PLASTICS

MARKET SITUATION REPORT 2019

INTRODUCTION

WRAP's series of Market Situation Reports provides in-depth information on the latest economic, market and regulatory trends affecting the capture and recycling of key recovered materials.

The previous update to the Plastics Market Situation Report was published in 2016. This report provides an update on key developments over the past few years and an opportunity to highlight the challenges and opportunities into the next decade.[1]

INTRODUCTION

KEY THEMES AND FIGURES

2.4Mt

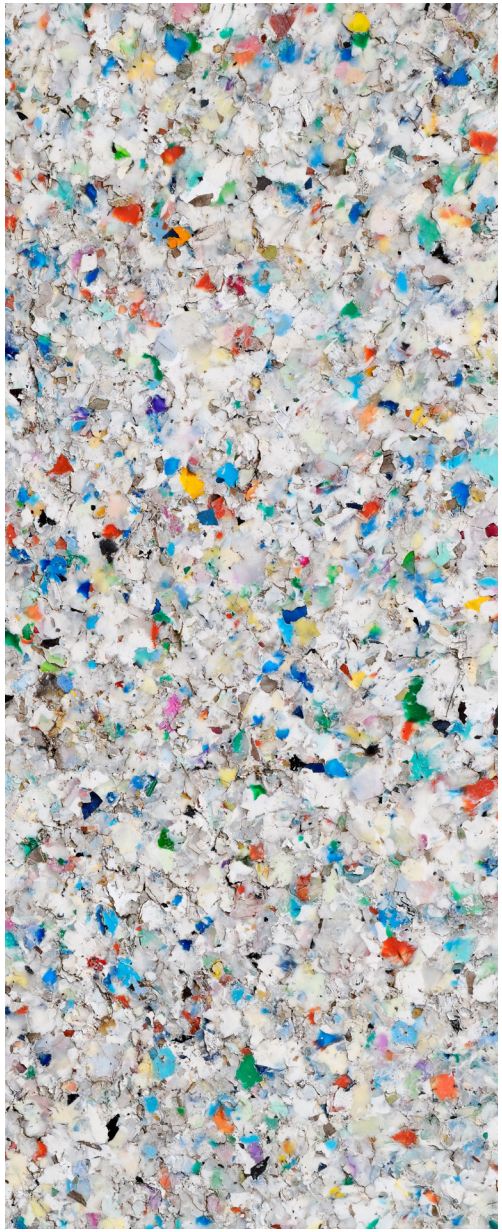
Plastic arising: Latest estimates indicate that around 2.4 million tonnes (Mt) of plastic packaging was placed on the UK market (POM) in 2017. Over the past decade the amount of plastic packaging POM is thought to have been broadly stable, with light-weighting believed to have countered rising consumption. Non-packaging plastic arisings are estimated to be 2.5Mt, primarily from the construction sector.

10%

Plastics collections: The amount of plastic packaging collected by UK local authorities (LAs) is estimated to have increased by 10% since 2013/14 to 550 thousand tonnes. Nearly all LAs collect plastic bottles with around four out of five collecting at least some types of pots, tubs and trays (PTTs). Finally, around 17% of LAs accept empty carrier bags in 2017, with 10% accepting all types of plastic film.

UK domestic plastic recycling needs to increase to meet targets: Greater competition for recycled plastic and the loss of traditional export markets mean that domestic recycling must increase in order to meet stretching targets. Nevertheless, investment in increased plastics recycling infrastructure must be able to weather economic volatility and be adaptable to changes in market need.

Export markets close the door on poor quality plastic: In mid-2017 China announced that it would ban or heavily restrict the import of plastics and other materials from the start of 2018. Other export markets, especially in South East (SE) Asia, have followed China's lead. This had a significant impact on the price of those polymers most exposed to the export market, in particular film and PTTs.



The UK Plastics Pact: In April 2018 WRAP launched The UK Plastics Pact, a world-leading initiative, which is blazing a trail for similar pacts across the globe in support of The Ellen MacArthur Foundation's New Plastics Economy. The targets are a strong driver of change to increase the recycling of plastic packaging and to create more sustainable end markets for plastic packaging.

Increased demand for recycled content: Demand for recycled content in plastic packaging has increased as brands pledge to reduce the environmental impact of their packaging, particularly through The UK Plastics Pact. In order to meet higher recycling targets there are likely to be opportunities to increase the amount of recycled plastic used by the automotive, electrical and construction sectors. Competition for recycled content across packaging and non-packaging applications is likely to increase.

A global challenge: Global plastic consumption is likely to continue to grow as emerging economies develop. Ensuring that all countries have the necessary waste management infrastructure will be central to ensuring that plastic waste does not end up in the environment. The launch of the Pact in the UK was rapidly followed by France, the Netherlands and Chile.

