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Sustainability

What goes around comes around: Circular plastics

23 July 2024

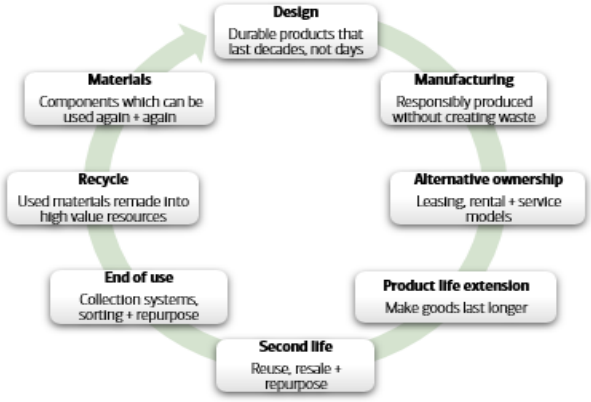
Key takeaways

- The circular economy is based on three principles: eliminate waste and pollution, circulate products and materials, and regenerate nature. Currently, the global economy is only 7.2% circular vs. 9.1% in 2018, meaning more than 90% of materials extracted are either wasted, lost, or remain unavailable.
- Global material use has more than tripled in five decades and continues to grow. And according to BofA Global Research, plastic consumption, waste, emissions and leakage could increase by 50-70% by 2040. The good news is, unlike some materials, plastic, which makes up c.16% of global solid waste and 4% of emissions, can be recycled.
- Over the past few years, global regulations and policies have been introduced calling for the plastics industry to meet higher recycling targets. Plus, emerging solutions like biobased plastics and chemical recycling can promote increased sustainability.

What is a circular economy?

The circular economy is a model of production and consumption and uses processes like reuse, repair, remanufacture, recycling, and composting. It is based on three principles: 1) eliminate waste and pollution, 2) circulate products and materials, and 3) regenerate nature. Understanding the circular economy is complex because the scope extends beyond waste prevention and management, to using natural resources efficiently increasing the use of secondary raw materials and securing access to strategic resources. It is estimated that adopting circular strategies across four industrial materials: steel, cement, plastics and aluminium, could decrease greenhouse gas (GHG) emissions by 40% by 2050 (Ellen MacArthur Foundation)[1].

Exhibit 1: An estimated 80% of a product's lifecycle environmental impacts are determined at the design stage
Eight stages of the circular economy



Source: Connor Hill, Inspire Circular

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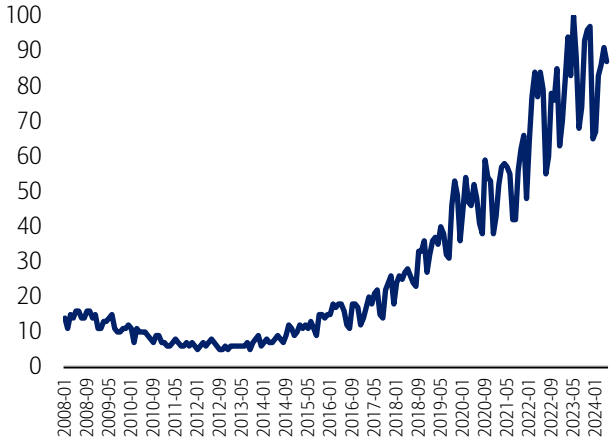
Exhibit 2: Circular economy is trending on web searches
Interest over time. Numbers represent search interest relative to the highest point on the chart. 100 = peak popularity, 0 = not enough data



Source: Google trends, 2004-May 2024

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[1] Climate and a circular economy | Ellen MacArthur Foundation

Using too much and reusing too little

Global materials use has more than tripled over five decades and continues to grow. Meanwhile, the economy is only 7.2% circular, meaning that more than 90% of materials extracted are either wasted, lost or remain unavailable. Not all virgin materials, which are anything extracted directly from nature without processing, can be substituted with secondary materials, or any material that is not the primary product from manufacturing and other industrial sectors. For instance, fossil fuels are combusted through use and hence can't be cycled back into the economy. Similarly, materials used in buildings or machinery are locked-in and hence not available for cycling for many years. But it's not all bad news: unlike some materials, plastic can be recycled!

