



The green deal

A game changer for the waste management and plastics industries

Responses to EU plastic recycling regulations for governments, EPR schemes, waste management companies, plastic sorting and recycling companies, plastic producers and corporate users

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Abstract

The EU is expanding its regulatory framework and targets regarding recycling of plastics in order to move to a circular economy. Meeting these targets will require major investments throughout the entire plastics (recycling) value chain, which will reshape the waste management, recycling and plastic production industry.

Supply of recyclable plastic waste to recycling companies will need to increase in the coming years as regulations will become stricter: a higher share of plastic (packaging) waste needs to be recycled. In order to comply with these and other recycling targets, governments should incentivise waste managers to (post-)sort residual waste and recycle the plastic fraction.

Until now, demand for recycled plastics has been limited due to low oil prices and a vicious circle of

low quality and correspondingly low prices of recycled plastics, low profitability and investments in the recycling sector, which keeps quality and demand low. As part of the Green Deal, the EU is expected to introduce quota for minimum usage of recycled content in new plastic products, which will break through this vicious circle. High(er) quality recycled plastics is required to meet these quota, which is highly scarce and expected to lead to significant price increases.

Sorting and recycling companies will need to invest in both capacity and technology in order to meet the increasing demand for high-quality recycled plastics and capture the opportunity of higher prices and returns, driven by the Green Deal quota. At the same time, plastic converters will need to adapt production to use more recycled plastics, and producers of virgin (petroleum-based) plastics will need to reconsider their strategy as they will lose market share.



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Introduction

EU recycling regulation: a call to action for governments, waste managers and the plastics industry

Plastic is a vital material in the European economy and society, but the increasing pressure on the environment has led to far-reaching EU regulations, affecting the entire plastics (waste) value chain.

As it is light, strong and durable, plastic is an attractive packaging solution and an often superior alternative to metal in construction and automotive applications.

The way we produce and dispose of plastic is however detrimental to the environment: it depletes natural resources, pollutes oceans, squanders land, and contaminates the air through CO₂ emissions. Therefore the European Union has marked plastics as a key priority in its Action Plan for a Circular Economy and has committed itself to addressing the challenges posed by plastics throughout the value chain.

The key focus of current regulation is the reduction and treatment of plastic (packaging) waste. After consumption and collection, plastic (packaging) waste can either be sent to landfill, incinerated for energy recovery, or recycled. To protect the environment, the EU aims to prevent landfill and encourage recycling: 55% of plastic packaging waste should be recycled by 2030.

However, historic recycling regulations have focused nearly exclusively on the supply side (from waste management to recycling): the output of

plastic recycling has been largely unregulated. Therefore, the primary focus in plastic recycling has been to create as much recycling volume and throughput, while only secondarily taking into account that the output needs to be of use for the plastic converting industry. As a result, recycled plastic primarily ends up in the lower-value parts of the plastic economy and the high-end parts of the plastic converting industry still rely solely on virgin plastic.

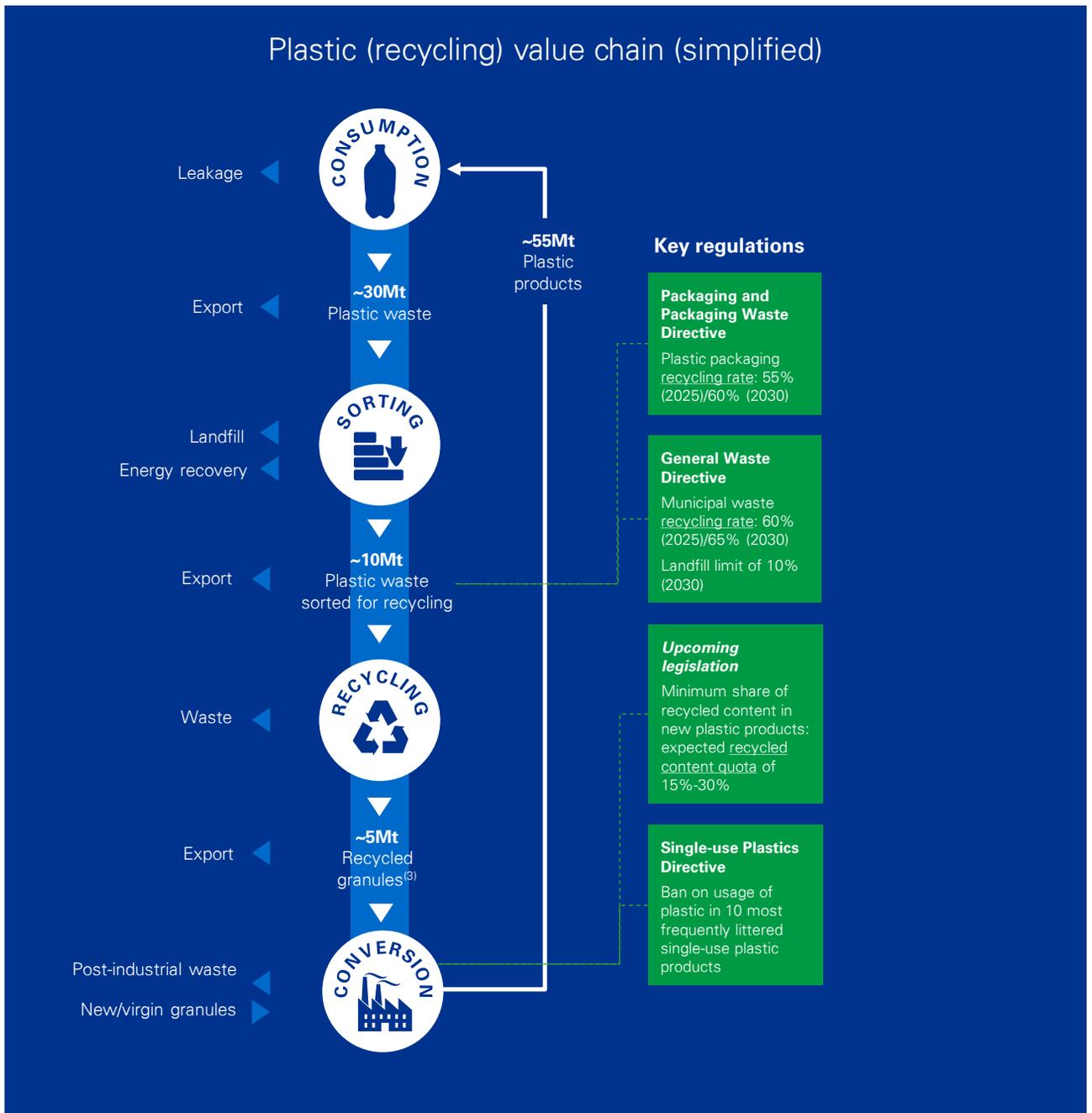
With increasing ambitions for recycling, the lower-value parts of the plastic converting industry are of insufficient size to absorb the recycled plastic and therefore areas of the plastic converting industry that currently largely or exclusively rely on virgin plastic must start to use recycled plastic.

