

TECHNICAL PLASTIC PARTS STRATEGY PAPER

THE WAY AHEAD FOR AUTOMOTIVE AND ELECTRICAL & ELECTRONIC PLASTICS WASTE



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FOREWORD

The European dependency on natural resources and unharmonised suboptimal waste management oblige for radical action. Among the industries that observe an increasing demand for resources are the electrical & electronic (E&E) appliances and the automotive sector. Consequently, the volume of waste generated within the Member States has been growing, requiring policymakers to opt for more efficient and circular end-of-life for products combined with advanced waste management systems and minimised outsourcing of raw materials. One of the measures which can advance this transformation is increased recycling. Turning plastics waste into high quality materials is key to fight climate change, marine litter, save natural resources and divert waste from landfilling and incineration.

To further support this transition, the European Union has developed a robust framework of legislative texts on products, materials, waste management operations and recycling targets.

Recycling is an essential element of the waste hierarchy and a sustainable approach towards an ever-growing, market-driven demand for new plastic articles. With rapid technological development, this is particularly true for the two industrial sectors which are the focus of this paper, namely: electrical & electronic appliances and automotive parts made of plastic.

The restriction on exporting plastic scrap to the Far East, as well as material specific EU and Member States' regulation, shall both be perceived as an opportunity for the industry. An opportunity that can be fully exploited only if a balanced approach is struck between improving the circularity of plastics, for example by including targets for a wider set of plastic products, to preserve the natural environment, and eliminating any risks to human health.

“ RECYCLING REDUCES THE ENVIRONMENTAL FOOTPRINT OF PLASTIC PARTS USED IN THE E&E AND AUTOMOTIVE SECTORS, IN ADDITION IT CREATES JOBS AND SUPPORTS A STABLE MARKET GROWTH ”

Recycling reduces the environmental footprint of plastic parts used in the E&E and automotive sectors, in addition it creates jobs and supports a stable market growth.

However, in order to fully integrate recycled materials in these sectors, a number of challenges must be addressed.

The European Strategy for Plastics in a Circular Economy¹ enlists a number of concrete actions to be implemented in the short term to increase the circularity of plastics and limit the adverse effects of plastic waste. However, a long-term strategy is required for the growing volumes of technical plastics on the EU market. Such a strategy should focus on enabling a controlled, highly certified and standards-based recycling of these plastics.

To that end, this document provides an overview of the demand of technical plastics, presents the current state of play in recycling, as well as highlights the pressing issues and opportunities that lie in this sector.

IMPACTS OF THE CIRCULAR ECONOMY PACKAGE



INCREASED RECYCLING RATES



DECREASED CO₂ EMISSIONS



DECREASED USE OF NATURAL RESOURCES



CONTROLLED EXPORTS



STABLE MARKET

ABOUT PLASTICS RECYCLERS EUROPE

Plastics Recyclers Europe (PRE) was established in 1996 with the purpose of developing and promoting plastics recycling in Europe. Via its decennial presence in Brussels and an extensive membership, PRE acquired considerable knowledge and expertise on policy measures to improve the circularity of plastics.

PRE represents mainly recycling companies reprocessing plastics from various waste streams including post-consumer and post-industrial streams. Reprocessing includes operations such as sorting, shredding, grinding, washing and extrusion. They transform plastic waste into high quality materials that can be used by converters in the production of new articles.

PRE is a key stakeholder in the process of formulating, monitoring and evaluating the EU policies that impact plastics recyclers. It promotes the use of quality plastic recyclates and offers concrete advice on how to develop innovative products and packaging with design for recycling. Through the implementation of EuCertPlast², PRE has been promoting the harmonization and development of a pan-European standard for plastics recyclates. The organisation supports the transition towards the circular economy in Europe.



1. TECHNICAL PLASTIC PARTS AN OVERVIEW

Plastics in technical applications conform to high standards as they must fulfil demanding mechanical, chemical, electrical, as well as safety requirements. Their mechanical properties must demonstrate durability, flexibility and fire resistance, to name a few.

