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change

Plastics recycling in a circular economy

Foreword

Plastics hold value

– the importance of plastics recycling in a circular economy

During the past years, politicians, citizens and organisations on the national, European and global levels have taken more assertive steps to make plastic use more sustainable. In increasing numbers, people are acknowledging the environmental crisis caused by the accumulation of plastic waste and microplastics in our seas and watercourses and other challenges related to plastics. These challenges include the use of plastics additives in production and the consequences of waste management and material recycling.

Durable, light-weight, easily moulded into all shapes and available in every colour, plastic is in many ways a superior material. However, we will not focus on the well-known merits of plastics in this review. Instead, we will emphasise the immense advantages of adopting a holistic approach to the sustainable production and use of plastics in a circular economy.

Our suggested approach seeks to take full advantage of the resource by enabling its reuse many times over, thus driving economic development, but without increasing the risk of damage to human health and the environment.

We at Fortum are guided by our vision for a cleaner world; and we see circular economy and plastics recycling as integral parts of this vision. As a company operating in recycling and waste management, we possess knowledge on how recycling can be done sustainably, resulting in high-quality recycled materials that can replace virgin materials.

To a large extent, the waste and recycling industry is driven by regulation, and we can enter into a circular economy only with the help of well-defined policies. The European Commission (EC) and various member states have already done a great deal, but further progress is needed. This publication seeks to introduce readers to Fortum's ideas on developing plastics use to make it more sustainable than it is today.

We will share our views on the types of regulation that would best support progress towards a future where products are designed to support their reuse and recycling, and where all plastics waste is collected and treated properly to facilitate the supply of high-quality recycled raw materials.

We hope that this publication contributes to an informative and forward-looking discussion about plastics as a part of a circular economy.



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More of Fortum's positions on topical energy issues:

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About this publication: This Plastics Review is part of the Fortum Energy Review series, which highlights challenges and opportunities in the energy sector and circular economy from Fortum's perspective. We seek to provide smart solutions for optimal resource efficiency and a low-emission energy system, and thus actively participate in transforming the market. We hope to engage our stakeholders in dialogue to help us drive the change towards a more sustainable future.



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Key facts about plastics and plastics recycling in the EU

Modern life with plastics

In modern life, all over the world, objects made of plastics are in daily use. They play a role in a large variety of applications such as in packaging, construction materials, electronics, clothes, toys, automotives, and much more.

Depending on their chemical structure and composition, plastics can meet a wide range of demands.

For instance, subject to the goods they are used for, packaging materials need to fulfil several requirements, with the most important ones being the protection and preservation of their contents. On the other hand, construction materials are longer-lived products and must meet completely different demands, such as durability, resistance to corrosion, fire safety, and suitability for installation, operation and maintenance. These two examples

illustrate plastics' adaptability in fulfilling the most varied criteria.

The production and use of plastics has increased significantly in recent decades, much faster than the development and establishment of waste management and recycling systems, or the return of recycled plastics for manufacturing new products.

Plastics have been recognised as a priority in the EU's work in striving towards a circular economy, and in January 2018, the Commission adopted a Plastics Strategy. In addition, a directive on single-use plastics was published in June 2019.

The EC report, A Circular Economy for Plastics (2019), brings insights to challenges in design, renewable feedstocks, littering prevention and circular after-use pathways for plastics, and policy recommendations to facilitate the transition from an unsustainable linear plastics economy towards a sustainable circular plastics economy.¹

Given the complexity of the topic and the need for interdisciplinary approaches, systematic change through policymaking will be the means towards a long-term solution. Several member states have prepared proposals and roadmaps on sustainable plastics use.

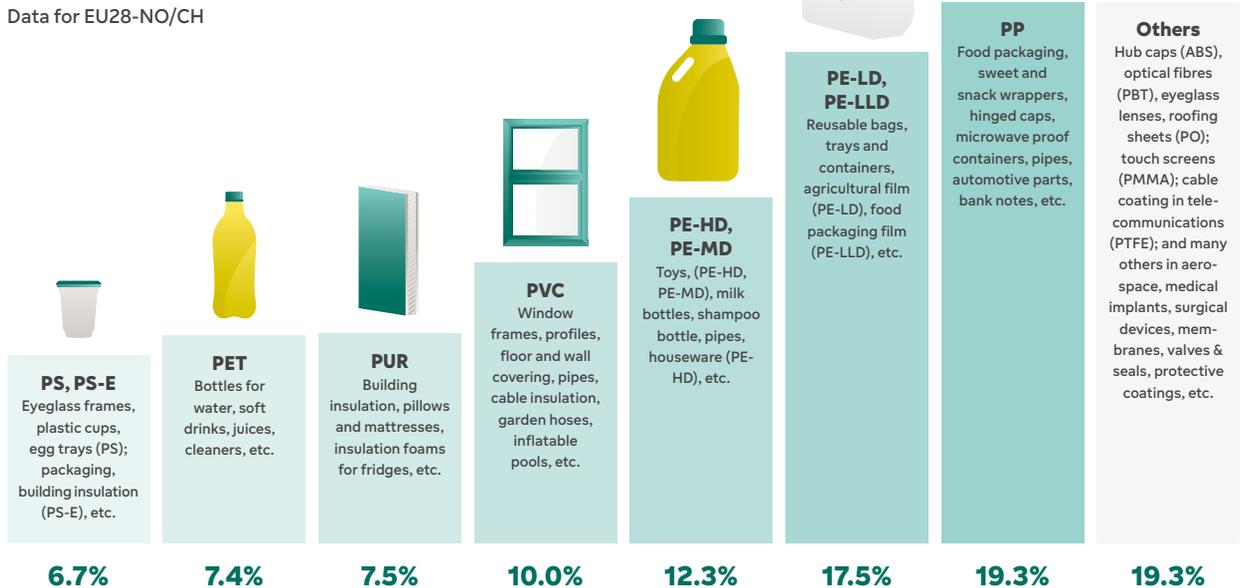
¹ A Circular Economy for Plastics (2019, ISBN 978-92-79-98429-7)