In order to reach the higher recycling targets, the EU also aims to boost the uptake of recycled plastics by the plastic converting industry in the production of new products, in order to move to a truly circular economy. In recent years this was attempted through EU-wide pledging campaigns, but ambitions have been accelerated by the Green Deal. By 2022 at the latest, it is expected that the European Commission will introduce minimum quotas for usage of recycled content in new plastic products, with which plastic converters and brand owners will have to comply⁽¹⁾. Although these quotas are currently being developed, industry experts expect them to range between 15% and 30%.



With a current recycling rate of less than 35%⁽²⁾ for plastic packaging waste, a penetration rate of recycled plastics in new products of less than 10%, and a supply-demand mismatch in terms of quality, the industry will have to take major steps order to comply with regulations and move to circular economy.

In this article we elaborate on the implications of key EU recycling regulations on the supply of plastic waste, demand for (recycled) plastics and the implications for governments, extended producer responsibility (EPR) schemes, waste managers, plastic sorting and recycling companies, virgin plastic producers and users (brand owners).



Recycling of plastic waste (supply)

Current recycling rates of plastic packaging waste are far behind EU targets

While EU recycling targets will increase, a new calculation method will result in a lower measured recycling rate and increase the gap that countries should overcome.

Treatment of plastic packaging waste is regulated through the Packaging and Packaging Waste Directive since 1994. In 2018, recycling targets were updated: the share of plastic packaging waste that is recycled⁽⁴⁾ should be at least 50% in 2025 and 55% in 2030. Recycling rates for individual EU countries ranged between 30%-52% in 2018, meaning all countries have to take further steps in order to achieve the 2030 EU targets.

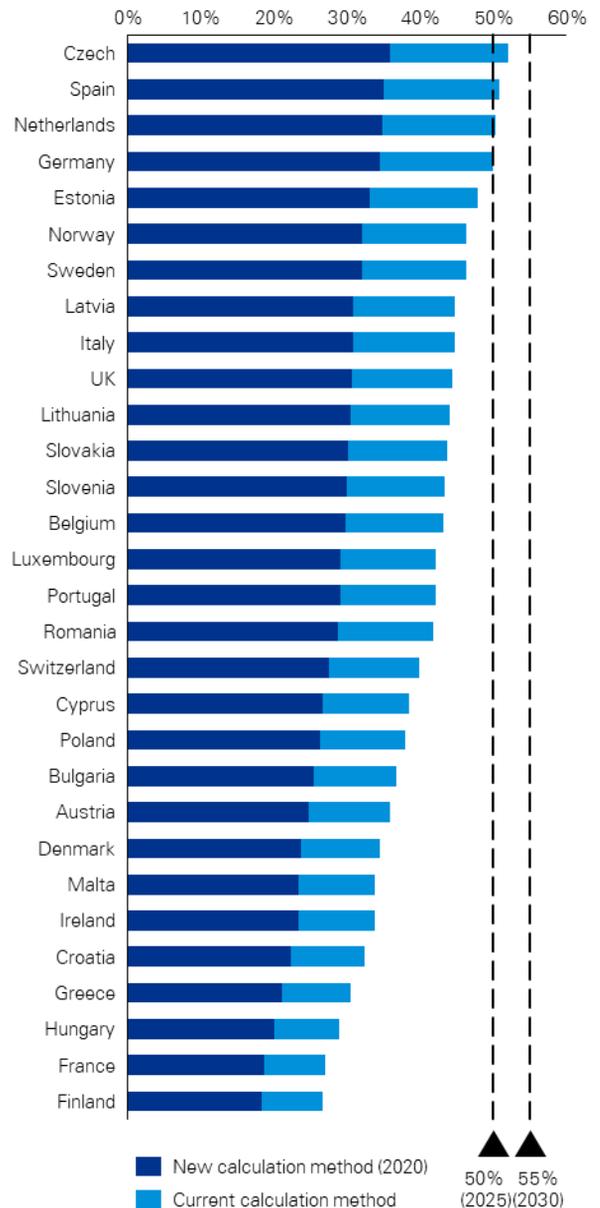
In 2020 a new calculation method will be introduced in order to reduce contamination and material loss during the recycling phase (refer to Appendix 1). According to this method, the average recycling rate would have been only 29% instead of 42% in 2018. This means that all member states have an even larger gap to close⁽⁵⁾.

While some countries like Greece do not have (mature) plastic collection and recycling systems for household waste, in many European countries systems are in place for both commercial and household waste.

The former countries can increase their recycling rates relatively easily by introducing such systems through regulation and promoting consumer sorting discipline, the latter countries need to improve the effectiveness of their current systems and rethink those systems.

