Marketing Communication for Professional Investors – July 2024

ENVIRONMENTAL STRATEGIES GROUP - ECOSYSTEM PILLARS SERIES

BEYOND THE BOTTLENECK: REDESIGNING OUR RELATIONSHIP WITH PLASTIC

BNP PARIBAS
ASSET MANAGEMENT

The sustainable investor for a changing world

INTRODUCTION

WHAT IS PLASTIC?

Plastics are a diverse range of materials which all share a key characteristic; their polymeric nature. Polymers are large molecules which are formed by joining smaller units together, like building blocks. In recent decades, technological developments and improvements in scientific understanding has catalysed synthetic polymer production, inspired by the polymers found abundantly in nature like cellulose. By arranging the carbon atoms of petroleum or fossil fuels in different lengths and patterns, plastic producers can manipulate the strength, weight and flexibility of plastic based on needs.

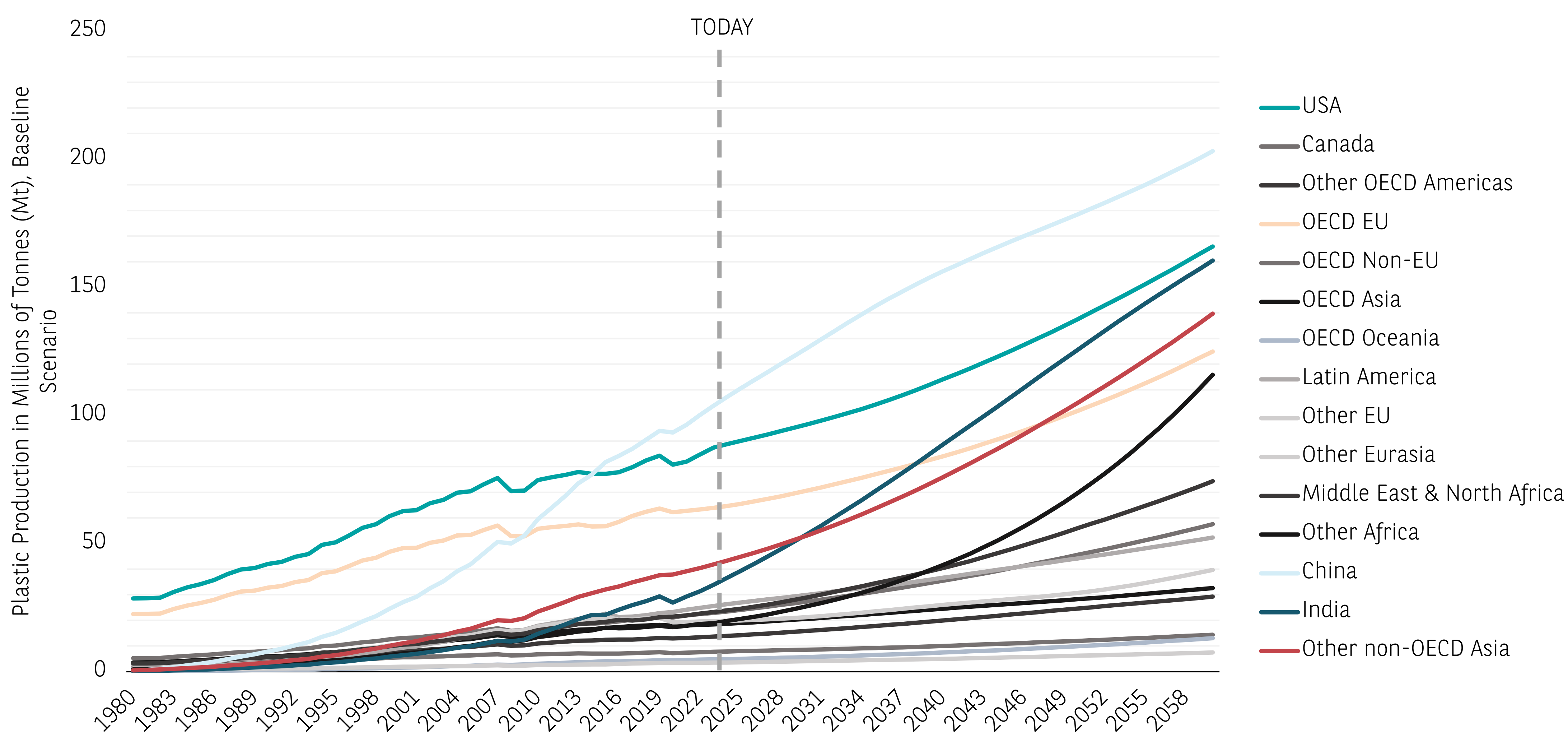
Their varying composition and consequential broad applicability have made them highly valuable, and ubiquitous in modern life since their invention. For example, they are now present across clothing and footwear (including synthetic fibres such as polyester), healthcare (disposable medical equipment), food and beverages (packaging) and even transportation (aircraft components).

THE RISE OF PLASTICS

Plastic Properties: Several factors have contributed to plastics' cost-effectiveness, including their: (1) versatility in design, (2) functionality across various temperatures, (3) high strength-to-weight ratio, (4) durability and (5) barrier properties.

Trends: Larger macro trends have also contributed to the rise of plastic production, including (1) population growth, (2) economic growth, especially in emerging markets (in sub-Saharan Africa, plastic use in 2060 is expected to be 6x larger than in 2019), (3) urbanisation, including city development and plastic use and fast paced lifestyles increasing demand for single use plastic, and (4) large-scale technological advancements, including the development of computers and mobile phones, which have been facilitated by plastics.

Historic and Future Projections of Plastic Production by Region



History and Future of Plastics | Science History Institute
Applications and societal benefits of plastics - PMC (nih.gov)
Plastics use projections to 2060 | Global Plastics Outlook Policy Scenarios to 2060 | OECD iLibrary (oecd-ilibrary.org)

TYPES OF PLASTICS

Types of Plastic | Learn What is Plastic Made Of & Different Types of Plastic - A&C Plastics (acplasticsinc.com)
BNPPAM Environmental Strategies Group x Northwestern Plastics Project

TYPES OF PLASTIC

	Name	Product Examples	Recycling Rate[6] (in the United States)
1	PET Polyethylene Terephthalate	Water Bottles; Jars; Bottle Caps	17%
2	HDPE High-Density Polyethylene	Shampoo Bottles; Grocery Bags	9%
3	PVC Polyvinyl Chloride	Cleaning Products; Sheeting	<1%
4	LDPE Low-Density Polyethylene	Bread Bags; Plastic Films	4%
5	PP Polypropylene	Yoghurt Cups; Straws; Hangers	1%
6	PS Polystyrene	Take-away and Hard Packaging; Toys	1%
7	Other Other	Baby Bottles; Nylon; CDs	NA

PLASTIC WASTE

THE SCALE OF THE ISSUE

Plastic has been available commercially since 1907, but mass production didn't commence until 1952. Since then, annual plastic production has increased nearly 200-fold.

When plastic waste is deposited into landfills or irresponsibly discarded, significant amounts are leaked into natural environments. Looking at the oceans alone:

- At least eight million tonnes of plastic ends up in ocean waters every single year
- It is estimated that roughly 40% of the ocean's surface is covered in plastic debris
- If our plastic consumption and behaviour continues, scientists warn that there will be more plastic than fish in the ocean as soon as 2030

High Waste Countries: The world's biggest contributor to plastic pollution is the US, generating about 42 million metric tons of plastic waste each year. This amounts to 130kg (287 pounds) per person, for context, a bag of sugar in the supermarket weights c. 1kg. An estimated 1.13-2.24 million metric tons of that waste is leaked into land and water-based environments every year.

High Waste Companies: A new analysis has found that less than 60 global companies are responsible for more than half of the world's plastic pollution, with six brands collectively accounting for 24% of the branded plastic items uncovered in the study. These include Coca-Cola Company (11%), PepsiCo (5%), Nestlé (3%), Danone (3%), Altria and Philip Morris International (2%).

