# THE CIRCULAR ECONOMY FOR PLASTICS

## A European Overview

PlasticsEurope
Association of Plastics Manufacturers

*This report is a contribution towards a better understanding of the circular economy of plastics. It provides a European overview of plastics production, conversion into parts and products, waste collection and treatment, including recycling. It also addresses the production of recyclates and their use in different applications.*

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# INTRODUCTION

**This report marks an important step in understanding the role that plastics can play in a circular economy. It is one of the first attempts to look beyond traditional studies that measure recycling rates. It analyses in more detail what happens to plastic materials after their initial use phase.**

The aim of this comprehensive research is to widen the scope of data collection on plastics waste. It is intended to provide better knowledge about the use of plastics recyclates and to identify opportunities to increase the circularity and resource efficiency of plastics materials.

## Closing the Loop of a Circular Economy

With their inherent versatility and capacity for innovation, plastics have a crucial role to play in a sustainable and resource-efficient economy. In the transport sector, their light weight makes them more fuel-efficient and helps reduce greenhouse gas emissions. In the building and construction sector, they are used to produce high-performance and long-lasting insulation products, window frames and piping systems that save energy and water. Finally, plastic packaging plays an important role in ensuring food safety and reducing food waste.

Simply put, plastics have the potential to help us to do more with less.

However, to fully deliver on this potential, it is also crucial to address the many challenges relating to littering and the end-of-life options for plastic waste – particularly packaging waste. Closing the loop of the circular economy for plastics will boost European competitiveness, help tackle climate change and reach the United Nations Sustainable Development Goals. [1]

In 2018, the European Commission released A European Strategy for Plastics in a Circular Economy, a four-pronged approach to make recycling profitable for business, curb plastic waste, stop littering at sea and drive investment and innovation.

The Strategy presents a “vision for a smart, innovative and sustainable plastics industry, [one that] brings growth and jobs to Europe and helps cut EU greenhouse gas emissions and dependence on imported fossil fuels”. [2]

In alignment with the European Commission’s strategy, PlasticsEurope launched the Plastics 2030 programme [3] – raw material producers’ Voluntary Commitment to help deliver on the potential of plastics in a circular economy. Plastics 2030 focuses on preventing the leakage of plastics into the environment, improving resource efficiency of plastics applications through life cycle thinking, contributing to a step change in understanding and turning plastic waste into new resources.

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1. United Nations Sustainable Development Goals : https://www.un.org/sustainabledevelopment/sustainable-development-goals/
2. A European Strategy for Plastics in a Circular Economy, p 3
3. PlasticsEurope’s Plastics 2030 Voluntary Commitment : https://www.plasticseurope.org/en/newsroom/press-releases/archive-press-releases-2018/plastics-2030-voluntary-commitment
4. All figures are for the year 2018
5. Directive (EU) 2018/852 of the European Parliament and of the Council of 30 May 2018 amending Directive 94/62/EC on packaging and packaging waste
6. The European Commission calls on stakeholders to come forward with voluntary pledges to boost the uptake of recycled plastics. The objective is to ensure that, by 2025, ten million tonnes of recycled plastics find their way into new products on the EU market

## Understanding Waste Data

One of the key commitments in Plastics 2030 was to widen the scope of data collection, in order to better understand the routes that plastic products take at the end of their initial use phase.

Since 2005, PlasticsEurope has commissioned successive EU28+2 Post-consumer Plastic Waste Management reports that investigate post-consumer plastics waste flows and treatment in the EU28, Norway and Switzerland and chart their evolution over time. While these reports could chart the increase in the rate at which plastics are 'sent for recycling' across Europe, they did not include data on how much of the recycled plastics or 'recyclates' end up being used in new applications.

This new study provides the broadest overview on the circularity of plastics in the EU28+2 to date[4], including – for the first time – an analysis of plastics consumption by end-users, plastics in use, life spans of a wide range of plastic products and recycling processes, which lead to the production of recyclates.

It also describes the life cycle of plastic products – especially the mechanical recycling processes – in order to better understand the challenges that must be overcome to increase the quantities of recycled post-consumer plastic waste in the EU28+2, meet the targets of new EU regulation[5] and achieve the levels of recyclates' use as outlined in the European Strategy for Plastics[6].

This new report is one of several studies, surveys and analyses which looks in more detail at the different steps of the life cycle of plastics. Studies like these can contribute to establish a European baseline of knowledge about plastic waste and the circular economy of plastics.

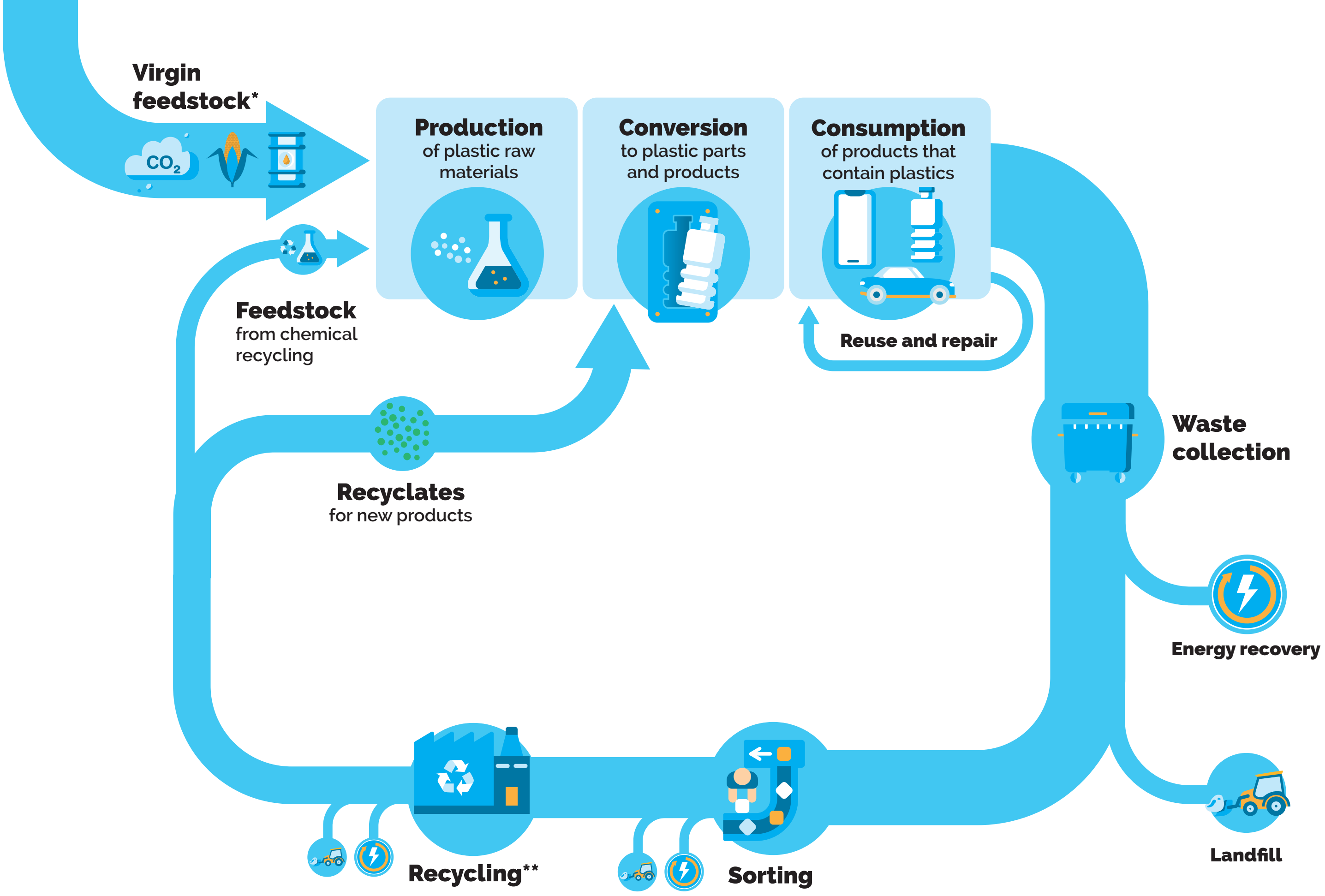
This summary document outlines the study's main findings at EU28+2 level. The study will be updated at regular intervals with a view to tracking progress against the initial results.

# The value in plastics

# WHAT IS THE PLASTICS CIRCULAR ECONOMY?

The plastics circular economy is a model for a closed system that promotes the reuse of plastic products, generates value from waste and avoids sending recoverable plastics to landfill. Plastic waste is a valuable resource that can be used to produce new plastic raw materials and manufacture plastic parts and products, or to generate energy when recycling is not viable.

