

The Circular Economy for Plastics

A European Analysis

Executive summary

MARCH 2024

About the report

The 2024 edition of this report is a contribution towards a better understanding of the circular economy for plastics, and its evolution over the years. It provides an overview of European plastics production, conversion into products and components, consumption, waste management. It also addresses the different recycling technologies and plastics production from non-fossil based resources, i.e. bio-based and bio-attributed and carbon captured plastics.

The report shows 2022 estimated data.

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Plastics Europe is the pan-European association of plastics manufacturers with offices across Europe. For over 100 years, science and innovation has been the DNA that cuts across our industry. With close to 100 members producing over 90% of all polymers across Europe, we are the catalyst for the industry with a responsibility to openly engage with stakeholders and deliver solutions which are safe, circular and sustainable. We are committed to implementing long-lasting positive change.

For more information, contact us at <u>connect@plasticseurope.org</u> or visit <u>plasticseurope.org</u>.

Foreword

Our vision is to create a European plastics system that continues to meet society's needs in a sustainable way by reducing waste, resource use and greenhouse gas emissions. To do so, we need to transition from a linear, fossil-fuel based system to a circular plastics economy – and this transformation needs to be accelerated.

Data-driven approach to circularity

"The Circular Economy for Plastics: A European Analysis" provides a European overview of plastics production, conversion, consumption, and waste management. It also addresses the different recycling technologies and plastics production from non-fossil feedstocks.

It is the latest in a series of Plastics Europe initiatives that includes the "Plastics Transition" roadmap and 'ReShaping Plastics' report. A red thread that cuts across these is the importance of a data-driven approach to managing the circularity transition.

Our aim is to strengthen and continually update a common circularity dataset to promote dialogue and inform evidence-based decision-making by our members, value chain partners and policy-makers.

I am, therefore, proud of our latest Circular Economy for Plastics report, which is broader in scope and contains more in-depth data than ever before.

Circularity picks up pace but challenges remain

Overall, the findings from the report are encouraging. It confirms the transition to circularity is firmly established and is picking up pace. The use of recycled plastics has increased by 70% since 2018, and circular plastics now make up 13.5% of all plastic resins converted into new products and components in Europe. When benchmarked against our "Plastics Transition" roadmap, the plastics system is more than halfway towards realising the ambition of achieving 25% circular plastics by 2030.

In total, 26.9% of European plastics waste is now recycled, meaning that, for the first time, more plastics waste is recycled than is put into landfill; an important circularity milestone.

The report also reveals that serious barriers and bottlenecks remain and progress is not uniform across the plastics value chain.



Virginia Janssens, Managing Director Plastics Europe

Whereas the packaging, building and construction, and agriculture sectors, for example, are making good progress on the use of recycled plastics, certain sectors, including automotive and electricals and electronics, are falling behind. We are also still incinerating and landfilling too much plastics waste in general, and the rate of incineration is going in the wrong direction – it has increased by 15% since 2018.

We need a massive upscaling of collection and sorting of post-consumer plastics waste, and to increase the availability of biomass and captured carbon, if we are to meet the growing demand for plastics manufactured from circular feedstocks.

Incentivising investment and innovation

We need a harmonised and enforceable EU policy and regulatory framework that enables the transition.

Legislative measures, such as mandatory recycled content targets and design for recycling guidelines, are vital for incentivising investment in waste management infrastructure and recycling technologies and, thereby, increasing circular feedstock availability. Public authorities should also harness the economic power of public procurement by prioritising circular plastics content in public tenders.

It is frustrating that we still landfill and incinerate so much plastics waste when this potential feedstock is desperately needed by our industry to accelerate the transition. The EU has ambitious legislation in place to reduce landfilling - this needs to be effectively implemented and enforced. Additionally, to rapidly reverse the increase in incineration, mandatory measures to encourage mixed waste sorting should be implemented and incineration included in the revised EU ETS system.