*"Our reckless plastic use and consumption has driven the world to generate approximately **400 million tonnes** of plastic waste each year to keep up with demand, **60%** of which ends up in our natural environment or landfills."*
– Olivia Lai for Earth.org

COVID'S CONTRIBUTIONS

To mitigate the contagion of COVID-19, single-use surgical face masks, Personal Protective Equipment (PPE) and plastic bottles of disinfectant became essential daily needs. Lockdowns and safety measures drove up the use of food takeaway packaging. But this extensive increase of plastic consumption resulted in an estimated 8.4 million tonnes of plastic waste generated from 193 countries since the start of the pandemic, 25,900 tonnes of which – equivalent to more than 2,000 double decker buses – has leaked into the ocean, according to recent research.

Conclusively, the majority of plastic lifecycle's follow a linear process: ***take, make, waste.*** To re-emphasise:

Around ***160,000*** plastic bags are used ***every second***

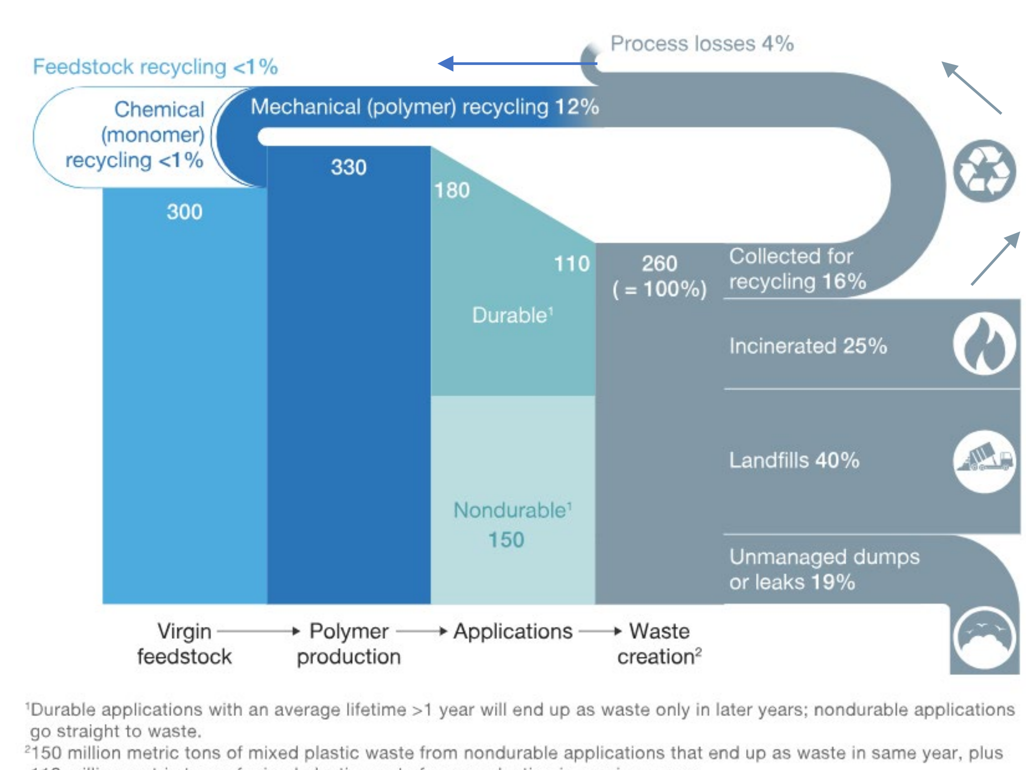
More than ***five trillion*** pieces of plastic are in our oceans

Almost half of all plastic waste ***(46%) goes to landfill***

1,500 plastic bottles are thrown away ***every second*** worldwide

Around ***83%*** of plastic packaging disposed of by homes is for food and drink packaging

Global Polymer Flows, millions of metric tons per annum, 2016



[1]Durable applications with an average lifetime >1 year will end up as waste only in later years; nondurable applications go straight to waste.
[2]150 million metric tons of mixed plastic waste from nondurable applications that end up as waste in same year, plus 110 million metric tons of mixed plastic waste from production in previous years.

8 Shocking Plastic Pollution Statistics to Know About | Earth.Org
Top Brands Linked to Quarter of Branded Plastic Pollution: Study (edie.net)
Recycling and the future of the plastics industry | McKinsey
Plastic Waste Facts | Plastic Waste Statistics | Business Waste

PLASTIC POLLUTION

The waste described on the previous page has serious consequences, as detailed below:

AIR POLLUTION

Plastic enters air circulation through:

- Incineration - Dangerous substances can be released into the air from burning plastics, including heavy metals, persistent organic pollutants (POPs), and other toxic chemicals. As POPs move around our planet via wind currents, they can easily be transported outside of the country they originate.
- Sea spray – Microplastics floating on the top of the ocean and around shorelines are another contributor. Researchers estimate that up to 136,000 tons of microplastic could be blown into the air and then on to land by sea spray every year
- Dust from cities - New studies label tyre dust as a "stealth pollutant". It enters the air from car tyre friction. The preservative 6PPD added to tyres to stop them breaking down, is very toxic for wildlife and humans when inhaled.

WATER POLLUTION

Plastics can enter fresh and marine ecosystems through stormwater runoff, sewer overflows, littering, inadequate waste management, etc. They can remain in their original form, or slowly break down into microplastics (<5mm) or nanoplastics (<100nm) because of solar UV radiation, wind, currents and other natural factors.

The most visible impacts of plastic debris are the ingestion, suffocation and entanglement of marine species. To elaborate, as marine wildlife ingest plastic mistaking it for prey, they are at risk of starvation as their stomachs become filled with plastic. They also suffer from lacerations, infections, reduced ability to swim, and internal injuries.

Floating plastics also help transport invasive marine species, thereby threatening marine biodiversity and the food web.

SOIL POLLUTION

Whilst the media has been spotlighting the effects of plastic on the ocean, recent research by UNEP and the FAO indicates that agricultural soils may receive greater quantities of microplastics than ocean. This build-up of plastic, can affect the physical characteristics of soil, like soil aggregation, water holding capacity, microbial activity, as well as toxicity. Consequently, soil fauna and flora are jeopardized by the degradation and imbalances caused by pollution.

Human health is also affected through direct exposure via ingestion or inhalation which can lead to inflammation, genotoxicity or oxidative stress which have scientifically proven links to soil pollution.

WILDLIFE HEALTH

Plastic pollution has many negative effects on biodiversity, including but not limited to:

1. Making natural habitats inhospitable
2. Animals ingest plastic, which can poison, break and block digestive systems
3. Spread of invasive species
4. Inadequate absorption of nutrients (plants)
5. Entanglement and harm
6. Genetic mutations
7. Decreases in reproduction
8. Psychological stress

HUMAN HEALTH

Plastic pollution has many negative effects on humanity, including but not limited to:

1. Endocrine disruption
2. Weight gain
3. Insulin resistance
4. Decreased reproductive health
5. Cancer
6. Weakened immune system
7. Lung irritation

CLIMATE CHANGE

Plastic Disposal: Plastic pollution's damaging environmental effects are more than just waste that is discarded. Studies estimate that incinerated plastic generated around 5.9 million CO_2e in 2015 in the US. This is expected to grow to 49 million per year by 2030 if plastics grow with their expected trajectory. Landfill also contributes towards climate change but generates fewer emissions than incineration. Notably, a degree of carbon offsets can be achieved through waste-to-energy or waste-to-fuel practices.

Plastic Production: Plastic's production is also contributing to global warming: in the United States, plastic production is currently responsible for 232 million metric tons of greenhouse gases every year, which is the equivalent of 116.5 gigawatts of coal plants. The production will outpace coal plants in the country by 2030, according to a 2021 report. This includes emissions from land disturbances, extraction and transportation.