Currently, the plastics industry is researching alternatives to replace fossil sources with renewable ressources and carbon dioxide ($CO_2$). New thinking all along the value chain – from product design to recycling – focuses on converting more waste into recyclates, maximising resource efficiency and reducing greenhouse gas emissions.



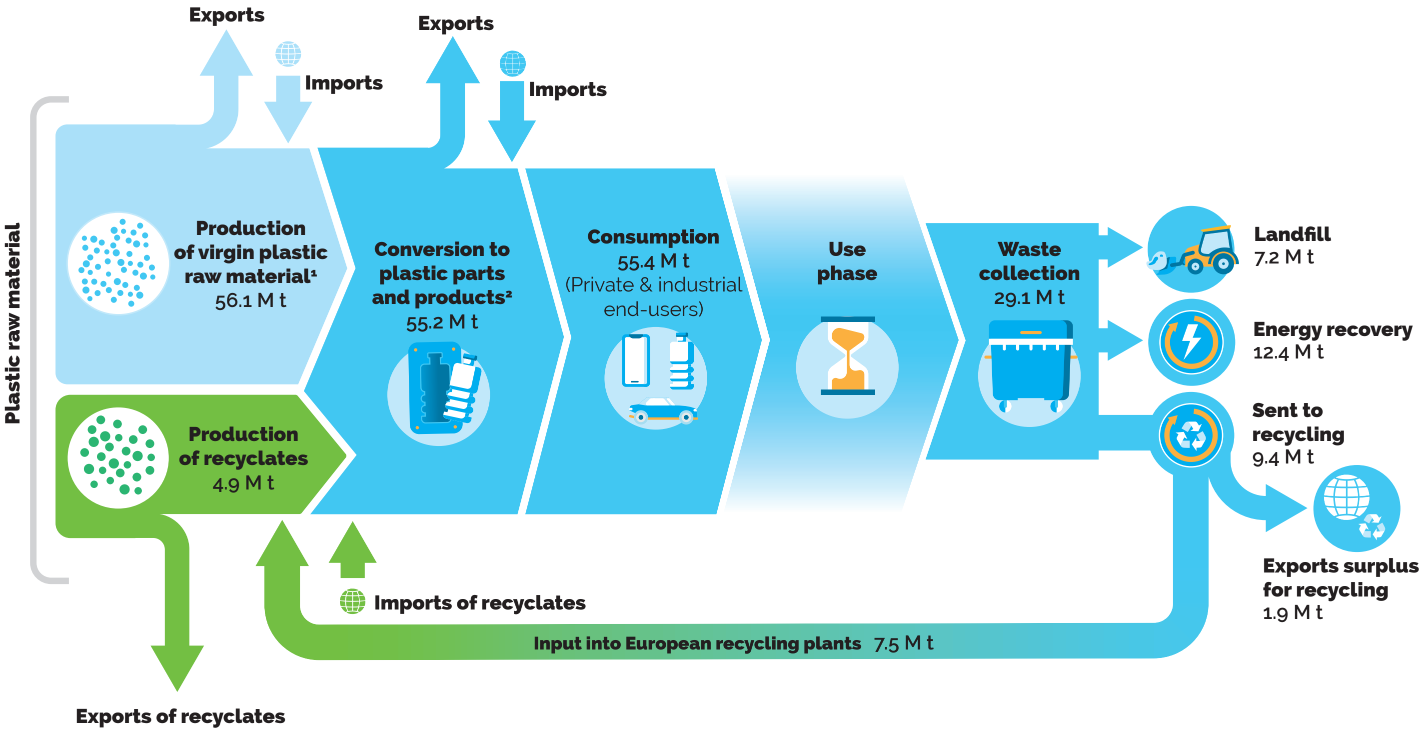

* Virgin feedstock originates from fossil fuels, $CO_2$ or renewable feedstock
** Recycling includes mechanical recycling, chemical recycling and dissolution

# UNDERSTANDING THE LIFE CYCLE OF PLASTICS

**60%** of **plastic products and products containing plastics** have a **use phase** that ranges from **1 to over 50 years** and take that long to become waste.

Plastics are used to produce products (e.g. a bottle, a pipe, a chair, etc.) or to produce parts for larger products (components and parts in vehicles and planes, insulation for houses, shoe soles, etc.). The former are called “plastic products” and the latter are called “products containing plastics”.

The use phase of plastic products or products containing plastics depends on their application, ranging from approximately less than one year to fifty years (e.g. beverage bottles, phones, car parts, insulation for homes and buildings,...). This explains why waste volumes for a given year (here 2018) are considerably smaller than the total manufactured plastic products and parts put on the market for the same year. Their longevity (use phase) is precisely what makes plastics so attractive in terms of delivering more value, sustainability and resource efficiency.

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The present document focuses only on recyclates from post-consumer plastic waste; therefore no figures are shown individually for post-industrial plastic waste

1. Virgin materials plus post-industrial recyclates

2. Thereof 51.2 M t virgin material and 3.98 M t recyclates from post-consumer plastic waste

# DID YOU KNOW?

The **SERVICE LIFE** or **USE PHASE** of plastic products and parts can be as long as **50 YEARS OR MORE**, which means it would take that long for those products and parts to **BECOME WASTE**.

**PLASTIC PIPES** used in building and construction can last over **100 YEARS**, making plastics the ultimate **DURABLE** material.

In 2018, **MORE THAN 9 MILLION TONNES** of post-consumer plastic waste were **SENT TO RECYCLING**.

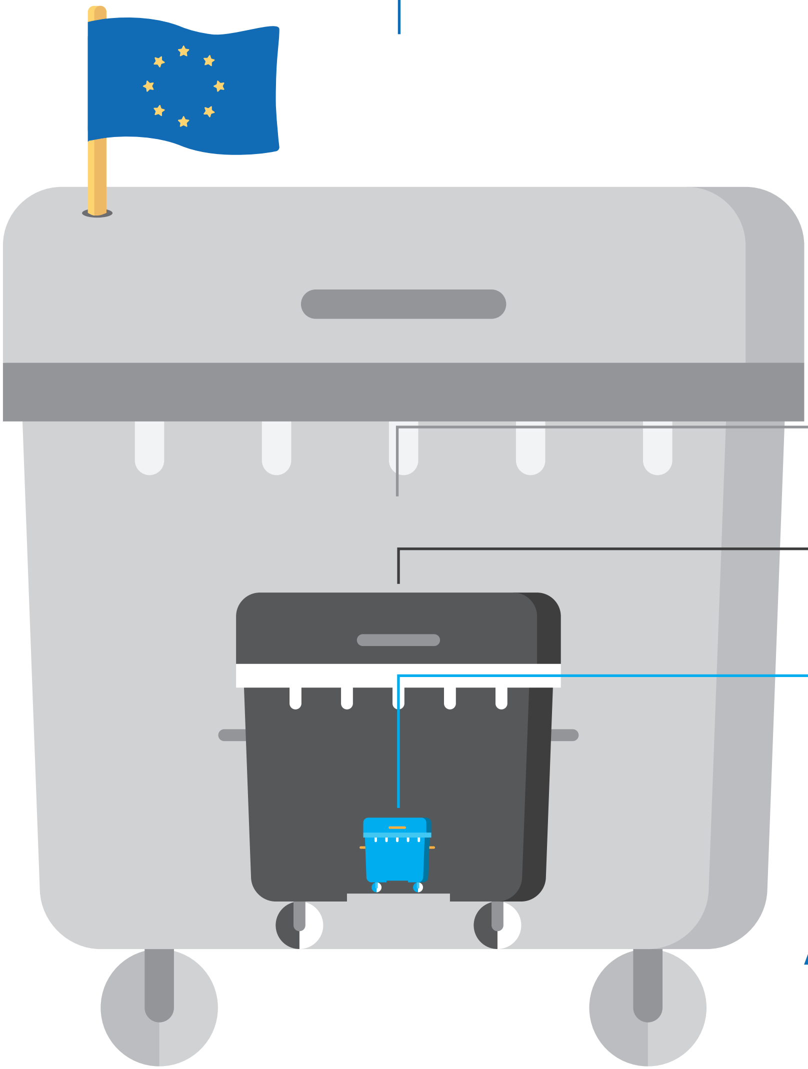
**COLLECTED PLASTIC** waste sent to recycling is **NEVER 100% PLASTIC.** Indeed plastic waste often contains food residues, metal parts, paper labels, etc.

