Impact of EU recycling regulations on China's key packaging intensive export sectors

October 2025

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1. Executive Summary

China plays a central role in global sustainability and recycling efforts. China's ban on plastic and other solid waste imports under its Operation National Sword policy initiative in January 2018 reshaped global recycling flows and forced many countries, including those in the EU, to reconfigure waste management systems. In parallel, the EU has rapidly developed its regulatory framework, setting standards for recycling, traceability and recycled content. As a result, the gap in practices and legal frameworks between the EU, a primary market for recycled material, and China, a leading producer of recycled material and an important commercial partner, has widened. As the developing regulatory landscape evolves in both countries, challenges and opportunities will arise.

Key conclusions follow below:

- The EU's circularity regulation is expected to increase demand for recycled material initially in packaging due to the implementation of the Packaging and Packaging Waste Regulation (PPWR), and also in automotive and potentially in textiles as similar legislations in these sectors are implemented.
- EU regulations mandating recycled content will boost demand for recycled material. ICIS estimates that for rPE, rPP and rPET combined, around 5.4 million tonnes/year by 2030 and around 11.5 million tonnes/year by 2040 will be required by EU domestic producers to meet mandated minimum recycled content targets for packaging, automotive and fiber applications.
- Given the limitations of mechanical recycling in meeting food-safety and performance requirements, chemical recycling will be crucial in delivering the volumes required to meet the demand for polyolefin recycled feedstocks for packaging
- Due to the interconnectedness of global trade flows, EU regulation will have spillover effects across several markets. Players placing products in the European market will need to comply with recycled content requirements, which in turn will boost demand for recycled polymers in the countries of origin.
- As a major trade partner to the EU, China will be impacted by these recycled content targets. It is expected that over 1 million tonnes of rPE, rPP and rPET will be required to meet the additional demand for export -bound finished goods by 2040. This is relatively small when compared with the size of the industry in China and while this may not drive capacity addition, it is expected to have a related transformational impact. The impact for exporters into Europe underscores that compliance is not only a precondition for market entry, but also an emerging axis of global competition.
- Compliance with mandatory recycled content targets for exports will likely require product redesigns for recyclability, as well as procurement of certified recycled plastics. Adding to the expected increase in short-term operational costs are the necessary efforts to navigate unharmonized standards and certifications, as well as potential changes in suppliers if the existing ones cannot meet the new requirements.

- Despite these short-term challenges, the demand for EU-compliant material is also creating emerging market opportunities for high-performance recycled plastics. Applying EU-compliant packaging standards across all export destinations may prove more cost effective than managing differentiated packaging streams depending on the export partner.
- The stringent EU requirements are expected to help drive the establishment of domestic recycling standards in China, potentially bolstering its internal demand for recycled polymers.
- China already has a solid institutional and regulatory foundation. Nonetheless, gaps remain: limited mutual recognition of traceability systems, high barriers in food-contact approval, and an incomplete compliance pathway for chemical recycling remain critical bottlenecks for market access.
- Circularity regulation is reshaping domestic China's value chains, as producers increasingly position themselves to align with EU requirements and growing demand from other export markets. This shift could help narrow the gap between domestic and international market standards, supporting greater consistency in quality and traceability of materials across circular systems. Also, it could catalyze broader transformation in the market, fostering strategic alliances that strengthen competitiveness. Given the size of China's market, the implications for the global circular economy could be considerable.
- The positive response from the industry in China, such as the investment in R&D for recycled and bio-based materials, is building momentum. This reflects a strategic shift from *reactive compliance* to *proactive positioning*, with firms seeking to convert compliance costs into sources of competitive advantage.
- China has the opportunity not only to safeguard exports, but also to ensure compliance, enabling value creation and shaping best practices, in the global circular economy.

The report highlights the following key opportunities for Chinese export industries:

The increasing demand in the EU for high-quality recycled material creates an export opportunity for producers in China that can meet certification and traceability standards

In the packaging and automotive sectors, early compliance with these standards could help recyclers in China become preferred suppliers

Companies that view compliance not as a burden but as a strategic advantage, by investing in design for recycling, advanced sorting technology and closed-loop systems, are likely to achieve long-term success and value

2. EU regulatory framework related to recycled polymers

The European Union (EU) has established a comprehensive and evolving regulatory landscape for plastics recycling as part of the Circular Economy Action Plan (CEAP)[1]. This is a key component of the broader European Green Deal[2], a comprehensive strategy to enable the transition to a climate-neutral, resource-efficient economy.

While there are several policy measures currently impacting the EU's plastics market, this section will focus specifically on key regulations affecting the use of plastics in packaging, automotive and textiles. These include the PPWR and the Food Contact Materials (FCM) regulation, as well as the proposed End-of-Life Vehicles (ELV) Regulation. Finally, under discussion, but potentially impactful on textiles and Fibers markets is the EU Strategy for Sustainable and Circular Textiles.

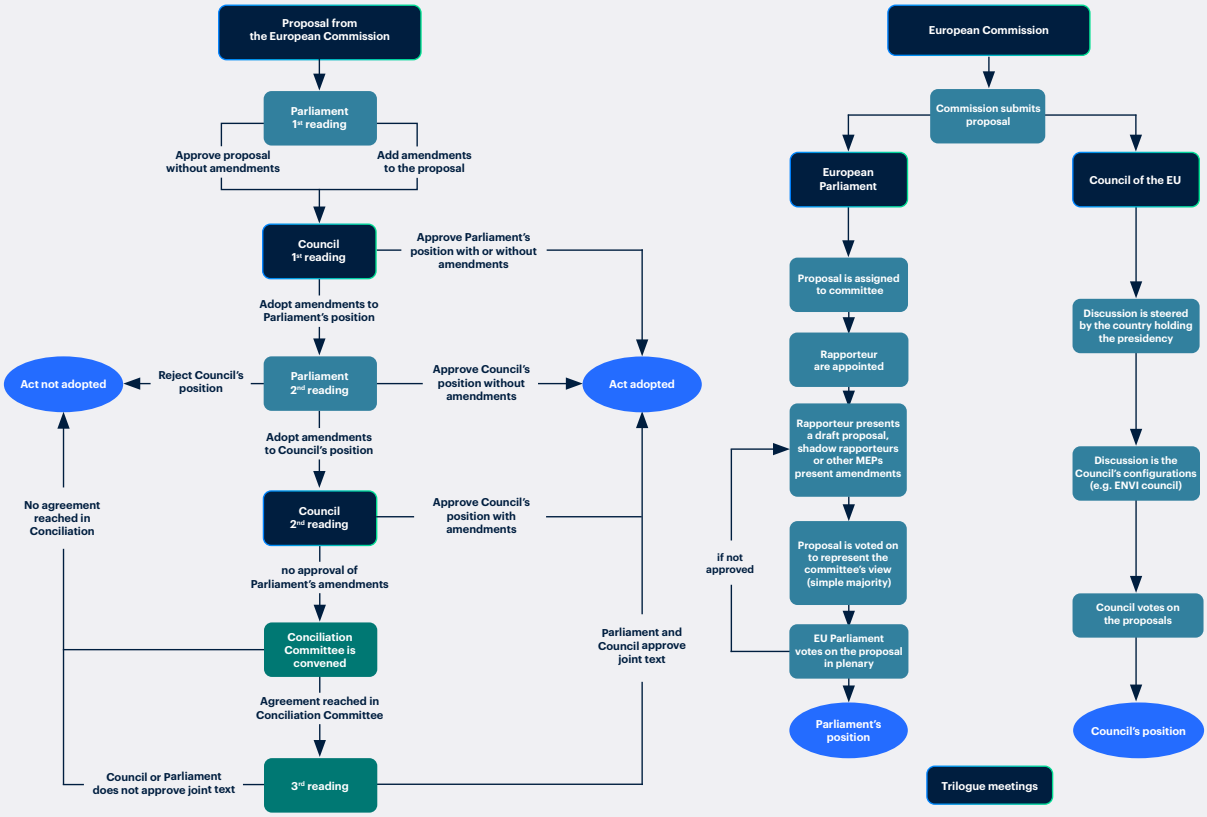
2.1. A complex system: How EU regulations come into force

The understanding of the EU legislative process is of utmost importance for correctly interpreting the meaning and significance of regulatory news. Sometimes, headline news covers the "adoption" of legislative pieces without clarifying on which stage of the process the vote has taken place. This can lead to misunderstandings given that voting can happen at different stages of what is a long process when implementing a regulation. For example, if the vote was in the EU Parliament's Committee prior to the first reading of Parliament, it is likely that the content of the legislative proposal will be significantly changed before adoption by both the EU Parliament's plenary (not the Committee) and the EU Council. Therefore, understanding the legislative process is key to keeping up to date with developments.

In the EU, the process of a regulation coming into force is structured by the Ordinary Legislative Procedure (OLP), a standard for most EU laws. The OLP, at EU level, is based on the principle of parity between the European Parliament, which is directly elected and represents the people of the Union, and the Council, which represents the governments of the EU member states. Once the Commission, representing the interests of the entire EU, has submitted a proposal, the two co-legislators must adopt legislation jointly or else the proposal is not adopted, and the procedure comes to an end. The process of reaching an agreement on legislation is rooted in the three possible readings under the OLP. The overall process is illustrated in Figure 1. On the left, the overall process between the Parliament and Council is described, and the right provides more details of the internal processes within the European Parliament and the Council.

[1]See more info at: Circular economy action plan - European Commission
[2]See more info at: The European Green Deal - European Commission

Figure 1: EU "Ordinary Legislative Procedure"



Source: ICIS

2.2. Current[3] and upcoming EU regulations on plastics circularity

Plastics circularity is part of the drive for a circular economy in Europe, which also follows the overall Green Deal focus of the region. The European Green Deal aims to transition the EU into a "modern, resource-efficient and competitive economy", with overarching objectives including net-zero emissions of greenhouse gases (GHG) by 2050 and economic growth decoupled from resource use. This focus on resources is a key driver for circularity within regulation. While regulation on packaging has already been adopted, circularity regulations for automotive and textiles sectors are at different stages of the EU legislative process.

These regulations cover products put on the EU market and therefore apply not only to domestic players, but also to non-EU companies exporting into the region. Imported goods need to comply with the regulations, thus non-EU companies should follow the changes to ensure compliance.

[3]As of September 2025.

Below we describe the most important pieces of plastics circularity regulation and provide an overview of the legislative process within the EU. This allows the reader to better understand where in the process the regulations currently are and what that means in terms of timelines and the extent of possible changes.

The regulations covered are:

Packaging (PPWR)

Automotive (ELV Regulation)

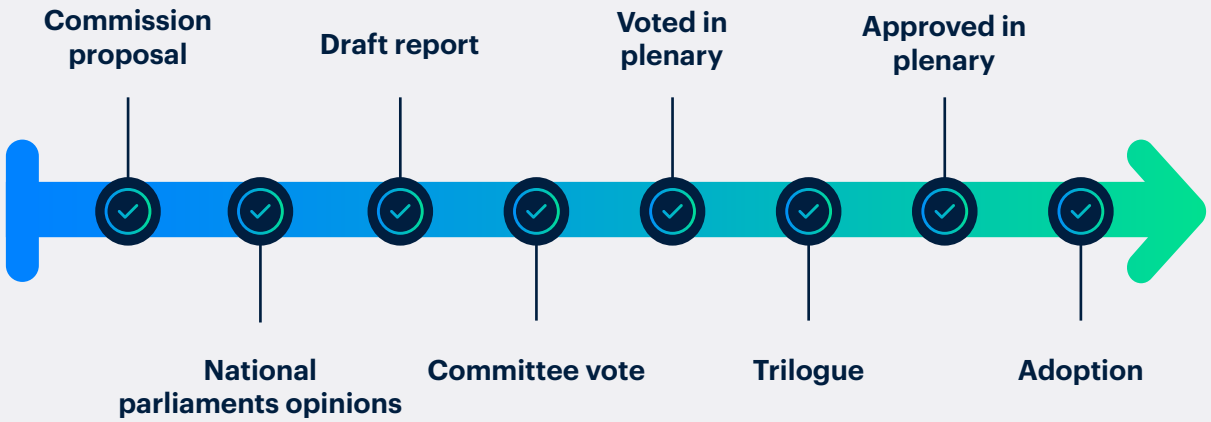
Textiles (EU Strategy for Sustainable and Circular Textiles)

The European Commission has published a proposal for the ELV Regulation and from the EU Parliament committees, amendment proposals have been published (July 2025). The strategy for textiles is still at an early stage of discussion.

There are other regulations focused on circularity, such as the Single Use Plastics Directive (SUPD), but the requirements and targets involved are aligned within the PPWR. In addition, supply is being met by Europe's domestic recycling value chain. Given the focus on meeting the initial recycled content target for PET (25%) through domestic supply has been so strong, this is absorbing a large proportion of food-grade rPET supply across the region. The secondary target of 30% for all plastic bottles, including PET, may generate demand for recyclates for all relevant polymers beyond domestic supply. This demand has been factored into the impact analysis of the PPWR in the "Shifting Demand: Internal EU Circular Targets Reshaping the Market" section of this report.

2.2.1. The Packaging and Packaging Waste Regulation (PPWR)

Figure 1: PPWR status



The PPWR has already been adopted by the Parliament and Council and is now legally binding for all member states. In force since February 2025, it is one of the most significant pieces of legislation for the packaging and recycling value chains in the EU.

With the growth of plastics usage in packaging, and particularly in single-use packaging, follows the rise in plastic packaging waste. To redress this is the ambition for greater circularity in packaging in the region and hence this legislation. It focuses on recyclability, design for recycling, collection targets, improving quality and grades of recyclate as well as mandates the use of recycled content. In addition, the shift to reuse-and-refill models aims to reduce the dominance of single-use packaging.

More specifically, this regulation introduces:

- Mandated packaging recyclability targets
- Minimum recycled content and reuse targets across packaging
- Mandatory deposit return schemes (DRS) and separate packaging collection targets
- New reporting and labelling obligations
- Extension of extended producer responsibility (EPR) schemes
- Restriction on plastic collation films except for transportation purposes
- Possibility of bio-based plastic contributing to recycling targets
- Allowance of imports to count towards recycling targets provided they are compliant with all regulations related to plastics and recycled materials use within specific applications

Recyclability Targets

The PPWR establishes that by 2030 all packaging must be recyclable or reusable. To be classed as recyclable, packaging must be:

- Designed for recycling
- Separately collected
- Sorted into defined waste streams without affecting the recyclability of other waste streams
- Possible to be recycled so that the resulting secondary raw materials are of sufficient quality to substitute the primary raw materials

Packaging recyclability performance grades are to be established by packaging category and classified as grades A, B or C, as Table 1 shows. After 1 January 2030, any packaging that falls below grade C will be restricted from sale in the market. After 1 January 2038, packaging classified below grade B will be banned from sale in the market.

Table 1: Summary of recyclability performance grades

Recyclability performance grade	Design for recycling assessment per unit (by weight)
Grade A	≥ 95%
Grade B	≥ 80%
Grade C	≥ 70%
Technically non-recyclable	< 70%

Source: Regulation (EU) 2025/40 of the European Parliament and of the Council of 19 December 2024 on packaging and packaging waste[4].

The criteria and rules are not defined yet, eg it is not clear yet how the grades of packaging (A, B or C) will be calculated/determined. The EU Commission will adopt delegated acts to establish the detailed criteria for design for recycling under the packaging categories by 1 January 2028 (Article 6.4 of PPWR). After the publication of these additional acts, the industry will have more clarity on implementation and potential impact.