Greater awareness of the environmental impact of mismanaged waste plastic: The carbon benefits of recycling plastic compared with using virgin plastic are well known and quantifiable. Plastic waste in the environment is much more visible, yet its impact is much harder to quantify. As our understanding of the issue increases, the impact that plastic waste has on the environment could be greater than was previously known. The impact that the mismanagement of plastic waste is having on the world's oceans and habitats is now a central issue of public concern.

Policy changes supporting positive change: Both in the UK, the EU and further afield, governments are consulting on policies that could enable both improved supply of quality recovered plastics but also demand-pull mechanisms that, up until recently, have largely been absent. In the UK these include extended producer responsibility (EPR) for packaging, deposit return schemes (DRS) and consistent municipal recycling collections (set to be introduced from 2023), and a tax on plastics packaging with low levels of recycled content (scheduled for April 2022).

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UK PLASTIC PLACED ON THE MARKET / ARISING

PLASTIC PACKAGING POM

Of the 2.36Mt of plastic packaging waste arising in 2017, 1.53Mt comes from the consumer sector (e.g. households) and 0.83Mt is used in the non-consumer sector which includes commercial and industrial (C&I), construction and demolition (C&D), and agriculture. Of the total amount of plastic packaging arising, around 1.6Mt is estimated to be rigid plastic packaging (for example bottles and pots, tubs and trays), while the remaining 0.8Mt is estimated to be films (Table 1).[2]

Note that the terms 'placed on the market (POM)' and 'arising' are used interchangeably throughout this report. Due to its short consumption time, plastic packaging is assumed to arise in the waste stream in the same year that it is purchased (POM). In the case of non-packaging plastics the term 'arising' is used.

Table 1. UK plastic packaging POM composition (2017)[3]

	HDPE	LDPE	PE	PET	PP	PS	PVC	Other	Grand Total
Film	98kt	363kt	103kt	31kt	133kt	2kt	9kt	19kt	759kt
Bottles	485kt	0kt	1kt	443kt	17kt	0kt	0kt	0kt	947kt
PTTs	26kt	1kt	12kt	168kt	161kt	57kt	13kt	2kt	441kt
Other	63kt	23kt	2kt	41kt	79kt	5kt	2kt	0kt	214kt
Grand Total	**671kt**	**388kt**	**118kt**	**683kt**	**391kt**	**64kt**	**25kt**	**22kt**	**2361kt**

Source: WRAP

In 2017, polyethylene terephthalate (PET) and high density polyethylene (HDPE) each accounted for 28% of total plastic packaging POM. Meanwhile, low density polyethylene (LDPE) and polypropylene (PP) both account for 17% of the plastic packaging POM. However, focusing on the consumer sector PET becomes much more important. An estimated 570kt of PET is POM in the consumer sector (37% of consumer POM), followed by 421kt of HDPE (27%) and 288kt of PP (19%).

An estimated 443kt of PET packaging is placed on the UK market in the form of bottles, of which 317kt is estimated to be drinks bottles.

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Natural (i.e. clear) HDPE is primarily used in the production of milk drinks packaging, with POM estimated at around 110kt. An estimated 160kt of coloured HDPE is also placed on the consumer market. This primarily includes household cleaners, detergents and personal care sector (e.g. bleach, washing liquids and shampoo). In recent years however, there has also been some growth in the use of coloured HDPE from the sports and dairy beverage market (e.g. drinking yoghurt, protein drinks).[4,5]

Of the 388kt of LDPE POM, 245kt is used by the non-consumer sector. Of which an estimated 110kt arises at retailers back of stores once pallets have been unwrapped. Finally, of the 391kt of PP packaging POM, 161kt is used in pots, tubs and trays (PTTs) and 133kt in film.

TRENDS IN PLASTIC PACKAGING POM

Improvements in the methodology used to estimate POM means that a direct comparison cannot be made with previous estimates (especially by polymer and format). Nevertheless, using data from obligated packaging producers on plastic packaging handled starting in 2006 indicates that overall plastic packaging POM has remained broadly stable as light-weighting has countered higher consumption.[6]

Since 2017 there has been some anecdotal evidence to suggest that packaging producers are substituting alternative polymers and materials. However, at the present time it is unclear whether this has resulted in a decline in overall plastic packaging placed on the market.

Factors that could have an impact on polymer consumption and composition over the next 5–10 years include, but are not limited to, the following: waste and resource policy initiatives, the price of plastic packaging, material substitution and prevention (e.g. increased use of reusable containers), technical innovations, changes in underlying consumer demand, and broader societal changes related to the use of packaging and plastic packaging specifically.

For example, greater demand for recycled content in plastic packaging may result in a switch from use of PP to PET. The main barrier to greater use of recycled PP is that the technology and infrastructure to produce food grade recycled PP from post-consumer household packaging is not currently available. As a result brands may switch from PP to PET.