Plastics are synthetic or semi-synthetic organic polymers built up by hydrocarbon chains with molecules of varying size and structure. To meet different demands for specific applications, other chemicals like fillers, flame retardants, colours, stabilisers and plasticisers are added.

Plastics can be divided into two main groups: thermoplastics and thermosetting plastics. Thermoplastics become soft when heated and hard when cooled without changing their chemistry or mechanical properties, and this makes them suitable for mechanical recycling.

European plastics converter demand by polymer type in 2016

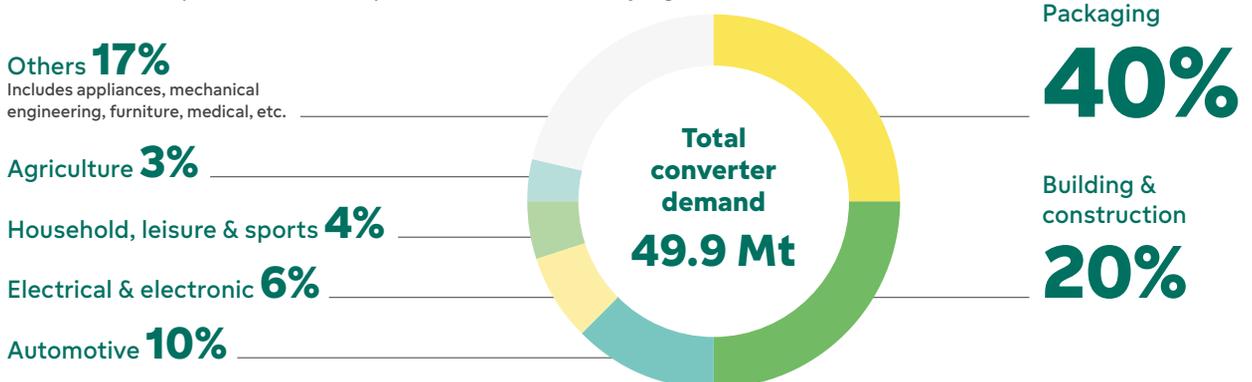
Data for EU28-NO/CH



Source: PlasticsEurope Market Research Group (PEMRG), Conversio Market & Strategy GmbH, and OECD report 2018

Plastics converter demand, main market sectors

Distribution of European (EU28+NO/CH) plastics converter demand by segment in 2016



Source: PlasticsEurope Market Research Group (PEMRG) and Conversio Market & Strategy GmbH

Policies and legislation supporting plastics recycling

The EC's Circular Economy Strategy has resulted in six amended waste directives on different topics; namely, waste, packaging, waste electrical & electronic equipment (WEEE), end-of-life vehicles (ELV), batteries, and landfills.

These directives are more or less connected to the recycling of plastics and provide several targets for recycling. The waste directive sets out overall targets for recycling of municipal waste. The packaging waste directive sets out specific recycling targets for plastics packaging. In order to achieve these targets, member states are required to ensure separate collection of plastics waste and establish extended producer responsibility (EPR) schemes for packaging waste.

At the outset, the work under the Circular Economy Strategy did not focus sufficiently on the challenges connected to plastics; however, plastics emerged as one of the hot topics as it progressed. In January 2018, the Commission published its Plastics Strategy and simultaneously released a communication about the interface between chemicals, products and waste legislation, which is strongly connected to the challenges in plastics and recycling.



EU targets related to plastics

Current and new targets from the EU waste package, including suggestions from the *Plastics Strategy* and *Single-Use Plastics Directive*

EU target *	2009	2020	2025	2029	2030	2035	Source
Municipal waste recycling [%]	-	50	55		60	65	Waste Directive 2008/98/EC, (EU) 2018/851
Landfilling max. [%] of MSW	-				10		Landfill Directive 1999/31/EC, (EU) 2018/850
All packaging waste recycled [%]	55		65		70		Packaging and Packaging Waste Directive 94/62/EC, (EU) 2018/852
• Plastics	22.5		50		55		Packaging and Packaging Waste Directive 94/62/EC, (EU) 2018/852
All plastic waste recycled [%]					50		Strategy for Plastics 1/2018
Beverage bottles average recycled content (PET bottles)			25		30		Single-Use Plastics Directive (EU) 2019/904
Beverage bottles separate collection targets			77	90			Single-Use Plastics Directive (EU) 2019/904

*The method for calculating EU targets for recycling rates has been revised in updated directives.