While investments by sorting and recycling companies in professionalisation, standardisation and the latest technologies can support further increases in recycling rates, it is unlikely that this will be sufficient to close the gap. In mature countries a broad reevaluation of the current systems is required.

Plastic packaging waste recycling rate, 2018 (current versus new calculation method)⁽⁶⁾



Sorting and recycling of municipal residual waste is required to reach recycling targets

In order to reach the plastic recycling targets, Europe needs to rethink its plastic recycling systems, particularly for household waste.

The European plastic recycling infrastructure is currently mostly focused on separately collected plastic packaging, separated at the source. However, in spite of source separation, significant amounts of plastics are not separated in practice and end up in mixed waste.

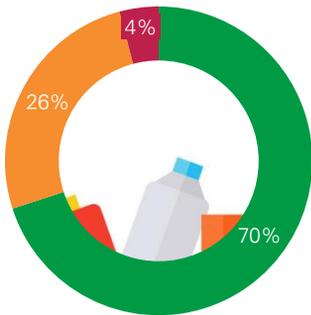
Despite the separate collection systems in most countries, over 40%⁽⁷⁾ of plastic packaging waste in Europe is in mixed waste streams, in particular municipal residual waste. Even in countries with the most mature pre-sorting infrastructure and discipline such as Germany, approximately 10% of municipal residual waste is plastic. This is due to limited

sorting discipline, changing guidelines and urban areas lacking space for separate collection.

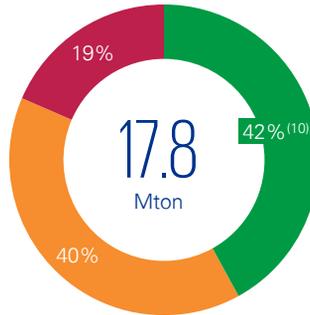
Municipal residual waste is mostly incinerated or sent to landfill as sorting and recycling of this highly contaminated stream has been considered too costly and difficult for many years. However there are several regions where municipal residual waste is sorted and recycled. Examples include (parts of) Spain, Norway and the Netherlands. Not surprisingly, these countries have relatively high plastic recycling rates. On a European level, less than 10% of municipal residual waste is sorted for recycling⁽⁸⁾. This needs to increase substantially in order for Europe to reach its recycling targets for plastic packaging waste.

Source and treatment of plastic packaging waste, Europe (2018)

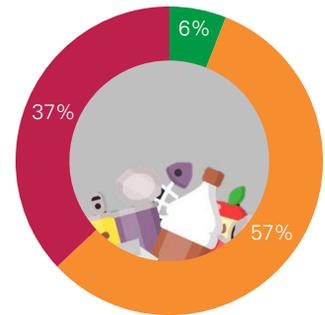
Separate waste collection⁽⁹⁾
(~55%)



Total post-consumer plastic packaging waste collected



Mixed waste collection
(~45%)



■ Recycling ■ Energy recovery ■ Landfill

A second reason for increased recycling of municipal residual waste is the latest EU regulation⁽¹¹⁾ on treatment of all municipal waste. Municipal waste covers all household and similar company waste, including both separately collected streams (such as plastics, glass, paper and compostable waste) and residual waste. To preserve land and avoid CO₂ emissions, the EU introduced:

- **Landfill restrictions:** Member states shall endeavour to ensure that from 2030 all waste suitable for recycling or other recovery, in particular in municipal waste, shall not be accepted in a landfill. In addition, member states will ensure that by 2035 the amount of municipal waste landfilled is reduced to 10% or less of the total amount of municipal waste generated;

- **Targets for the recycling of municipal waste:** From 2025 the share of municipal waste recycled should be at least 60%. This figure should be 65% in 2030.

These targets on overall municipal waste should result in more sorting and recycling of municipal waste, which contributes to the recycling of plastic packaging waste.



Governments and EPR schemes need to incentivise waste managers to invest in post-sorting installations

As the end-to-end business case of post-sorting tends to be negative, external funding is required to ramp-up post-sorting.

Municipal residual waste is typically collected by (municipal) waste management companies. It is incinerated or landfilled as the costs of sorting and collecting plastic packaging waste are not covered by the price that recyclers are willing to pay for sorted plastic waste.

Therefore collection and sorting of plastic packaging waste is typically funded by EPR schemes. Through these schemes governments oblige plastic packaging producing companies to contribute to the sorting and recycling of plastic packaging waste. This funding is typically directed to collection and sorting companies focused on pre-sorted waste. In order to reach the targeted recycling rates, governments should also enforce that (post-)sorting operations for municipal residual waste are funded by EPR schemes. With sufficient funding, incinerators can build a profitable business case and start investing in (post-)sorting installations. This business case may become even more attractive when sorted plastic waste becomes scarce.

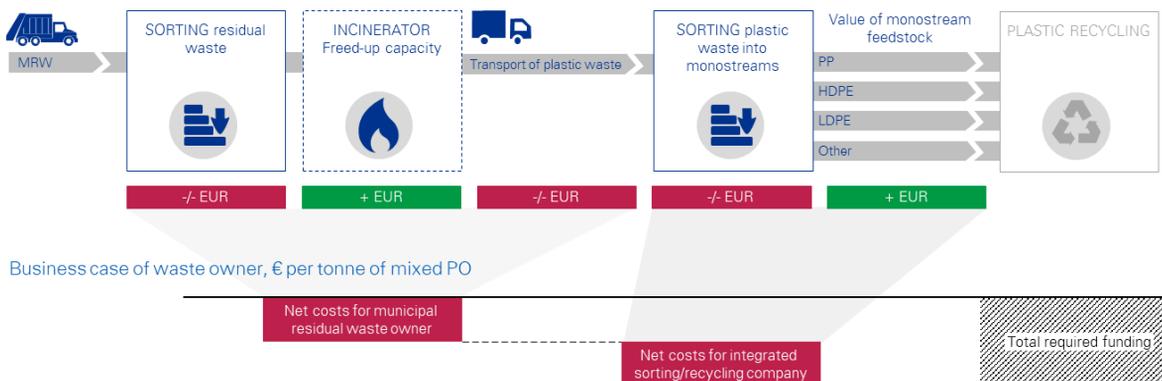
Based on current plastic waste volumes and the previously-mentioned gap with recycling targets, >100 new post-separation installations may be needed⁽¹²⁾. In addition, an even larger number of new recycling facilities is needed to process the increased supply of plastic waste into recycled plastics (as recycling companies tend to be much smaller).