By 2035, the requirement is that packaging waste needs to be recycled at scale.

[4]Full text available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L_202500040

Minimum recycled content targets

From 1 January 2030, all plastic packaging placed in the EU market must include a minimum percentage of recycled content, from post-consumer waste only, as indicated by Table 1. These shares are calculated by weight and the minimum content requirements are set to increase by 2040.

Table 2: Summary of recycled content targets set by the PPWR

Minimum recycled content target	2030	2040
Contact sensitive packaging made from PET as major component, except single-use plastic beverage bottles	30%	50%
Contact sensitive packaging made from plastic materials other than PET, except single-use plastic beverage bottles	10%	25%
Single-use plastic beverage bottles	30%	65%
Plastic packaging other than those referred above	35%	65%

The recycled content targets are considered as very ambitious by many market participants, especially in the case of polyolefins, with regard to food contact materials. The implications on supply and demand are discussed in more detail in “Section 2: Shifting Demand: Internal EU Circular Targets Reshaping the Market” of this report.

Key remaining open questions on PPWR

While some requirements and targets are clear, several points still need to be clarified, with secondary acts specifying or newly defining important aspects of the PPWR.

For contact sensitive packaging, and in particular for recycled polyolefins technologies where the necessary assessments of the European Food Safety Authority (EFSA) are currently not achievable, the recycled content targets pose a huge challenge. Availability of recyclates will thus depend on the combination of technological developments and (speed of) regulatory approval of those for food contact materials for use in packaging applications.

> **By 12 February 2028, the Commission shall review the state of technological development and environmental performance of bio-based plastic packaging, ... [and] present a legislative proposal ... [to] introduce the possibility to achieve the targets ... by using bio-based plastic feedstock instead of recycled content recovered from post-consumer plastic waste in the event that suitable recycling technologies for food contact packaging ... are not available**
>
> **PPWR, Article 8**

Bio-based plastic feedstock might be allowed to count against the PPWR's recycled content targets. While this is only a possibility, not an expectation, the PPWR explicitly instructs the Commission to review this option. In an early draft of the regulation, a threshold of up to 50% of the recycling content target has been mentioned. If decided so, this opens the opportunity to use alternative feedstocks aside from recycling only and could have an impact on the demand for recycled plastics for those applications able to switch to bio-based plastic.

Finally, the rules applicable for non-EU recycling producers that want to export their products into the EU will only be clarified at the end of 2026. Only then potential exporters of recyclates will learn about the exact requirements and therefore costs involved in the certification process for EU compliance in all regulations related to packaging.

> **By 31 December 2026, the Commission shall adopt implementing acts establishing the methodology for assessing, verifying and certifying, including through third-party audit, the equivalence of the rules applied in cases where the recycled content recovered from post-consumer plastic waste is recycled or collected in a third country**
>
> **Article 7, 10 of PPWR**

2.2.2. Food contact materials

Regulation (EU) 2022/1616

In October 2022, the European Commission introduced new regulations to replace Regulation (EC) 282/2008. Regulation (EU) 2022/1616 sets out rules to ensure the safety of recycled plastic materials used in contact with food. This applies to both:

- Suitable technology addressing previously evaluated processes where sufficient data is available
- Novel technology for processes that have not yet been assessed

Regulation (EU) 2022/1616 includes:

Establishment of a new registration system for all recycling organizations, facilities and lines producing recycled materials for food contact applications

Rule that effective July 2023, only plastics containing recycled plastic manufactured with a suitable recycling technology may be placed on the market, unless manufactured with a novel technology

New governance on novel technologies, applicable to all technologies that are not yet suitable (eg mechanical PET recycling and closed-loop recycling)

Effective October 2024, certification of quality assurance systems for collection, sorting centers and pre-processing operator

Exemption for recycling technologies producing a starting substance provided that it is included in the Union list of Regulation (EU) No 10/2011 and of a high degree of purity

Rule that domestic competent authorities in exporting countries need to act on behalf of local applicants for the award of technology and production certificates

Regulation (EU) 2022/1616 sets high-quality expectations for the safety of recycled plastics in food contact applications. The requirements, including those related to sources of waste and applicable collection systems, challenge the capability of polyolefins to comply with these regulations and have formed a hindrance to progress in polyolefin circularity through mechanical recycling. As a result, the value chain increasingly looks to the development of solutions to produce the recycled feedstocks required for food contact applications from chemical and mechanical processes.

The highest impact of this legislation falls on the recycled polyolefins market. An example is the challenge to identify food and non-food contact materials at the sorting stage and therefore meet the purity levels required in feedstocks. Therefore, it currently makes attaining a positive opinion for recycled polyolefins from the EFSA unfeasible.

Packaging consumes a wide range of polymers in the market, some of which are yet to establish recycling capabilities at scale across the region. This again creates a challenge in meeting all the standards and requirements of legislation and will need substantial investment in infrastructure, technology and capacity across the value chain.

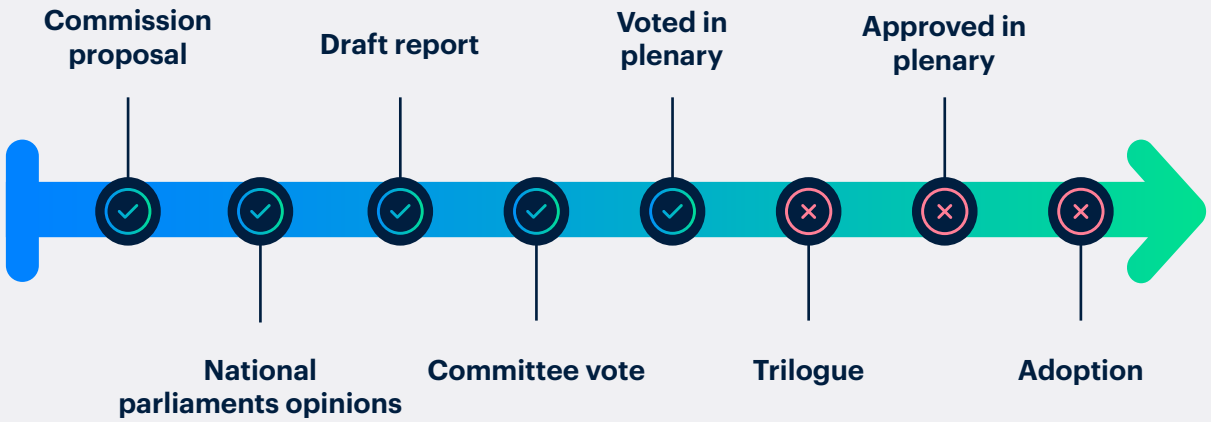
Compliance with this regulation, in all aspects including traceability, auditing and other certifications, is relevant to all those selling in the EU market. For exporters of finished goods, developing compliant packaging materials is a challenge and this impact is explored further in subsequent sections of the report.

Any supply gap in the European recycling market offers an opportunity for the export of those recycled polymers to the region. With compliance there is cost, but even more than the direct financial burden is the effort to ensure all aspects of attaining certifications for those recycled polymers are addressed.

Packaging consumes a wide range of polymers in the market, some of which are yet to establish recycling capabilities at scale across the region.

2.2.3. Automotive (ELV Regulation)

Figure 2: ELV Regulation status



In July 2023, the European Commission proposed a regulation for ELVs, to replace the End-of-Life Vehicles Directive and the 3R Type-Approval Directive. In September 2025, the EU Parliament adopted its position. The Council has also published their position. The next step will be for the Council and Parliament to negotiate a joint position (Trilogue).

The Commission's proposal sets out circularity requirements for the design and production of vehicles (mainly applicable to passenger cars and light commercial vehicles), focusing on reusability, recyclability, recoverability and the use of recycled content. Specifically, it sets a minimum requirement of 25% recycled content for plastics in new passenger vehicles, of which 25% must be recycled plastics from ELVs. These requirements would apply for vehicles type approved 6 years (72 months) after the regulation is adopted. For example: if the regulation is adopted in January 2026, ECWVTA approved cars[5] that are type approved before January 2032 would not need to comply with recycled content requirements, even if the cars are produced much later. The proposal also sets out information and labelling requirements for parts, components and materials in vehicles. In addition, the proposal includes targets for reuse, recycling and recovery, as well as an annual recycling rate of 30% for plastics in ELVs.

[5]In the EU market, before a car model is launched in the market, it must go through an approval process that certifies compliance with all EU safety, environmental and production requirements before. The process is known as European Community Whole Vehicle Type Approval (ECWVTA).

The Parliament's position starts with a recycled content target of 20% 6 years after adoption and increases this target to 25% after a further 4 years. The Council's position starts with 15% 6 years after adoption, increases this to 20% 2 years later and also to 25% after another 2 years. While the Council did not change the Commission's proposal that 25% of recyclates should come from ELVs, the Parliament position reduces this share to only 15%. The different positions are summarized in the following table:

Table 3: Summary of different targets proposed for ELV Regulation as of September 2025

Different proposals presented	Entry into force after adoption of law	+ 6 years	+ 8 years	+ 8 years
EU Commission	Recycled content share	25.0%	25.0%	25.0%
	Thereof from ELVs	6.3%	6.3%	6.3%
EU Parliament	Recycled content share	20.0%	20.0%	25.0%
	Thereof from ELVs	3.0%	3.0%	3.8%
EU Council	Recycled content share	15.0%	20.0%	25.0%
	Thereof from ELVs	3.8%	5.0%	6.3%

Both the Council and Parliament adopted positions with differing targets, both lower than the original Commission proposal. Until the legislative process has concluded, the targets are yet to be determined.

The Parliament's position would also allow for up to 50% of the targets to come from pre-consumer recycling. The position also explicitly mentions chemical recycling to be considered for compliance. Additionally, the recycling targets would apply to a "new vehicle type3 that is type-approved". This means that existing vehicle types (even if updated) may benefit from transitional arrangements or less stringent rules, depending on how the regulation is finalized.

The inclusion of a mandatory benchmark for recycled content is expected to stimulate investment in the technology and infrastructure needed to efficiently recycle plastics from ELVs. However, should the pre-consumer content be included, this will have an impact on the demand for recyclates as the sector already uses a high level of pre-consumer recycled material.

The demand based on the new targets is estimated to grow ten-fold. However, the challenge remains ensuring materials from ELVs are accessible through robust collection and sorting systems across the region. The trade of vehicles to secondary markets, typically outside the EU, means that the primary source of ELVs is sometimes inaccessible. To this end, the proposal includes a ban on the export of used vehicles which, although are not formally at a waste stage, are at the end of their service life.

The wide range of polymer fractions in a car that are typically painted or black means that near infrared (NIR) sorting technologies are unable to detect them and separate them out before the shredding process. Hence, solutions to separate before shredding will be key. OEM contribution to the dismantling of vehicles or innovative solutions to enable this will be needed. Suggestions to reduce the number of polymers used in cars, currently around 150-200 polymer fractions, have also been put forward.

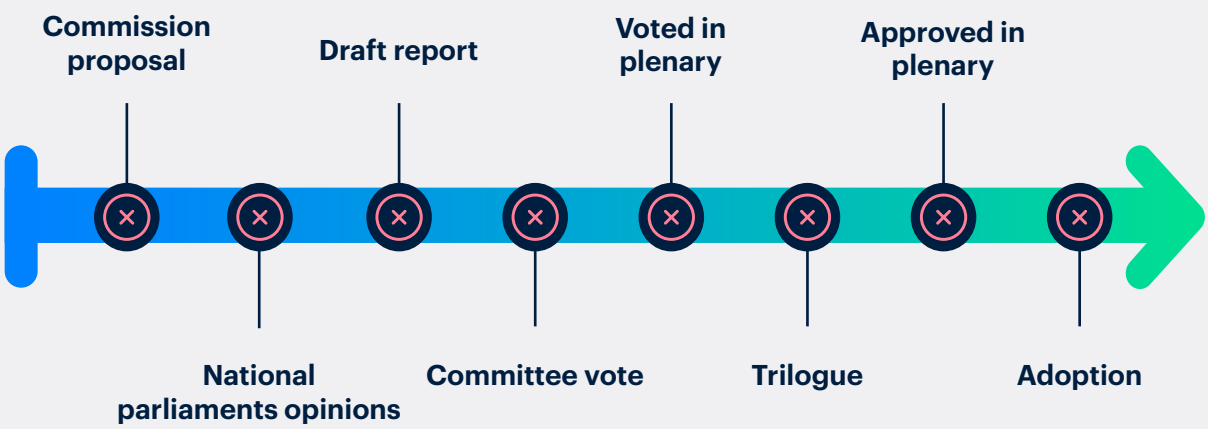
Overall, the impact of this legislation would be felt greatest by the rPP market. PP, as the dominant polymer utilized in cars, would see buyers seek recycled grades of PP to meet any mandates for recycled content.

Most important remaining regulatory risks of proposed ELV Regulation

The ELV Regulation is still in the legislative process, with uncertainty created on the final outcome on the agreed targets and its true impact on the market, with scenarios discussed further in the "Shifting Demand: Internal EU Circular Targets Reshaping the Market" section of this report.

2.2.4. Textiles (EU Strategy for Sustainable and Circular Textiles)

Figure 3: Status of the EU strategy for sustainable and circular textiles



In March 2022, the European Commission published the 'EU strategy for sustainable and circular textiles'[6]. The strategy proposes actions for the entire lifecycle of textiles products, while supporting the ecosystem in the green and digital transitions, and works in conjunction amendments adopted by the Parliament and Council to the Waste Framework Directive on 9 September 2025[7]. The current Waste Framework Directive requires EU member states to set up separate collection of textiles by 1 January 2025. The amendments introduce mandatory and harmonised EPR schemes for textiles in all EU member states. Producers that make textiles available in the EU will have to cover the costs of their collection, sorting and recycling through eco-modulated fees. Such eco-modulation fees are based on the circularity and environmental performance of the textile product. The amendments now need to be adopted into national law of each member state within 24 months and EPR schemes have to be set up within 30 months after the amended directive's entry into force.

Development in technology is needed for textile recycling to achieve any potential targets in this regulation and ultimately find its own path to circularity. There are other elements throughout the textile life cycle to be addressed, such as higher textile collection rates and capabilities to sort textile waste.

[6]Textiles Strategy - European Commission
[7]Parliament adopts new EU rules to reduce textile and food waste | News | European Parliament

The Commission has proposed to clarify the definition of waste and reusable textiles, to reduce illegal waste shipments to non-EU markets. New waste shipment regulation will complement this to ensure textile waste is exported with guarantees that the waste is managed in an environmentally sound manner.

The strategy mentions a set of actions for the future and proposes the Commission to work, inter alia, on:

- A circular business model that incentivizes recycling, reuse and repair
- The reduction of unintentional release of microplastics from synthetic textiles
- The reduction of the extent of fast fashion, and to establish design requirements for textiles so that they last longer and are easier to repair and recycle, as well as minimum recycled content requirements
- More transparent and clearer information to tackle greenwashing and raise awareness about sustainable consumer fashion
- A Digital Product Passport for textiles
- The discouraging of the destruction of unsold or returned textiles
- EPR rules for textiles in all member states
- The restriction of the export of textile waste

Once the harmonized EU rules on EPR schemes for textiles are in place, eco-modulation of fees can be applied to incentivize material circularity and design for sustainability. As a key product value chain, textiles have a strong potential for the transition to sustainable and circular production, consumption and business models. The strategy aims to promote fiber-to-fiber recycling and shift away from PET bottle-to-textile recycling.