**25% OF PLASTIC WASTE** in the EU28+2 is still sent to **LANDFILL** each year. It has been shown that **LANDFILL RESTRICTIONS** encourage recycling.

# From post-consumer plastic waste to recyclates

# PLASTICS: A SMALL SHARE OF POST-CONSUMER WASTE

Plastics account for **1%** of all EU28+2 **post-consumer waste**.

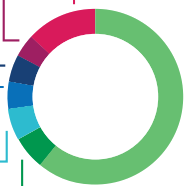


From the total amount of waste produced in 2018, the current study examined all plastic-relevant streams of post-consumer waste (i.e. waste streams that contain plastics as an essential component) and found that the figure for post-consumer plastic waste collected annually from such streams stands at 29 million tonnes per year (1% of EU28+2 post-consumer waste).

**Total post-consumer waste collected**
2,600 million tonnes

**Total post-consumer waste collected in plastic relevant streams***
550 million tonnes

**Total post-consumer plastic waste collected via those streams**
29.1 million tonnes

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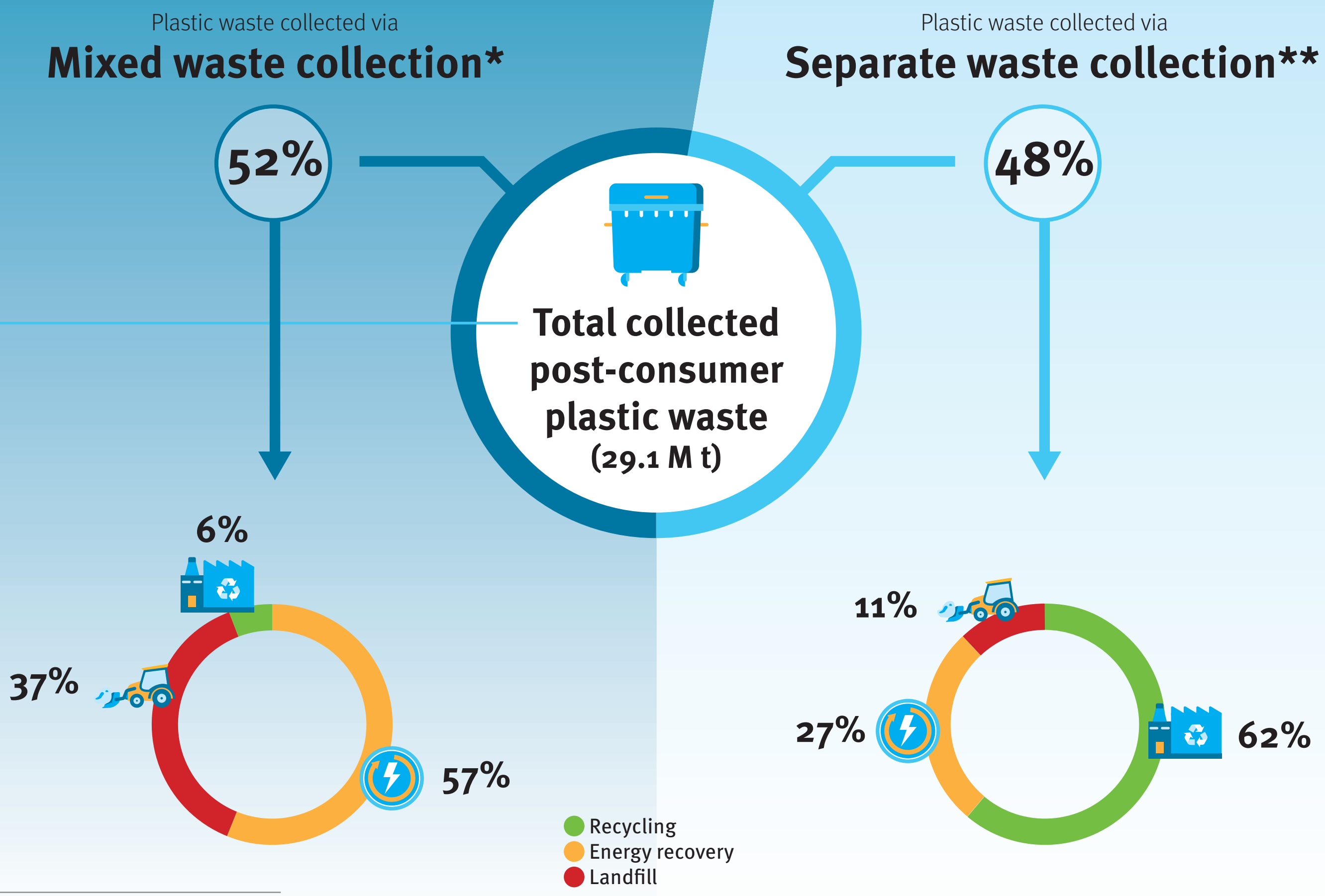
*Plastic relevant streams are waste streams that contain plastics as a relevant component, mixed with other types of waste (e.g. household residual waste, WEEE,etc.)

# WHY IS SEPARATE COLLECTION KEY FOR RECYCLING?

More than half of all post-consumer plastic waste is collected via different mixed waste collection schemes in which the share of plastics ranges from 2 to 8%.

Most recycled plastics come from waste that is collected separately at home or in commercial activities. Consumers therefore play an important part in the effort to recycle more plastics.

Plastic waste recycling rates are **10 X HIGHER** when collected separately compared to mixed collection schemes.

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* Waste collection in which end-users do not sort the different types of waste (e.g. household residual waste and municipal waste)

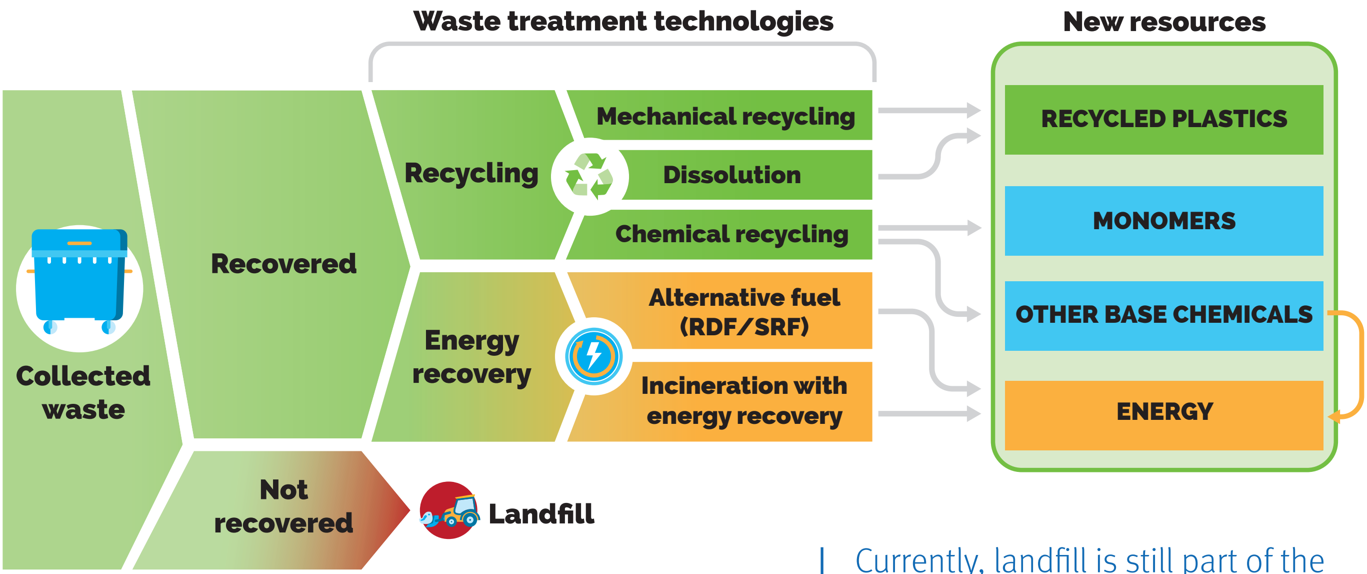
** Waste collection in which end-users sort the different types of waste (e.g. household lightweight packaging, WEEE collection, container parks)

# HOW IS POST-CONSUMER PLASTIC WASTE TREATED TO PRODUCE NEW RESOURCES?

Today, plastic waste that cannot be recycled mechanically, such as composite materials, is recovered to produce heat and electrical energy. However, new developments in chemical recycling are showing that, in the near future, this type of waste will be recycled more often.

Innovations such as chemical recycling and solvent dissolution provide the potential for complementary recycling methods to mechanical recycling. The combinations of these recycling methods have the potential to reshape waste management.

