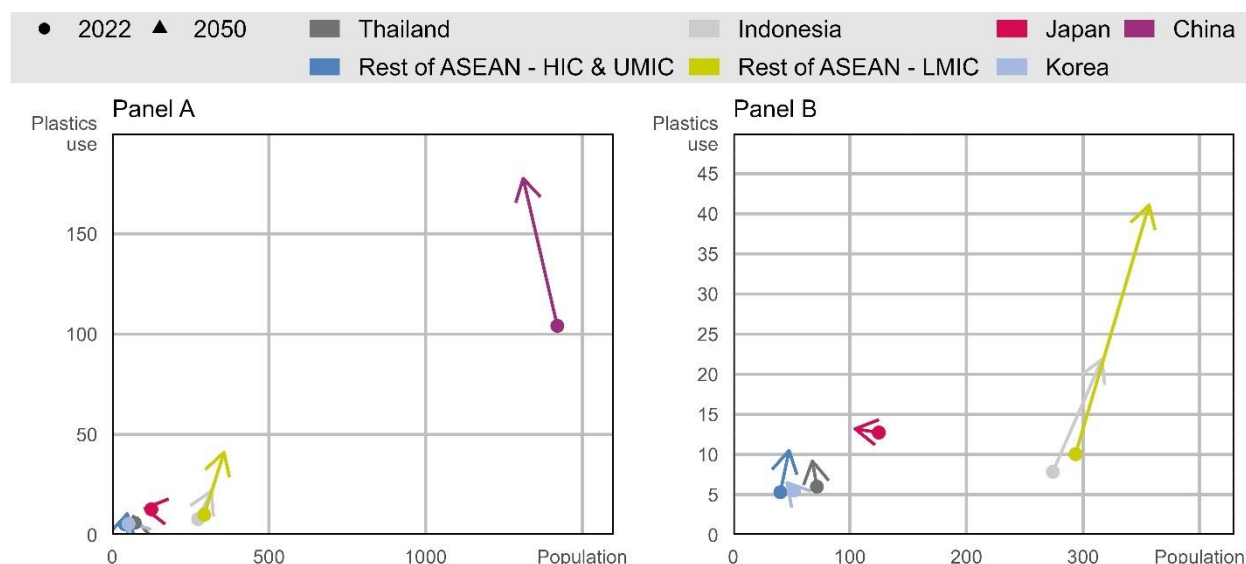
Source: OECD ENV-Linkages model.

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While all countries are projected to increase their plastics use per capita, the dynamics of this growth vary significantly across the region (Figure 4.10). In Indonesia, Rest of ASEAN – HIC & UMIC, and LMIC, both population and plastics use are projected to rise, although the latter will experience a higher increase. In contrast, Japan, China, and Thailand are projected to increase their plastics use despite declining population numbers. In the case of Korea, both population and plastics use are remaining almost unchanged.

Figure 4.10. Plastics use and population have heterogenous dynamics across APT countries

Population (millions) and plastics use (Mt) from 2022 to 2050



Note: Panel B zooms in on the bottom-left corner of panel A.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

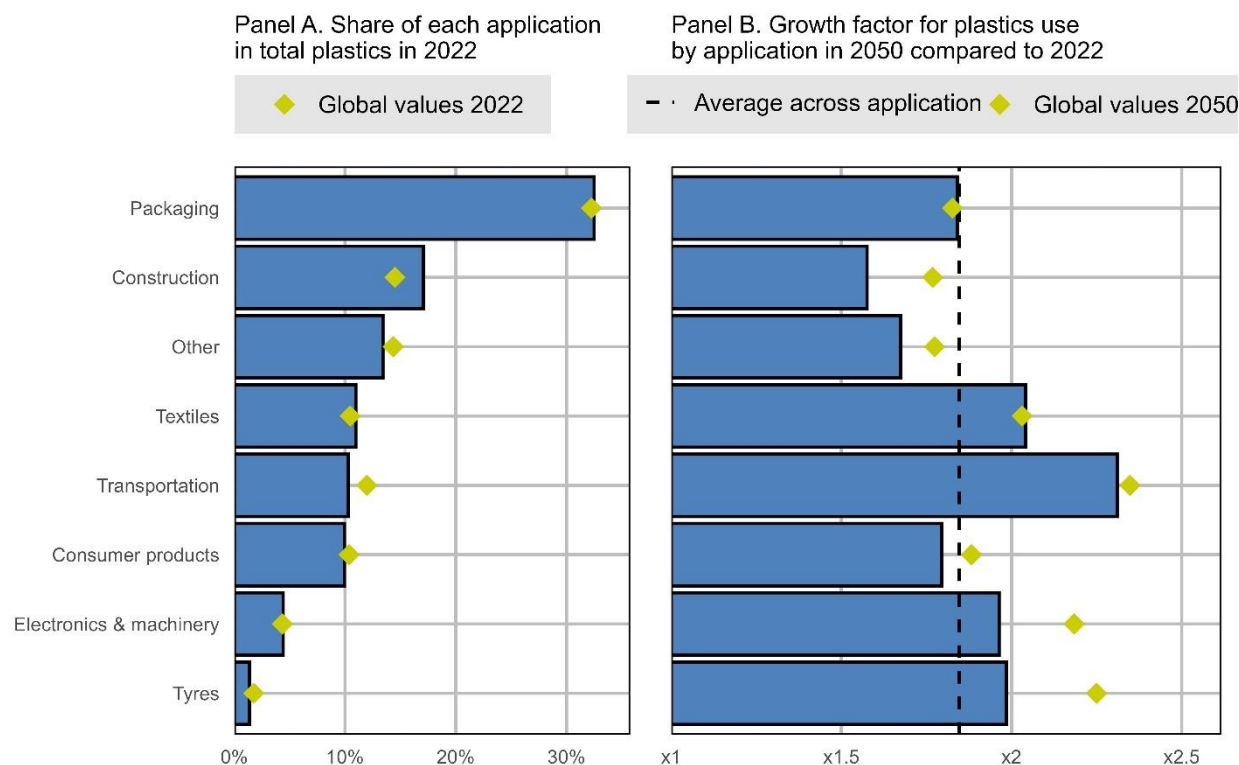
Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/714ks5>**4.3.4. Packaging and transportation drive much of the increase in plastics use**

Changes in the sectoral structure of the economies in the APT, with fast industrial growth in ASEAN countries and ongoing servitisation in the Plus Three, are reshaping the composition of plastics use by application. Packaging remains by far the largest share of plastics use, accounting for a constant near one-third of total use through to 2050 (Figure 4.11). Plastics used in transportation are projected to increase fastest (2.5 times between 2022 and 2050). This reflects the increasing importance of the transport sector, a trend seen globally (compare the green diamonds in the right panel with the bar for APT). In contrast, plastics used in construction are projected to grow the least. This is largely due to the waning of China's infrastructure and construction boom, which previously drove demand. While some ASEAN countries have fast growth in infrastructure and construction, the volumes remain modest compared to the earlier boost observed in China. Plastics in electrical and electronic products, and tyres, are also projected to grow fast at a global level, but this is less pronounced in the APT region due to its specific economic profile. Conversely, textiles grow more rapidly in the APT than globally, reflecting the economic development trends in both ASEAN and Plus Three presented in Figure 4.5 above.

Figure 4.11. Plastics use will grow the most in transportation by 2050

Plastics use in million tonnes (Mt), Baseline scenario



Note: The applications for personal protective equipment linked to COVID-19, and personal care products, are omitted from the graph as the quantity of plastics they use is too small for the calculation to be meaningful.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/c7iqo9>

The increase of plastics use in applications such as motor vehicles and electronics (Figure 4.11) is intrinsically linked to the economic growth these industries will enjoy within the APT region (cf. Figure 4.5). Motor vehicles show a significant increase in this sector in ASEAN countries (+211%) and China (+126%), while in Japan and Korea this sector is projected to decrease (-26%). The electronic sector shows a similar trend however this sector is one that requires less plastics, fostering the reduction of plastics by structural changes.

These sectoral trends also affect the plastic intensity of the different economies in the APT region (see Annex Figure 4.A.4 in Annex 4.A). In Japan and Korea both plastic intensity and economic growth are lower compared with the rest of the APT countries, where overall (albeit not in all sectors), plastic intensity is projected to increase in the coming decades. Plastic-intensive sectors in China like food and textiles will remain important in the APT region. These sectors are closely linked with packaging applications, where plastics will continue to play an essential role.

4.4. Steady growth in plastic waste leads to larger volumes of recycling and mismanaged waste to 2050

4.4.1. Plastic waste is projected to more than double by 2050

As in many regions worldwide, plastics use in APT countries remains largely linear rather than circular, resulting in significant amounts of plastic waste. Much of this is incinerated, landfilled or mismanaged (including a portion leaking to the environment). Plastic waste, when collected, is typically managed as part of Municipal Solid Waste (MSW), alongside other materials. In addition, plastics is also present in other types of waste, such as industrial waste.³

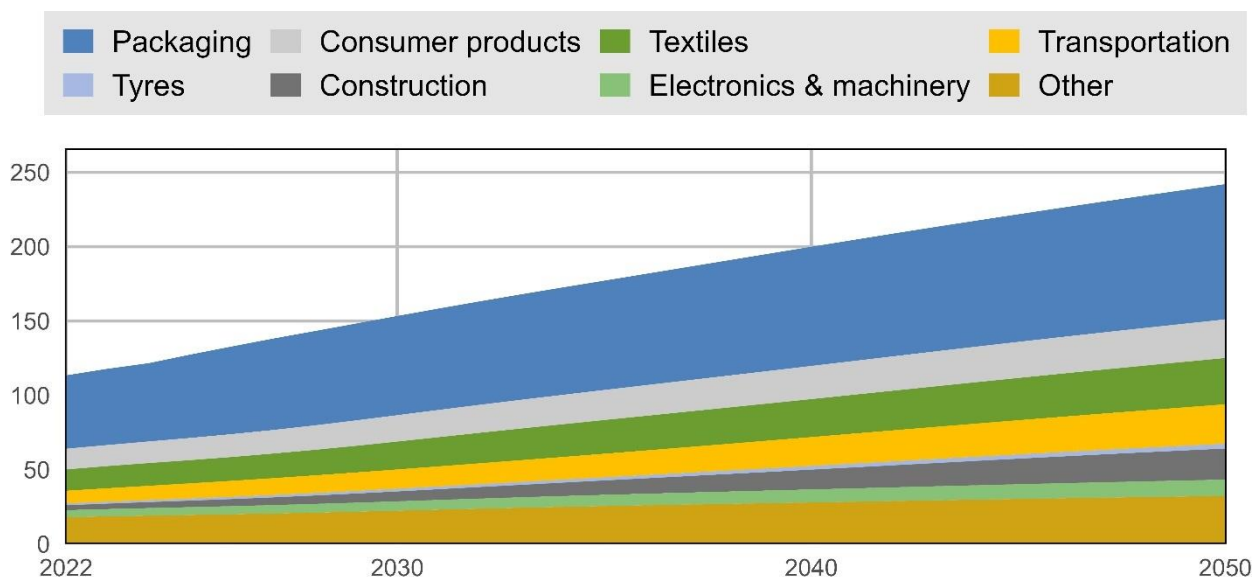
The dynamics of plastic waste generation differ from those of plastics use as there is a time lag between use and waste, which varies by product lifespan (OECD, 2022^[3]). For example, plastics used in transportation only become waste after 13 years on average, whereas the lifespan of some plastics in construction can be as long as 70 years (35 years on average). Plastics in packaging and consumer products and packaging have short lifespans, often less than 1 year.

In the *Baseline* scenario, plastic waste in APT countries is projected to more than double, from 113 Mt in 2022 to 242 Mt in 2050 (Figure 4.12). Continued socio-economic developments and economic growth (as shown in Section 4.2) lead to rapidly rising plastics use (Section 4.3), particularly in ASEAN countries with fast-growing plastics use as they catch up to higher income countries.

In line with the growth in the use of plastics, plastic waste increases for all applications, though at different rates. Waste from short-lived plastic products, such as packaging, consumer products and textiles, is projected to almost double (from 78 Mt in 2022 to 148 Mt in 2050 for these three applications together, and from 49 Mt to 91 Mt for packaging alone). However, the share of short-lived products in overall waste is projected to slightly decrease, from 68% in 2022 to 61% in 2050. In contrast, waste increases at a faster rate for longer-lived applications, including construction. This surge reflects the inertia of durable products in the system: as fast-growing economies such as China invest in infrastructure and construction on a massive scale (OECD, 2019^[8]), they drive a rapid increase in the use of durable plastics with long lifespans. The role of “historical” waste, i.e. waste from applications produced before 2022, is quite substantial for durable products such as those used in the vehicle and construction industries. The lag between plastics use and waste implies that plastic stocks accumulate and continue to create waste flows beyond 2050.

Figure 4.12. Plastic waste is projected to more than double by 2050

Plastic waste for APT countries by application in Mt, *Baseline* scenario



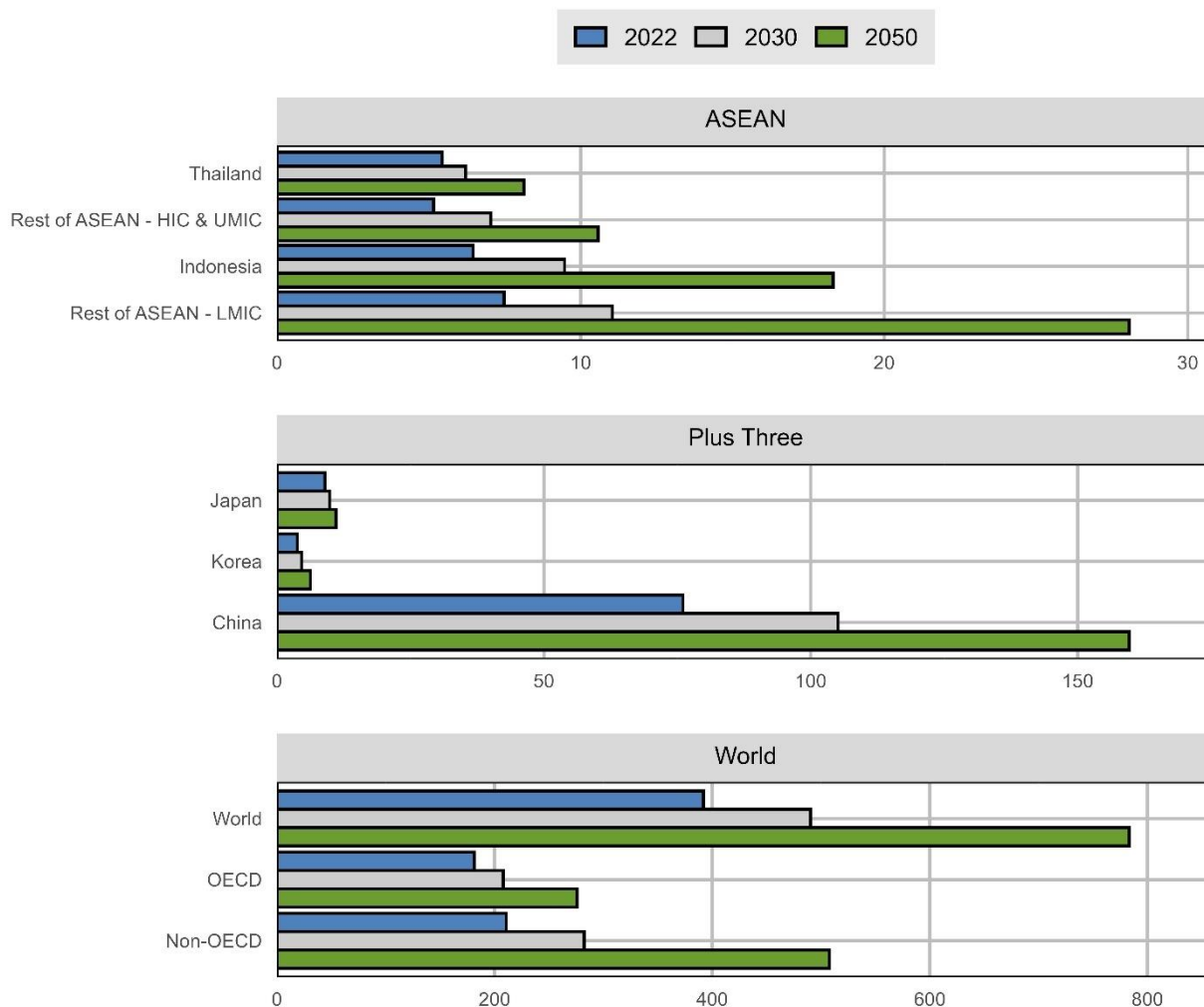
Source: OECD ENV-Linkages model.

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Within APT region, the largest absolute growth in plastic waste volume is projected to occur by China (from 76 Mt in 2022 to 160 Mt in 2050; Figure 4.13), which combines very large volumes of short-lived plastics use with large volumes of waste from long-lived applications that are discarded before 2050, as outlined above. In line with the results for plastics use – not surprising given the dominance of short-lived plastics such as packaging in total plastics use – the Rest of ASEAN – LMIC region show the fastest growth in relative terms, almost quadrupling (from 7.5 Mt in 2022 to 28 Mt in 2050); Indonesia is also expected to experience a sharp growth, from 6.5 Mt in 2022 to 18 Mt in 2050 (+183%). In per capita terms, the differences across regions are somewhat smaller, as fast growth in plastics use occurs in countries with fast population growth (see Annex Table 4.A.1 in Annex 4.A).

Figure 4.13. Plastic waste will grow faster in most ASEAN countries than the global average

Plastic waste by region in million tonnes (Mt), *Baseline scenario*



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

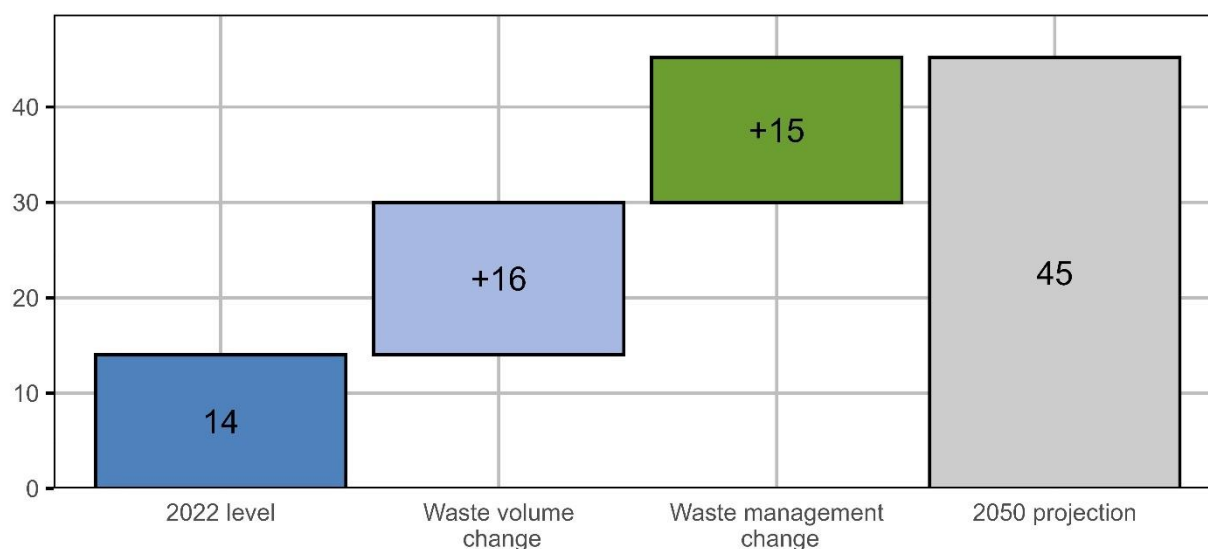
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4.4.2. Waste management improves, but not enough to offset growth in waste, and thus mismanaged waste increases

The evolution of specific end-of-life fates for plastic waste depend on a combination of (i) the growth in the total volume of waste and (ii) changes in the shares of different waste management options.⁴ In the case of recycling, both the increased quantity of waste and improved waste management contribute to a strong increase in the amount of waste being recycled (Figure 4.14 shows this for the aggregate APT region). Improved waste management takes into account changes in the share of plastic waste collected for recycling, as well as in the share of plastics that is collected for recycling but ultimately discarded and not converted into scrap (i.e. recycling losses; see (Roosen et al., 2020^[9]) and (OECD, 2022^[1]) for more details).

Figure 4.14. More plastic waste and better waste management drive the increase in recycled waste

Factors driving the increase in recycled plastic waste in Mt between 2022 and 2050, *Baseline* scenario



Notes: *Waste volume change* represents a hypothetical projection in which all management shares are assumed to be fixed at the 2022 level. Thus, plastic waste collected for recycling is assumed to grow at the same speed as total plastic waste.

Waste management change represents the change in the waste management shares; this reflects a balance between larger shares of waste being generated in emerging and developing economies and improved waste management systems in all countries.

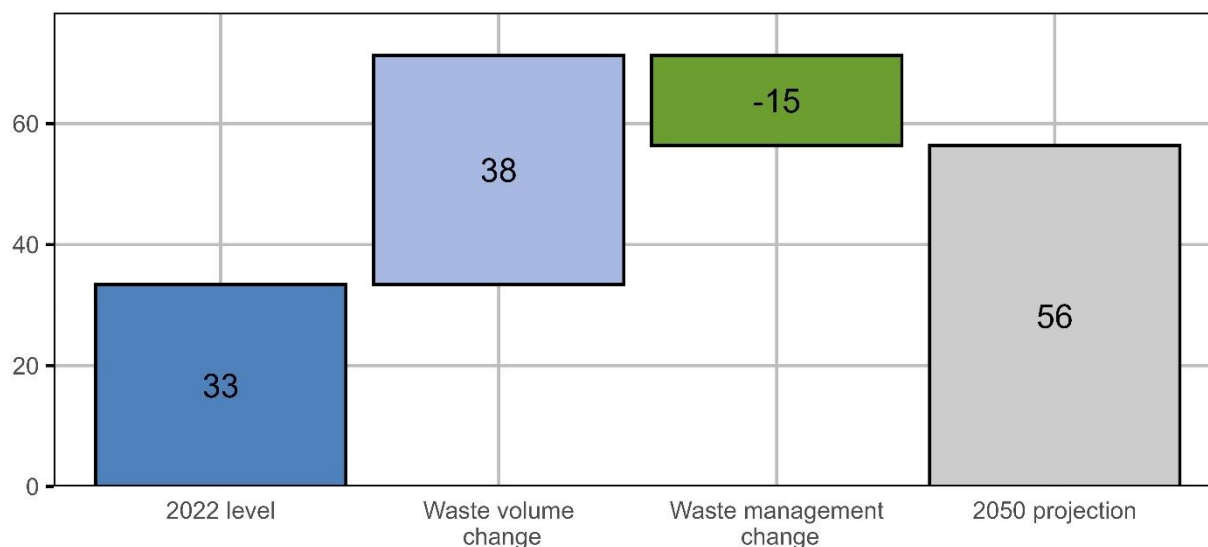
Source: OECD ENV-Linkages model.

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In contrast to recycling, the volume of mismanaged waste contains a trade-off between the amounts of total waste and the share of waste that is properly managed (collected and sorted) (Figure 4.15). The fast growth in plastic waste generation, which by 2050 contributes 38 Mt to the 2022 mismanaged waste level of 33 Mt, is only partially offset by the improvements in waste collection and sorting, which prevent 15 Mt of generated plastic waste from being mismanaged; thus, the total volume of mismanaged waste increases to 56 Mt by 2050.

Figure 4.15. The increase in mismanaged plastic waste is only partly offset by better waste management

Factors driving the increase in total mismanaged waste in Mt between 2022 and 2050, *Baseline* scenario



Notes: *Waste volume change* represents a hypothetical projection in which all management shares are assumed to be fixed at the 2022 level. Thus, plastic waste collected for recycling is assumed to grow at the same speed as total plastic waste.

Waste management change represents the change in the waste management shares; this reflects a balance between larger shares of waste being generated in emerging and developing economies and improved waste management systems in all countries.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/7it4hw>

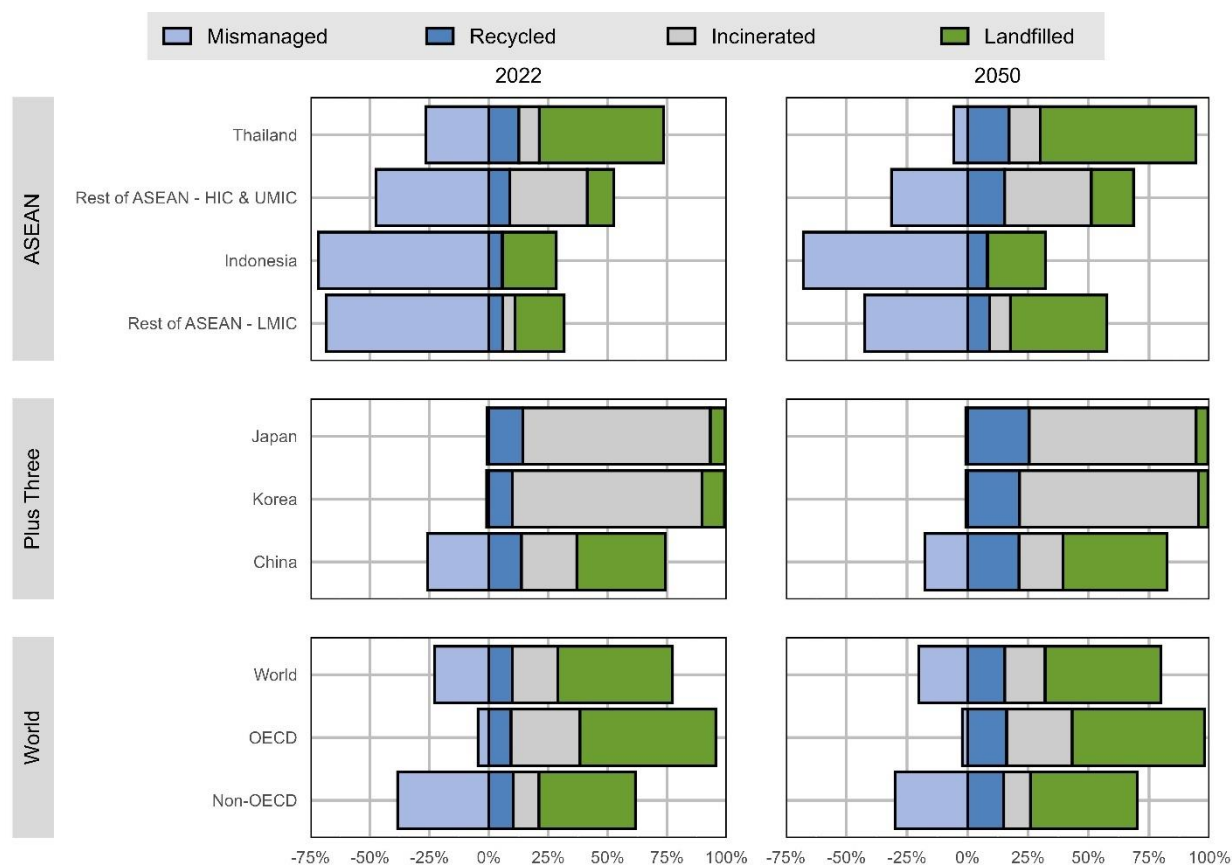
There are noticeable differences in waste management – and thus end-of-life fates – between countries in the APT region, reflecting past trends, countries' regulations and other related policies, as well as local circumstances. In line with the overall trends, recycling shares increase in all countries while mismanaged shares (insofar applicable) decrease (Figure 4.16). For instance, recycling is projected to rise steeply in the Plus Three countries (Japan, Korea and China), following strong policy commitments. The share of incineration is projected to decline in these countries, as countries move from incineration to recycling. In China, there is also a trend of increased landfilling to reduce the mismanaged waste share.

In most ASEAN countries, it is the share of landfilling that is projected to increase the most, reflecting the dominant effect of increased waste collection and sorting efforts; this growth comes on top of widely differing 2022 share though. Indonesia is an extreme case, with very high levels of mismanaged waste in 2022, reflecting the unique local circumstances (see Chapter 2). Thus, despite the improvements in waste management from current policies and income growth, the *Baseline* scenario projects a mismanaged share of plastic waste in Indonesia going from 72% in 2022 to 68% by 2050.⁵ The uncertainty level is very high for these projections. Landfilling in particular is very hard to estimate, as the distinction between sanitary and unsanitary landfilling, as well as the acceptability of new landfills, remains a large unknown.

The share of recycling is also projected to increase in all ASEAN countries, though remaining relatively limited in the lower middle-income countries, but more substantial in the high- and upper middle-income countries (which tend to have better developed recycling sectors). However, mismanaged waste remains a significant share of plastic waste in many ASEAN countries in the absence of new policies.

Figure 4.16. Mismanaged plastic waste rates remain high in ASEAN and China

Shares (%) of plastic waste in million tonnes (Mt) by waste management category, Baseline scenario



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

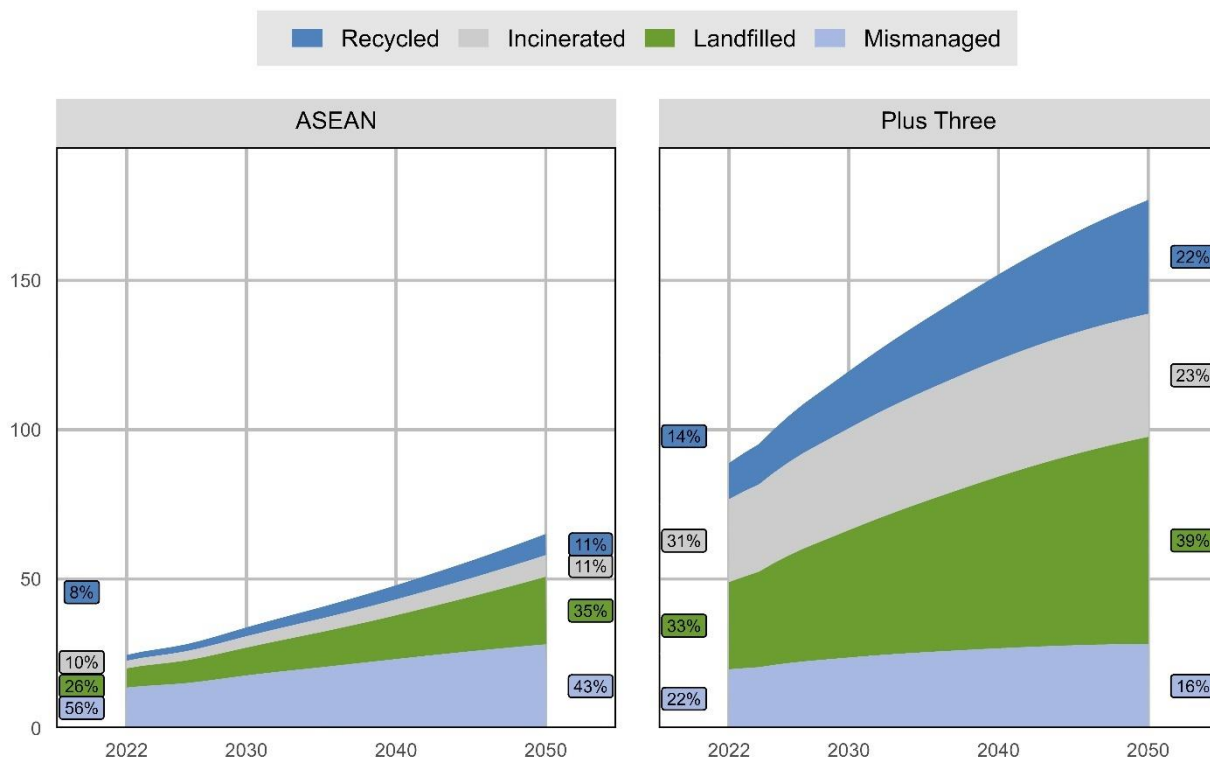
Source: OECD ENV-Linkages model.

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Finally, as the decomposition graphs (Figure 4.14 and Figure 4.15) show, total recycled plastic waste and total mismanaged plastic waste volumes as projected for the APT region combine the effects of improved waste management (Figure 4.16) with continued increase in waste volumes (Figure 4.13). The total volume of mismanaged waste therefore continues to rise in the ASEAN group of countries as well as in China (Figure 4.17).⁶ Total mismanaged waste in the ASEAN region is projected to grow from 14 Mt in 2022 to 28 Mt in 2050, and from 20 Mt to 28 Mt in China. With this increase comes a significant additional environmental burden, as shown in the next chapter.

Figure 4.17. Despite waste management improvements, less than one-quarter of plastic waste is projected to be recycled in 2050

Plastic waste by waste management category in million tonnes (Mt), *Baseline scenario*



Note: The numbers to the left and right show the share of each fate in 2022 and 2050 respectively.

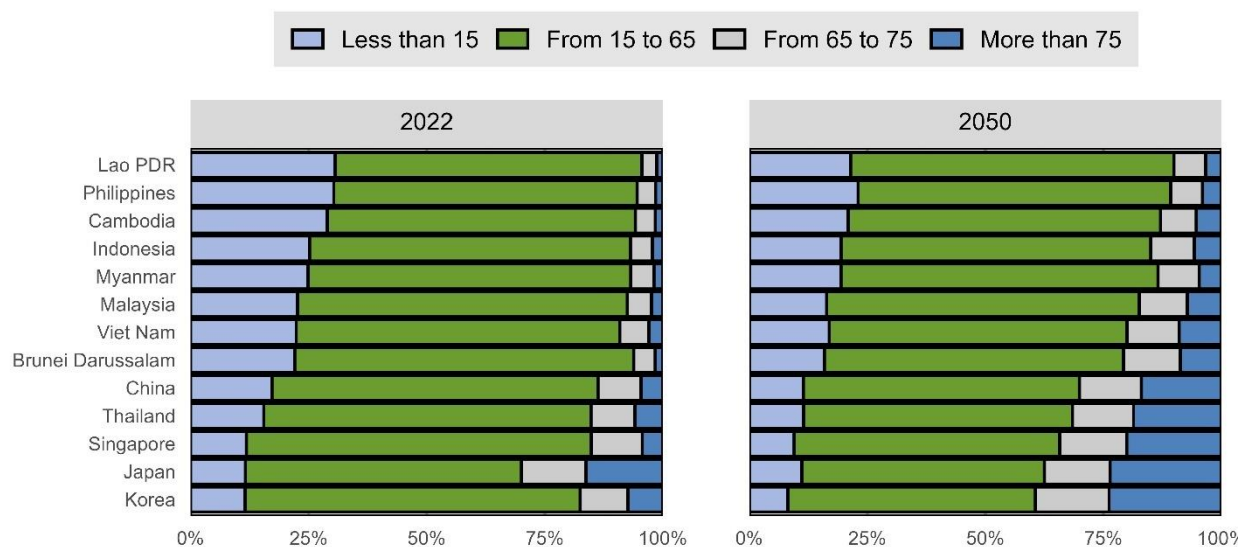
Source: OECD ENV-Linkages model.

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Annex 4.A. Detailed results on the *Baseline* projections

Annex Figure 4.A.1. The population in the APT region will be aging considerably in the coming decades

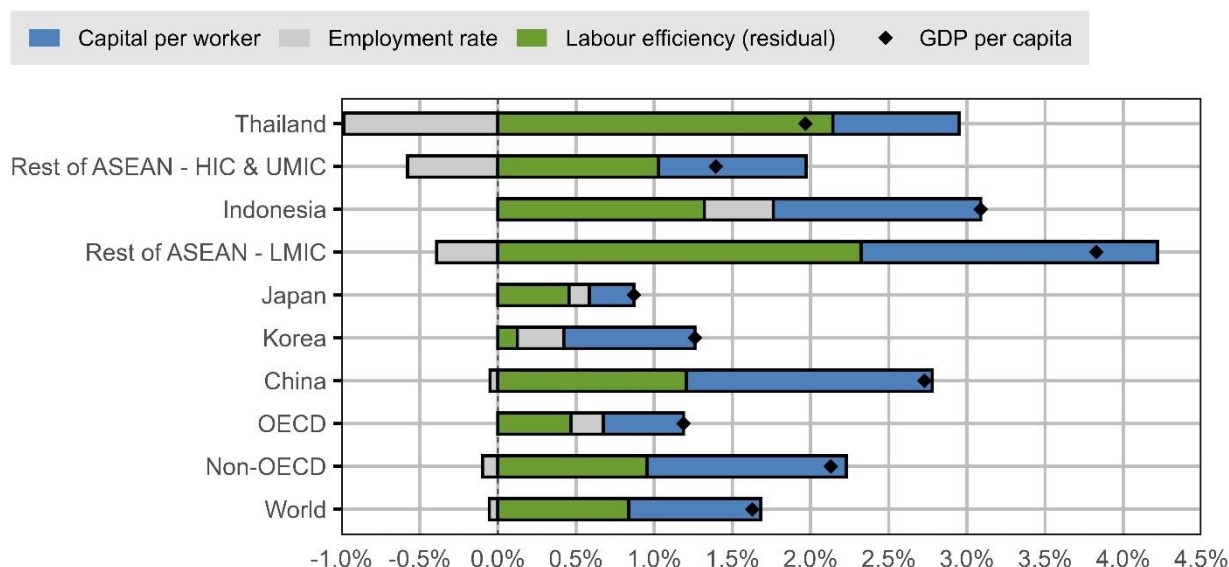
Share of population by age range.



Source: Authors' calculations based on The World Population Prospects: 2017 Revision (UN, 2017^[4]).

Annex Figure 4.A.2. The drivers of GDP per capita growth are heterogeneous

Contribution of each factor to growth between 2022 & 2050, all in percentage points.