The initiative is at an early stage. There is not even a Commission proposal published and it is too early to predict an outcome of the regulation. Eco-modulation of EPR fees could provide recycling incentives, and/or recycled content shares could be mandated. Textile producers selling into the EU should take note of upcoming developments, as new EU regulations for textiles will provide both opportunities and challenges.

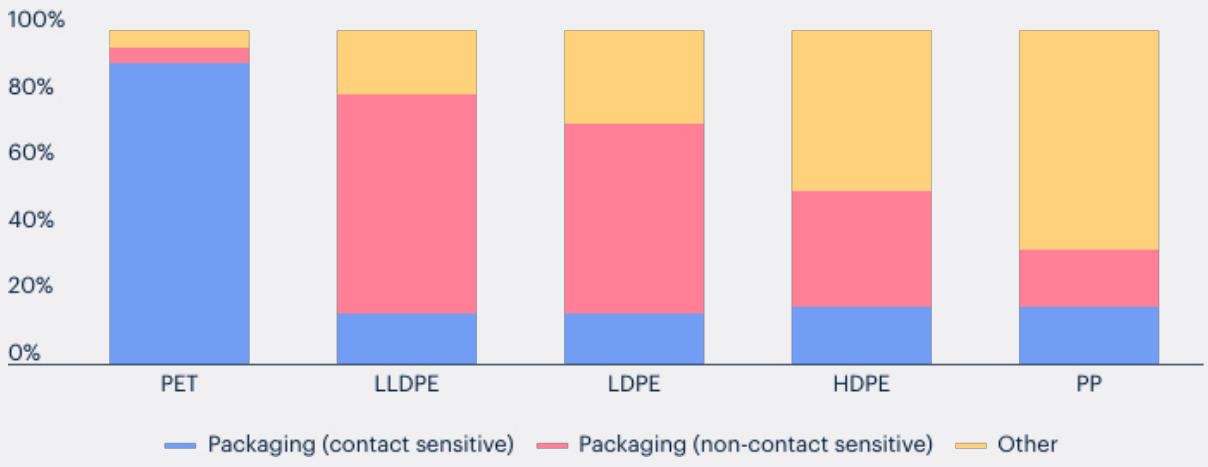
3. Shifting demand: Internal EU circular targets reshaping the market

Amid revisions of brand owners' voluntary commitments, EU legislation is widely considered as the most powerful driver to accelerate growth of plastics recycling. The adopted PPWR mandates very ambitious recycled content targets. These should create a significant demand surge for recycled polymers, additionally strengthened by the drafted ELV Regulation as well as theoretically anticipated targets for the textile industry. Being a positive signal for plastics recycling markets overall, all these legislative developments also raise a question whether supply will be able to keep up with increasing demand.

3.1. EU packaging industry

The PPWR is expected to become the most important piece of legislation for key commodity polymers such as PET, HDPE, LDPE, LLDPE and PP. This is due to the fact that packaging is the single largest end-use segment for all of these, as shown in Figure 1, with the share of packaging exceeding 50% for all, except for PP.

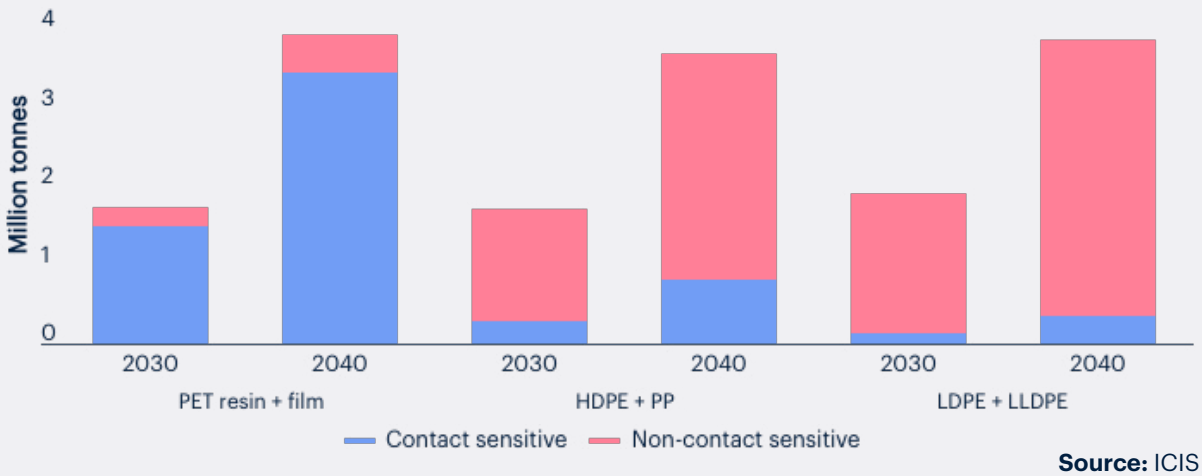
Figure 1: PET and polyolefins end-use applications, Europe 2024



Source: ICIS

Projections based on the ICIS Supply & Demand Database show that PE, PP and PET recyclates required to meet the PPWR targets reach around 5.4 million tonnes by 2030 and 11.5 million tonnes by 2040. For rPE and rPP , approximately 0.4 million tonnes by 2030 and roughly 1.2 million tonnes by 2040 will be required for contact sensitive applications only, as shown in Figure 2.

Figure 2: Recycled PET and polyolefins required to meet PPWR targets for domestic EU producers



Source: ICIS

Meeting demand for recycled polymers in packaging is likely to require different approaches with regards to contact and non-contact sensitive segments. This is due to the stringent nature of the EFSA requirements for recycled polymers coming into contact with food. It is extremely challenging to meet those requirements via mechanical recycling processes for rPE and rPP, with chemical recycling being better positioned to potentially serve this segment.

Key trends in the EU packaging industry:

The PPWR goes far beyond just recycled content targets and should drive comprehensive transformation of the entire sector:

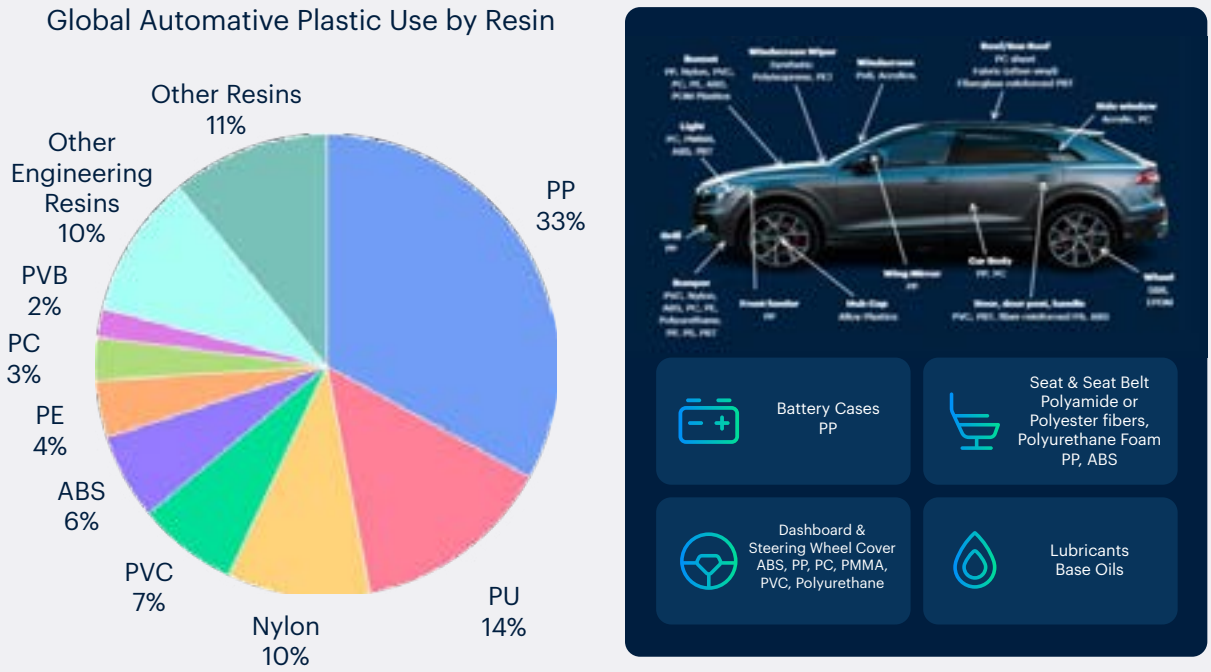
- **New packaging models:**
  - **Design for recycling**, eg switch to mono-materials to meet the required recyclability parameters.
  - **Packaging minimization**, eg reducing the ratio of empty space in packaging.
  - **Reuse models**, eg wider introduction of reusable packaging to comply with the regulation targets.
- **Material substitution:** Availability of suitable recycled polymers is expected to be one the major factors to drive inter-polymer (eg PS to PET) as well as inter-material substitution (eg polymer to paper).
- **Flexibles:** Given the existing challenges with recycling household films (eg multilayered films, contamination, difficulty with separate collection and sorting) flexible packaging is in a particularly vulnerable position and will require additional investment in infrastructure.

3.2. EU automotive industry

Recycled polymers in automotive applications are already utilized by many producers, driving both economic and sustainability efficiencies. As automotive brands look to align their production practices towards a more sustainable future, recyclate use has been tested in most components with innovative cases such as interior textiles with ocean plastic content or bumpers made from bumpers.

As shown on Figure 3, PP, PU, Nylon, PVC and ABS make up 70% of thermoplastic materials used in an average car. The remainder includes PE, PC, and over 20% thermoset plastics, elastomers and other specialized engineered polymers.

Figure 3: Polymer breakdown used in automotive industry



Source: ICIS

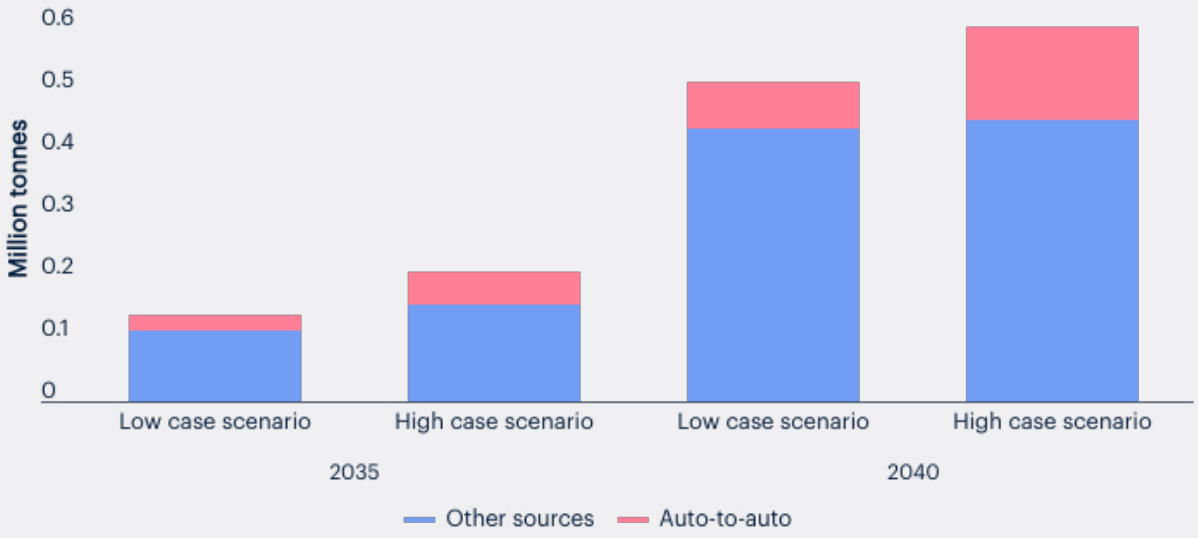
The revision of the Directive on ELV, to become regulation once the legislative process is complete, is yet to provide a clear picture of how minimum recycled content and other sustainable targets will impact the automotive industry. The three different proposals from the EU institutions/bodies described in *Section I: EU regulatory framework and global spillover effects* provide a range of scenarios for demand of recycled polymers.

However, in all three cases it is expected that the use of recycled polyolefins will be the largest share, approximately 75%, of overall volume of recycled content incorporated to meet the targets. This is due to PP and HDPE recycling feedstock being generally more widely available. PP and HDPE waste feedstocks are also available in simpler, less compounded and easier-to-recycle formulations (eg PP or HDPE packaging with few additives vs fiberglass-filled ABS blend).

Extracting polymers from ELV is a long and costly process. Most ELV treatment facilities are currently not set up for extraction of plastic for recycling - they are removed for utilisation through landfilling or incineration. Therefore, it is expected that, unless otherwise mandated (through minimum recycled content from circular automotive to automotive applications), the recyclate used in cars will predominantly be sourced from other waste - this is likely to comprise of commercial and industrial (C&I) and household packaging, durable household goods and construction waste.

Based on the proposals described in Section I: EU regulatory framework and global spillover effects of this report, as shown on Figure 4, 0.5 million-0.6 million tonnes/year of recycled polyolefins will be required by 2040 to meet the ELV Regulation targets with up to 0.15 million tonnes/year coming from circular sources (auto-to-auto).

Figure 4: Recycled PP and HDPE required to meet proposed the ELV Regulation targets for domestic EU producers



Source: ICIS

Key trends in the EU automotive industry:

Lightweighting persists as a manufacturing trend, which goes hand in hand with the development of more fuel-efficient internal-combustion engines (ICE) and electric vehicles (EV). Due to this trend, a growing overall volume of polymers are used in cars, from 150kg to 250kg in some cases.

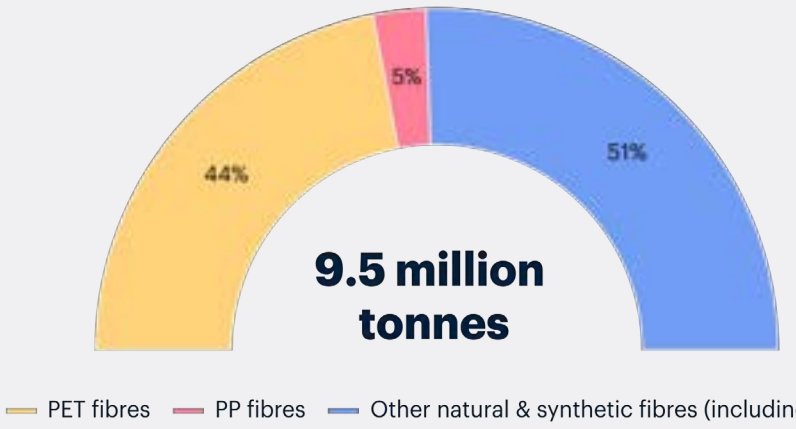
Despite automotive manufactures trialing different innovative applications of recycled polymers, those ad-hoc recycling initiatives are largely aimed at brand promotion and do not create real tangible extra demand for recycled polymers beyond regulatory requirement.

A large portion of the recycled material currently used comes from pre-consumer feedstock sources. Hence, the main challenge for producers is expected to be around sourcing post-consumer material for automotive applications.

3.3. EU textile industry

In 2024, as shown in Figure 5, the EU consumed over 9.5 million tonnes of apparel, household, footwear, technical and carpet textile products, with PET and PP fibers making up around 50% of this total.