Post-separating municipal residual waste is actually a more cost-efficient way to sort plastics (and requires less subsidisation) than the pre-sorting infrastructure that prevails in most countries⁽¹³⁾, because there is no separate collection infrastructure and less incineration capacity is required⁽¹⁴⁾.

This offers countries that lag behind the opportunity to catch up much more cost-efficiently by fully focusing on post-separation instead of setting up a new costly pre-sorting infrastructure. Furthermore, many of those countries still rely heavily on landfill, which needs to be reduced according to EU legislation.

Investing in post-separation installations would contribute to recycling targets, reduces the need for new incineration capacity, and is therefore beneficial for the environment.

Costs of and revenue from sorting plastics from municipal residual waste (MRW)



Usage of recycled plastics (demand)

Current penetration of recycled plastic is relatively low due to quality issues

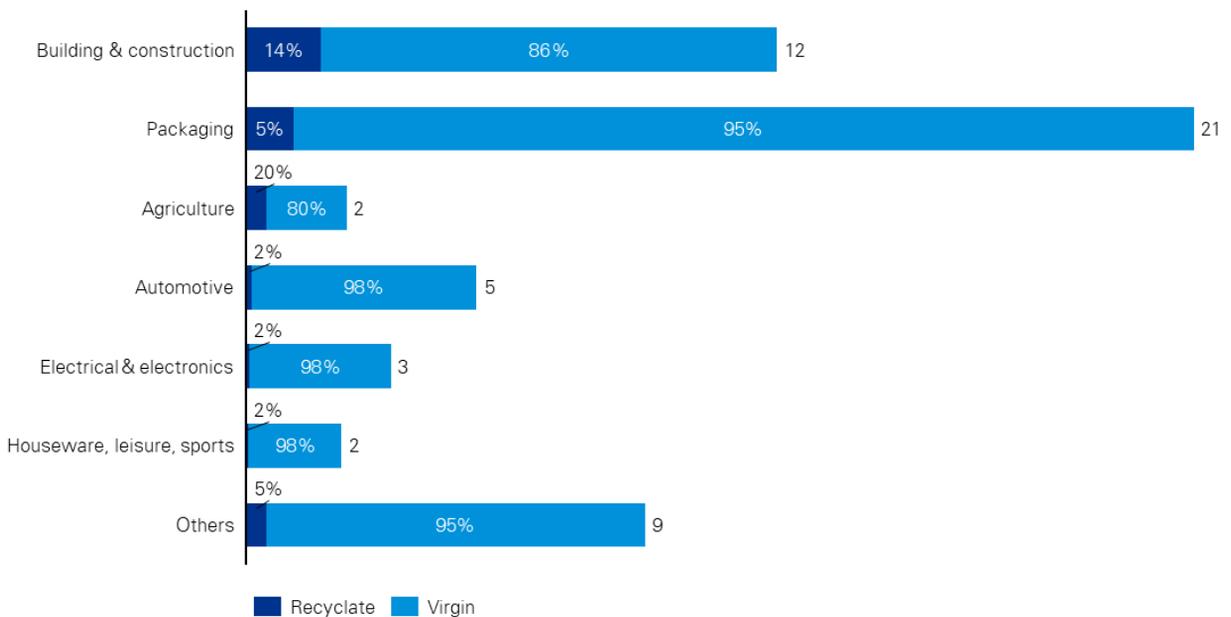
The current quality of recycled plastics is insufficient for wide usage.

The current penetration of recycled plastics is approximately 10%, although varying by application. Besides the currently relatively low oil price which keeps virgin plastic attractive, a lack of quality is the key reason for this limited penetration. Recycled plastic can have a strong smell, troubled colours and is not as homogenous as virgin plastic. As a result, recycled plastic is primarily 'down-cycled' to lower-value applications such as traffic cones, agricultural foils and crates.

In order to become truly circular, usage of recycled plastic needs to increase. Some brand owners such as Coca Cola and Danone have explicit targets to

increase their use of recycled plastic. However in order to replace virgin plastic more broadly, the quality of recycled plastic needs to increase. This is possible (refer to page 17), but requires significant investments. However many recycling companies experience a vicious circle of limited quality output, leading to correspondingly low prices for recycled plastic, leading to low profitability, in turn limiting the ability to invest heavily in quality, keeping quality and demand low. A way to break through this vicious circle, and make sure that major investments in quality will be earned back, is by enforcing an increase in demand through regulations.