Not all packaging applications are likely to be able to do this. Tubs used for yellow-fats (e.g. margarine) are likely to continue to use PP due to the relative low density of PP versus PET, and the subsequent impact on cost. Meanwhile, it is possible that there will be polymer substitution towards PP, in particular from non-food packaging which currently uses difficult to recycle polystyrene (PS) and polyvinylchloride (PVC).

Meanwhile, The UK Plastics Pact identified a list of eight problematic or unnecessary single-use plastics that members are expected to remove from shelf and stores by the end of 2020. Plastic packaging can be problematic or unnecessary if its use is avoidable or reusable options are available, if it's not recyclable or hampers the recycling process or if it pollutes our environment. The list includes PVC and PS plastic packaging as well as several other non-packaging items.[7]

The UK Plastics Pact

In April 2018 WRAP launched The UK Plastics Pact.

By 2025 members of the Pact agree to meeting the following targets: eliminate single use plastic packaging, 100% of plastic packaging to be reusable, recyclable or compostable, 70% of plastic packaging to be effectively recycled or composted, and finally 30% average recycled content across all plastic packaging.[8]

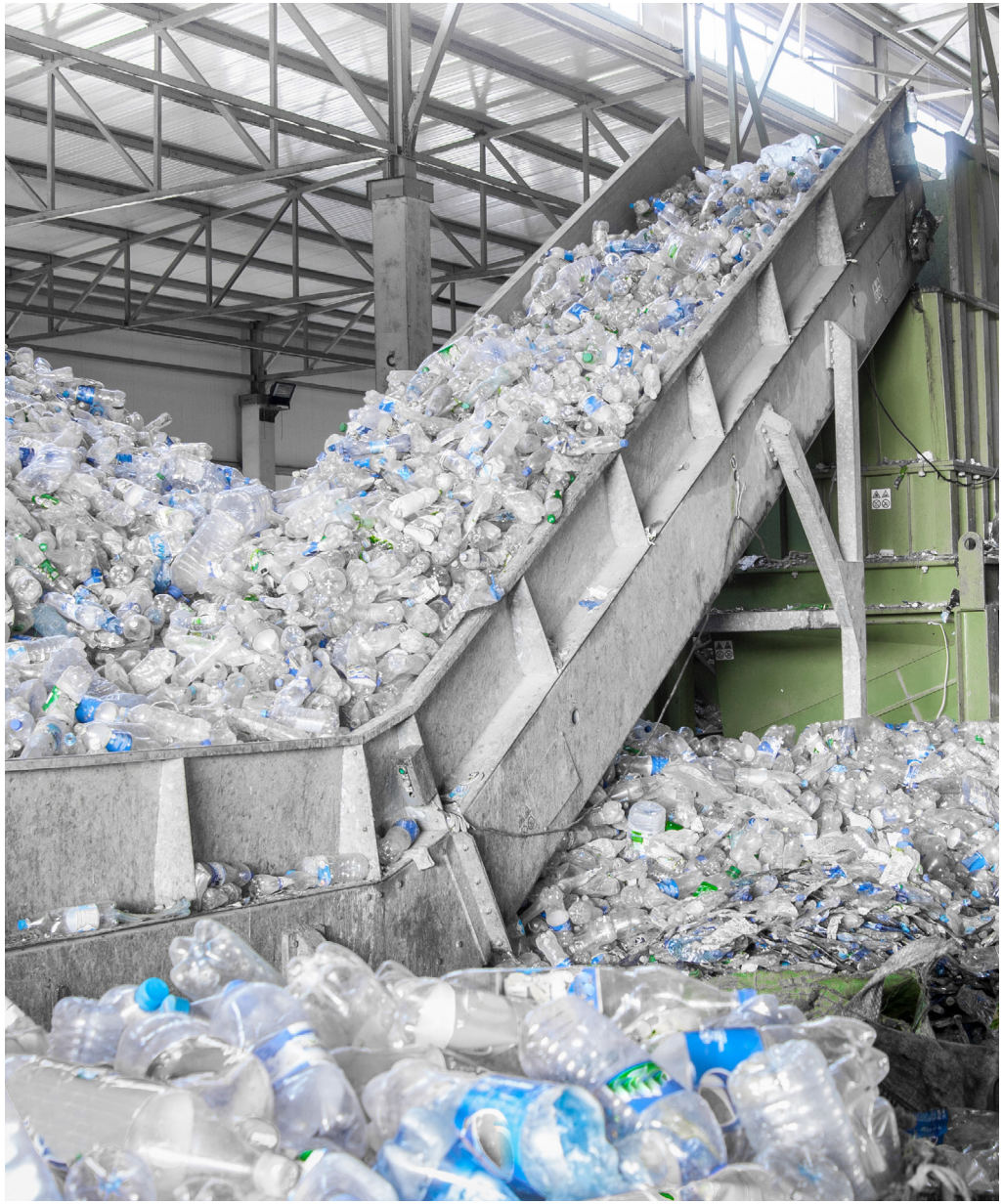
NON-PACKAGING PLASTIC ARISING

WRAP analysis suggests that non-packaging plastic arisings could be around 2.5Mt.[9] This includes 0.4Mt from waste electrical and electronic equipment (WEEE),[10] 0.4Mt from end-of-life vehicles (ELV), 0.8Mt from the construction sector and 0.9Mt across a range of other end markets.[11]