Figure 5: PET and PP fibers share of total textile consumption, EU 2024



Source: ICIS

Around 6.3 million tonnes of total textile products consumed in the EU were produced and imported from outside the region, and around 3.2 million tonnes of finished textile products were produced within the EU.

As highlighted in *Section 2 - EU regulatory framework related to recycled polymers*, the coming years will see various policies being introduced by the EU to improve circularity in the textiles industry. Currently, there are no implemented or drafted minimum recycled content targets for textiles. However, the EU authorities will be defining sustainability targets for the textile industry in upcoming delegated acts of the Ecodesign for Sustainable Products Regulation (ESPR), the majority of which should all be adopted into law by 2030. The apparel end market in particular has been made a priority, and the delegated act due in 2027 is expected to include recycled content targets.

In this report, ICIS explored two hypothetical scenarios for recycled content target levels and coverage to illustrate potential market impact on the textile sector. Figure 6 summarises the results of the scenarios developed.

Scenario 1: 25% recycled content target for apparel textiles by 2035

This scenario assumes the 2027 ESPR delegated act would implement a minimum recycled content target of 25% for apparel textiles. Any other textile uses would not have to meet the target.

Following a similar timeline to the ELV Regulation proposal, the mandated target is expected to come into effect in 2033, allowing the industry at least six years to achieve this target.

The assumption is that the recycled content target will largely be achieved via rPET, due to the significant share of PET consumed in textiles and the higher availability of rPET material as the market is more established, and unlikely to be achieved via rPP for the same reason. In this scenario around 250,000 tonnes/year of rPET would be required in 2035 to meet the recycled content target considered.

Scenario 2: 25% recycled content target for plastics in all textiles end-use sectors by 2035

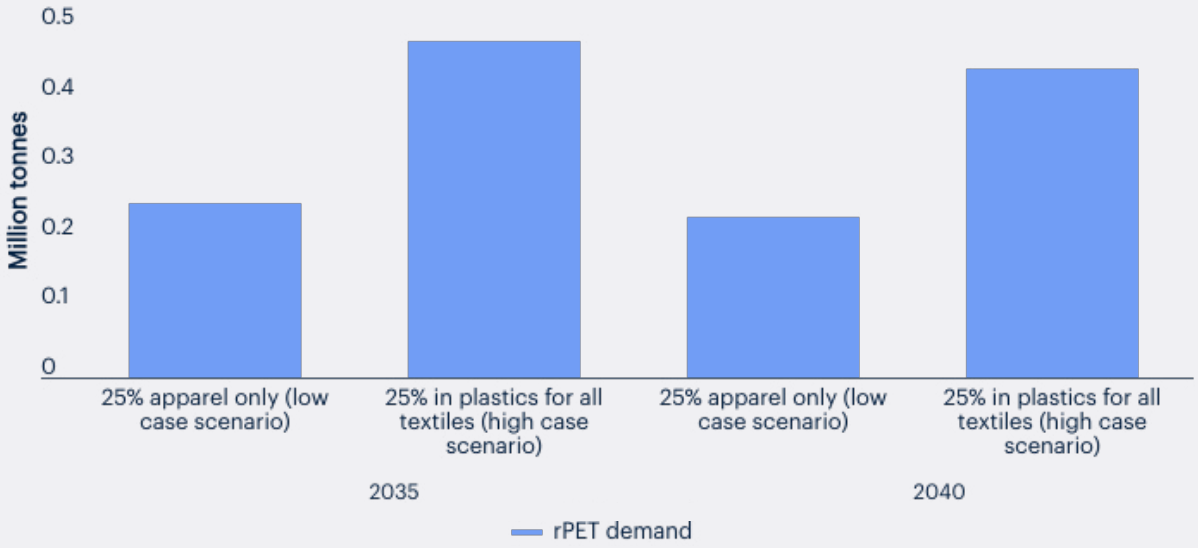
This scenario assumes recycled content targets would be set per type of material feedstock used, assuming a similar approach to the ELV Regulation draft proposal. In reality, the mandated targets set per textile end-use sector may be different as these each fall under different ESPR delegated acts.

Following the assumptions in Scenario 1, the 25% mandated target on plastics is expected to come into effect by 2035, giving industry time to achieve the mandated recycled content targets assuming adoption into law by 2030, and will be achieved via rPET[8].

In this scenario, around 480,000 tonnes/year of rPET would be required in 2035 to meet the targets considered.

[8]Nylon is another synthetic fiber used in textiles production and brands, noted particularly in voluntary commitments in the carpet sector. This can potentially be used to contribute towards recycled content targets although to a limited extent given the nascent state of recycled nylon in textile. Overall, nylon stays beyond the scope of this report.

Figure 6: Recycled PET required to meet hypothetical recycled content targets in textiles for domestic EU producers



Source: ICIS

Key trends in the EU textile industry:

Major brands in the apparel, household textiles, footwear and carpet sectors have set ambitious voluntary sustainability targets, such as the use of 100% recycled or sustainable materials by 2025 or 2030. Apparel and footwear brands have also set targets up to 50% or 100% recycled content for PET. These brand pledges have stimulated demand for recycled material as well as organic and bio-based fibers in textiles.

The implementation of the separate collection of textile waste from 2025 in addition to the proposed textiles and footwear EPR across EU member states is expected to improve collection, and hence, availability of textile waste for recycling. The lack of collection and sorting infrastructure and fragmented systems for textile waste management are major bottlenecks to improved textile recycling. However, the separation of textile materials is still one of the biggest challenges at the preparation step of textile waste for recycling due to different fiber material blends and non-fiber components often found in textile products. As a result of its material complexity, it is a costly process, and existing technical solutions are limited, which will limit growth of supply of textile waste feedstocks suitable for recycling.

Chemical recycling is increasingly being put forward as the solution for textile-to-textile recycling given its ability to tackle the high volume of complex multi-material waste feedstocks as well as produce a virgin-like quality output difficult to achieve via mechanical recycling processes. However, less than 2% of textile waste is currently being recycled via chemical recycling. Chemical recycling is a nascent industry, and further investment is required to reach industrial scale.

Growth in the EU textile industry is limited by forecasted population decline and increased consumer awareness of the negative impact of fast fashion on the environment. Second-hand clothing and reuse consumption models are becoming increasingly popular, with upcoming regulations expected to further formalize these. These combined drivers contribute to ICIS's outlook of gradual decline in textile industry demand between 2024 and 2035.

3.4. EU recycled polymer supply profile

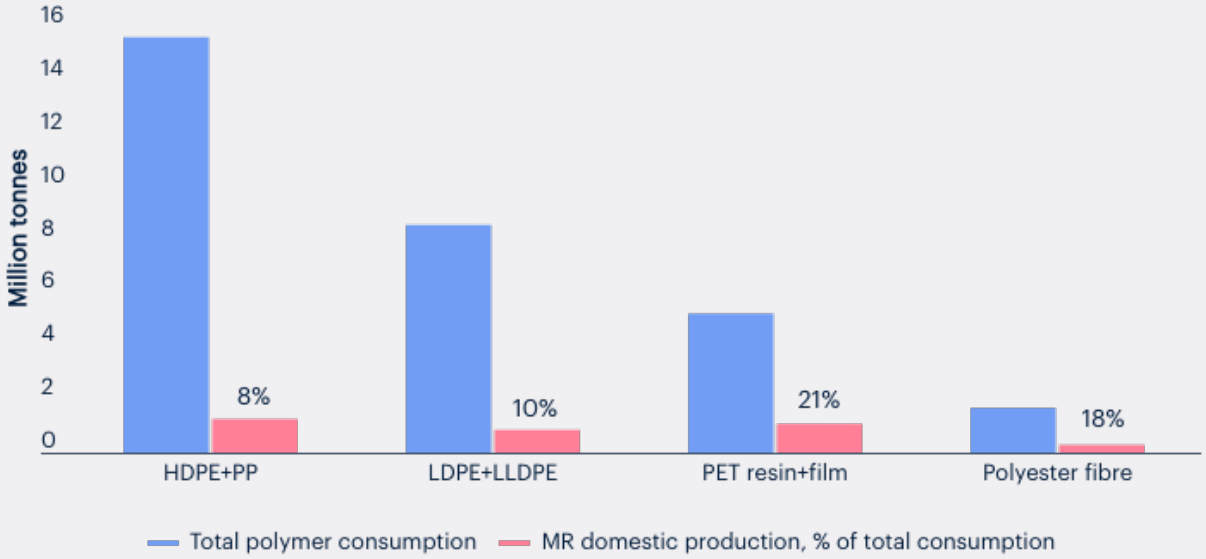
Over the few past years, the European plastics recycling industry faced a number of challenges, such as weak macroeconomic growth, high energy costs, low demand for plastics overall, lower cost virgin material and accessible imports.

However, the adopted and upcoming EU regulation launches a new reality for the European plastics recycling industry and creates an unprecedently powerful push for investment into the recycling infrastructure, in an attempt to increase supply of recyclates in line with expected demand growth.

In 2024, ICIS data showed that mechanically recycled (post-consumer material only) share of demand[9] in the EU was 8% for HDPE and PP, 10% for LDPE and LLDPE, 21% for PET resin and film, and 18% for polyester fiber, with total recycling output of around 1.3 million, 0.9 million, 1.1 million and 0.3 million tonnes respectively, as seen in Figure 7.

[9]Mechanical recycling (MR) market share of demand is defined as total domestic actual production of mechanically recycled polymers from post-consumer feedstock (excluding production waste, as per ICIS definitions stated in the glossary) divided by total consumption of polymer pellets (MR share of demand = MR domestic production/Total demand).

Figure 7: EU mechanical recycle (post-consumer material) share of demand, 2024



Source: ICIS

Overall, intrinsic technological barriers as well as the profile of end-use applications create natural challenges for polyolefins to be recycled mechanically. Significant expansion in polyolefin recycling is expected with the adoption of chemical recycling, which can process more complex materials and unlock new opportunities. However, chemical recycling is currently a nascent industry and acceleration of its growth is anticipated only after 2030.

Given that the above challenges are exacerbated by global virgin overcapacity, legislation becomes one of the key incentives (in addition to brand commitments and NGO pressures) for PE and PP recycling growth.

As for PET, European rPET is recognized as an established market, where industry has invested in collection, sorting and recycling infrastructure to achieve an elevated share of demand. Europe has been driven by high recycled content targets set by voluntary sustainability commitments and legislation, such as the EU SUPD.

Nevertheless, limitations arise when considering EU rPET feedstock and value chains for tray and fiber polyester production. For example, over 95% of rPET supplying the textile end market is produced from PET bottle bales and not from textile waste. Given ambitious recycled content targets for the packaging sector in the PPWR and the focus on circularity in EU regulation across industry sectors, PET bottle waste is expected to increasingly remain in a closed loop system, used to produce rPET for PET beverage bottles.

In total for rPE, rPP and rPET combined, around 5.4 million tonnes/year by 2030 and around 11.5 million tonnes/year by 2040 will be required by EU domestic producers to meet mandated minimum recycled content targets for packaging, automotive and fiber applications. In 2024, total output for all recycled polymer grades of rPE, rPP and rPET[10] was around 3.6 million tonnes.

[10]Some of those recycled polymers cannot be used for high-quality application like packaging and require further investment to upgrade the infrastructure to get to the suitable quality.

Table 4: Potential market impact of new EU recycling regulations

Regulations	Polymers primarily affected	Impact on demand for recyclates	Current potential to meet targets
PPWR	PET, PP, HDPE, LDPE, LLDPE	High ~11.5 million tonnes by 2040	High for PET Moderate for HDPE & PP
ELV-R	PP	Moderate ~0.5 million tonnes by 2040	Moderate
Potential textile industry regulation	PET	Moderate ~0.5 million tonnes by 2040	Moderate

Source: ICIS

Overall, EU plastics recycling output is poised for growth based on the following key factors and incentives for plastics recycling[11]:

- **Legislative incentive** – regulatory mandates for minimum recycled content and financial instruments, such as plastic taxes or eco-modulated EPR schemes, stimulating demand and consequently investment into capacity building for recycled polymers.
- **Sustainability commitment** – despite the most recent revisions of their voluntary pledges, brand owners still consider sustainability as one of the ways to achieve long-term competitive advantages in the market.
- **Actionability of recycling agenda** – despite slowdown in progress due to the wider economic environment, governments (new regulation and investment support), industry (voluntary pledges) and consumers (willingness to pay for sustainable products) remain committed to the sustainability agenda in the long term.
- **Waste management** – separate collection and sorting, including DRS, are gradually improving, including formal partnerships and joint venture investment of producers and waste managers into sorting infrastructure.

It remains unclear though whether these drivers will be enough to support development amid the challenging economic conditions and infrastructural constraints. If current development pace remains, ICIS expects demand to outpace domestic supply potential in the long term. While this is true for all polymers, PET is better positioned in terms of supply potential.

[11]ICIS Whitepaper 'Mechanical Recycling: state of play and long-term outlook', 2025

3.5. Routes to bridge the expected supply-demand gap

Given this likely situation with demand for recycled polymers outpacing supply in the ICIS baseline scenario for the EU regulatory targets, the region has several options to bridge the supply and demand gap[12].

Table 5: How to address expected supply-demand gap of recycled polymers to meet EU targets

	Increase import of recyclate	Allow bio-based polymers	Accelerate recycling growth
Complexity of implementation	Medium	Low	High
Implementation time horizon / effect speed	Mid-term	Short-term	Long-term
Contribution to solving EU plastic waste problem	Low	None	High

Source: ICIS

First, according to the PPWR, imported materials can count towards recycled content targets if they comply with the EU standards. This potentially opens an opportunity for recyclers outside the region to become suppliers to Europe, subject to obtaining the required certification, which has yet to be developed.

Second, upon review by the EU Commission by 2028, bio-based materials could potentially be included in the possible supply routes to meet some of targets. The expected increase of availability of bio-feedstocks for petrochemical steam crackers, such as bio-naphtha and bio-LPG, which is primarily driven by the ambitious sustainable aviation fuel (SAF) targets in the EU, can make bio-attributed polymers[13] a less complex way to address the recycled material supply and demand gap. However, this could also negatively impact the growth of recycling infrastructure. In addition, the switch to bio-based polymers does not tackle the issue of plastics waste at the end-of-life stage.

[12]The PPWR as well as drafted versions of ELV Regulation allow potential relaxation from, or exemption of targets based on the availability of recycled material through publication of further legislation.

[13]Bio-attributed polymers are typically produced from bio-naphtha and/or bio-LPG via existing petrochemical facility using mass-balanced approach.

Third, the most preferable way to address the gap is to accelerate growth of plastics recycling in the EU. However, this requires implementation of complex system-level solutions, as per Table 6, and can bring the desired effect only in the mid- to long-term horizon.

Table 6: System-level approach to plastics recycling growth

	Key areas	Particular measures
	Incentives for long-term demand	Mandated recycled content targets and well-tuned plastic taxes
	Economic support to infrastructure development	Extended producer responsibility (EPR) schemes and eco-modulated fees
	Best practices and innovations in waste management	Aligned guidelines and standards, design for recycling, high-tech for sorting (e.g. watermarks and artificial intelligence (AI)) and complex integrated recycling centres
	New recycling technologies	Legally recognised chemical recycling and a mass balance chain of custody model, greenfield capacity building
	Pro-active engagement with consumers	Benefits of deploying all the recycling technologies available and transparent environmental impact studies (LCA)

Source: ICIS

Key takeaways

- The EU's adopted and emerging regulation should significantly increase demand for recycled polymers.
- Major market impact in terms of demand for PE, PP and PET recyclates is expected from the PPWR.
- The ELV Regulation and potential textile regulation are likely to add extra demand for recyclate, particularly for PP and polyester fibers respectively.
- The required supply of recycled polymers is unlikely to keep pace, so a gap is anticipated.
- This gap can potentially be bridged by the acceleration of domestic recycling growth, inclusion of bio-based polymers as counting towards the targets or imports of recycled polymers.
- In addition to domestic producers, exporters to the EU market must prepare as well, including Chinese suppliers of finished goods in packaging, automotive and textile producers.