Mechanical recycling (post-consumer) accounted for 13.2%, compared to only 0.1% for chemical recycling, of European plastics production in 2022. Chemical recycling is a complementary solution to mechanical recycling and will enable the full transition to the circularity of plastics. Upcoming EU regulation will have a direct impact on the level of chemical recycling investment and innovation in Europe, and the speed and scale at which it is deployed.

We can no longer overlook the competitive pressures faced by the European plastics sector. Our share of global production decreased from 22% to 14% between 2006 and 2022. If this continues, Europe will become increasingly dependent on imports, and our ability to invest in circularity will be undermined. Restoring our competitiveness must be a priority.

Deeping value chain and policy-maker collaboration

The European plastics system is too big, complex, and interconnected for any part of it to successfully address these challenges alone. That is why deepening our collaboration with our value chain partners is so important.

To boost this collaboration, we are calling on the European Commission to urgently establish a Clean Transition Dialogue to look at the roadblocks and solutions for creating a competitive circular plastics system in Europe together.

The plastics sector, and our partners, are already driving major advances in circularity. With closer collaboration and the right type of policy-maker support we still have an opportunity to accelerate and lead the transition to a circular plastics economy.

Executive summary

THE CIRCULAR ECONOMY FOR PLASTICS - A EUROPEAN ANALYSIS | 2024

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Introduction

Plastics Europe and its members recognise and share societal concerns about the European plastics system's contribution to climate change, the challenge of plastics waste, and the need to ensure the sustainable use of plastics.

Plastics continue to be critical and irreplaceable materials for almost every sector of the European economy, including automotive, construction, packaging, consumer goods, healthcare and renewable energy. They will continue to play a key role in meeting a wide range of functional needs, while enabling circularity and delivering emissions savings for a wide range of sectors.

Plastics Europe's vision is to create a sustainable plastics system that continues to meet consumer and societal demands, supports the transitions of many downstream industries, and remains a strategic asset for the European economy. Realising this vision requires the European plastics system to shift from a linear fossil-fuel based feedstock model to one based on circularity: the circular plastics economy.

The "Circular Economy for Plastics – A European Analysis" report aims to support this transition by increasing all stakeholders' understanding of the developments and trends within the circular plastics economy. The data it provides is vital for guiding and benchmarking the transition of the plastics industry and wider plastics system against its transition ambitions, and has an important role to play in supporting evidence based policy-making.

The report looks at the production of plastics, their conversion into products and components and their consumption by endusers, as well as plastics waste collection and treatment, including recycling. It also covers the production of recycled plastics and their use in different applications and import and export data. For the first time, the report covers production and conversion of plastics from bio-based feedstock and chemical recycling.

Whilst Plastics Europe supports the role of reuse to achieve circular targets, as most reuse systems will be managed by other actors further in the plastics value chain, and generating accurate data is currently extremely challenging, the report focuses on the circularity of plastics converted into products. 87 m



Pathway to a circular plastics economy

The plastics circular economy is a sustainable model where plastics remain in circulation longer; their use is reduced¹, and they are reused and recycled at the end of their life span. It allows to retain the value of plastics waste as a resource, whilst reducing CO_2 emissions and preventing plastics from ending up in landfill, being incinerated or polluting the oceans.

The "ReShaping Plastics" report, published in 2022, confirmed circularity is the fastest, most affordable, effective and reliable method for reducing plastics waste and GHG emissions from the plastics system. Creating a circular plastics economy is also central to the EU's Plastics Strategy and is a key element of the EU's Circular Economy Action Plan and the Green Deal.

Essential to the circular plastics economy is the need to significantly reduce Europe's dependency on fossil feedstocks, and switch to circular feedstocks. These include recycled plastics waste, sustainably sourced bio-based feedstock, and CO₂ captured from industrial processes.