The range of polymers used by the non-packaging applications varies significantly. Both small and large domestic electrical equipment (e.g. vacuum cleaners, kettles and ovens) contain PP, acrylonitrile butadiene styrene (ABS), PVC and PS. Fridge freezers meanwhile contain polyurethane (PU) foam, but also include PS (High Impact Polystyrene), PP and PVC.

ELV plastics comprise a wide range of polymers, the most common being PP (which is used in bumpers, wheel arch liners and dashboards), PU (which is used in seat foam), ABS and nylon.

Finally, construction plastics typically use PVC, HDPE and EPS. Approximately 290kt of PVC was consumed in the UK in 2017. PVC is often used in construction products such as windows, flooring and electrical products.



PLASTIC COLLECTION

In 2017/18, UK local authorities (LAs) are estimated to have collected 550kt of plastic packaging from the UK household waste stream (Table 2), 10% higher than the amount collected in 2013/14 (the data published in the previous Plastics Market Situation Report). Scotland has seen the fastest rate of growth of all the nations during that four year period, rising by 43% to 43kt (based on 2017 data).

The proportion of LAs offering kerbside collections of non-bottle rigid plastic packaging has continued to grow, increasing from 67% in 2014/15 to 79% in 2017/18.

Table 2: Plastic collected for recycling from UK household waste stream by source (2017/18, 2017 for Scotland) thousand tonnes

	Kerbside	HWRC/bring site	Total
England	421	29	450
Wales	37	6	43
Scotland	43	0	43
NI	12	3	14
UK	**512**	**38**	**550**

Source: WasteDataFlow and WRAP estimates

Almost all UK LAs operate a kerbside plastic bottle collection scheme (Table 3). Meanwhile, the proportion of LAs offering kerbside collections of non-bottle rigid plastic packaging has continued to grow, increasing from 67% in 2014/15 to 79% in 2017/18.[12]

Table 3: Local Authority plastic collection schemes (2017/18)*

	Plastic bottles		PTT	
	LAs	Percentage	LAs	Percentage
England	322	99%	250	77%
Wales	22	100%	21	95%
Scotland	32	100%	26	81%
NI	11	100%	11	100%
UK	**387**	**99%**	**308**	**79%**

*NI local authorities were reduced from 26 to 11 in April 2015
Source: WRAP

Table 4: Plastic collected at the kerbside by plastic type (2017/18, 2017 for Scotland) thousand tonnes

	Plastic bottles	PTT	Film	Total
England	314	91	15	421
Wales	26	10	1	37
Scotland	30	10	2	43
NI	10	2	–	12
UK	**380**	**114**	**18**	**512**

Note: Data relates to the amount of material collected for recycling
Source: WasteDataFlow and WRAP estimates

In 2017/18 an estimated 0.5Mt of plastic was collected from UK kerbside collection schemes, an increase of 56kt or 12% from 2013/14 (Table 4). The rise in plastics collected has been supported by a broadly equal increase in both bottle and PTT tonnage.

Around 380kt of plastic bottles were collected by kerbside collection schemes in 2017/18, a collection rate of 60%. Of these an estimated 200kt are thought to be plastic drinks bottles, two-thirds of which are likely to be PET. Finally, an estimated 114kt of PTT was collected kerbside, a 38% collection rate.[13]

Based on current collection rates, around 18kt of film is collected at the kerbside from the municipal waste stream compared with total municipal sector arisings of 395kt – a collection rate of just below 5%. According to data collected by Recoup 17% of UK local authorities accepted empty carrier bags in 2017, with 10% accepting all types of plastic film.[14]

It's important to note that since the start of 2018 concerns about the sustainability of end markets and low prices (following import bans and restrictions announced by China and other countries) led some authorities to reduce the amount and range of plastics they collected for recycling. The impact of these measures is not fully reflected in the collection data shown in this section.

Deposit return schemes

A deposit return scheme (DRS) for England, Wales and Northern Ireland is in discussion and development.