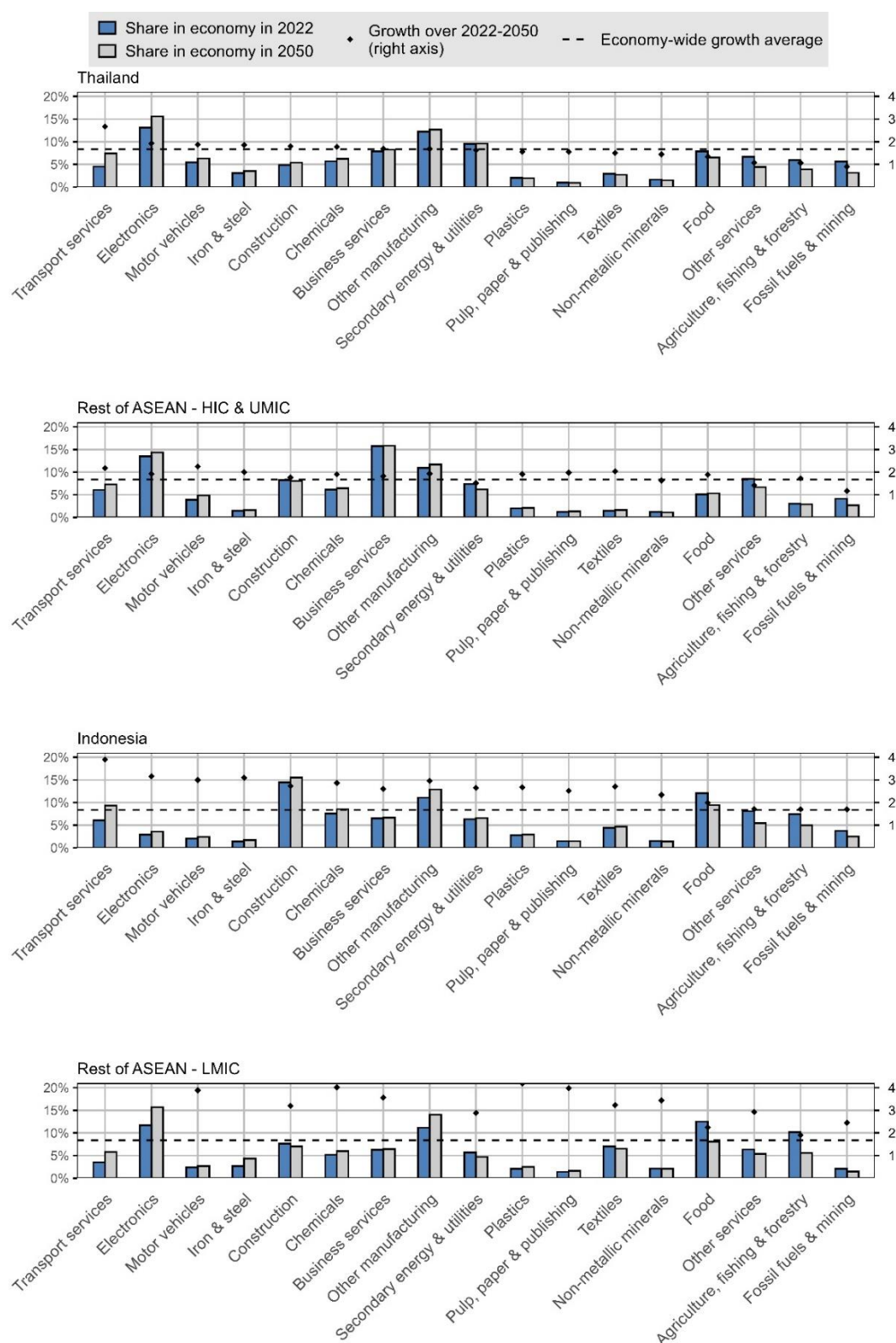


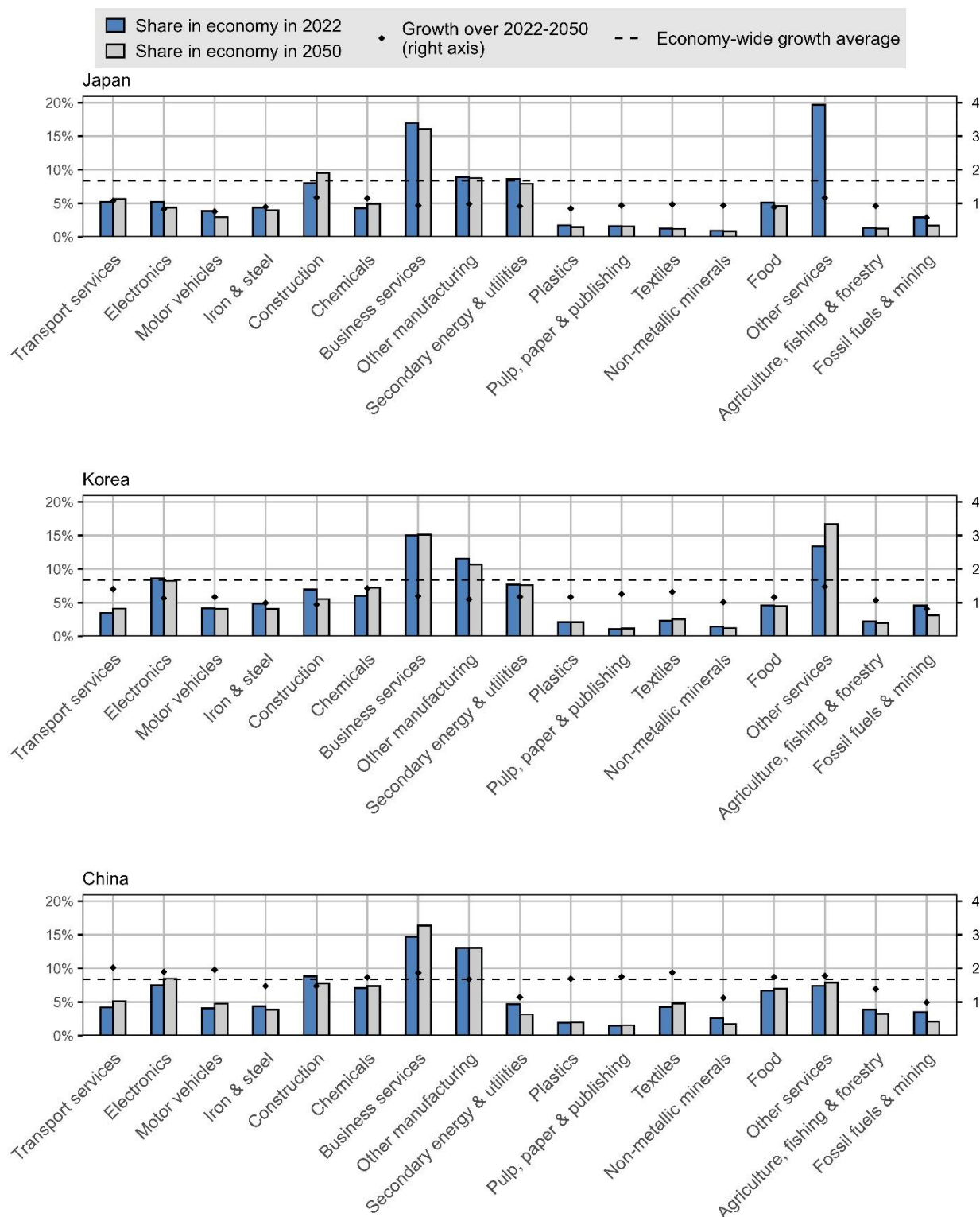
Note: The changes in the GDP per capita in market exchange rates (y) are decomposed in three components: (i) the change in employment rate (ER), (ii) the change in capital per worker (where capital is defined in a broad way including land and natural resources) (k), and, as a residual factor, (iii) the change in labour efficiency (A). Changes in GDP (in market exchange rates) can be decomposed as in the following formula: $\frac{\Delta y}{y} = \alpha \frac{\Delta A}{A} + (1 - \alpha) \frac{\Delta K}{K} + \frac{\Delta ER}{ER}$ where α is the share of labour income in GDP. The GDP per capita growth rate in market exchange rates differs from the one in PPP exchange rates as the weights of different countries in regional aggregates differ.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

Annex Figure 4.A.3. APT countries are shifting towards more service-oriented economies





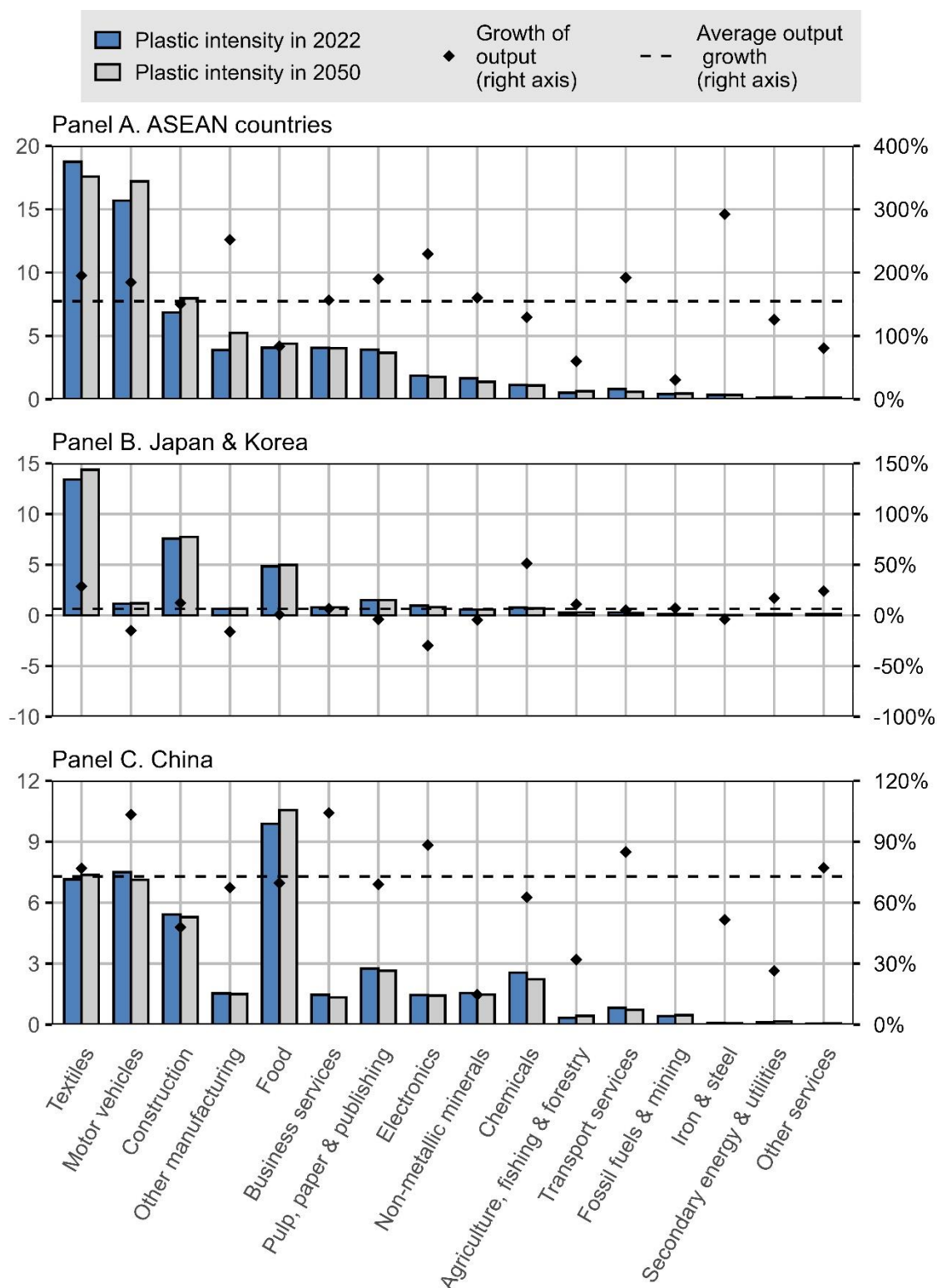
Note: Sorted by 2022-2050 sectoral output growth in Indonesia.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

Annex Figure 4.A.4. Some fast-growing sectors have a high plastic intensity

Plastic intensity in grams of plastics per unit of sectoral output in USD (g/USD) and sectoral growth



Note: sorted by plastic intensity in 2022 in ASEAN countries.

Source: OECD ENV-Linkages model.

Annex Table 4.A.1. Plastic waste per capita projections

Plastic waste by region in kilogrammes per capita (kg p.c.), *Baseline* scenario

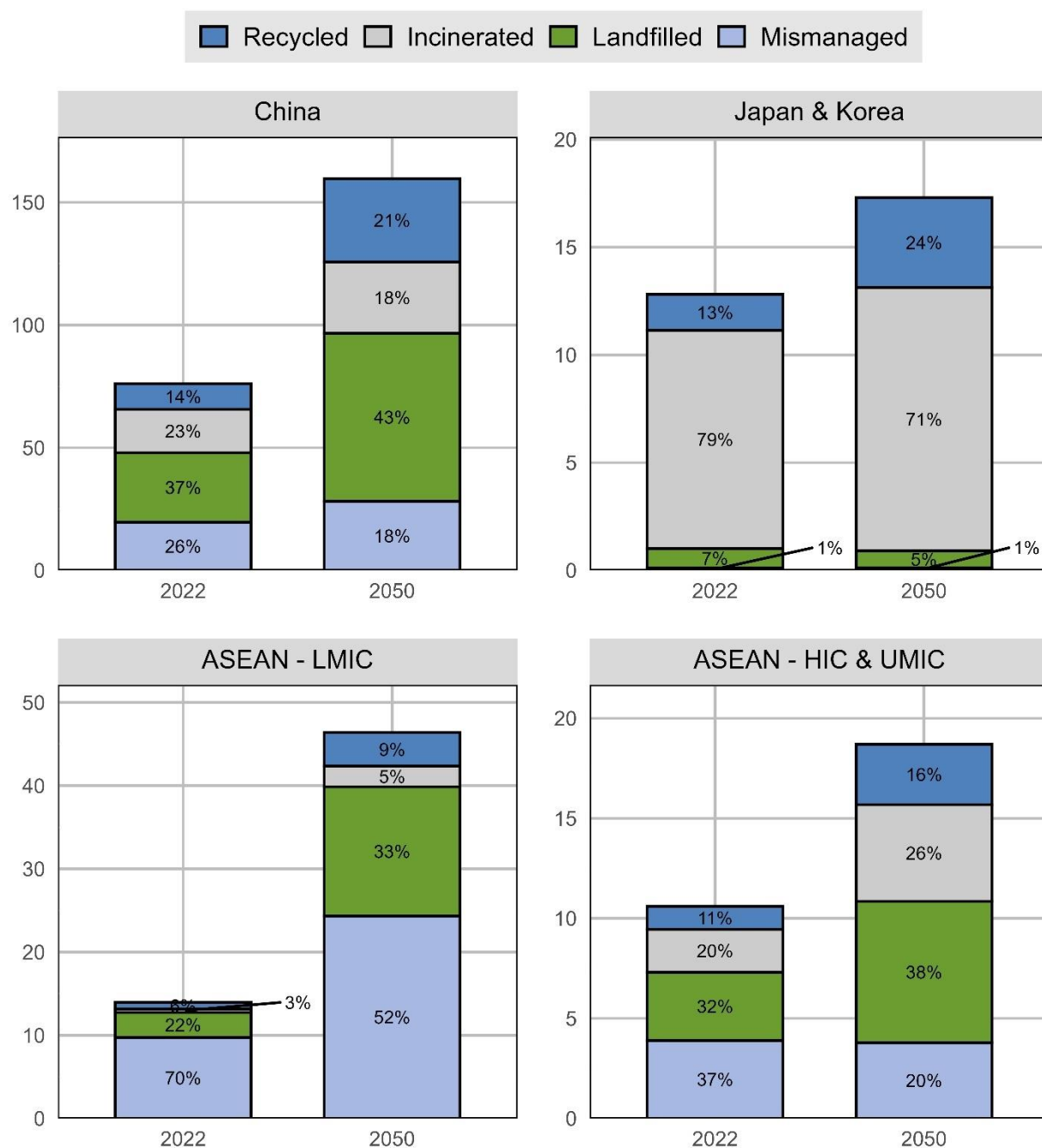
		2022	2050	Growth from 2022
Averages	World	50	83	1.6
	APT	50	108	2.2
	ASEAN	36	83	2.3
APT	Indonesia	24	58	2.5
	Rest of ASEAN - HIC & UMIC	128	221	1.1
	Thailand	76	120	1.6
	Rest of ASEAN - LMIC	25	79	3.1
	Japan	72	106	1.5
	Korea	73	136	1.9
	China	54	122	2.3

Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

Annex Figure 4.A.5. Increasing waste volumes combine with improved waste management to increase both recycled and mismanaged waste volumes

Plastic waste in Mt and shares (%) of plastic waste by waste management category, Baseline scenario



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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Notes

¹ Productivity growth is projected to be very small for Singapore, with a declining labour force and population; combined these imply virtually no income growth in the region between 2022 and 2050.

² These are based on a decomposition of the growth of plastics use between 2022 and 2050 based on the underlying drivers, see (OECD, 2022_[1]) for more details.

³ Waste estimates from the ENV-Linkages model include MSW as well as microbeads, waste from road markings and industrial waste, which includes waste from construction and transport activities.

⁴ One of the underlying assumptions discussed in detail in (OECD, 2022_[1]; OECD, 2022_[10]) is that the share of plastic waste collected for recycling keeps growing to 2050. Another important assumption is that countries with growing income invest in better waste collection and treatment as well as in improved litter clean-up, resulting in lower shares of total mismanaged waste (and in most cases more landfilling).

⁵ These numbers are aligned to earlier projections for Indonesia (cf. Chapter 2), but differ slightly due to re-allocation of imported plastic waste and collected and uncollected litter.

⁶ More detailed results are presented in Annex Figure 4.A.5 in Annex 4.A.

5

Projections of environmental impacts to 2050

This chapter quantifies the projected environmental consequences of the plastic lifecycle in the ASEAN Plus Three (APT) region through 2050, under current policies. It focuses on two main impact areas: leakage of plastics to the environment (including leakage to freshwater and oceans, accumulated aquatic pollution, and transboundary flows) and plastics-related greenhouse gas (GHG) emissions. The analysis shows that, despite the projected APT's declining share of global leakage, plastic pollution in the APT is projected to continue to increase. The chapter provides a breakdown of leakage pathways, identifying hotspots and flows across the APT.

Key insights

- Without additional policies, leakage of plastics in APT countries is projected to increase by 68%, from 8.4 Mt in 2022 to 14.1 Mt in 2050. Expected improvements in waste management systems are projected to help temper growth in leakage, but not enough to reverse current trends.
- As leakage is projected to grow even more rapidly in some other parts of the world (e.g. Sub-Saharan Africa), the contribution of the APT to global leakage is projected to slightly decline over time, from 38% in 2022 to 35% in 2050.
- Regional disparities within the APT drive diverging leakage trajectories. The ASEAN group of countries is projected to see a doubling of plastic leakage (from 3.5 Mt to 7.1 Mt by 2050), driven by strong growth in LMIC in particular. China is projected to remain the largest individual contributor to leakage, though with a declining relative share in the region.
- Under current policies, aquatic ecosystems are projected to be under growing pressure from plastic pollution. Annual plastic leakage into rivers, lakes and oceans is expected to increase from 3.0 Mt in 2022 to 5.1 Mt in 2050. The vast majority of plastics initially enter freshwater bodies, especially rivers, with significant shares rapidly sinking to river or lake beds (2.7 Mt in 2050) and another 1.9 Mt floating in rivers.
- The cumulative burden, including historical flows, is expected to be significant: by 2050, rivers and lakes are projected to hold 126 Mt of plastics, more than doubling the amounts estimated for 2022. Ocean accumulation is also projected to more than triple from 2022 levels, reaching an estimated 55 Mt by 2050.
- Rivers and ocean currents transport leaked plastics across countries and regions, with lower middle-income ASEAN countries receiving the highest share of leaked plastics travelling to their coastlines. High- and upper middle-income ASEAN countries and China are important sources of these flows. These patterns are projected to persist through 2050, highlighting the urgency of regional co-operation and shared ambition.
- Greenhouse gas (GHG) emissions from the plastic lifecycle are projected to almost double for APT countries, increasing from 0.6 GtCO₂e in 2022 to over 1.0 GtCO₂e in 2050, mainly driven by continued demand for primary plastic production.

5.1. Introduction

Chapter 4 comprehensively assessed projected trends in plastics use, waste generation and end-of-life fates in the ASEAN Plus Three (APT) region through 2050, under current policies (*Baseline* scenario). This Chapter complements the analysis by providing an overview of environmental impacts under current policies, including projections for plastic leakage to the environment, implications for aquatic pollution (including leakage to freshwater and oceans, accumulated aquatic pollution, and transboundary flows), as well as plastics-related GHG emissions.

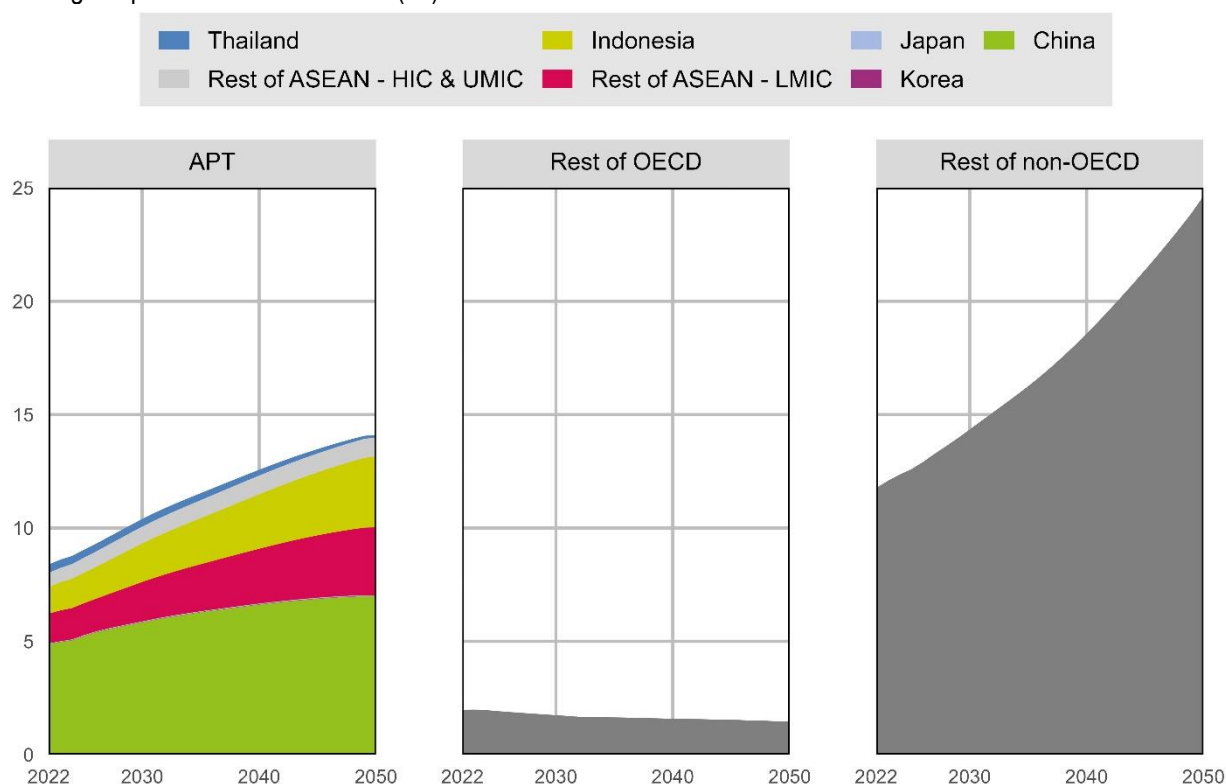
5.2. The APT is projected to remain a hotspot for plastic leakage to the environment under current policies, despite some progress

Under current policies, the APT region is projected to remain an important source of plastic leakage to the environment. Figure 5.1 presents this evolution for the 2022-2050 period. The leakage of plastics to the environment in APT countries is projected to increase by 68%, from 8.4 Mt in 2022 to 14.1 Mt in 2050. While this is a substantial increase, it is significantly smaller than the expected doubling in waste generation (from 113 Mt to 242 Mt), reflecting some progress in waste management (see Chapter 4 for a discussion on expected improvements in waste management under current policies). As a result, the share of the APT in global leakage is expected to decrease slightly, from 38% to 35% during the same period (while their share in the global population is projected to decrease from 29% to 24%).¹

Trajectories of plastic leakage vary sharply across APT countries. Leakage in ASEAN is projected to double, from 3.5 Mt in 2022 to 7.1 Mt in 2050. This is driven in particular by growth in lower middle-income ASEAN countries (Indonesia and Rest of ASEAN – LMIC), where leakage is projected to more than double (from 1.8 Mt in 2022 to 4.0 Mt in 2050). Leakage is projected to slow down in Thailand by 69% (from 0.37 Mt in 2022 to 0.11 Mt in 2050) thanks to improvements in waste management, but to increase in the rest of high- and upper middle-income ASEAN countries (Rest of ASEAN – HIC & UMIC) by 34% (from 0.6 Mt in 2022 to 0.8 Mt in 2050). In China, the leakage of plastics would continue to increase, from 4.9 Mt in 2022 to 7.0 Mt in 2050, but at a pace slower than economic growth. The plastic leakage of Japan and Korea is projected to remain low, below 0.03 Mt annually, reflecting mature waste management systems.²

Figure 5.1. The APT share in global plastic leakage is projected to decline, but still exceed one-third by 2050

Leakage of plastics in million tonnes (Mt).



Notes: The APT grouping includes 11 non-OECD countries and two OECD countries (Japan and Korea). "Rest of OECD" includes 36 of 38 OECD countries (excluding Japan and Korea). "Rest of non-OECD" includes all other countries.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model, adapted from (OECD, 2022^[1]).

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5.3. Aquatic stocks are projected to triple by 2050, with the fastest growth in ASEAN

While plastic leakage contributes to pollution in all environmental media, implications for aquatic environments are of particular interest due to the high potential for environmental and economic damages in the APT region.

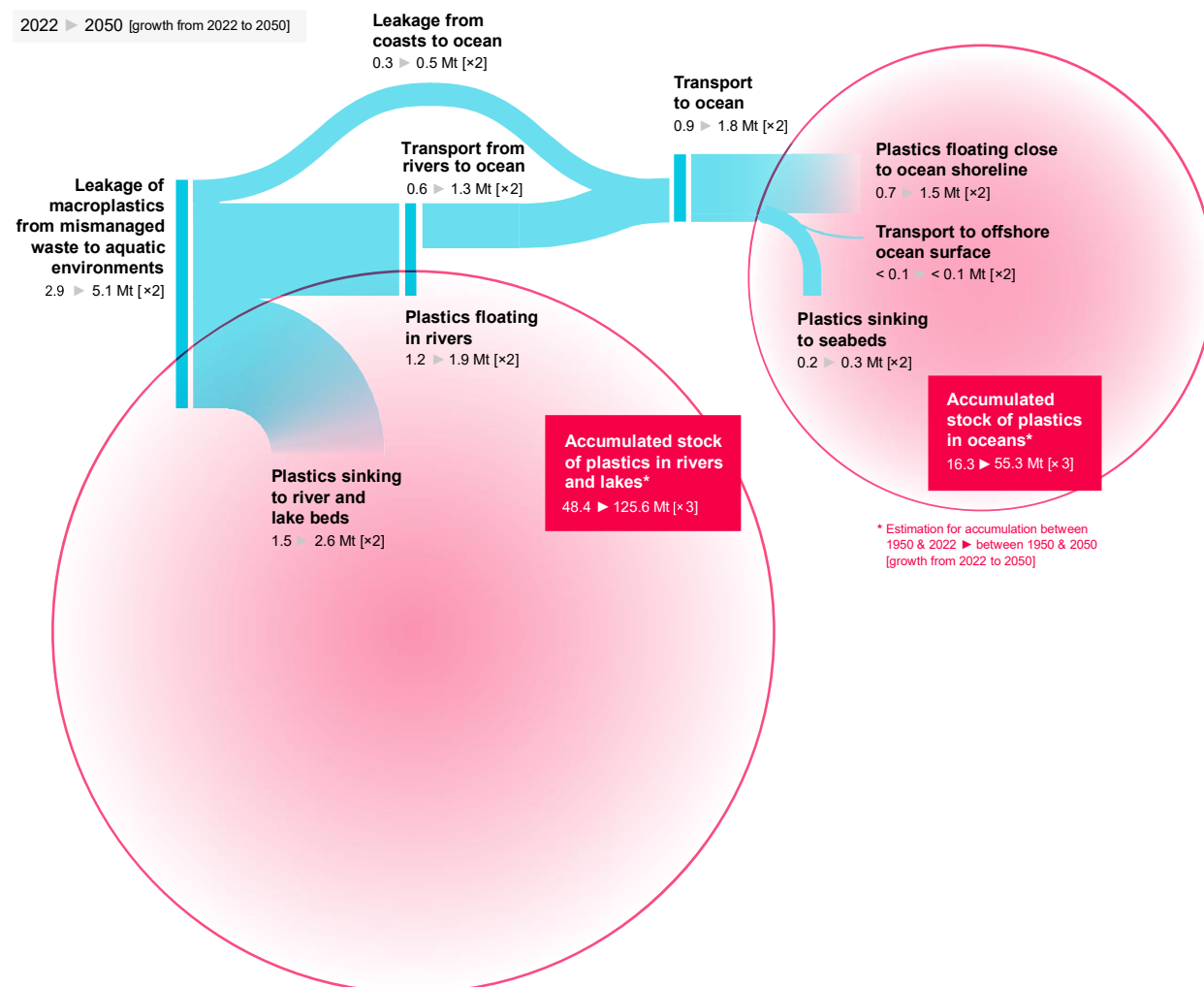
Aquatic ecosystems in the APT are under growing pressure from plastic pollution (see Chapter 2): without urgent action, the flow of plastics to rivers, lakes and oceans will continue to rise, amplifying long-term risks to biodiversity, fisheries, ocean-based economies, livelihoods and human wellbeing. As shown in Figure 5.2, annual leakage of plastics to aquatic environments from the APT is expected to increase from 2.9 Mt in 2022 to 5.1 Mt in 2050³, despite a slight reduction in the share of the APT in global aquatic leakage (in line with expected trends for overall leakage to the environment).

Similarly to 2022 dynamics, one-half of plastics entering aquatic environments (5.1 Mt) rapidly sink to the bottom of rivers and lakes, 1.9 Mt is expected to remain floating in rivers, and the rest to enter oceans (of which 1.3 Mt from rivers), in 2050. The cumulative burden, including historical flows, is expected to be

significant: by 2050, rivers and lakes are projected to hold 126 Mt of plastics, more than doubling the amounts estimated for 2022. Ocean accumulation is also projected to more than triple from 2022 levels, reaching an estimated 55 Mt by 2050. There are long delays from leakage to the final accumulation of stocks, especially in oceans. Thus, even if leakage slows down, aquatic flows remain high and ocean accumulation will continue to increase for a long time.

Figure 5.2. The majority of leakage to aquatic environments is to freshwaters, and over time sinks to river beds or contributes to ocean pollution

Plastic leakage to aquatic environments in the APT region in million tonnes (Mt), *Baseline scenario*



Source: Adapted from (Borrelle et al., 2020^[2]; Meijer et al., 2021^[3]), based on OECD ENV-Linkages model.

All APT countries contribute to aquatic leakage and pollution, but at different scales and speeds.⁴ China is projected to remain the largest contributor, accounting for roughly one-half of total annual flows, due to its size, high plastic intensity of economic activity, significant volumes of total leakage of plastics to the environment, and its geographies (with several major rivers). The fastest growth in aquatic plastic flows is expected in ASEAN (as described in Annex Figure 5.A.1), amplifying pollution in freshwaters and oceans and the associated risks. Plastics leaking from ASEAN to aquatic environments annually are expected to double from 1.4 Mt in 2022 to 2.8 Mt in 2050. The fastest growth is projected in particular in ASEAN LMIC (Indonesia and Rest of ASEAN – LMIC). In contrast, in Japan and Korea levels of mismanaged plastic

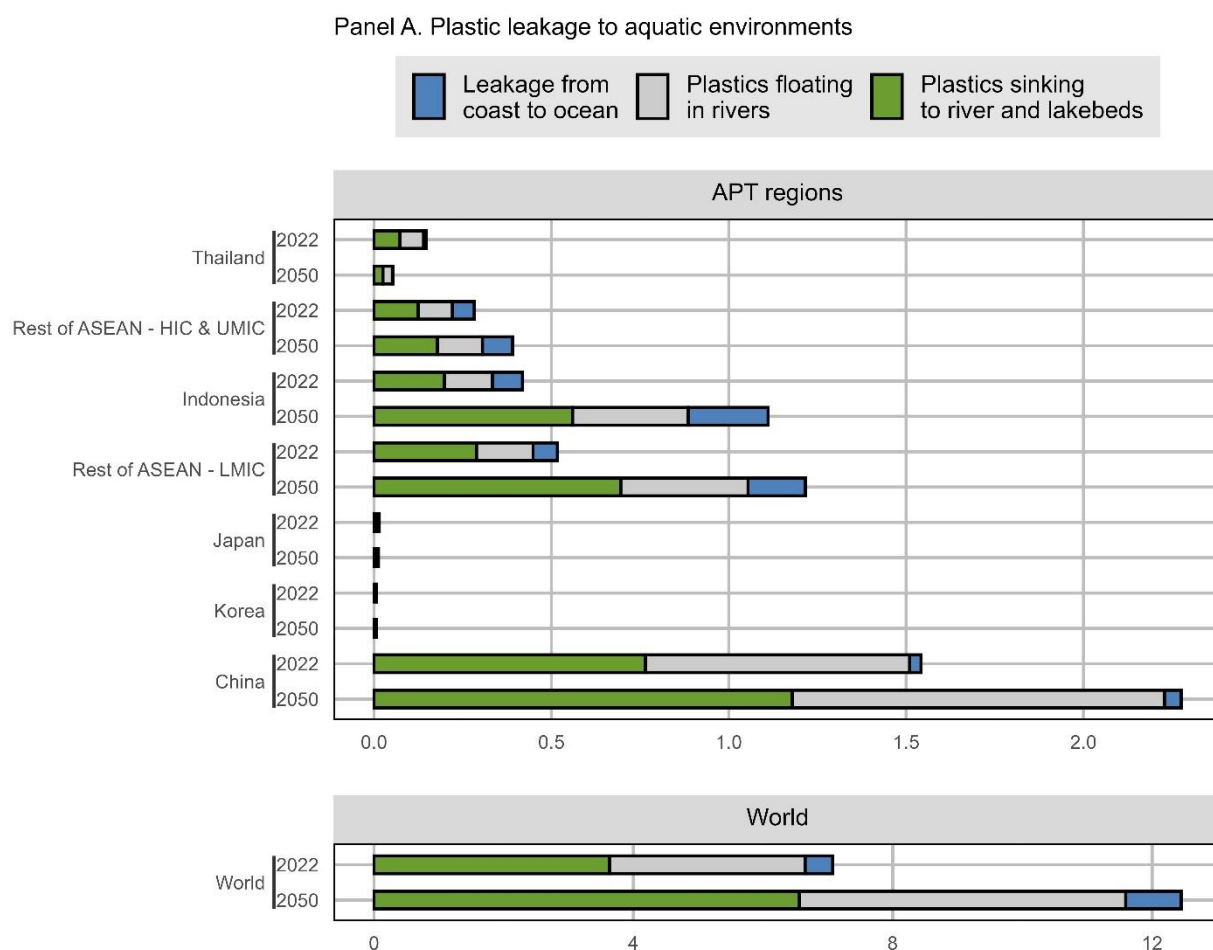
waste and aquatic plastic leakage are projected to remain at low levels (contributing less than 1% of the APT total in both 2022 and 2050).

Geographical features influence where and when plastics enter aquatic environments, as described in Figure 5.3. Freshwaters, and in particular rivers, represent the major first point of entry for plastics in aquatic environments across countries. However, In Indonesia and other ASEAN countries with extensive shorelines, a higher proportion of plastics enters oceans directly from the coasts, compared to rest of the APT (or the rest of the world). In contrast, in China, by 2050 only 19% (18.0 Mt) of total plastic leakage is projected to accumulate in the ocean, with the rest in rivers and lakes. These differences shape not only pollution patterns but also the feasibility of recovery and the choice of effective points of intervention for remediation efforts.

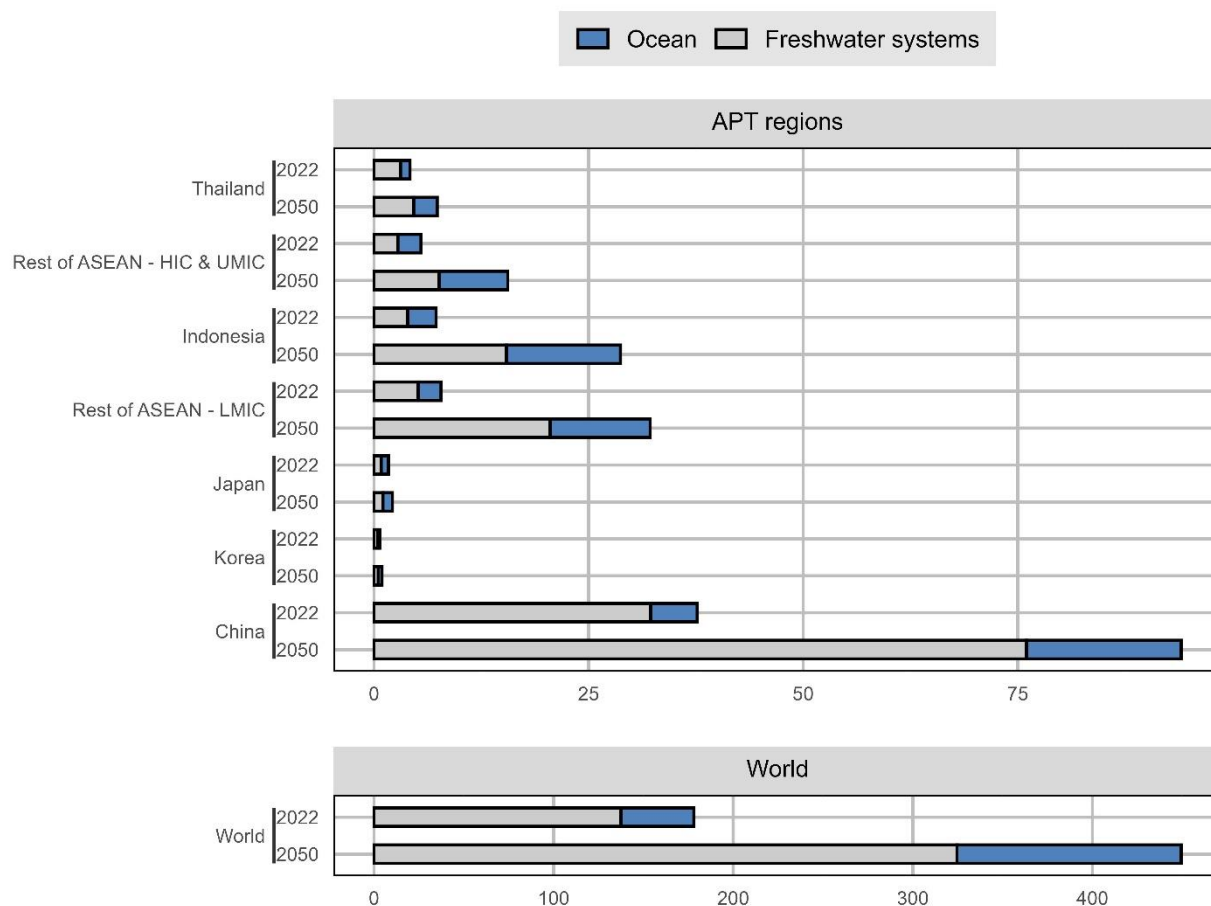
The accumulation of plastics in aquatic systems is compounding. Including historical leakage to aquatic environments, water bodies in the APT are projected to hold a total of 180.9 Mt of plastics by 2050, representing 40% of the global total stock in freshwaters and oceans. Focusing on ASEAN specifically, about 48.1 Mt of plastics are projected to accumulate in rivers and lakes by 2050, while plastics in oceans in ASEAN would increase four-fold, reaching 35.7 Mt in 2050 (from 9.8 Mt in 2022; including due to leakage that occurred in neighbouring countries and regions, as discussed further below).