The transition will also require the plastics system to be redesigned using circular business models, design for recycling, new infrastructure and technical innovations; as well as major advances in the collection, sorting and recycling of plastics waste, and the energy efficiency of plastics production processes (including through the use of more low carbon and renewable energy).

The complex and inter-connected nature of the plastics system means that the transition to a circular plastics system cannot be achieved without close collaboration with converters, brands, waste collection businesses, recyclers and other value chain actors.

To support this transition, European plastics manufacturers published their "Plastics Transition" roadmap in 2023 (called "roadmap"). The roadmap establishes a pathway to reduce greenhouse gas emissions from the overall plastics system by 28% by 2030 and towards net-zero by 2050. In parallel, it predicts the gradual substitution of fossil-based plastics, and that circular plastics could meet 25% of European demand in 2030 and 65% by 2050. Cumulated additional investments and operational costs to reach these ambitions are projected to be at least €235 billion.

The roadmap identifies the key levers and enablers, and details the immediate, short, and mediumterm milestones and actions, for plastics manufacturers, policy-makers and the wider value chain, for accelerating the transition to a circular plastics economy. "The Plastics Transition" roadmap



Case studies to increase circularity



It is important that any consideration of reductions of plastics applications is science-based, material neutral and considers the role of these applications. Any such measures must be accompanied by a clear impact assessment, that
includes all environmental indicators (including environmental footprint, water consumption, land use, etc.).

Circular plastics economy



1. Pre-consumer plastics waste is mainly originating from the plastics conversion activities, and production to a lesser extent.

Including recycling of EU27+3 plastics waste abroad.
 Several steps are needed between the input of plastics waste into chemical recycling and the input into polymerisation, also depending on the chemical recycling technology.

11

Key report figures

summary Executive



reaching 6.8 Mt.



Plastics recycling rate reached



since 2018, reaching 16 Mt.

of plastics waste is still sent to landfill.

Europe's share of global plastics production dropped from 22% in 2006 to **4%** in 2022.

2. Recycled quantities were previously measured upon leaving the sorting centres. The measurement is now done when the recycling actually takes place, according to the Packaging and Packaging Waste Directive (PPWD) (EU) 2018/852. The calculation point therefore lies after impurities and unsuitable substances have been removed from the sorted materials

3. The vast majority of plastic waste incineration in the EU27+3 is with energy recovery

^{1.} This number excludes pre-consumer recycled plastics content (pre-consumer recycled plastics from waste arising from the plastics production and converting processes). The "Plastics Transition" roadmap defines 'circular plastics' as an overarching term including post-consumer recycled plastics, plastics from bio-based feedstock, and from carbon-capture. To measure progress towards the 25% and 65% circular plastics content ambitions by 2030 and 2050 set in the roadmap, pre-consumer is excluded.



Key report findings

The report confirms that the transition towards higher circularity increased significantly between 2018 and 2022.

The availability of post-consumer recycled content has, for example, increased by 70% since 2018 (6.8 Mt in 2022), and circular plastics now make up 13.5%¹ (7.3 Mt) of all plastic resins converted into new products and components in Europe. The plastics sector is more than halfway towards realising the roadmap ambition of 25% circular plastics by 2030.

The report also found that the **recycling rate reached 26.9%2 in 2022** (8.7 Mt), and for the first time more plastics waste is being recycled than put in landfill. Although this is an important circularity milestone, further investment in sorting and recycling infrastructure and technologies, including chemical recycling, are required to increase the recycling rate and ensure that the demand for recycled content can be met.

However, despite the overall progress, the report identifies issues and challenges that need to be addressed.

Incineration3 has, for example, increased by more than 15% since 2018 (16 Mt in 2022), and about 25% of plastics waste is still sent to landfill (7.6 Mt in 2022). The report also confirms the growing competitiveness gap between Europe and the rest of the world which, unless addressed, will undermine the transition to a circular plastics economy.