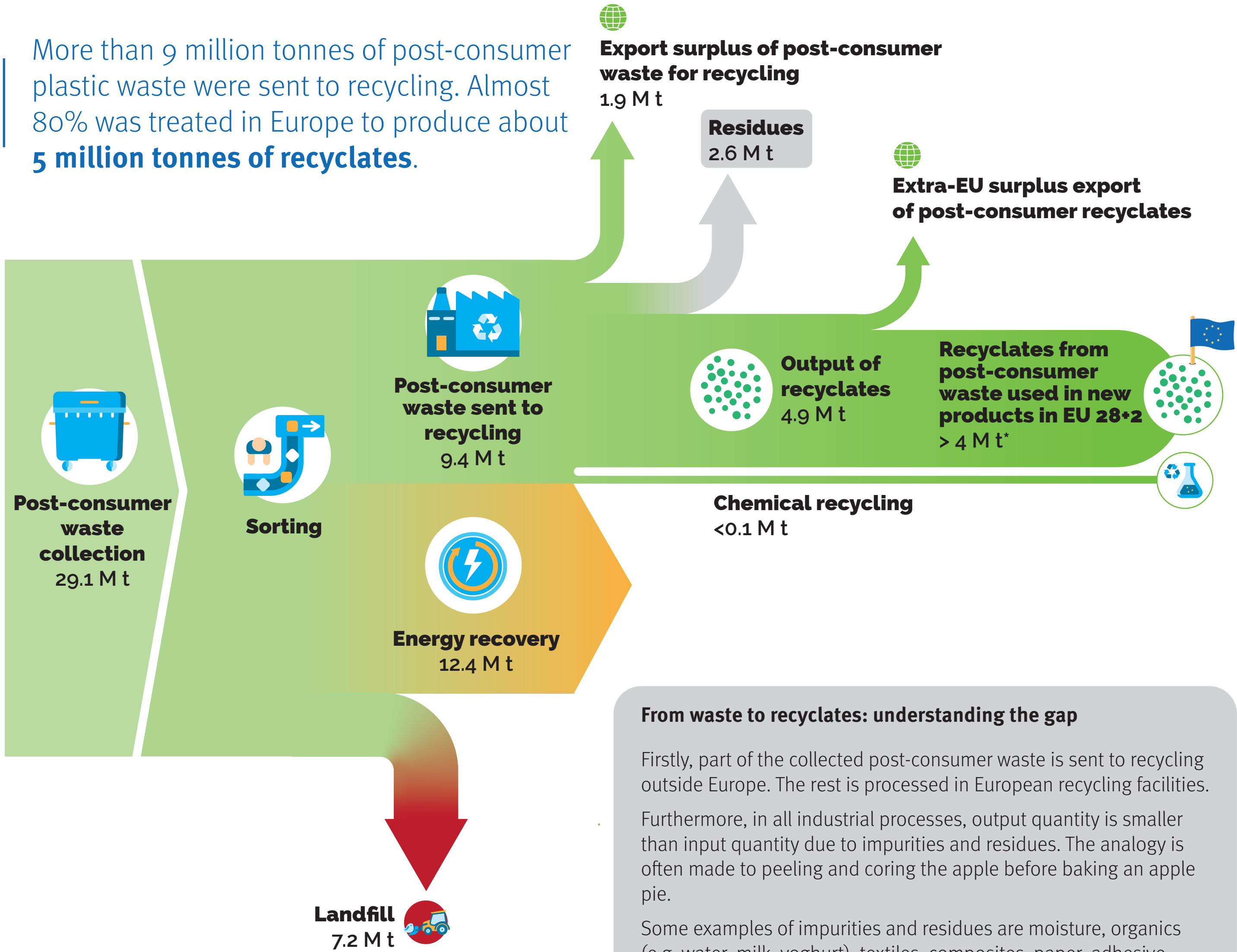
**Innovations** in recycling technologies help transform plastic waste into a **valuable new resource**.




Currently, landfill is still part of the end-of-life equation for plastics, and **restriction measures** enforced at national level are **required** to put an end to this practice.

# WHAT IS THE OUTPUT OF RECYLATES FROM THE RECYCLING PROCESS?

More than 9 million tonnes of post-consumer plastic waste were sent to recycling. Almost 80% was treated in Europe to produce about **5 million tonnes of recyclates**.




**From waste to recyclates: understanding the gap**

Firstly, part of the collected post-consumer waste is sent to recycling outside Europe. The rest is processed in European recycling facilities.

Furthermore, in all industrial processes, output quantity is smaller than input quantity due to impurities and residues. The analogy is often made to peeling and coring the apple before baking an apple pie.

Some examples of impurities and residues are moisture, organics (e.g. water, milk, yoghurt), textiles, composites, paper, adhesive, metals and plastic residues discarded from the recycling process (e.g. foils).

Better waste collection schemes and sorting techniques, combined with enhanced eco-design and innovation can help increase the efficiency of recycling processes and minimise these residues.

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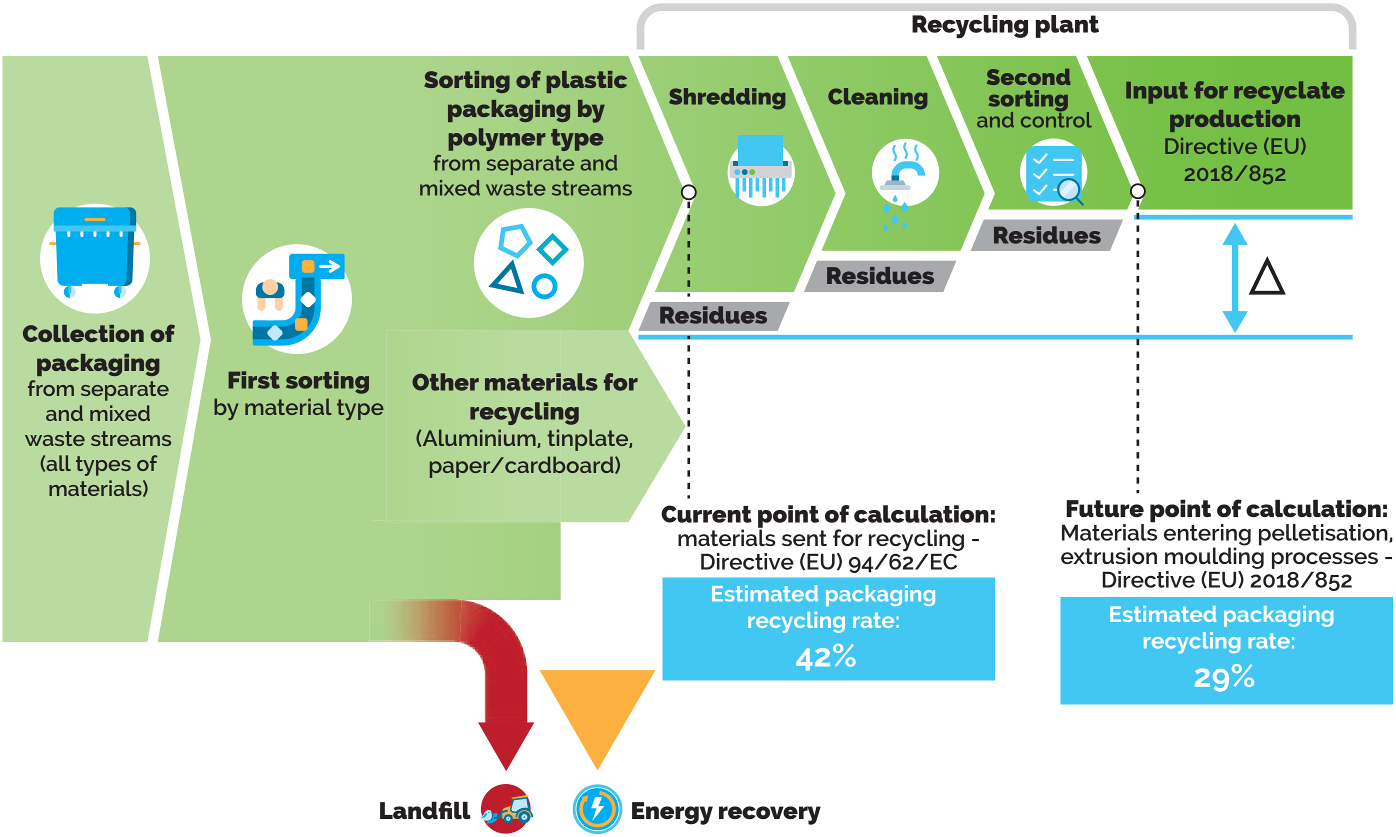
* This study estimates at least 4 M t of recyclates, from post-consumer waste, used in new products in 2018 in EU28+2. No exact data can be given for the extra-EU surplus of post-consumer recyclates since there is only limited information available

# HOW IS PLASTIC PACKAGING RECYCLED?

**Better waste collection** systems and innovations in sorting and recycling technologies can lead to greater recycling efficiency with **fewer residues**.