4. Impact on China's export sectors: risks, costs and compliance pressure

4.1. Market status of China exports to Europe along with an analysis of the most significant impacts

Following its green transition strategy, the EU is implementing a series of circular economy regulations such as the PPWR and the ELV Regulation, which establish targets regarding the incorporation of recycled content and recyclability. Ability to comply with these requirements will influence future market access and long-term competitiveness of Chinese export goods in the EU.

This section aims to address the crucial question: to ensure Chinese exports to the EU comply with recycled content regulations, how much recycled polymer would be needed? This is complex question to answer. In the case of packaging, for example, not only would direct packaging exports be affected, but in theory, packaging used in several finished product exports would need to be compliant with the PPWR's requirements. Adding to the complexity, different materials are used in packaging.

China exports a vast range of goods to the EU annually, spanning diverse sectors such as automobiles, electronics, textiles, toys, furniture, footwear, plastic products, among others. Leveraging this information as well as expert's views, ICIS developed estimates to answer this complex question.

Furthermore, collaborating with CPCIF, a view of how the Chinese industry is preparing for the implementation is shared.

4.1.1. Automobile industry

In 2024, China's automotive export value surpassed $117.4 billion, reflecting a 16% increase compared with 2023 ($101.6 billion). Concurrently, data from the China Association of Automobile Manufacturers (CAAM) indicates that China exported 5.859 million vehicles in 2024, marking a 19.3% year-on-year growth. In 2024, the export value of automotive products from China to the EU market is estimated to be around $32 billion, marking a 2% year-on-year increase and constituting approximately 15% of the total automotive export value. Specifically, complete vehicles account for around 62% of this export value, while components such as parts and bodies make up the remaining 38%.

In 2024, China exported a total of 896,000 vehicles to the EU, with 60% of these vehicles being traditional fuel cars, primarily in the commercial and entry-level passenger vehicle segments.

Impact of EU recycling regulations on plastics used in automobile manufacturing

PP is one of the primary raw materials for automotive plastics, widely utilized in the automotive industry. Although PE is used in certain components like fuel tanks and car interiors, and other types of plastics are also found in cars, PP is used the most, and therefore it is the focus of the impact estimates. According to ICIS estimates, in 2024, the total amount of PP embedded in vehicles exported from China to the EU market was 79,000 tonnes. This considers that each car exported requires approximately 56kg of PP. Additionally, in the same year, estimates show that automotive components exported from China to the EU market required around 27,000 tonnes of PP, accounting for 35% of the total PP needed for Chinese exports of automotive goods to the EU.

Assuming that the EU ELV Regulation is implemented as explained in *Section I: EU regulatory framework and global spillover effects* of this report, Chinese automotive exports would need to incorporate recycled plastics in the cars and, potentially, also in car parts to ensure compliance. Looking ahead to 2040, the total amount of rPP required for automotive exports from China to the EU is estimated to reach 26,000 tonnes, according to the low case scenario. In the high case scenario, the demand for rPP is expected to reach 29,000 tonnes to meet EU regulatory requirements.

With the continuous growth in China's automotive exports, these are the key trends for automotive plastics in products exported from China to the EU:

By 2040, automotive plastics in products exported from China to the EU is expected to increase to 205,000 tonnes, compared to 152,000 tonnes in 2024.

This growth is primarily driven by the increase in exports of new energy vehicles, especially as the export of hybrid vehicles rises. Hybrid vehicles, needing to balance both fuel and electric systems, exhibit greater demand for plastics compared to purely electric models.

The main reasons for the expected increase in demand for rPP materials in the automotive sector are the recycled content requirements.

4.1.2. Packaging material

The EU serves as a crucial destination in China's export market, playing a key role in China's export business, despite facing fluctuations in market share and to some extent geopolitical challenges. According to China's customs data, in 2024, the EU ranked as the third largest destination for exports, following ASEAN and the US, representing approximately 14% of China's total exports.

Chinese exports to the EU primarily consist of electronic products and labor-intensive products (such as textiles and footwear) showing a trend towards higher value-added grade goods. These products span various key established industries including electronics, furniture, toys, daily necessities, and medical devices, while experiencing growth in sectors such as new energy vehicles, photovoltaics, medical equipment, and cosmetics.

However, due to logistics, supply chain disruptions and rising labor costs, some traditional industries such as textiles, garments, and footwear, are facing challenges in demand from export markets.

Despite variations in export trends for different product types and diverse demands for plastic packaging across various goods, it is evident that these products heavily rely on plastic packaging. Each year, a large quantity of disposable packaging films, dust-proof bags, stretch films, and other plastic packaging products are widely used in goods exported from China to the EU.

Based on China customs data and other market information, ICIS estimates that the amount of plastic packaging required for Chinese exports to the EU exceeded 1.27 million tonnes in 2024. This takes into consideration China's annual demand of plastic packaging in major sectors in China - including electronics, furniture, toys, daily necessities and medical devices, among others - and the share of these products from China exports to the EU. From this, PE constitutes the largest proportion of raw materials needed for the plastic packaging, exceeding 60%, followed by PP at near 20%.

Impact analysis of EU regulations on plastics used in packaging industries

Based on ICIS's estimation, by 2040, demand for plastic packaging exported from China to the EU is projected to reach 1.52 million tonnes.

Taking into account that PE and PP account for over 80% of the polymers used in non-food plastic packaging, ICIS estimates a need for 601,000 tonnes of rPE and 195,000 tonnes of rPP by 2040 to ensure that plastic packaging for goods exported from China to the EU comply with the PPWR.

4.1.3. Textiles industry

China holds a dominant position in the global polyester fiber market as it is the largest consuming and producing country for both virgin and recycled fibers. The country is responsible for approximately 75% of worldwide polyester fiber demand and 79% of total global production. Moreover, polyester fiber represents a vital raw material in the textile and clothing manufacturing sector within China, constituting about 55% of the overall consumption of textile raw materials.

Approximately 55-60% of polyester fiber end-products from China, which encompass apparel, household textiles, footwear, and more, are designated for global export. The EU stands out as one of the significant markets for textile consumption and serves as a crucial export destination for Chinese products.

Consequently, any potential regulatory changes within the EU are likely to have an impact on the polyester fiber market in China.

Based on data from Chinese customs, ICIS analyzed exports of apparel, textiles, household textiles, carpets, and footwear, revealing that approximately **2.681 million tonnes** of these products were exported from China to the EU in 2024. This represents around **15%** of total textile exports from China for that year[14].

According to ICIS estimates for each export category in 2024, polyester fiber constituted approximately 57% of all textile products exported to the EU. This suggests that around **1.527 million tonnes** of polyester fiber was consumed domestically in China. This figure represents approximately 2.5% of China's total polyester fiber consumption and 2.4% of the country's overall polyester fiber production.

In 2024, while the EU has yet to establish specific regulations regarding the recycling content required in textile products, Chinese textile manufacturers are including recycled materials in their clothing production to meet industry ambitions. This is largely driven by their recognition of the growing emphasis on environmental sustainability within the EU market and targets from industry sectors such as apparel. Consequently, according to some textile and clothing traders, textile items that carry labels indicating that they contain over 50% recycled materials tend to have a competitive advantage and sell more readily in the target market.

[14]Specifically, this analysis includes products categorized under HS Codes 61, 62, parts of 63, 64, and 57.

In recent decades, the escalating labor costs in China have significantly impacted the production costs for textile and clothing manufacturers. Consequently, labor costs have assumed a more pivotal role in influencing operating costs within this industry. As a result of these shifts, the pricing differential between recycled and virgin fibers has narrowed. This shift results in a low differential between the two materials, encouraging an increased rate of adoption of recycling materials among textile and apparel producers, particularly for export orders designed for the EU and US markets.

Market research indicates that in 2024, nearly half of all export orders of apparel, household textiles, footwear, and more, originating from China to the EU market have incorporated recycled materials in varying levels. While these recycled materials encompassed various types such as polyester fiber, cotton, and hybrid fabrics, among others, recycled polyester fiber is presumed to maintain its status as the most prevalent due to its well-established technology and readily available raw materials.

It is estimated that the proportion of the recycled material used in these export orders was around 40% in 2024, with approximately 90% of this being attributed to recycled polyester fiber alone. This estimate suggests that approximately 0.483 million tonnes of recycled polyester fiber could be integrated into textile products exported from China to the EU directly in the last year. This equals around 18% of recycled polyester fiber used in all the textile products exported from China to the EU.

Furthermore, given the longer value chain associated with the polyester fiber industry, a significant portion of downstream polyester products like fabrics and cloths are exported from China to countries in southeast and south Asia. These products may eventually undergo further processing into end products within this region and finally exported to the EU market. These volumes traded within the Asia-Pacific region are not accounted for in the total export volumes to the EU.

This is one of the important scenarios which underscores how segments of the export market are intricately linked with recycling material usage amid evolving regulatory frameworks within the EU market.

When examining the exclusive focus on the Chinese market, it becomes apparent that two different scenarios will result in diverse implications for the future demand of recycled polyester fiber in China. The analysis takes into account a correlation between China's export growth to the EU and the growth rate of local textile demand within the EU.

Market research indicates that in 2024, nearly half of all export orders of apparel, household textiles, footwear, and more, originating from China to the EU market have incorporated recycled materials in varying levels.

Scenario 1: 25% recycled content target for apparel textiles by 2035

The data indicates that in 2024, China exported roughly 1.602 million tonnes of textiles and clothing to the EU. ICIS forecasts a reduction in local clothing demand within the EU by 2035.

Based on this trend, it is projected that China's exports to the EU will amount to around 1.378 million tonnes.

To meet the minimum requirement of 25% recycled content in these exports would result in a consumption level of 0.358 million tonnes of recycled polyester fiber.

Scenario 2: 25% recycled content target for plastics in all textiles end-use sectors by 2035

Likewise, if China's exports of all textiles end-use products to the EU was reduced by around 14%, this would result in China's export volume to the EU reaching 2.305 million tonnes by 2035.

Applying a mandate on the 70% polymer content used in textile products of minimum 25% recycled content in these exports suggests that the consumption of recycled polyester fiber would be at least 0.403 million tonnes.

In the longer term, and subject to the introduction of regulation supporting the use of recycled materials in food contact applications, there could be a shift in feedstock availability for textiles. The growth in demand for high quality feedstocks from the packaging, mainly beverages, sector will expand the end markets available for rPET. With multiple global brands in this sector holding ambitions of an average 50% recycled content in the 2030+ timeframe, this could attract rPET producers to switch to food grade qualities, thereby potentially achieving higher premiums. The impact would be of increased competition for, and higher prices of, feedstocks. Overall, this has the potential to reduce the supply of rPET to the textile sector, which could negatively impact the demand for those textiles should they fall below the required recycled content levels of existing clients - namely in Europe and North America.

4.2. Coping with strategies diversity of Chinese enterprises

This section focuses on understanding how Chinese players in sectors such as packaging and automotive have been reacting to EU's recycling regulation. It offers a view of response strategies of enterprises based on data from 12 companies interviewed by CPCIF. While the sample size is small for a large and fragmented market as the Chinese one, research findings indicated a high level of awareness with some of the companies interviewed already incorporating them into their strategic planning.

4.2.1. Analysis of Chinese exporters' awareness of EU-27 regulations

Among the EU circular economy regulations mentioned by the interviewed companies, the PPWR is most frequently cited. It is the most prominent regulation influencing industries such as packaging, beverages, and cosmetics, reflecting compliance pressure in the packaging export sector.
For respondents in the automotive industry, the ELV Regulation was the main regulation mentioned.

4.2.2. Impacts and strategic responses of Chinese exporters to EU recycling regulations

When asked about the expected impacts of the implementation of EU circularity regulation, interviews shared views that pointed to a duality.

While regulations such as the PPWR and ELV Regulation are seen as challenging to comply with, they also considered an opportunity. Aligning with certification and traceability requirements might require changes in material sourcing and in some cases product design, leading to additional operating costs in the short term. However, it is expected that demand for compliant materials will be boosted. Some Chinese companies have also indicated that through compliance, they expect to further enhance their competitiveness in the international market.

For instance, in terms of cost-effectiveness, in the short term, regulations may lead to increased operating costs, but the premium pricing position of their products is mentioned as likely to improve. In the long term, incorporation of recycled materials can support sustainability goals and potentially enhance brand value perception.

When asked about strategies to deal with the upcoming changes, most companies emphasized plans to focus on obtaining relevant certifications as well as developing specific product lines for export to the EU. Additionally, some companies have already shifted their research and development (R&D) focus to not only to recycled materials, but also to bio-based solutions. China has the potential to make advances in the bio-based sector given the scale of projects typical to this market. It will, of course, depend on end-user appetite to adopt, but with supply availability and price currently a major barrier to the market then future developments will be key to supporting any breakthrough for this feedstock. Others believe that EU regulations can also help drive the establishment of domestic standards in China, eventually supporting internal demand for recycled polymers.

In terms of the impact on strategy, companies interviewed demonstrated three key approaches to address these developments, including:

- Basic compliance through certification and regulatory alignment.
- Market differentiation by developing EU-specific product lines and enhancing brand value through sustainability.
- Business model restructuring, including shifts in R&D toward recycled and bio-based materials.

In addition to these strategic responses, companies anticipate that the impact of EU regulations will manifest across four main areas: cost structure, market access, technological innovation, and trade flows. In the packaging industry, companies expect additional costs arising from potential packaging redesigns and procurement of certified recycled plastics. Need for dedicated compliance/stewardship teams is also expected to contribute to additional costs. Furthermore, these companies will also alter their raw material sourcing channels due to the necessity of utilizing compliant recycled materials. If Chinese raw materials fail to meet the requirements, some enterprises may be compelled to establish packaging lines in other markets, leading to short-term cost increases.

In the automotive and parts industry, key barriers include stricter material recycling requirements, increased costs from battery passport systems, and a shortened procurement radius for recycled plastics. These factors may prolong certification periods and reduce competitiveness of some players in export orders.

For chemical raw material companies, the main impact comes from rising transformation pressures, including increased investment in chemical recycling and longer R&D cycles for chemically recycled and bio-based materials. At the same time, growing demand for EU-compliant recycled materials presents opportunities for high-performance and polymers that are easy to recycle.

5. Overview of China's regulations on recycled polymers

As one of the world's largest producers and consumers of plastics, China faces the dual challenge of plastic pollution and resource circularity. Guided by its "carbon peaking and carbon neutrality" targets, China has built a comprehensive plastic life-cycle governance framework globally. Through an integrated "five-pillar"[15] system of institutional innovation, the country is playing a key role in reshaping the sustainable development trajectory of the global plastics value chain. The strategy aims to achieve reduction, reuse and resource recovery of plastics via source reduction, process management and end-of-life recycling - accelerating the sector's transition toward a circular economy.