 This number excludes pre-consumer recycled plastics content (pre-consumer recycled plastics from waste arising from the plastics production and converting processes). The "Plastics Transition" roadmap defines 'circular plastics' as an overarching term including post-consumer recycled plastics, plastics from bio-based feedstock, and from carbon-capture. To measure progress towards the 25% and 65% circular plastics content (area based for the plastics) and 2050 set in the roadmap, pre-consumer is excluded.

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Significant advances in circularity but challenges remain

Circular plastics production

Circular plastics production in Europe continues to increase and represented 14.3% of European plastics production in 2022. 'Circular plastics' is an overarching term that includes recycled plastics, plastics from bio-based feedstock, as well as plastics derived from carbon capture.

Recycled plastics

Plastics production via mechanical recycling¹ has increased by more than 57% since 2018 (7.7 Mt in 2022).

Although chemical recycling is a complementary recycling solution and a key building block of the circular plastics economy, it currently accounts for only 0.1% of European plastics production (~0.1 Mt).

Further increase of plastics production via mechanical and chemical recycling requires policy measures that stimulate demand for recycled plastics content and major investments in waste management infrastructure and all recycling technologies.

Plastics Europe member companies have already announced investments of more than 8 billion euros in chemical recycling projects to produce 2.8 Mt of recycled plastics per annum by 2030.



^{1.} This number excludes pre-consumer recycled plastics production (pre-consumer plastics waste recycling means recycling of waste arising from the plastics production and converting processes). The "Plastics Transition" roadmap defines 'circular plastics' as an overarching term including post-consumer recycled plastics, plastics from bio-based feedstock, and from carbon-capture, and excluding pre-consumer recycled plastics.



Plastics from bio-based feedstock

Biomass used as feedstock for plastics production can significantly reduce CO_2 emissions and, in applications with long life cycles, can even serve as a form of carbon storage. This biomass can either be generated from primary sources (e.g. crops) or secondary (e.g. organic waste such as compost or cooking oils, crop and farm residues, animal fats, forestry waste and sewage sludge).

Whilst production of plastics from bio-based feedstock still accounts for only 1% of the plastics produced in Europe, bio-based feedstock availability is steadily increasing and plastics production from bio-based feedstock has significant growth potential.

Carbon Capture and Usage (CCU):

The use of captured carbon to manufacture plastics can prevent CO_2 from being emitted during the plastics production process.

Despite its potential, CCU based plastics production in Europe remains negligible. This confirms the importance of providing support for CCU-related investment, research and innovation if the potential of this circular feedstock is to be realised.

Circularity in new plastic products

Executive summary

Data measuring the proportion of circular plastics converted into products and components is an important benchmark of the development of the circular economy for plastics and will be used to assess progress towards the 25% (by 2030) and 65% (by 2050) circular content ambitions set out in roadmap.

In 2022, circular plastics content, as defined in the roadmap reached 13.5%¹ of converted plastics (of which 12.6% of post-consumer recycled plastics and 0.9% of plastics from bio-based feedstock). This figure highlights the significant effort still required to meet the roadmap's 2030 ambition.

The process of turning plastic resins into plastic products or components is called "conversion". In 2022, the biggest markets for converted plastics in the EU27+3 were packaging, building and construction, and automotive.

Circular plastics content in new products was **13.5%** in 2022 (7.3 Mt).



 This number excludes pre-consumer recycled plastics content (pre-consumer recycled plastics means recycled plastics from waste arising from the plastics production and converting processes). The "Plastics Transition" roadmap defines "circular plastics" as an overarching term including post-consumer recycled plastics, plastics from bio-based feedstock, and from carbon-capture. To measure progress towards the 25% and 65% circular plastics content ambitions by 2030 and 2050 set in the roadmap, pre-consumer is excluded.

Post-consumer recycled content in new products



since 2018, the use of post-consumer recycled plastics increased by +70%

The report also gives an overview of the recycled content state-of-play, enabling to assess progress towards future mandatory recycled content targets².

reaching 6.8 Mt.