Other actions	2009	2020	2025	2029	2030	2035	Source
Separate collection of plastics waste		X					Waste Directive 2008/98/EC, 2018/851
Extended producer responsibility obligations for plastic packaging		X					Packaging and Packaging Waste Directive 2018/852
All plastic packaging reusable or recyclable					X		Strategy for Plastics 1/2018
Plastics sorting and recycling capacity fourfold compared to 2015					X		Strategy for Plastics 1/2018

How recycling rates are calculated, and when waste ceases to be waste

The waste directive aims to clarify and harmonise the way recycling rates are calculated; and in order to do that, it must define the point at which waste is considered recycled. Member states have used different methodologies for

calculating recycling rates, and for this reason the data from the various states has not been comparable. One calculation method has been agreed upon in the amended directive, although the interpretation of the point where recy-

cling is considered to have taken place can still vary. An EC Implementing Decision (EU 2019/665) has been published in April 2019 clarifying the calculation points for the attainment of the recycling targets.

Waste may cease to be waste either when the waste material is used in the manufacturing of new materials or products, or after the waste has been recovered and processed to fulfil the end-of-waste criteria for the specific material and use.

The waste directive regulates the conditions for end-of-waste criteria, which are specified by the following:

- The European Commission (EC), as EU-wide end-of-waste criteria
- Member states, as national end-of-waste criteria, with reporting obligations to the EC
- Case-by-case end-of-waste criteria, verified by competent authorities in member states without any obligation to report to the EC.



Currently, there are no EU-wide end-of-waste criteria for any plastics.

Waste shipments are regulated by international agreements

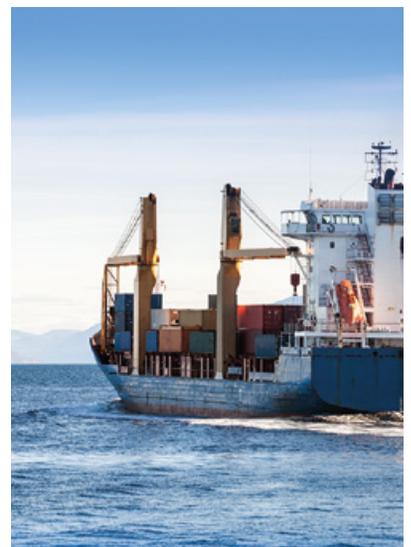
The EU is party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. The main purpose of the convention is to prevent waste dumping, and its rules are transposed into the EU's Waste Shipment Regulation (WSR).

For plastics waste, the WSR applies when shipping the materials across country borders, in which case shipments of waste may be subject to prior informed consent. There is an eased process for certain wastes (green-list waste), that do not pose any likely risk to the environment when shipped for

recovery, and for which shipment can start without prior informed consent.

Under certain circumstances, plastics waste can be shipped under the green list if considered sufficiently uncontaminated. Norway has recently proposed amendments to the Basel Convention in order to require prior informed consent for shipment of plastics wastes, except for uncontaminated single-polymer plastics.

For secondary plastics raw materials that have ceased to be waste, waste shipment regulation does not apply. However, if the importing country disagrees on the end-of-waste status, the WSR may still apply.





Uptake of recycled plastics

Packaging design

In its Plastics Strategy, the European Commission recognises that current legislation for packaging does not address design for recyclability. For that reason, and in order to reach the target of 100% easily recyclable and reusable packaging by 2030, the EC has set to work on adjusting the essential requirements for placing packaging on the market. An EU harmonised standard, EN13428 “Packaging – Requirements specific to manufacturing and composi-

tion – Prevention by source reduction” is currently under revision.²

It is possible, within extended producer responsibility schemes, to charge different fees for products taking into account their durability, reparability, reusability and recyclability, and presence of hazardous substances.³

Published in 2009, the European Union’s Ecodesign Directive set minimum energy performance requirements for products in the European market. The directive has been enhanced to

include the lifecycle analyses of products which must encompass their entire lifespans, taking their recyclability, reparability, water use, emissions, and information on hazardous substances into account, rather than their energy consumption alone. It provides a framework and product-specific regulations that set out detailed requirements, such as timetables for enforcement and monitoring.⁴

² Swedish Ministry of Environment. <https://www.regeringen.se/4aeebe/contentassets/9286487f6ecb45e2a2de0f90bfeea8e8/det-gar-om-vi-vill---forslag-till-en-hallbar-plastanvandning-sou-201884> (SOU2018:84 p. 167)

³ Amending Directive 2008/98/EC on Waste, article 8 (a) 4.(b). <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L0851&rid=1>

⁴ Swedish Energy Agency (Energimyndigheten). Ecodesign Directive. <http://www.energimyndigheten.se/energieffektivisering/jag-ar-saljare-eller-tillverkare-av-produkter/ekodesign-energimarkning-och-ce-markning/ekodesign/ekodesigndirektivet/>.