5.1. Overview of China's regulatory framework

5.1.1. Top-level legal framework

China has established a legal system for plastic pollution control centered on the Law on the Prevention and Control of Environmental Pollution by Solid Waste (revised 2020) and the Circular Economy Promotion Law. The Solid Waste Law enshrines the principles of "reduction, resource utilization and harmlessness", strengthens government oversight responsibilities, explicitly bans the import of foreign waste and codifies household waste classification. The Circular Economy Promotion Law establishes mandatory recycling mechanisms and provides the legal foundation for EPR schemes. Together, these two laws create a regulatory framework for full life-cycle plastic governance - addressing pollution prevention and resource management. Building on this foundation, the Action Plan on Plastic Pollution Control (2021) incorporated plastics into national EPR pilots, requiring companies to assume end-to-end responsibility across product design, collection and disposal.

5.1.2. Policy opinions and action plans

China has further shaped its policy framework through two cornerstone documents: the Opinions on Further Strengthening the Control of Plastic Pollution[16] and the 14th Five-Year Action Plan on Plastic Pollution Control[17]. Together, these policies define a governance pathway of "banning and restricting a group, substituting a group and standardizing a group", setting the direction for systematic plastic management. Figure 8 summarizes key targets:

[15]Refers to legal constraints, policy incentives, standards leadership, market drivers, and technological support.
[16]NDRC Environment & Resources [2020] No 80, hereinafter "Document 80"
[17]NDRC Environment & Resources [2021] No 1298, hereinafter "Document 1298"

Figure 8: Summary of China's key policy documents impacting waste plastics

Phased restrictions and bans on plastics

(Document 80 introduces a gradual control regime targeting four categories of key plastic products)

By end-2020: A full ban on the import of waste plastics; phase-out of ultra-thin plastic bags (<0.025mm) and single-use foamed tableware

By end-2022: Expansion of the ban on non-degradable plastic bags, straws and related items from municipalities to all county-level cities and above nationwide

By end-2025: Complete prohibition of non-degradable plastic packaging bags and adhesive tape in postal and courier outlets

Comprehensive governance targets (by 2025)

(Document 1298 sets three quantitative targets across the full plastics value chain)

Source reduction: Virtually all e-commerce parcels to require no secondary packaging; promotion of 10 million reusable courier packages

Recycling and recovery: Nationwide coverage of waste sorting and plastic recycling systems in all prefecture-level cities and above; agricultural mulch film recovery rate ≥ 85%

End-of-life disposal: Urban municipal solid waste incineration capacity increased to 800,000 tonnes/day; plastic landfilling reduced by over 30%

5.1.3. Departmental regulations and standards

China is advancing high-quality development of its recycled plastics industry through a comprehensive standardization framework.

Industry regulations. In 2015, the Ministry of Industry and Information Technology (MIIT) issued the Specifications for the Comprehensive Utilization of Waste Plastics, setting entry thresholds for enterprises (eg new PET facilities must have a minimum annual processing capacity of 30,000 tonnes). A "white list" mechanism was also introduced to guide industry consolidation, with nearly 100 enterprises currently included.

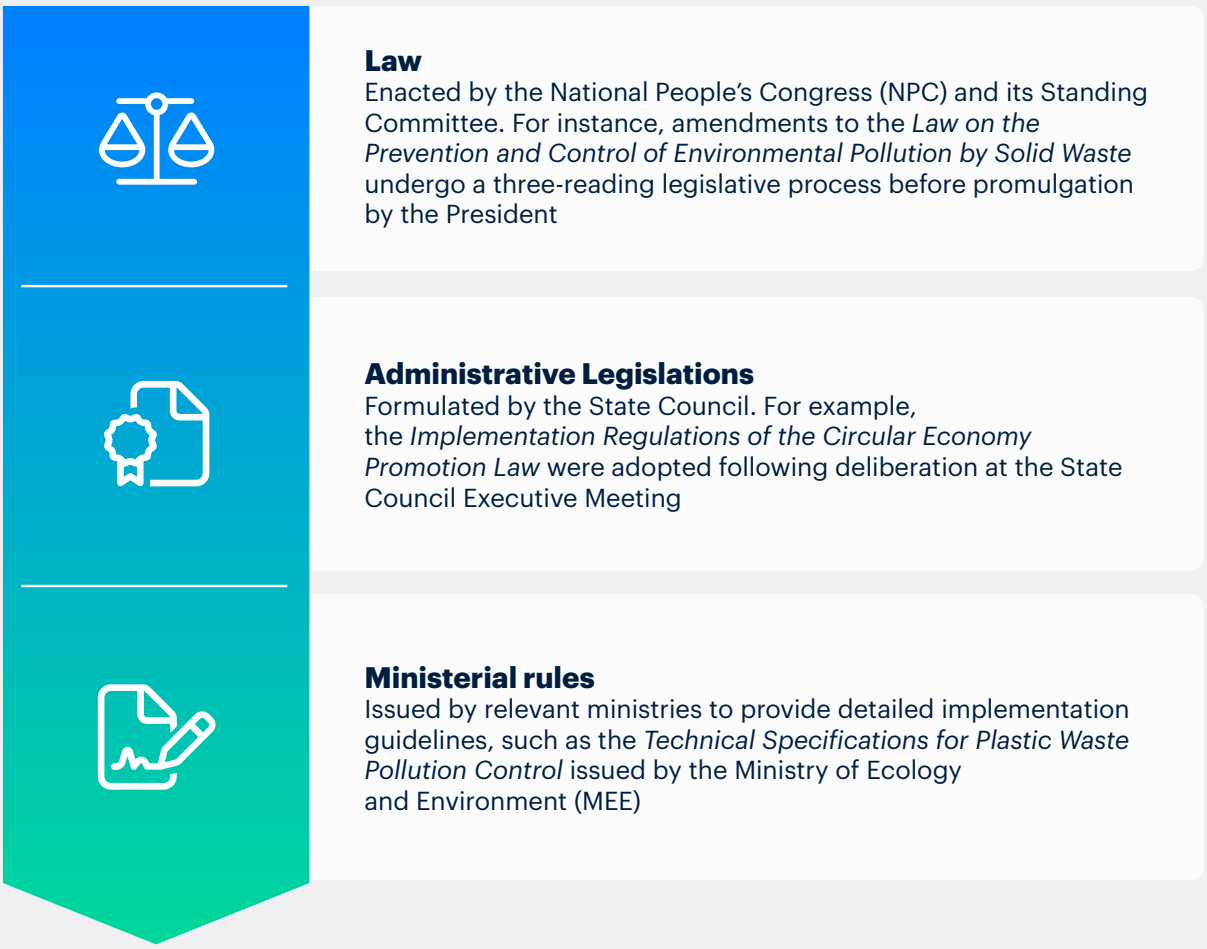
Standards system. In 2023, the release of the National Standards for Recycled Plastics filled a long-standing gap in quality benchmarks for rPET, rPE and rPP resins. The standard for rPET bottle flakes is aligned with high quality grades found in other markets and has been adopted as a basis for customs supervision. At the same time, the industry has established certification systems such as the "Dual-Easy Label" (circular arrow symbol) and the "Recycled Mark" (再), enhancing traceability of recycled content.

Multi-tier framework. To date, China has developed a multi-layered system compromising quality and reporting standards at national, industry, provincial and association level. This framework has significantly improved product quality and industry transparency, accelerating the sector's shift toward standardized and higher-value development.

5.2. Overview of China's legislative process

China promotes the development of a plastics circular economy through a multi-tier legislative framework comprising three levels, as shown in Figure 9 below:

Figure 9: Overview of China's legislative process



5.2.1. Ministerial rules

Issued by relevant ministries to provide detailed implementation guidelines, such as the Technical Specifications for Plastic Waste Pollution Control issued by the MEE.

The legislative system follows a rigorous procedure, including consultation and expert reviews over multiple stages of legislation development. Major legislation is coordinated with lower-tier regulations to ensure the integration of policy at various levels, ensuring plastic pollution control measures and circular economy objectives are aligned.

This three-tier legislative model of "law–regulation–rule" provides a robust institutional foundation for the full life-cycle management of plastics.

5.3. Key regulatory policies: Objectives and timelines

China's regulations on plastic recycling and pollution reduction are typically structured around phased objectives and implementation schedules, designed to achieve policy goals in a progressive manner. Table 7 highlights the major milestone targets of selected key policies:

Table 7: Summary of key policies

Policy document	Timeline	Core targets and quantitative indicators
Opinions on Further Strengthening the Control of Plastic Pollution (2020)	**By end-2020**	• Ban on the production and sale of nine categories of products, including ultra-thin plastic bags • Prohibition of non-degradable plastic bags in supermarkets and shopping malls in key cities
	By end-2022	• Prohibition of non-degradable plastic bags in supermarkets and shopping malls in all prefecture-level cities • Ban on non-degradable tableware in the catering sector of county-level cities • Ban on non-degradable packaging in the express delivery sector in key provinces and cities
	By end-2025	• Nationwide ban on non-degradable packaging in all courier outlets • 30% reduction in single-use plastic tableware consumption in the takeaway sector
14th Five-Year Action Plan on Plastic Pollution Control (2021)	**By 2025**	• 100% of e-commerce parcels shipped in original packaging • 10 million reusable courier packages in circulation • Full coverage of waste sorting systems in all prefecture-level cities • Agricultural mulch film recovery rate ≥ 85% • Municipal solid waste incineration capacity of 800,000 tonnes/day
Opinions on Building a Circular Economy System for Waste Utilization (2022)	**By 2025**	• 450 million tonnes/year of recycled resource utilization • Yuan (CNY) 5 trillion output value of the circular economy industry
	By 2030	• Significant increase in the share of recycled materials • Circular utilization level among the world's leading standards

5.4. Challenges faced by enterprises

As plastic recycling and circular utilization regulations become increasingly stringent, enterprises will encounter multiple challenges and pain points in achieving compliance. These are summarized in Table 8.

Table 8: Major challenges for recycling industry development in China

Main challenge	Current situation	Difficulties faced by enterprises
High certification thresholds for recycled material quality	• New national standards require recycled resin purity (eg PET flakes) to approach virgin-grade quality. Regulatory authorities (eg Customs) are already inspecting recycled products against these standards, with non-compliance subject to penalties	• Need to upgrade sorting and washing equipment, increasing capital expenditure • Must establish end-to-end quality control systems to ensure compliance and high product pass rates
Challenges in digital traceability of supply chains	• The Green Recycled Plastics Supply Chain Group (GRPG) standard requires full-chain traceability, with data retention and verification across collection, processing and sales	• Plastics recycling chains are long and fragmented, making it difficult to verify the proportion and legality of recycled content in products • Achieving transparency and traceability requires cross-industry collaboration and regulatory incentives
High compliance costs and investment pressure	• Historically, many small-scale workshops have operated with limited environmental controls, posing pollution risks. Compliance now requires multiple permits, certifications and third-party audits, all of which add hidden costs.	• Higher quality requirements for recyclates demand more precise sorting, washing and modification, necessitating advanced equipment • Building wastewater and air treatment facilities requires specialized technical expertise • Meeting plastic ban requirements may involve reformulating products, adopting degradable materials or redesigning for recyclability, raising overall costs
Structural imbalance in raw material supply	• **Policy-driven demand growth:** Rising demand for high-quality recycled materials from brand owners and downstream users	• **Feedstock shortage:** Since the 2018 ban on imported plastic waste, supply is entirely dependent on domestic collection, which remains insufficient

Table 8: Major challenges for recycling industry development in China

Main challenge	Current situation	Difficulties faced by enterprises
Structural imbalance in raw material supply	• **Domestic supply chain instability:** Raw material shortages and quality variability limit substitution of virgin resins • **Low recycling rate:** Only ~30% of plastic waste is recycled in China, with significant losses due to inadequate sorting and reliance on incineration/landfills • **Uneven recycling structure:** Easily recyclable streams (eg PET bottles, packaging films) dominate, while mixed plastics remain difficult to recycle at scale • **Corporate responses:** Some large enterprises are investing in closed-loop recycling (eg beverage companies reclaiming PET bottles, appliance makers recycling used appliances) or importing high-performance grade recyclates to fill gaps	• **Quality inconsistency:** Variations in impurity levels and performance across batches complicate stable industrial use, requiring additional quality control (QC) and modification • **Rising management costs:** Companies must strengthen oversight across procurement and processing to ensure quality against increasing operational complexity and cost • **Shortage of high-performance grade recyclates:** Domestic supply of premium recycled plastics remains limited, forcing some firms to rely on imports, with demand expected to rise further by 2025 • **Limited policy support:** Enterprises call for stronger government action to improve collection systems, raise recycling rates and support quality upgrading and technological innovation

These challenges highlight that achieving policy objectives requires not only government regulation and standards-setting but also sustained corporate investment and technological innovation. Leading enterprises are already transforming compliance requirements into opportunities for transition - investing in R&D to design products that are easier to recycle and regenerate, while increasing the share of recycled materials in their portfolios. However, small- and medium-sized enterprises (SMEs) generally face the dual constraints of limited capital and access to technology, making them more vulnerable to regulatory measures.

Targeted policy support - such as fiscal subsidies, tax incentives and industry guidance - is urgently needed to mitigate these risks. Only by addressing enterprises' practical difficulties can the ambitious vision of a plastics circular economy be fully realized.

5.5. Outlook on recycled material demand and supply: Demand alignment under policy impacts

5.1.1. Rising demand for recycled materials

Restrictions on single-use plastics and incentives for circular economy development are accelerating the adoption of recycled plastics across industries. As waste-sorting systems improve and public awareness of environmental protection grows, more plastics are being collected and reprocessed, partially substituting virgin resin. Against the backdrop of carbon neutrality, using recycled resins in place of petrochemical plastics can significantly reduce carbon emissions, leading more companies to incorporate recycled content into their decarbonization strategies. In 2025, for the first time, recycled plastics were explicitly referenced in the State Council's Government Work Report, underscoring high-level recognition of the sector. This is expected to further strengthen market confidence and attract state-owned enterprises and foreign investors into the recycled plastics sector, accelerating industry expansion.

If policy stringency continues to increase alongside effective incentive mechanisms, the recycled plastics market is likely to evolve from being primarily cost-driven to policy- and value-driven. Penetration rates across packaging, automotive, home appliances and construction materials could rise significantly. As one of the largest users and generators of plastics and plastic waste, China will account for a substantial share of incremental demand. Recycled plastics would thus transition from a supplementary feedstock at the margins to a core material stream for the plastics industry - potentially ushering in a golden era for the country.

5.5.2. Raw material supply and recycling capacity

To meet surging demand, domestic supply of feedstock and recycling capacity must scale up in tandem. Over the past two years, major petrochemical and environmental companies have built or expanded recycling facilities, deploying advanced processes to improve output quality. For example, petrochemical firms are piloting chemical recycling technologies that break down plastic waste back into oil or monomers, while home appliance companies are building closed-loop disassembly–modification–remanufacturing lines to produce high-performance grade recycled resins. New capacity investments in chemical recycling are expected to gradually expand overall domestic supply.

5.5.3. Policy-market synergies

The government has acknowledged the supply-demand mismatch and is advancing standards and oversight to improve the quality of domestic recyclates, while also leveraging international cooperation to diversify feedstock sources. Measures include encouraging compliant overseas processing of recyclates with subsequent imports, as well as participation in global plastics circularity initiatives to secure shared material supply channels. Looking ahead, with improvements in collection systems, technological upgrades and continued policy support, China's recycled plastics market is expected to gradually reach supply-demand equilibrium in the long term, fostering high-quality growth of the circular economy.