Figure 5.3. Rivers remain the main point of entry for plastic leakage and the main channel for plastic to reach the ocean, but there are differences across the APT

Values in million tonnes (Mt) by region of origin for the *Baseline* scenario.



Panel B. Plastic leakage accumulated in aquatic environments



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: Adapted from (Borrelle et al., 2020^[2]; Meijer et al., 2021^[3]), based on OECD ENV-Linkages model.

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While the absolute values of plastic leakage are important to measure environmental impacts, the intensity of leakage (per capita and per GDP) are also helpful indicators to be able to compare across countries, isolating trends in leakage from demographic and economic growth. Table 5.1 presents both metrics for 2022 and 2050. While China is by far the largest source of leakage, it is not the most intensive either in per capita terms or per unit of GDP output. The highest intensity in aquatic leakage is in Rest of Asia – LIC, followed by Rest of Asia – HIC & UMIC.

Per capita aquatic leakage levels are projected to keep increasing overall, faster than the global average. The country projections tell a more nuanced story. While per capita leakage grows for China and ASEAN countries, Thailand stands as an exception, which stems from the improvement in waste mismanagement rates (see Chapter 4). In contrast, the intensity per GDP shows a net decrease, which brings the region close to the current global average, as GDP grows much faster than leakage (and population).

Table 5.1. Plastics use per capita and plastic intensity

Countries	Per capita aquatic leakage (kg/cap)		Per GDP aquatic leakage (t/k\$ in PPP)		GDP per capita (k\$ in PPP/cap)	
	2022	2050	2022	2050	2022	2050
Thailand	2.0	0.8	119	27	17.1	29.6
Rest of ASEAN – HIC & UMIC	7.0	8.2	180	142	39.0	57.5
Indonesia	1.5	3.5	117	115	13.1	30.6
Rest of ASEAN – LMIC	1.8	3.4	221	149	8.0	22.8
Japan	0.1	0.1	3	2	41.4	52.8
Korea	0.1	0.1	3	2	42.1	59.8
China	1.1	1.7	56	42	19.3	41.0
APT average	1.3	2.3	67	60	19.1	37.6
Global average	0.9	1.3	52	48	17.6	27.6

Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: Adapted from (Borrelle et al., 2020^[2]; Meijer et al., 2021^[3]), based on OECD ENV-Linkages model.

5.4. Plastics cross borders, leading to transboundary impacts

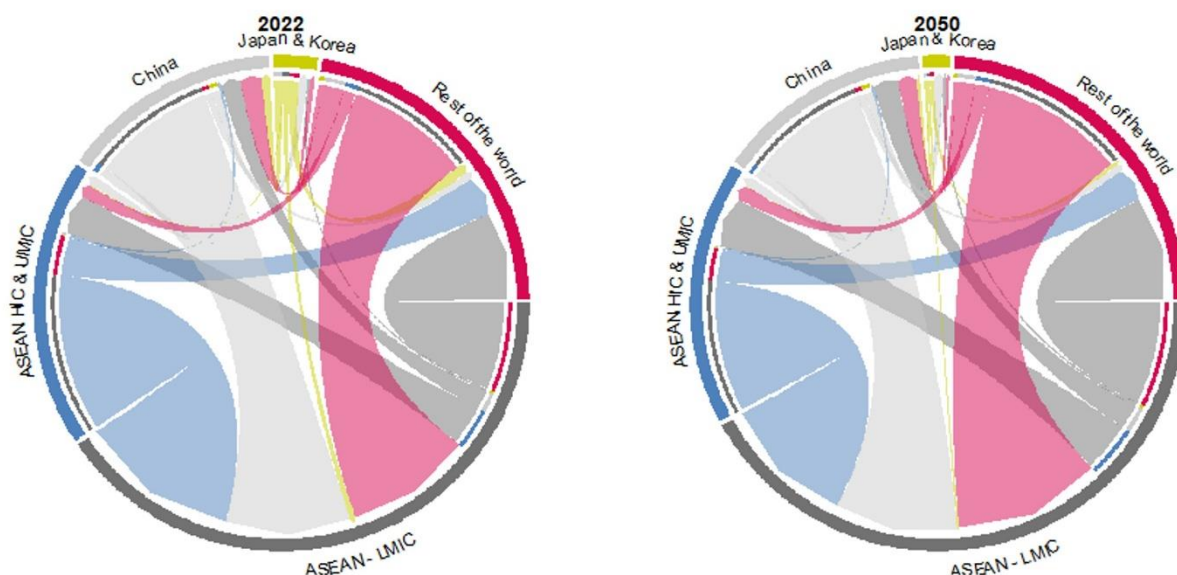
Plastic pollution is transboundary in nature; for instance, plastic leakage to freshwaters and oceans originating in one country can travel across borders to neighbouring countries and regions. Once in coastal waters, plastics can be transported across vast distances by ocean currents, washing up on the shores of other countries, often far from the source, as shown in Figure 5.4.

Lower middle-income countries are the largest recipients of plastic leakage originating in other countries. For instance, more than half of the plastics leaked from the coasts of China and high- and upper middle-income ASEAN countries are estimated to reach ASEAN LMIC shores, and this trend is projected to remain constant through 2050. Indonesia, already struggling with domestic plastic leakage, is a major recipient of plastic waste from foreign coasts, especially from neighbouring ASEAN countries (ASEAN – HIC & UMIC). The high flows from other countries to the ASEAN LMIC contrasts with the smaller flows of plastic originating in the coasts of these countries that is transported to other APT countries (although ASEAN LMIC do contribute to flows of plastics to the coasts of the rest of the world). These dynamics are expected to persist through 2050.

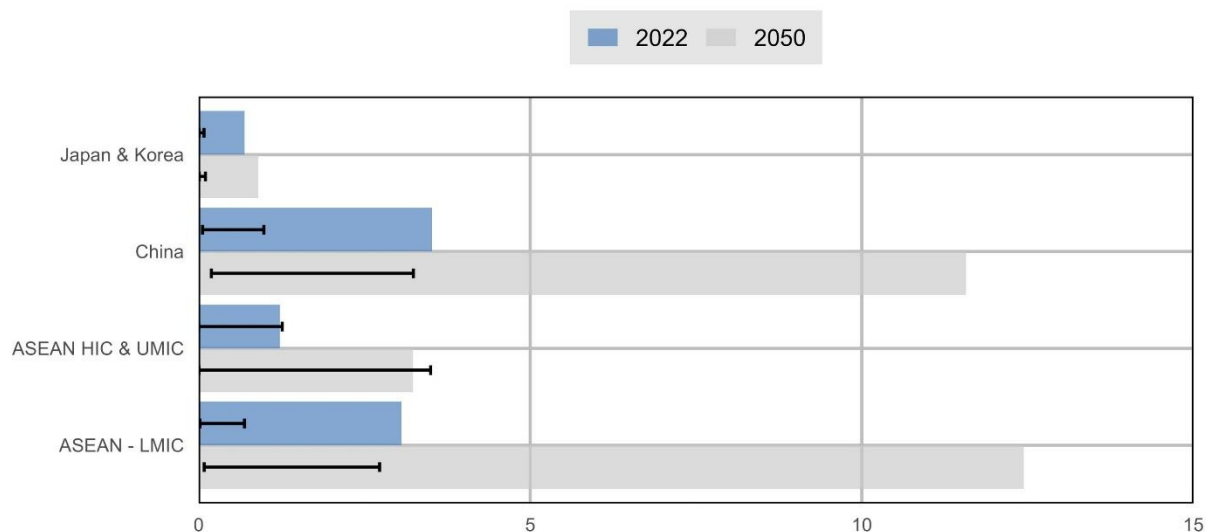
Figure 5.4. Lower middle-income countries receive the highest share of leaked plastics travelling through the coastlines

Plastic leakage traveling between countries in million tonnes (Mt) in 2022, *Baseline* scenario

Panel A. International Flows (flows are coloured by country of origin)



Panel B. Intra-regional (domestic) flows within regions



Note: Panel A excludes intra-regional flows. The value indicated by the bars in Panel B shows the domestic flow of plastic leakage—that is, the plastic leakage emitted and received within the same region. Meanwhile, the intervals in each region show the maximum and minimum values of international flows (traveling to different regions) of plastic leakage emitted by each region. These serve to compare how large the domestic flows are in relation to the international flows. For example, in Japan & Korea, the flows of plastic leakage to other regions are minimal compared to the flows that stay within the same region.

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

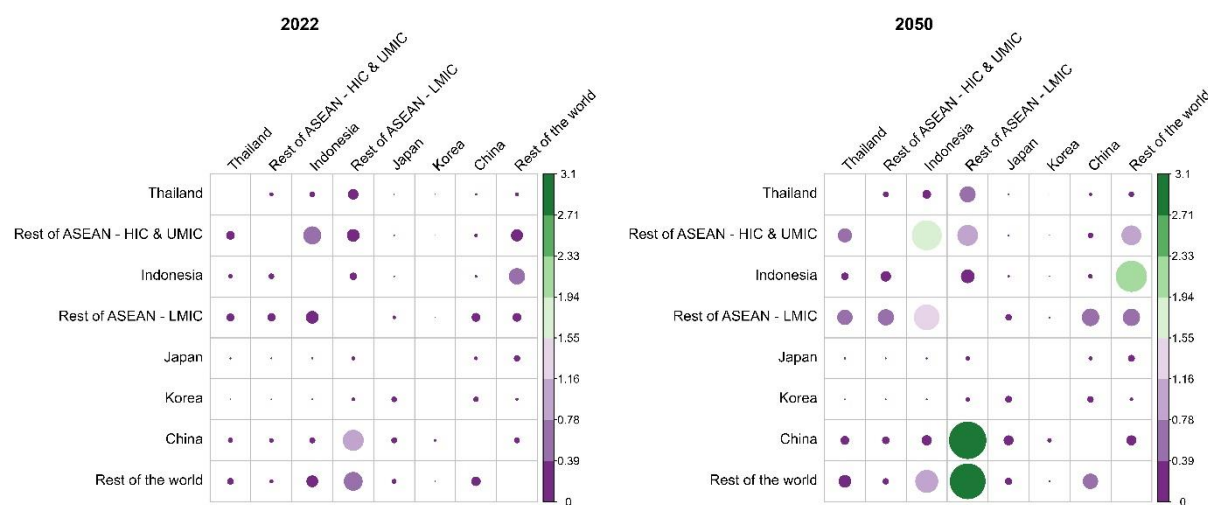
Source: Adapted from (Borrelle et al., 2020^[2]), (Meijer et al., 2021^[3]) and (Chassignet, Xu and Zavala-Romero, 2021^[4]), based on OECD ENV-Linkages model.

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In the absence of additional policies, the accumulation of plastics in coastal areas is projected to rise steadily by 2050 (Figure 5.5). This increase is particularly pronounced for flows reaching the coasts of the rest of ASEAN - LMIC from China and the rest of the world, or from ASEAN – HIC & UMIC to Indonesia. This highlights an environmental justice issue: the countries least equipped to manage the impacts are bearing the greatest burden.

Figure 5.5. Significant volumes of plastic leakage are transported from China and countries outside the APT to the lower middle-income ASEAN countries

Plastic leakage traveling between countries in million tonnes (Mt), *Baseline scenario*



Note: The table reads from line (emitting region) to column (receiving region). Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

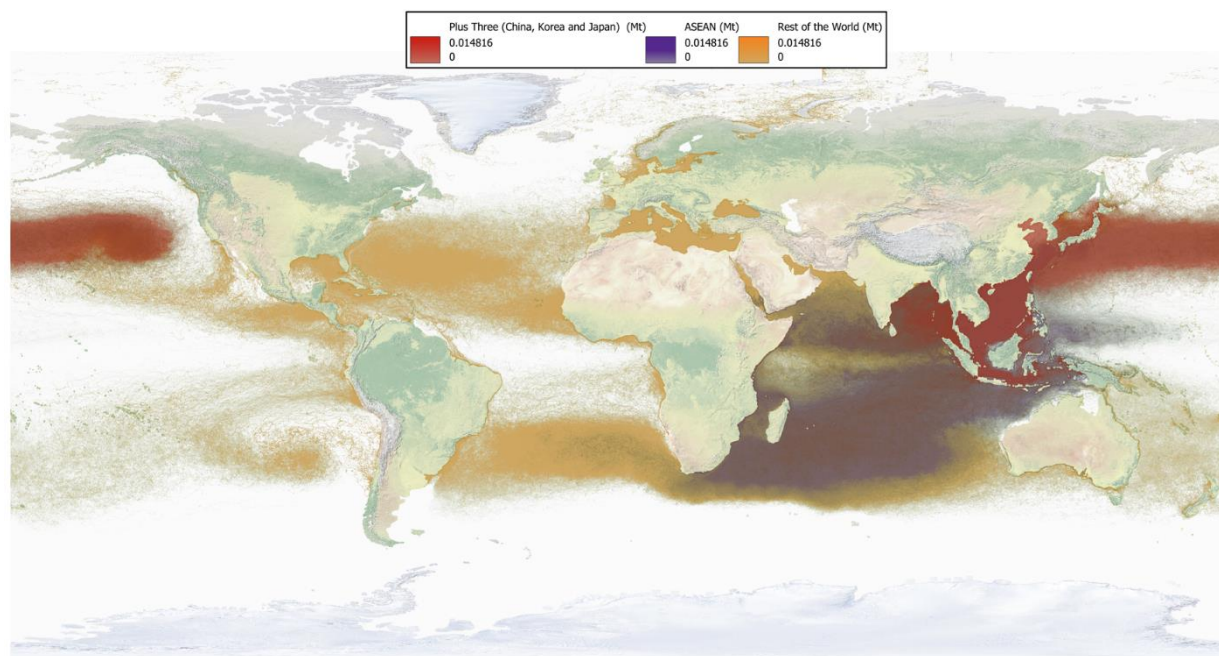
Source: Adapted from (Borrelle et al., 2020^[2]), (Meijer et al., 2021^[3]) and (Chassignet, Xu and Zavala-Romero, 2021^[4]), based on OECD ENV-Linkages model.

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The international transport of plastic leakage reaches many oceans and countries in the world, and the lower middle-income countries seem particularly at risk within the APT region. Figure 5.6 presents the international transport of aquatic leakage. The flows of plastic leakage travel significantly between countries. The flows from ASEAN countries (in purple) reach not only ASEAN countries (mostly received in lower middle-income countries as seen in Figure 5.5) but many countries on the coast of the Indian Ocean, especially on the Southeastern coast of Africa. The flows of the Plus Three countries (in red, predominantly from China) reaches many a coast in ASEAN countries (again mostly received in lower middle-income countries as seen in Figure 5.5), but a large band extends across the Pacific Ocean (which would spread wider in time). Finally, the flows from the Rest of the world travel widely in all the oceans on the globe, ubiquitous in all the oceans and reaching many coasts, including the ASEAN and Plus Three countries (again mostly received in lower middle-income countries as seen in Figure 5.5).

Figure 5.6. Visualisation of international transport of plastic leakage for 2050

International transport of plastic leakage



Note: The map shows where travel distances and concentrations for each location of plastics over a 5-year period, originating from ASEAN countries in purple, Plus Three countries in red and the Rest of the world in orange.

Source: Adapted from (Lebreton, Egger and Slat, 2019^[5]), based on OECD ENV-Linkages model.

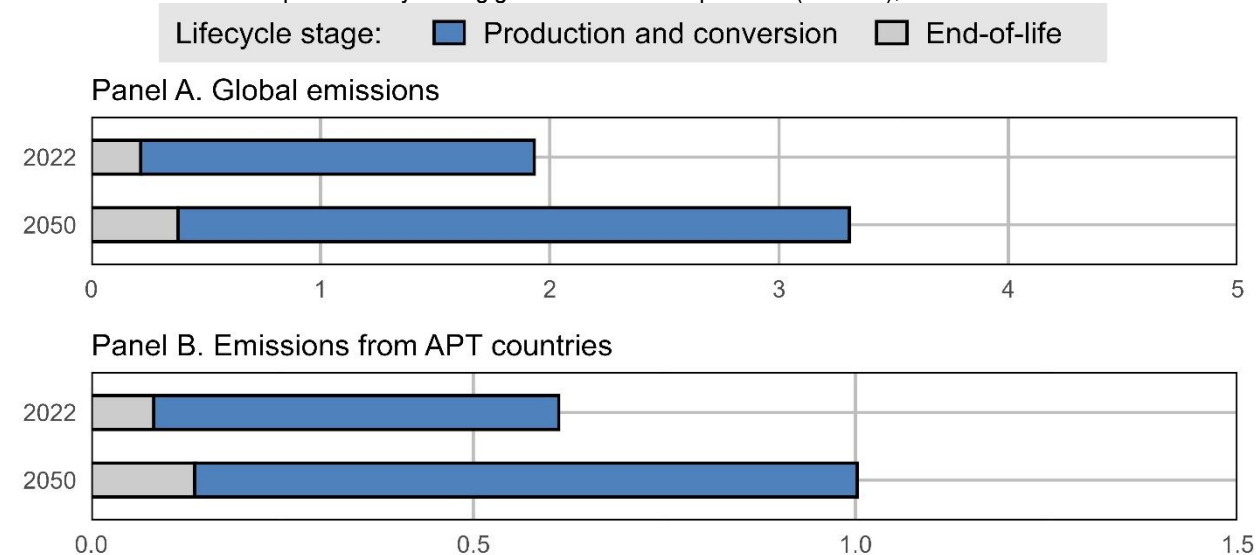
5.5. Greenhouse gas emissions for the plastic lifecycle are projected to double

Under current policies, GHG emissions from the plastic lifecycle are projected to nearly double in APT countries, from 0.6 Gt CO₂e in 2022 to over 1.0 Gt CO₂e in 2050.⁵ This is aligned with projections for the global level. This increase is mainly driven by continued increases in primary plastic production, as well as improved waste collection and management. In comparison, global emissions are projected to increase slightly faster in the same time period from 1.9 to 3.3 Gt CO₂e. Figure 5.7 show that the share of production and conversion, and end-of-life stages seem to remain roughly constant over time and are similar for APT countries and globally (with the caveat of the unavailability of data at local level).

Total GHG emissions are projected to keep growing in the *Baseline* scenario in APT countries from 18 GtCO₂e to 20 GtCO₂e (with a fall in the global share from 36% in 2022 to 30% in 2050, as shown in Annex Figure 5.A.3). As a consequence, the share of plastics in APT GHG emissions soars from 3% in 2022 to 5% in 2050. This growth in the plastic share in GHG emissions is of the same order of magnitude as the global one shown in (OECD, 2022^[1]), showing that while global efforts are slowing down the growth in GHG emissions, plastics remain a fast growing source.

Figure 5.7. GHG emissions from the lifecycle of plastics are projected to almost double by 2050

GHG emissions from the plastic lifecycle in gigatonnes of CO₂ equivalent (GtCO₂e), *Baseline scenario*



Note: End-of-life includes recycling, incineration, landfilling and mismanaged waste.

Source: OECD ENV-Linkages model.

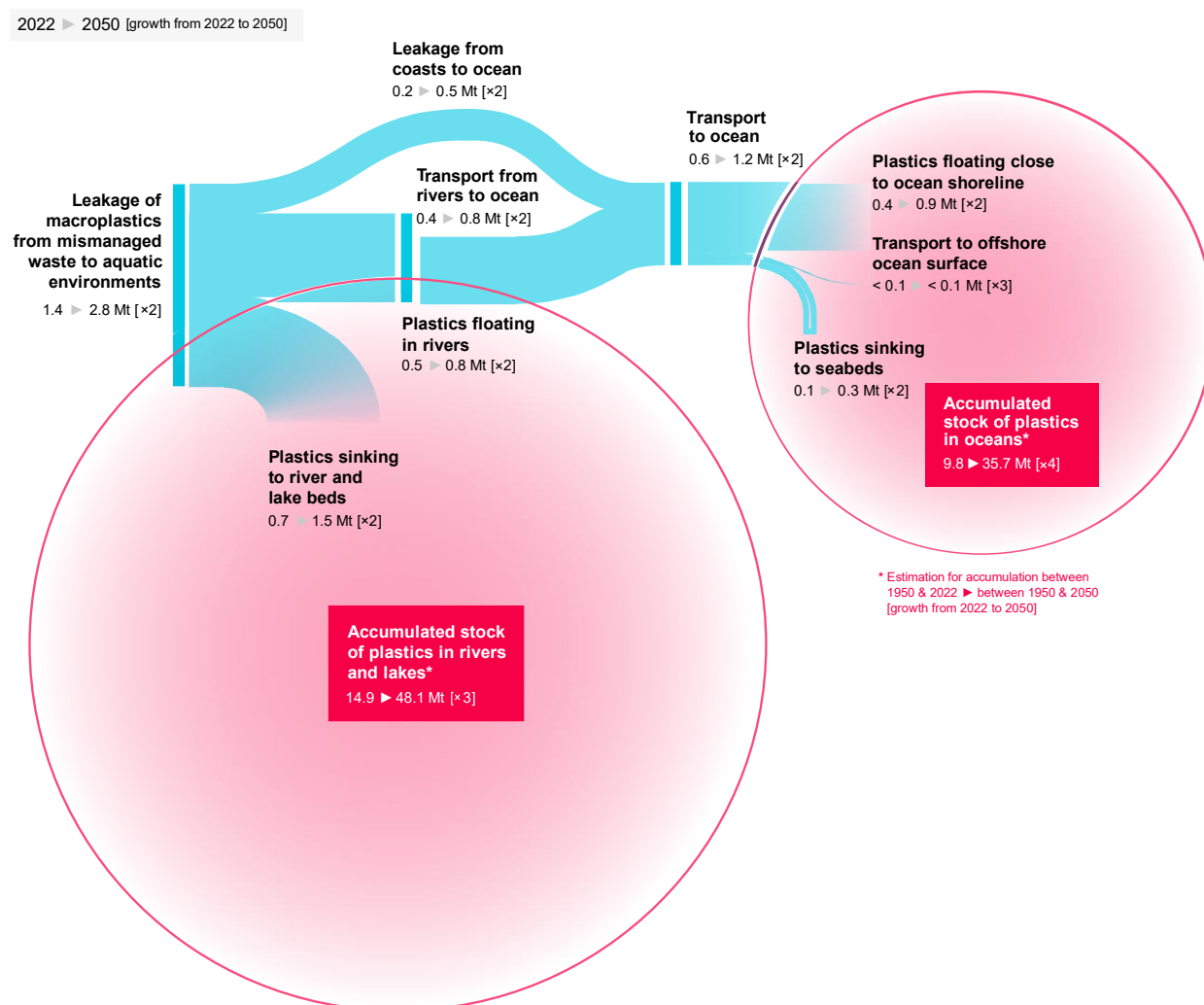
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Annex 5.A. Detailed results

Aquatic leakage

Annex Figure 5.A.1. The flows of plastics into rivers and lakes in ASEAN is substantially larger than outflows to the ocean

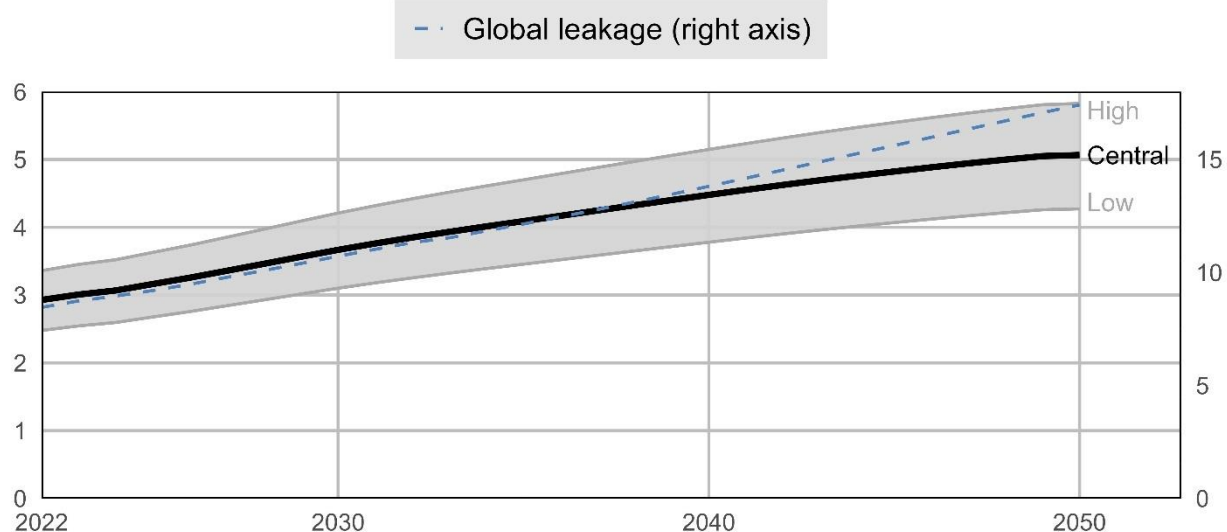
Plastic leakage to aquatic environments in the ASEAN region in million tonnes (Mt), *Baseline* scenario



Source: OECD ENV-Linkages model, based on (Lebreton, Egger and Slat, 2019^[5]).

Annex Figure 5.A.2. Plastic leakage to aquatic environments in APT countries is projected to double by 2050

(Macro)plastic leakage to aquatic environments in million tonnes per year (Mt), *Baseline scenario*



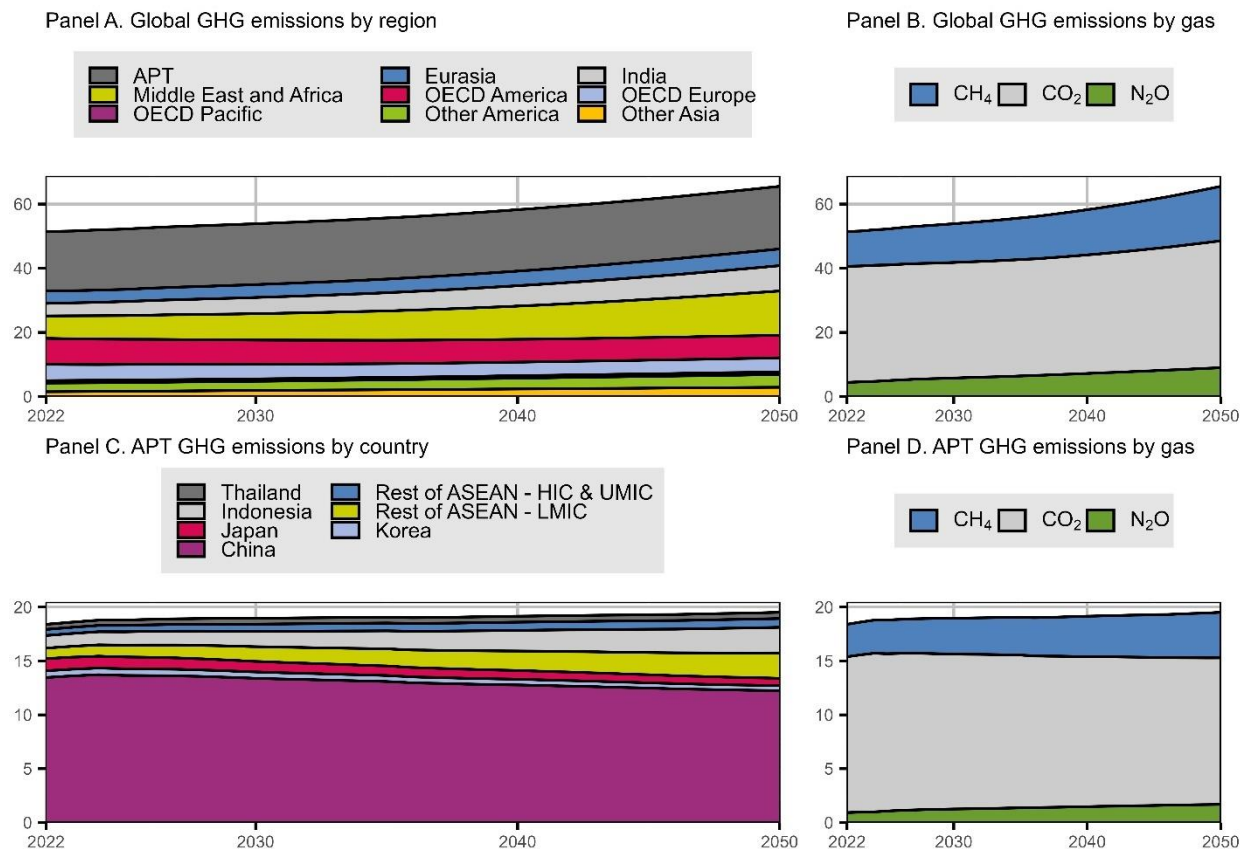
Note: High and low correspond to high and low emission probability ranges.

Source: Adapted from (Lebreton and Andrady, 2019^[6]), based on OECD ENV-Linkages model.

Greenhouse gas emissions

Annex Figure 5.A.3. Global GHG emissions are projected to keep growing by 2050

GHG emissions in GtCO₂e, *Baseline* scenario



Note: The figures exclude emissions from land use, land use change and forestry (LULUCF).

Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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Notes

¹ This compares to, for instance, an 9% increase in the contribution of Sub-Saharan Africa (from 16% of global leakage in 2022 to 25% in 2050) and a 3% increase in the contribution of India (from 10% of global leakage in 2022, to 13% in 2050).

² The remaining leakage in these countries is from e.g. uncollected litter.

³ There are uncertainties around the annual plastic leakage into aquatic environments, due to the complex nature of these plastic flows and data limitations. Projections fall in the range of 4.2 to 5.8 Mt for the year 2050.

⁴ Note that these projections are for leakage by country of origin. The destination of the leaked plastics may be in other countries as they travel through the marine environment.

⁵ These calculations are done following the estimate of the Global Plastics Outlook (OECD, 2022^[1]). The emissions presented are estimated using global emission coefficients, since plastics-related lifecycle emission coefficients are only available at global level, due to limited availability of data.

Part III Pathways to ending plastic pollution

6 Policy scenarios to halt plastic leakage to the environment

This chapter presents a scenario-based assessment of how the ASEAN Plus Three (APT) region can reverse current trends. The central scenario, *High Stringency*, models the implementation of a stringent policy package by all APT countries targeting plastics throughout their lifecycle to eliminate plastic leakage in the APT by 2050. The chapter also develops additional scenarios to investigate the consequences of implementing (i) ambitious policies across the plastic lifecycle globally – to highlight that only global action can deal with global pollution – and (ii) levels of ambition that depend on income levels within the APT and on the lifecycle stage – to highlight that only *High Stringency* can eliminate leakage. The policy scenarios underscore the important role of the APT in global efforts to end plastic pollution.

Key insights

- A coherent policy response in the APT, containing stringent policies to curb plastic production and demand, design for circularity, enhance recycling and close leakage pathways (*High Stringency* scenario), could nearly eliminate mismanaged plastic waste by 2050 and deliver large environmental benefits.
- The *High Stringency* scenario is projected to reduce total plastics use by 28% in the APT compared to *Baseline* (280 Mt in 2050 in the *Baseline* vs. 201 Mt in the *High Stringency* scenario), although still above the 2022 level of 152 Mt. ASEAN lower middle-income countries (LMIC) achieve the largest percentage reduction (36%) from *Baseline* 2050 levels (41 Mt vs. 63 Mt), while in Japan and Korea the plastics use is projected to decline to below 2022 levels (jointly 27% below *Baseline*, 20 Mt vs. 14 Mt; when it was 18 Mt in 2022).
- All growth in plastics use between 2022 and 2050 would be met with secondary plastics (which will grow from 11 Mt in 2022 to 84 Mt in 2050) in the *High Stringency* scenario, allowing primary plastics use in the APT to stabilise below 2022 levels (from 140 Mt in 2022 to 117 Mt in 2050).
- Recycling would become the primary waste treatment option, covering more than half of all plastic waste. Mismanaged plastic waste would be reduced by 98% compared to *Baseline* (56 Mt vs. 1.5 Mt), and plastic leakage to the environment would be nearly eliminated, from 14.1 Mt in *Baseline* to less than 0.5 Mt in the *High Stringency* scenario. The largest reductions in plastic leakage are projected in China (from 7.0 Mt to 0.4 Mt) and ASEAN LMIC (from 6.1 Mt to 0.1 Mt). In the ASEAN LMIC, formal waste systems can displace open dumping and burning, while ambitious policies upstream help to slow down the growth in plastic waste generation.
- The implementation of the *High Stringency* scenario is projected to result in modest costs in terms of the change in GDP for the APT as a whole in 2050 (-0.8% below *Baseline*). However, these costs are unevenly distributed: costs for the ASEAN (2.4%) are significantly larger than the costs for the Plus Three (-0.3%).
- An alternative scenario that looks into the implications of different levels of ambitions across income levels and lifecycle stage within the APT region (*Differentiated Stringency*) suggests that it would lead to significantly higher plastics use (260 Mt vs. 201 Mt in the *High Stringency* scenario), plastic waste (227 Mt vs. 186 Mt in *High Stringency*), and mismanaged waste (18 Mt vs 1.5 Mt in *High Stringency*). A major consequence of the larger volumes of mismanaged waste is increased leakage of plastics to the environment: by 2050, in the *Differentiated Stringency* scenario 4.5 Mt is projected to leak to the environment – 2.6 Mt in ASEAN, 2.0 Mt in the Plus Three.
- For the APT as a whole, the *High Stringency* scenario delivers better environmental outcomes at lower cost compared to *Differentiated Stringency*. However, the ASEAN countries have higher macroeconomic costs in the *High Stringency* scenario than in *Differentiated Stringency*, while the reverse is true for the Plus Three (due to competitiveness gains from ambitious ecodesign policies).
- High policy stringency in the APT can nearly end plastic leakage to the environment regionally and deliver large regional benefits. However, regional action alone cannot entirely solve plastic pollution: globally ambitious policies (*Global High Stringency*) remain critical to comprehensively end plastic pollution and protect global commons such as the oceans.

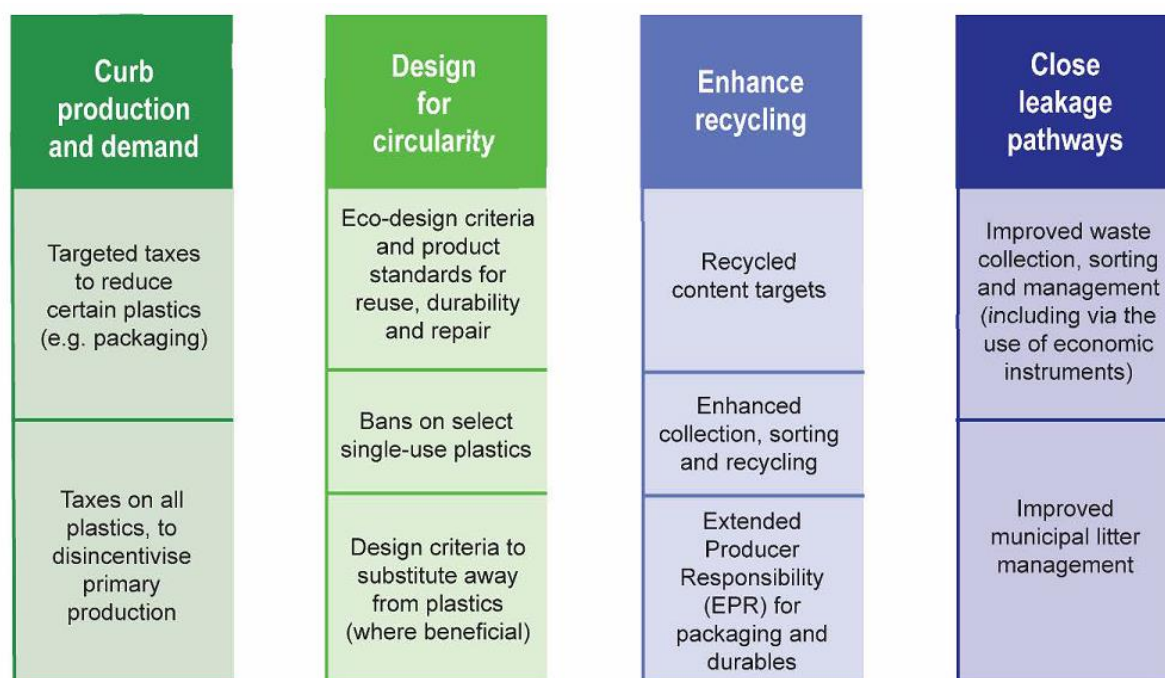
6.1. Introduction

This chapter presents policy scenarios outlining pathways for eliminating plastic leakage in the APT. Previous OECD (2024^[1]) findings indicate that cost-effectively halting plastic leakage requires comprehensive policy packages. Accordingly, the policy scenarios in this chapter employ a set of ten policy instruments. These instruments fall into four broad levers targeting different parts of the plastic lifecycle (see Figure 6.1): i) curb production and demand (hereafter curb demand), ii) design for circularity of plastic products and packaging, iii) enhance recycling, by improving the separate collection, sorting and recycling of plastic waste, and iv) close leakage pathways (i.e. minimise losses into the environment), by strengthening waste collection and treatment systems.

The choice of policy instruments is not intended to be prescriptive, but to serve as examples of potentially effective and cost-efficient measures, and to offer a benchmark against which countries can evaluate alternative or complementary policy options. Common instruments include, for instance: bans, standards, phaseouts, reuse systems, stimulating repair services, the removal of subsidies to primary plastic production, restrictions on problematic and hazardous chemicals, landfill and incineration taxes, deposit-refund systems, pay-as-you-throw schemes.

A fifth lever concerns clean up and remediation, i.e. the removal of plastic from the environment (e.g. via collection on beaches or the installation of river litter booms that capture plastics) and the mitigation of associated risks. The evaluation of this approach is not included in the policy scenarios used in this Outlook, which focus on the objective of preventing plastic leakage to the environment but is discussed qualitatively in Chapter 7. In addition, OECD (2022^[2]) discusses the cost-effectiveness of possible actions in this lever.

Figure 6.1. Policy instruments modelled in the policy scenarios



Notes: The packaging tax could be interpreted as a shadow-price for alternative instruments to curb production and demand.

Source: Authors' own elaboration.

Previous OECD work (2024^[1]; 2022^[3]) showed adopting comprehensive, stringent policies in all countries can effectively eliminate plastic leakage. This also holds true for the APT: a *Global High Stringency* scenario can eliminate mismanaged waste and plastic leakage in APT almost completely (mismanaged waste from 34 Mt in 2022 to 1.4 Mt in 2050; leakage from 8.4 Mt in 2022 to 0.47 Mt in 2050). A *High Stringency* scenario a regional level, where the APT act alone can deliver nearly identical environmental outcomes, reducing mismanaged waste in the APT to 1.5 Mt and leakage to 0.47 Mt in 2050. As detailed further in Section 6.5, this shows that – while global action would be ideal to mitigate total plastic leakage from within and outside the region – APT holds the ability to address plastic leakage in the region. Hence, the core scenario explored in this chapter is the *High Stringency scenario* which chart a pathway to ending plastic pollution in the APT. This scenario includes stringent policies across the four policy levers in all APT countries (Figure 6.1) aligned with the goal to eliminate plastic leakage to the environment by 2050.¹ At the same time, the policy package strikes a balance with some differentiation in timelines and targets to take into consideration different starting points, particularly in waste management (see Table 6.1). Alternative scenarios, varying in the geographical scope, level of policy stringency across the countries within the APT region and what stages of the plastic lifecycle they cover, are then examined to explore the environmental and economic implications of implementing policies to tackle plastic pollution in the APT.