Two main applications representative of technical, or so-called engineering plastics are:

- **THE AUTOMOTIVE AND TRANSPORT SECTOR**, where technical plastic parts are used to cover metallic and engine parts, to protect cables, in the realization of interior and exterior body parts and in mechanical parts, with PP, PUR and ABS most commonly used;
- **THE ELECTRICAL AND ELECTRONIC INDUSTRY (E&E)**, used for various components of electric appliances, such as dishwashers or laptops; most commonly used polymers are PS, ABS, PP, PC, PA and PBT.

The use of Technical Plastic Parts (TPP) has been growing steadily over the past decades, providing a more economic and environmentally-friendly solution to heavier and less resistant materials that were previously used.

Given the technological development in the recycling sectors and the adoption of circular policies at the EU and national levels, a growing number of leading companies in Europe started using recycled materials. In the near future, fully recyclable and recycled TPP in the automotive and E&E industries will potentially become the European Union's circular model that could be exported to non-EU markets.

Furthermore, new recycling technologies involving chemical reactions that transform plastic waste into feedstock will further improve the quality and quantity of recycled plastics. For TPP, when developed at industrial scale, these technologies will ensure that a wider set of highly contaminated plastics is safely placed back on the market in the form of clean recycled plastic products.

However, the main challenge to achieve this is to adapt business models and manufacturing processes to the newly developed circular economy pillars. Building trust in recycled plastics among all the actors in the value chain, from producers to consumers, is essential in advancing the circularity of TPP. Several conditions, as explained below, need to be met if we want to succeed with this approach.

The first condition is an improved waste management, with increasing harmonisation. It is the starting point for building a credible circular model for TPP. Targets must be foreseen for collection and sorting operations for these materials, with standardised best practices for each product and polymer type.

Secondly, standardisation should be further extended to all the actors in the value chain, allowing for the production of certified recycled products. This would lead to an increased traceability and transparency of plastic waste management.

Thirdly, waste exports must be limited and the movement of TPP waste within the Single Market shall be promoted between certified actors of the value chain, to avoid exports to countries where comparable waste management operations and standards do not exist. Retaining resources and processing them in accordance with high standards ensures that the recycled materials, which are fed back to the European market are of high-quality and that they conform with a strict legislation.

HOW CAN EUROPE ENHANCE THE RECYCLING OF TECHNICAL PLASTIC PARTS?



The transition towards the circularity of TPP and the fulfilment of the above-mentioned conditions call for a consistent legislative environment at EU and national levels, prompting long-lasting rules and allowing the market for recycled plastics to flourish.

2. MARKET DEVELOPMENT AUTOMOTIVE

PRODUCTION

According to the recent study by the American Chemistry Council³, the use of technical plastics in the automotive sector alone has doubled during the last 25 years. Whereas in the 1950s the share of plastics in a vehicle was very low, today roughly 12 to 15% of it is made of plastics⁴.

Plastics constitute a half of the components found in a modern car, while their weight amounts to a scarce 10% of the total. The advantages are self-explanatory, lightweight parts greatly contribute to fuel economy standards.

According to the same study, by reducing a vehicle's weight by 10% its fuel economy can improve up to 6-8%, while lowering the overall weight of a vehicle by 1 kg is expected to cut 20 kg of CO₂ emissions⁵. This demonstrates that, by replacing conventional materials, technical plastic parts greatly contribute to lower GHG emissions and CO₂ pollution.

Due to their versatility, light weight, flexibility, safety, and durability plastics are particularly valuable and widely used. The annual plastics demand in the automotive sector is approximately 5 million tonnes⁶ in Europe alone. On the other hand, the annual tonnage of End of Life Vehicles (ELV) is roughly 6.3 million tonnes, of which 1.2 million tonnes are plastics⁷.



RECYCLING

Compared to a decade ago, the European market for plastics used in the automotive sector has made important steps towards improving their end-of-life. In the past, plastic waste was considered a “problematic” material, as it constituted the higher share of automotive shredder residue (ASR). ASR is a mixture of waste materials including fibers, glass, rubber, plastics and automobile liquids. Formerly, this waste has largely been either exported or landfilled.