Composition of new plastic products, post-consumer recycled⁽¹⁵⁾ versus virgin plastics (2018)⁽¹⁶⁾



The Green Deal will result in higher demand for high quality recycled plastics

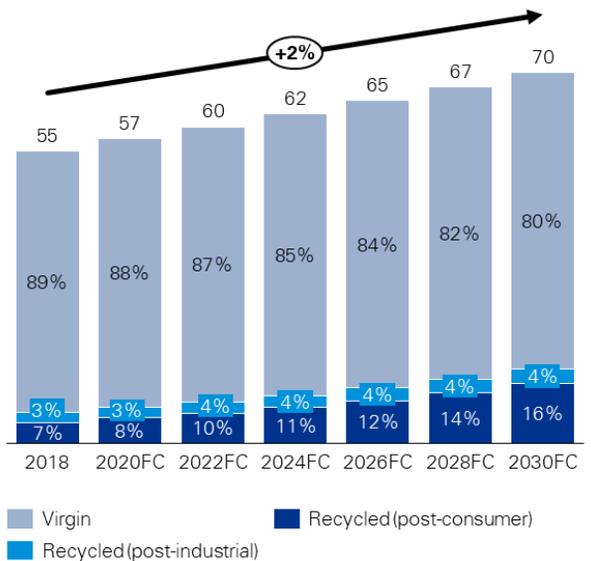
Green legislation will stipulate more usage of recycled plastics. In order to use them in a wide range of products, quality should increase.

Until recently, EU legislation was focused on collection, sorting and sending as much plastic waste as possible to recycling facilities, without much attention on whether the eventual recyclate is of use to the plastic converting industry. This is about to change drastically as the European Commission has recognised the need to legally enforce higher usage of recycled plastics in order to become truly circular and break through the vicious circle of low quality, prices, quality investments and demand.

The Circular Economy Action Plan, part of the European Green Deal, indicates the introduction of legislation around the use of a minimum share of recycled content in new plastic products by 2022 at the latest. This is expected to apply to all plastic products except food packaging (due to food safety regulations) and PET (which already has a mandatory recycled content quota of 25%). Although percentages are currently being developed, industry experts expect the quota to range between 15%-30%.



Plastic converter demand in Europe, virgin versus recycled (2018-2030FC)⁽¹⁷⁾⁽¹⁸⁾⁽¹⁹⁾



This means that applications which currently only include virgin plastic, will need to include recycled plastic. This will have major implications for the plastics industry, refer to adjacent box.

As a result of the enforced increase in demand, several industry participants anticipate shortages of high-quality recycled plastic. This offers opportunities for owners of plastic waste and plastic recycling companies.



Brand owners will need to revise parts of their product design, which may include usage of other materials or colours.

Plastic converters will need to adapt their production process to make it suitable for recycled plastic, including extensive testing on quality.

Producers of virgin plastic will need to revise their strategy as they will lose market share (see chart below). Major plastic producers Borealis and LyondellBassell are already anticipating this transition and acquired plastic recycling companies in order to be able to supply their customers with recycled plastic.

Recycling sector

Step-up in quality can be achieved through investments in technology and professionalisation

Traditionally the quality of plastic waste has been regarded as a key determinant of output quality, but major improvements can be achieved by the recycling sector itself.

Better pre-sorting (separate collection) and producing products that decompose more easily can enhance the input and therefore output of recycling.

However, major improvements can be achieved by the plastic recycling sector itself, with technology as

a prerequisite. Low-quality waste can (only) be recycled into high-quality output with the latest sorting and recycling technologies. This is demonstrated by the largest European recycling company Morssinkhof, that produces near-virgin-quality recycled plastic from plastic that is sorted from municipal residual waste by the sorting company Omrin. This requires significant investments in machinery, in particular hot-washing and extensive colour sorting through near-infrared visual light sensors (refer to the table below).

Selected advanced mechanical recycling technologies

Technology	Function
 Ballistic separators with integrated air separation	Allows for high-quality separation of 2D/3D material
 Wet grinding	The combination of water and friction (cutting) results in better washing results
 Near-infrared with visual light sensor	Enables colour sorting, especially if conducted in multiple stages, thereby solving one of the key recycling issues
 Hot-washing	Allows for better cleaning and smell reduction, enabling recycling of highly contaminated plastic waste
 Compounding extruder	A compounder allows the addition of additives, fillers and reinforcing agents, enabling higher (more homogenous) quality and production of specific characteristics (colours)
 Intermediate silos	Provides for more (intermediate) quality checks

While technology is key to producing high-quality output, it is not sufficient. Producing consistent output quality requires a high degree of standardisation and operational excellence, including the continuous fine-tuning of machine settings and extensive quality control.

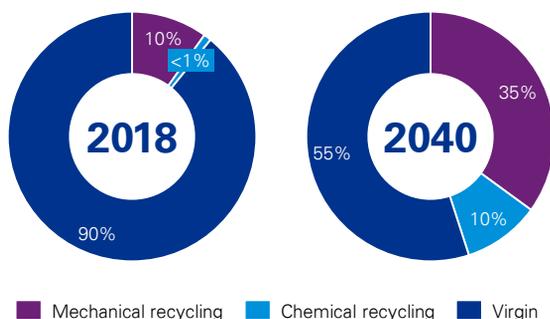
However, the recycling sector is relatively immature and characterised by many small, entrepreneurial companies, with management teams that often have limited experience in the professional plastic

industry. For companies that lack scale, expertise and funds to invest, consolidation within the plastic recycling industry and/or partnering with players from adjacent industries (e.g. waste management, plastic manufacturing) or financial investors might be a potential solution. The latter is actually what is happening in recent years, with a significant number of adjacent industry parties and to a lesser extent financial investors entering the plastic recycling market.

Besides quality improvements, enhanced scale can significantly increase profitability. Economies of scale can be achieved in the procurement of waste, water, energy, machinery and larger companies have more power in terms of negotiations with customers. Refer also to the article 'The Plastic Recycling opportunity', as published by KPMG in October 2019.

Finally, to further professionalise the sector, a professional secondary market for recycled plastic needs to be developed. Whereas the virgin plastic market is highly liquid and transparent with quality specifications that allow for efficient trading, recycled plastic is only traded over the counter. Establishing a well-functioning internal market for secondary raw materials (in particular plastic), is one of the key objectives of the Green Deal Circular Economy Action Plan. The European Commission is investigating the development of recycled product standards (standardisation) and the feasibility of establishing a market observatory for key secondary raw materials. Both initiatives will rely and build upon national and commercial initiatives.