The European Commission's new Packaging and Packaging Waste Directive (PPWD) amends the methodology used to calculate packaging recycling rates by measuring recycled quantities at a later stage of the recycling process.




As shown above, the current 42% recycling rate for plastic packaging may change to approximately 29% when the new methodology is applied. This highlights how much progress is still needed to meet the new ambitious 55% recycling target for all plastic packaging by 2030.

Δ The change of calculation methodology lead to lower recycling rates

**Residues** The typical composition of impurities and residues is moisture, organics (e.g. water, milk, yoghurt), textiles, composites, paper, adhesive, metals and plastic residues discarded from the recycling process

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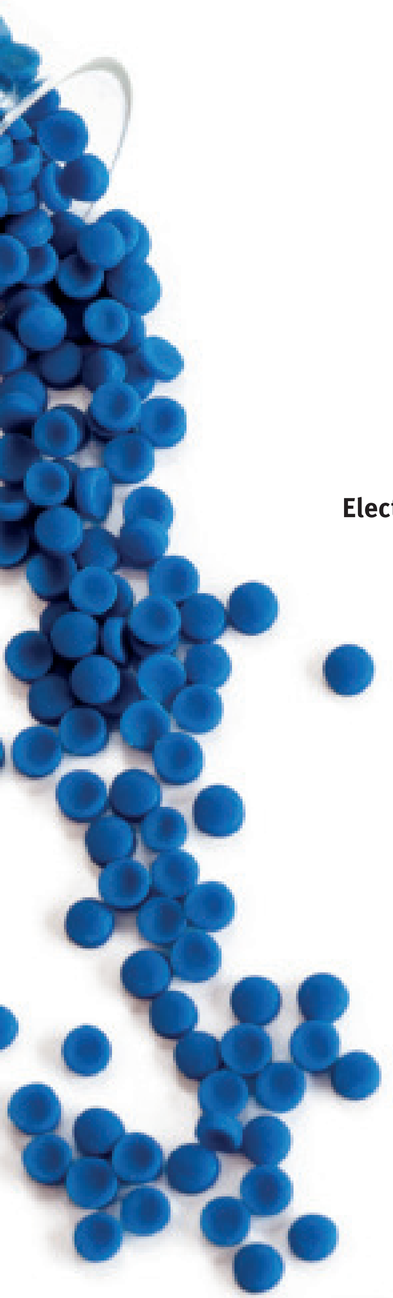
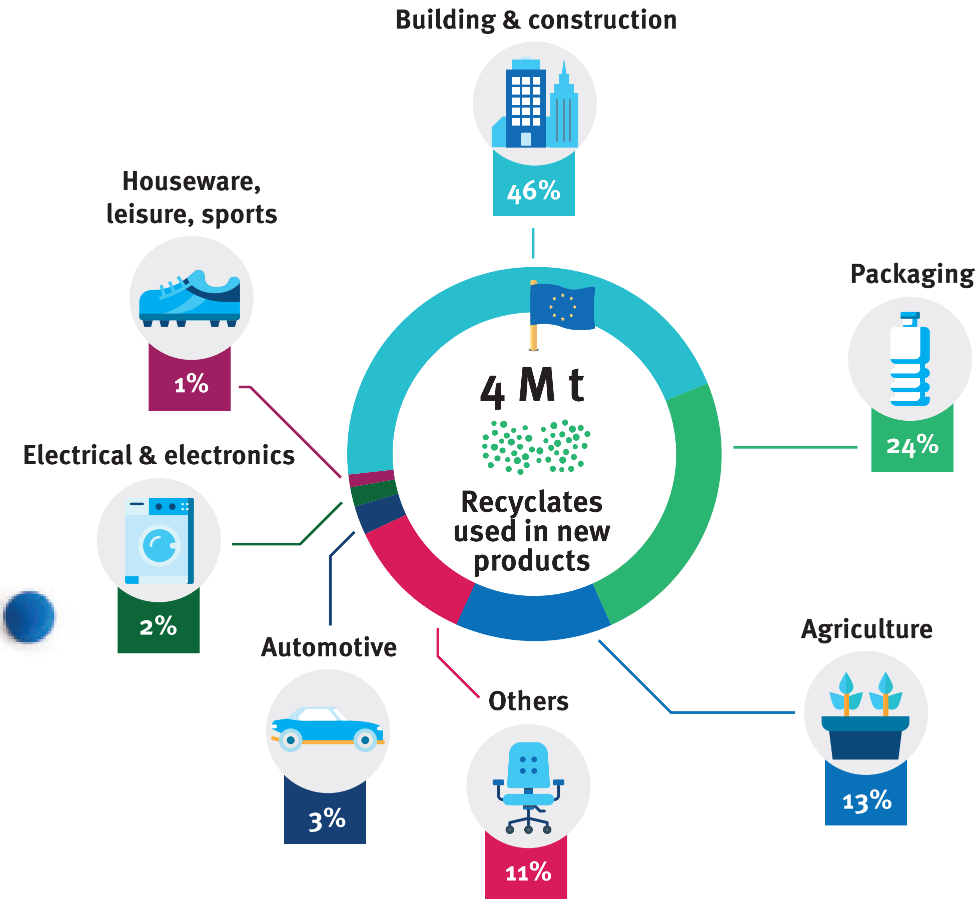
# Making the most of our resources

## How plastic recyclates re-enter the economy

# WHERE ARE PLASTIC RECYCLATES USED TODAY?






Depending on their quality, recyclates can be used in various applications. A closed loop recycling system (e.g. bottle to bottle) is not always possible, particularly in high performance applications where the highest quality is needed to meet product specifications and regulatory requirements.

Currently, recyclates are used mostly in building and construction, packaging and agriculture.

With the help of innovative recycling and sorting technologies, the quality of recyclates will increase, and so will the range of applications in which they can be used.

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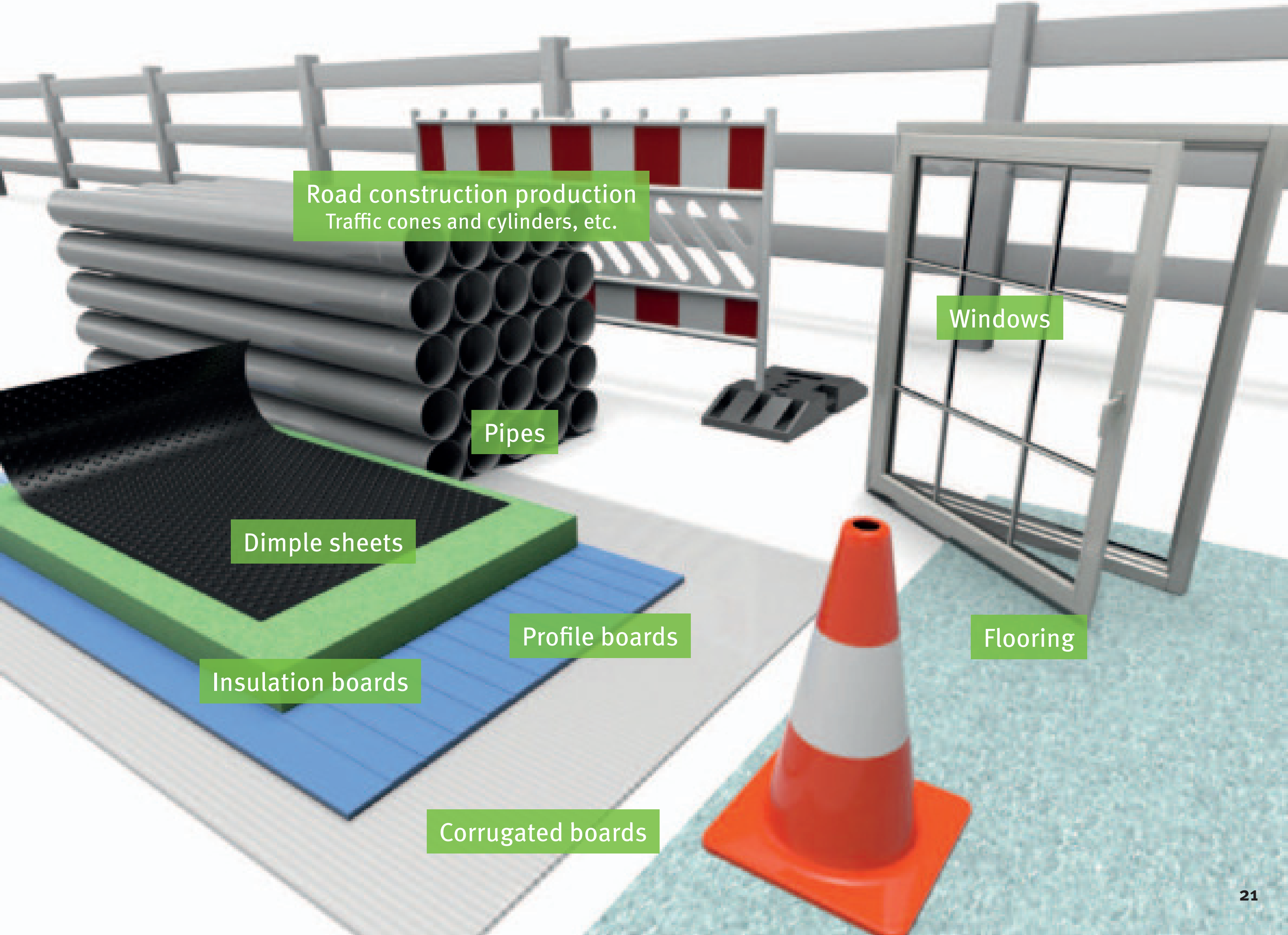
Recyclates from post-consumer waste only