However, processing of waste that is exported abroad in most cases does not conform with strict regulation and high reprocessing standards, thus precluding broadly equivalent conditions. This in turn has consequences for ensuring safety of recycled products placed back on the European market.

Regulation and recycling targets in EU and in the Member States, made it possible to improve this situation, even though recycling targets by weight at first underprivileged the recycling of plastics to metals and heavier materials.

The Chinese ban on the imports of plastic scrap greatly contributed to a decrease in the exports of plastic waste outside of Europe. Since the ban took effect and compared to the figures of 2016, 1.2 million tonnes less of plastic waste has been exported in 2018⁸.

The end-of-life of these plastic parts is what challenges waste management systems across Europe. The collection, sorting and recycling of these materials will have to meet a higher demand from the market in the near future.

An increase in the use of recycled plastics in the automotive sector is complementary to the overall transition in Europe from a linear to a circular model. Major car brands have developed industrial schemes including environmental sustainability assessments of their production models. Key in this respect is the collaboration between car manufacturers and recyclers.

It is plausible to argue that in the near future recycled plastics will be used for a wider set of applications in the automotive sector, from bumpers to inner cabin components, under hood materials and even mechanical parts.

Car brand owners have pledged to use recycled plastics in their production lines. Voluntary commitments represent a key incentive for transitioning to the circular model, however, pivotal for the market is to provide a constant flow of input materials (recyclates), to ensure that post-consumer plastic can be part of this innovative model. Separate collection and sorting of plastics from the automotive sector and for the same application must be swiftly improved.

“ THE END-OF-LIFE OF THESE PLASTIC PARTS IS WHAT CHALLENGES WASTE MANAGEMENT SYSTEMS ACROSS EUROPE. THE COLLECTION, SORTING AND RECYCLING OF THESE MATERIALS WILL HAVE TO MEET A HIGHER DEMAND FROM THE MARKET IN THE NEAR FUTURE. ”

ELECTRICAL & ELECTRONIC

PRODUCTION

Between 2000 and 2008 the demand for polymers used in the E&E sector has been growing, with an incremental average increase of ca. 0.1 million tonnes per year. Today, the European demand in this sector exceeds 3 million tonnes⁹.

The main applications for plastics in the E&E sector are temperature exchange equipment, screens, lamps, large & small equipment, and small IT. Out of these categories, a reduction in the production of plastics has only been registered for screens and lamps.



RECYCLING

The generation of waste from E&E is, consequently, characterised by a growing trend, with an expected increase of 46% in 2020 in Europe, when compared to 2000¹⁰.

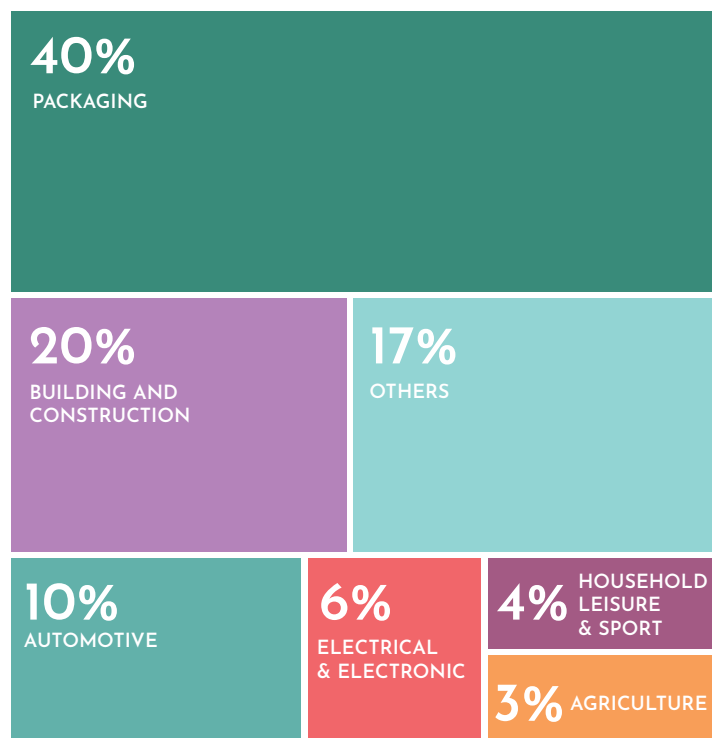
This waste, similarly to the automotive sector, was shredded and exported, leading to suboptimal waste management operations in countries outside Europe. The presence of precious materials in many electrical components is at the detriment of plastic recovery operations, leading for incineration in most cases and energy recovery in the best-case scenario.