Table 6.1. Quantification of the policies in the *High Stringency* scenario

Lever	Policy instrument	Quantification
Curb demand	Packaging plastic tax	APT: USD 1 /kg by 2030, doubling by 2050, constant thereafter
	Non-packaging plastic tax	APT: USD 0.75 /kg by 2030, doubling by 2050, constant thereafter
Design for circularity	Eco-design for durability & repair	APT: 15% lifespan increase by 2030, constant thereafter; 10-20% decrease in demand for durables by 2030, constant thereafter; increase in demand for repair services such that ex ante (i.e. at original prices) total expenditures are unchanged
	Ban selected single-use plastics	APT: phase-out of polypropylene (PP) for selected consumer products by 2030 (based on a representative set of consumer products covered by the European Union's Single Use Plastic Directive)
	Substitute away from plastics	APT: reduction of plastics use in production by 17% by 2030 with compensating increase in use of other inputs (paper, metals, minerals and wood)
Enhance recycling	Recycled content target	APT: 30% recycled content target by 2040, 40% by 2050
	EPR for packaging, electronics, automotive and wearable apparel	APT: tax on plastic inputs USD 0.3 /kg by 2030, constant thereafter; 30%-points increase in recycling by 2040, constant thereafter; subsidy on waste sector such that the instrument is budget neutral
	Enhance recycling through waste management	Japan & Korea: 60% recycling rate target by 2030, 73% by 2050; China: 73% recycling rate target by 2050; ASEAN: 55% recycling rate target by 2050
Close leakage pathways	Improved plastic waste collection	APT: full reduction of mismanaged waste shares by 2050
	Improved litter collection	APT: High-income countries' collection rates increase 5%-points by 2050; middle-income countries' income-scaled increase between 5 and 10%-points.

Notes:

1. Some targets are specified for an earlier date than 2050, as aligned to (OECD, 2022^[2]); the recycling rate targets for 2050 are in line with the pathway to 2060 targets provided in (OECD, 2022^[2]). PP stands for polypropylene.
2. The quantification of the policy instruments is based on a combination of similar policy scenarios in the Global Plastics Outlook (OECD, 2022^[2]) and the Policy Scenarios for Eliminating Plastic Pollution by 2040 report (OECD, 2024^[1]). Specifically, the Global High Stringency scenario is parallel to the Global Ambition scenario as modelled in the earlier reports, with a 2060 target date in the former, and with a 2040 target date for the latter. The current report takes an intermediate approach and targets 2050. This choice aims at striking a balance between the need for urgent action, while allowing sufficient time to build up policies, capacity and infrastructure, such as recycling systems at scale.
3. For non-APT countries, differentiated ambition levels are used: (i) high-income and upper middle-income non-APT countries adopt low stringency for policy levers to curb demand and design for circularity, and high stringency for levers to enhance recycling and close leakage pathways; (ii) lower middle-income non-APT countries adopt low stringency for levers to enhance recycling and close leakage pathways, and maintain current policies (Baseline) for the mid-and upstream policy levers. Low stringency targets are based on the Uncoordinated Action scenario in (OECD, 2022^[2]), adapted to the 2050 horizon.

This chapter unfolds as follows. Section 6.2 demonstrates that a comprehensive policy response targeting the entirety of the lifecycle of plastics can eliminate plastic leakage in the APT by 2050. Section 6.3 shows the costs of the *High Stringency* scenario are modest, amounting to 0.8% of GDP in 2050 compared to *Baseline*. Section 6.4 discusses the consequences of the differentiated level of ambition within the APT and across the stages of the plastic lifecycle, providing evidence that lower stringency is more costly in selected APT countries and cannot eliminate plastic leakage. Section 6.5 shows that regional co-ordination and co-operation between ASEAN and the Plus Three countries is crucial to ending plastic leakage. Finally, while the *High Stringency* scenario explores a scenario where the APT acts alone to prevent the local problem of pollution, Section 6.5 shows that global High Stringency policies can bring further environmental benefits.

6.2. Comprehensive, stringent policies can eliminate plastic leakage

6.2.1. The High Stringency scenario can more than halve the growth of plastics use in the APT compared to Baseline

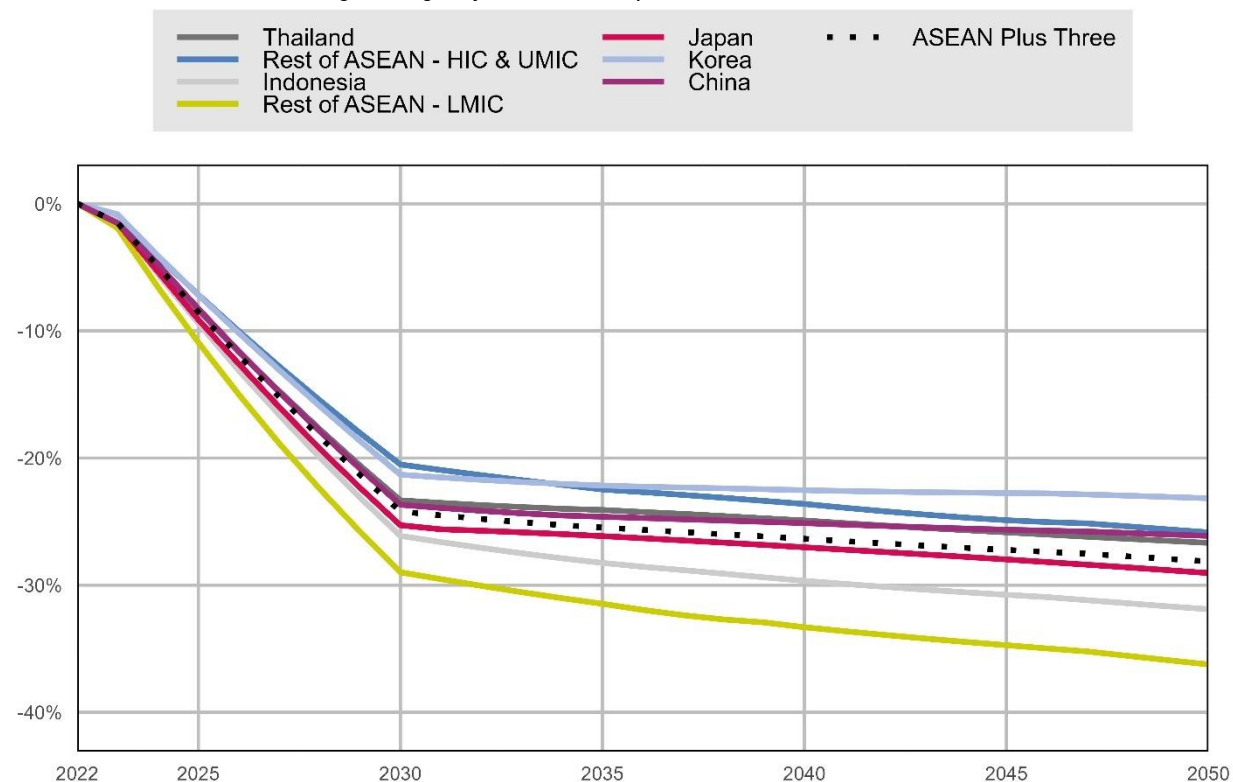
The implementation of stringent policies along the plastic lifecycle (*High Stringency* scenario, described in Table 6.1 above) can significantly limit the growth of plastics use in the APT region, from 280 Mt in 2050 in the *Baseline* to 201 Mt in the *High Stringency* scenario, although this remains significantly above the 2022 level (152 Mt). This corresponds to a reduction of 28% in plastics use relative to the *Baseline* in 2050 (Figure 6.2). Previous OECD reports discussed the importance of upstream and midstream policies to slow down plastics demand, waste generation and pollution; Box 6.1 outlines how demand reduction policies can play a critical role in plastic pollution mitigation, while highlighting the importance of unintended impacts and trade-offs through careful policy design.

Policies to curb demand, promote eco-design and foster substitution are the main policy levers driving reductions in plastics use. Increasing plastic taxes on packaging (to USD 1/kg by 2030) and non-packaging products (to USD 0.75/kg by 2030) and doubling further by 2050 and Extended Producer Responsibility (EPR) schemes that are phased in until 2030 to facilitate a shift away from primary plastics towards recycled material, together provide financial incentives to curb plastics supply and demand in the policy scenario. The emphasis on policy action before 2030 with gradual increase in policy stringency thereafter implies that the plastics use declines more quickly until 2030, followed by a slower reduction from 2030 onwards. Circular eco-design policies introduced in the APT as part of this policy package also increase the lifespan of plastic products by 15%. A decrease of 10-20% in demand for durables by 2030 further contributes to moderating the growth in plastics use. Meanwhile, the gradual increase of substitutable inputs - replacing plastics with paper, metals and minerals, glass and wood – leads to a 17% reduction of plastics used as inputs to production by 2030.

The extent of reduction of plastics use in comparison to the *Baseline* scenario differs across APT countries. In ASEAN countries, ambitious policy package is projected to reduce plastics use in 2050 to 56 Mt (vs. 83 Mt in *Baseline* 2050), although still an increase relative to 29 Mt in 2022. The Plus Three countries jointly limit their use in the policy scenario to 146 Mt in 2050 (vs. 197 Mt in *Baseline* 2050 and 122 Mt in 2022), with all growth in plastics use coming from China.² ASEAN LMIC are projected to achieve the largest reduction from the *Baseline* levels in 2050 (-36%) while Korea will see the smallest (-23%). Nonetheless, the fast growth in plastics use in the *Baseline* in the ASEAN LMIC implies a significant growth from 2022 levels (from 18 Mt in 2022 to 41 Mt in 2050 in the *High Stringency* scenario).

Figure 6.2. The decrease in plastics use ranges between 23% and 36% among APT countries

Plastics use reduction in the *High Stringency* scenario compared to the *Baseline* scenario.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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Box 6.1. Clarifications on the role of reduction policies in plastic pollution mitigation

Plastic demand reduction is not an end in itself, but a critical lever for reducing plastic pollution. Containing the amounts of new plastics placed on the market can reduce plastic waste generation, and thus pressure on waste management systems and risks of leakage, while also mitigating upstream impacts linked to primary plastic production, including chemical pollution and plastic pellet losses. As highlighted in OECD (2024^[1]), upstream and midstream measures such as reuse, eco-design and higher resource efficiency, are essential to limit the scale and costs of waste collection and treatment.

However, not all plastics reduction delivers the same environmental benefits. Problematic or avoidable plastics are generally considered a priority for reduction. These include for instance short-lived items that often escape formal waste systems and end up in the environment, as well as plastics containing chemicals of concern (Raubenheimer and Urho, 2024^[4]). Reducing these is aligned with both pollution prevention and lifecycle impact reduction. Conversely, reducing plastics in some applications, such as in durable goods, transport or healthcare, may involve greater trade-offs along several dimensions (e.g. economic, social, environmental and related to health). In all cases, it is important that any material substitution be considered weighing economic, environmental and health impacts. The environmental footprint of plastics depends on the specific polymer, application and context, and, in some cases, alternatives may be more resource-intensive or result in higher greenhouse gas emissions along the lifecycle (Avery et al., 2025^[5]). For

instance, bio-based alternatives may reduce reliance on fossil fuels, but they can also raise concerns about land use change and deforestation if poorly sourced (OECD, 2022^[3]).

To reduce the total negative environmental and health impacts across materials, shifting to new systems, such as moving from single-use to reuse delivery models, can lower environmental impacts provided that the recirculation of items is guaranteed (United Nations Environment Programme, 2021^[6]). Lifecycle assessment studies demonstrate that the environmental footprint of a product depends not only on material type, but also on reuse rates, product design, supply chain emissions, and end-of-life treatment (Meng, Brandão and Cullen, 2024^[7]). Where reduction leads to substitution, careful assessment of the full lifecycle effects and system-level trade-offs is needed, including impacts on emissions, biodiversity, human toxicity, circularity potential as well as affordability (United Nations Environment Programme, 2021^[6]).

A wide range of policy instruments can support plastics demand and waste reduction. This report models a package including taxes on plastics, EPR schemes, recycled content requirements and eco-design policies. Other options include bans, phaseouts and standards targeting unnecessary or problematic plastics, incentives and mandates for product longevity (e.g. durability rules, right to repair, reuse requirements), shifts to service-based delivery models, other types of taxes on plastics, as well as structural reforms such as the removal of subsidies to fossil fuels and plastics production. Chapter 3 presented policy measures already in use in the APT, while Chapter 7 discusses in more details interventions that could be introduced or strengthened.

The reductions in plastics use by applications are closely linked to the sectoral use of plastics: the use of plastics for packaging, transportation and construction applications in particular would decline significantly (see also Box 6.2). Nearly 55 Mt of the reduction in plastics use by economic applications will come from the decrease in use for producing packaging (23.5 Mt), building & construction materials (16.3 Mt), and transportation (excluding tyres) (14.7 Mt) (Figure 6.3). China drives the trend for packaging and building and construction applications given the weight of its economy. ASEAN countries, LMIC in particular, contribute to the highest proportion of the reduction in plastics use for “transportation (excluding tyres)”, as the implementation of ambitious policies partially mutes the rise in demand for vehicles and associated plastics use driven by the region’s projected rapid GDP and population growth (see also Chapter 4) in the *Baseline* scenario.

Box 6.2. Four sectors will drive three-quarters of plastics use reduction

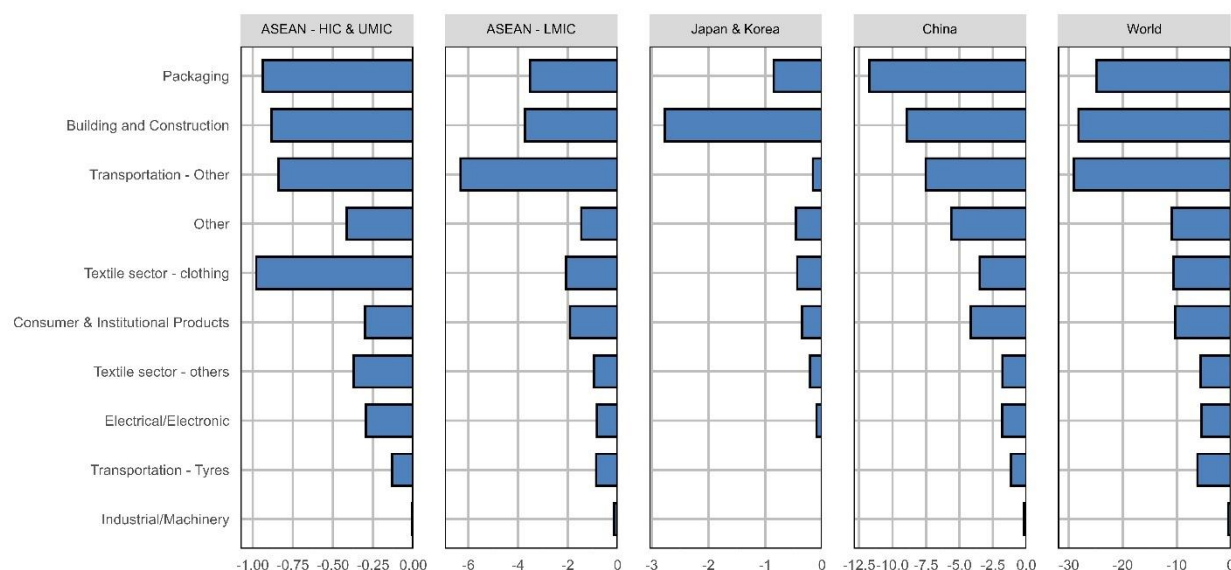
The links between applications and production sectors are detailed in Chapter 2; in some cases there is a one-on-one correspondence, e.g. the building and construction application is linked to the construction sector, while in other cases multiple sectors are linked to the same application, e.g. in the case of packaging or transportation. Due to their high plastic intensity, four sectors (Food, Construction, Textiles and Motor Vehicles) contribute most to the plastics use reduction in the APT, and are responsible for reducing 57 Mt of plastics in 2050, compared to the *Baseline* scenario (see Annex Figure 6.B.1 in Annex 6.B), while still remaining associated with half of the remaining use in the policy scenario. The food sector will experience the largest reduction (-18 Mt) as plastics use for food packaging is large and the plastics packaging tax thus induces cost increases. Construction is another important sector that will see a reduction of 16.6 Mt of plastics use in the APT, of which 9.1 Mt in China alone. Textiles and motor vehicles – which are also plastic-intensive – will also see substantial reductions of 12.9 Mt and 10 Mt, respectively. The effect of material substitution policies (inducing a turn to non-metallic minerals, pulp and paper and iron and steel, mainly) also play a role in these sectoral shifts.

In ASEAN LMIC, these four sectors are projected to see their plastics use decline by 11.7 Mt (53% of total regional reduction); the corresponding number for the upper middle ASEAN countries is projected at 3.4 Mt (63% of total).

Comparing these trends in APT countries to the global plastics use shows how plastics profiles differ considerably across countries, although packaging is in the top 3 in all countries and all years, constituting the application with the largest projected reduction at global level, together with transportation (other). The results for the various applications drive the changes in plastics use by polymer (Annex Figure 6.B.2 in Annex 6.B). For example, the significant reductions in packaging affect PP more than most others.³ Changes in use of four “hard to collect or recycle” polymers – PS, PUR, PVC and Other plastics, which include thermosets, sealants, adhesives, marine coatings, and more – are relatively more modest.

Figure 6.3. The largest decreases in plastics use applications are projected for packaging, construction and transportation

Plastics use reduction by application in APT in Mt in the *High Stringency* scenario in 2050 compared to the *Baseline* scenario.



Note: Scales differ by panel.

Source: OECD ENV-Linkages model.

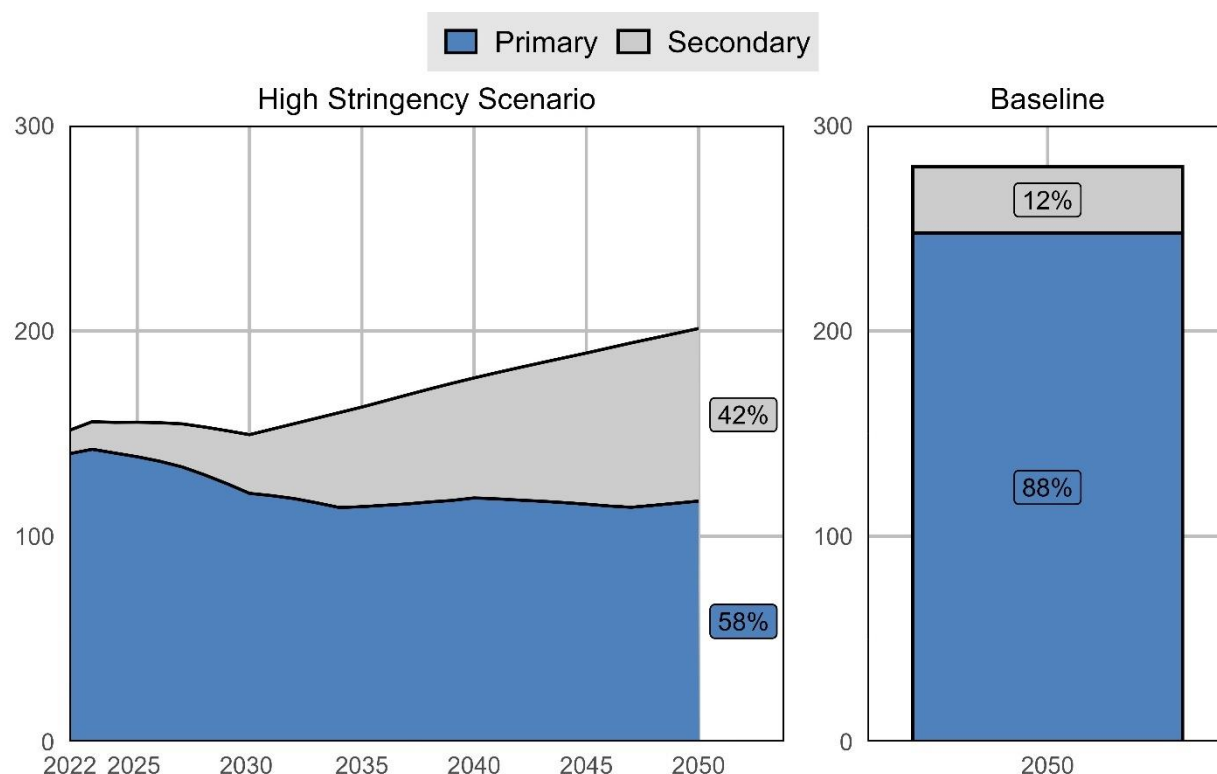
StatLink  <https://stat.link/6usdvk>

While total plastics use is still projected to increase relative to current levels, ambitious policies could ensure that all growth is met with secondary plastics. Primary plastics use in APT can fall below 2022 levels with the ambitious policies (117 Mt in the *High Stringency* scenario in 2050 vs. 140 Mt in 2022), thus reducing the environmental burden associated with primary production (Figure 6.4). The combination of high recycling rates, recycling content targets and substantial improvements in waste management would enable a substantial share of plastic waste to be collected and recycled. This will lead to the increased share of secondary plastics increasing within total production from 8% in 2022 to 42% in 2050. The 84 Mt of secondary plastics produced in the APT countries in 2050 will more than cover the projected growth in total plastics use in the region between 2022 and 2050 (which increases by 49 Mt in the *High Stringency* scenario). The stringent policies of the *High Stringency* scenario make this possible by curbing demand

and improving recycling, waste management and plastics circularity in the APT. The increase in secondary plastics use is especially pronounced from 2030 onwards, as the policies which gradually increase in stringency to enhance recycling become more effective while the emphasis on curbing total demand in policies implemented before 2030 eases off and results in more sustained demand for secondary plastics (see above).

Figure 6.4. Secondary plastics use grows rapidly in the *High Stringency* scenario

Primary vs secondary plastics use in APT in Mt.



Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/v9aofw>

In all APT countries, the shares of secondary plastics in 2050 are projected to increase to more than 40% of total production and use (Annex Figure 6.B.3 in Annex 6.B) – this is directly driven by the recycled content targets (of 40%) to incentivise recycling and secondary production.⁴ For example, Indonesia, the country in the region that has the lowest share of secondary plastics in 2022, is projected to increase its secondary share from 3.3% in 2022 to 40% in the *High Stringency* scenario (x12). In contrast, the relative growth of secondary plastics in Japan is smaller, as it has the highest share of secondary plastics in 2022 in the region, but the share (43%) in 2050 is still projected to be among the largest in the APT region. The implications of these results for policy roadmaps in the APT are discussed in the next chapter (Chapter 7), particularly with regard to specific policy interventions that can help to reduce production and demand (e.g. bans, taxes, eco-design criteria and product standards, reuse schemes, material and product innovation) and to enhance the supply and demand for recycled plastics.

6.2.2. Total mismanaged plastic waste will be cut almost to zero in the High Stringency scenario

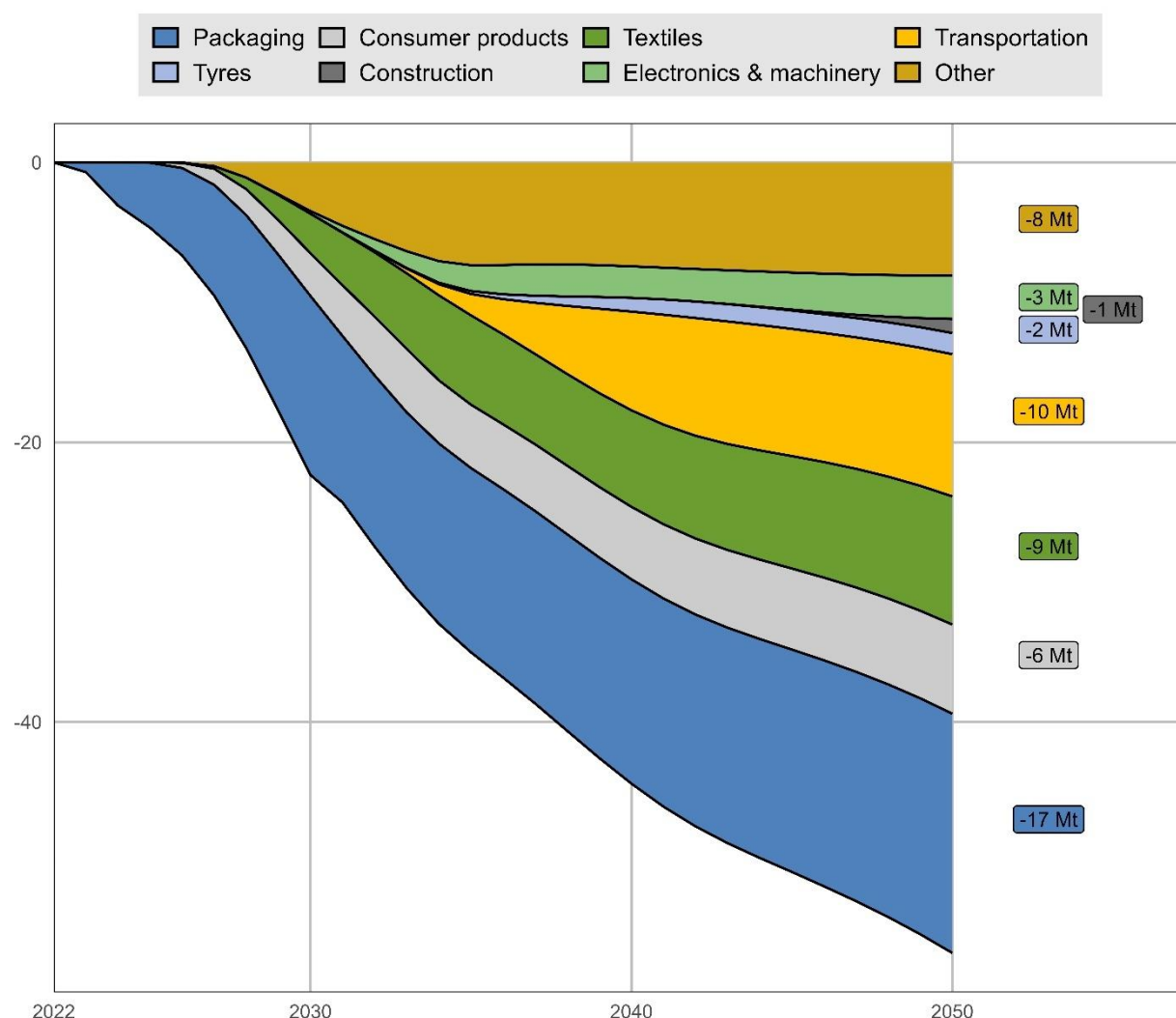
The *High Stringency* scenario lays out a pathway to reduce the total waste generated in the APT by 23% in 2050, compared to the *Baseline* (242 Mt in 2050 in the *Baseline* scenario vs. 186 Mt in the *High Stringency* scenario). This decrease is projected across all applications, albeit to different degrees (Figure 6.5). The *High Stringency* scenario aims at decoupling plastics use from economic growth. Thus, the implementation of ambitious upstream policies, differentiated across the region, is projected to deliver a sizable reduction in plastic waste generated overall. There is a time lag before the effects of policies on waste become apparent, however, as several plastics applications have lifetimes that can be significant (especially for construction, which has an average lifetime of 35 years), as demonstrated in the reduction in plastic waste in construction (by 1 Mt) achieved only in later decades. Thus, the reduction in plastic waste generated in the APT region by 2050 is smaller than the reduction in plastics use over the same period (23% vs 28%). This also means that the evolution of (the reduction in) plastic waste through to 2030 is much smoother than the evolution of plastics use (compare the time profile of changes in use and waste in Figure 6.2 and Figure 6.5, respectively), as not all reductions in use immediately lead to reductions in waste.

The largest reduction in waste in absolute terms will come from the packaging sector, with a notable decrease of 17 Mt (or 19%) by 2050 compared to *Baseline*. This is mainly attributable to the effects of ambitious policies to curb demand, including the higher tax rate on packaging than on other applications, as well as to the policy lever of design for circularity.

The implementation of comprehensive Extended Producer Responsibility (EPR) schemes in ASEAN countries and China in the *High Stringency* scenario, and the strengthening of such schemes in Japan and Korea, combined with policies to extend product lifespans and plastic taxes, would also result in substantial waste reductions in other key applications. One such example is transportation which is projected to see an almost 39% reduction in plastic waste by 2050 compared to the *Baseline* (corresponding to 12 Mt). Under the assumption that producers will transfer the cost of end-of-life waste collection on to consumers, the policy increases the costs of the products covered by the EPR system and thus dampens demand for these products.

Figure 6.5. A substantial overall reduction in plastic waste is projected in the *High Stringency* scenario

Plastic waste for APT countries by application in Mt in deviation from *Baseline* scenario.



Source: OECD ENV-Linkages model.

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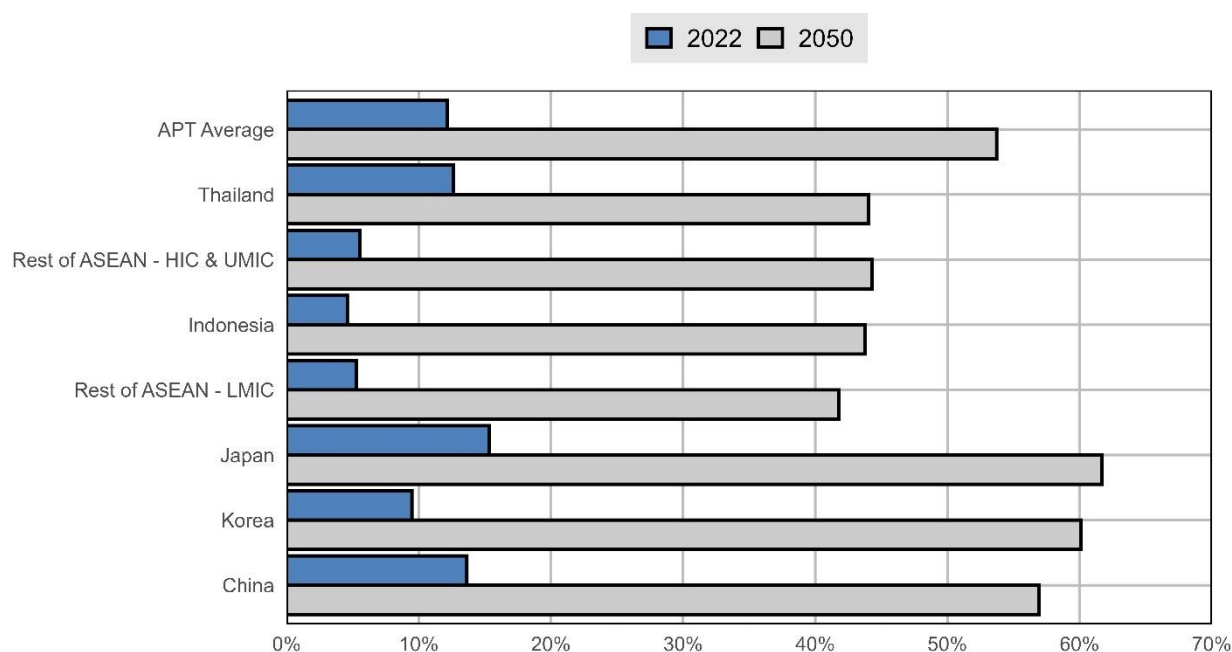
The differences in effects of the policy package across countries on plastic waste generation are significant, and roughly in line with their effects on use, i.e. a significant reduction from the *Baseline* 2050 levels, but well above 2022 volumes. Compared to 2022 levels, plastic waste is projected to see a relatively modest increase in Japan (4%) and Thailand (18%). At the same time, a substantial increase in plastic waste is expected in the Rest of ASEAN LMIC (161% above 2022 levels) and Indonesia (+102%, i.e. doubling). Although the *High Stringency* scenario implies that all countries implement policies to contain the increase in waste, a faster increase in waste in ASEAN LMIC is projected in both the *Baseline* and *High Stringency* scenarios.

Implementing the ambitious policy package for the APT region also involves significantly improving the way plastic waste is treated. Recycling is set to play a significant role, as all APT countries take action to increase the recycling rates (Figure 6.6). The associated infrastructure needs would be addressed mainly through the ramp-up of mechanical recycling facilities, alongside the development of comprehensive and formalised separate waste collection systems for some ASEAN countries.⁵

The policy scenario projects that Japan and Korea will lead the way in helping to ramp up overall recycling rates in the region, as these countries already possess comprehensive and formalised separate waste collection systems, a good level of pre-existing recycling capacity, as well as the technological know-how. In contrast, ASEAN LMIC would need to improve waste management more comprehensively and take a gradual (but equally ambitious) approach, by developing the needed infrastructure to progressively ramp up recycling capacity. It is projected that the recycling rate for the APT region will rise to 54% in 2050 in the *High Stringency* scenario, compared to 12% in 2022 (Figure 6.6) – this implies that total recycled waste is projected to drastically increase from 14 Mt in 2022 to 100 Mt in 2050. Global technical co-operation – and potentially financial support – would be crucial to assist ASEAN LMIC in particular, in achieving these recycling targets (see Chapter 7).

Figure 6.6. Massive increases in recycling rates are projected in all APT countries as part of the *High Stringency* scenario

Recycling rates for APT countries (%), *High Stringency* scenario.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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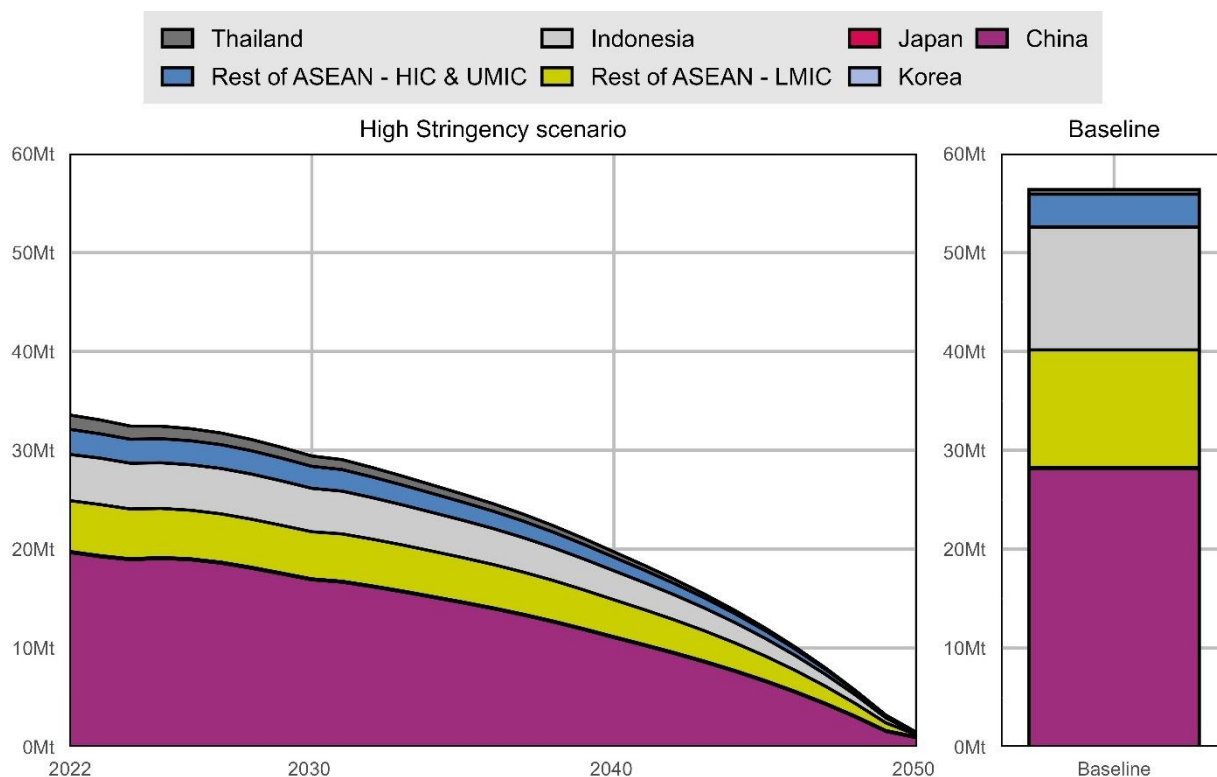
Total mismanaged plastic waste in APT is projected to be cut almost to zero (1.5 Mt) by 2050, compared to 2050 *Baseline* (56 Mt) and 2022 (33 Mt; see Figure 6.7). The sharp decline in shares of mismanaged plastic waste is driven by improvements in waste management in most ASEAN countries and China, owing to the introduction and strengthening of formal waste management systems in addition to policies that would discourage open dumping and burning of waste, as well as minimise losses in the waste collection

and sorting process (including reducing the amount of plastic waste that is collected for recycling but not actually recycled). The most sizable reductions in mismanaged plastic waste are projected in China and Indonesia. Mismanaged plastic waste does not actually decline to zero in any of the APT countries, however, as some plastic streams evade waste collection.⁶

There are important synergies to be exploited between the policies to encourage recycling and the policies to minimise mismanaged plastic waste. One such avenue for the APT region is for policies to encourage the formalisation of the informal waste sector. Countries that rely heavily on the informal sector for waste collection and sorting risk informal waste pickers discarding, dumping or burning residual waste deemed to be of low economic value, hence triggering an exacerbation of the mismanaged waste problem (OECD, 2022^[3]). Formalising the informal waste pickers and integrating them to national waste management systems would bring about positive changes for the natural environment and also alleviate the negative human health and social impacts from utilising improper (and likely hazardous) waste treatment options.

Figure 6.7. Mismanaged plastic waste would be almost eliminated in the *High Stringency* scenario

Mismanaged plastic waste in APT countries in Mt.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/5uxnw6>

Due to the different national contexts, the *High Stringency* scenario projects that waste management strategies will be context-dependent, varying according to country realities and priorities. The massive ramping up of recycling and elimination of mismanaged waste as outlined above also affects incineration and landfilling. In Korea and Japan, the share of waste incineration, currently the dominant waste management practice (see Chapters 2 and 4, and Annex Figure 6.B.6 in Annex 6.B), would go down.

Strong upstream and midstream policies would also result in the minimisation of landfilling (the foreseen lack of adequate land providing a further incentive). In the case of China, incineration and landfilling are expected to play a significant role through 2050, as recycling alone is unable to absorb the increase in plastic waste generation. Further, China's current investments in incineration capacity imply the continued use of this modality in the medium- to long-term (throughout their scheduled lifetimes). However, the relative importance of different types of waste management may vary across the country.

Strategies would diverge for the ASEAN countries: for these countries, although recycling rates do significantly rise across the board, sanitary landfilling is still foreseen to play a sizable role, on a par with recycling – the share of landfilling in waste management is set to remain constant in ASEAN HIC and UMIC while growing in the ASEAN LMIC, as landfilling is the cheaper option for eliminating mismanaged waste. International co-operation remains a critical factor for facilitating the APT countries achieve these improvements in waste management and to help address any challenges that may hinder effective implementation (see Chapter 7).