# RECYCLED PLASTICS EVERYWHERE

**46%** of recyclates in the EU28+2 are used in **BUILDING AND CONSTRUCTION APPLICATIONS** that require high-performance and durable products. The longer the life span of a product, the greater its contribution to resource efficiency and circularity.



# RECYCLED PLASTICS EVERYWHERE


**24%** of recyclates are used in common household and industrial **PACKAGING PRODUCTS AND APPLICATIONS**. This figure may increase when food contact material regulations are adapted to the circular economy, and if a larger variety of recyclates meets the product specifications.

*Intermediate bulk container

# RECYCLED PLASTICS EVERYWHERE


**17%** of recyclates are used in **AUTOMOTIVE, ELECTRICAL & ELECTRONICS** and in a wide range of **OTHER PRODUCTS**.

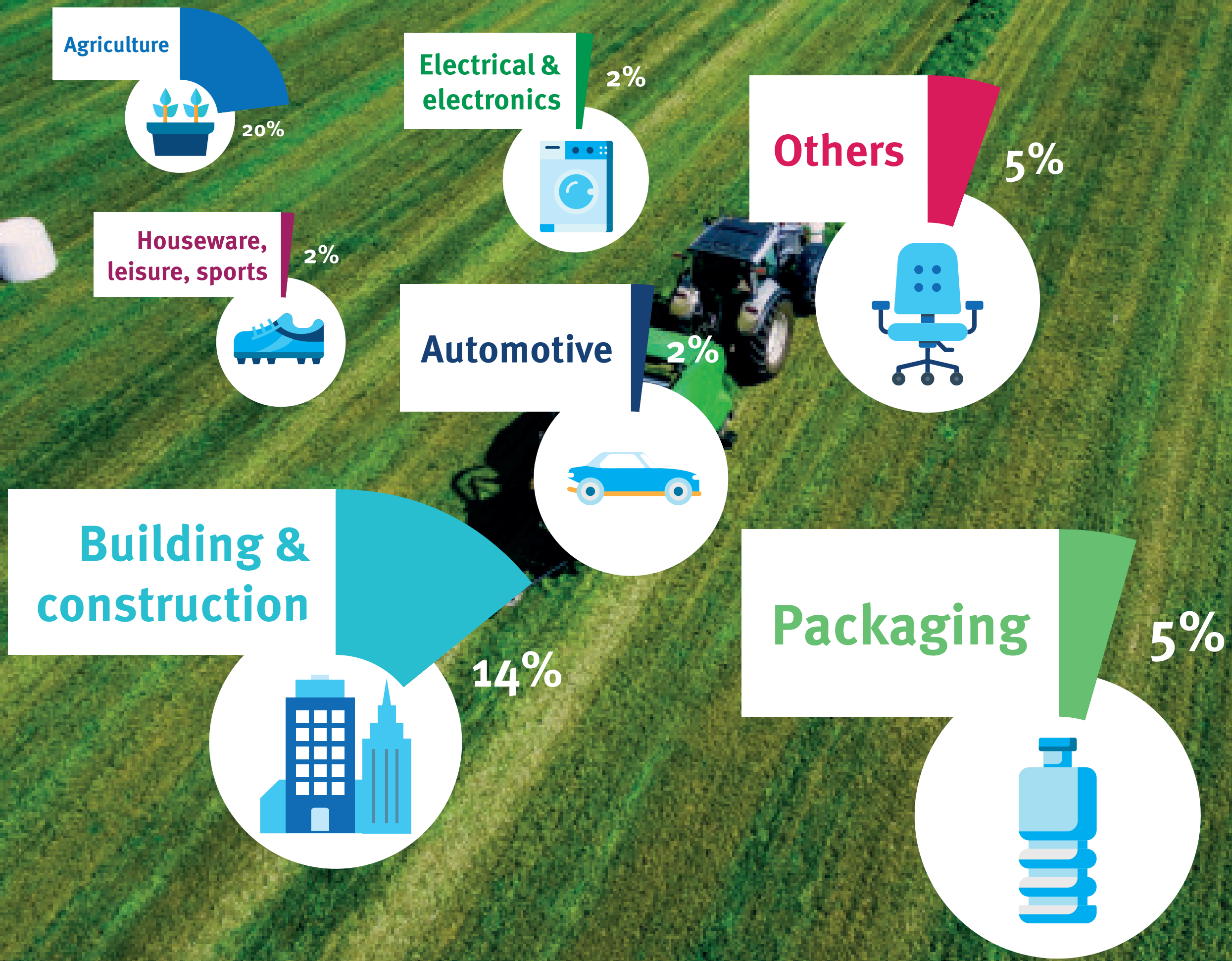
# RECYCLED PLASTICS EVERYWHERE

**13%** of recyclates in the EU28+2 are used in **AGRICULTURE AND GARDENING APPLICATIONS**, ranging from compost bins and rain barrels to irrigation pipes.

# WHAT PROPORTION OF RECYCLATES IS CONTAINED IN PRODUCTS FROM THE MAJOR MARKET SECTORS?

Applications in **agriculture** lead other sectors by ratio of **recyclates** to virgin raw material used in plastic products and parts.

Although building and construction uses more recyclates than any other market sector, it is agricultural plastics that contain the highest proportion of reyclates of any product or part.




Above charts show the importance of the different sectors in terms of their general use of plastics raw materials, combined with the proportion of recyclates they use.
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Recyclates from post-consumer waste only

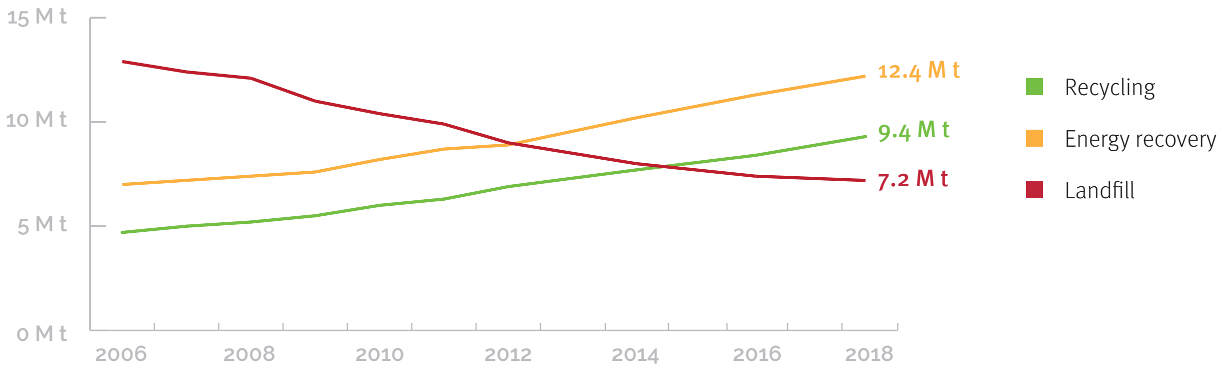

# Trends
# 2006-2018

# EVOLUTION OF POST-CONSUMER PLASTIC WASTE TREATMENT

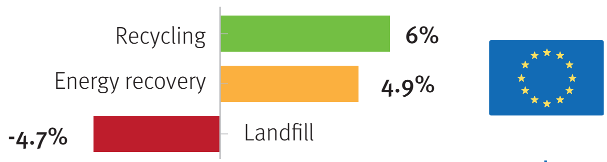
Since 2006, the total quantities of plastic waste sent to recycling facilities increased twofold. Although landfilled quantities have fallen by 44% compared to 2006, 7.2 million tonnes of plastic waste still ended up in landfill in 2018.