In the E&E sector, Europe has already developed a network of recycling facilities transforming waste electrical and electronic equipment (WEEE). Out of 1.2 million tons of plastic collected from the sector, 75% is exported and roughly 300,000¹¹ tonnes handled by specialized TPP recycling facilities in Europe and properly recycled.

This highlights the need to further increase the collection and sorting of plastics, to incentivize the recycling in separate streams and allow a broader set of applications for recyclates.

Plastics used in both the automotive and the E&E sector represented 13% in 2011¹² and 16% in 2017¹³ of the overall European demand for plastics.

2017 PLASTICS CONVERTERS DEMAND BY SEGMENT



3. TPP RECYCLING: CHALLENGES TODAY

The recycling of TPP in Europe represents an opportunity to become an important stream for the plastic recycling industry. It prevents landfilling, incineration and exports outside Europe of plastic waste that must be treated under the safeguards of European standards to ensure environmental and human health protection.

Unsatisfactory levels of separate collection and sorting remain the main challenge for plastic recyclers today. Nevertheless, landfilling must be avoided, as resources are lost at the detriment for the environment. To this end, the coordination between actors from the waste management value-chain and from the automotive and E&E industry must be further strengthened and valued.

The legislative framework at the European and Member States' level must tackle this issue and provide solutions in the short term, such as material specific measures enabling separate collection and sorting, leading to higher recycling rates. Moreover, policymakers must allow the recycling of TPP for appliances and products whose material characteristics might no longer be inline under the current legislation.

Unwanted substances can represent a severe constraint to the quality, as well as the monetary value of recyclates. Whereas, the main objective of plastic recyclers in Europe is to place on the market high-quality output materials, destined for the production of high-quality products. At