Circular plastics: Invest, reuse, repeat

According to BofA Global Research, plastic accounts for c.16% of global solid waste generated and its lifecycle emissions account for 3.6% of the global total in 2020, of which 90% is from their production and conversion from fossil fuels. Additionally, a World Wildlife Fund-commissioned report estimates the total lifetime costs of plastic in low- and middle-income countries is eight times of that incurred by high-income countries ($150 vs. $19/kilogram).

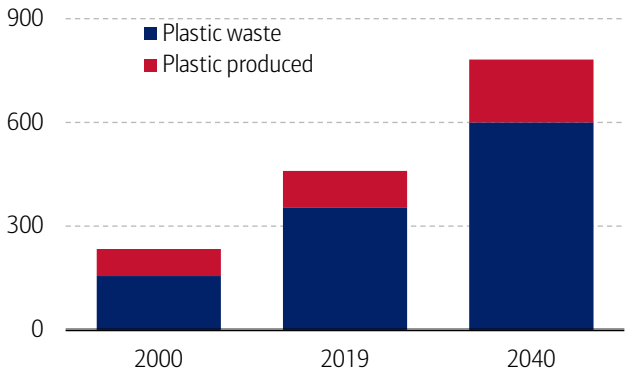
Plastic production and plastic waste have more than doubled over the last two decades. And half of all plastic produced is designed for single-use purposes. In 2020, only 9% of plastics were recycled, while c.70% ended up in landfills or incinerated and 22% were mismanaged, according to BofA Global Research. Based on current trends, plastic consumption, waste, emissions, and leakage could increase by 50-70% by 2040 which is unsustainable (OECD).

Business-as-usual is unsustainable

The interim findings of the forthcoming Organization for Economic Co-operation and Development (OECD) report 'Towards Eliminating Plastic Pollution by 2040: A Policy Scenario Analysis' reveal that with current population and income trends, plastic use and waste generation would increase by 70% in 2040 vs. 2020. Furthermore, the share of emissions from the plastics lifecycle is projected to rise to 5.0% (from 3.6%) by 2040 – an outcome that goes against the Paris Agreement.

Exhibit 3: Plastic production and waste has more than doubled over two decades and, at the current rate, is expected to increase 70% by 2040

Annual plastics use, business-as-usual scenario (tons)



Source: OECD ENV-Linkages mode

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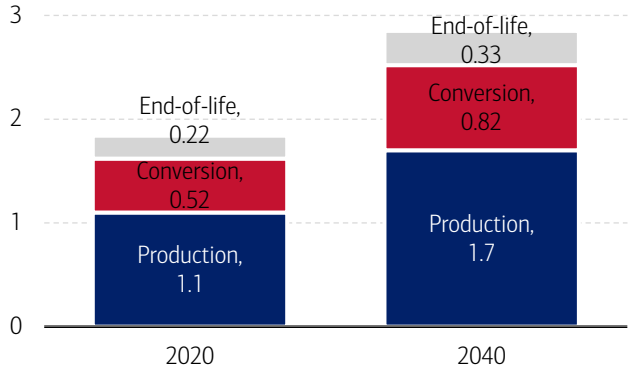
Exhibit 4: GHG emissions from plastics are projected to rise by 60% by 2040

Annual GHG emissions from the plastics lifecycle, business-as-usual scenario (gigatons carbon dioxide equivalent (GtCO2e))



Source: OECD ENV-Linkages mode

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Global policy ambition is key and would only cost 0.5% of global GDP

Global ambition with early, stringent and coordinated policy action could cut plastic waste by 25%, eliminate mismanaged waste and nearly eliminate plastic leakage by 2040, per BofA Global Research. And the best part? Such action would cost only 0.5% of global GDP.

A "Paris Agreement" for plastics

About 160 financial institutions, managing more than $15.5 trillion in assets, signed a Finance Statement on Plastic Pollution in April, that acknowledges the role of the financial sector in mitigating the material financial risks related to plastic pollution through incorporating plastic pollution risks into their investment and financing decision-making processes, as well as promoting stewardship with companies and policymakers to address such risks. Plus, seeing appropriate disclosure from businesses on plastic-related issues engages in plastic value chain initiatives.