Tyre dust: the 'stealth pollutant' that's becoming a huge threat to ocean life | Fish | The Guardian
How does plastic cause air pollution? - Purpose Rising Blog (repurpose.global)
Microplastics discovered blowing ashore in sea breezes | Plastics | The Guardian
plastic-pollution-issues-brief-may-2024-update.pdf (iucn.org)
Solutions to Plastic Soil Pollution - British Society of Soil Science
Plastics and Biodiversity | Plastics and the Environment Series – Geneva Environment Network
Marine plastic pollution - resource | IUCN
How plastics contribute to climate change » Yale Climate Connections
Plastics set to overtake coal plants on U.S. carbon emissions, new study shows (mongabay.com)

REGULATORY SUPPORT TO REDUCE PLASTIC WASTE

8 Shocking Plastic Pollution Statistics to Know About | Earth.Org
The table is a direct extract from: Barclays; Time for Advanced Recycling to Scale via BNPPAM subscription

REGULATORY SUPPORT

Despite these alarming statistics, scientists say it is possible to slash 80% of that pollution: by reducing the growth of virgin plastic production, improving waste collection systems, and investing in recyclable plastics. This is underpinned by supportive regulation; facilitating the transition away from a linear production model towards circularity.

Country/Region /Organisation	Implementation Date	Title of Policy	Description
EU	Mar-24	Directive on Single Use Plastics	• Provisional agreement to reduce, reuse and recycle packaging, increase safety and boost the circular economy.
Seoul, South Korea	Sep-23	Single-use Plastic Ban at Han River Parks	• Plastic cups and containers banned from Han River parks • Aim to increase recycling rate by 10%, decrease plastic waste by 10% in the city
EU	Jul-23	European Commission's Proposal for Regulation on Circularity Requirements for Vehicle Design & Management of End-of-Life Vehicles	• Mandatory target requiring 25%+ of plastics in new cars from recycled materials
India	Jul-22	Ban on Single-Use Plastics	• Banned single-use plastics, including straws and cigarette packets
California, USA	Jun-22	SB 54	• 25% reduction in single-use plastic by 2032 • 65% of all plastic items sold / distributed in CA must be recyclable by 2032—otherwise fined up to $50k / day
Japan	Apr-22	Act on Promotion of Resource Circulation for Plastics	• Promotes "Reduce, Reuse, and Recycle + Renewable" throughout plastic product design, sale, and disposal through various measures, including encouraging businesses to offer alternatives to single-use plastics to customers
UN	Mar-22	End Plastic Pollution	• Endorsed resolution at UN Environment Assembly to End Plastic Pollution and forge international legally binding agreement by 2024
EU	Jul-21	EU Single Use Plastic Directive	• Single-use plastic plates, cutlery, straws, etc. cannot be placed on the market in EU Member States • 25% recycled content in PET bottles by 2025, up to 30% by 2030
China	Jan-21	Single Use Plastic Straw Ban	• Restaurants banned from providing single-use plastic straws • Stores in major cities banned from providing plastic shopping bags
G7	Jun-18	Ocean Plastics Charter	• Initially adopted by Canada, France, Germany, Italy, the UK, and the EU • 100% reusable, recyclable, or recoverable plastics by 2030 • Increase recycled content by at least 50% in plastic products where applicable by 2030

COLLABORATIVE INITIATIVES

THE PLASTICS PACT

The Ellen MacArthur Foundation and WRAP have convened a Global Plastics Pact Network, an aligned response to plastic waste and pollution to facilitate knowledge sharing and coordinated action. It is a network of national and regional initiatives which brings together key stakeholders to implement solutions towards a circular economy. Each initiative is led by a local organisation and unites multiple stakeholders, including businesses, government institutions, NGOs and citizens behind a common vision. The pact has set out a list of ambitious local targets aiming to:

- Eliminate unnecessary and problematic plastic packaging through redesign and innovation
- Move from single-use to reuse
- Ensure all plastic packaging is reusable, recyclable, or compostable
- Increase the reuse, collection, and recycling or composting of plastic packaging
- Increase recycled content in plastic packaging

The Plastic Pact Network includes national plastic pacts in the UK, France, Chile, South Africa, Portugal, the US, Poland and Canada, Colombia and India. Regional pacts include the Australia, New Zealand and Pacific Islands (ANZPAC) Plastics Pact.

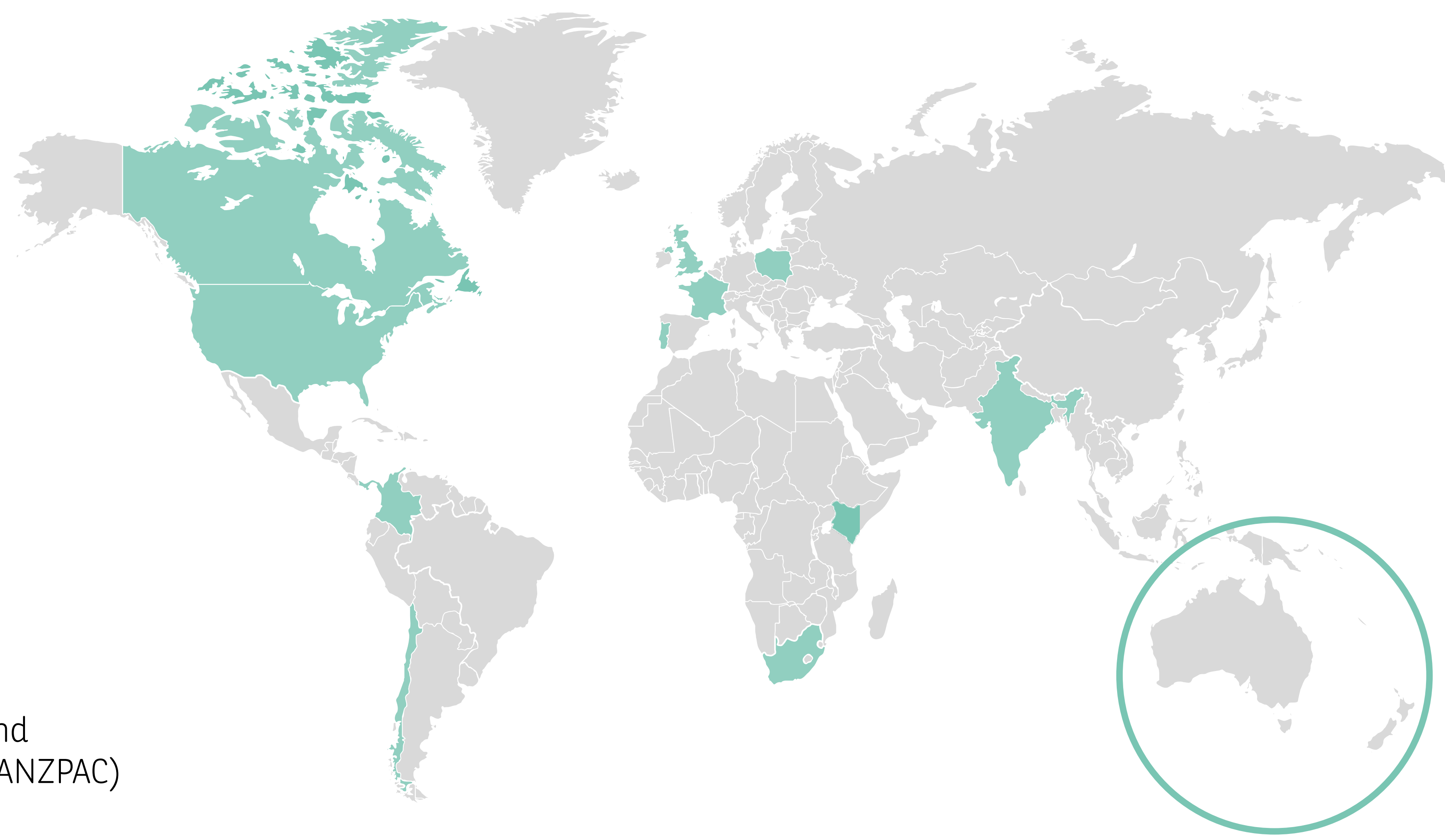
NATIONAL AND REGIONAL ACTORS

National Plastics Pact

- Canada
- Chile
- Colombia
- France
- India
- Kenya
- Poland
- South Africa
- United Kingdom
- United States of America

Regional Plastics Pact

- Australia, New Zealand and the Pacific Island Nations (ANZPAC)



The Plastics Pact Network | WRAP
The Plastics Pact Network | Ellen MacArthur Foundation

COLLABORATIVE INITIATIVES

GLOBAL PLASTICS TREATY

There's a growing international movement urging the United Nations to create a legally binding treaty on plastic pollution. This treaty would tackle plastic through its entire lifecycle, from raw material extraction to disposal and cleanup. It has the potential to significantly reduce the harm plastic causes to human health, wildlife and the environment.