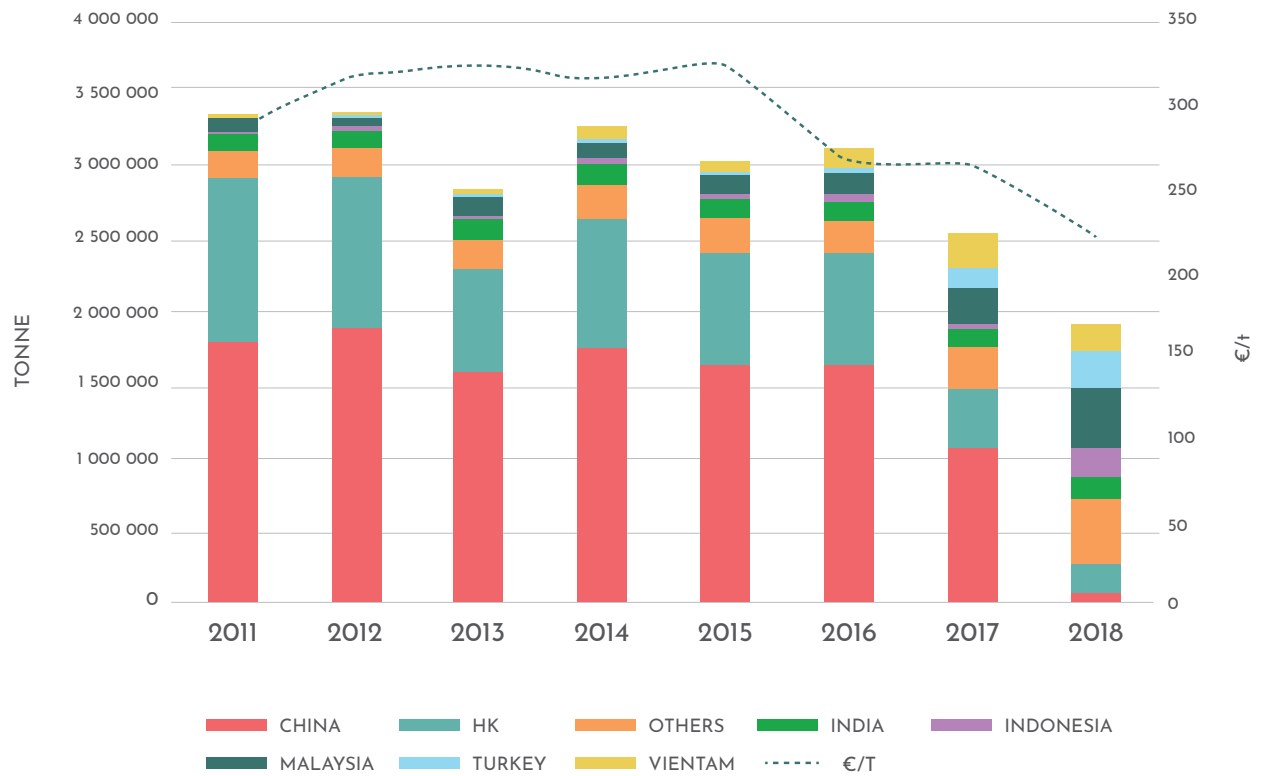
today's industrial level, the available technology allows to reprocess materials and purify plastic streams to concentration levels that are hardly detectable by the current testing systems.

“THE MAIN OBJECTIVE OF PLASTIC RECYCLERS IN EUROPE IS TO PLACE ON THE MARKET HIGH-QUALITY OUTPUT MATERIALS, DESTINED FOR THE PRODUCTION OF HIGH-QUALITY PRODUCTS.”

Priority must be given to a stable legislative environment which assesses and provides policies in accordance with the state-of-art technological and testing capacity. Otherwise, ELV and WEEE will be shipped abroad, recycled under lower standards and reimported back to Europe in the form of contaminated final products of poorer quality than the material recycled in the EU.

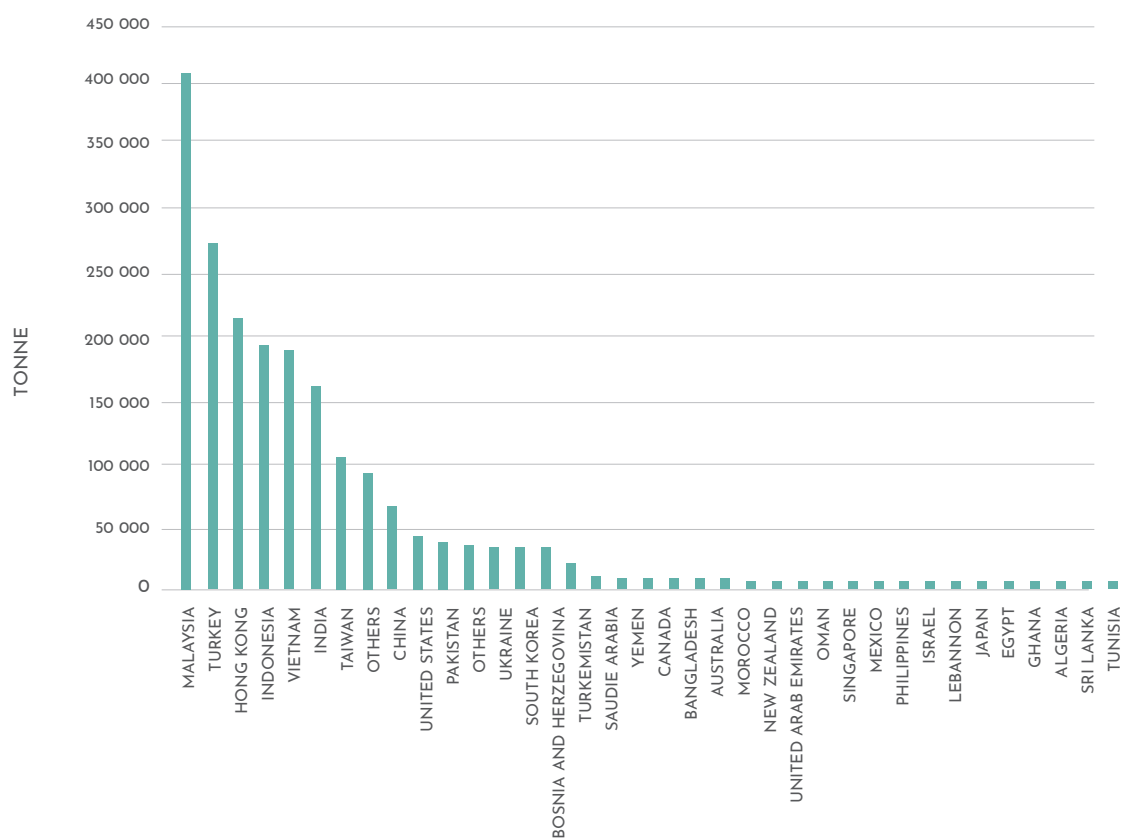
Without a stable legislative environment, investments to expand and strengthen waste management operations and recycling processes within Europe will be put on hold or even diverted to other markets.