In 2022, post-consumer recycled plastics represented 12.6% of converted plastics in Europe (or 6.8 Mt). This represents a 70% recycled content increase since 2018.

In terms of recycled content rates, some sectors, such as packaging (9.7%), building and construction (22.7%) and agriculture (37.5%), are more advanced compared to others, such as automotive (4.6%) and electricals and electronics (3.2%). To encourage the rapid transition of all markets, Plastics Europe supports legislative measures that set ambitious targets for the different sectors.

The report also shows that the proportion of plastics from bio-based feedstock in converted plastics remains low: 0.9% (0.5 Mt).

1. For data availability reasons, mechanically and chemically recycled plastics data (post-consumer) cannot be shown separately. Chemically recycled plastics represent a small share of the total post-consumer recycled plastics. 2. For example, in the context of the Packaging and Packaging Waste Regulation, or the End-of-Life Vehicles Directive revision.

17

Plastics waste sorting and recycling

It is estimated that 32.3 Mt of post-consumer plastics waste¹ was collected in 2022.

The report shows that, for the first time, the share of post-consumer plastics waste collected separately is slightly higher compared to mixed collection streams, reaching 50.7% (16.4 Mt). This is a positive development since recycling rates for separately collected plastics are 13 times higher than those collected via mixed streams. In the case of plastics packaging, post-consumer waste is currently almost only recycled if collected separately.

For the first time, more post-consumer plastics waste is being recycled than sent to landfill, accounting for 26.9%² (8.7 Mt) of waste treated in 2022.







1. Post-consumer plastics waste generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes returns of material from the distribution chain or the installation of plastic products (e.g. cut-offs of insulation, flooring or wall-covering boards).

2. Recycled quantities were previously measured upon leaving the sorting centres. The measurement is now done when the recycling actually takes place, according to the Packaging and Packaging Waste Directive (PPWD) (EU) 2018/852. The calculation point therefore lies after impurities and unsuitable substances have been removed from the sorted materials.

PACKAGING

For plastics packaging waste, the recycling rate reached 37.8% in 2022¹ (7 Mt) . This rate will need to improve even further within the next 3 years to reach the 2018 Packaging and Packaging Waste Directive² targets of 50% by 2025, and stay on track for 55% by 2030.

Post-consumer plastics packaging waste management 2022 in the EU27+3



To maximise recycling rates we need to significantly increase investment in sorting and recycling capacities, including in chemical recycling.

Extended Producer Responsibility (EPR) schemes to increase separate waste collection and other mandatory measures to incentivise mixed waste sorting³ will be very important. Fostering market demand for circular plastics resins can also play a vital role in encouraging the necessary investment.

Chemical recycling, as a complement to mechanical recycling, is essential to maximising the resource potential of plastics waste currently being sent to landfill and incineration. The transition to a plastics circular economy cannot be achieved without a continent-wide roll-out chemical recycling technology.

^{1.} Recycled quantities were previously measured when they were sent to recyclers. The measurement now takes place at the final step of the recycling process, according to the Packaging and Packaging Waste Directive (PPWD) (EU) 2018/852. The calculation point therefore lies after sorting and post-sorting, when plastics waste enters a recycling process.

^{2.} Directive (EU) 2018/852.

^{3.} Mixed waste sorting of residual municipal waste is defined as the sorting system to recover recyclable materials that would otherwise be sent to landfill or incineration.

Incineration and landfilling of plastics waste

In addition to the negative environmental impact, incineration¹ and landfilling of plastics waste results in the loss of a valuable raw material and key circular feedstock for the plastics system transition.

The report found that the quantity of postconsumer plastics waste sent for incineration is not going in the right direction; with an increase of over 15% since 2018.

On the other hand, landfill of post-consumer plastics waste maintains its decreasing trend (-6% since 2018). Although a move in the right direction, landfill nonetheless continued to account for close to 25% of plastics waste treatment in 2022. Despite the Landfill Directive imposing a ban on landfilling of separately collected waste by 2030, 11% of it is still landfilled in 2022.