6.2.3. Plastic leakage will be nearly eliminated in the High Stringency scenario

Plastic leakage is projected to be reduced to less than 0.5 Mt in 2050 in the *High Stringency* scenario (0.4% of total waste). This is a reduction of more than 95% (Table 6.2) from 2022 (8.4 Mt, 7.4% of total waste) and *Baseline* levels in 2050 (14.1 Mt, 5.8% of total waste).

ASEAN countries are projected to reduce plastic leakage in 2050 from 7.1 Mt in the *Baseline* to 0.1 Mt in the *High Stringency* scenario, with the share of leakage in total plastic waste declining from 14.2% in 2022 to 0.2% in 2050. In particular, leakage rates in ASEAN LMIC⁷ are projected to decline substantially (from 17.8% in 2022 to 0.2% in 2050) as a result of the combined effects of income-driven improvements in waste management (foreseen even in the *Baseline* scenario) and effective policies in the *High Stringency* scenario.

In Japan and Korea, the difference between the leakage rates in 2022 and 2050 are much smaller (from 0.3% in 2022 to 0.2% in 2050), reflecting their already advanced waste management systems. China is projected to drastically cut its plastic leakage from 7 Mt in the *Baseline* to 0.35 Mt in the *High Stringency* scenario, representing a reduction in leakage rate from 6.4% in 2022 to 0.3% in 2050. However, the remaining plastic leakage in China is larger in absolute terms than in the other APT countries, because of the sheer size of the country. Even if litter collection rates in China are assumed to increase to the same level as other APT countries, this represents a larger volume of plastics that still leaks to the environment.

Comparing the average leakage rate in the APT to the averages outside the region clearly illustrates the position of the APT: in 2022 the leakage rate in the APT is higher than the global average, but lower than the non-OECD average, reflecting the mixture of countries with relatively high (e.g. Indonesia) and low (Japan and Korea) leakage rates within the region. Plastic leakage rates in ASEAN countries are clearly above the non-OECD average, which suggests that ASEAN countries are hotspots for plastic leakage. The *Baseline* development to 2050 illustrates how current policies in the APT, and especially in the ASEAN, already result in significant reductions: the leakage share comes down more rapidly in the ASEAN than in either global or non-OECD averages. Yet it also shows that existing policies are still insufficient to end plastic leakage by 2050, especially in ASEAN LMIC (13.2% of plastic leakage in Indonesia and the Rest of ASEAN LMIC together in the *Baseline*). The differences across APT countries in the *High Stringency* scenario are much smaller than in the *Baseline* scenario, as all APT countries aim to eliminate plastic leakage.⁸

Table 6.2. Plastic leakage is reduced to near zero in the *High Stringency* scenario

Share of plastic waste that leaks to the environment and reduction in volume.

Country	2022	Baseline in 2050	High Stringency in 2050	Reduction in volume
Korea	0.3%	0.2%	0.2%	<0.01 Mt
Japan	0.3%	0.2%	0.2%	0.01 Mt
China	6.4%	4.4%	0.3%	6.6 Mt
Indonesia	18.3%	17.1%	0.2%	3.1 Mt
Thailand	6.8%	1.4%	0.2%	0.1 Mt
Rest of ASEAN – HIC & UMIC	12.0%	7.9%	0.1%	0.8 Mt
Rest of ASEAN – LMIC	17.4%	10.7%	0.2%	3.0 Mt
ASEAN average	14.2%	10.9%	0.2%	7.0 Mt
APT average	7.4%	5.8%	0.3%	13.6 Mt
OECD average	1.1%	0.5%	0.2%	0.9 Mt
Non-OECD average	9.5%	7.6%	3.5%	23.3 Mt
Global average	5.6%	5.1%	2.3%	24.2 Mt

Note: The reduction in volume shows the difference between the projected levels in the *High Stringency* and *Baseline* scenarios in 2050. Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

6.3. The benefits of ending plastic leakage come with modest economic impacts as a share of GDP, but they are unevenly distributed

The policy package in the *High Stringency* scenario affects economic activity and thus macroeconomic indicators such as GDP. For a proper cost-benefit analysis, these macroeconomic costs would have to be compared with the environmental benefits that result from the reduced pressures on the environment along the plastic lifecycle, including reduced adverse impacts for ecosystems, climate, human health and livelihoods. However, as not all these benefits can be valued and made comparable to the economic costs, the analysis here presents the *gross* economic cost, i.e. the change in GDP, without correcting for environmental benefits. Nonetheless, the environmental benefits are likely to outweigh these costs (OECD, 2022^[3]; OECD, 2022^[2]).

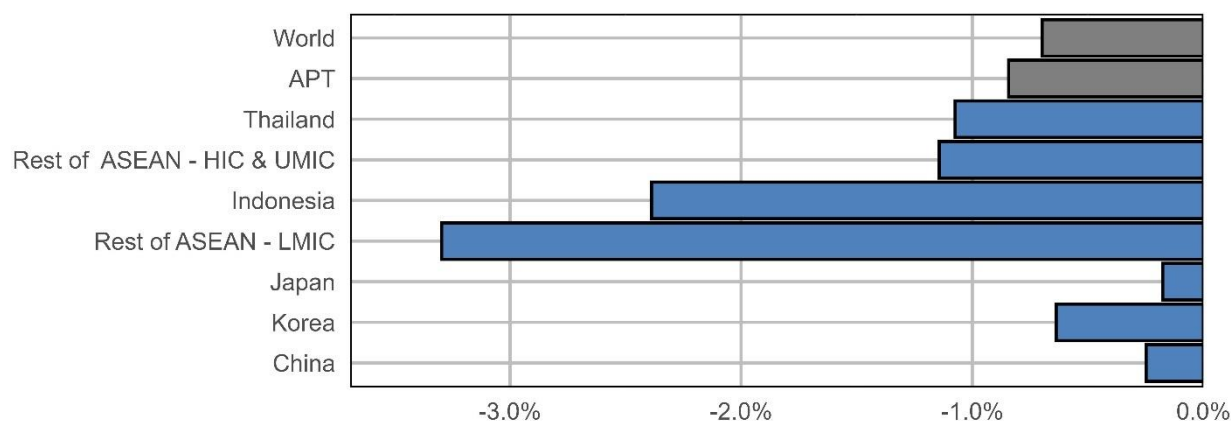
The implementation of the *High Stringency* scenario is projected to result in a modest GDP cost for APT in 2050 (-0.8%) when compared to *Baseline* projections (Figure 6.8). This impact should be seen in the context of continued economic growth between 2022 and 2050: average annual GDP growth in the APT region is projected at 2.38% in the *High Stringency* scenario, compared to 2.41% in *Baseline* projections. However, variations within the APT are significant. The macroeconomic impacts are projected to be smaller in the Plus Three countries than in ASEAN. Within the Plus Three, Korea is projected to experience -0.6% reduction in GDP, while Japan is projected to experience a -0.2% reduction. This disparity arises from a range of interacting factors, including the economy's openness, structure (especially the size of sectors producing plastics and their substitutes), diversification as well as the impacts on production costs in the plastics sector, textiles and chemicals. In China, for instance, macroeconomic impacts of ambitious policies (-0.2%) are mitigated since the policy package boosts sectors that produce substitutes for plastics, alleviating the impact of the losses in the plastics sector (see (OECD, 2024^[1]) for a more detailed discussion). The ASEAN LMIC, including Indonesia, are projected to face more significant economic impacts, as they require a larger overhaul of their economic system across the plastic lifecycle than high- and upper middle-income countries, resulting in a projected GDP loss of 2.8% relative to the *Baseline*. The cost for the ASEAN as a whole is also significantly larger than the APT average, at -2.4% (versus -0.8% for the APT).

Trade dynamics, particularly in the plastic and manufacturing sectors, significantly influence the region's economic response to the *High Stringency* scenario policies. Changes in global trade patterns can either worsen or alleviate the economic consequences of reduced plastic production, and what drives trade results is not the absolute impact of the policy on sectoral production costs, but how such impacts compare to the impacts on foreign competitors. The country-specific reliance on the plastics sector or on sectors that produce substitutes for plastics plays a crucial role. This level of dependency shapes the depth and speed of economic repercussions from the policy scenario, contributing to regional variations in the economic impact.

These macroeconomic impacts are the result of a wide range of underlying changes in costs, including (i) changes in waste treatment costs (see below), (ii) changes in production costs for specific sectors associated with the specific policy instruments (see (OECD, 2022^[3]) for a more detailed discussion on how the different policy instruments affect the macro economy) and (iii) induced economic effects, such as changes in competitive position of specific sectors that drive changes in demand and trade patterns (as relative prices start to shift). Importantly, these GDP impacts do not include the monetary benefits of policy action through the benefits of reduced plastic pollution. Such benefits are especially strong in the more vulnerable, developing countries (Agnelli and Tortora, 2022^[8]). Reducing plastic pollution would generate important benefits especially in developing countries, by alleviating the burden of pollution on socioeconomic outcomes. These benefits of policy action are very hard to express in monetary terms and are excluded from the modelling analysis. The GDP impacts therefore reflect a gross cost of policy action, that needs to be evaluated in the context of a wide range of benefits.

Figure 6.8. The implementation of the *High Stringency* scenario has modest macroeconomic impacts

Variation of GDP in 2050 in deviation from *Baseline* scenario.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

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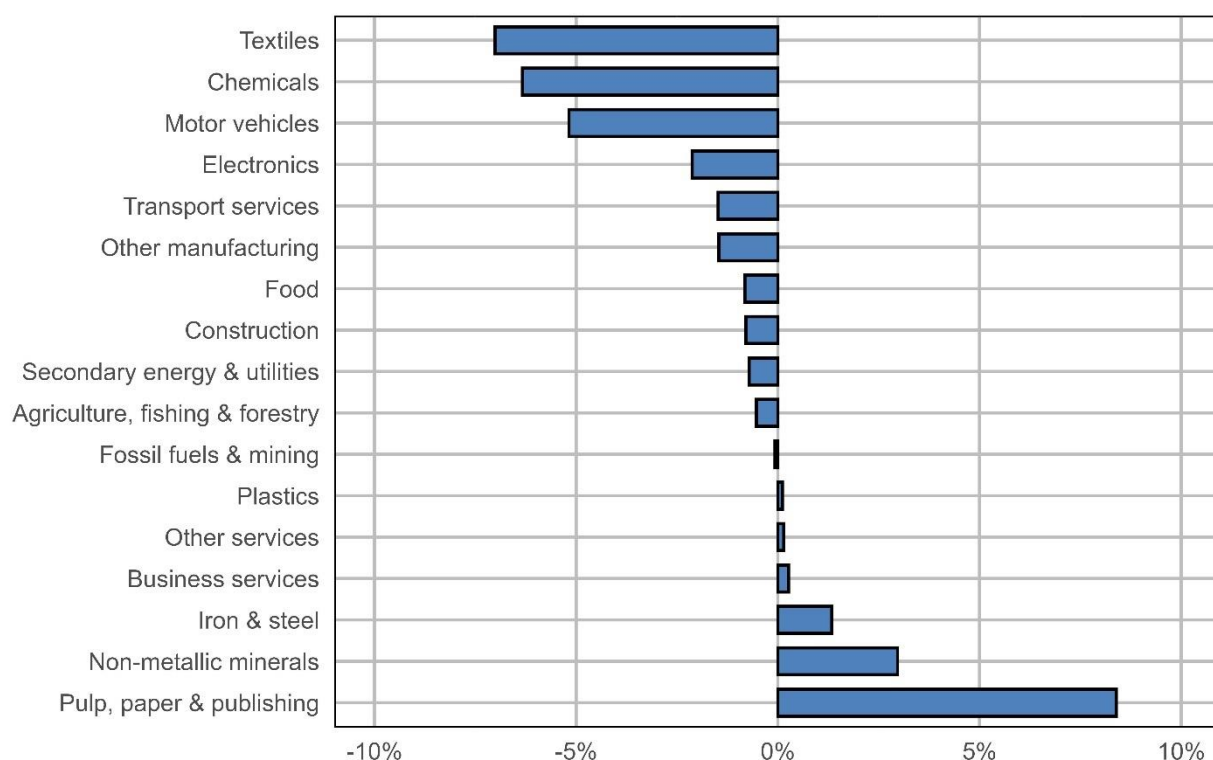
While the macroeconomic impacts are negative in all APT countries, some sectors are worse off, while others stand to benefit from the implemented policies (Figure 6.9). The plastics sector is projected to show similar output levels as the *Baseline* projections, hiding a large shift from primary production to secondary production. However, in the absence of explicit policies in the instrument mix to limit plastic production the effect is limited; and may be further diminished by the possibility for producers to turn to the global market to maintain production levels. Chemicals, which serve as inputs for the plastics industry, are projected to

decrease by almost 8% in output levels, reflecting a combination of lower plastic production and the transition to secondary plastics. Other sectors closely tied to the use of plastics (cf. Chapter 2), including textiles, motor vehicles, and electronics, are also anticipated to experience reductions ranging from 7% to 2%.

Meanwhile, the substitution away from plastic products in the *High Stringency* scenario benefit alternative material sectors which will see their outputs increase relative to the *Baseline* scenario. These include the pulp, paper, and publishing sector (+9%), the non-metallic minerals sector (+3.3%) and iron and steel manufacturing (+1.5%). These shifts illustrate a policy-driven realignment in the market, where sectors that offer alternatives to plastics gain economic traction in response to the policies to end plastic leakage.⁹

Figure 6.9. The *High Stringency* scenario constrains plastic-related industrial sectors and boosts substitute-producing sectors

Sectoral output change in the APT region in the *High Stringency* scenario in deviation from *Baseline* scenario.



Source: OECD ENV-Linkages model.

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To eliminate plastic leakage by 2050, a strategic realignment of investments into waste management is required, prioritising recycling over other waste management options, and eliminating mismanaged waste by increasing waste collection and sorting, as well as litter collection (Figure 6.10). Even with current policies (i.e. in the *Baseline* scenario), significant cumulative investments in waste treatment are required between 2022 and 2050. These amount to more than USD 1.1 trillion for the APT as a whole, of which ASEAN countries need a modest share (USD 178 billion (bln)) while by far the largest share is required in China (almost USD 800 bln). For the *High Stringency* scenario, there are two related dynamics at play that determine how much investments into waste management are required for different end-of-life categories. On the one hand, additional investments are required to ensure waste is treated with the least

environmental burden, with most of these investments moving towards the recycling sector in the *High Stringency* scenario. On the other hand, the implementation of the *High Stringency* scenario results in lower waste generation, leading to reduced volumes of waste that need to be collected and sorted, thus lowering investment requirements in comparison to the *Baseline* scenario for these end-of-life categories. In most APT countries, the overall investments into waste management required in the *High Stringency* scenario are similar or even less than that in the *Baseline* (and USD 1.1 trillion for the APT as a whole in both scenarios).

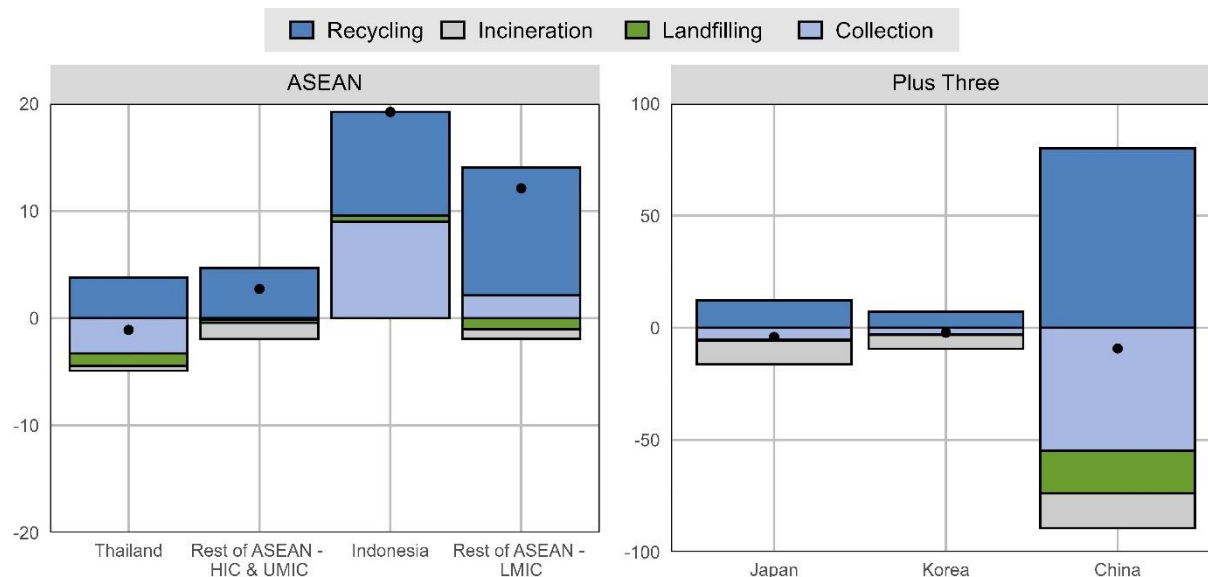
Specifically, cumulative waste management costs over the period between 2022 and 2050 are slightly lower in the *High Stringency* scenario than in the *Baseline* in Japan (USD 4 bln) and Korea (USD 2 bln), as increased expenditures on recycling are more than compensated by lower costs for collection and sorting, as well as lower costs for incineration. As discussed above, the main effect of the policies in these countries is a shift from incineration to recycling; the incremental costs of such shift are fairly limited. Moreover, the *Baseline* collection and sorting rates in Japan and Korea are already very high, so the additional costs of increasing these rates are very low and far outweighed by the reduction in costs due to reduced waste volumes. The transition to cleaner waste management in these countries can therefore be considered as financially neutral.

In China, similar mechanisms are at play, but the magnitudes are substantially larger, and the cost savings mostly concern landfilling rather than incineration. As the cost of landfilling one kg of plastic are estimated to be lower than the cost of incineration (OECD, 2022^[2]) this implies lower savings from avoided plastic waste. On balance, the cumulative waste management costs are USD 12 bln lower than it would be in the *Baseline* as a result of the policy package. Thailand follows a similar pattern, with significant net savings amounting to USD 1 bln over the period between 2022 and 2050; compared to *Baseline* investments needed in the country amounting to USD 42 bln.

The other ASEAN countries stand to benefit less from the savings from reduced waste volumes, as, at least in ASEAN LMIC, mismanaged waste shares are high and waste collection rates are relatively low. In particular, significant additional investments are required in Indonesia to increase waste collection and sorting, recycling, and even landfilling, reflecting the unique challenges the country faces. Given the very high *Baseline* mismanaged waste shares, the volume of landfilled waste increases in the *High Stringency* scenario, accounting for a larger share of smaller volume of waste in 2050. The *Baseline* cumulative waste management costs of USD 32 bln in Indonesia between 2022 and 2050 will therefore increase to USD 51 bln in the *High Stringency* scenario. The additional investments for collection and sorting are substantially smaller in the other ASEAN LMIC, leading to cumulative waste management costs increasing from USD 58 bln in the *Baseline* to USD 70 bln under *High Stringency*.

Figure 6.10. Ending plastic leakage requires investments in waste management

Cumulative waste management costs for 2022-2050 in deviation from *Baseline* scenario in the APT region, USD bln.



Note: Scales are different by panel.

Source: OECD ENV-Linkages model.

StatLink <https://stat.link/giew93>

6.4. The *Differentiated Stringency* scenario is costlier and cannot eliminate plastic leakage

The *High Stringency* scenario investigated assumes that there is a common ambition all across the APT (with aligned stringency of policies as outlined in Table 6.1). However, given the different contexts in which the APT countries operate, it is conceivable for high- and upper middle-income countries in the region to implement more stringent policies than the lower middle-income countries. Furthermore, countries may not agree on shared goals throughout the plastic lifecycle, and could opt for more stringent policies downstream in the lifecycle (i.e. to enhance recycling and close leakage pathways) than mid- and upstream (i.e. to curb demand and design for circularity). It can therefore be relevant to investigate an alternative scenario that looks into the implications of different ambitions across income levels and lifecycle stage.

The *Differentiated Stringency* scenario does exactly that; it explores the environmental and economic implications of less ambitious policies in the APT region than what is assumed in the *High Stringency* scenario. In particular, it assumes that (see also Annex 6.A):¹⁰

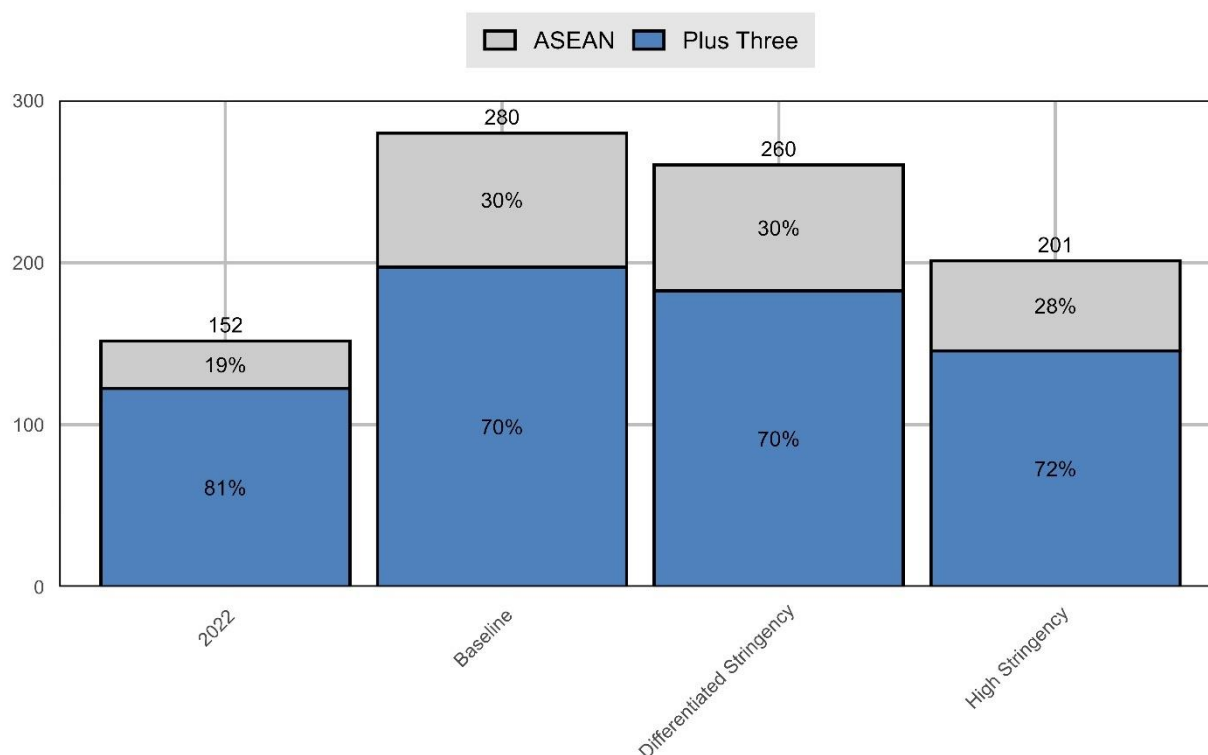
- High-income and upper middle-income APT countries¹¹ adopt low stringency for policy levers to curb demand and design for circularity, and high stringency for levers to enhance recycling and close leakage pathways.
- lower middle-income APT countries¹² adopt low stringency for levers to enhance recycling and close leakage pathways, and maintain current policies (*Baseline*) for the other two policy levers.¹³

6.4.1. The Differentiated Stringency scenario implies higher mismanaged plastic waste and worse environmental outcomes than the High Stringency scenario

In the *Differentiated Stringency* scenario, plastics use in the APT region is substantially above 2022 levels, and only moderately below *Baseline* 2050 levels, leading to levels of plastics use of 260 Mt in 2050 (Figure 6.11). This is significantly above the projections for the *High Stringency* scenario (201 Mt), with the difference becoming increasingly significant over time as the lower ambition policies fail to curb demand. The extent to which the plastics use is reduced is varied across APT regions. In the *Differentiated Stringency* scenario, reductions in plastics use in 2050 in the APT countries are around 7% from *Baseline* on average. The range across the APT countries is significant: from 5.5% in Indonesia to 12% in Japan. In general, the plastics use is reduced more in high- and upper middle-income countries than in lower middle-income countries, as the former implement low stringency policies to curb demand while the latter maintain current policies on the policy lever. Nonetheless, plastics use declines below *Baseline* levels in all countries in response to the policies to enhance recycling, which disincentivise primary plastic production and use.

Figure 6.11. Total plastics use in 2050 is substantially higher in *Differentiated Stringency* than in *High Stringency*

Plastics use in 2050 in Mt.



Note: More detailed results are presented in Annex Figure 6.B.4 in Annex 6.B.

Source: OECD ENV-Linkages model.

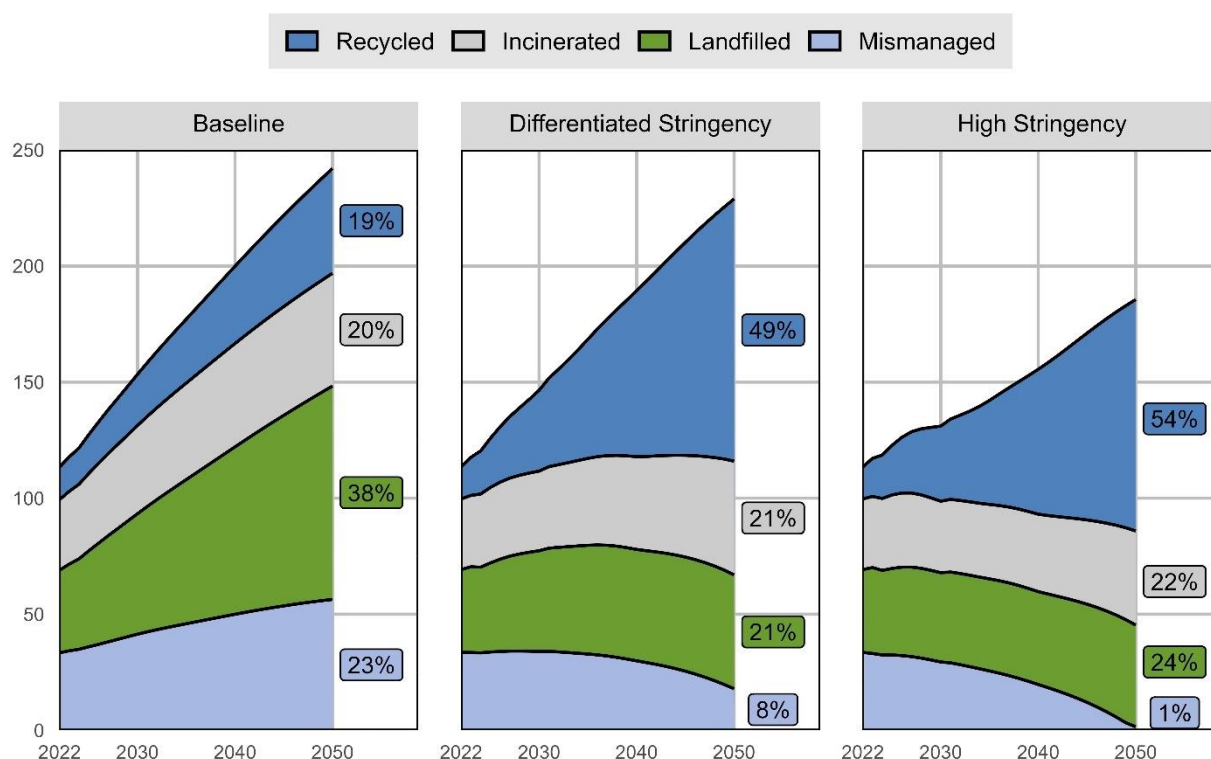
StatLink  <https://stat.link/9p8257>

With the implementation of policies to enhance recycling, the share of secondary plastics out of total use is growing rapidly to 37% in the *Differentiated Stringency* scenario. As total use of plastics is higher, secondary production in the APT region is projected to amount to 97 Mt in 2050 in the *Differentiated Stringency* scenario, versus 84 Mt under *High Stringency* (Annex Figure 6.B.5 in Annex 6.B). Yet secondary markets cannot fulfil the entire growth in use of plastics, and thus primary plastic production continues to expand over time.

When APT countries implement *Differentiated Stringency*, the policies to improve waste management are not as effective as when combined with stringent policies to curb demand and promote design for circularity (as in *High Stringency*). Shares of mismanaged waste remain significant in the APT (18 Mt in 2050, 8% of total waste), despite the emphasis of the *Differentiated Stringency* scenario on downstream policies (see Figure 6.12; more detailed results are presented in Annex Figure 6.B.6 in Annex 6.B). This is influenced by two mechanisms: (i) ASEAN LMIC only halve their share of mismanaged waste, and (ii) even in the rest of the APT countries, high stringency policy to eliminate mismanaged waste is not fully effective, as total waste volumes are much larger than in the *High Stringency*. Thus, the policy lever to close leakage pathways leads to a decline in the share of mismanaged waste to 6% of total waste (i.e. 1.0 Mt) in 2050 in ASEAN – HIC & UMIC in the *Differentiated Stringency* scenario, but this goes down to 1% (0.1 Mt) if combined with stringent action on levers across all stages of the plastic lifecycle (*High Stringency*). For the ASEAN LMIC, the difference is even more stark: the policies in the *Differentiated Stringency* scenarios can slightly reduce the volume of mismanaged waste over time (from 9.8 Mt in 2022 to 9.3 Mt in 2050), bringing down the share of mismanaged waste from 70% in 2022 to 21%. The considerable remaining leakage in this region in the *Differentiated Stringency* scenario stems from large waste volumes (44 Mt in 2050 vs 14 Mt in 2022) and limited effectiveness of the downstream policies to close leakage pathways.

Figure 6.12. Mismanaged waste remains an issue in the *Differentiated Stringency* scenario

Waste in Mt.



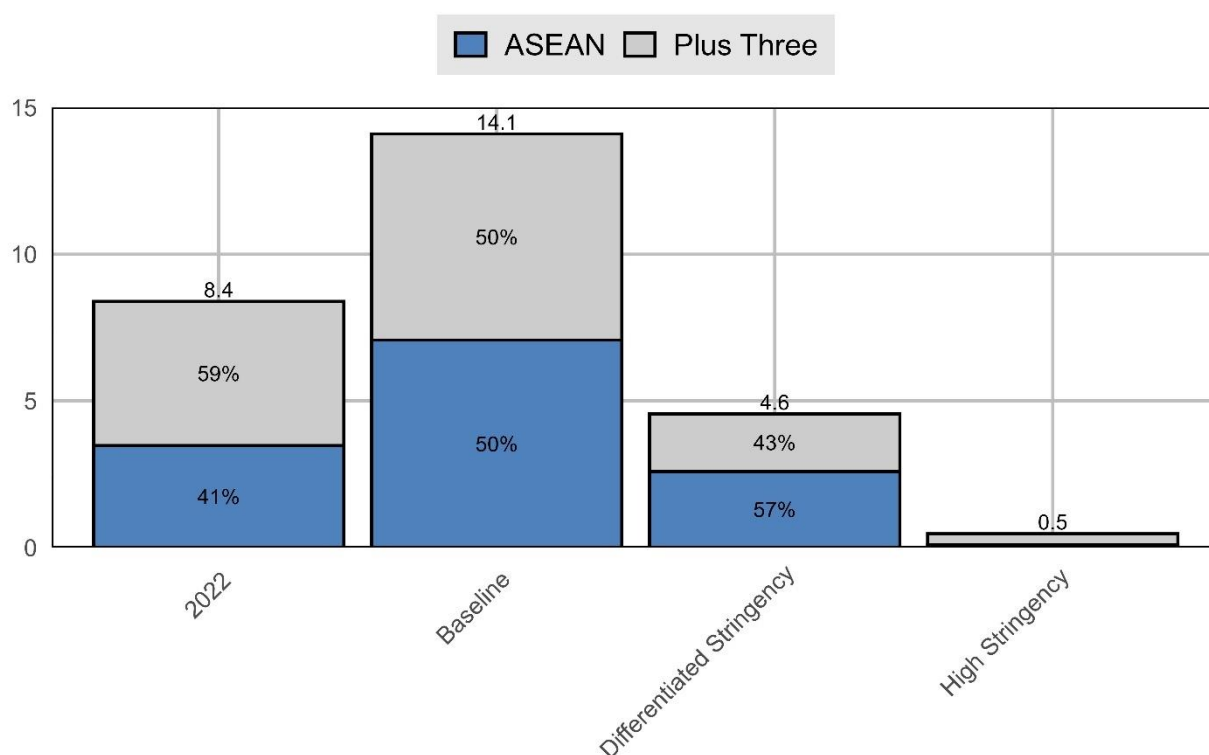
Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/tg4zym>

A major consequence of the larger volumes of mismanaged waste in the *Differentiated Stringency* scenario is the increased leakage of plastics to the environment: by 2050, 4.6 Mt is projected to leak to the environment – 2.6 Mt in ASEAN, 2.0 Mt in the Plus Three (Figure 6.13). The biggest contributions come from countries that have large waste volumes and significant shares of mismanaged waste, notably China (low mismanaged waste share but very high volumes of waste) and the lower middle-income ASEAN countries (they have significant mismanaged waste shares). This is still substantially below the *Baseline* projection (of 14.1 Mt), but implies that every year the stocks of plastic in the environment continue to accumulate, and plastic pollution in the APT region cannot be eliminated.

Figure 6.13. Plastic leakage is eliminated only in the *High Stringency* scenario

Plastic leakage to the environment in Mt.



Source: OECD ENV-Linkages model.

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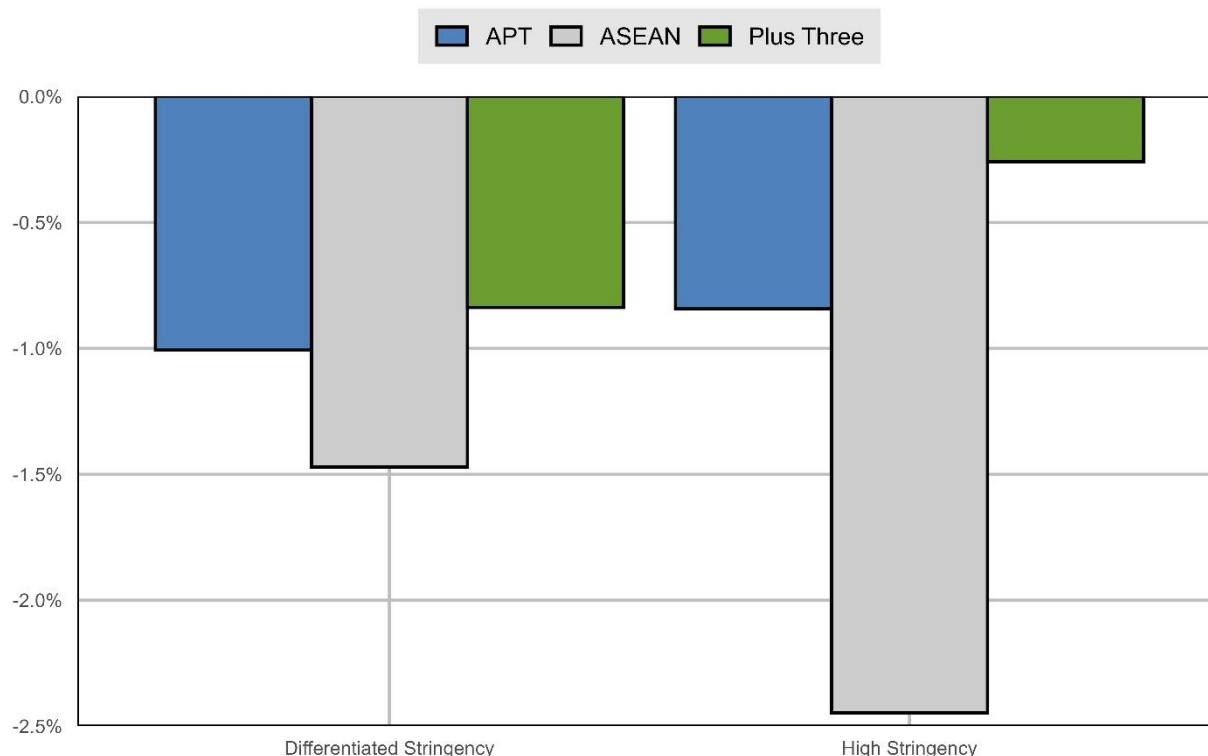
6.4.2. The *Differentiated Stringency* scenario has lower costs for ASEAN countries, but not for the APT as a whole

A priori, less ambitious policies to mitigate plastic leakage may seem appropriate from a narrow policy cost perspective.¹⁴ This is true to some extent in the ASEAN countries, where the *Differentiated Stringency* policies can lower some of the macroeconomic costs from implementing policies to end plastic leakage (Figure 6.14). Specifically, it can be costly for ASEAN LMIC with high *Baseline* share of mismanaged waste to achieve the high recycling rates in the *High Stringency* scenario, and the lower ambition levels for lower middle-income countries in the *Differentiated Stringency* scenario imply smaller and thus less costly adjustments. The opposite holds, however, for the Plus Three countries as they can benefit from improvements in their competitive position, driven not least by the positive economic effects of the eco-design policies (as these make production of plastic substitutes and repair services cheaper). Overall, the

macroeconomic impacts for the APT are worse in the *Differentiated Stringency* scenario than in the *High Stringency* scenario. These results point to the need for an equitable sharing of the burden to end plastic pollution, and potentially for financial or technical support for ASEAN LMIC to contribute to the regional and global efforts to eliminate plastic leakage (see Chapter 7 for a further discussion).

Figure 6.14. Lower ambition levels lower the GDP costs in ASEAN countries, but not in the Plus Three

Deviation from *Baseline* scenario in 2050.