Expected shares of mechanically and chemically recycled plastic and virgin plastic, 2018 and 2040⁽²⁰⁾



Chemical recycling

The dynamics and technologies as described on the previous page concern the current plastic recycling industry, which is a mechanical recycling industry. This is the most common type of recycling (>99% of volumes), where polymers remain intact. In recent years, several breakthroughs in chemical recycling have been achieved. Chemical recycling includes various chemical treatments which break down the polymers back to monomers or other base chemicals in order to rebuild them into new plastics. This has several advantages over mechanical recycling:

- Higher output quality, making the recycled plastic feasible to replace virgin plastic, even in sensitive applications such as food packaging, medical items and toys;
- Less dependence on feedstock quality, as plastic waste streams are treated so extensively, reducing them to their base components, that even the most contaminated streams can be recycled;
- No degradation; chemical recycling allows plastic to be recycled an infinite number of times, while mechanical recycling reduces the quality of the plastic, meaning it can only be recycled successfully a few times.

While chemical recycling is a very promising solution, it is still in its infancy. Furthermore it is and will remain much more costly (energy consuming) than mechanical recycling. Hence, industry experts expect chemical recycling to become only complementary to mechanical recycling for the foreseeable future.



Anticipated pricing dynamics make investments in high-quality sorting and recycling increasingly attractive

Prices of recycled plastics have been relatively low, but are expected to increase significantly, especially for higher qualities.

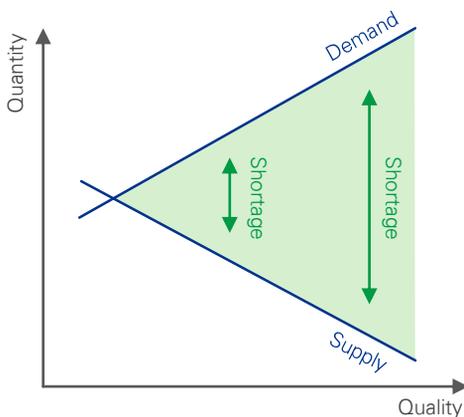
As a result of the relatively low quality and the limited applications where recycled plastic can be used, recycled plastic has been trading at discounts of 20%-40% compared to virgin plastic⁽²¹⁾. The potential for further penetration of this low-quality plastic appears limited. Hence sorting and recycling companies that continue to supply more of the same low-quality recycled plastic, encouraged by governments aiming to increase the recycling rate for plastic waste, face the risk of oversupplying the market, resulting in price decreases.

On the other hand, the previously-mentioned scarcity of high-quality plastic will result in much higher prices for such quality plastic. This is demonstrated by recycled PET⁽²²⁾. For several years high-quality recycled PET has actually been trading at a premium compared to virgin instead of a discount. Furthermore, price differences between low- and high-quality recycled plastic can be significant, with prices of the latter being 1.5-2 times as high.

By investing in the latest technologies and professionalisation, sorting and recycling companies can produce high-quality plastic and benefit from expected price increases for other types of plastic as well.

Scenario 1

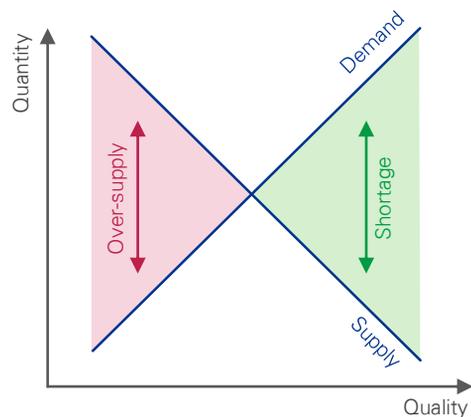
- **Recycling rate of 40%** for plastic packaging waste by 2025; targets not met as (MRW) sorting lags behind, resulting in only limited increase in the supply of plastic waste
- Recycled plastic quota for new products of **30%** already in **2025**



- Overall shortage of plastic waste
- Overall price increase for plastic waste and recycled plastic
- Highest shortage and price increases for the highest qualities

Scenario 2

- **Recycling rate of 50%** for plastic packaging waste by 2030; targets are almost met, resulting in a strong increase of supply of plastic waste
- Recycled plastic quota for new products of only **15%** in **2030**



- Shortage and price increase for high-quality recycled plastic
- Oversupply and price decrease for low-quality recycled plastic

Conclusion

Regulations provide opportunities throughout the value chain, but require proactive investments

EU regulations enforce more recycling of plastic waste and higher usage of recycled plastic. This requires major investments throughout entire value chain and calls industry participants to action.

Overview of impact and suggested actions along the value chain		
Party	Impact	Suggested actions
Governments	 Face increasing EU targets for the recycling of plastic packaging waste and municipal waste	<ul style="list-style-type: none"> — Incentivise waste managers to sort municipal residual waste by providing funding via local governments and/or EPR schemes — Demand funding from plastic producing companies
Local governments and EPR schemes (executing bodies of national governments)	 May be asked by waste managers or sorting companies for funding to sort the additional volumes of plastic to be recycled	<ul style="list-style-type: none"> — Demand funding from the national government and/or plastic producing companies in order to finance sorting more plastic waste and send it for recycling
Waste managers and sorting companies	 May facilitate (and profit from) collecting and sorting more plastic waste for recycling	<ul style="list-style-type: none"> — Invest in sorting plastic from municipal residual waste with funding from (local) government/EPR schemes — Invest in high-quality sorting technologies
Recycling companies	 May benefit from increasing demand for high-quality recyclate, or suffer decreasing prices for low-quality recyclate	<ul style="list-style-type: none"> — Secure (more) plastic waste as feedstock — Invest in high-quality recycling technologies and professionalisation
Virgin plastic producers	 Will face a decrease in market share to be replaced by recycled plastic In the short to medium term this may be compensated by an absolute increase in demand for plastic	<ul style="list-style-type: none"> — Revise strategy as customers will demand more recycled instead of virgin plastic i.e. consider entering into mechanical and/or chemical recycling — Invest in compounding (blending recycled with virgin plastic) — Contribute knowledge to professionalise the plastic recycling industry (quality standards)
Plastic converters, manufacturers and brand owners	 Will face EU quota for using a minimum share of recycled content in new products	<ul style="list-style-type: none"> — Revise product material/design strategy to include more recycled plastic or non-plastic substitutes — Adapt production process to include recycled plastic — Secure supply of recycled plastic — Make plastic products more easily recyclable (decomposable) to allow for reuse or recycling — Contribute knowledge to professionalise the plastic recycling industry (quality standards)
All		<ul style="list-style-type: none"> — Large industry participants and (or through) coordinating bodies should develop a more professional, liquid and transparent secondary market