Recycled plastics and food contact

Recycled plastics for food packaging are highly restricted by an EU regulation (EC No 282/2008). Polymers derived from chemical depolymerisation of plastics materials and articles as well as unused plastic production offcuts can be used for food packaging. Other recycled plastic materials can also be used behind a functional barrier. The recycling process must be authorised and managed by an appropriate quality assurance system guaranteeing the quality of the recycled materials.

European (CEN) and International (ISO) standards for the recycling of plastics

There are several hundred published standards relating to plastics within the European Committee for Standardization (CEN) and the International Organization for Standardization (ISO), but only 13 of them deal with plastics recycling. Therefore, in autumn 2018, a new working group for plastics recycling was established in ISO to review and develop new and existing standards. In the annual Union work programme for European standardisation for 2019, the EC proposes the development of standards addressing the procedural and infrastructure issues for recycling.



Facts about SVHC

- A chemical substance may be proposed as a substance of very high concern (SVHC) if it is carcinogenic, mutagenic, or toxic for reproduction; or persistent, bioaccumulative and toxic.
- Examples of possible SVHC in plastics are certain phthalates that are used as plasticisers.

Legacy substances must be removed from cycles to ensure high-quality recycled plastics

Some plastics products entering recycling can contain, for example, certain substances and compounds used as additives, the use of which could currently be restricted according to EU chemical legislation. These so-called legacy substances may be of very high concern, causing them to need authorisation to be put on the market.

Legacy substances in plastics products must be managed in a safe manner and prevented from being recycled into new products. To support recyclers, the

amended waste framework directive has required the European Chemicals Agency (ECHA) to introduce a database of articles containing substances of very high concern (SVHC), and to make the information available to consumers and recyclers.

Plastics may also contain persistent organic pollutants (POPs), which according to EU Regulation, must not be recycled. Plastics containing certain old POPs with concentration levels above the limit value are considered hazardous waste according to EU waste classification rules. However, currently, plastics containing newer POPs may not necessarily be classified as hazardous waste.



Facts about the Stockholm Convention and EU Regulation on POPs

- The Stockholm Convention is an international treaty protecting human health and the environment from persistent organic pollutants (POPs).
- POPs are controlled by EU regulation.
- Waste containing POPs above the regulated limit values must be irreversibly destroyed and must not be recycled.
- Examples of possible POPs in plastics are some brominated flame retardants and short-chain chlorinated paraffins.



2

The plastic conundrum

There may be more plastics than fish in our oceans by the year 2050, and preventing this impending catastrophe is one of the most significant challenges to the Earth's future.

This monumental crisis is a direct result of the intentional and unintentional littering of plastics debris on land, in watercourses and seas.

In order to avert further harm, a full system approach starting from design

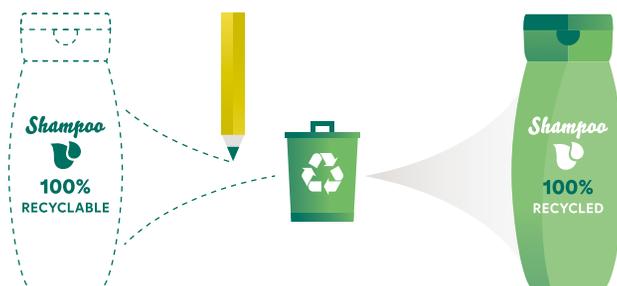
and production to collection and recycling should serve as the fundamental basis for a sustainable plastics circular economy.

The traditional fossil feedstock to produce new products must shift to novel sources such as bio-based or waste-based ones.

Sustainable economics must serve as the guiding approach; and when undertaken properly, recycling materials that have already been in use produces the least environmental footprint compared to any other option.

Plastic packaging can be designed to be 100% recyclable

New packaging can be created out of 100% recycled materials



The quality of recycled materials is key

Once recycled materials are recognised for their high quality, the acceptance of those materials and the confidence to utilise them will follow. In short, trust in recycled plastics will result from quality.

The solutions to make products and packaging recyclable should be considered in the design phase, when already the fate of the products after their use should be determined. What collection systems will be available, and for what kinds of treatment – mechanical recycling, chemical recycling, or perhaps industrial composting? Local conditions may vary, and should also be taken into account.

To promote circularity, raw materials from the most sustainable sources must be considered; and these include materials that are waste-based and bio-based.

However, fossil feedstock is comparatively cheaper and easier to process, and consequently, has traditionally been considered the most feasible choice for raw material production. Mechanically or chemically recycled materials and bio-based materials must therefore endure fierce competition.