Governments took a major step forward at the recent UN Environment Assembly meeting by agreeing to develop this ambitious agreement. It will include specific legal requirements and commitments to prevent and clean up plastic pollution, along with its toxic effects. Importantly, the process must involve all stakeholders to ensure the treaty is effectively implemented at all levels and respects human rights throughout.

However, progress has been slow. While negotiations haven't yet agreed on binding limits for new plastic production, over 50 countries are exploring what a sustainable level of production might be (although it is questioned whether this is possible). Additionally, 28 countries are committed to seeing the treaty through, including production limitations. There has been progress on banning unnecessary plastic products and implementing design standards. Negotiations are set to continue in Busan, South Korea later this year.

THE ROLE OF BNP PARIBAS ASSET MANAGEMENT

In November 2023, as the Intergovernmental Negotiating Committee (INC-3) of the Global Treaty on Plastic Pollution convened in Nairobi, Kenya, we joined CDP alongside 48 financial institutions in an open letter calling on governments for mandatory disclosure of plastics data, in keeping with our participation in the Business Coalition for a Global Plastics Treaty, which we joined in September 2022. For investors, this call to governments directly supports the assessment and management of portfolios' exposure to biodiversity loss and environmental pollution-related risks by mandating corporate data that is rarely available. In addition, BNP Paribas Asset Management is a participant in the annual CDP Non-Disclosure Campaign, which has incorporated a module on Plastics disclosure since 2022.

Scientists - A New Global Treaty On Plastic Pollution (plasticstreaty.org)
BNP Exane; Michael Clarke via BNPPAM subscription
f25fbc8f-d674-419f-93ca-78f1fa3a3ca5 (bnpparibas-am.com)

THE SOLUTIONS

THE DIFFERENT PROCESSES

There are two main ways to produce recycled plastic resins (materials derived from previously used consumer products or industrial and manufacturing processes): mechanical or advanced recycling.

Mechanical Recycling
Mechanical recycling offers a way to reuse plastic waste. The process is threefold, involving an initial plastic collection, its cleaning, including the washing and drying of the materials, and then the griding and melting stage, where its shredded and melted into pellets for reuse.

However, there are limitations to this process:

1. Downcycled quality: Repeated heating weakens the plastic, making the recycled pellets less durable than virgin plastic. They can only be recycled a limited number of times.
2. Potential for impurities: Colours and contaminants might remain, which can cause issues especially for plastic being redirect to the food and medical industries.

Despite these limitations, the supply for recycled plastic pellets is expected to grow as recycling rates improve and authorities are beginning to issue labels (e.g. food-safe and non-food safe) and guidelines for how to distinguish between mechanically recycled plastic grades. For example, the FDA has established guidelines focusing on:

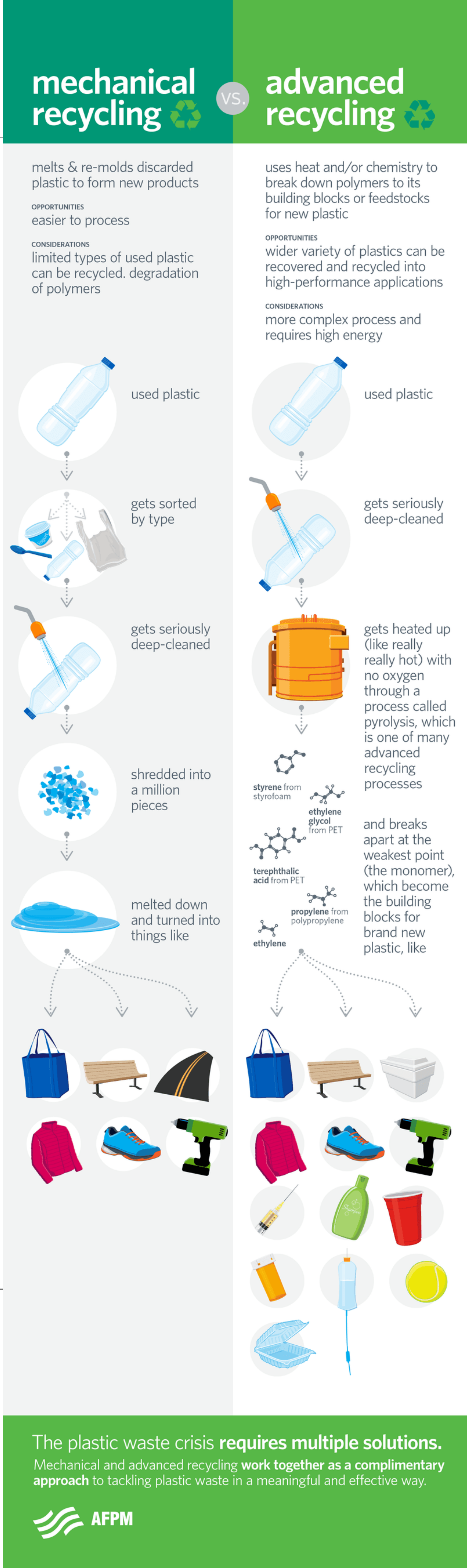
- Source: they verify the origin of the recycled plastic waste, ensuring it comes from food-grade sources
- Cleaning efficiency: they assess the recycling process' ability to remove contaminants through testing with simulated contaminants.

Advanced/Chemical Recycling
There are three types of processes involved in advanced recycling:

(1) Pyrolysis: This is a thermal process that breaks down plastic using high temperatures, in the absence of oxygen, into smaller molecules like gas, oil and char. It doesn't directly aim to recover the original building blocks of plastic, monomers.
(2) Depolymerization: This is a chemical process that breaks down plastic using specific chemical reactions (often involving heat, solvents or catalysts such as enzymes) to revert it back to monomers.
(3) Purification: This is a process that involves two steps, firstly, dissolving plastic in a solvent, then secondly, separating and purifying the mixture to extract additives and dyes. This results in a "purified" plastic in the form of polymers.[26]

Advanced recycling has two distinct advantages: firstly, unlike mechanical recycling, advanced recycling can be repeated indefinitely without deterioration in quality. Secondly, all contaminants can be removed, producing virgin-like materials.

Mechanical vs. advanced recycling — what's the difference? | American Fuel & Petrochemical Manufacturers (afpm.org)
Mechanical vs. chemical vs. advanced recycling. What are the differences? – BreadBags
Defining Recycling in the Context of Plastics (csagroup.org)



BNP PARIBAS
ASSET MANAGEMENT

THE SOLUTIONS

TYPES OF RECYCLING[6]

BNPPAM Environmental Strategies Group x Northwestern Plastics Project

Process	Input Product	Technology	Output Product
Polymer Recycling	PET, PVC, PS, LDPE, PP	Purification	Polymers (Recycled Plastic)
Monomer Recycling	PET, PS	Depolymerization (includes thermal and enzymatic depolymerization)	Monomers (Recycled Plastic and Rubber)
Feedstock Recycling	LDPE, HDPE, PP	Pyrolysis	Refined Hydrocarbons (Recycled Plastic and Fuels)