Key:  High
 Low

Developments in supply, demand and quality will also determine how much funding the plastic recycling value chain requires. In the short term, more funding will be required to sort more plastic waste. However in the long term, when usage of recycled plastic becomes mainstream with correspondingly high prices, less funding may be required. In any case, industry participants throughout the entire value chain will be affected and need to respond to EU regulations, in order to move towards a circular economy.

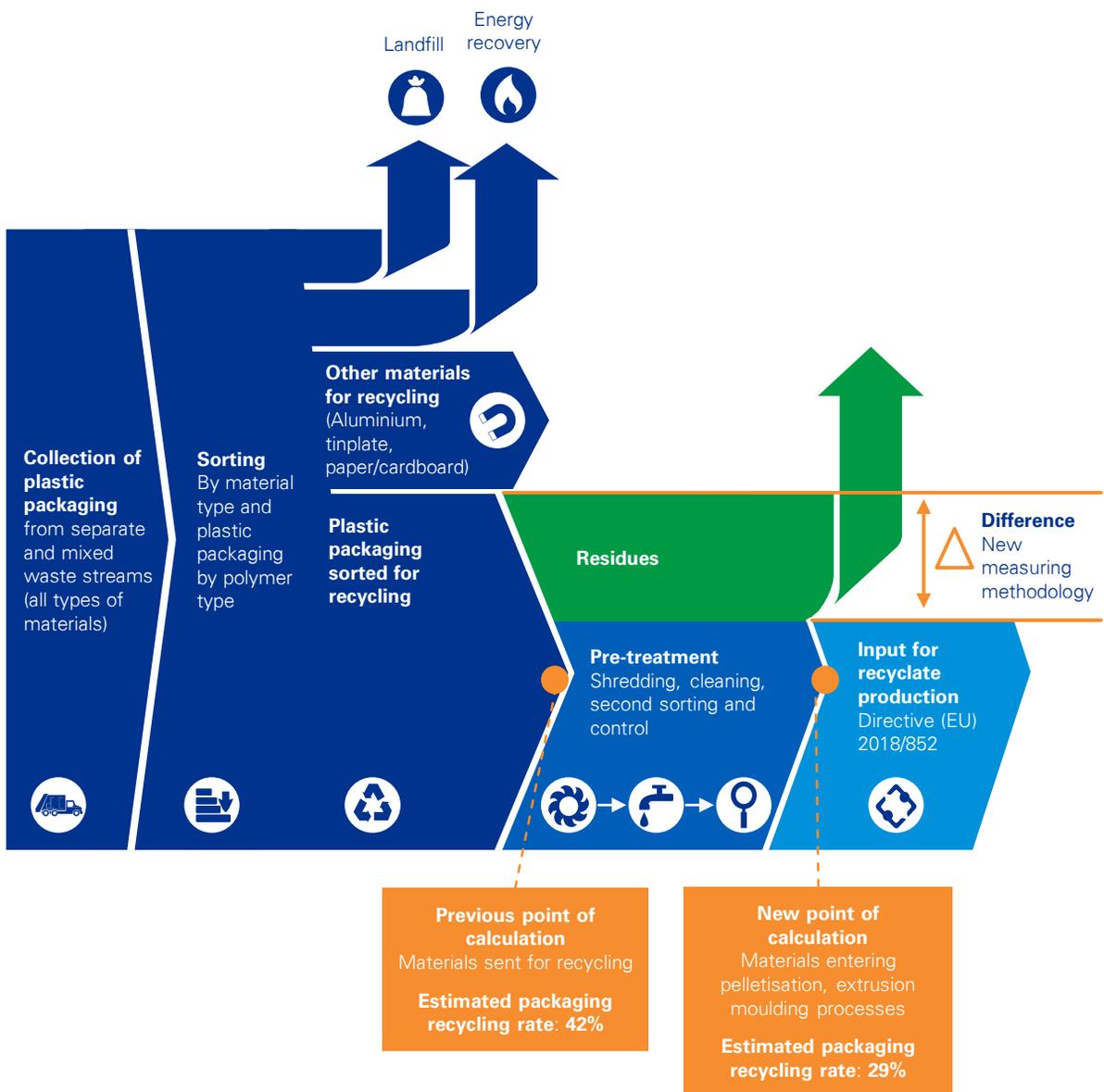
Appendix

New calculation method

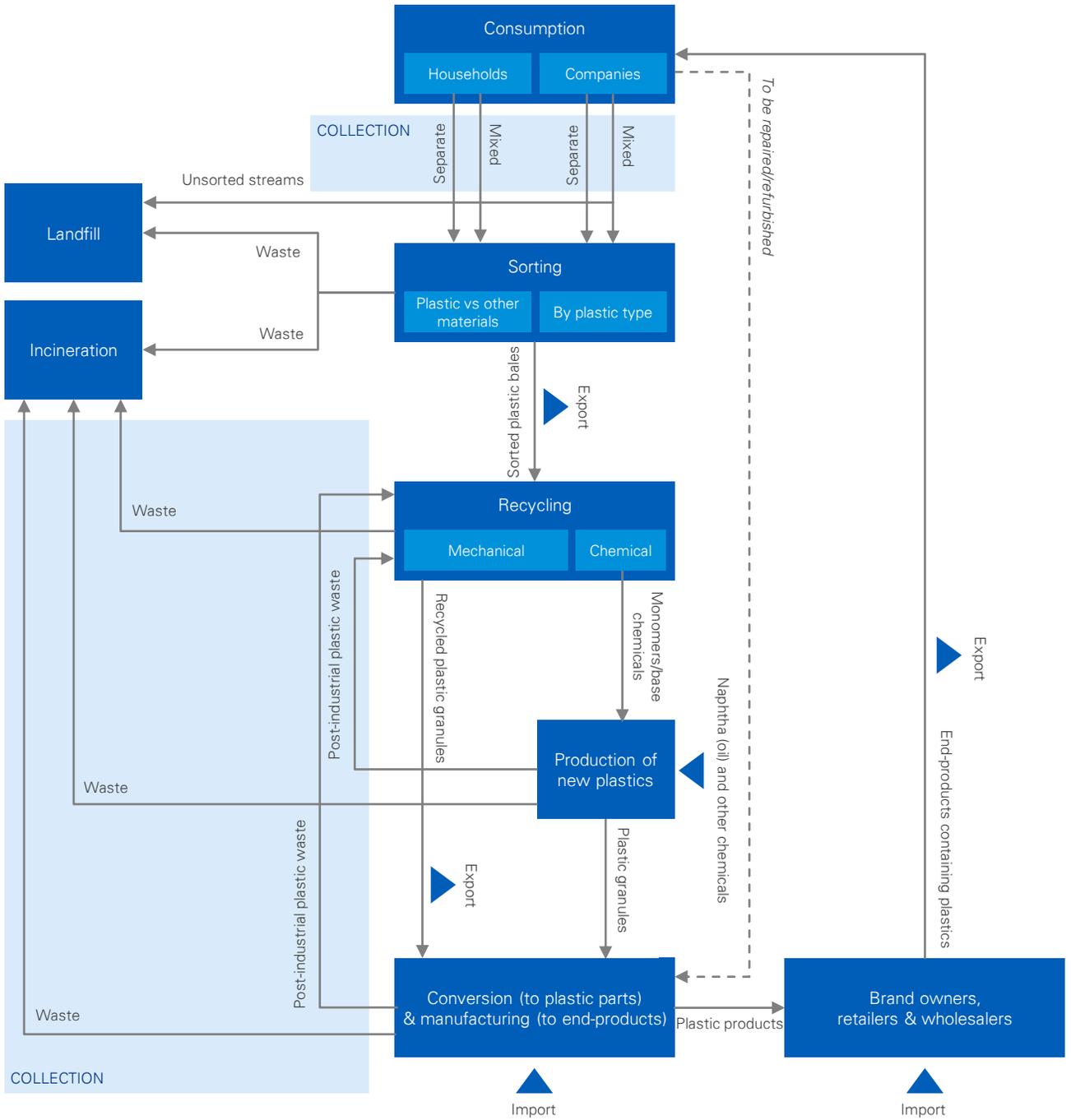
Until 2019, the recycling rate was based on the volume sent to recycling facilities. The recycling process consists of two phases: pre-treatment in which residues are filtered out through shredding, washing and further sorting operations, and the pelletisation (extrusion) phase in which plastic flakes are melted into new plastic granules. Effective 2020, the recycling rate will be measured based on the

volume that enters the pelletisation (extrusion) phase of the process, instead of on the volume that is sent to recyclers. By shifting the point of measurement the regulator has created an incentive to increase the recycling yield by limiting contamination and therefore loss during the pre-treatment phase. Based on this method, the European recycling rate was only 29% in 2018.

European recycling rate according to previous versus new calculation methodology



Detailed value chain



Sourcing and notes

1. New Circular Economy Action Plan.
2. According to the adjusted calculation method, refer to page 23.
3. From post-consumer waste.
4. Recycling meaning any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. This does not include energy recovery through incineration.