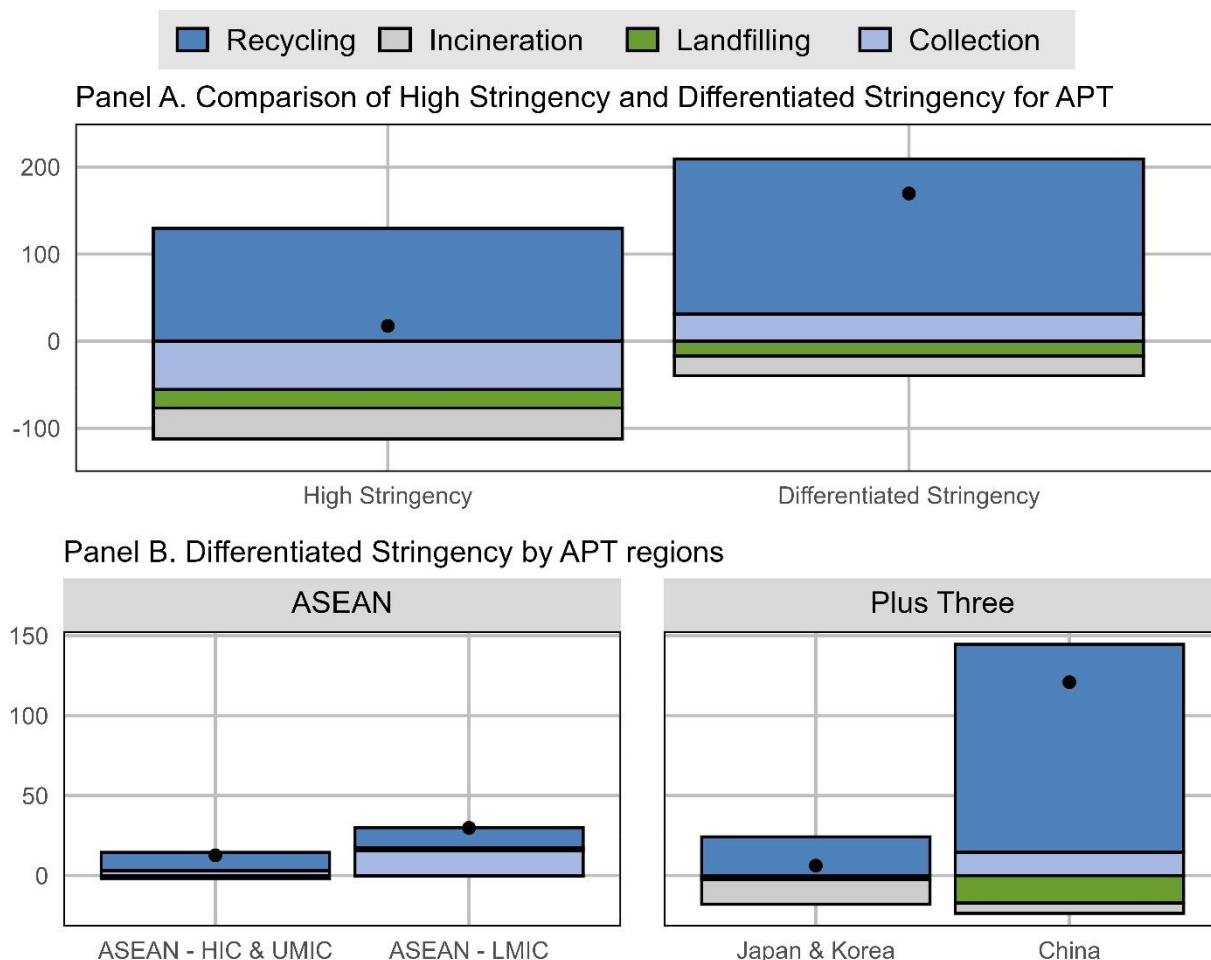
Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/ez2dfu>

In terms of (cumulative) waste treatment costs, (OECD, 2024^[1]) already clearly showed that the focusing only on downstream policies are less cost-effective than implementing policies throughout the plastic lifecycle. Comparing the *High Stringency* and *Differentiated Stringency* scenarios illustrates that this is also the case for the APT region (Figure 6.15). While the *High Stringency* scenario primarily revolves around a re-orientation of investments into waste management, the larger volumes of waste in the *Differentiated Stringency* scenario imply higher costs for collection and sorting (USD 29 bln above *Baseline* in *Differentiated Stringency* vs. USD 58 bln below *Baseline* in *High Stringency*), as well as higher costs for recycling (USD 178 bln above *Baseline* in *Differentiated Stringency* vs. USD 130 bln above *Baseline* in *High Stringency*). Furthermore, the cost savings from lower shares of incineration and landfilling are smaller (USD -40 bln and USD -57 bln, respectively), as larger volumes have to be treated. Thus, total cumulative waste treatment costs in the *Differentiated Stringency* scenario amount to USD 167 bln above *Baseline*, versus USD 15 bln in *High Stringency*, a difference of USD 153 bln.

Figure 6.15. Less ambitious policies can lead to higher waste management costs

Cumulative waste management costs for 2022-2050 in deviation from Baseline scenario, USD bln.



Source: OECD ENV-Linkages model.

StatLink <https://stat.link/8pijfh>

The composition of this additional cumulative cost of USD 153 bln in total differs significantly across countries (panel B in Figure 6.15): in the high- and upper middle-income countries, i.e. ASEAN HIC & UMIC and the Plus Three, the additional costs are concentrated in recycling, as waste collection and sorting already take place for almost all generated waste in the *Baseline*. Furthermore, the reduction in waste volumes translates into cost savings for collection, sorting and incineration (or landfilling, depending on the country) compared to the *Baseline*; the latter effect remains strong in Japan and Korea in the *Differentiated Stringency* scenario (USD 18 bln below *Baseline*), although still weaker than in *High Stringency*. China is an intermediate case, where the waste collection savings are not very significant (also in comparison to the savings in *High Stringency*), but there is a shift in costs from landfilling to recycling.

The ASEAN LMIC are in a different situation, given the significant amount of mismanaged waste in the *Baseline*: more waste needs to be collected and sorted and then either landfilled or recycled in the *Differentiated Stringency* scenario than in *High Stringency*. These all lead to additional costs, and there are almost no savings from reduced waste volumes, which decrease from 46 Mt in 2050 in the *Baseline* to 44 Mt in the *Differentiated Stringency* scenario (and 33 Mt in *High Stringency*).

6.5. The *High Stringency* scenario can deliver large benefits for the region, but global ambition remains critical

While this Outlook focuses on policy action in the APT, global policy ambition and strengthened co-operation are critical to ending plastic leakage globally, as emphasised by previous OECD analyses (OECD, 2022^[3]; OECD, 2024^[11]). The core scenario discussed in this chapter (*High Stringency*) explores a pathway to ending plastic leakage, focusing on the APT region. The scenario assumes that the countries outside the APT implement policies with differentiated ambitions.¹⁵ This section complements the analysis by discussing how policies in the rest of the world can influence outcomes of policy action to end plastic leakage, in the APT and globally.

While the APT region can nearly eliminate its own plastic leakage through ambitious and regionally co-ordinated domestic policies, the effective protection of shared global commons requires ambitious policies also at the global level. The ocean is home to rich biodiversity that underpin indispensable and often irreplaceable ecosystem services that benefit all countries, including support for livelihoods for billions of people, climate regulation, carbon sequestration and oxygen generation. Oceans are also interconnected systems. Plastic leakage is transboundary, meaning that leaked plastic originating outside the APT contributes to the region's environmental burden, and equally, plastic leakage in the APT region can also affect the environment in the rest of the world.

This section explores the implications of high policy ambition in the rest of the world. It evaluates the implications in terms of environmental benefits for the APT region and globally, by looking in particular at the transboundary movements of leaked plastics from neighbouring regions to the APT region, which contribute to pollution in aquatic environments. It also assesses the economic implications of policy action in the APT on i) the comparative advantage of the APT economies and ii) changes in demand for APT goods and services to explore whether there would be significant economic implications for the APT in taking ambitious policy action independent of the level of ambition in the rest of the world. Implications for financing and needs for capacity-building are discussed separately, and in more detail, in Chapter 7.

6.5.1. The *High Stringency* scenario nearly eliminates mismanaged plastic waste in the APT

If the rest of the world aligns with the APT to implement High Stringency policies (*Global High Stringency* scenario), plastics use in the APT region declines slightly more by 2050 to 194 Mt (vs 201 Mt in *High Stringency*). The reason for this is an indirect knock-on effect of policies implemented outside the APT region. Specifically, the stringent policies outside the APT – which are aligned with the stringency in the APT region and more stringent than in the *High Stringency* scenario – result in less demand for plastic products from the APT region. Thus, producers in the region can export less plastics, thereby reducing production and use of plastics in the APT region by 4% compared to the *High Stringency* scenario (see Annex Figure 6.B.5 in Annex 6.A for results on effects for specific sectors).

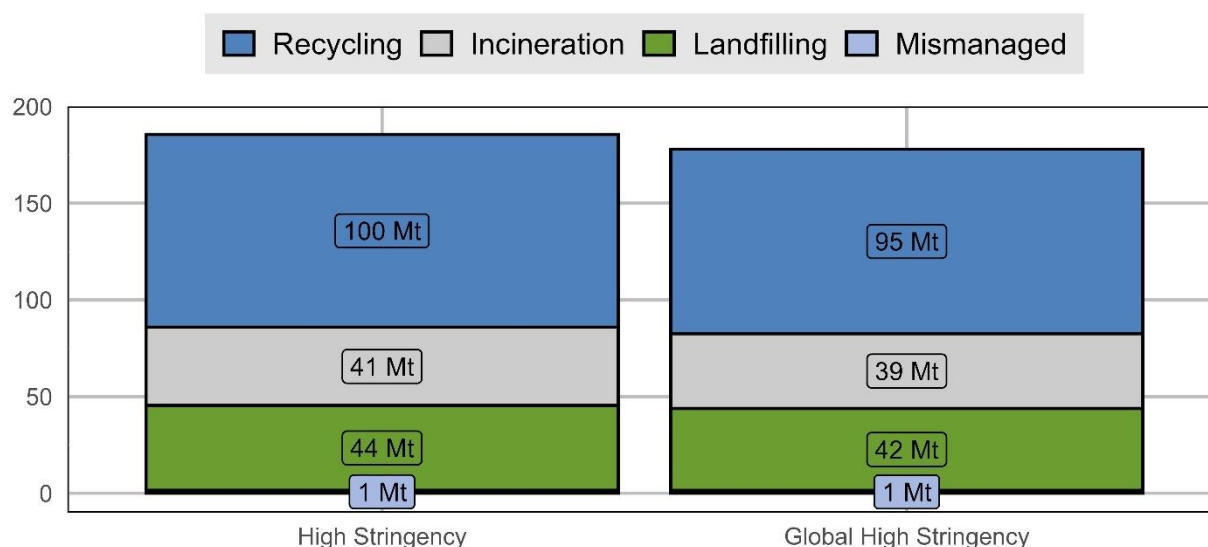
As all APT countries export less plastics in the *Global High Stringency* scenario; net exports from the APT region decrease by 16% compared to the *High Stringency* scenario.¹⁶ These changes depend crucially on the competitive position of the plastics sector: the domestic production prices of primary and secondary plastics shift, and these shifts are not homogeneous across countries. Thus, there are comparative advantages to be exploited by revising trade flows. In terms of plastics applications, this trade effect mostly affects packaging plastics (see Annex Figure 6.B.4 in Annex 6.A).

As in the other scenarios, regional waste streams largely follow the patterns of plastics use, with a time lag depending on the application; the effect of plastic waste trade flows remains limited.¹⁷ Thus, total waste in the APT region in 2050 is projected to be slightly lower (4%) in the *Global High Stringency* scenario (178 Mt vs. 186 Mt in the *High Stringency* scenario; see Figure 6.16). As expected, the effects of policies outside

the APT on the ways in which waste is treated are minimal, despite some minor differences in plastic waste trade volumes (the projections assume imported waste is handled together with domestically produced waste).

Figure 6.16. Total plastic waste in the APT region is nearly the same in the *High Stringency* and *Global High Stringency* scenarios

Plastic waste in Mt in 2050.



Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/9oxvj3>

6.5.2. Regional policy action alone cannot solve plastic pollution entirely

While plastic leakage from land-based sources in a given country is primarily determined by domestic activities, policies and waste management infrastructure, plastic pollution is a global issue, both in its causes and its consequences (Annex Figure 6.B.7 in Annex 6.B shows how ambitious policy outside the APT region affects plastic leakage). Ambitious regional policy action in the APT countries alone suffices to nearly eliminate plastic leakage originating from the region.¹⁸ However, plastic pollution, including that in shared aquatic environments, cannot be fully addressed through regional action alone. Furthermore, as highlighted above, the main benefit of the *Global High Stringency* scenario is that it protects the planet and its oceans from plastic pollution, rather than only protecting the environment in the APT.

Even if the APT countries eliminate their own plastic leakage, they remain vulnerable to plastic leakage originating elsewhere. By 2022, the volume of leaked plastics originating outside the APT but stranded in aquatic environments in the APT region is estimated at 1.3 Mt (Table 6.3), while 1.1 Mt has transferred from the APT to the rest of the world. Furthermore, the Plus Three countries are the origin of 1.1 Mt of plastics accumulated in the ASEAN aquatic environments; the opposite transfer, from ASEAN to Plus Three, is much smaller at 0.2 Mt, reflecting the geography of the region as well as historic volumes of plastic leakage (see Chapter 2). Larger amounts are transferred among ASEAN countries (2.2 Mt) albeit not much between the Plus Three (0.2 Mt), highlighting that while plastics flow across borders, the effects decline with distance.¹⁹

While these numbers are smaller than the domestic plastic leakage in the APT (for comparison, 65 Mt of plastic has accumulated in the APT aquatic environment in 2022), it highlights that no country can fully insulate itself from global environmental problems. Over time, amounts of plastics stranded in APT aquatic environments grow steadily. By 2050, under current policies (*Baseline* scenario), the annual “inflow” of plastics from outside the APT amounts to 0.2 Mt (Annex Figure 6.B.8 in Annex 6.B), particularly affecting ASEAN LMIC (82% of inflows), and less so ASEAN HIC & UMIC and the Plus Three. By 2050, 4.3 Mt of plastics leaked outside the APT is projected to be stranded in ASEAN, and another 0.6 Mt in the Plus Three. Cross-border transfers among countries in the APT region lead to a projected 11.8 Mt of plastics stranded in a different APT country than where it originated. Flows from the APT to the rest of the world rise less rapidly, amounting to 3.9 Mt of APT-originated plastic stranded outside the APT.

The *High Stringency* scenario, which assumes High Stringency within the APT but not globally, projects a slowdown of these cross-border flows of plastic, but still steady increase in plastic leakage to rivers, lakes and oceans in the APT region. The accumulation of plastics from outside the region is limited to 4.5 Mt (i.e. 0.4 Mt below *Baseline*, and 3.2 Mt above 2022 values). But APT-originated leaked plastic stranded outside the region declines from 3.9 Mt to 2.6 Mt as a result of the APT policies.

In the *Global High Stringency* scenario, the stronger policy action outside the APT mitigates the amounts of plastics stranded in the APT to 3.7 Mt by 2050, 0.8 Mt less than the *High Stringency* scenario. The leakage from APT countries stranded outside the region remains the same across the two policy scenarios (2.6 Mt). There are also some differences between the *High Stringency* and *Global High Stringency* scenarios in leakage that flows among the Plus Three countries and to ASEAN, with the global scenario leading to lower transfers of leaked plastics. This is in line with the differences in total and mismanaged waste in the Plus Three countries described above: lower domestic leakage also means lower transfer of leaked plastic to other countries.

While changes across scenarios in inflows of plastics to aquatic environments in the APT do not seem very large on an annual basis, the build-up over time is significant. The shares of the different destinations do not alter significantly across scenarios (Annex Figure 6.B.7 in Annex 6.B presents the associated regional flows in more detail). However, cumulative values underscore the importance of global ambition to comprehensively end plastic pollution. Plastics still leaking into the environment between now and 2050, and flowing between different aquatic environments for decades to come continue to accrue. Thus, stocks of plastics in the APT aquatic environment continue to rise until 2050, even in the most ambitious global scenario, ranging from 181 Mt in the *Baseline* to 121 Mt in the *High Stringency* scenario and 120 Mt in the *Global High Stringency* scenario (compared to 65 Mt in 2022). Moreover, interventions such as clean-up measures and remediation interventions could be envisioned as part of a high ambitious scenario implemented globally, however these are not modelled as part of the *Global High Stringency* scenario and the possible benefits in reducing transboundary flows of plastic leakage are not quantified.

Ultimately, the case for global High Stringency extends beyond regional flows of aquatic plastic leakage. Oceans and freshwater ecosystems provide critical ecosystem services, including carbon sequestration, biodiversity preservation and livelihoods and food security. Their health depends on action that transcends national borders. The APT can control its own contribution to plastic leakage, however securing long-term environmental benefits requires shared global responsibility and ambitious global policy action.

Table 6.3. More leaked plastics from outside the APT region accumulate in ASEAN than in the Plus Three

Accumulation of non-domestically leaked plastics in regional aquatic (shoreline) environment by origin and destination, and by scenario

		to ASEAN	to Plus Three	to Rest of the World
2022	from ASEAN	2.2	0.2	1.0
	from Plus Three	1.1	0.2	0.1
	from Rest of the World	1.1	0.2	
Baseline 2050	from ASEAN	7.1	0.8	3.6
	from Plus Three	3.6	0.4	0.3
	from Rest of the World	4.3	0.6	
High Stringency 2050	from ASEAN	5.1	0.6	2.4
	from Plus Three	3.1	0.3	0.3
	from Rest of the World	3.9	0.5	
Global High Stringency 2050	from ASEAN	5.1	0.6	2.4
	from Plus Three	3.0	0.3	0.3
	from Rest of the World	3.2	0.4	

Source: Adapted from (Borrelle et al., 2020^[9]), (Meijer et al., 2021^[10]) and (Chassignet, Xu and Zavala-Romero, 2021^[11]), based on OECD ENV-Linkages model.

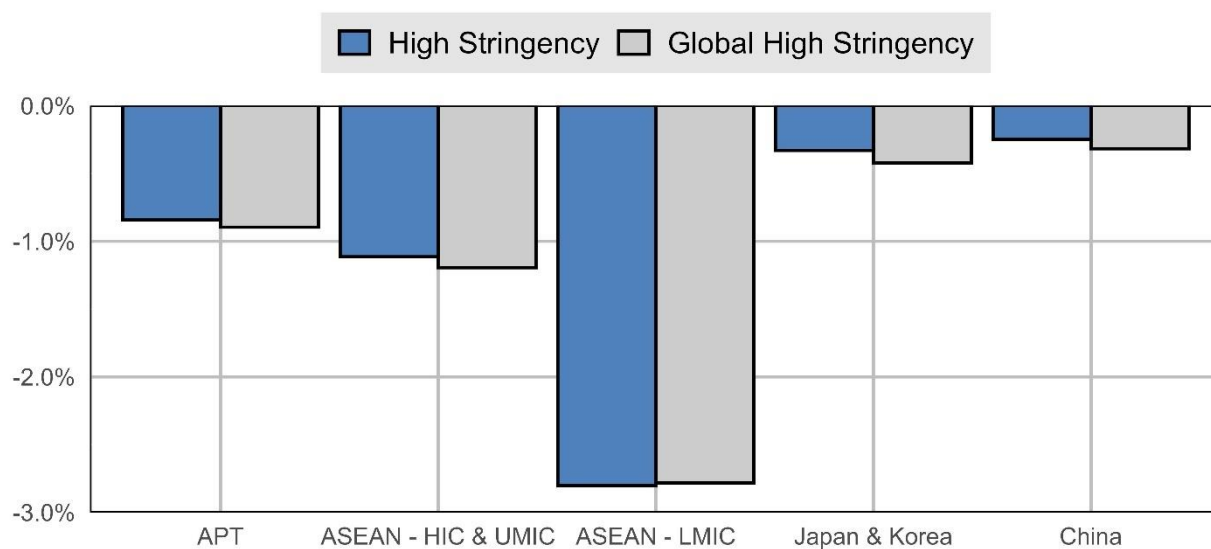
6.5.3. Cost and competitiveness implications are limited for APT countries, even without global ambition

In both *High Stringency* and *Differentiated Stringency* scenarios for the APT, the average cost of the policy package in terms of GDP loss from *Baseline* are slightly higher when countries outside the APT implement High Stringency policies, but similar overall (Figure 6.17). When countries outside the APT increase their ambition, their economies contract compared to the scenarios with laxer policies; this then also reduces demand for goods and services from the APT region.²⁰ Nonetheless, the differences are small, especially in the countries with the largest economic impact, i.e. ASEAN LMIC. Importantly, this implies that the APT region does not lose significant competitive position vis-à-vis their competitors when they do not align their policy stringency to other countries.

Of all four scenarios, the one where APT countries implement High Stringency policies while the rest of the world have differentiated ambitions, leads to the lowest aggregated macroeconomic impact. In other words, a "go high alone" strategy where APT countries adopt high stringency policies throughout the lifecycle is not more costly than global high stringency action – competitiveness concerns should not deter the APT region from increasing their domestic ambition on plastics-related policies (as long as they adopt a balanced set of policies tackling the entire lifecycle). Nonetheless, global technical co-operation and finance, which are not explicitly modelled in these scenarios, could potentially affect these results significantly (see Chapter 7).

Figure 6.17. The regional macroeconomic impacts are very similar between *High Stringency* and *Global High Stringency* scenarios

Variation compared to the *Baseline* scenario in 2050.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

StatLink  <https://stat.link/psuhf5>

Annex 6.A. Details of the modelling set-up

Annex Figure 6.A.1. Visual summary of the main policy scenarios

Full name	APT	Rest of the world
<i>Baseline</i>		
<i>High Stringency</i>		
<i>Differentiated Stringency</i>		
<i>Global High Stringency</i>		

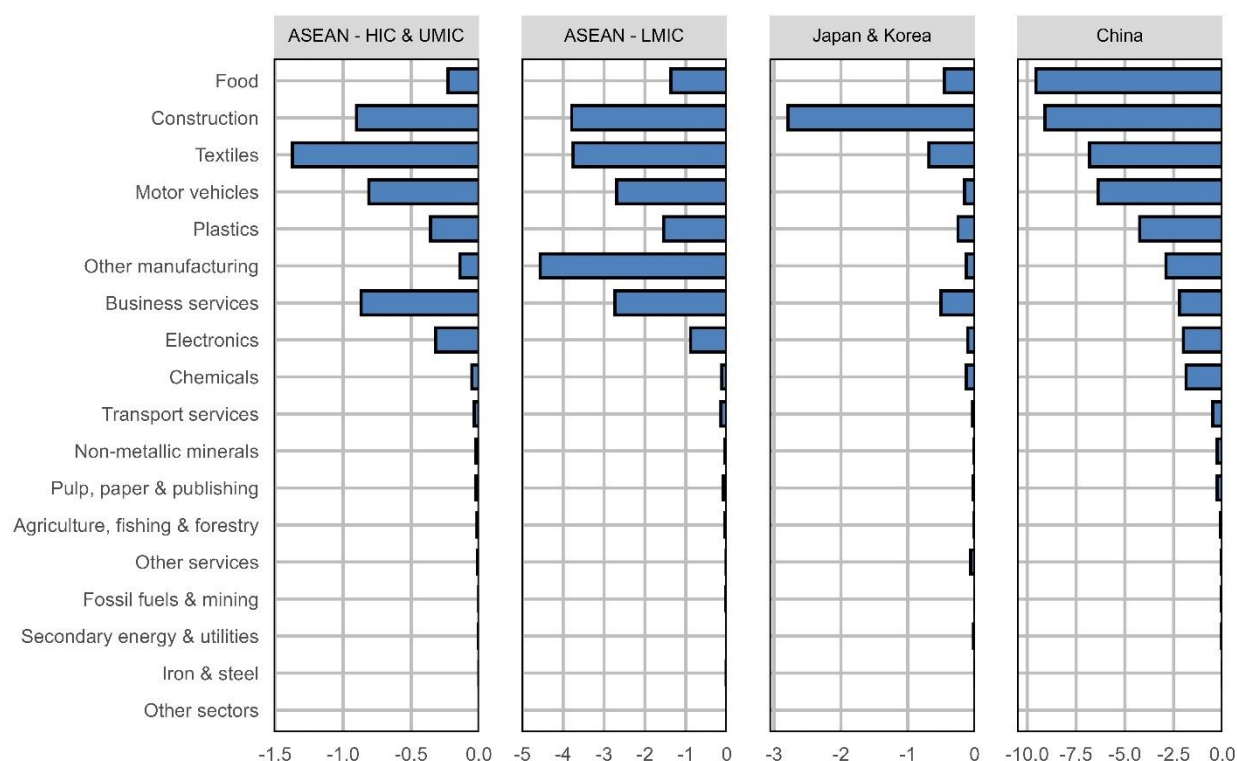
Notes: White cells represent *Baseline* assumptions; light-blue cells low stringency; dark blue cells high stringency (see (OECD, 2024_[11]) for more details).

HUMIC = High- and upper middle-income countries; LLMIC = Low and lower middle-income countries; regional allocation is an approximation by model region, not by country: the model HUMIC regions include all OECD regions, China, Non-OECD EU, OECD and non-OECD Latin America, Eurasia as well as Thailand and Rest of ASEAN - HIC and UMIC (Brunei Darussalam, Malaysia, Singapore).

Annex 6.B. Detailed results of the policy scenarios

Annex Figure 6.B.1. Sectoral plastics use reductions in the APT regions

Sectoral plastics use reduction in the APT region in Mt in the *High Stringency* scenario in 2050 compared to *Baseline*.

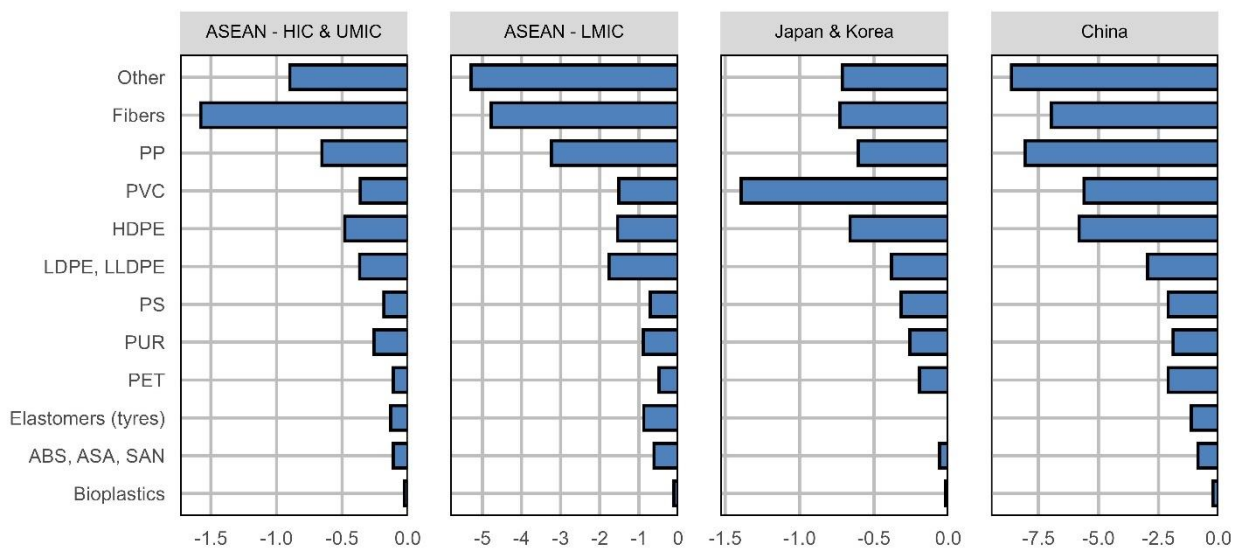


Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

Annex Figure 6.B.2. Four ‘hard to collect or recycle’ polymers are relatively less reduced than other polymers

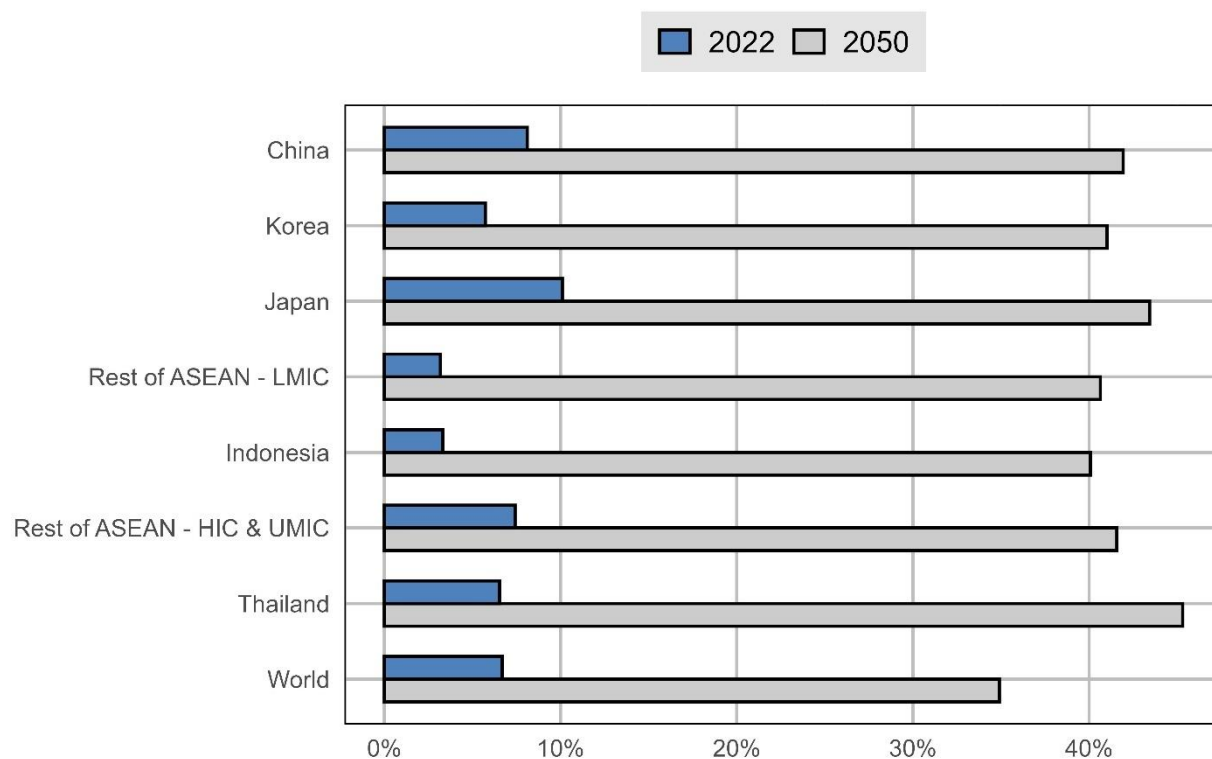
Reduction in plastics use by polymer types in APT in Mt in the *High Stringency* scenario in 2050, relative to *Baseline*.



Note: "PVC," "Other," "PS" and "PUR" are the "hard to collect or recycle" polymer types referenced. Scales differ by panel. Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.
Source: OECD ENV-Linkages model.

Annex Figure 6.B.3. All APT countries are projected to reach a secondary share over 40% by 2050

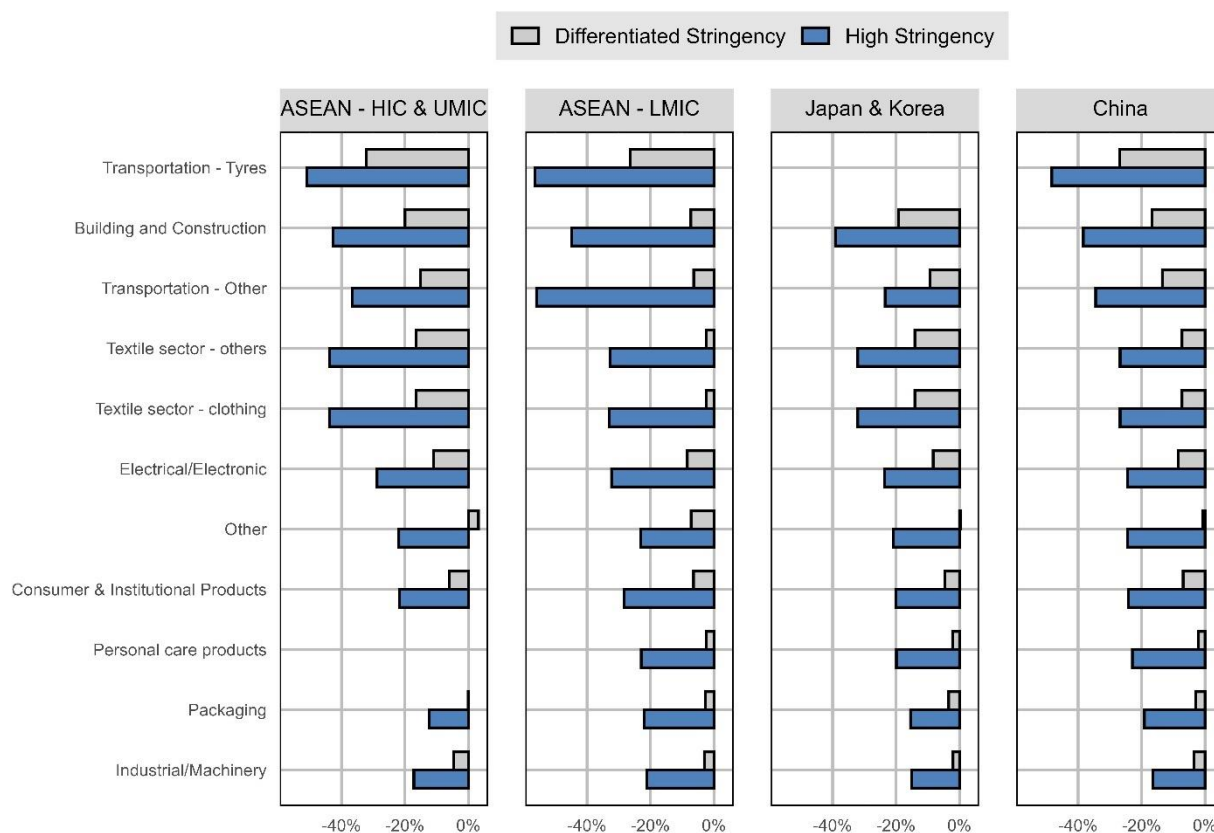
Share of secondary plastics in total production in the *High Stringency* scenario.



Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

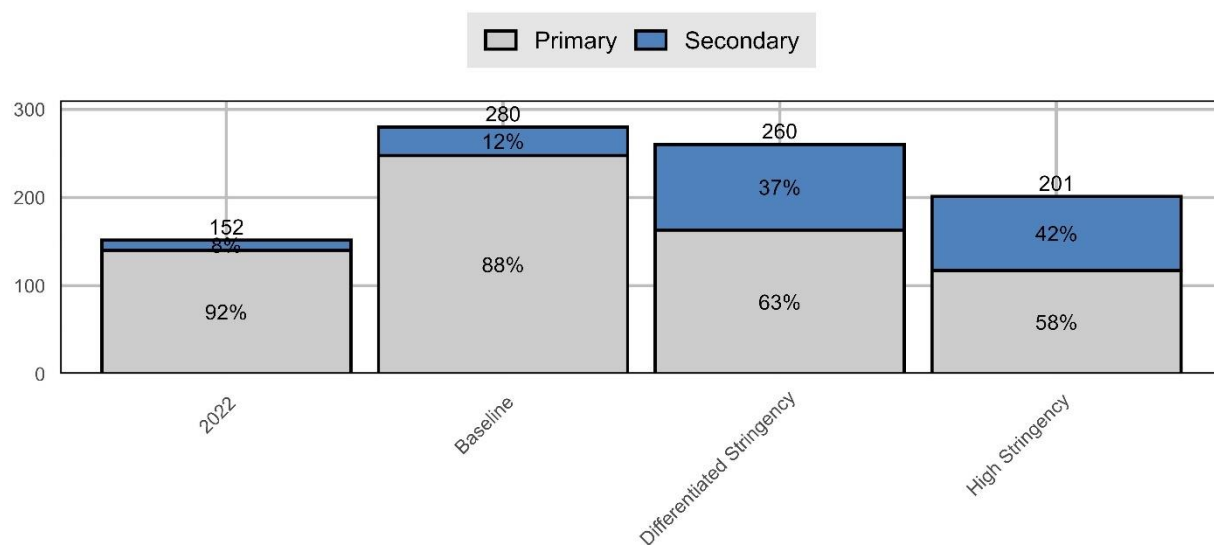
Annex Figure 6.B.4. Total plastics use percentage change with respect to *Baseline* in 2050 by scenario and application



Note: In some cases, the amounts of plastics for specific applications are too small to report changes across scenarios. Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.
Source: OECD ENV-Linkages model.

Annex Figure 6.B.5. Primary and secondary plastics use by scenario

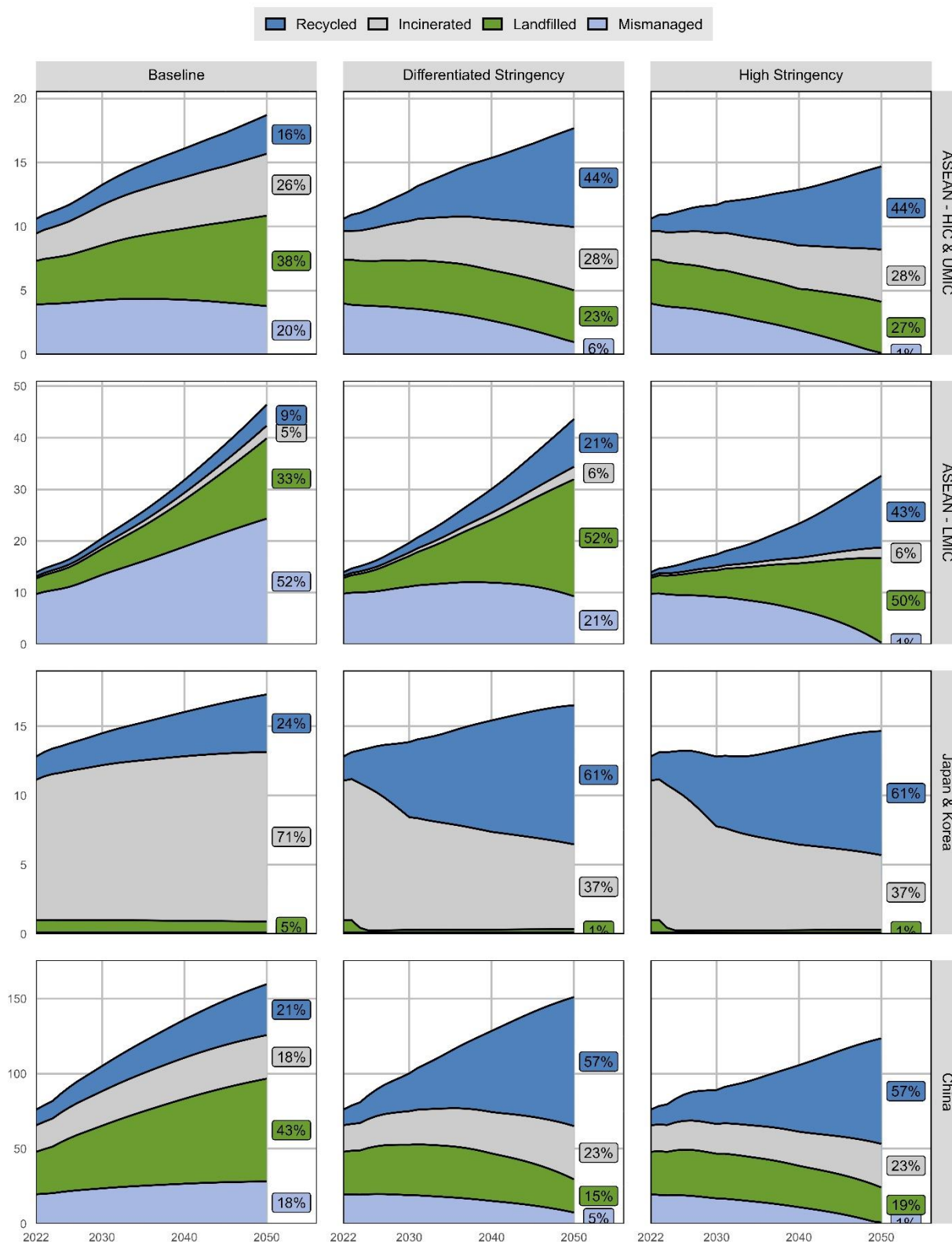
Total plastics use in million tonnes (Mt), and shares of primary and secondary



Source: OECD ENV-Linkages model.