According to projections by the China National Resources Recycling Association (Recycled Plastics Branch), by around 2030, recycling will overtake incineration and landfills as the dominant disposal pathway for plastic waste. This implies that most plastic waste will be reintroduced into the material's lifecycle through mechanical or chemical recycling.

Overall, China's regulatory framework for plastic recycling and the circular economy is driving deep structural change across the industry. From government to enterprises and the public, a growing consensus is emerging: plastic pollution control and circularity are not only environmental imperatives but also new engines for economic opportunity and industrial advancement.
Under the dual forces of policy guidance and market dynamics, China is poised in the coming years to significantly increase the recycling and recovery of plastic waste, transitioning from a major plastics producer and consumer to a global leader in plastic circularity, while contributing valuable experience to the global circular economy.

Overall, China's regulatory framework for plastic recycling and the circular economy is driving deep structural change across the industry. From government to enterprises and the public, a growing consensus is emerging: plastic pollution control and circularity are not only environmental imperatives but also new engines for economic opportunity and industrial advancement.

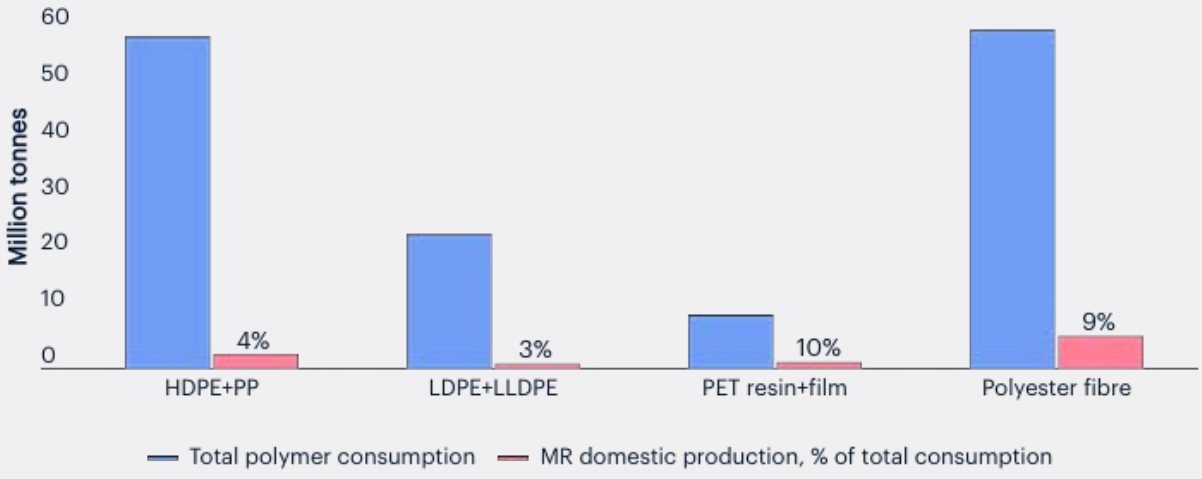
6. Supply outlook and industrial synergies: EU-China recycling landscape

6.1. China's recycling market status

As the largest plastics producer and consumer, China also produces the largest volumes of recycled polymers globally. In 2024, China's total mechanical recycled polyolefin and polyester polymer output with feedstock from post-consumer waste reached 9.6 million tonnes.

The mechanically recycled (post-consumer material only) share of demand[18] was 4% for HDPE and PP, 3% for LDPE and LDPE, 10% for PET resin and film, and 9% for polyester fiber, with total recycling output of around 2.4 million, 0.7 million, 1 million and 5.6 million tonnes, respectively, as shown in Figure 10.

Figure 10: Mechanical recycling (post-consumer material) share of demand in China in 2024



Source: ICIS

[18]Mechanical recycling (MR) market share of demand is defined as total domestic actual production of mechanically recycled polymers from post-consumer feedstock (excluding production waste, as per ICIS definitions stated in the glossary) divided by total consumption of polymer pellets (MR share of demand = MR domestic production/Total demand).

As figure 10 shows, polyester fiber accounts for the largest mechanical recycling output in China, reaching 5.6 million tonnes. While this represents 9% of demand for fibers, recycled polyester fibers are currently almost exclusively produced from PET resin waste (bottles). The demand for recycled PET resin in China is still a nascent market as regulation currently does not allow the use of recycled polymers for food contact applications domestically. Presently, some Chinese companies produce food grade rPET for export markets such as the US. China's domestic policy discussions and technical evaluations are ongoing, and expectations are that in the future China may allow the use of recycled plastics in food contact applications. This could impact the feedstock availability for recycled polyester fiber due to the potential competition with food contact applications.

China's output of recycled polyolefins is relatively lower compared with recycled polyester fiber and PET resin. The country's recycled polyolefin output with feedstock from post-consumer waste reached 2.4 million tonnes for HDPE and PP, and 0.7 million tonnes for LDPE and LLDPE in 2024, ICIS data shows.

Despite its market size, China's recycling plastics industry is fragmented and unevenly developed across its regions, with thousands upon thousands of companies involved in material flow of waste management, sorting and recycling.

The capacity scale of medium-to-large recycled plastics producers in China is 10,000-20,000 tonnes/year for recycled polyolefins and 50,000 tonnes/year for rPET producers. Currently, there are a limited number of large-scale rPET manufacturers in China, with capacities above 100,000 tonnes/year. Meanwhile, there are thousands of smaller-scale recycled plastics producers in China with an average capacity at 1,000 tonnes/year. The plastic waste collection industry is even more fragmented. There are more market players in the upstream feedstock sector including waste management and sorting, currently representing the vast majority of those employed in the recycling sector.

In recent years, China's waste management and recycling infrastructure has seen significant advancements, particularly in major cities. But notable disparities persist, especially in the rural areas and less-developed urban centres (tier-3 cities). Key improvements include the expansion of sorting centres, enhanced municipal collection systems[19], and pilot projects incorporating digital recycling platforms alongside smart sorting technologies such as AI-powered sorting and IoT-enabled tracking. Leading cities such as Shanghai and Beijing have established municipal recycling parks and community collection points as part of these advances.

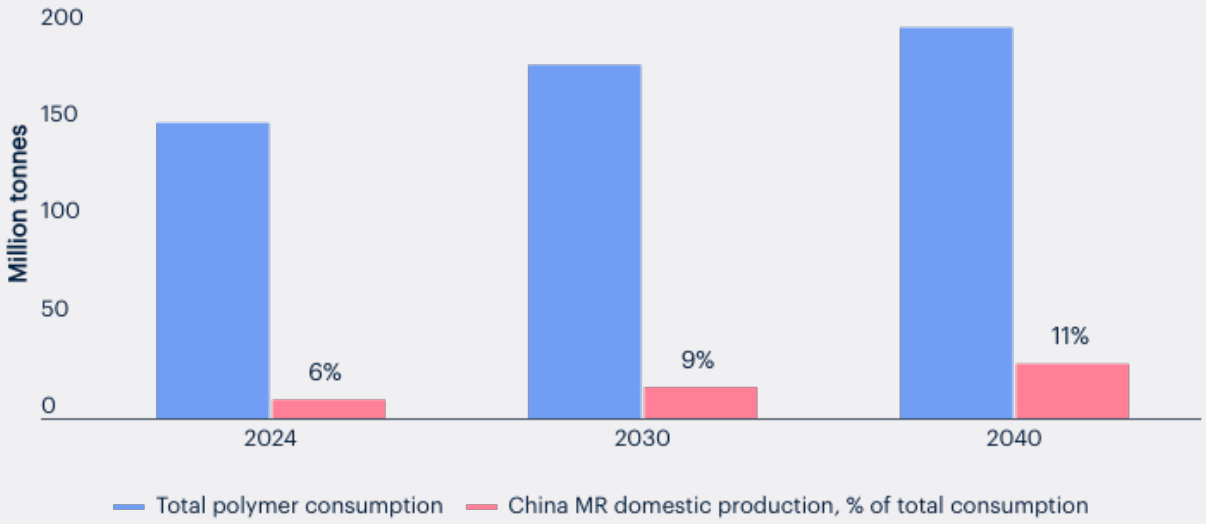
Despite these rapid developments, challenges remain in achieving a uniform waste classification system, ensuring collection quality, enabling effective feedstock traceability and extending network coverage outside major metropolitan areas. To overcome these gaps, substantial investment from both the public and private sectors needs to be directed towards expanding clean collection systems, developing regional processing hubs, adopting advanced sorting technologies and implementing digital traceability mechanisms.

[19]Example
JingSu: Creating value from plastic waste along the Yangtze | AEPW
Partnership with LOVERE | AEPW
AI-enabled sorting machines keep plastic in circular economy | Unilever

6.2. China's recycling market supply outlook

In 2024, mechanical recycled polymers accounted for around 6% of China's total polyester and polyolefins demand. It is expected to increase to around 9% and 11%, respectively, in 2030 and 2040 in the ICIS base case scenario. This equates to 16 million tonnes and 22 million tonnes of recycled polymer output with feedstock from post-consumer waste.

Figure 11: Mechanical recycling (post-consumer material) polymer output as a share of demand, 2024-2040



Source: ICIS Recycling Supply Tracker and Supply & Demand Database

China's plastics recycling output is poised for this growth based on the following key factors:

1. Legislative incentive to drive demand – Despite the widespread ban on certain types of single-use plastics across different regions in an attempt to control plastic pollution, the lack of mandates on recycled content incorporation is limiting the growth of demand for recycled plastics domestically. Meanwhile, in China, Ministries including the MIIT have called for the promotion of advanced technologies such as integrated crushing, washing, compounding and pelletizing lines, as well as the enhancement of capacity and quality of recycled plastics production.

2. Sustainability commitment – Although there is a general trend of governments enforcing stricter standards by requiring more public companies to report on sustainability milestones in accordance with international standards, the voluntary recycling pledges are considered to have a weaker impact on long-term demand relative to Europe or the US. As pressure from consumers is limited, companies are likely to decrease some sustainability commitments in light of possible economic pressure. The competition from virgin material remains a key factor, with many brand owners being likely to prioritize healthy margins over the potential price premium required to incorporate high-quality recycled material. That limits the attractiveness of investments to recycling from this part of the chain.

3. Actionability of recycling agenda – While China's policy measures are driving up demand for high-quality recycled materials, the current supply chain remains underdeveloped and unstable. Gaps in supply chain maturity are a key bottleneck in realizing circular economy targets. Achieving policy objectives requires more than regulatory mandates - it depends equally on enterprise-level innovation and investment, as well as consumer willingness to pay a premium for recycled material, which is overall considered lower relative to Europe and North America.

4. Waste management – Local governments have pushed for a more systematic waste collection and sorting system in some cities in east China but this system is unevenly developed elsewhere, especially in rural areas. China's State Council issued the "Opinions on Accelerating the Construction of a Waste Recycling System"[20] in early 2024. It is a comprehensive policy framework aimed at rapidly developing a nationwide, efficient and standardized waste recycling system across all sectors, with deeper advancement by 2030. An improvement of the country's waste management infrastructure is widely expected based on the related policies.

[20]See "https://www.gov.cn/zhengce/zhengceku/202402/content_6931080.htm" Opinions on Accelerating the Construction of a Waste Recycling System

Besides the incremental supply of recycled polymers brought about by mechanical recycling, the rapidly developing chemical recycling sector is considered one of the main drivers of recycled polymers supply in the long term. By enhancing the efficiency of recycling mixed plastics that are difficult to process through mechanical recycling, chemical recycling can leverage vast volumes of plastic waste for recycling and increase recycle plastics supply in the long term.

6.3. Increasing demand from Europe

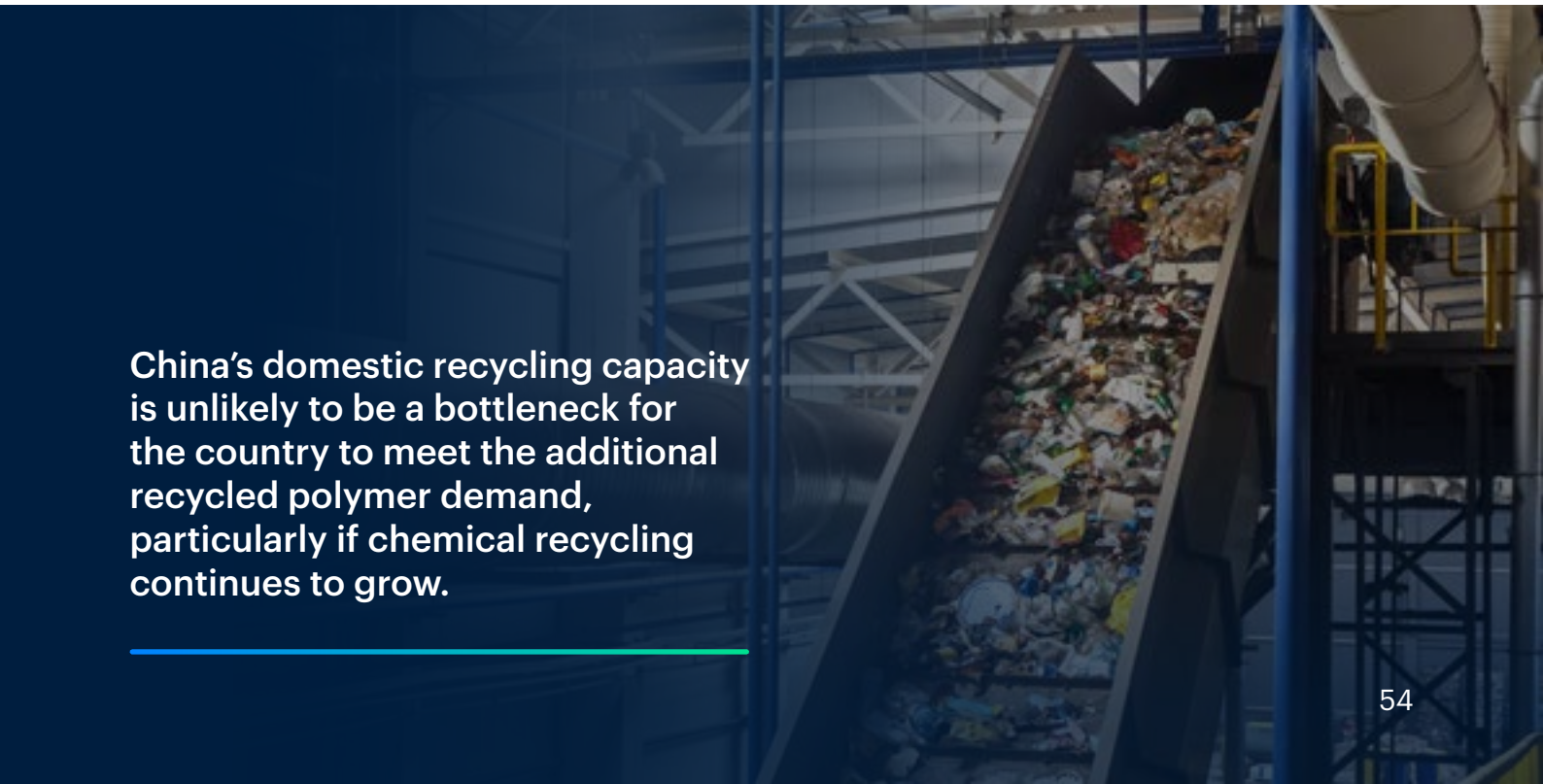
According to the estimates developed in the "Impact on China's export sectors: Risks, costs, and compliance pressure" section of the report, over 1 million tonnes of recycled polymers (rPE, rPP, rPET) could be necessary to meet circular economy recycled content in product exported to the EU.