EU28 PLASTIC WASTE EXPORTS



Source: Eurostat, EU trade since 1988 by CN8 [DS-016890]. Last update: 15-03-2019

2018 EU28 PLASTIC WASTE EXPORTS



Source: Eurostat, EU trade since 1988 by CN8 [DS-016890]. Last update: 15-03-2019

To avoid exports and inefficient waste management processes outside Europe, key for the development of a market of high-quality plastic recyclates, while ensuring environmental protection and human health, harmonised standards at Union level must be introduced for collection and sorting facilities.

Auditing schemes certifying these facilities are required, as they enable increased traceability of plastic waste throughout the entire value-chain. In turn, improved traceability and with it trust would lead to increased investments in the entire value-chain, from collectors to converters.

4. TPP RECYCLING: WAY FORWARD

On-site recycling, closed-loop production, re-use and recycling of plastic parts is happening already today. Investments in this sector were made and pilot projects developed to create a production model that makes of circularity a keyword. Successful examples of a proper end-of-life treatment for TPP must however include engagement and cooperation of stakeholders from the whole value-chain in order to succeed and make a long-term change.

Separate collection and sorting techniques must be further developed, while methodologies to identify and qualify waste shall be shared among stakeholders and between the Member States. To pursue these goals, car manufacturers and E&E producers must cooperate with the recycling industry and with the waste management sector, and thus create a network of best practices shared between the main actors involved in the ELV¹⁴ and WEEE¹⁵.

The way forward for recycling of TPP must include measures aiming to increase and harmonise the waste management operations required to widen the set of applications for recyclates.

Among other measures, PRE has identified key steps supporting the circularity of TPP:

- **INCREASED COLLECTION AND SORTING OF TPP**
- **A CONSISTENT LEGISLATIVE ENVIRONMENT**
- **STANDARDISED WASTE MANAGEMENT AND SORTING PRACTICES**
- **HARMONISED MONITORING OF SUBSTANCES BY RECYCLERS**
- **SAMPLING & TESTING METHODOLOGY TO IDENTIFY SUBSTANCES OF CONCERN**
- **INCREASED TRACEABILITY**
- **CERTIFICATION**
- **INCREASED INVESTMENTS**

INCREASED COLLECTION AND SORTING OF TPP

Collection and sorting of end-of-life vehicles represents a waste management operation shared Union-wide, the missing link being a specific measure for plastics. Hence, separate collection and sorting of plastics in the automotive sector must be improved, standardised and implemented at Union level. Technologies have increased the competitiveness of recovery operations vis-à-vis virgin production, under a resource efficiency and monetary terms, the lack being in the waste management operations.