5. Countries that lag significantly behind will get more time to close the gap.
6. Current calculation method: Plastics Europe. New calculation method: KPMG analysis based on applying a yield of 69% to all countries, based on the average difference between the current and new calculation method. Refer to the Appendix.
7. Based on Plastic Europe for total plastic waste. This is assumed to also apply to packaging waste as >60% is packaging. Cross-checked with data from the Dutch Central Bureau of Statistics.
8. Plastics Europe.
9. Including civic amenity sites.
10. According to the current (2018) methodology.
11. DIRECTIVE 2015/0275 (COD) OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL, amending Directive 2008/98/EC on waste.
12. KPMG plastic recycling model based on data from Plastics Europe, Eurostat and interview feedback.
13. KPMG analysis based on KV+ and interview feedback.
14. Existing incineration capacity can often be filled up by other municipal residual waste as most European countries face shortage of incineration capacity. One ton of plastic waste can be replaced by 2-4 tons of municipal waste without plastics, as the caloric value of plastic is much higher.
15. From post-consumer waste. Split by application not available for recycle from post-industrial waste.
16. Plastic the Facts and The Circular Economy for Plastics – Plastics Europe.
17. Assuming the introduction of a recycled content quota.
18. From post-consumer and post-industrial waste.
19. KPMG plastic recycling database-model based on European legislation, Plastic the Facts and The Circular Economy for Plastics – Plastics Europe and interview feedback.
20. KPMG analysis; interview feedback; KPMG Thought Leadership research: 'The plastic recycling opportunity'.
21. Plasticker.de; vraagenaanbod.nl.
22. Vraagenaanbod.nl.



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