In the case of recycled feedstock from gasification or pyrolysis, those result in simpler chemicals which cannot directly be converted back to plastics. In other words, the resulting feedstock needs to be processed in several steps before becoming new polymers. While the output can theoretically be used very flexibly to produce

new polymers, there are difficulties in developing techniques, as well as a lack of infrastructure and capacity. Moreover, new polymer production faces competition from other interests such as fuel production, which cannot be included in the calculation towards plastics recycling targets.

As for chemical recycling technologies, they have the potential to supplement mechanical recycling, but should not be perceived as the silver bullet to deal with mixed waste and contaminated plastics. To achieve systematic change, downstream solutions must work hand in hand with upstream solutions in the plastic value chain.

Retaining plastics' value

In a circular economy, after-use plastics should be turned into valuable feedstock. In order to achieve this, the design of after-use pathways for plastics needs to consider how the value of the materials can be retained.

When a plastics product is designed for an after-use pathway in industrial composting, for example, its degradation should result in improved compost or soil quality. In other words, the material output should hold value. Additionally, it should be ensured that the fate of the product leads to an industrial composting plant, since the properties of the plastics may have adverse impacts on other recycling options. Not to forget that the degradation of the plastic may cause environmental problems if the product is mistaken as compostable by home composting or littered and expected to disintegrate naturally in the environment.

If the quality of the output materials meet expectations, it is more likely that the materials will be able to hold their value. Challenges originate in the various steps of the value chain. If a product is designed to be suitable for mechanical recycling in the after-use phase so that the output materials are of such quality that they can replace virgin raw materials, then it is reasonable to expect that the material will hold its value over and over again.

When mechanical recycling is used, the carbon footprint for recycled plastics expressed as Global Warming Potential (GWP) can be up to 10 times smaller

and save 1.0–1.5 kg of CO₂/kg of resin compared to using virgin materials, thus supporting the EU's low-carbon path.

Products designed for mechanical recycling should find their pathways through separate collection schemes. At present, the most prevalent collection schemes for bottles made of PET are good examples of systems that support high-quality recycling where plastics hold value. Some member states use deposit refund schemes which incentivise users to return their bottles to the recycling system. Strong demand for PET compared to a still-limited supply of recycled resin, driven by the brand value of using recycled plastics, explains to some extent the relatively high price of recycled PET (rPET).

When mechanical recycling is used, the carbon footprint for recycled plastics can be up to 10 times smaller compared to using virgin materials.

For short life-span plastics such as other packaging materials, design for mechanical recycling and systems for returning them to recycling should be preferred for reasons such as value, knowledge about the materials, the demand for recycled materials, and the reduction

in environmental footprint. Mechanical recycling faces tough hurdles, such as the rapid increase in complex materials, and the struggle to separate complex materials such as composites, multi-layer materials, and associated adhesives.

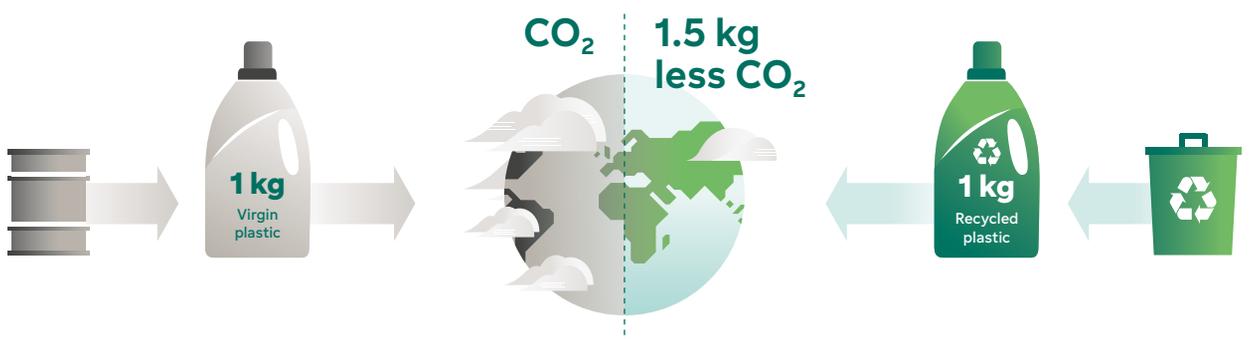
Although there are forthcoming solutions for multi-layer materials that add chemicals to make their components mix better into a composite resin, the materials are not likely to hold their value. Avoiding multi-layer materials in the first place when they are unnecessary supports sorting and recycling and the retention of the material's value.

The ability to achieve high-quality recycled materials through mechanical recycling relies heavily on external factors upstream in the plastics value chain. Many decontamination technologies in mechanical recycling exist and are able to remove additives and inks, but they have not been widely introduced at scale.

It is generally acknowledged that low-quality recycling is not a sufficient basis for a circular plastics economy, as significant values are lost. Therefore, it is necessary to ensure the high quality of recycled materials.

A clearer understanding of how different forms of recycling such as mechanical, chemical and organic recycling could work together would facilitate the development of systems for recycling plastics with varied compositions.