Today, many Member States have waste management systems in place allowing E&E appliances to be separately collected from other discarded products, treated in specialised sorting facilities and separated into distinguished waste streams. This approach must be further harmonised at Union level. Waste management operators, together with competent authorities of the Member States, must enable the circularity of TPP in concert with converters and producers.

The recycling process purifies waste from its impurities and contaminants, but sorting cannot be 100% reliable and very low fractions of unwanted substances could still be present in shredded plastics.



A CONSISTENT LEGISLATIVE ENVIRONMENT

The progressive substitution of substances of concern from plastic production is the only circular approach to technical plastic parts. EU policies allowing for specific concentration levels of these substances, feasible in today's industrial setting for the recycled output specifically are therefore welcome and necessary.



By looking at the provisions included in the EU legal framework, such as the WEEE and the Ecodesign¹⁶ directives, the separation and sorting of different plastic waste types contributes

to defining a separate waste stream to be reprocessed by recyclers. In fact, recyclability by design helps sorting facilities to treat E&E waste more efficiently, granting a higher quality and a wider set of plastic waste to be reprocessed by recyclers.

The Ecodesign Directive and Ecolabel Regulation¹⁷ play an essential role when it comes to E&E, as they provide for concrete guidelines on how to improve the recyclability and reusability of the most present items in our everyday lives. To this end in the E&E sector, eco-design and design for recycling of TPP's products must become an essential requirement.

To this end, a legislative far-reaching environment, at the national and international level, characterized by harmonised and balanced rules, is key to the development

of a mature industry for recycled TPP in Europe. Older articles placed on the market under a previous legislative framework may contain substances that are today classified under CLP¹⁸, restricted under REACH, or have been included in the Persistent Organic Pollutants (POPs) Regulation¹⁹. Measures shall progressively be implemented by the relevant authorities, allowing for a transition from a linear to a circular model. Nevertheless, legislation must consider the long lifespan of EE and automotive products.

For recyclers, legislative certainty is much needed, as investments are particularly required to further define the TPP streams. The internal market for recyclates has yet to be fully established, and for TPP, whose recycling method is very technical mainly due to the additives these plastics contain, quality is at the core of future market developments.

STANDARDISED WASTE MANAGEMENT AND SORTING PRACTICES

To help achieve increased separate collection and high-quality sorting of plastic waste, standards must be developed especially for sector specific waste streams. A harmonised standardization on collection and sorting of plastic for reuse and recycling in Europe could allow a Union wide improvement of end-of-life practices for the automotive and E&E sectors. To this regard, best practices that have been implemented in some Member States could be imitated.

Only with a standardised environment of waste management operators working under the same rules that it is possible to certify the entire value-chain and ensure that high-quality recycled materials will be sold on the EU market to constitute core elements of new products.



HARMONISED MONITORING OF SUBSTANCES

Controlled presence of harmful substances in the European market calls for regular and harmonised monitoring. Furthermore, monitoring of substances in long lifespan products is essential for high-quality and safe recycling of these goods.

Therefore, a system needs to be put in place which allows for a uniform transfer of relevant information from producers to recyclers. Harmonising such a system would ensure there are no discrepancies in the information flow among the stakeholders operating in different Member States.

Guidelines concerning the composition of TPP bulks are a necessary instrument for operators to acquire information indispensable for proper waste management.

SAMPLING & TESTING METHODOLOGY TO IDENTIFY SUBSTANCES OF CONCERN

PRE is actively developing a harmonised methodology for sampling waste-product streams to analyse the presence of Substances of Concern (SoC). The aim of this project is to ensure that recycled products adhere to specific conditions, in line with relevant legislative requirements.

Transparency is key for consumers, while ensuring that recyclates containing SoCs will be handled and used only under safe requirements in terms of environmental and human health protection opens the market for higher-end applications for these recyclates.