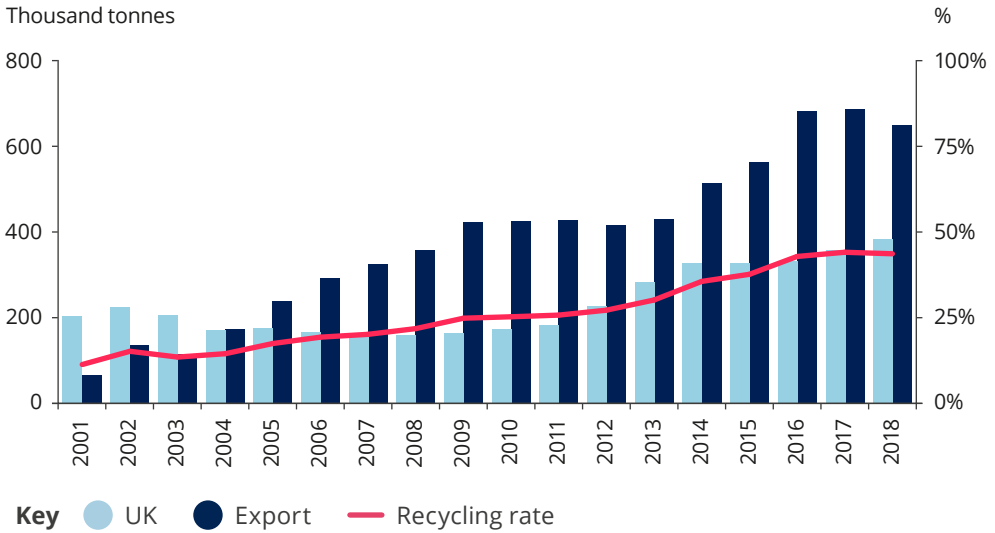
According to Defra, "The government is minded to introduce a deposit return scheme for drinks containers from 2023, subject to further evidence and analysis. We have committed to reviewing the inclusion of drinks containers up to 3L in volume, and a final decision will be made as part of our more detailed proposals in 2020".[15]

Scotland has also outlined proposals for its own DRS scheme. The 'all-in' DRS scheme includes all PET plastic drinks bottles, aluminium and steel cans, and glass bottles. HDPE milk bottles will not be included in the DRS, although could be added at a later date. Legislation mandating the scheme was published in late 2019 with the DRS scheme scheduled to be introduced in 2020.[16]

For more discussion on DRS and the broader policy environment around plastics see [section 9].

UK PLASTICS RECYCLING

Chart 1: Plastic packaging reprocessing



Source: NPWD

Plastic packaging recycled in the UK has increased sharply since 2010/11 (Chart 1). Up until this point annual plastic packaging recycling was broadly stable around 150kt–200kt. Since 2011 the amount of plastic packaging recycled in the UK has more than doubled to 384kt in 2018. Overall UK plastic packaging recycling capacity is estimated at approximately 425kt.

Despite the increase in domestic recycling, the UK remains dependent on export markets for recycling its plastic packaging. In 2001 around three-quarters of plastic packaging recycling took place in the UK. This gradually fell to around 30% during 2007–11 as overseas plastic packaging recycling grew strongly.

However it has remained around 35% since then, leaving the UK heavily dependent on export markets for recycling – around 650kt of plastic packaging is estimated to have been exported for recycling in 2018.[17]

The growth in both UK and overseas reprocessing contributed to a steady increase in the plastic packaging recycling rate. From a low of 15%–20% in the early 2000s the recycling rate increased to around 30% by 2013 and to around 45% by 2018.[18]

Investment in UK recycling infrastructure is showing signs of growth as businesses respond to higher demand for recycled content, the potential loss of export markets and in anticipation of future policy drivers. Since the start of 2019 UK plastics recyclers have announced plans for additional plastics packaging recycling capacity totalling over 250kt, with plants currently scheduled to begin operations between late 2019 and 2021. Meanwhile, there has been a rise in interest and innovation in new recycling and sorting technologies and processes, including detectable black pigment and digital watermarking.[19]

The UK plastics packaging recycling industry has gone through a challenging period in recent years, especially between 2014 and 2016. A confluence of low virgin plastic prices and high feedstock prices left some business models unable to adapt. Many operators struggled to ensure their business remained viable, while some eventually had to shut down their operations. Furthermore, high energy and insurance costs also adversely affected the sector and continues to be an issue for operators.

A sustainable UK plastic recycling sector needs to be able to weather the changing economic, market and commodity price climate. WRAP research has identified four factors that have been critical in ensuring long-term success for plastics recyclers in the UK:

Management: Successful plastics recyclers are characterised by a strong board and executive management structure with significant sector experience. This enables the company to recognise risks and opportunities, aiding the company in adjusting its business plan to changes in market conditions, while also ensuring that they do not over expand.

Financial: Plastic recycling companies that have grown organically have typically expanded within prudent gearing and leverage multiples. Whilst external private equity investors continue to play a part in this sector too, the interests and timescales of the companies/investors do need to be compatible to avoid conflicts of interests arising.

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Operational: Related to evidence of management experience, the knowledge and ability to run the day to day side of the business well is crucial. For example, if there isn't adequate equipment of the right size and specification in place, then the firm will not achieve the necessary economies of scale to compete and survive in adverse price environments for feedstock and recyclate. What ifs, downtime, single points of failure, and related risks should be identified and planned for. This will add additional costs to the day to day operations (for example holding of critical spare parts).