Virgin plastic compared to recycled plastic





Uptake of recycled materials

Over the past decades, reliance on the export of after-use plastics has left the EU market underdeveloped, while creating significant adverse externalities abroad.

Exports collapsed abruptly when China banned the import of plastics waste. As a result, Europe has been forced to upgrade its ability to deal with lower-quality recyclates over the short term, and significantly increase its capacity to convert larger volumes of after-use plastics to high-quality recyclates in the long term. These efforts require major investments in collection, sorting and recycling infrastructure, as well as drastic changes in the design of plastics products.

In addition, recycled materials compete with virgin materials; and one reason virgin plastics come at such a low price is the externalisation of many of their costs. Rebalancing the cost of virgin plastics can improve the competitiveness of recycled plastics.

Effective measures could include differentiated fees in extended producer responsibility schemes. Fiscal and regulatory measures could support the uptake of recycled plastics.

Support for design that uses recycled materials is one example of a means to encourage further uptake. Plastics converters may need to adjust their production to use recyclates; hence, assistance may be needed for those efforts as well. Other ways by which uptake could be facilitated are certification and labelling.

Support for design that uses recycled materials is one means to encourage further uptake.

The adoption of recycled plastics suffers in part from the lack of a coherent regulatory and legislative framework across Europe. The legal status of recycled plastics is in need of clarification. To gain a better understanding of the existing situation, the EC is currently launching a study on member states' practices regarding when waste ceases to be waste.

To progress towards a low-carbon bio-economy, plastics can also be produced from bio-based feedstock. The polymers in the bio-based plastics can either be traditional polymers or novel polymers; however, the latter are usually preferred from the manufacturing point of view as they are easier to produce from bio-based feedstock. The options for recycling novel polymers must be considered to ensure their uptake. Furthermore, recycling facilities may need to be modified to suit novel plastics.



3 Fortum's view on solving the challenges that plastics create in the EU area

This Plastics Review proposes key solutions to help solve the challenges caused by plastics in Europe. We believe that our recommendations can help to create a level playing field that would lead to a more sustainable use of plastics as part of a circular economy.

1 To achieve the most environmental gains, plastics should be recycled many times over

For raw materials that are considered scarce, mining valuable elements from discarded products such as electronics is an obvious path to take. However, for those resources for which even an over-supply of virgin raw materials is available on the market, finding incentives to use recycled materials is more challenging.

Shifting efficiently from a take-make-dispose society to a circular economy where discarded products could contain materials that are less valuable than novel materials is a major challenge. Materials must retain their value in a second life to gain all the environmental benefits over the longer term, such as preventing waste to landfill, avoiding littering, and reducing emissions. Many types of plastics can technically be recycled several times, and safeguarding the conditions that allow this is crucial.

The shift to using products made of bio-based materials, including plastics made of bio-sources, is sometimes presented as a solution in support of a bio-circular economy. However, the challenge with most present-day production technologies is that when the

full manufacturing chain and lifecycle are taken into account, current bio-based plastics products may have a larger carbon footprint compared to fossil ones. Another challenge is that many novel bio-based plastic polymers are not necessarily

recyclable by existing methods, and so may be lost after their first use. In the current state of play, the biggest environmental benefits can be achieved by the recycling of existing materials in use over and over again.

Current need for crude oil in order to produce PE



Source: SOU 2018:84

The biggest difference to the environment is gained by recycling existing plastics

There seems to be consensus that the best way to save resources and reduce a product's carbon footprint is to utilise recycled plastics as input material for new products as much as possible. Nevertheless, new developments in the production of bio-plastics are welcome.

Spokespersons for bio-based plastics assert that these types of plastics save fossil resources and reduce products' carbon footprints, but this may not always be the case. The need for fossil raw materials in production can cancel this advantage out, and the carbon footprint of bio-based plastics may, as a result, be larger than that of fossil-based ones. Supporting the use of potential food crops such as corn and sugarcane as raw material can also be problematic.

It is crucial that conventional fossil-based plastics are not replaced by materials that are poorer in terms of their lifecycle impact, or by plastics which limit the possibilities for conventional plastics to be recycled.



2 Products must be designed for recycling

In its strategy on plastics, the EC addresses the importance of the recyclability of plastics and challenges related to it. The Plastics Strategy sets the EU target that by 2030, all plastics packaging will be either recyclable or reusable, and that by the same year, more than 50% of all plastics waste generated in Europe will be recycled.

Whether or not a plastic product or plastic packaging is recyclable is mainly determined in the design phase. In order for all plastic packaging to be either recyclable or reusable in 2030, Fortum suggests that EU member states enforce the obligation for extended producer responsibility (EPR) schemes.

These schemes must differentiate the financial responsibilities of producers according to the reusability and recyclability of their plastic packaging, with lower costs for producers who use packaging that facilitates recycling. Furthermore, the schemes should incentivise the use of recycled raw materials.

Fortum believes that common EU rules for design for reusability and recyclability would facilitate development. European Committee for Standardization (CEN) standards or widening the scope of the Ecodesign Directive may be useful tools in this effort.