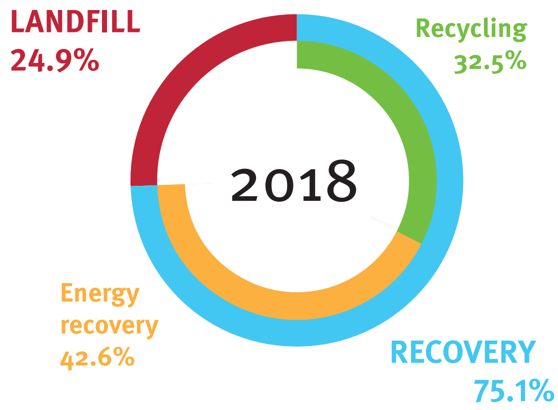
**Recycling** rates are **increasing faster** than any other waste **treatment alternative**.

**Waste treatment options for post-consumer plastic waste 2006-2018 in EU28+2**




**Average annual growth rate 2006-2018**

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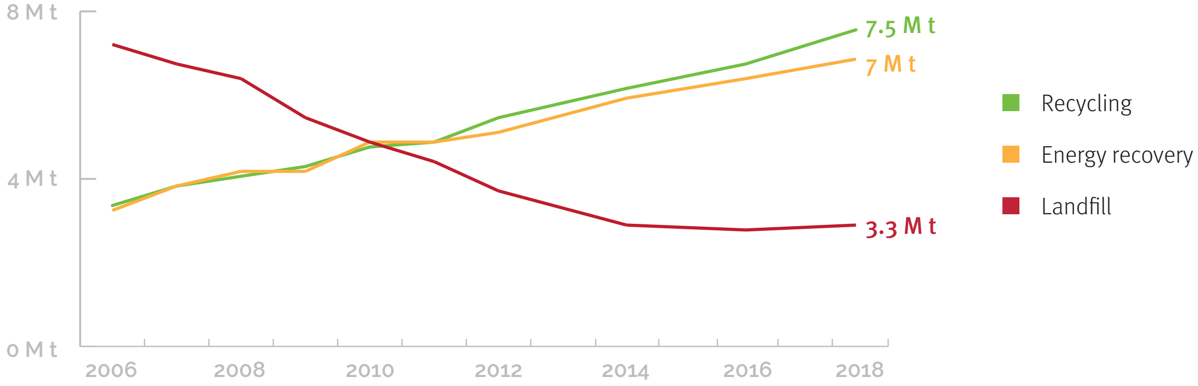
For more information, please check Plastics the Facts 2019: https://www.plasticseurope.org/en/resources/publications/1804-plastics-facts-2019

# EVOLUTION OF POST-CONSUMER PLASTIC PACKAGING WASTE TREATMENT

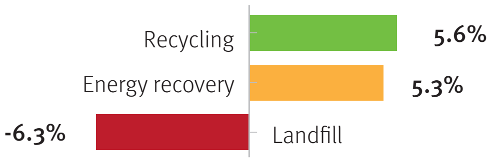
In 2018, compared to 2006, the total volume of plastic packaging waste sent to recycling facilities has increased by more than 92%. The quantity of plastic packaging waste sent to landfill decreased by 54% compared to 2006, but 3.3 million tonnes of plastic packaging waste still find their way to landfill.

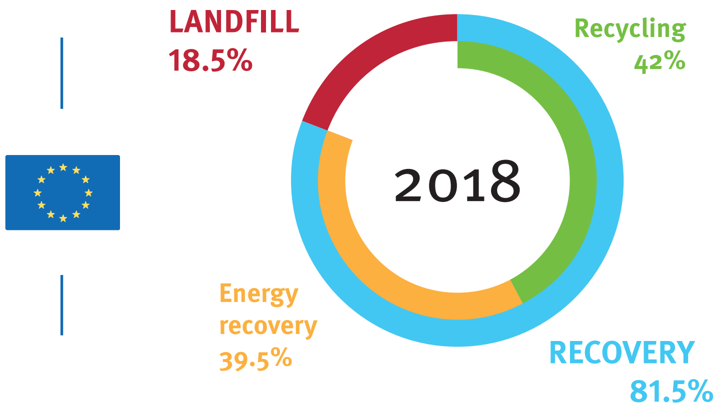
Since 2006, the quantities of plastic **packaging waste** sent to recycling have almost **doubled**.

**Waste treatment options for post-consumer plastic packaging waste 2006-2018 in EU28+2**




**Average annual growth rate 2006-2018**

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For more information, please check Plastics the Facts 2019: https://www.plasticseurope.org/en/resources/publications/1804-plastics-facts-2019

# FINAL REMARKS

## Looking ahead: a roadmap for sustainability

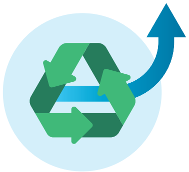
PlasticsEurope is fully committed to supporting the EU Strategy on Plastics, through its Plastics 2030[1] Voluntary Commitment and by joining the Circular Plastics Alliance of the EU Commission[2]. This includes working together with stakeholders towards the objectives of increasing recycling rates and re-introducing 10 million tonnes of recycled plastics into the European economy by 2025.

This report contains valuable data that can help stakeholders make a more granular assessment of waste collection, waste treatment and the uptake of plastic recyclates in today's European economy. It can also contribute to identifying potential barriers and new opportunities for increasing and improving the quality of recycling and recyclates.

Data collected between 2006 and 2018 shows clear progress in the amount of post-consumer plastics waste sent for recycling over the last decade. However, more must be done in order to achieve greater circularity in the plastics industry as outlined in the EU strategy on plastics. The involvement of the entire plastics value chain – from plastics producers and converters to brand owners, and consumers to waste management companies – is essential, along with the support of policy makers, to create in Europe a legal, technological and economic environment that encourages the uptake of plastic recyclates and champions the circular economy.

A mix of legislative measures, investments in innovative technologies and industry action is needed for plastics to deliver on their potential in a circular economy. This study highlights the need to make progress both in increasing recycling rates and in fostering the uptake of recyclates.

To boost the amount of plastic waste sent for recycling and re-entering the value chain as recyclates, steps should be taken in the following areas:



## Increased and improved recycling

- As a fundamental starting point, public authorities, industry and citizens in general should continue to make every effort to combat littering of plastics and any other materials;
- Another basic step is to ensure that wherever plastics waste is collected, it should be diverted from landfill all over Europe. It has been proven that landfill restrictions encourage recycling;
- Improvements in collection schemes and in sorting technologies are key to achieve higher recycling rates;
- At the same time, growing environmental awareness and the increasing involvement of commercial and private consumers in separate waste collection systems will help achieve higher waste recycling targets. As shown in this report, waste collected separately is more recycled than mixed waste by a factor of ten. Yet more than half the plastic waste we generate is still collected via mixed collection schemes;
- R&D and further investments in chemical recycling as a complement to mechanical recycling and dissolution technologies will also lead to higher recycling rates in the future;

## Boosting the quality and uptake of recyclates

- Improvements in collection and in sorting plastic waste are also key to ensure higher quality recyclates;
- Further investment in recycling technologies (mechanical and chemical) is needed to improve the quality of recyclates, to a point where they can compete with virgin feedstock;
- Innovation through the entire life cycle of plastics, including the development of eco-design guidelines (as in packaging applications) can help maximise product recyclability. This will have a positive impact, not only on recycling rates, but also on the quality of recycled plastics;
- Standardization and quality certification will level the playing field and open up new markets for recyclates with homogenized properties, whilst also ensuring product quality, performance and safety;

**All in all, increasing the quality of recyclates will boost demand on the market and widen the scope of applications that use alternatives to virgin materials. That will be a real game changer for the circularity of plastics.**

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1. PlasticsEurope's Plastics 2030 Voluntary Commitment to increasing circularity and resource efficiency of plastics. Specifically, for plastic packaging waste the target is: 60% re-use and recycling by 2030 and 100% re-use, recycling and recovery by 2040
2. On 20 September 2019, PlasticsEurope signed the Declaration of the Circular Plastics Alliance together with more than 100 public and private partners from across the plastics value chain. The Declaration promotes voluntary actions in favour of the EU market in recycled plastics. https://ec.europa.eu/growth/industry/policy/circular-plastics-alliance_en. Declaration of the Circular Plastics Alliance: https://ec.europa.eu/docsroom/documents/36361

# DISCLAIMER AND METHODOLOGY

The present report draws from a larger study on the Plastics Circular Economy 2018 in EU28+2 countries. The latter provides a detailed analysis of the plastics material flow in the European Union, Switzerland and Norway (for the reference year 2018). It looks at the production of plastic raw materials, their conversion into plastic parts and products, as well as plastic waste collection and treatment, including recycling. It also covers the production of recyclates and their use in different applications. Finally, import and export data is also analysed to provide an accurate representation of the circular economy of plastics. The report does not show polymer specific data, but only aggregates data.