Process	Feedstock Purity		Emissions		Output Product	
Purification	**Purity of Input**	Single-resin feedstock, contamination reduces economic value of output	**Emission Intensity**	Lowest emissions intensity; 20% lower than virgin plastics	**Output**	Single Colour Recycled Pellets
	Potential Source	Municipal recycling after sorting process	**Process Efficiency**	Highest material processing efficiency	**Usage/ Quality**	Direct Polymer Usage
Depolymerization	**Purity of Input**	Requires relatively high-quality, pure feedstock	**Emission Intensity**	Average of 12% lower emissions than virgin plastics	**Output**	Monomers (Recycled Plastic and Rubber)
	Potential Source	Leftover from mechanical recycling processes or pre-sorted	**Process Efficiency**	Material processing efficiency of 67%	**Usage/ Quality**	Used to produce virgin-equivalent plastic polymers
Pyrolysis	**Purity of Input**	Can handle contaminated feedstocks	**Emission Intensity**	Average of 7% lower emissions than virgin plastics	**Output**	Naptha Fuels Base Chemicals
	Potential Source	Most post-consumer waste streams, including municipal solid waste	**Process Efficiency**	Material processing efficiency only 44% for plastics	**Usage/ Quality**	Can be sold as fuels and/or to petrochemical facilities to make refined products

Key Takeaways:

1. Depolymerization and purification require relatively pure feedstock quality, while pyrolysis can handle mixed feedstocks
2. Purification has a shorter route back to plastics resulting in the lowest emission intensity and material losses, while pyrolysis has the longest route and highest emissions
3. Pyrolysis creates an output with the most uses, but purification and depolymerization produce the most readily usable materials for plastics

"All three of these technologies are complements to the mechanical recycling and can transform plastics into secondary raw materials reintroduced at different steps of the plastic production process. Through these technologies, we can move from a linear plastic economy to a circular one" – Eckert et al., 2022: Northwestern University

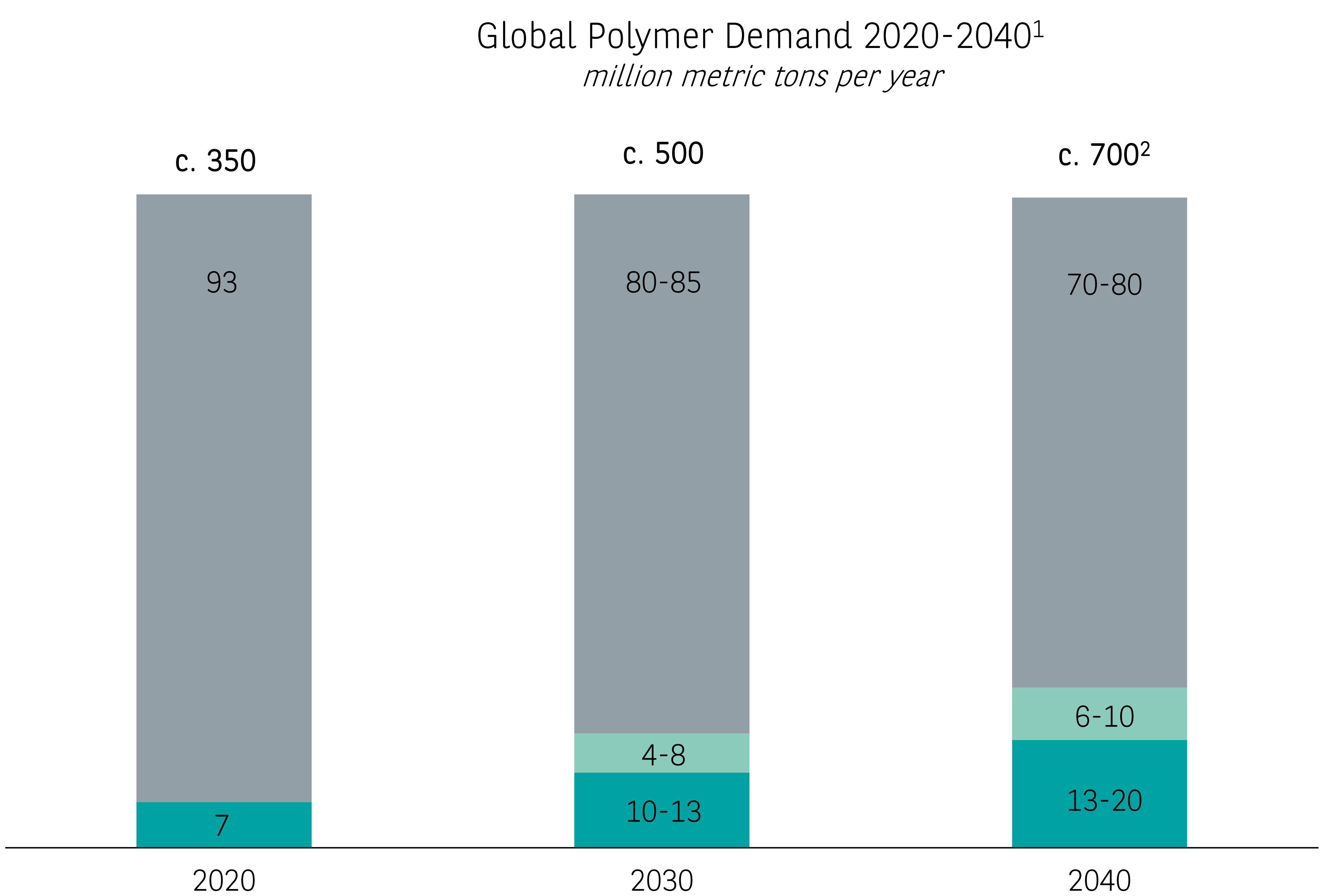
THE SOLUTIONS

PREDICTED GROWTH AND USE CASES OF ADVANCED RECYCLING TECHNOLOGIES

With the continued rate of acceleration and removal of obstacles, advanced recycling is expected to experience significant growth and become a key player in achieving recycled polymer targets.

- **Market Potential:** McKinsey predicts advanced recycling could meet 4-8% of the total plastic demand by 2030
- **Investment needed:** this growth would require over $40 billion in investment over the next decade
- **Significant growth:** While this might seem like a small share, it represents a massive jump from its current near-zero level
- **Rapid advancement:** the technology has the potential to grow more than 20% annually until 2030

Advanced recycling could grow to 20 to 40 million metric tons, or 4 to 8 percent of the total plastics supply by 2030, requiring more than $40billion of total investment



Share by category, %

- Virgin
- Advanced
- Mechanical

1: Polymer demand includes fibres (polyester and polyamide), excludes rubbers and intermediates

2: Figures may not sum to 100%, because of rounding

3: Assumes capital intensity range of $1500 to $3000 per ton

	2020	2030	2040
Investment in Advanced Recycling, $ Billons[3]		40+	90+

Advanced recycling: Opportunities for growth | McKinsey

CHALLENGES

CHALLENGES IN THE PLASTIC RECYCLING

The plastic recycling industry is still relatively new, and presents a complex landscape to navigate, marked by technical hurdles, economic playoffs and even issues of consumer behaviour. Understanding these roadblocks is crucial for investing effectively in the space and unlocking its potential. The industry currently flags two key headwinds hindering the development of plastic circularity:

1. FEEDSTOCK SECURITY

Despite the abundance of plastic waste, plastic recycling companies grapple with a surprising challenge: securing sufficient feedstock at a reliable quality. The material needed to create circularity in plastic manufacturing is present in waste streams, but it's been too expensive to reclaim, and too hard to consistently source at scale. This stems from a lack of infrastructure that can efficiently collect, sort and recycle plastics at high rates and quality. Plastic collection is highly fragmented, leading to inconsistent supply chains. Plastic waste is also highly heterogenous, in that it often comprises of a combination of different plastics (i.e. PET mixed with HDEP plastics, or mixed colour plastics) or is contaminated with non-plastic materials (i.e. leftover food waste). Furthermore, limited consumer education on proper sorting practices in their neighbourhood can exacerbate the problem. This makes it difficult for large scale supply chains to develop. Mechanical recycling is typically better at dealing with mixed waste streams, but often results in downcycling due to inconsistent structural properties and colours. However, advanced recycling typically requires a higher purity feedstock to ensure efficient conversion and yield. As seen in the figure on page 3, only 16% of waste is collected for recycling, and the process of this loses 4%, with 12% being circled back into mechanical recycling, and <1% in advanced recycling (in the United States).