3 The quality of recycled materials must be prioritised

The quality of the recycled material is a decisive factor in the level of confidence in recycled plastics and products made from them.

The separate collection of wastes of different origins and natures is an essential factor in the pursuit of high-quality recycled materials. Separate collection allows each material stream to be recycled for a specific application, improving the recycling rate of each stream.

There are still plastic items in use that have been produced over past decades, which contain legacy substances; and some of these substances are restricted in current legislation. To make sure that wastes containing unwanted substances are not mixed with streams dedicated for recycling, separation and monitoring is needed. High-temperature incineration

or waste incineration with energy recovery should be a preferred option for treating such waste and destroying those substances that must not be recycled. Incineration of rejects from recycling should be recognised as a preferred treatment option. An added advantage incineration offers is that the recovered energy can help fulfil demands for thermal and electric energy.

Fortum believes it is crucial that member states fully enforce the existing waste directive rules on separate collection, mixing bans, and the traceability of wastes containing hazardous substances. The treatment of rejects with energy recovery must be recognised in EU policy. Fortum believes that the incineration of rejects is an important enabler of a safe circular plastics economy.

4

Demand for recycled materials should be fostered

There is a recognised mismatch between the supply of recycled plastics and the demand for them in the EU. Recyclers have pledged to produce more recycled plastics than converters have committed to use. Therefore, in order to support the effort to reach recycling targets, there needs to be greater uptake of recycled plastics. Clearly, the reasons for the gap must also be analysed further.

Fortum believes that confidence in recycled materials must be stimulated in order to encourage demand for recycled plastics. Standards, as well as the EU Ecolabel criteria for certain products, could be developed to include requirements for minimum content of recycled plastic raw material; for example, in packaging or in certain parts of products. Fortum believes that the clear and informative labelling of products which include recycled plastics could aid consumers who wish to make informed choices.

Fortum supports the development of public procurement criteria as a tool for the increased uptake of recycled plastics. We are also in favour of further assessments to enable the development of incentives for plastic converters who want to adjust their production to use recycled plastics.



5

Prevent unsound false recycling and grey zone shipments of plastics waste

Fortum promotes high-quality recycled materials, by which we refer to recycled materials of such quality that they can replace virgin raw materials. An example of high-quality recycled plastics are polymer granules produced at the Fortum plastics refinery (see page 18).

Fortum believes it is important that the calculation rules set in the waste directives are applied when following up recycling targets. It must be ensured that member states do not calculate sorted and collected plastics as recycled, since those steps only prepare the material for recycling. In addition, plastics must not automatically be calculated as recycled once they are exported. Instead they must undergo

effective recycling and comply with the calculation rules of the EU.

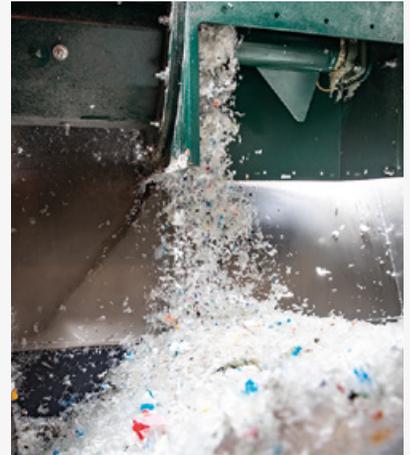
In order to monitor plastic waste until the very end, Fortum supports the Norwegian initiative to strengthen the international control of plastics waste by amending the Basel Convention. Insufficiently sorted and contaminated plastic waste shipments from the EU should be subject to the Basel Protocol to improve the control of waste shipments. This would help prevent the adverse health and environmental impacts in waste-receiving countries that can arise from poor working conditions and defective waste treatment options for residues. The transport of plastic waste between EU member states should be possible with the current procedure.

6 Prioritise mechanical recycling

To reach the set targets of plastics recycling in EU, investments in developing high-quality mechanical recycling, particularly for large volume, short life-span plastics products, should be top priority, since mechanical recycling has the lowest carbon and environmental footprint among the various recycling options.

As not all plastics waste is currently suitable for high-quality mechanical

recycling, chemical recycling could serve as a supplementary option for the synthesis of new materials, although further technical and process developments are needed. According to the calculation rules in the directive, fuel production from chemical recycling does not count towards recycling targets. Hence, when aiming towards the targets, fuels derived from chemical recycling will not improve recycling rates.



Fortum strongly believes that investments in waste management infrastructure, high-quality recycling facilities, and in shaping people's behaviour can promote the greatest change.

7 Curb littering and marine pollution

It is vital that the EU take the necessary actions to curb the momentous global challenge of littering and marine pollution from plastics. Fortum strongly believes that investments in waste management infrastructure, high-quality recycling facilities, and in shaping people's behaviour can promote the greatest change. The key to curbing littering is to turn waste into valuable material that can be used over and over again.