Annex Figure 6.B.6. End of life plastic fates by region and scenario, 2022-2050

Mt

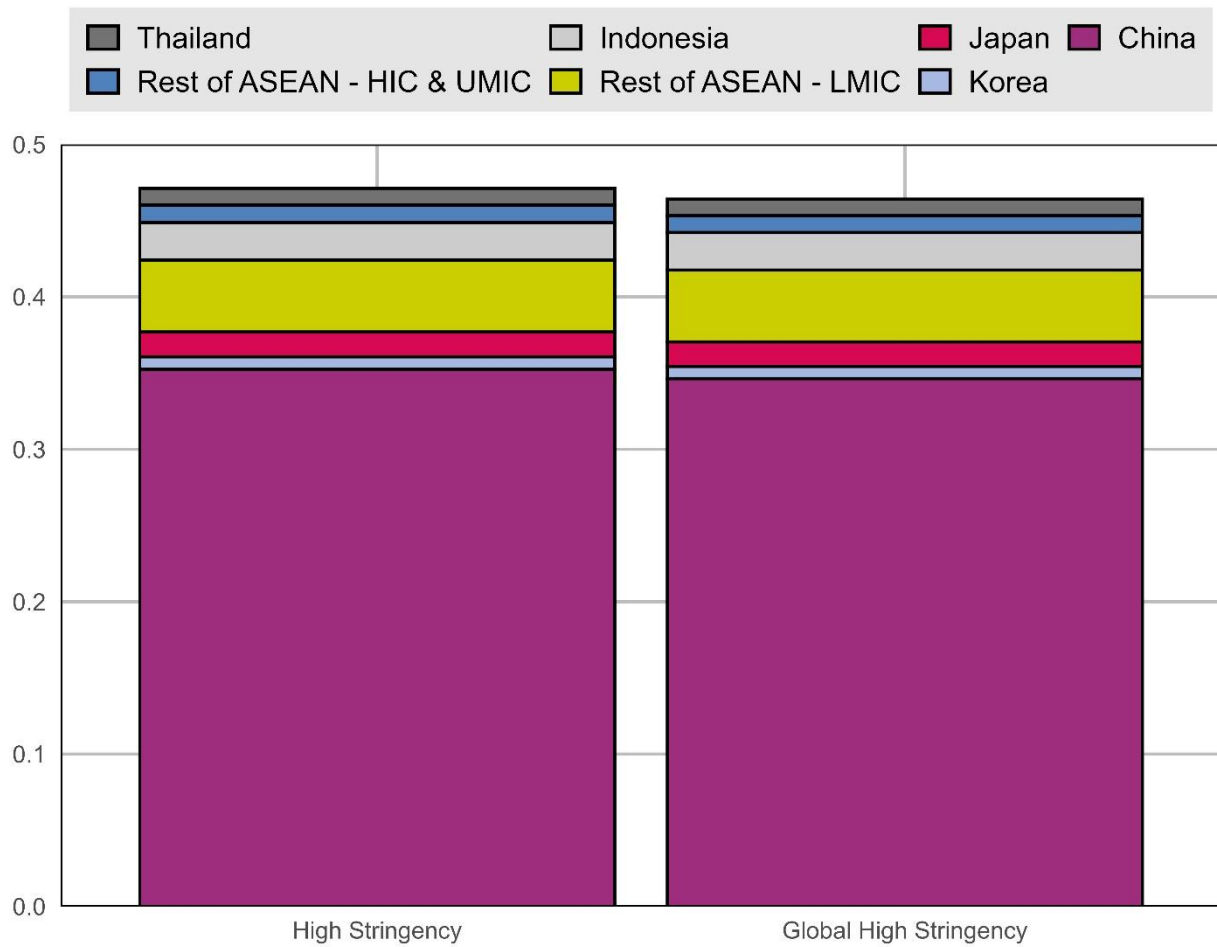


Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: OECD ENV-Linkages model.

Annex Figure 6.B.7. Domestic policies drive plastic leakage originating in the APT

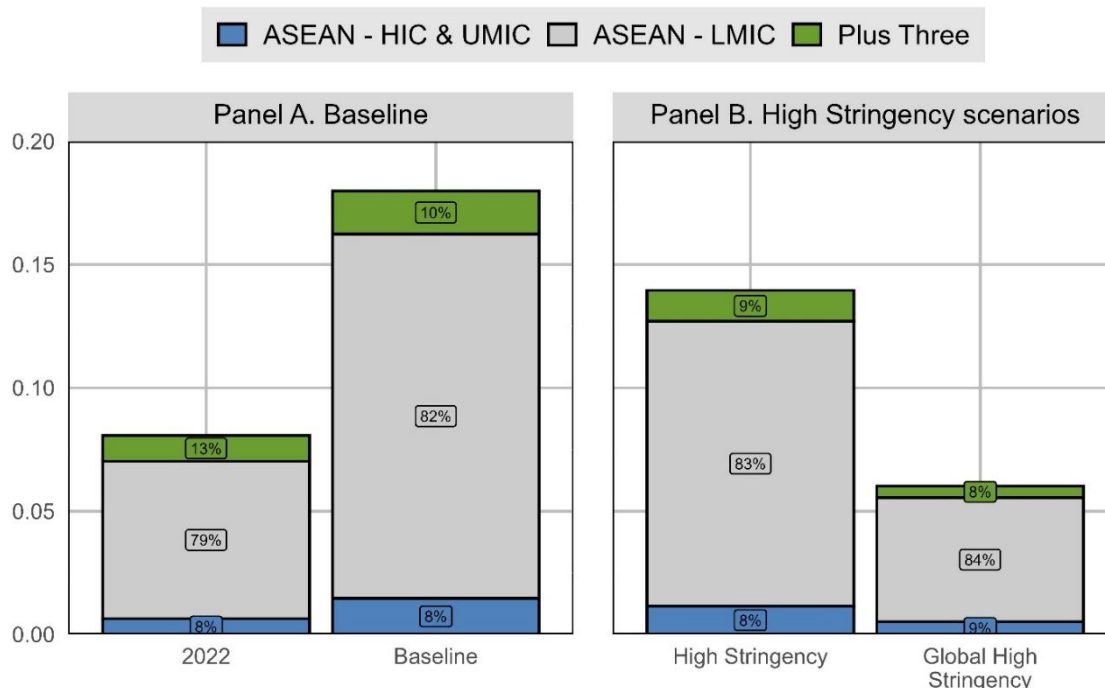
Plastic leakage to the environment in Mt in 2050.



Source: Adapted from (Borrelle et al., 2020^[9]; Meijer et al., 2021^[10]), based on OECD ENV-Linkages model.

Annex Figure 6.B.8. Relatively small amounts of leaked plastics that originate outside the APT enter APT aquatic environments annually

Aquatic leakage from rest of the world reaching the APT aquatic (shoreline) environment in 2050 per scenario, Mt.

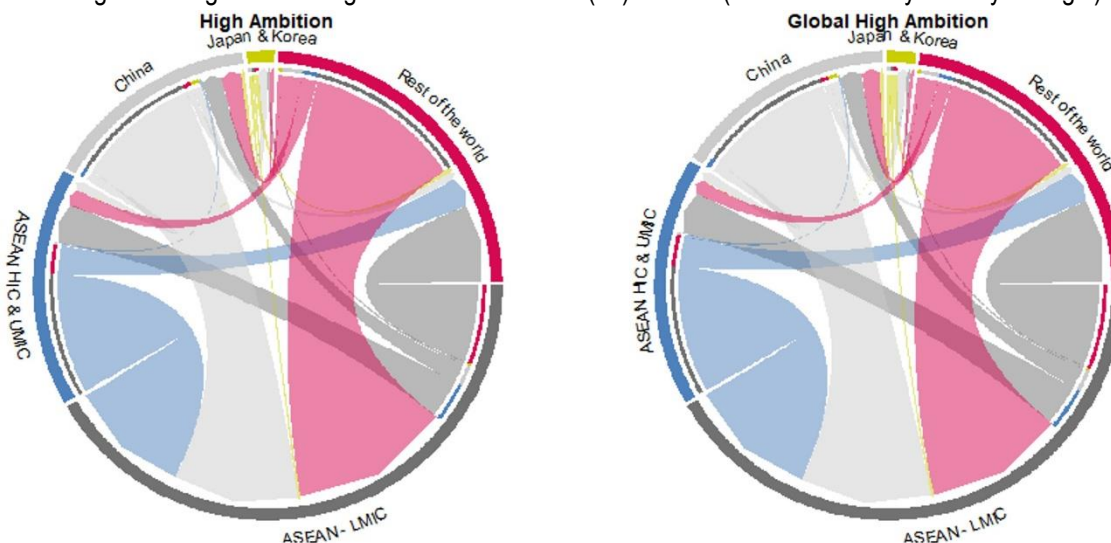


Note: Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: Adapted from (Borrelle et al., 2020^[9]), (Meijer et al., 2021^[10]) and (Chassignet, Xu and Zavala-Romero, 2021^[11]), based on OECD ENV-Linkages model.

Annex Figure 6.B.9. Plastic leakage flows between regions in 2050

Plastic leakage traveling between regions in million tonnes (Mt) in 2050 (flows coloured by country of origin)



Note: Excludes intra-regional flows. Rest of ASEAN – LMIC includes Cambodia, Lao PDR, Myanmar, Philippines, Viet Nam; Rest of ASEAN – HIC & UMIC includes Brunei Darussalam, Malaysia, Singapore.

Source: Adapted from (Borrelle et al., 2020^[9]), (Meijer et al., 2021^[10]) and (Chassignet, Xu and Zavala-Romero, 2021^[11]), based on OECD ENV-Linkages model.

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Notes

¹ The policy scenario analysis focuses on the elimination of mismanaged plastic waste and of the leakage to the environment of macroplastics, i.e. recognisable plastic items and litter. Microplastic leakage projections are beyond the scope of this Outlook.

² In contrast, plastics use in the policy scenario is below 2022 levels in Korea and Japan.

³ The ban on selected single-use plastic products also affects PP specifically.

⁴ These shares of secondary plastics in production and use do not transpose proportionately to the different sectors, applications and polymers. Secondary plastics are easier to implement in certain application and polymers than others, and in countries with low shares of secondary in the Baseline, the transition will be slower, affecting especially long-lived applications and the corresponding sectors (not least construction). These results hinge crucially on overcoming technical barriers to increase recycling of all polymers and reducing recycling losses, as discussed in (OECD, 2022^[3]).

⁵ Due to concerns with the feasibility and the environmental impacts of chemical recycling, the scenario analysis assumes that mechanical recycling technologies are the primary type of recycling technology adopted by countries (OECD, 2023^[12]).

⁶ The policy scenario assumes improvements in litter collection rates, especially in the lower middle-income ASEAN countries. Such improvements will bring these countries up to the global best practice, but cannot avoid all littered plastic from leaking to the environment.

⁷ Cambodia, Indonesia, Lao PDR, Myanmar, Philippines and Viet Nam.

⁸ The policy scenario does not assume high stringency global policies, but rather differentiated ambitions outside of APT (see Annex 6.A). The consequences of policy action in the rest of the world are explored in Section 6.5.

⁹ Whether these alternatives have a better environmental profile is still subject of discussion, and depends among others on how often products are reused (see e.g. (Meng, Brandão and Cullen, 2024^[7]) for a discussion on climate effects and (Avery et al., 2025^[5]) for a discussion of packaging alternatives). Box 6.1 discussed some of the considerations to keep in mind when designing reduction or lifespan extension policies, as well as risks for unintended effects.

¹⁰ This effectively aligns the ambitions in the APT to the ones outside the region.

¹¹ Plus Three (China, Korea and Japan), and ASEAN HIC & UMIC (Thailand, Brunei Darussalam, Malaysia and Singapore).

¹² ASEAN LMIC (Indonesia, Cambodia, Lao PDR, Myanmar, the Philippines and Viet Nam).

¹³ Low stringency implies that new policies are implemented beyond the Baseline (and thus go beyond current policies), but with lower stringency than in High Stringency.

¹⁴ Narrow in the sense of looking only at the cost of action, and ignoring the cost of inaction, i.e. the full welfare cost associated with environmental impacts.

¹⁵ Annex 6.A details the modelling set-up for the scenarios and Annex 6.B provides detailed results by scenario.

¹⁶ This regional result reflects an arbitrage in the model calculations between producers across countries, and depends on the specific model and policy assumptions. Different policy instrument choice could for example affect this outcome significantly.

¹⁷ The modelling scenarios do not include scenario-specific assumptions on the evolution of waste trade; one could imagine that a specific regional policy package for the APT countries would include specific policies related to waste imports or exports, but that is beyond the scope of the current analysis. (OECD, 2022^[3]) has shown that the impact of the assumptions on plastic waste trade is limited.

¹⁸ Some leakage would remain in the absence of specific solutions for uncollected litter, road markings, etc.

¹⁹ This reflects only transfers between countries and excludes domestic leakage that strands within the country.

²⁰ The full story is more complicated, as all relative prices start to shift in response to the policy shocks and thus competitive positions of all industries in all countries change at the margin. But the trade effect tends to dominate.

7 A roadmap for turning ambition into action

This chapter explores how the ASEAN Plus Three (APT) region can effectively implement the types of policies needed to end plastic pollution. The chapter first discusses notable policy gaps and implementation challenges that need to be bridged for countries to move from current policy trajectories to those compatible with the *High Stringency* policy scenario. It subsequently identifies priority areas to accelerate progress. Finally, the chapter considers the role of an enabling environment, including the provision of support for capacity building, access to investments, the integration of informal workers and the contribution of regional and international co-operation.

Key insights

- Ending plastic pollution is achievable in the APT with ambitious policies across the lifecycle of plastics, but it requires major policy efforts and system-wide changes to bridge the gaps between current policy ambition and implementation.
- The region's diversity means no one-size-fits-all solution: policy design must be aligned with each country's infrastructure readiness, institutional capacity, socio-economic and policy context.
- Universal access to waste collection and environmentally safe waste treatment are of critical importance. A *High Stringency* scenario could eliminate mismanaged plastic waste, but in many countries (albeit not Japan and Korea) this would require very significant improvements compared to the current situation. Especially the ASEAN countries, many of which have the share of mismanaged plastic waste above 50% (37% in ASEAN HIC & UMIC and 70% in ASEAN LMIC on average), require significant improvements. Current gaps, particularly in rural and underserved areas, drive waste mismanagement (e.g. open dumping, burning) and plastic leakage, especially in Indonesia, Cambodia, Lao PDR, the Philippines, Viet Nam and Myanmar. Waste collection targets and EPR systems offer powerful policy options: although EPR adoption is growing in the region, many countries face challenges with enforcement, tracking and stakeholder engagement.
- A *High Stringency* scenario projects that the average recycling rate in the region increases by more than 40 percentage-points by 2050. The increase in recycling rates needed in the APT countries ranges from 31%-points in Thailand (from 13% in 2022 to 44% in 2050) to 50%-points in Korea (from 10% to 60%). Scaling up recycling requires investments in sorting, cleaning and processing capacity, the integration of informal workers, improved waste segregation at source, better product design for recycling, and the development of domestic and international markets for recycled plastics. Achieving high recycling rates for all polymers may also require technological breakthroughs and reliable scrap material supply, all across the APT region.
- Slowing down plastics use and plastic waste generation at the source is essential, especially as plastics use in the APT region is projected to grow under current policies (*Baseline* scenario) due to population and economic expansion. There are large untapped opportunities to scale up solutions to curb plastics demand and to promote eco-design across the region.
- Local governments across the APT have led the way in the introduction of targeted policies such as bans on single-use plastics, but enforcement is weak, especially in informal markets, due to low awareness and lack of affordable alternatives. There are substantial benefits to be gained from better enforced bans and phase-outs, a stronger use of eco-design and chemical regulation, a scale-up of reuse systems, as well as the promotion of material and product innovation.
- Policy momentum is growing in the APT, but success hinges on overcoming major cross-cutting implementation challenges, including weak monitoring and enforcement, limited local capacity, financing gaps and the need to integrate and professionalise informal waste workers. Multi-stakeholder engagement, capacity-building efforts, and regional and international co-operation offer opportunities to enhance policy design and implementation, bridge knowledge gaps, strengthen and align policy frameworks and standards.

7.1. Introduction

Ending plastic pollution would deliver wide-ranging benefits in the APT region, particularly for ASEAN countries which face high levels of waste mismanagement, riverine and ocean pollution (originating domestically or abroad) and important ocean-based economic sectors. Plastics in the marine environment undermine key sectors like fisheries, aquaculture and tourism (McIlgorm et al., 2022^[1]). Mismanaged plastic waste, still prevalent in the APT region, increases health risks, for example via air pollution from informal waste burning. The APT region is home to some of the areas most affected by plastic pollution but also to vibrant manufacturing hubs – ending plastic pollution is therefore an environmental and health imperative as well as a strategic opportunity for innovation and economic growth.

Most APT countries recognise the urgency and opportunities for mitigating plastic pollution, as reflected in national action plans and policies (Chapter 3). Rising amounts of mismanaged plastic waste, combined with the influx of some hard-to-recycle waste, have spurred calls for stronger policy action (Agnelli and Tortora, 2022^[2]; Ng et al., 2023^[3]). Many APT countries are introducing bans and restrictions on single-use plastics, targets and incentives for recycling, and various measures for pollution prevention. There are also a multitude of projects on the ground, including projects supported by bilateral and multilateral agencies. While the policy landscape remains diverse and uneven, there is evidence of high policy ambition in the region.

The projected consequences of current policies (*Baseline* scenario, Chapters 4 and 5) highlight the need for ambitious policy action to prevent a doubling of mismanaged plastic waste in the APT by 2050 (reaching 59 Mt) and stop plastic leakage to the environment.

Ending plastic leakage in the APT requires the implementation of stringent policies across the lifecycle of plastics (Chapter 6), but success hinges on countries moving well beyond current policies and overcoming implementation challenges. Substantial gaps exist between the existing policy landscape and the comprehensive policy packages required to end plastic leakage cost-effectively. For example, policies promoting reduction, reuse and eco-design remain largely underutilised, despite their essential role in decoupling economic activity from waste generation. Recycling policies are expanding, but structural challenges persist, such as cost and quality disadvantages of recycled materials and slow progress in increasing recycling rates (currently 12% on average in the APT).

Implementation capacity also varies widely across the APT. In countries like Cambodia, Lao PDR, Myanmar, and parts of Indonesia and the Philippines, environmental agencies often lack staffing, funding and tools to monitor compliance effectively. Even middle-income ASEAN countries, like Thailand, Viet Nam and Malaysia, may face issues of fragmented enforcement and inconsistent policy implementation, particularly in rural areas. Table 7.1 summarises the status of policy action on plastic pollution in the APT along with key opportunities for improvement.

Table 7.1. Key insights from the review of the current policy stocktake in APT

		ASEAN LMIC (Indonesia, Cambodia, Lao PDR, Philippines, Viet Nam, Myanmar)	ASEAN HIC and UMIC (Thailand, Brunei Darussalam, Malaysia, Singapore)	Plus Three (China, Japan, Korea)
National Action Plans	Presence of NAPs and targets	9 APT countries have national action plans. Quantitative targets are common, especially for waste reduction, pollution reduction or recycling		
Close leakage pathways	Waste collection	Large opportunities for improvement	Systems exist, but can be improved	Mostly advanced
	Treatment infrastructure and end-of-life fates	Large opportunities for improvement	Infrastructure can be improved	Mostly advanced
Enhance recycling	Measures to mandate and incentivise recycling	Significant potential for development	Significant potential for development. EPR schemes for packaging are emerging	Advanced in Japan and Korea, not in China
	Advanced policies to enhance sorting at source	Large opportunities for improvement	Significant potential for development	Some in use in Japan and Korea, not in China
Design for circularity	Measures to promote eco-design	Some in use or planned to promote recyclability, large opportunities for action	Some in use or planned to promote recyclability, large opportunities for action	In use, but opportunities to promote longer lifespans
Curb production and demand	Measures to promote reduction	Some in use to promote sustainable materials, but large opportunities to promote reduction further	Some in use to promote sustainable materials, but large opportunities to promote reduction further.	Some in use, but large opportunities to promote reduction further
Policy enforcement	Enforcement of policies	Significant potential for improvement. Needs for better data, funding, tools and capacity to monitor progress and compliance	Potential for improvement, especially to overcome issues of fragmented enforcement.	Enforcement is stronger, but new policies create new challenges for monitoring and compliance

Bridging this ambition gap will require supportive policy frameworks and effective implementation, including strong enforcement, market development and infrastructure investments. ASEAN countries, in particular, often face interrelated challenges that include (ASEAN, 2021^[4]):

- **Escalating waste generation**, especially in rapidly growing economies catching up with the levels of plastics use seen in high-income countries.
- **Limited access to finance** for interventions across the lifecycle of plastics.
- **Gaps in infrastructure and technical capacity**, especially in rural areas and within local governments.
- **Weak data systems**, particularly around plastic flows, plastic waste generation, composition and leakage pathways. This hampers targeted interventions.
- **A prevalence of the informal sector in waste management**, with limited pathways for formalisation and professionalisation.
- **Fragmented institutional responsibilities and limited co-ordination**, creating inefficiencies, overlapping mandates and gaps in policy implementation.
- **Insufficient public awareness and limited private sector engagement**, which are critical to behaviour change among households and businesses and for policy success.

Translating action plans into meaningful outcomes and preventing delays in effectively ending plastic pollution will require proactive steps to address these gaps. This chapter identifies opportunities to strengthen the current policy mix towards alignment with the *High Stringency* scenario (Section 7.2) and explores priorities tailored to the APT (Section 7.3).

7.2. A coherent policy mix

Ending plastic pollution in the APT requires stringent, lifecycle-wide policy measures. To align with the ambition of a *High Stringency* scenario, a coherent mix of policy measures is required to:

- Expand waste collection and treatment, to ensure the environmentally safe handling of waste,
- Scale up recycling and accelerate the shift from primary to secondary plastics,
- Slow down (primary) plastic production and demand,
- Extend product lifespans, promote eco-design, and prevent waste generation,
- Mitigate environmental risks, especially in pollution hotspots, through prevention and clean-up.

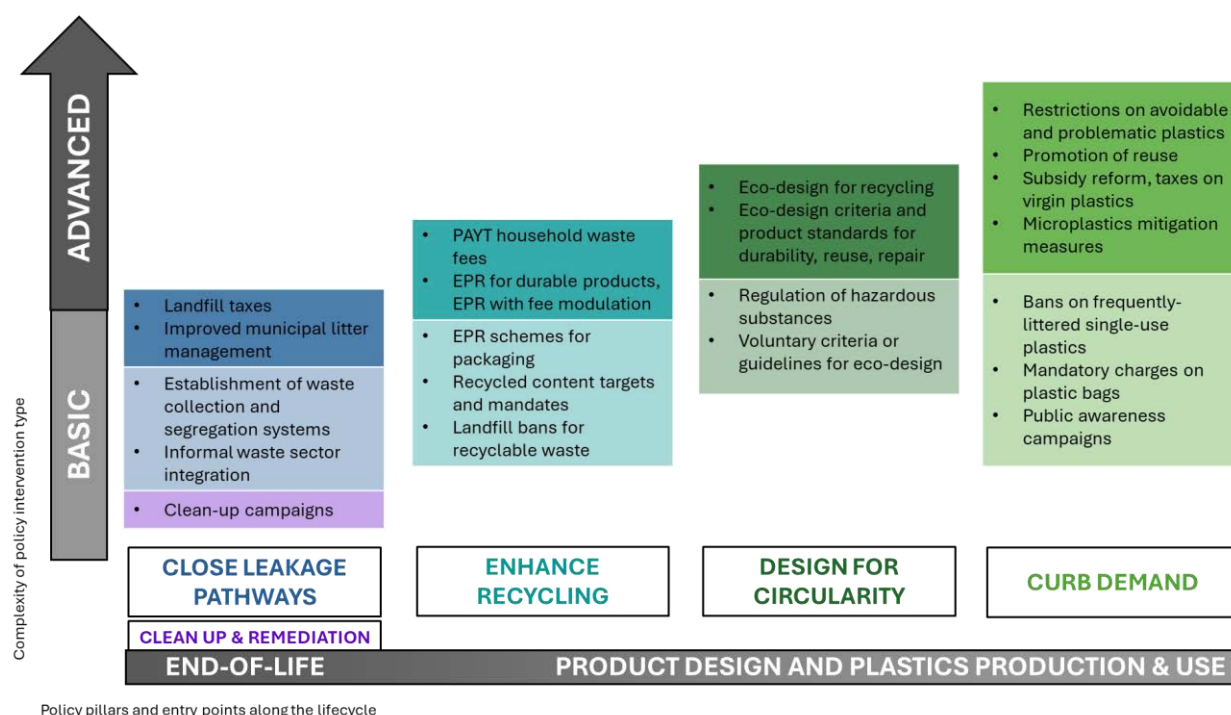
Figure 7.1 illustrates a range of policy instruments commonly used by countries to mitigate plastic pollution.

The specific policy mixes must be tailored to national and local conditions and priorities, reflecting differing socio-economic conditions, infrastructure capacities, policy frameworks, ease of access to finance and public awareness. For instance, while Japan, Korea and Singapore have already advanced frameworks and enforcement mechanisms for waste management in place, many others in the APT region are still developing systems for waste collection. In addition, the region's varied geographies present additional structural challenges: archipelagic nations need to manage waste collection across thousands of islands, often in areas with limited transport infrastructure, while remote, mountainous or flood-prone regions in the APT face challenges to year-round service provision. Within countries, there can be large disparities between urban and rural or remote areas.

This diversity calls for a comprehensive, regionally co-ordinated but context-sensitive policy approaches, as also promoted in the ASEAN Regional Action Plan (2021^[4]). Country-specific priorities might include: prioritising waste collection and segregation, especially in ASEAN LMIC, and in rural and remote areas, supporting informal sector integration, or targeting plastics particularly prone to causing harm, such as certain single-use plastics, or plastics containing harmful additives. Figure 7.1 shows examples of common policy instruments mitigate plastic pollution, typically used by countries at different levels of policy maturity.

Drawing from the review of the current policy landscape in APT countries (Chapter 3), the following sections identify key policy gaps that need to be bridged to move from current trajectories to a *High Stringency* scenario. It highlights both the scale of the challenge and the policy levers available, while underscoring implementation barriers to be overcome.

Figure 7.1. Examples of policy instruments employed to mitigate plastic pollution



Source: Adapted from (OECD, 2022^[5]; OECD, 2024^[6]).

7.2.1. Curb demand and design for circularity

Reducing plastic waste and pollution at the source is critical (OECD, 2024^[6]; ASEAN, 2021^[4]; United Nations Environment Programme, 2023^[7]). Under current policies (*Baseline* scenario), plastics use in the APT is expected to continue to rise, driven by population growth, growth of manufacturing and services, as well as continued rapid urbanisation, especially in mid-level sized cities. Relying only on waste management and recycling policies is not sufficient, and often costlier, than preventive lifecycle-wide strategies (including also action to curb demand for plastics and promote eco-design) (OECD, 2024^[6]). In contrast, a shift to the *High Stringency* scenario would see a 23% reduction in plastic waste generated in the APT in 2050, relative to current policies (declining from 242 Mt in the *Baseline* scenario to 186 Mt), including a strong 17 Mt reduction in packaging waste alone. Table 7.2 shows examples of the improvements necessary to align with *High Stringency* in the APT, across different countries and income groups, including important reductions in plastic waste generation and plastic intensity compared to under current policies (*Baseline* scenario).

Table 7.2. Selected examples of improvements necessary to align plastics use and waste with *High Stringency*Percentage changes, *High Stringency* scenario

		Change in waste generation		Change in plastic intensity
		Compared to <i>Baseline</i> in 2050	Compared to 2022 levels	Compared to <i>Baseline</i> in 2050
APT total		-23% (242 Mt to 186 Mt)	Contain growth to 64% (113 Mt to 186 Mt)	-28% (5.7 to 4.1 t/Million USD)
<i>ASEAN HIC & UMIC</i>	Thailand	-21%	18%	-26%
	Brunei Darussalam, Malaysia, Singapore	-22%	61%	-25%
<i>ASEAN LMIC</i>	Indonesia	-29%	102%	-30%
	Cambodia, Lao PDR, Philippines, Viet Nam, Myanmar	-30%	161%	-34%
<i>Plus Three</i>	Japan	-15%	4%	-29%
	Korea	-16%	39%	-23%
	China	-23%	62%	-26%

Notes: colour shading highlights the largest identified changes compared to *Baseline*. Plastic intensity is measured as plastics use per unit of GDP.

Source: OECD ENV-Linkages model.

Achieving these reductions will require far-reaching structural transformations in the use of plastics and the design of plastic products. In the modelling exercise presented in this Outlook, reductions in plastic production and use are primarily achieved through economic instruments, such as taxes on plastics use by industries and households. In practice, policymakers have a broader toolbox to achieve reductions in plastics demand. The following subsections discuss the potential of selected measures to curb demand and improve design for circularity. While this Outlook focuses on national and subnational measures, global commitments could emerge from negotiations on an international legally-binding treaty on plastic pollution, but these are beyond the scope of this Outlook.

Bans, restrictions and fiscal instruments to curb demand

Targeted policy interventions to reduce the use of avoidable and problematic plastics, especially single-use plastics, are essential to mitigating plastic pollution (OECD, 2024^[6]). A range of policy instruments exist to curb demand, including: bans, standards, phaseouts, taxes on selected applications, virgin material taxes, as well as a reform of subsidies to primary plastic production.¹

As discussed in Chapter 3, several APT countries have or are considering measures to slow down plastics use, including planned reductions, phase-outs and bans. These usually target plastic items with high littering or leakage potential, such as carrier bags, plastic straws and cutlery. In ASEAN countries, sub-national and local governments have often led the way: for example, urban centres in Indonesia and national parks in Thailand have banned single-use plastic bags (Napitupulu, Hamzah and Haniy, 2021^[8]; World Bank, 2024^[9]). Japan enforces mandatory charges for plastic bags and promotes alternatives, while Korea has adopted phased bans on specific single-use items.

However, implementation challenges persist. Enforcement of bans is often weak due to limited monitoring capacity, low public awareness and the absence of viable, affordable alternatives for consumers and retailers (ASEAN, 2021^[4]). Enforcement challenges are particularly acute with informal markets and small-scale vendors, that often fall outside the scope of regulatory frameworks but remain significant users of

single-use plastics. Limited capacity for monitoring and the absence of clear incentives or support mechanisms have made compliance difficult. In some cases, banned items are replaced with other single-use items, which may not yield better environmental outcomes (ASEAN, 2021^[4]). Moreover, illicit trade in regulated plastic packaging can undermine policy effectiveness.

To maximise impact, bans and restrictions should be embedded in integrated policy frameworks that combine awareness campaigns, capacity-building for local governments tasked with enforcement, support for innovation, alongside regional and international co-ordination and co-operation to ensure coherence and market transformation.

There are also opportunities to broaden the scope of restrictions to tackle persistent sources of plastic pollution. Excessive use of plastic packaging or of problematic materials, and the prevalence of low-value and hard-to-recycle flexible packaging, remain major challenges (World Economic Forum, 2020^[10]; Suwarno et al., 2025^[11]). For instance, low-value plastic packaging represents as much as 61% of the plastic packaging units entering the Philippine market, posing a considerable challenge to achieving higher recycling rates (World Bank Group, 2021^[12]; Suwarno et al., 2025^[11]). Co-ordinated efforts, internationally and regionally, to identify unsafe plastic applications, polymers and additives, and to develop solutions that avoid possible unintended risks of substitution, could support evidence-based national policy action in this area (Raubenheimer and Urho, 2024^[13]).

Eco-design criteria and standards for plastic products

Incorporating circularity considerations into product design is essential to prolong product lifespans and enable reuse, repairability and recycling. A fundamental component of circular design is the regulation of chemicals of concern in plastics, such as plasticisers, flame retardants and other additives, that may pose risks to human health and the environment. Chemicals regulations remain underdeveloped in the majority of APT countries. Limited co-ordination between environmental, health and industry authorities can also result in regulatory gaps or weak enforcement. Strengthening national legislation by drawing on international frameworks could enhance transparency and oversight on chemicals in plastic products.

Harmonised standards for plastic products and packaging across the APT region could help accelerate circularity, notably by facilitating recycling and enabling the safe use of recycled plastics, including in sensitive applications such as food contact materials (ASEAN, 2021^[4]). At present, differing standards on recycled content and chemical additives hinder higher recycling rates (as discussed in Chapter 3). Standards for reuse could also be beneficial. Enhanced regional co-operation on standard-setting and mutual recognition of certifications could close these gaps, improve product quality, build market confidence in reusable packaging or products with recycled content, and boost recycling output and safety. This would also reduce trade frictions and improve material flows for recycling across borders.

Reuse systems

Reuse systems, such as refill stations and returnable packaging systems, represent one of the most effective pathways for reducing demand for single-use plastics and cutting waste at the source. Designed to enable multiple circulations of packaging, reuse systems diminish demand for new virgin plastics, while ensuring that consumers benefit from the service provided by the item (e.g. packaged meals, followed by the return of the packaging to the provider). As reusable packaging typically involves higher upfront material and energy inputs than single-use counterparts and dedicated infrastructure and maintenance is required (e.g. for washing), the certainty of multiple uses is essential to realising net environmental benefits.

Across the APT region, reuse initiatives exist and are gaining increasing ground, with some promising outcomes (Suwarno et al., 2025^[11]). Examples include drinking water refill stations in Thailand and Indonesia, goods delivery platforms offering reusable packaging in Indonesia, and refill systems in traditional neighbourhood stores in the Philippines (Global Alliance for Incinerator Alternatives, 2024^[14]).

However, these initiatives remain largely localised and small-scale, due to limited policy support, inadequate infrastructure, lack of standardised design guidelines, financial constraints and entrenched consumption habits favouring convenience (Suwarno et al., 2025^[11]). Reuse systems yield the greatest impacts when scaled, but this requires co-ordinated policy efforts, including financial incentives, public investment in reuse infrastructure, public education, as well as regulatory frameworks that promote standardisation or interoperability.

Innovation in material and product design

Innovation in material development and product design is a critical enabler for reductions in (primary) plastic production and use, offering pathways to more sustainable and circular alternatives. Governments can foster innovation through e.g. public-private partnerships, innovation hubs focused on circular product design, infrastructure investments, and development and harmonisation of technical standards and labelling schemes. For instance, policy action is needed to provide a clear framework for bio-based or compostable plastics (as detailed also in Box 7.1). Currently, a variety of plastic products and packaging available on markets in the APT region are labelled as biodegradable or compostable, leading to possible confusion among consumers or contamination in plastic waste streams (ASEAN, 2021^[4]). Malaysia and Viet Nam have introduced standards and labels for compostable plastics and recycled content (see Chapter 3).

Infrastructure plays a key role in determining whether novel materials can actually deliver environmental benefits at end-of-life. For instance, gaps in composting or mechanical recycling currently mean that novel materials cannot always be managed sustainably at end-of-life. Government can also leverage public procurement to drive demand for products that meet eco-design criteria, such as recycled content, as well as supporting the adoption of new delivery systems that reduce consumption of single-use plastics (ASEAN, 2021^[4]). Publishing environmental criteria for products and packaging can further signal policy direction and stimulate industry innovation.

Box 7.1. A note on compostable plastics

Interest is growing across the region in non-plastic substitutes (i.e. natural materials with properties similar to those of fossil-fuel plastics) and plastic alternatives (i.e. bio-based plastics) that can offer similar functional benefits as conventional plastics with lower environmental impacts. Among these, interest in compostable plastics is growing, especially in response to single-use plastic bans. Compostable plastics, whether bio-based or fossil fuel-based, decompose in industrial composting facilities and, if sourced responsibly, may help reduce environmental impacts. For instance, compostable plastic bags can facilitate the collection of food waste and reduce contamination in organic waste streams.

However, the existence of well-functioning collection systems, with separate collection for organic waste, is essential to ensure that these materials are well-managed at the end-of-life. However, these benefits are dependent on the existence of a separate collection stream and treatment infrastructure for compostable waste, as well as on proper sorting behaviour by households. In no case should compostable (or biodegradable) plastics be considered a solution for littering or inappropriate waste management. The presence of clear product labelling is also critical, to prevent consumer confusion around “biodegradable” or “compostable” claims and ensure high-quality sorting at source.

Source: (ASEAN, 2021^[4]; OECD, 2024^[6]).

7.2.2. Improve waste management, enhance recycling and prevent pollution

Efficient waste collection and sorting are fundamental to ending plastic pollution, yet waste collection remains inadequate or non-existent in many APT countries, particularly in rural and underserved areas, and in countries that rely heavily on informal waste management practices (United Nations Environment Programme, 2017^[15]). Improper disposal practices, such as open dumping and burning, remain widespread, exacerbating pollution and risks for human health. Recycling rates in ASEAN LMIC are generally below 10%, constrained by insufficient infrastructure, lack of market incentives and limited public awareness (World Economic Forum, 2020^[10]; Ng et al., 2023^[3]). As plastics use and waste generation rapidly increase in less-developed countries under current policies, the pressure on their waste systems will only intensify.

Table 7.3 shows examples of the improvements in waste management and recycling necessary to align with *High Stringency* in the APT, across different countries and income groups. Under a *High Stringency* scenario, mismanaged plastic waste would be nearly eliminated and recycling would cover 54% of waste generated in APT in 2050 (up from 12% in 2022). Achieving this recycling rate will require significant investments in waste management, as well as tailored national and local approaches across the APT countries. The next sub-sections discuss key policy measures to improve waste management, enhance recycling, as well as to strengthen other pollution prevention measures. Related global commitments or targets could emerge from negotiations on an international, legally-binding treaty on plastic pollution and further support progress, but these fall outside the scope of this analysis.

Table 7.3. Selected examples of improvements necessary to align waste treatment with *High Stringency*

Share of waste that is mismanaged, and recycling rates, *Baseline* and *High Stringency* scenarios

		Share of waste that is mismanaged			Recycling rate		
		2022 levels	Baseline 2050	High Stringency 2050	2022 levels	Baseline 2050	High Stringency 2050
APT total		29% (33 Mt out of 113 Mt of total waste)	23% (56 Mt out of 242 Mt of total waste)	<1% (1 Mt out of 186 Mt of total waste)	12%	19%	54%
ASEAN HIC & UMIC	Thailand	27%	6%	<1% (-88% reduction compared to Baseline 2050)	13%	17%	44%
	Brunei Darussalam, Malaysia, Singapore	47%	31%	<1% (-98% reduction compared to Baseline 2050)	9%	15%	44%
ASEAN LMIC	Indonesia	72%	68%	<1% (-99% reduction compared to Baseline 2050)	5%	8%	44%
	Cambodia, Lao PDR, Philippines, Viet Nam, Myanmar	68%	42%	1% (-98% reduction compared to Baseline 2050)	6%	9%	42%
Plus Three	Japan	<1%	<1%	<1% (-25% reduction compared to Baseline 2050)	14%	26%	62%
	Korea	<1%	<1%	<1% (-23% reduction compared to Baseline 2050)	10%	22%	60%
	China	26%	18%	<1% (-97% reduction compared to Baseline 2050)	14%	21%	57%

Note: colour shading highlights the largest identified changes compared to *Baseline*.