Commercial: Ensuring access to both reliable feedstock and to sustainable end markets is vital. Vertical integration (where a company expands its business operations into different stages on the same production process) has been one of the major markers for success in the plastics recycling sector. Meanwhile, given the volatility in recovered and virgin plastic prices and the rapidly evolving nature of the industry, the ability to be flexible and adapt to market conditions is crucial. Minimum term contracts need to be in place to offer tonnage/quality and price certainty to both parties so that companies can plan both operationally and financially.

If one or more of these critical success factors has been missing then there has been an increased risk that a company will fail. Indeed, in many of the companies that have failed in the past, it was not just one or even a number of factors that contributed to their failure, but their confluence at a particularly vulnerable time that exaggerated the adverse impact. The evolving policy landscape (discussed in [section 9]) may serve to change the relative degree of importance of each of these factors.[20]

NON-PACKAGING PLASTIC RECYCLING

Rigid plastics recovered from WEEE and ELV are sent for recycling in the form of automotive shredder residue (ASR). Due to the complexity and range of 'metal-rich' waste items entering scrap metal shredders and the many types of product covered under 'WEEE' product categories, the plastic streams that result from advanced ASR processing plants often contains a mix of plastic parts from both WEEE and ELV.

After going through Post-Shredder Treatment (PST) plant sorted streams of hard plastics are sent to advanced plastics sorting facilities to separate individual polymer types and further refine the targeted plastics. At present none of the non-rigid plastic (including foam, textiles and rubber) arising from ELV is recycled. Instead, this fraction is thought to be typically sent to solid recovered fuel (SRF).[21]

An estimated 100kt of plastics in ASR and WEEE shred is sent for reprocessing in the UK compared with total capacity of 135kt. However, given significant yield losses only around half of this is actually turned into recycled plastic.[22]

The amount of non-packaging plastics from the construction sector sent for reprocessing in the UK is estimated to be around 140kt per annum. PVC recovered from profiles (e.g. windows) and cables account for the vast majority sent for reprocessing, with smaller amounts recovered from flexibles and film (e.g. flooring) and pipes.[23]

NON-MECHANICAL RECYCLING

Non-mechanical recycling can be grouped into four technological categories, with some polymers more suited for some technologies than others: pyrolysis (PE, PP), gasification (PET, PE, PP and other), solvent dissolution (PP and other), and chemical depolymerisation (PET).

There are currently no full scale commercial non-mechanical recycling plants in the UK, however smaller scale plants exist and commercial scale plants are planned for the near future. Meanwhile, there are signs that major virgin plastics producers are partnering with plastics recyclers to secure feedstock supply into their petrochemical operations. Non-mechanical recycling can be counted as effectively recycled, but only when it is converted into a product or raw material, not when converted to a fuel or via energy recovery.

The amount of non-packaging plastics from the construction sector sent for reprocessing in the UK is estimated to be around 140kt per annum.

PLASTIC EXPORT END MARKETS

In early 2013 China implemented Operation Green Fence with the aim of reducing the import of low quality, heavily contaminated plastics. Then in 2017 the government announced a one year crackdown on poor quality imports and mismanagement by its own recycling sector, known as National Sword. In mid-2017 China went one step further.

In a notification to the World Trade Organisation (WTO), China announced that it would be heavily restricting the amount of recovered materials that it would import and the level of contamination that it would accept. The restrictions were prompted by concerns that contaminated materials were being exported to China, that domestic recyclers in the country were not handling the material effectively, and that it was leaking into the environment.

At the start of 2018 China introduced tighter waste import controls, completely banning the import of mixed, unsorted paper, household and commercial plastics and certain other materials. Of those materials that are allowed, China announced that from 1st March 2018 it would also restrict the import of recycled materials to a maximum contamination level of 0.5% (1% for non-ferrous metals).[24]

There has been a transition away from a heavy reliance on China as an export end market for some time, even before China's announcement to the WTO. Back in 2015 two-thirds of the plastic the UK exported for reprocessing was going to China/ Hong Kong. In the first half of 2017 (before the WTO notice was issued) the UK sent less than half of its plastic exports to China/Hong Kong.