China's mechanical recycled polymer output is expected to increase from around 9.6 million tonnes in 2024 to 16.0 million tonnes and 22.0 million tonnes in 2030 and 2040.

Therefore, while volumes are considerable, China's domestic recycling capacity is unlikely to be a bottleneck for the country to meet the additional recycled polymer demand, particularly if chemical recycling continues to grow. Ensuring the availability of suitable plastic waste will, however, be crucial to allow this. It is also important to consider that China's domestic market is still developing and there could be significant changes in recyclate availability for exports if domestic recycled content mandates are implemented or if for example regulation allows the use of recycled polymers in applications such as packaging.

Additionally, there could be also an opportunity to supply recycled polymers directly, if the EU uses imported recyclates to bridge the expected supply gap. ICIS estimates that around 5.4 million tonnes of rPE, rPP and rPET will be required by EU domestic producers to meet the mandated minimum recycled content targets for packaging, automotive and fiber applications by 2030. This is expected to increase to 12 million tonnes by 2040. In 2024, Europe's total output for all recycled polymers was around 3.6 million tonnes.

That means the EU's additional demand for recycled polymers will be around 1.8 million tonnes by 2030, and around 8.4 million tonnes by 2040 compared with its output in 2024. While this gap could potentially be bridged by accelerating growth in the EU's recycling capacity or through the inclusion of bio-based polymers in targets, imports could be another possible avenue.



China's domestic recycling capacity is unlikely to be a bottleneck for the country to meet the additional recycled polymer demand, particularly if chemical recycling continues to grow.

7. Case studies: Chinese industry initiatives

7.1. Chemical recycling - HCpect: Tackling the challenge of mixed plastic waste through chemical recycling

Company profile

HCpect is an innovative high-tech enterprise that has pioneered the development of "Catalytic Pyrolysis for Deep Conversion of Mixed Waste Plastics" (CPDCC), enabling the high-value utilization of low-grade mixed plastic waste—including contaminated and composite materials. Through this technology, the company is reshaping the model of municipal solid waste management and petrochemical feedstock supply chains, while driving upstream–downstream integration.
Its proprietary CPDCC technology not only represents a major technological development but also establishes a closed-loop model that spans the entire value chain.

First demonstration plant

HCpect's first CPDCC facility has been commissioned in Jieyang, Guangdong, with an annual capacity to process 200,000 tons of plastic waste. The project uses municipal solid waste and waste plastics from paper mills as feedstock, offering a practical solution for the high-value utilization of low-grade mixed plastics and providing a feasible pathway to eliminate plastic pollution.

Figure 12: View of Pyrolysis Unit of HCpect's first CPDCC facility in Jieyang, Guangdong
Source: HCpect

Technological Breakthroughs

Independently developed by the company, CPDCC technology overcomes key bottlenecks. According to HCpect, it can process low-value mixed plastics (including PVC), with stable feedstock supply. Additionally, it also features reverse-flow reactor design, multi-olefin catalyst systems, and integrated HCl capture and removal. The technology enables one-step catalytic pyrolysis of mixed plastics into ethylene, propylene, and BTX aromatics, with an overall reported product yield of 92%. Compared with traditional two-step processes, HCpect states that CPDCC improves olefin yields by approximately 40% while significantly reducing energy consumption and carbon emissions.

Closed-Loop Value Chain: Waste Plastics to Plastics

On the output side, the products are supplied to major downstream petrochemical enterprises, replacing around 30% of fossil-based feedstocks according to HCpect and forming a circular pathway of "waste plastics → low-carbon olefins → new plastics." At the same time, HCpect collaborates with leading packaging companies to apply chemically recycled materials in high-end PE/PP film packaging, reaching international application standards.

Figure 13: View of Feedstock-to-Chemicals Unit of HCpect's first CPDCC facility in Jieyang, Guangdong
Source: HCpect

Key Takeaways

Through the model of "waste plastics collection + chemical recycling technologies + petrochemical integration," HCpect has delivered a scalable and commercially viable solution for complex, low-value mixed plastics. By embedding its technology into the petrochemical value chain, the company not only ensures economic feasibility but also delivers potential substantive impact for the circular economy.

Figure 14: Panoramic View of Pyrolysis Unit of HCpect's first CPDCC facility in Jieyang, Guangdong
Source: HCpect

7.2. Mechanical Recycling - Kingfa Sci & Tech: Multi-Technology Matrix and Global Value Chain Leadership

Company profile

As a leader in modified plastics, Kingfa is driving the green transformation of the plastics industry through three synergistic pathways: recycled materials, bio-based polymers, and biodegradable plastics. Leveraging a global recycling network and cross-sector collaboration, Kingfa aims to strengthen its position within the circular economy by embedding sustainability as a core source of competitive advantage.

Technology Platform Strength

In recycling, Kingfa employs AI-enabled sorting and cascade recycling technologies to produce recycled materials, with its scope reaching 95% of virgin plastics, according to the company. These recycled materials have received company approvals from international clients including Mercedes-Benz, BMW, Lenovo, HP, Dell, Nestlé, IKEA, Canon, Epson, Unilever, and Procter & Gamble, and are widely applied across the automotive, home appliance, consumer electronics, and packaging sectors.

In bio-based innovation, the company has developed a first in 100% bio-based PBS, certified for food contact, and Kingfa states its bio-based BDO achieves a 40% lower carbon footprint compared with conventional production routes - setting a benchmark for industry decarbonization.

Figure 15: Waste plastics washing line from appliance dismantling at Qingyuan
Source: Kingfa

Ecosystem Integration

Kingfa has built an international recycling network with 60 collection centers and 500 suppliers, covering both post-consumer and ocean plastics.

Through cross-sector collaboration the company stated developments include:

Automotive: Co-developing recycled PP bumpers with Toyota, reducing carbon emissions by 30%.

Electronics: Supplying Lenovo with PC/ABS alloys containing 30% recycled content for premium laptops.

Packaging: Collaborated with Unilever, L'Oréal, and Procter & Gamble to develop personal care packaging with high rPE content; supplied bio-based, biodegradable plastics to Carrefour, Sam's Club, and Walmart for use in single-use shopping bags.

On the ESG front, Kingfa has established a supplier rating system and requires major brand partners to increase the adoption rate of recycled materials.

Standards and Circular Thought Leadership

Kingfa has introduced its "Plastic to Purpose" framework, covering the entire value chain from collection to recycling to end market application, and has replicated this model across southeast Asia. According to the company, in 2023, its recycled plastics business achieved a 35% gross margin, enabling annual R&D investments of CNY1.5 billion and reinforcing a positive cycle between scale and innovation.

Key takeaway

Through its "Technology + Network + Standards" approach, Kingfa demonstrates how sustainability can evolve from a compliance requirement into a core business driver - transforming into a source of competitive advantage for the industry.

Figure 16: Food-grade rPE/rPP processing line at Pizhou
Source: Kingfa

8. Navigating EU recycling regulations: Challenges and opportunities for Chinese exports

China plays a central role in global sustainability and recycling efforts. China's ban on plastic and other solid waste imports under Operation National Sword in January 2018 reshaped global recycling flows and forced many countries, including the EU, to reconfigure waste management systems. The EU has rapidly developed its regulatory framework, setting standards for recycling, traceability and recycled content. As a result, the gap in practices and legal frameworks between the EU, a primary market for recycled material, and China, a leading producer of recycled material and an important commercial partner, has widened.

Table 9: Gap analysis

	EU27 requirements	Current state in China	Gap analysis
Recycling standards	Mandatory recycled content (PPWR)	No recycled content targets in place; restrictions on use of recycled material in food contact applications	Lack of harmonized definitions and quality criteria
Traceability	Digital product passport; chain of custody for post-consumer feedstock	Limited end-to-end traceability	No common platform; no digital traceability; no auditable system
Certification	EFSA, Food contact certification	Domestic systems not recognized internationally	Expensive, redundant and non-harmonized
Governance	CEAP mandatory reporting and enforcement	Uneven implementation; focus on volume, not quality	Difference in definitions and scope

Since the 2018 import ban, China's recycling feedstock depends only on domestic collection. While this was an important step to accelerate the development of domestic waste management systems, the collection for recycling remains inconsistent across the country. Large companies are seemingly beginning to build larger scale, more structured collection networks, but smaller enterprises remain exposed to unstable supply.

Rising quality requirements are reinforcing this divide. For instance, certification for rPET flakes demands higher quality feedstock, traceability of materials and rigorous quality control. Customs now penalize non-conforming exporters, while emerging frameworks such as the GRPG certification and “Re” label require digital integration and end-to-end record keeping. Some leading companies are piloting blockchain and digital passports, but SMEs face steep learning curves and mounting compliance burdens.

Stricter domestic regulation is accelerating investment in advanced processing, treatment and certification, compressing margins and resulting in the closure of smaller enterprises. However, regulation is seen by many Chinese players as an opportunity, ie less as a threat than a catalyst, raising standards, eliminating weaker players and opening higher-value markets. Short-term costs aside, firms frame compliance as a driver of R&D and stronger competitive positioning.

For instance, China is expected to eventually permit rPET in contact-sensitive applications, intensifying competition for feedstock. rPET consumed into fibers may shift to bottle resin production, where recycled pellets can secure higher premiums.

Chemical recycling technologies are widely regarded as a game changer in recycling, as they enable the production of virgin-like resins suitable for demanding uses such as food contact packaging and high-performance materials. Unlike mechanical routes, which suffer from quality degradation and limited application in contact-sensitive areas, chemical recycling can depolymerize into monomeric raw materials or convert plastic waste back into petrochemical feedstock such as pyrolysis oil.

As in other regions, investments in chemical recycling are gaining momentum in China and could prove disruptive, particularly across polyolefins and polyester value chains. For polyolefins, it offers a pathway to meet regulatory and customer requirements in key export markets such as the EU, where high-quality post-consumer recyclate (PCR) supply remains structurally constrained. The opportunity for Chinese exporters is substantial, with implications reaching beyond packaging into broader end-use sectors.

8.1. Overview of key challenges and opportunities for Chinese exports

Compliance with regulation is the main bottleneck for recycled polyolefins and polyester, as market access depends on compliance with EU-recognized standards.

The PPWR will apply not only to EU producers but also to all imported packaging, creating compliance pressure for Chinese exporters of consumer goods. Recycled content targets will raise demand for recyclates in China's packaging sector, from export-oriented players trading finished goods with the EU. Applying EU-compliant packaging across all export destinations may prove cheaper than managing differentiated packaging streams depending on the export partner.

While this increases costs for exporters, it also creates opportunities for Chinese recyclers able to meet EU certification standards. By 2040, the EU's ambitious targets may outstrip domestic recycling capacity, especially for polyolefins, opening the door to recycled polymer imports from compliant Chinese producers.

Chinese car exporters need to comply with the proposed EU ELV regulation, creating both compliance challenges and demand opportunities. For Chinese recyclers, the ELV framework represents a long-term driver of demand growth in high-quality recyclates for automotive applications, including exports to neighboring countries such as Japan and South Korea, where OEMs are also targeting EU regulation-compliant supply chains.

The report highlights the following key opportunities for Chinese export industries:

The increasing demand in the EU for high-quality recycled material creates an export opportunity for producers in China that can meet certification and traceability standards

Symbol only refers to automotive when it should refer to packaging too.

Companies that view compliance not as a burden but as a strategic advantage, by investing in design for recycling, advanced sorting technology and closed-loop systems, are likely to achieve long-term success and value

8.2. Concluding remarks

Circularity regulation is reshaping domestic Chinese value chains, as producers increasingly position themselves to align with EU requirements and growing demand from other export markets. This shift could help narrow the gap between domestic and international market standards, supporting greater consistency in quality and traceability of materials across circular systems. Also, it could catalyze broader transformation in the market, fostering strategic alliances that strengthen competitiveness. Given the size of the Chinese market, the implications for the global circular economy could be considerable.

Moreover, investments in chemical recycling are accelerating. Chemical recycling of polyolefins and polyester offers a route to meet the stringent requirements of export markets, where high-quality PCR remains scarce, with opportunities extending beyond packaging into textiles and other end-use sectors.

These shifts suggest that the same policies that once reshaped global recycling flows are now driving change within China itself. The transformation underway could position China as an enabler to global markets, but also as a central force in shaping the next phase of circular economy development worldwide.

Chemical recycling of polyolefins and polyester offers a route to meet the stringent requirements of export markets, where high-quality PCR remains scarce, with opportunities extending beyond packaging into textiles and other end-use sectors.

Appendix A - Glossary of terms

ABS	Acrylonitrile butadiene styrene
Bio-based plastics	Bio-based products are wholly or partly derived from materials of biological origin (such as plants, animals, enzymes, and microorganisms, including bacteria, fungi and yeast).
Chemical recycling	This is an umbrella term for a range of chemical and thermal processes that alters the materials fundamental chemical properties and reverts plastic waste to an earlier molecular state. Some examples are pyrolysis, gasification, glycolysis, hydrolysis, methanolysis, etc.
Delegated acts	Delegated acts are non-legislative acts adopted by the European Commission that serve to amend or supplement the non-essential elements of the legislation.
Design for recycling	Rethinking product design considering end-of-life to ensure that the product is compatible with existing, commercially available collection and recycling systems.
ELV	End-of-Life vehicles refers to vehicles that are no longer in use and are therefore considered waste.
EPR	Extended Producer Responsibility
Mechanical recycling	This process breaks down plastic into smaller pieces without altering the chemical structure.
NIR	Near Infrared technologies are increasingly being used to sort materials based on their unique properties.
PE	Polyethylene polymer, including different grades such as HDPE (high density polyethylene), LDPE (linear density polyethylene), LLDPE (linear low-density polyethylene).
PCR	Post Consumer Recyclate. Output of a recycling process that used post-consumer plastic waste as feedstock.

Post-Consumer Plastic Waste or **Post consumer material**

ICIS defines post-consumer waste is material that has been used by the end consumer and discarded after fulfilling its intended purpose. This could be either in a consumer-facing application (Post-User Waste) or within an industrial setting (Post-Industrial Waste).

Post-User waste	Includes waste from households, serviced businesses, and commercial establishments such as hotels, restaurants, and cafes (hotel, restaurant and catering sectors), as well as materials collected through deposit return schemes. It originates from individual or consumer use and enters the recycling stream only after reaching the end of its functional life.
Post-industrial waste	It is material that has completed its intended use within an industrial setting. It includes waste that originates from components from ELV buildings or vehicles, in-transit packaging, and industrial or commercial waste from construction, logistics, or mobility operations. It differs from pre-consumer material as it has already served a functional purpose before being recovered for recycling.
PP	Polypropylene
PET	Polyethylene terephthalate
PC	Polycarbonates
PVC	Polyvinyl chloride
Polyolefins	Group of polymers including PE and PP
rPE	Recycled PE
rPP	Recycled PP
rPET	Recycled PET
Secondary act	In common EU language, secondary acts refer to delegated and implementing acts. Delegated and implementing acts are legal instruments adopted by EU legislators to supplement, amend, or ensure uniform application of legally binding Unions acts, such as regulation and directives

Contact us

For more information, further market breakdowns, or if you have any questions, please contact us through the specified information below.

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