The biodegradability of plastics in single-use products has been seen

as a solution to the littering problem caused by plastics. However, while there are several plastic materials with biodegradable properties on the markets, it is proven that these plastics do not degrade easily under all conditions. On the contrary, even specially designed digestion or composting plants have problems creating the optimum conditions for biodegradable plastics. Furthermore, these plastics can harm recycling operations when mixed with conventional recyclable plastic wastes.

Plastics are frequently needed as a material, and their use in many applications contribute to other environmental benefits. To effectively shift consumers' attitudes from littering to recycling, there needs to be easy access to a modern waste management infrastructure. It should be more widely known that biodegradable plastic materials are not the solution – they do not prevent littering and pollution, and can severely harm recycling operations in the EU area.

Case

CIRCO® – a sustainable alternative to virgin plastic

Circo recycled plastic products are made entirely of recycled industrial and commercial plastics and plastic consumer packaging.

Until recently, recycled plastic wasn't on par with virgin plastic. Plastic industry wasn't interested in using the recycled raw material as it meant compromising efficient production. Fortum's Circo recycled plastic offers manufacturers a sustainable and safe alternative to virgin plastic.

Circo recyclete is produced at Fortum's modern recycling plant, where plastic waste bound for recycling is efficiently separated and cleaned. Producing the recycled plastic granulates only uses about 15% of the energy needed to make virgin plastic.

"Our customers are committed to sustainability, and we offer them full transparency. They can rest assured

that the waste is properly sorted and the production is environmentally sound and energy efficient," says **Kalle Saarimaa**, Vice President, Fortum Recycling and Waste.

Using the recyclete as raw material saves energy and reduces the carbon footprint of plastic product manufacturers while enabling them to give plastic waste new life in a different form.



4 Summary and recommendations

The transition to a circular economy for plastics is in its nascent stage. It requires a paradigm shift, departing from a take-make-dispose economy, and involving changes across a variety of aspects, including design, production, use, reuse, recycling, investment in waste management infrastructure, as well as social behaviours and habits. The success of the transition depends greatly on how well the existing framework is reset to support a circular economy. For a circular plastics economy to be able to endure over time, it is fundamental that it is competitive.

Fortum's key recommendations towards the transition to a circular plastics economy in the EU



Merely recycling and retaining as much of the value as possible from already existing plastics, instead of producing virgin plastics, will make a great difference in saving carbon and reducing environmental footprints.



Products should be designed in a way that enables recycling and retaining material value. Extended producer responsibility schemes should support design for recycling, as well as the uptake of recycled materials and system design for separate collection.



Quality is the key to confidence in recycled plastics and is a prerequisite for a circular plastics economy. Keeping track of material streams of various natures, the separate collection of different plastic waste streams, and ensuring decontamination of streams with substances of concern are crucial for non-toxic high-quality recycled plastics. Incineration with energy recovery should be recognised as a preferred option for treating rejects.



Closing the gap between supply and demand for recycled plastics requires measures to raise confidence and interest in recycled plastics, as well as adjustments to enable recycled plastics' use as raw material. Possible measures include the development of standards, eco-labelling, public procurement criteria, as well as other incentives and economic instruments for the uptake of recycled plastics.



A functioning EU market for plastics recycling should be supported through the proposed change to the Basel Convention, which seeks to prevent the export of plastic waste to countries outside Europe with less environmental protection. Better control of plastics waste shipments under the convention will support investment into recycling facilities. In order to achieve a circular economy for plastics in the EU, shipments between member states should still be possible in the way they are today.



The priority order of recycling options should consider carbon and environmental footprints. Mechanical high-quality recycling has the lowest environmental and carbon footprints and should be preferred. Although chemical recycling needs to be developed further, it can be a supplement to mechanical recycling.



Biodegradable plastics are not the solution to curb littering and marine plastic pollution. Efforts to prevent plastics pollution and littering must be accelerated, and substantial measures approaching behavioural as well as system design for after-use pathways such as waste management and recycling infrastructure are needed. The ease of returning plastic products after use also needs to already be taken into account in the design phase.

Towards a circular plastics economy in Europe

Key messages

- ▶ Recycling existing plastics many times over while retaining as much of their value as possible will aid in reducing plastics' carbon footprint and in mitigating global warming.
- ▶ Extended producer responsibility schemes should support design for recycling, as well as the uptake of recycled materials, and system design for separate collection, e.g. for electronics, packaging, and batteries.
- ▶ To ensure the quality of recycled materials, member states must fully enforce existing waste directive rules on separate collection, mixing bans, and traceability of wastes containing hazardous substances.
- ▶ Various measures, such as standards development, eco-labelling, and public procurement criteria, should be taken to support the demand for recycled plastics.
- ▶ In order to achieve a circular economy for plastics in the EU, shipments between member states should still be possible in the way they are today. Exports outside the EU should be subject to the Basel control procedure; and when calculating the attainment of the targets, the same rules must apply.
- ▶ Mechanical high-quality recycling has the lowest environmental and carbon footprints and should be the preferred option.
- ▶ Biodegradable plastics are not the solution to curb littering and marine plastic pollution. Efforts to prevent plastics pollution and littering must be accelerated.