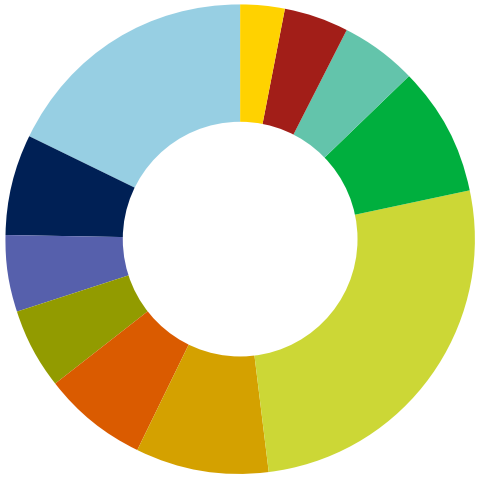
As 2018 progressed, alternative markets including Malaysia, Taiwan, and Vietnam opened up. Many recycling operations based in China either moved their operations or established subsidiaries in these and other countries. They could take advantage of relatively cheap feedstock, recycling the plastic into pellet and then export it back into China.[25]

However, a combination of ports being unable to handle the volume of imported plastics and other materials, inadequate waste management infrastructure, and some poor business practices meant that some of the imported plastics are likely to have been mismanaged.[26]

Import restrictions on plastic were subsequently introduced and announced in Malaysia, Indonesia, and Vietnam among others. In contrast to the China ban/restrictions these measures were initially introduced to remove the backlog of material that was clogging many of their ports.

As of mid-2019 the most important export market for the UK's recovered plastic is Turkey (Chart 2). Based on monthly trade data for Jan–Jun 2019 the UK exported 12kt per month to Turkey (142kt annualised), accounting for 26% of total recovered plastic exports from the UK. In addition, Hong Kong and the Netherlands each account for just less than 10% with seven other countries accounting for around 5% each.[27]

Chart 2: UK recovered plastic export destinations (Jan–Jun 2019)[28]



Belgium	3.1%
France	4.5%
Germany	5.2%
Netherlands	9.0%
Turkey	26.3%
Hong Kong	9.1%
Poland	7.2%
Malaysia	5.6%
Spain	5.4%
Indonesia	6.8%
Other	17.7%

Source: HMRC

As with those export destinations in SE Asia, there are also concerns that Turkey has the necessary infrastructure and standards in place to manage imported recovered plastics correctly. At the time of publication there was some uncertainty as to whether Turkey would continue to allow imported plastics.[29]

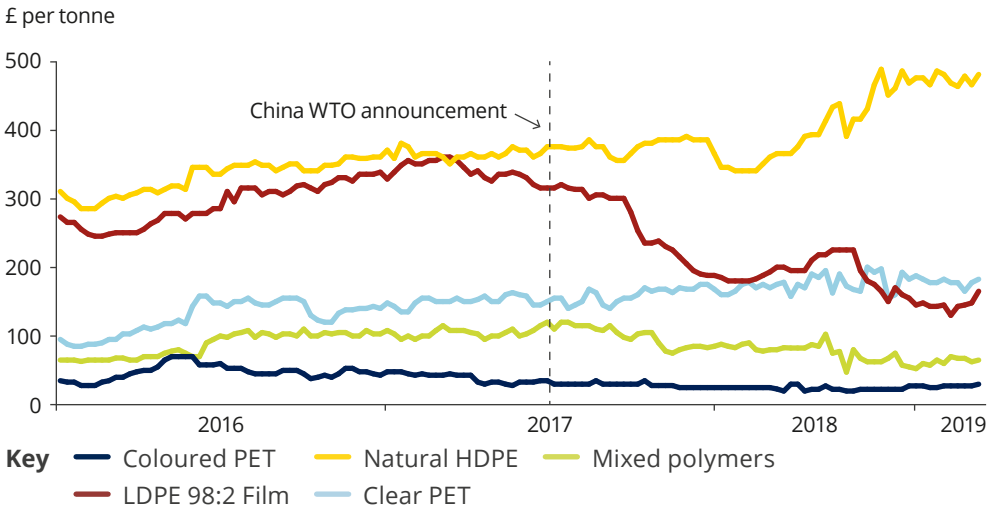
Clear PET and natural HDPE bottle prices have increased in value by 40% since the start of 2017.

A GREATER PREMIUM FOR SORTED, HIGH QUALITY POLYMERS

The main recovered plastic to be directly affected by the introduction of greater restrictions on plastics imports into China was LDPE film (Chart 3). The price of LDPE 98/2 film fell from £350 per tonne in early 2017 to £175 per tonne twelve months later, a 50% decline. Up until 2017 the primary export market for LDPE was China (the material being recycled for use in manufacturing and agriculture).[30]