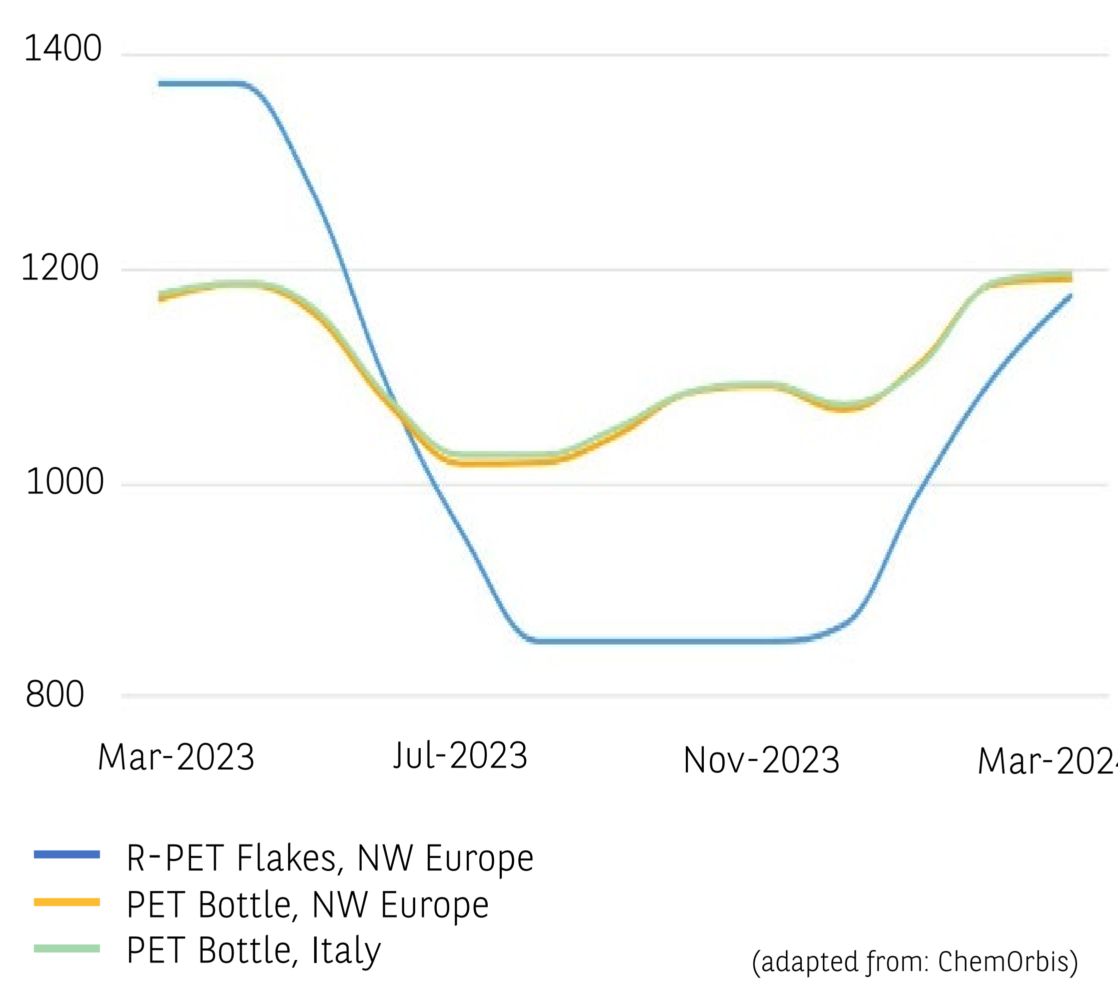
To overcome this challenge, McKinsey proposes two key solutions: recycling companies could establish partnerships and identify acquisition targets to gain access to feedstock, technology and research. Secondly, companies can work to secure long-term deals with municipalities, waste management companies and landfills can guarantee a steady supply of plastic waste.

2. ECONOMIC VIABILITY

To build a new advanced plastic recycling plant, the economic investment often hinges on a Green Premium – when an environmentally preferred option costs more to produce than the unsustainable option. Price premiums are common among customers and offtakes as typically the cost to produce recycled plastics (cost of recycled waste feedstock + sorting + plant processing) are greater than the cost of producing new virgin plastics (cost of oil-based feedstock + plant processing). For example, the figure alongside shows that in March 2023, the cost to purchase recycled waste feedstock (R-PET flakes, blue), excluding plant processing, was greater than the cost of producing new oil-based plastics (Green and Yellow). This cost environment and volatility creates challenging economics from the start.

There is however a growing willingness and acceptance for customers to pay more for recycled products, driven by company targets or regional mandates. Offtakes for recycled plastics today typically see a 10% - 20% premium above their virgin oil-based counterparts. When premiums approach >30% then industry does start showing increased sensitivity towards lower cost substitutes. Prices premiums also differ significantly between different types of plastics and how hard they are to recycle. For example, advanced recycled HDPE from PureCycle and other industry players, which is typically much harder to recycle than PET, is expected to receive premiums of >60% – highlighting that specialized products can capture and potentially maintain higher premiums.

Reference European PET Plastic Prices (€/mTon)



(adapted from: ChemOrbis)

Recycling and the future of the plastics industry | McKinsey
Capturing the green-premium value from sustainable materials | McKinsey
PureCycle Technologies

INVESTING IN RECYCLING

INTRODUCTION TO THE ENVIRONMENTAL STRATEGIES GROUP

The Environmental Strategies Group was founded in 2019 by Edward Lees and Ulrik Fugmann. As of today, the team manage five environmental thematic listed equity funds focused on purer-play environmental solutions companies across decarbonisation of energy related activities and natural capital solutions, respectively. The BNPP Energy Transition and BNPP Ecosystem Restoration Funds are the group's high-conviction, unconstrained thematic funds whilst the BNPP Climate Solutions range spans all themes with an explicit volatility-dampening tracking error constraint. Finally, the group manage an equity long/short fund, EARTH. The Group comprises of a team of nine: the two co-CIOs, three equity analysts, one quantitative analyst, one environmental analyst and an investment specialist team. Collectively, the group brings over a 100 years of experience to the table, and fosters a diversity of backgrounds, encompassing various industries, cultures, languages, skill-sets and strengths. This breadth allows the group to approach fund management from a holistic perspective. All members of the Group work collaboratively from the London office of BNP Paribas Asset Management, fostering a meritocratic team culture that is ambitious and focused fuelled by a shared passion for environmental solutions.

INTRODUCTION TO THE ECOSYSTEM RESTORATION STRATEGY

BNPP Ecosystem Restoration fund seeks to invest in companies at the forefront of various ecosystem considerations, including segments such as water, land and food. This includes but is not limited to smart agriculture, food innovation, clean water, circular economy and eco-design. The fund views driving impact and achieving returns as joined objectives. It seeks to protect our natural capital resources and reduce the pressure society puts on the world around us through investing in companies whose products and/or services enable environmental solutions, solutions which simultaneously can achieve sustainable, above market returns over the longer term. The fund invests across style factors, geographies, technologies, and market capitalizations to drive impact broadly and aid portfolio diversification.

THEMATIC BREAKDOWN

Qualifying environmental solution providers for Ecosystem Restoration are those which accelerate the transition of our economy to one which operates more in harmony with nature. The portfolio invests solely in companies which provide technologies or services which facilitate the protection, restoration or sustainable use of natural capital. Examples of the key focus areas of the fund are below:

OCEAN HEALTH & WATER SYSTEMS

AQUATIC ECOSYSTEMS
sustain the lives of billions of people, regulate climate, produces half our oxygen, & fuels the water cycle.

- Clean Maritime Mobility
- Desalination
- Smart Irrigation
- Sustainable Aquaculture & Feed
- Wastewater Treatment & Distribution
- ...

SMART AGRICULTURE & FOOD INNOVATION

TERRESTRIAL ECOSYSTEMS
provide the basis for life through food supply, water, habitats for organisms and biodiversity

- Alternative Protein & Plant-based Products
- Animal Health & Nutrition
- Bio-based Chemicals & Products
- Environmental Data Analytics & Services
- Food Ingredients & Enzymes
- ...