INCREASED TRACEABILITY

Traceability of recyclable waste from the point of its collection up to the output of the recycling facility would unquestionably contribute towards increased transparency and provide for statistics on a consistent basis. Market trends in this regard are necessary for the development of a market itself. Traceability creates trust among converters as well as consumers buying the recycled end-products.

CERTIFICATION

A certification system harmonised at the Union level enables the traceability of plastics within the whole value-chain. Only with certified recycling plants, the quality of the recycled materials introduced to the market can be verified



EuCertPlast²², for example, is an EU-wide certification targeting post-consumer plastics recyclers. It was developed via a three-year project co-financed by the European Commission under the Eco-Innovation Programme. The certification works according to the European Standard EN 15343:2007, which specifies the procedures needed for the traceability of recycled plastics. EuCertPlast aims at encouraging environmentally friendly



recycling of plastics, particularly by focusing on the process of traceability and assessment of conformity and content of recyclates. The overall objective of this certification is to establish an EU-wide, harmonised certification scheme for plastics recycling in Europe.

Such certification testifies to the high-standard reprocessing of plastic waste. Furthermore, the certification attests to the quality of recycled material produced and can therefore boost the demand for recyclates.

This EU-wide certification would need to be further extended, to allow credible tracking of the material flow, starting with the waste management companies throughout the entire recycling process up to the converters, retailers, brand owners and finishing with the end-users.

INCREASED INVESTMENTS

In a 2015 study conducted by PRE²³, it was estimated that more than 250 new sorting facilities and 300 recycling facilities would need to be built in order to reach the targets of 2025. To be precise, in order to support the increased inflow of materials to be recycled, investments are needed to improve the overall waste management infrastructure.

Supporting the transition towards a circular economy requires simultaneous improvements across all the segments of the value chain from the design of products to the actual recycling processes. At the same time however, due to the improved waste management system and increased number of collection, sorting and TPP recycling facilities across Europe, the employment rate will register a positive trend. Namely, running and operating of these facilities alone would boost the creation of new jobs.

Progressively, as with other waste streams, the recycling of TPP could be financed in part by the value from the recovered materials.

As stated above, reaching the set targets needs to be supported by increased investments. Ultimately, these investments would however be offset through the added-value created with the proper management of TPP and the overall economic, social and environmental benefits.



5. CLOSING REMARKS

Given the latest market and technology developments, as well as the legislative changes, **Europe is in the ideal position to become the pioneer of the circular economy models, in particular for plastic materials.**

The increase of TPP recycling rates can successfully be sustained in a stable legislative environment, where **standards-based, high-quality recyclates are reintroduced on the EU market after being reprocessed by the EU certified recycling facilities.** Additionally, the risks associated with the contaminants and additives found in TPP waste shall be appropriately addressed in the European legislation, avoiding unnecessary exports to countries outside of the EU.

Therefore, an increase in collection and sorting capacity in the waste management across Europe is necessary today in order to keep technical plastic parts, a valuable recyclable resource, within the EU market borders.

Thanks to the ambition of the European Union to tackle plastics and environmental pollution associated with bad waste management practices, **the export of recyclable plastic waste abroad could become part of a past linear model, where the value of these plastics was not recognized.** Tracing the whole process through which plastic waste is transformed into a new product demonstrates transparency and, among converters, producers and consumers improves its perception, contributing to the development of a secondary market for these materials.

Companies in the automotive and E&E sectors are already developing solutions to make technical plastic parts a circular material. The challenge is to widen the types of products and items to be included in this circular model, by keeping environmental and health standards as high priorities.

Whereas technical plastic parts are produced according to specific characteristics (for example weight reduction), the use of recyclates is a practice that is becoming more trending in the automotive industry. **The key to this trend is adoption of design measures to increase the operational recyclability of main plastic parts, to close the loop of plastics while extending the environmental benefits.**

A progressive approach is necessary for an efficient transition from a linear to a circular model, where stakeholders and experts from the entire value chain are involved in the decision-making processes and further improvements to the quality of recycled materials.

NOTES

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making plastics circular

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