This study focuses on the following plastic materials: PE-LD/ LLD, PE-HD/MD, PP, PVC, PS, PS-E, PA, PET, ABS, ASA, SAN, PMMA and other plastics, incl. PUR. The following polymers are not included because they are not considered relevant for this study: elastomers, adhesives, coatings and sealants.

The methodology of Conversio Market & Strategy GmbH for this study includes both primary and secondary research.

Primary research includes data collection from European and national authorities, the European Association of Plastics Recycling and Recovery (EPRO), waste management as well as sector organisations. PlasticsEurope's Market Research and Statistics Group (PEMRG) also provided input on the production of and demand for plastic raw materials. Additionally, interviews were conducted with stakeholders along the plastics value chain: 250 in-depth interviews with plastic converters in several European countries – to get a better and more nuanced view of how plastics are used and re-used along the value chain – and 100 additional in-depth interviews with plastic producers, converters, compounders, brand owners, EPR schemes, packaging systems, waste management companies, sorting plants and recyclers.

The secondary research includes the analysis of existing waste stream at the country and regional levels, data collection from extended producer responsibility (EPR) schemes and other organisations (EPRO, VinylPlus, Petcore, etc.). Additionally, it uses official ELV (end-of-life vehicles) and WEEE (waste from electrical and electronic equipment) data and statistics from European associations, private entities, environmental agencies and NGOs.

The study was performed from October 2018 until September 2019 and based on 2018 figures. In some cases, official data for 2018 was not available at the time of publication. Therefore, some figures are extrapolated. All figures in the study are rounded up. The study has some limitations in so far as it does not include waste that was not officially collected, stored or littered. EU import/export figures for post-consumer recyclates are also not shown as no trade statistics are available. Estimates are based on mass balances and market surveys.

The multi-methodological approach used for this study leads to the best possible data availability and accuracy. The final data set was reviewed by PlasticsEurope and partner organisations that have directly participated in the development of the study (BKV, EPRO, VDMA).

# KEY CONCEPTS

**Base chemicals**
Materials used as resource for the production of other chemicals or products. Basic chemicals may also be used as such.

**Chemical recycling**
Chemical recycling (sometimes also called feedstock recycling) converts plastic waste into chemicals. It is a process where the chemical structure of the polymer is changed, and the plastic is converted into chemical substances that are used again as raw material.

*Note: Processes where plastic waste is treated with solvent/steam to purify the plastic/polymer do not fall under this category.*

**Consumption**
Every plastic product (e.g. a bottle) or part embedded in larger products (e.g. a plastic component in a car), which has been sold to the end-user for household, commercial and industrial activities.

**Conversion of plastic parts and products**
Manufacturing of plastic parts and products from plastic raw materials.

**Landfill**
Landfill means a waste disposal site for the deposit of waste onto or into land (i.e. underground).

**Dissolution**
A process in which the plastic is dissolved in a solvent in order to separate and purify the target polymer(s) from additives and other added materials and contaminants. The resulting output – the recovered polymers – remains largely unaffected by the process and can be reformulated into plastics. This process may also enable the recovery of other valuable components of the plastic.

**Energy recovery**
Energy recovery means the use of combustible plastic waste as a means to generate energy through direct incineration, with or without other types of waste, for electricity and/or heat conversion. Energy recovery also includes high-grade energy recovery in industrial facilities, if the main purpose of the operation is to replace fossil fuels (e.g. cement kilns, pulp mills, gasification plants).

Refuse Derived Fuel (RDF) or Solid Recovered Fuel (SRF) is a fuel produced by shredding and dehydrating municipal solid waste (MSW). RDF largely consists of municipal waste combustible components such as plastics and biodegradable waste and serves as an alternative fuel that can be used to generate energy. SRF can be distinguished from RDF by standardized classifications such as CEN/343 ANAS.

**Extended producer responsibility**
According to OECD definition: an environmental policy approach in which a producer's responsibility for a product is extended to the post-consumer stage of a product's life cycle.

**Extrusion moulding process**
Manufacturing process that consist of melting plastic into a liquid that is extruded and cooled into various solid shapes.

**Mechanical recycling**
Mechanical recycling is a method by which plastic waste is recycled into "new" (secondary) raw materials without changing the basic structure of the material. Plastic waste undergoes sorting processes in specialised sorting facilities to separate different plastic streams. After cleaning and grinding the sorted plastic waste, the material is recovered by melting and regranulating processes.

**Mixed waste collection**
Collection of waste without pre-sorting of plastics or other materials by the end-user (e.g. household residual waste, municipal waste).

**Monomer**
Molecule that is used to produce polymers. Monomers are the main building blocks of polymers.

**Pelletisation**
The action of producing plastic pellets, i.e. granulates. These pellets are then used by plastics converters to manufacture plastic parts and products.

**Plastics**
Plastics is the term commonly used to describe a wide range of synthetic or semi-synthetic materials that are used in a huge and growing range of applications. Plastics are organic materials, just like wood, paper or wool. The raw materials used to produce plastics are natural products such as cellulose, coal, natural gas, salt and, of course, crude oil. Plastics have become the modern material of choice because they make it possible to balance today's needs with environmental concerns.

**Plastic recovery**
The activity of transforming plastic waste into new resources through recycling or energy recovery.

**Plastic relevant waste streams**
All waste streams that can contain plastics as a relevant component, e.g. household packaging waste separately collected, household residual waste, WEEE. These waste streams include separate or mixed waste streams.

**Polymer**
A polymer is a large molecule composed of repeated subunits – monomers. Plastics are based on polymers.

**Post-consumer waste**
According to ISO 14021 standard: material 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.

**Post-industrial plastic waste**
Waste arising from the plastics production and plastics converting processes.

**Production of plastic raw materials**
The manufacturing of plastic raw materials which are typically organic polymers combined with additives. They can be found in the form of pellets (granulates), flakes or powders to be used in the manufacture of plastic parts and products.

**Recyclates**
Plastic recycled materials that can be used as resources for the manufacturing of new plastic parts and products.

**Recycling (Waste Framework Directive)**
According to the Waste Framework Directive (EU)2018/851: recycling means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It does not include energy recovery and the reprocessing into materials that are to be used as fuels.

**Renewable feedstock**
According to ISO 24699 standard, section 3.1.1: materials that have been produced from a source, usually plant or animal biomass, that can be renewed by short- to medium-term regeneration.

**Residues**
Together with impurities, residues are material losses in a recycling process. The typical composition of the residues is moisture, organics (eg. water, milk, yoghurt), textiles, composites, paper, adhesive metals and plastic residues discarded from the recycling process.

**Separate waste collection**
Collection of pre-sorted waste (e.g. household lightweight packaging, WEEE collection, container park).

**Service life**
The life span of a product.

**Sorting**
Treatment of waste streams with the aim of separating its constituents by material / polymer type for further recycling.

**Use**
The time span during which a product is utilized by the end-user. Every plastic product (or part embedded in larger products) that is still utilized, independently of when it was put on the market (for e.g. plastic parts in a car that was put on the market in 2005; plastic insulation board placed in a house in 1997, etc.).

**Virgin feedstock**
Feedstock originating from fossil fuels, $CO_2$ or other renewable sources, used for the manufacturing of plastic raw materials.

**Acronyms**

**EPR:** Extended Producer Responsibility

**EU28+2:** 28 European member states + Norway + Switzerland

**M t:** million tonnes

**RDF:** Refuse Derived Fuel

**SDF:** Solid Recovered Fuel

**WEEE:** Waste Electrical & Electronic Equipment

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European Association Of Plastics Recycling & Recovery Organisations

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