The statement also calls for an ambitious international legally binding instrument to end plastic pollution, a similar policy mandate to the Paris Agreement and Kunming-Montreal Global Biodiversity Framework. The United Nations (UN) aims to complete the negotiations for a treaty to end plastic pollution in November/December 2024.

Meanwhile, as part of the European Green Deal, 55% of plastic packaging waste should be recycled by 2030. Moreover, the European Union (EU) adopted the Packaging and Packaging Waste Regulation (PPWR) in April, which establishes requirements for the entire packaging lifecycle, from raw material to final disposal (concerning environmental sustainability and labelling), in order to be placed on the market and for extended producer responsibility, collection, treatment, and recycling of packaging waste.

PPWR applies to EU-based companies as well as those importing packaging into the region. Under PPWR, all packaging (except for lightweight wood, cork, textile, rubber, ceramic, porcelain and wax) should be reusable or recyclable in an economically feasible way by 2030. It also set a packaging reduction target, including: 1) a ban on single-use plastics in Hotel, Restaurant, and Café/Catering (HORECA) from January 1, 2030, minimum recycled content targets for plastic packaging and 2) by 2029, 90% of single-use plastic and metal beverage containers (up to three litres) will have to be collected separately (via deposit-return systems or other solutions that ensure the collection target is met).

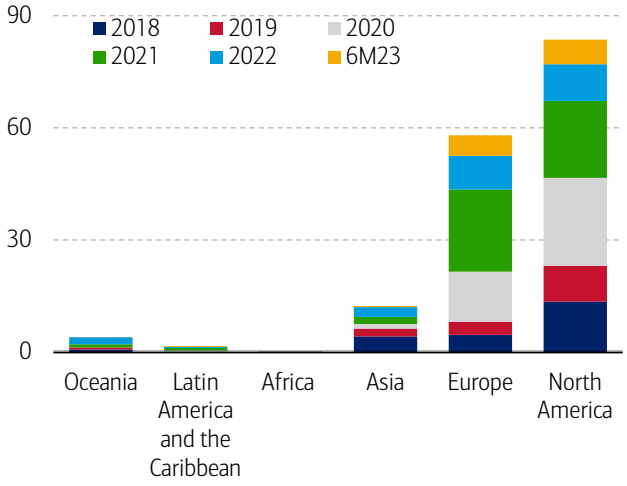
In the US, the US Plastics Pact aims to 1) have 100% of plastic packaging be reusable, recyclable, or compostable by 2025, 2) achieve an average of 30% recycled content or responsibly sourced, bio-based content by 2025, and 3) undertake ambitious actions to effectively recycle or compost 50% of plastic packaging by 2025.

Investing in the plastic transition

Given current trends, countries will need to invest at least $2.1 trillion by 2040 to deal with increasing plastic waste (OECD).[2] Over the past few years, new regulations and policies have been introduced calling for the industry to meet higher recycling targets. And the industry is scaling through vertical integration in the recycling sector by working with waste managers, polymer producers, brand owners, converters, and retailers.

Exhibit 5: The US and Europe has received major share of private investments in plastic circularity

Plastics Circularity Investments by region ($bn), 2018-06/23, as of 11/23



Source: Plastics Circularity Investment Tracker

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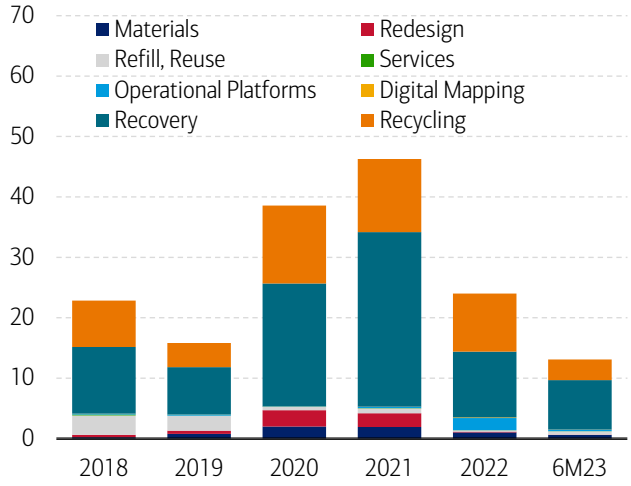
Exhibit 6: Most private investments in plastic circularity have gone into recovery and recycling solutions