CIRCULAR ECONOMY & ECO-DESIGN

CIRCULAR ECOSYSTEMS
Reducing, re-using and recycling materials to reduce waste and pollution

- Bio-based & Biodegradable Plastics
- Circular Packaging Manufacturers
- Clean Air Technologies
- Metal & Material Recycling
- Plastic Recycling ←
- ...

INVESTING IN RECYCLING

About Veolia in the UK | Veolia UK
innocent - recycling activists, recycled bottles (innocentdrinks.co.uk)

PLASTIC RECYCLING THEMATIC

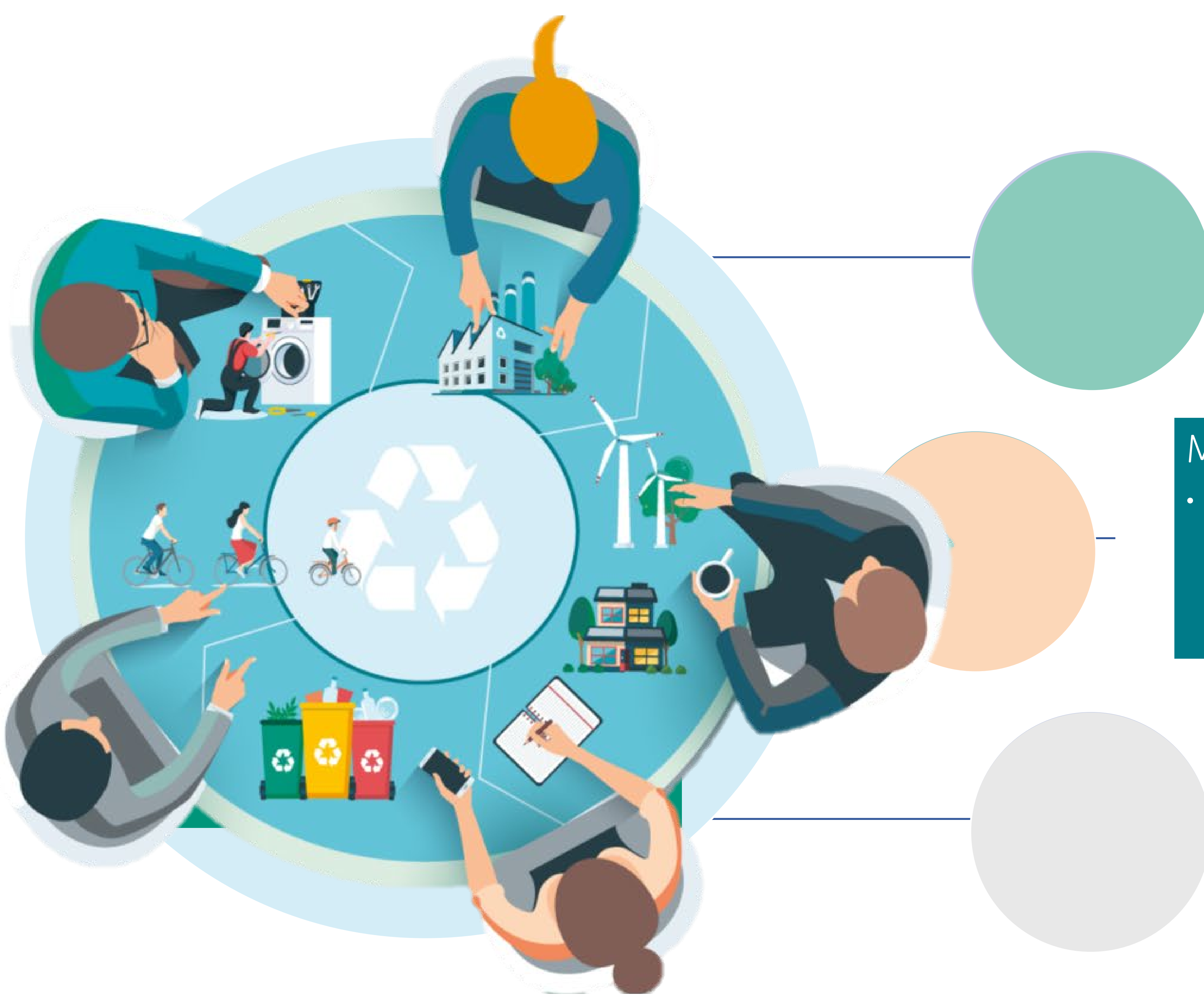
The strategy focuses on capturing the entire value chain of plastic recycling by investing in companies at various stages. We target both early stage and mature solution providers, fostering innovation across the recycling landscape. This is expanded on in the Investment Scope graphic below. We believe investing in plastic recycling presents a long-term economic opportunity; as demand for sustainable products grows, the market for recycled plastics is predicted to surge. Companies at the forefront of these technologies will be well-positioned to meet this demand, gaining a competitive advantage.

Investment Scope

Upstream Case Study (Included in the Ecosystem Restoration strategy): Veolia
Veolia is a world leader in environmental services and offers a complete range of solutions for managing water, waste, and energy on five continents. Through its three complementary business activities, Veolia helps to develop access to resources, preserve available resources, and to replenish them. Veolia supplied approximately 79 million people with drinking water and some 60 million people with wastewater service, produced approximately 48 million megawatt hours of energy and treated some 48 million metric tons of waste.

Midstream Case Study (Included in the Ecosystem Restoration strategy): Please find on page 14.

Downstream Case Study (Excluded from Ecosystem Restoration Strategy): Innocent Drinks Companies utilising plastic recycling technologies include Innocent Drinks, which currently compose all their juice and smoothie bottles of 50% rPET (recycled PET), and 15% plant plastic (which originates from a by-product of sugar cane). By 2030, the company aims for all packaging to be made from recycled or plant-based (renewable) material and reduce the weight of packaging by 20% per litre of drink.



Upstream

- We invest in municipal waste companies that form the backbone of plastic recycling. These companies play a crucial role in facilitating efficient collection and sorting of plastic waste, ensuring a clean and consistent feedstock for the recycling process.

Midstream

- Our focus extends to innovative advanced recycling technologies. These technologies offer promising solutions for tackling complex waste streams, such as mixed plastics or those traditionally considered unrecyclable.

Downstream (Excluded)

- It's important to consider that this strategy excludes investments in end-users of recycled plastics, which might utilize them to achieve their own sustainability targets. Our focus lies on companies that make recycling possible, not the final product manufacturers.

CASE STUDIES: PURECYCLE & AGILYX

PURECYCLE

Company overview

PureCycle Technologies, Inc. (PCT) have commercialized a patented purification recycling technology, originally developed by The Procter & Gamble Company, for restoring waste polypropylene into resin with near-virgin characteristics. This is called ultra-pure recycled (UPR) resin, which has nearly identical properties and applicability for reuse as virgin polypropylene.

The technology

PCT's recycling technology is a *purification recycling process* that uses a combination of solvent, temperature and pressure. Waste stream polypropylene is returned to near-virgin condition through a novel configuration of commercially available equipment and unit operations. The process puts the plastic through a physical extraction process using super critical fluids that both extract and filter out contaminants and purify the colour, opacity, and odour of the plastic with minimal controlled alteration of the physical characteristics of the polymer. By not altering the chemical makeup of the polymer, the company is able to use significantly less energy and reduce production costs as compared to virgin resin. The unique super-critical fluid extraction process does not require chemical reactions.

The company's UPR resin technology results in near-virgin equivalent quality and colour, and substantially improved odour profile compared to traditional recycled polypropylene. UPR resin provides the company's customers with 100% recycled content without compromising appearance, purity, odour or performance in finished products.