2018-2022 evolution



2022, in the EU27+3



Weakening European competitiveness: a threat to the transition

The report findings should be considered against the backdrop of a growing competitiveness gap between Europe and the rest of the world. Europe's share of global plastics production decreased from 22% in 2006 (53.9 Mt) – when Plastics Europe began tracking global production data – to 14% in 2022 (58.8 Mt), with China, North America and the Middle East accounting for 32%, 17%, and 9% respectively.

If this continues, Europe will become increasingly dependent on imports which do not necessarily meet EU sustainability standards, and the ability of European plastics producers to invest in circularity, and the transitions of the many sectors that rely on plastics, will be undermined. It is essential that the competitiveness of the European plastics sector is restored.

Click or scan here to access more detailed World production data.



"Plastics - the fast Facts 2023".

Europe in the global production



Intensifying policy-maker and plastics value chain collaboration

Plastics Europe's members are already driving major advances in the circularity of their operations, including investing in cutting-edge recycling technologies, renewable energy and producing more plastics from biomass and CO₂. They are also working closely with their value chain partners to deliver new systems thinking, higher performing products, eco-design innovation and new infrastructure.

The roadmap prioritises what the industry, as plastics producers, can do to further accelerate this transition, but also provides recommendations to policy-makers as to how they can support the transition through the creation of an enabling policy and regulatory framework:

Incentivising circular plastics production and conversion: increasing the availability of circular feedstock for plastics production and setting minimum mandatory circular content targets in new plastics products is essential for incentivising investment and innovation, and key in sectors such as automotive and electrical and electronics.



Chemical recycling: to unlock investments and stimulate innovation, policy-makers need to give a green light to this essential technology. To do so they should, for example, adopt a Mass Balance attribution method¹ (as already used in sectors like renewable energy and wood, and for fair trade cocoa and chocolate) for calculating chemically recycled content in new plastic products, and introducing more ambitious recycled content targets for sensitive applications.

Phase-out of landfill and incineration: to

accelerate this process, whilst avoiding the shifting of plastics waste from landfill to incineration, existing EU legislation, including the Landfill Directive, needs to be properly implemented and enforced. Minimum and steadily increasing landfill and incineration taxes should be introduced on all waste streams containing plastics, and mandatory measures to incentivise mixed waste sorting should be implemented. Municipal waste incineration should also be included in the revised EU ETS system, the potential of chemical recycling as an alternative to landfilling and incineration should be properly recognised and carbon capture should be obligatory for remaining waste incinerators after 2040.

- European competitiveness: a level playing field needs to be urgently created to restore the plastics sector's competitiveness through, for example, the development of a comprehensive EU equivalent to the US Inflation Reduction Act, and the creation of a harmonised and consistent regulatory framework across the EU Single Market.
- Public procurement: considering its economic importance, it can play a crucial role in promoting circularity by, for instance, prioritising circular plastics content in public tenders.

Waste management and recycling:

incentivising the massive additional investments in separate collection, sorting and recycling infrastructure and technologies that are required is vital. More specifically, separate plastics waste collection needs to be significantly increased through, for example, Extended Producer Responsibility schemes, and mandatory measures to incentivise mixed waste sorting as a complementary solution to separate collection of plastics waste.

Collaboration between all actors within the European plastics system, and with policy-makers and regulators, needs to be intensified. To support this objective, the European Commission should urgently initiate a Clean Transition Dialogue with the plastics industry, which looks at the enablers, investments, roadblocks and solutions for reaching a circular, net zero and sustainable plastics system in Europe.

^{1.} Plastics Europe supports a fuel-use exempt Mass Balance attribution model because it would provide for a robust system, which is viable with chemical recycling routes, and will allow producers and users of recycled content to reach the levels expected by the market and required by EU legislation in a timely manner.





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