Source: OECD ENV-Linkages model.

Establishing basic waste collection systems and disposal facilities

Strengthening waste management begins with clear policy frameworks (at national, sub-national and local level) to enable investments and improvements in collection, sorting and treatment. Proven approaches include Extended Producer Responsibility (EPR) schemes and waste collection targets. EPR allocates the responsibility for the end-of-life management of products to producers, who typically contribute fees to support collection, sorting and processing (OECD, 2016^[16]). Well-designed EPR schemes have contributed to boosting separate collection and recycling rates, reduced the financial burden on local governments, and secured dedicated funding for the management of covered waste (OECD, 2024^[17]). EPR fees may also be used to initiate investment in recycling facilities.

As discussed in Chapter 3, EPR schemes are gaining traction across the APT region, but remain in the early stages of development and implementation in most ASEAN countries. Japan and Korea have mature EPR schemes for packaging and some durable products, while the Philippines, Viet Nam, Singapore, Thailand, Indonesia as well as Malaysia have introduced EPR legislation or are in the process of developing regulatory frameworks for mandatory EPR for (plastic) packaging. Common challenges include unclear definitions of producer obligations, limited administrative and enforcement capacity, limited tracking systems for waste flows and difficulty in engaging SMEs and key stakeholders. In the case of developing countries (within the APT and beyond), the design and implementation of EPR schemes should also effectively involve the informal sector (OECD, 2016^[16]; International Alliance of Waste Pickers, 2023^[18]). Tailored technical guidance, capacity-building for government agencies, and stakeholder engagement are critical to improve EPR design and implementation. At the regional level, sharing best practices and harmonised eco-design principles can help countries accelerate the development of effective EPR schemes (ASEAN, 2021^[4]).

Promoting and enhancing recycling

The status of plastic recycling is very heterogeneous across the region. While countries like Japan (14% plastic recycling rate), China (14%) and Korea (10%) have recycling rates above the global average (10%), plastic recycling remains limited in many ASEAN countries, and generally highly reliant on informal practices (Suwarno et al., 2025^[11]). ASEAN LMIC have lower recycling rates, including Indonesia (6%) and other ASEAN countries (9% for HIC & UMIC and 6% for LMIC). Key challenges are inefficient and incomplete waste collection and sorting, particularly in rural areas. Mixed and contaminated waste streams undermine the quality of recycled plastics and lead to lost value. In addition, many plastic products are not designed for recycling, such as multi-layer packaging or plastics containing certain chemical additives. Market challenges further constrain recycling outcomes: virgin plastics are often cheaper and preferred by industry, due to perceived higher quality and higher reliability of supply (ASEAN, 2021^[4]; Suwarno et al., 2025^[11]; World Bank Group, 2021^[12]).

Governments can pursue a mix of regulatory and economic policy interventions to both expand the supply of recycled plastics and to create demand for their use (OECD, 2018^[19]). This dual approach of removing supply-side barriers while creating strong market incentives, will be key to unlocking higher recycling rates.

On the supply side, scaling up investments in the infrastructure for sorting, cleaning and processing of waste plastics is essential. The integration of informal waste pickers into formal value chains and setting mandatory recycling targets for municipalities and producers (e.g. through EPR) are also critical. Strengthening international markets for plastic scrap is important to ensure sufficient availability of scrap materials and enable the ambitious scale up of recycling envisioned in the *High Stringency* scenario. Technological innovation will be required to improve recycling methods for hard-to-recycle plastics and broaden the range of materials that can be effectively processed. Box 7.2 describes how China is transitioning from dependence on imported plastic waste to building a modern, integrated system for plastic recycling through policy reforms and industry developments that harmonise domestic collection, sorting and recycling practices and expand capacity nationwide.

On the demand side, ensuring a stable market for recycled materials is equally important to strengthen the business case for recycling. Support to recycling and recycled plastics could help change the relative prices in favour of secondary plastics. At the same time, demand-side approaches such as recycled content requirements can help level the playing field with primary plastics, by mandating the inclusion of a minimum percentage of recycled material in products like packaging, construction materials or textiles. They can be implemented as direct regulation or through instruments such as public procurement. Establishing quality and certification standards for recycled plastics, alongside investments in testing and traceability infrastructure, can address market concerns around safety and reliability, especially in sectors like food packaging and consumer goods (ASEAN, 2021^[4]). At the regional level, the promotion of harmonised quality standards for recycled materials and for recycled content could also further strengthen markets for recycled materials and improve cross-border trade.

Finally, while the *High Stringency* scenario envisioned large improvements in recycling rates for plastics, this vision hinges on the assumption that high recycling rates can be attained for all waste streams and polymers, including those that are barely recycled at present, via mechanical recycling technologies.² This assumption requires caution: some polymers and applications, such as multi-layer plastics or lightweight films, are inherently difficult or impossible to recycle currently, with existing technologies. Major technical and market shifts will need to occur to enable the large-scale switch from primary to secondary plastics for all polymers and achieve the consequential reductions in environmental impacts. The rapid recycling expansion envisioned in the *High Stringency* scenario also raises concerns regarding the availability of sufficient scrap materials and the functioning of international scrap markets to sustain this ambitious effort. Delays in infrastructure development, technical challenges or shortfalls in available scrap materials could slow progress and raise costs. Should such breakthroughs fail to materialise, meeting the ambitions of the policy package will require heightened ambition in other parts of the policy package, such as reductions in the use of hard-to-recycle polymers or deeper reductions in overall plastics demand.

Box 7.2. How China is shifting towards an integrated, circular plastic recycling system

Following its 2017 ban on plastic waste imports and tightened quality standards for scrap, China has accelerated efforts to build a robust domestic recycling system (Yoshida, 2021^[20]). Under the Action Plan for Plastic Pollution Control, the government is rolling a range of measures to modernise and expand recycling. Firstly, segregation-at-source has become mandatory in all cities at or above prefecture level (covering 65% of the population) by 2025 (CMS Legal, 2023^[21]; NDRC China, 2021^[22]). Municipal authorities are also expected to enforce new national technical specifications, developed in 2022 and covering collection, transportation, sorting, storage, pre-treatment, recycling and disposal (MoEE China, 2022^[23]). The government has also invested in the improved organisation of the recycling industry through standardisation and implementation of a modern information exchange system (by 2025) (CMS Legal, 2023^[21]).

The government is also supporting infrastructure investments, including with the planned building of over 1 000 green sorting centres linked to an established recycling network system for waste and used materials, and support for chemical recycling, mainly via pollution prevention and control requirements and monitoring (MoEE China, 2022^[24]). In addition, a preferential value-added tax (VAT) rate of 3% (in 2022) was introduced for enterprises that collect and recycle recyclable waste (Deloitte China, 2022^[25]).

According to the China National Resources Recycling Association, as of 2023, large-scale plastics processing centres and recycled plastic trading markets have formed. The number of businesses entering the plastic recycling sector is growing annually. Recycling outlets are present all over the country and the industry is transforming from a “labour-intensive, random application, and loose industry to technology-intensive, standardised application, and industrial scale”. The association also expects the recycling industry to process 11% more waste plastics in 2023 compared to 2022, from 16.3 Mt to over 18 Mt (CMRA, 2023^[26]).

Enhancing various other pollution prevention measures

Municipal litter management

In addition to improving waste collection and recycling, effective pollution prevention measures are also essential, including management of municipal litter (i.e. waste that escapes collection, either because it is littered by individuals or due to fly-tipping). The implementation of the ambitious policy package envisioned in the *High Stringency* scenario would nearly eliminate plastic leakage to the environment by 2050, including by reducing littered waste that requires additional collection interventions (2.2 Mt, compared to 2.6 Mt in *Baseline* in 2050).

Achieving this vision will also require a major increase in litter picking rates and street sweeping in all regions, beyond the improvements in this area already expected in the *Baseline* scenario. Large increases in municipal litter management are required especially in countries like Indonesia and Thailand, which in 2022 had litter collection rates of 65% and 70% respectively, and are expected to reach 85% by 2050 in the *High Stringency* scenario.

Prevention of plastic leakage from sea-based sources

The prevention of plastic leakage from sea-based sources, including fishing gear and shipping related sources, is also critical to mitigate plastic pollution. Policies to reduce pollution from abandoned, lost or otherwise discard fishing gear (ALDFG), include: improved design to require gear marking and to facilitate repair and recycling, requirements or incentives for the reporting of lost gear, support of efforts to retrieve lost gear, and the provision of adequate disposal facilities and the promotion of recycling (OECD, 2021^[27]). The effective implementation of guidelines to address sea-based sources of pollution, such as the principles of the MARPOL Convention, is critical (ASEAN, 2021^[4]).

Given the intensity of fishing activities in the ASEAN region and the significant environmental and socioeconomic impacts associated with ALDFG, a more comprehensive assessment of its occurrence, causes, consequences, and countermeasures is warranted. In addition, it is important to assess the environmental impacts of different fishing gear types and to strengthen data collection and monitoring, to support the development of evidence-based policies that help minimize the environmental footprint of fishing activities.

Clean-up and remediation interventions

Clean-up and remediation also form an important part of the policy mix to complement prevention efforts. As discussed in Chapter 6, legacy plastic pollution and additional contributions that would still be expected between 2020 and 2050 would lead to an amplification of plastic pollution. Stocks of plastics in rivers and oceans, often taken as a proxy for plastic pollution, would rise from 178 Mt in 2022 to 449 Mt in 2050 at the global level, and to from 65 Mt to 181 Mt in rivers and oceans specifically in the APT region. Furthermore, even *High Stringency* would not eliminate plastic pollution completely, and about 1.5 Mt of plastic waste would still be mismanaged in 2050 in the APT, largely due to littered waste that is difficult to collect via municipal litter collection.

Remediation interventions play an important role in mitigating risks for ecosystems, economies, human well-being and livelihoods, especially in developing countries most affected by plastic pollution. Plastic pollution in the marine environment can be particularly problematic and difficult to revert: prevention measures and interventions that can capture plastics (e.g. the 80% of floating plastics that stays close to land, see Chapter 2) can play an important role to prevent and mitigate marine plastic pollution. OECD (2022^[28]) discusses the cost-effectiveness of possible clean-up measures. Targeted clean-up interventions, such as in pollution hotspots, may also help to gather data on environmental pollution and to inform policy efforts, especially if coordinated at the regional level (OECD, 2024^[6]; ASEAN, 2021^[4]).

However, care is needed to ensure that clean-up interventions do not lead to unintended harm to ecosystems and that they are deployed efficiently (Falk-Andersson et al., 2023^[29]).

This report does not investigate the impacts of plastic pollution on critical ecosystems in the APT region, such as coral reefs and mangrove forests. These ecosystems are essential for coastal protection, biodiversity and livelihoods, and are known to be vulnerable to pollutants such as plastics in the environment. Future studies and assessments should prioritize a deeper examination of how plastic pollution is affecting coral reef systems and mangrove forests across the region, to help inform policy responses and conservation efforts.

Mitigation of microplastic leakage and pollution

Microplastic pollution poses an emerging threat to the environment and human health. Due to data and information limitations, the *High Stringency* scenario includes only a limited set of policies targeting microplastic leakage. Reductions in microplastic leakage in this scenario (compared to *Baseline*) are largely indirect, e.g. stemming from reductions in overall plastics use, improvements in end-of-pipe capture (e.g. wastewater treatment), or less degradation of plastics polluting the environment. However, targeted policies on will also need to form an important part of the policy mix to ensure effectively mitigate microplastic pollution, globally and in the APT region (Ng et al., 2023^[3]; OECD, 2022^[28]). Crucially, improved monitoring, data collection and research are also needed to better estimate microplastic leakage and identify priority sources and pathways.

Policy measures span four key areas (OECD, 2021^[30]):

- *Source-directed*: sustainable product design and manufacturing (e.g. tyres, vehicles, textiles, paints) to minimise the likelihood of microplastic generation, as well as measures to prevent pellet losses during manufacturing and transport.
- *Use-oriented*: best use practices (e.g. laundering parameters, eco-driving) and mitigation technologies (e.g. filters) to reduce preventable releases during the use phase.
- *End-of-life*: improved waste management to prevent leakage to the environment and potential degradation to microplastics.
- *End-of-pipe*: enhanced collection and treatment wastewater, stormwater and road runoff, to retain microplastics before they reach the environment.

Policy action on microplastic leakage is emerging globally and can provide helpful to inform policy efforts in the APT. In addition, while further research is needed to assess the cost-effectiveness of several mitigation options for microplastic leakage, significant progress can be made by focusing on no-regrets interventions and mitigation options that offer co-benefits (OECD, 2021^[30]). There are a range of measures that align with existing policy goals, such as improving air and water quality or reducing GHG emissions, while simultaneously reducing microplastic leakage (e.g. reductions in road transport volumes).

7.3. Some considerations for the implementation of ambitious policy packages

The review of the policy landscape (Chapter 3) revealed persistent, cross-cutting challenges hindering the effective implementation of policies to tackle plastic pollution in the APT. This section explores key barriers and opportunities and suggests priority actions to accelerate progress. Box 7.3 illustrates barriers for 2 ASEAN countries.

Box 7.3. Achieving ambitious national targets on waste management requires stronger local financing, coordination and data systems

In Indonesia, the government aims to safely manage 100% of its MSW (see Chapter 3). Progress is being made, with MSW collection rates reaching 65% in 2021, although this remains well below the ambitious target of 98% set for 2021. The government highlighted that limited local budget remain a critical hurdle as well as burden for municipalities, that have around half of their total budget allocated to waste management on average. Strengthening financing mechanisms for municipalities will be key to sustaining progress and meeting future targets, in Indonesia as in other ASEAN countries.

In the Philippines, the Development Plan 2017-2022 set a MSW diversion target rate of 80% by 2022. This measure aimed to divert waste away from disposal facilities, such as landfills, through recycling, reuse, composting or other methods. As of 2021, only 39% of the local government units had material recovery facilities operational, and the nation reported the accomplished goal rate to be 54%. The Commission on Audit of the Republic of the Philippines's 2023 report on waste management underscores uncertainties surrounding the reported 54% progress figure. It highlights several issues limiting the nation's advance towards the waste diversion goal, including the incompleteness and unreliability of material recovery facilities data, the lack of data monitoring, the lack of local government units consultation on the national target formulation, unavailability of funds, the lack of strong implementation support, slow progress on MSW plan submission and approval from central authorities, and the absence of rewards and incentives. Advancing towards national targets will require more coordinated, cross-sectoral action, stronger support for local governments, as well as improved data and incentive systems.

Sources: (MoEF Indonesia, 2023^[31]; NEDA Philippines, 2023^[32]; COA Philippines, 2023^[33])

7.3.1. Multi-stakeholder engagement and public awareness

The transition to a more sustainable and circular plastics economy hinges on robust stakeholder coordination and inclusive policy design (Suwarno et al., 2025^[11]). Engaging business, academia, local communities and civil society groups (including the informal sector) can ensure the development of feasible solutions with a broad buy-in. Mechanisms like multi-stakeholder forums at local, national and regional levels already facilitate knowledge sharing and coordination of efforts.

However, engagement levels remain uneven across the APT. In less-developed countries, institutional frameworks for stakeholder engagement remain weak or lacking (Suwarno et al., 2025^[11]). Stakeholders playing a vital role in plastics value chains (such as local communities, SMEs or the informal sector) may remain excluded from policy formulation and implementation. Common obstacles include limited capacity in local governments, fragmented initiatives (often reliant on short-term funding) or weak coordination across different levels of government (see also Box 7.4).

Nonetheless, promising examples are emerging. Multi-stakeholder engagement is becoming more institutionalised in the APT countries that have adopted or are in the process of developing national plastic action plans, such as Indonesia, Thailand or Viet Nam. International efforts, such as the Global Plastic Action Partnership, are helping to create multi-stakeholder consultation mechanisms (in Indonesia, Viet Nam, Cambodia, the Philippines and Lao PDR) (World Economic Forum, 2022^[34]).

Public engagement is equally critical for facilitating behavioural change. Consumers may help reduce plastics demand and waste directly, such as by avoiding packaging from shops or from online sales, and indirectly, such as via consumption choices for consumer products containing plastics (e.g. synthetic

clothing). Households also contribute to recycling of plastic packaging and can drive industry shifts to a more circular modes of consumption. Interventions that promote behavioural change are most impactful when they integrate behavioural insights and consider gender roles and related consumption preferences (OECD, 2021^[35]; OECD, 2017^[36]).

Box 7.4. Effective implementation needs strong multi-level governance and public engagement

Two examples, from Cambodia and Malaysia, highlight the importance of strong public engagement and institutional coordination in realising the full potential of policy measures targeting plastic pollution.

In 2017, Cambodia introduced a mandatory charge of USD 0.10 per plastic bag issued to customers, by supermarkets and retailers in malls and business centres (Sub-Decree 168 of 2017), with the aim of reducing single-use plastics. A 2022 field investigation revealed that, while a few major businesses in the capital city implemented this mandatory charge, the potential of the policy measure remained untapped (UNDP Cambodia, 2022^[37]). Awareness of the policy among local government officials remained low, hindering its enforcement (UNDP Cambodia, 2022^[37]).

Malaysia introduced a legal framework for mandatory waste separation at-source in 2015, applying across 6 states and 2 federal territories (covering an estimated 38% of the national population), with possibilities of fines in case of non-compliance (Daim and Radhi, 2023^[38]). However, as recognised in the Plastics Sustainability Roadmap 2021-2030, low public awareness of sorting-at-source practices remained a key barrier to effective implementation and scaling up recycling (MoEW Malaysia, 2021^[39]; Akenji et al., 2019^[40]). In 2021, segregated-at-source recyclable waste comprised only 0.14% of Malaysia's 2021 MSW (DoS Malaysia, 2022^[41]). This highlights the need for integrated policy strategies and sustained public awareness campaigns to deliver meaningful progress.

7.3.2. Monitoring, enforcement and governance

Robust monitoring and enforcement capacities are essential to ensuring policies deliver impact. While several APT countries have banned selected single-use plastics, implementation is often hampered by weak enforcement (as well as low public awareness and a lack of affordable alternatives). The risk of sanctions for non-compliance, such as those against the illegal dumping of waste or illegal waste trafficking, remain weak especially in ASEAN LMIC (United Nations Environment Programme, 2017^[15]; UNEP and UNODC, 2024^[42]).

Enforcement challenges fall into three broad categories (Chapter 3):

- **Institutional and legal gaps:** In countries such as Cambodia, Lao PDR, Myanmar, and parts of Indonesia and the Philippines, environmental agencies often lack staffing, funding and tools to monitor compliance effectively. Even middle-income ASEAN countries, such as Thailand, Viet Nam and Malaysia, may face issues of fragmented enforcement and inconsistent policy implementation, particularly in rural areas.
- **Informality and data deficits:** The widespread presence of informal markets in food services, retail, and waste collection complicates regulation across the APT region, as many of these actors operate outside formal regulatory frameworks. Meanwhile, the absence of reliable data on plastic flows and pollution sources impedes monitoring of progress and the targeting of enforcement controls (ASEAN, 2021^[43]).
- **Evolving compliance challenges:** In high-income countries such as Japan and Korea, enforcement systems are well-established and advanced, but new policies like extended producer responsibility (EPR), eco-design standards and recycled content requirements, demand more sophisticated monitoring tools and greater information sharing across complex supply chains to

ensure compliance. In Korea, for example, producers of packaging are required, under the EPR scheme, to evaluate and label the recyclability of their packaging materials based on a four-tier scale, with criteria covering material composition, label separability and other factors (Korea, 2017^[43]). Supporting measures include certification schemes and labelling for recycled content.

Strengthening enforcement requires equipping regulatory agencies and local governments with adequate resources, trained personnel and legal authority to carry out inspections and issue fines. Existing guidelines on the collection and monitoring of data on plastic flows and pollution can support efforts to develop and strengthen local statistics and monitoring systems (UNEP, UNITAR, forthcoming^[44]; GESAMP, 2019^[45]). The next sections discuss strategies for capacity-building (7.3.3) and for developing plastic pollution inventories and data sharing mechanisms across the region (7.3.6).

Opportunities to improve policy effectiveness also lie in strengthening cross-sectoral coordination and multi-level governance. Fragmentation of institutional responsibilities related to waste management and plastic pollution among ministries and agencies, may slow down cohesive policy implementation (United Nations Environment Programme, 2023^[7]). National steering committees or inter-ministerial task forces can help align policy goals, clarify roles and responsibilities, and facilitate coherent implementation from national to municipal levels.

7.3.3. Capacity-building

Effective policy intervention on plastic pollution hinges on the capacity of governments to design, implement, monitor and enforce policies. In ASEAN LMIC, capacity gaps remain a critical barrier to scaling up interventions. Municipalities, in particular, struggle with limited technical expertise, financial resources and institutional support (World Economic Forum, 2020^[10]). Empowering subnational and municipal governments is vital, as they shoulder much of the responsibility for plastic waste management and the implementation on the ground of national strategies and policies. Building their financial planning skills and creditworthiness can unlock financing for infrastructure upgrades (ASEAN, 2021^[4]).

Institutional capacity-building spans national coordination on plastics-related policies, skilling of public officials and enhanced data systems for tracking plastic flows. Support can take the form of targeted training, technical toolkits or peer-learning platforms. Beyond government agencies, it can also be beneficial to provide training and enhance information sharing for waste operators, SMEs, informal workers, as well as producers and brand owners. Support should be tailored to local conditions to maximise effectiveness.

Several initiatives are already bolstering capacity in the APT region. For instance, Indonesia's National Plastic Action Partnership convenes ministries and local stakeholders to build knowledge, train actors along the value chain and co-design solutions. Development agencies and banks are providing technical assistance that helps local authorities strengthen governance and access financing for climate and circular economy projects. For instance, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) supports the *Reduce, Reuse, Recycle to Protect the Marine Environment and Coral Reefs (3RproMar)* project in Indonesia, which builds institutional capacity and promotes source-separated waste collection (GIZ, 2023^[46]).

APT countries could further accelerate capacity building by leveraging regional frameworks and political momentum. The *ASEAN Regional Action Plan* (2021^[4]) calls for enhanced technical assistance, funding and knowledge-sharing. For instance, the Capacity Building Programme for Reducing Recycling Related Marine Plastic Pollution in ASEAN Cities provides training, mentoring and technical support to cities across ASEAN countries (ERIA, 2024^[47]), helping them improve waste separation at source, recycling and marine litter prevention. Regional training hubs can draw on the experience of frontrunner countries and support cross-border knowledge transfer, while public-private partnerships can mobilise local expertise and expanding the reach of capacity-building programs.

Finally, ongoing negotiations for an international legally-binding instrument on plastic pollution may result in further capacity-building and technical assistance opportunities for developing countries.

7.3.4. Access to funding and investments

Securing adequate funding for capital and operational expenses is paramount to delivering interventions envisioned in national action plans, particularly those targeting waste management. The *High Stringency* scenario reduces overall waste management investment needs in the APT region compared to *Baseline* (particularly, for waste collection; see Chapter 6)³. However, a major scale-up of funding is still needed relative to current investment levels, especially in countries with currently low waste collection rates and heavy reliance on informal waste management practices.

While ambitious policy packages lead to modest GDP losses in the APT region (0.8% in 2050 for the *High Stringency* scenario) compared to the *Baseline*, the projected macroeconomic costs are significantly higher in ASEAN than in the Plus Three countries (see Chapter 6). These costs exclude the economic benefits resulting from reduced pressures on the environment, climate and human health along the plastic lifecycle.

ASEAN LMIC face particularly acute infrastructure deficits, needing considerable investments in municipal solid waste collection, sorting, recycling and disposal systems. In 2022, the APT region saw investments of USD 22 billion in plastic waste management annually (this is projected to rise further to 53.2 billion in 2050 under *Baseline*). Achieving near-zero mismanaged waste (as envisioned in the *High Stringency* scenario) will demand further scaling up, to:

- **Expand waste collection and treatment systems.** Indonesia requires an additional USD 9 billion until 2050 (on top of *Baseline* levels) to expand waste collection and sorting systems, while other ASEAN LMIC will need an additional USD 2 billion until 2050 (on top of *Baseline* levels).
- **Scaling recycling improvements across the APT region.** Scaling up recycling will require USD 130 billion cumulatively by 2050 (on top of *Baseline* levels). In ASEAN HIC & UMIC, this represent a reorientation of waste management activities towards recycling, while in most ASEAN LMIC additional investments are needed (i.e. USD 9.7 billion in Indonesia and USD 11.9 billion on top of *Baseline* levels for the rest of the ASEAN LMIC) to finance recycling improvements.

The waste management sector offers long-term investment opportunities, but this requires governments to establish clear policy frameworks that build market confidence. Countries like Japan and Korea show that comprehensive policy frameworks in place, with e.g. household waste management fees and EPR schemes, can ensure the financial sustainability of waste collection, sorting and recycling. Strengthening local government capacities and financing mechanisms across the APT can enable more countries to achieve effective plastic waste management (World Economic Forum, 2020^[10]).

Private-sector investments are growing globally, but remain unevenly distributed geographically and along the plastics value chain. Only 8% of the USD 160 billion invested into “plastics circularity solutions” globally between 2018 and 2023, flowed to Asia (The Circulate Initiative, 2023^[48]). In ASEAN countries, investments in plastic recycling are growing, but tend to prioritise the recovery of PET and some PP, due to their higher recyclability and greater market value (ASEAN, 2021^[4]). In addition, current investments are concentrated on the end-of-life stage, leaving significant untapped potential to promote investments towards e.g. reuse schemes, eco-design and innovation (The Circulate Initiative, 2023^[48]).⁴

Donor funding and public-private partnerships already support infrastructure development, but improving access to financing for SMEs and in rural areas will be key to unlocking further progress (ASEAN, 2021^[4]). Targeted financial instruments can help overcome current challenges in bankability, scale and risk perception, particularly for startups pioneering innovative solutions and for rural or remote areas where logistical challenges and weak economies of scale deter private investment. A just transition for informal workers will also require dedicated resources (International Alliance of Waste Pickers, 2023^[18]).

Mobilising finance for scalable, investment-ready solutions requires a combination of three levers: policy clarity and certainty to create market confidence, de-risking instruments to reduce investor exposure, and institutional support to crowd in both public and private capital. Blended finance and other risk-sharing instruments present opportunities to mobilise resources across the lifecycle of plastics. *Multilateral funds*, such as the Global Environment Facility (GEF) and the Green Climate Fund (GCF), can co-finance large-scale programmes, although developing countries may need capacity support to access such funds. *Development finance institutions* offer concessional loans and risk-sharing instruments to crowd in private capital, de-risking early-stage and innovative solutions (OECD, 2025^[49]). *National development banks* and public investment agencies can offer concessional financing and green lending mandates to stimulate broader market shifts. Successful models from outside the region, such as green bonds in Brazil and Chile, can offer useful references (UN Environment Programme Finance Initiative, 2023^[50]). An example of blended finance in action is Circulate Capital's Ocean Fund, that provides early-stage venture debt and equity for recycling, waste management as well as innovation such as new delivery models and innovative materials, in South and Southeast Asia (World Economic Forum, 2022^[51]).

Private capital is also beginning to flow into circular economy initiatives through corporate social responsibility funds, impact investing and sustainability-linked loans. Institutional investors can be encouraged to finance plastics-reduction projects via the creation of green taxonomies that define eligible activities, or via ESG disclosure rules mandating greater transparency on plastics flows (UN Environment Programme Finance Initiative, 2023^[52]). Various countries are exploring sustainability bond frameworks that could include plastics-related or circularity targets. For instance, Natura & Co.'s sustainability bonds in South America committed the company to reducing GHG emissions and increasing the use of recycled plastic packaging (World Economic Forum, 2022^[51]).

Public policy remains the cornerstone for unlocking investments. Measures such as household waste fees, EPR schemes or taxes can mobilise capital and create stable revenue streams. Fiscal incentives and regulation can further mobilise financial flows, such as via green procurement mandates and plastic taxes or charges. Governments can also offer guarantees or insurance schemes to reduce investment risks for early movers in reuse or reverse logistics infrastructure. Incubators, innovation grants and co-investment platforms can help circular business models to scale. Public policy can also support the deployment of community-led initiatives such as waste banks in Indonesia can contribute to improving waste sorting and recycling, although limitations persist, as described in Box 7.5. Financing strategies must also be socially just, ensuring affordability for low-income communities and supporting livelihood transitions for informal workers. Beyond resource mobilisation, aligning all financial flows with sustainability and circular economy principles will be critical to delivering a comprehensive transition across the plastic lifecycle (OECD, 2024^[6]).

Box 7.5. How Indonesia's waste banks incentivise the collection of recyclables in rural areas

Indonesia's waste banks are a decentralised community waste management program, aimed at improving waste collection in rural and remote areas, where municipal services often fall short. Waste banks treat waste as a resource, by enabling individuals to deposit sorted recyclable or reusable materials and products in exchange for credits, that vary based on waste type and weight. Credits can be redeemed for cash or in-kind benefits, such as language or activity classes. Waste banks sell the collected waste to intermediaries.

The waste bank program contributes to 2.7% of reductions in solid waste. The current system handles 1-2% of recyclable waste, considerably lower than the 10-15% recovered by informal collectors. Additionally, a study on 13 waste banks in Batu, Indonesia, found that the average resource recovery rate of waste in that community averaged 15.2%, compared to a potential resource recovery rate of 39.5%.

Waste banks have potential for scalable, locally-managed collection and recycling programmes, but the model currently faces a range of limitations and challenges, including limited household and community participation. Researchers have emphasised the need for greater community engagement, sustainable mechanisms for operational costs, and integration with broader waste management strategies.

Source: (Mukhtiningsih et al., 2023^[53]; Septyanun et al., 2022^[54]; Wang and Karasik, 2022^[55])

7.3.5. Formalisation and professionalisation of informal workers

Informal waste pickers are essential contributors to plastic waste management and recycling in the APT region (World Economic Forum, 2020^[10]). They collect and sort materials that would otherwise end up in landfills or pollute the environment. Yet, they often operate under precarious conditions: without adequate social protection and recognition while facing stigma and unsafe work environments (UNEP, COBSEA and Stockholm Environment Institute, 2019^[56]). Formalisation, professionalisation and empowerment of this workforce is not only a matter of social equity, but also a powerful lever for expanding plastic waste collection and improving recycling output (The Circulate Initiative, 2023^[57]).

Effective formalisation and professionalisation strategies include: registering waste pickers and recognising their role in national waste management frameworks, providing equipment and access to social protections, offering training, and integrating them into Extended Producer Responsibility (EPR) schemes as service providers or subcontractors (World Economic Forum, 2020^[10]; Suwarno et al., 2025^[11]; International Alliance of Waste Pickers, 2023^[18]). Improving price transparency along the recycled plastics supply chain can benefit all stakeholders, including helping to ensure fairer compensation for informal workers (The Circulate Initiative, 2023^[57]). Successful integration models are emerging. For instance, Viet Nam, Indonesia and the Philippines piloted initiatives for the organisation of informal workers into co-operatives or community-based enterprises that contract with local governments or private waste management companies.

Ultimately, integrating informal waste pickers into formal value chains can increase the volume of feedstock reaching recycling markets. The process of integration should be inclusive, with the participation of informal workers, civil society and local authorities.

7.3.6. Regional and international co-operation

Regional and international co-operation are essential to scaling up efforts action against plastic pollution in the APT region. While many challenges in APT countries are rooted in domestic systems, cross-border collaboration can amplify national efforts. Existing initiatives such as the Bangkok Declaration on Combating Marine Debris in the ASEAN Region, the related framework and regional action plan (ASEAN, 2019^[58]; ASEAN, 2019^[59]; ASEAN, 2021^[4]), the Osaka Blue Ocean Vision (IGES, 2024^[60]) and UNEA

Resolution 5/14 and the resulting negotiations for an international legally-binding treaty on plastic pollution (UN Environment Assembly, 2022^[61]), provide momentum for collective action.

Sharing best practices and data

Regional platforms play a pivotal role in policy alignment, knowledge sharing, peer learning and capacity-building. Key knowledge-sharing initiatives and platforms are shown in Annex Table 7.A.1. In addition, platforms such as the ASEAN Working Group on Coastal and Marine Environment and the SEA circular initiative by UNEP and COBSEA offer valuable spaces for sharing good practices and tracking progress. Regional cooperation also strengthens institutional capacity through joint training, technical exchanges and coordinated research programmes. Countries with more advanced policy frameworks can support peer learning and accelerate knowledge transfer.

Regional coordination also plays a critical role in enabling data collection and sharing. Common monitoring frameworks and open-data platforms, such as the ASEAN Regional Knowledge Hub on Marine Debris, enable countries to better understand plastic leakage pathways, identify priority hotspots and track progress. This enhances transparency, reduces duplication of efforts and supports evidence-based decision-making. Despite regional initiatives and progress, there is still a lack of a harmonised monitoring and reporting framework for plastic pollution, which hampers data sharing, regional benchmarking and coordinated enforcement of transboundary issues. Developing common indicators, reporting systems and compliance mechanisms would significantly enhance governance in the region. Regional policy action in this area can also bolster cross-ministerial coordination domestically, as well as create stronger accountability and regular monitoring of progress.

Scaling circular solutions

Cross-border collaboration is key to developing strong circular economies for plastics. Harmonised product standards, labelling and certifications schemes can enable economies of scale in circular plastics, such as those with recycled content or reusable packaging, making them more cost-effective and widely available (Suwarno et al., 2025^[11]; Ng et al., 2023^[3]; ASEAN, 2021^[4]). Regional forums also facilitate multi-stakeholder engagement, where governments, industry, civil society and academia co-create solutions, test new technologies and mobilise resources more effectively within coordinated frameworks (Suwarno et al., 2025^[11]). Co-operation at this level can also support the design of tailored financing strategies in the region and foster investments in circular value chains.

Enhancing international co-operation and coordination on waste trade

Given the transboundary nature of plastic pollution and the uneven distribution of costs of policy action, global co-operation is essential for effective and equitable solutions (OECD, 2024^[6]). For instance, strengthening coordination around the enforcement of maritime conventions, such as the MARPOL Convention, the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, can help reduce plastic pollution and marine debris (ASEAN, 2021^[4]).

Regional and international co-operation are also key to coordinating efforts on plastic waste trade, particularly to facilitate trade for material recovery and support viable investment projects for recycling, provided mechanisms to ensure appropriate quality levels are in place (ASEAN, 2021^[4]). International instruments also aim to regulate the trade of plastic waste. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal governs the transboundary movement of hazardous waste to prevent the transfer of hazardous waste from developed to less developed countries. Since its recent amendments, only certain types of clean, sorted recyclable plastic waste can be freely traded; all other types of plastic waste require prior informed consent from importing countries. This regulatory shift empowers countries to curb unwanted plastic imports and reinforces the need for robust domestic waste management.

Annex 7.A. Additional information

Annex Table 7.A.1. Overview of marine plastics-related knowledge platforms in the ASEAN Region

Platform Name	Host Institution	Description
ASEAN Circular Economy Stakeholder Platform	ASEAN Centre for Sustainable Development Studies and Dialogue (ACSDDSD) at Mahidol University, Thailand	Aims to support the Association of Southeast Asian Nations (ASEAN) Member States (AMS) in transitioning towards a circular economy.
ASEAN Environment Knowledge Hub	ASEAN Secretariat	Integrated system for environmental information and data management to support policymaking among AMS.
COBSEA Regional Node Platform	Coordinating Body on the Seas of East Asia (COBSEA)	Hosts knowledge and network resources on plastic pollution to promote collaborative and evidence-based actions in the East Asian Seas region.
CounterMEASURE GIS Platform	United Nations Environment Programme (UNEP)	Developed as part of the Promotion of Countermeasures Against Marine Plastic Litter in Southeast Asia and India (CounterMEASURE) project, which focused on identifying a model to monitor and assess pollution reduction and plastic leakage in the region.
Regional Knowledge Centre for Marine Plastic Debris (RKCMPD)	Economic Research Institute for ASEAN and East Asia (ERIA)	Information clearinghouse to support the ASEAN+3 (ASEAN, China, Japan, and the Republic of Korea) Member States in addressing marine plastic debris.
Know Waste Knowledge (KWK)	Platform Regional Resource Centre for Asia and the Pacific (RRC. AP) at the Asian Institute of Technology	Platform of information and knowledge sharing on waste management to support decision-making related to marine debris in the ASEAN region.
Environment Protection of the South-East Asian Seas (MEPSEAS)	International Maritime Organization (IMO)	IMO project aimed at assisting developing countries address marine environmental issues relating to ships and shipping through the implementation of four key IMO international environmental conventions.
Seas of East Asia (SEA)	Knowledge Bank Partnerships in Environmental Management for the Seas of East Asia (PEMSEA)	Supports integrated coastal management as well as investment in sustainable coastal and marine development and management in the Seas of East Asia region.
Unwaste	United Nations Office on Drugs and Crime (UNODC)	Project focusing on fighting waste trafficking between the European Union (EU) and Southeast Asian countries through the promotion of EU–ASEAN partnerships and a transition towards a circular economy

Note: In addition, there are also ongoing regional projects and activities such as the ASEAN-Norway Cooperation Project on Local Capacity Building for Reducing Plastic Pollution in the ASEAN Region (ASEANO) project, launched in 2019.

Source: (Suwarno et al., 2025^[11]).

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Notes

¹ Direct controls on virgin plastic production, such as limits on specific polymers, could potentially also reduce environmental impacts in the upstream segments of the plastic lifecycle, as well as curb plastics use. However, care must be taken to avoid unintended consequences, such as shifting demand to alternative materials with greater environmental impacts.

² Due to concerns with the feasibility and the environmental impacts of chemical recycling, the scenario analysis assumes that mechanical recycling technologies are the primary type of recycling technology adopted by countries.

³ This is achieved thanks to stringent policies to curb demand and promote eco-design, that together help contain waste generation.

⁴ These interventions are essential to mitigate environmental impacts, but also to contain the investment needs into waste management, especially in rapidly growing developing countries (OECD, 2024^[6]).

Regional Plastics Outlook for Southeast and East Asia

Countries around the world are increasingly taking action to end plastic pollution. Southeast and East Asia is uniquely positioned to tackle this issue, as it accounts for nearly one-third of global GDP and plays an important role in plastics value chains. It has also become a hotspot for plastic pollution, having experienced escalating levels of waste generation and insufficient, albeit accelerating, improvements in waste management in recent decades. These trends underscore the need for additional, ambitious policies.

This Regional Plastics Outlook provides a roadmap to support policy design and implementation in the 10 ASEAN Member States along with Japan, Korea and the People's Republic of China (ASEAN Plus Three countries). It both assesses the current situation and policy landscape, and quantifies regional plastics flows through 2050, including plastics use, waste and end-of-life fates, as well as environmental impacts linked to plastics. The Outlook also presents policy scenarios and recommendations to end plastic leakage in the region.



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