AGILYX

Company overview

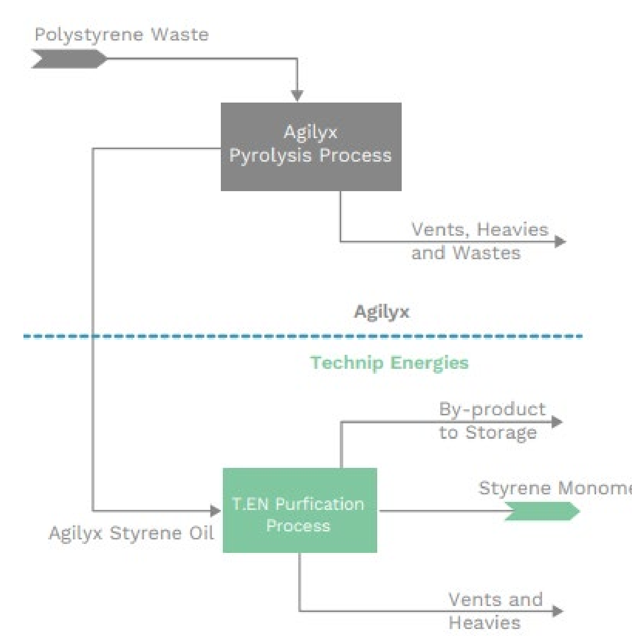
Agilyx ASA, a technology company, engages in the chemical recycling of difficult-to-recycle post-use plastic streams. The company operates through two segments, Agilyx, the advanced recycling technology branch, and Cyclyx, a consortium to improve post-use plastic sourcing.

The technology

The company currently has one commercialised licensing product pathway:

TruStyrenyx is Agilyx's proprietary waste polymer-monomer technology where polystyrene waste is *depolymerised* in pyrolysis reactors. It is/has:

- 99.8% purity
- Styrene product can make food grade products or packaging
- Compliant as an ISCC PLUS certified circular pathway
- Process can handle distressed feedstocks with minimal pre-processing
- Based on T.EN's technology leadership in styrene purification



The above-mentioned securities are for illustrative purpose only and do not constitute any investment recommendation.

ALTERNATIVES

Bioplastics—are they truly better for the environment? (nationalgeographic.com)
The Truth About Bioplastics – State of the Planet (columbia.edu)
The multifaceted challenges of bioplastics | Nature Reviews Bioengineering
Biodiversity benefits of seaweed and mussel farming | The Fish Site
Company (notpla.com)

ALTERNATIVES TO TRADITIONAL PLASTICS

1. Bioplastics

Bioplastic or bio-based plastic refers to plastic made from plants like corn or sugarcane instead of conventional petroleum. It can be made in two ways, firstly these biological materials can be converted into polylactic acids (PLAs) used for food packaging, or it can be made from polyhydroxyalkanoates (PHAs) engineered from microorganisms and often used for medical devices. PLA is the cheaper and most common form, as it can be produced in the same large industrial facilities making products like ethanol.

Regarding climate change, bioplastics produce less emissions than traditional plastics over their lifetime. This is because there is no net increase in carbon dioxide when they break down - the plants that bioplastics are made from absorbed that same amount of carbon dioxide as they grew. To contextualise this impact, a 2017 study found that corn-based PLA has the potential to cut U.S. greenhouse gas emissions by 25 percent.

In terms of disposal, discarded bioplastic must either be sent to a landfill, recycled like traditional plastics, or sent for industrial composting (depending on polymer type). Intense heat is still required in the disposal process, as without it, bioplastics won't degrade on their own in a meaningful timeframe. Crucially, if they end up in marine environments, they can cause the same damaging consequences petroleum-based plastic.

This is not the only challenge to the growth of bioplastics: for example, the production of many bioplastics still relies heavily on food crops, such as corn, which raises concerns over potential competition with food supplies, effects on food security or use of pesticides. Despite these concerns, studies show that only 1.5% of the total agricultural land would be needed for bioplastics to completely replace petroleum-based plastics.

2. Plastic Alternatives

Alongside innovations in recycling, scientists, engineers and designers are shifting their focus to ecologically friendly alternatives that create circular, low-waste economies. Importantly, these alternatives provide many benefits outside of waste reduction and climate mitigation. For example, seaweed farms have the potential to boost marine biodiversity and support wild fish populations.

Companies in this space are often private and in the early stages of development. The Environmental Strategies Group are paying close attention to their development, and opportunities to support their growth.

Examples include:

- Beeswax: Beeswax wraps are an all-natural biodegradable food storage option that replaces disposable plastic such as cling film or foil.
- Bamboo: Bamboo is also a natural, renewable and biodegradable material that can replace plastic in many household items. It does not require pesticides or chemicals and is not key for food security. It also has antibacterial properties.
- Seaweed: Seaweed is suitable for a wide range of applications and can mimic the versatility and durability of plastic.

Spotlight

Notpla Disappearing Packaging

Notpla, which stands for "Not Plastic", is a company which produces regenerative packaging materials made from seaweed and plants. Solutions they currently provide include food containers, pipettes, paper and pods. The packaging is fully compostable and disappears without a trace, like a fruit peel.

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FUND DETAILS

Base Currency: EUR
Launch Date: 01.06.2021
Sustainability Credentials: Article 9, AMF Cat 1
Maximum Management Fees: 1.50%
Ongoing Costs: 2.02% (21.12.2023)
Benchmark: MSCI AC World (EUR) NR

Legal Form: Sub-fund of SICAV BNP PARIBAS FUNDS Luxembourg domicile
Management Company: BNP Paribas Asset management Luxembourg
Delegated Manager: BNP Paribas Asset Management UK
ISIN code: LU2308191738
SRI: 5/7

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Alexandra is the groups Environmental Analyst with responsibility of the groups biannual environmental reporting as well as steering the groups work and innovation on environmental issues and regulations in collaboration with the firms Sustainability Centre. Alexandra has a keen interest in sustainability having worked in Fiji as an Assistant Marine Researcher in 2018, having continued to develop her experience in the field of ESG and environmental issues at Magellan Advisory Partners in 2020 and having been an ESG analyst at both Acasta and Gneiss Energy in 2022.
Alexandra recently graduated from University of York with a MSc in Environmental Economics and Environmental Management.

Lee Gordon, Equity Research Analyst

Lee is an equity analyst in the Environmental Strategies Group having joined BNPP AM in 2023. Prior to joining, Lee held previous roles within the equity research team at Credit Suisse, focusing on integrated energy companies within EMEA, and the research team at Aurora Energy, focusing on European power markets.
Lee has a Master of Philosophy in Energy Technologies from the University of Cambridge and received his BSc (Hons) in Chemical Engineering.

PORTFOLIO MANAGERS

Edward Lees, Co-head Environmental Strategies Group, ESG Champion

Edward is co-CIO of Environmental Strategies Group and senior portfolio manager of long only and long-short environmental strategies managed by the group having joined BNPP AM in 2019. Edward began his career in 1994 at Morgan Stanley in New York in investment banking and private equity. He joined Goldman Sachs in 2000 where he was an MD and founded and co-ran the Goldman Sachs Thematic Investment Group (2005-2009). Edward set up thematic fund Clear River Capital in 2009 and subsequently went to UBS as a MD to start a principal investing business. Since 2012, Edward was the CEO and co-founder of North Shore Partners that became part of Duet Asset Management in 2015 and later co-founded Sustainable Solutions (2017-2019). He holds an MBA from Wharton and a BA from Amherst College.

Ulrik Fugmann, Co-head Environmental Strategies Group, ESG Champion

Ulrik is co-CIO of Environmental Strategies Group and senior portfolio manager of long only and long-short environmental strategies managed by the group having joined BNPP AM in 2019. Ulrik began his career in 2001 at Goldman Sachs in London investing in companies globally focused on how the world feeds, moves, energises and builds itself. He formed part of the internal investment group Goldman Sachs Principal Strategies Group from 2005-2007 and later co-ran the Goldman Sachs Thematic Investment Group from 2007-2012. From 2012, Ulrik was the CIO and co-founder of thematic asset management boutique North Shore Partners - became part of Duet Asset Management in 2015 - and later co-founded an environmental solutions focused business, Sustainable Solutions, in 2017-2019. He holds a MSc in Economics and Political Science from University of Copenhagen.

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