Plastics Circularity Investments by archetype ($bn), 2018-06/23, as of 11/23



Source: Plastics Circularity Investment Tracker

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According to the Circulate Initiative's Plastics Circularity Investment Tracker, about $160 billion of private capital has been deployed globally in plastics circularity between 2018 and the first half of 2023. The majority of this has been in corporate investments (through joint ventures, mergers, acquisitions, secondary transactions, bonds, etc) and financed by banks (loans/bonds) followed by private equity investment and in the US and Europe (Exhibit 5).

Most of the investment has gone into recovery and recycling solutions (Exhibit 6). The recovery solutions support plastic circularity through collecting and sorting plastic waste prior to disposal, like plastic litter and waste collection services, and riverside clean-up technologies.

Bio-based plastics are green and growing

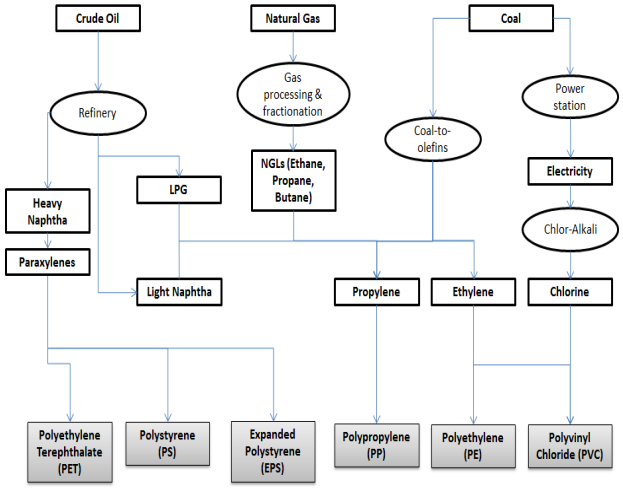
According to BofA Global Research, about 98% of single-use plastic products are made from fossil fuel, or "virgin" feedstock, such as coal, crude oil, and natural gas. These raw materials are refined and put into a steam cracker, fluid catalytic cracking unit,

[2] Plastics | OECD

or aromatics reformer to create a monomer, which is then polymerized into a final product (i.e., plastic resin). Polyethylene (PE) and polypropylene (PP) are the most widely produced types of plastic (Exhibit 7).

On the other hand, bioplastics are biobased, biodegradable, or both (Exhibit 8). Biomass used as feedstock for plastics production can significantly reduce CO2 emissions. In applications with long lifecycles, it can even serve as a form of carbon storage. This biomass can either be generated from primary (e.g., crops) or secondary sources (e.g., organic waste such as compost or cooking oils, crop and farm residues, animal fats, forestry waste and sewage sludge). The benefits are, however, highly dependent on several factors, including the chemical structure, manufacturing process and the most likely end-of-life (EOL) scenario.

Exhibit 7: Polyethylene (PE) and polypropylene (PP) are the most widely produced types of plastic
Plastic resin production flow chart



Source: BofA Global Research

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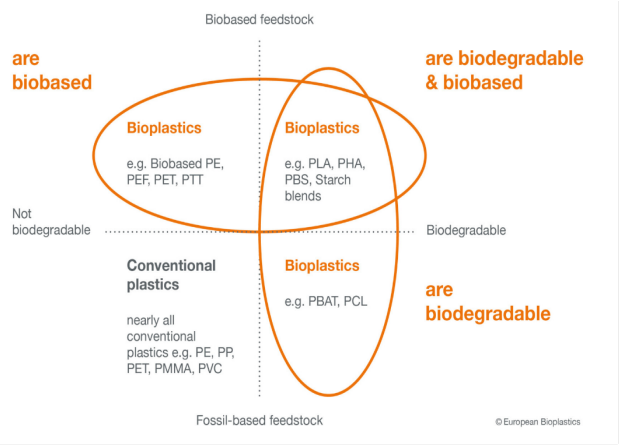
Exhibit 8: Bioplastics are biobased, biodegradable, or both. Polylactic acid is the most widely produced 100% biobased plastic material
Material coordinate system of bioplastics



Source: European Bioplastics

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While plastics from biobased feedstock only account for less than 1% of the plastics produced, per BofA Global Research, biobased feedstock is becoming increasingly available. The total global production capacity of bio-based plastics (BBPs) is expected to grow from 2.2 Metric Tons in 2023 to 7.4 Metric Tons by 2028, and its share of biodegradable productions capacities to increase by 10% to 62%.

Additionally, BBPs can be compatible with existing recycling systems. Emerging chemical and biological methods can also enable the upcycling of plastic waste into higher-quality materials. Packaging is currently the largest market, with 43% of the BBP market in 2023 or almost 934,000 tons. In addition, the automotive, packaging and electronics industries stand to benefit as well from BBPs, according to BofA Global Research.

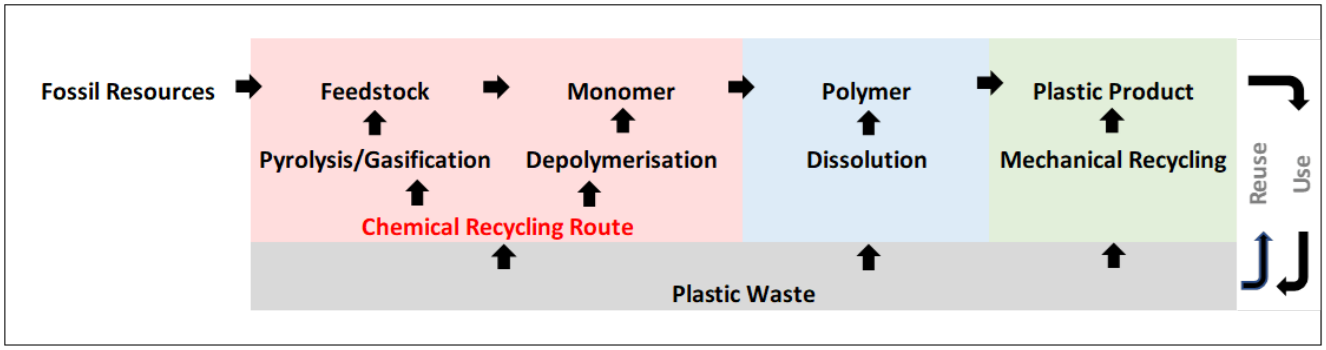
The key challenge is cost parity with traditional PE, which costs up to two to three times less than BBPs. However, the latest data per BofA Global Research indicates that existing facilities are running at full capacity and economies of scale will make bioplastics less expensive.

Chemical recycling can reduce emissions and resist resource depletion

Chemical recycling is the process of breaking down plastic to its core building blocks, i.e., the molecular level. Whereas mechanical recycling is the process of recycling post-consumer waste into “new” raw materials without changing the basic chemical structure of the material and therefore keeps the polymer intact. Chemical recycling is seen as complementary to mechanical recycling as it further depolymerizes step further by depolymerizing the material that can be used as feedstock for new plastics, fuels, or other petrochemicals. And it can help reach higher recycling rates, and prevent mixed plastics waste being sent to incineration or landfill.

Although chemical recycling is not new (some programs have been under development for 25 years), it has been limited by cost-effective upstream infrastructure leading to high gate fees. Many small-unit conceptual designs have thus not expanded to operate at an industrial level, which is why most chemical recycling projects are in very early development stages. Importantly, chemical recycling can significantly reduce emissions and virgin fossil resource use.

Exhibit 9: Chemical recycling is seen as complementary to mechanical recycling and can help reach higher recycling rates
Chemical vs. mechanical recycling of plastic waste



Source: BofA Global Research

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