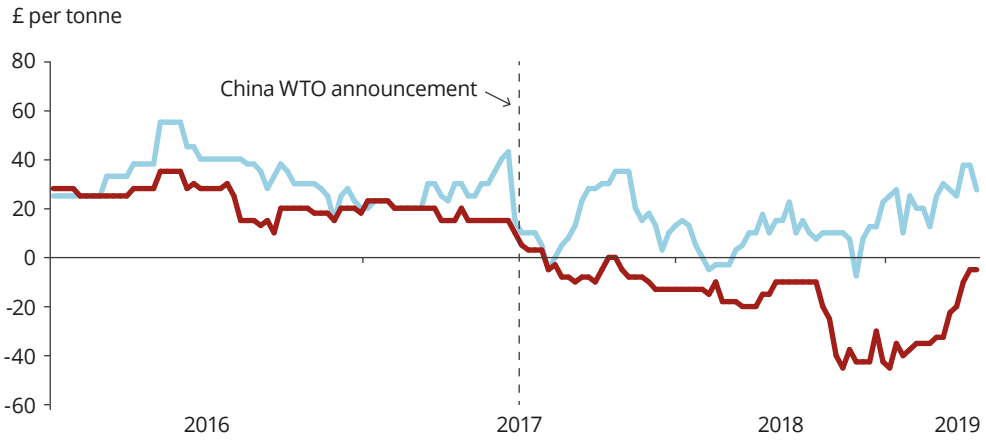
In contrast there has been a notable shift in the premium placed on good quality, sorted polymers. Natural HDPE bottle prices increased from £350 per tonne in early 2017 to almost £500 per tonne in 2018/19. Meanwhile, clear PET bottle prices increased by £65 per tonne to £200 per tonne. Despite very different applications and exposure to export markets, both clear PET and natural HDPE bottle prices have increased in value by 40% since the start of 2017.

Chart 3: Recovered plastic prices (1)



Source: WRAP Materials Pricing Report

Chart 4: Recovered plastic prices (2)



Key Baled carrier bags — Mixed rigids

Source: WRAP Materials Pricing Report

Low grade plastic prices experienced sharp declines (Chart 4). The price of mixed PTTs declined from £40–£60 per tonne in 2016 to around £0–£40 per tonne in 2018–19. Meanwhile, baled carrier bag prices saw even steeper declines, hitting a low of negative £30–£40 per tonne in late 2018.

Although film and PTTs were subsequently exported to alternative markets (for example Poland), many of these are now also thought to be closed, either because of outright import bans or due to limited capacity.

In the aftermath of the Chinese import ban, WRAP, with the support of the National Association of Waste Disposal Officers (NAWDO), regularly surveyed UK local authorities to understand the impact of the restrictions. Some respondents to the survey reported that low grade plastics, that would normally be recycled had been diverted to Energy from Waste (EfW) / Solid Recovered Fuel (SRF), a finding that was identified by other survey evidence carried out by Recoup.[31]

PLASTIC PACKAGING END MARKETS

The introduction of import restrictions on many recovered materials by China and other countries in South East Asia has highlighted how dependent the UK and many other countries have been on exporting our recovered plastic elsewhere in the world.

In the past the argument has always been that the UK does not have growing demand for recovered materials, or that the end consumer didn't value recovered plastic highly enough. That argument is no longer valid.

This section outlines what current UK end markets look like for plastic packaging, how much recycled content is currently utilised and the challenges and opportunities looking forward.

PET MARKET

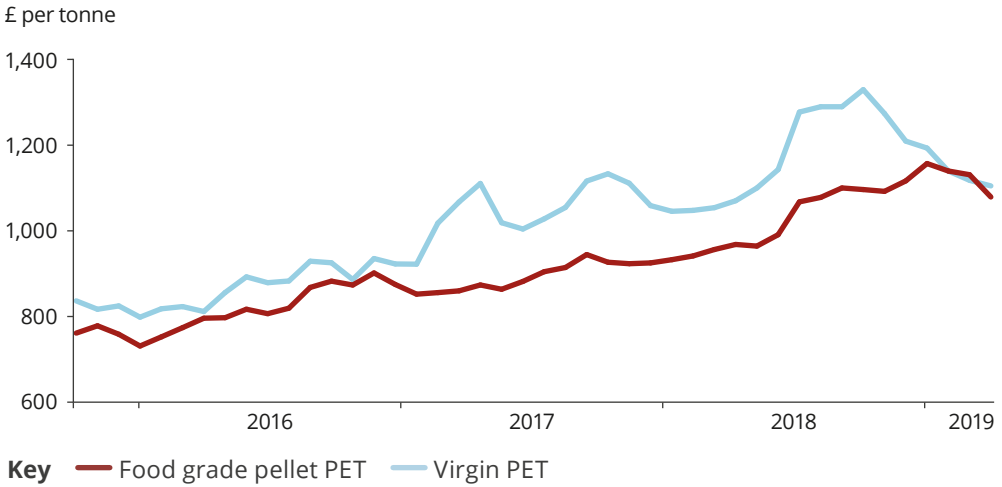
The largest UK end market for recovered PET packaging during 2017 (the latest estimates available) was sheet, typically used to make packaging trays etc, and accounted for around two-thirds of UK end market demand for PET. Bottles accounted for just under one-third of UK demand, with polyester fibre around 5%. Note that the bottle proportion of UK end market demand is thought to have increased since 2017.[32]

Based on 2018 WRAP analysis, rigid consumer PET packaging contains between 5–10% recycled content sourced from UK material. Accounting for imports and cross-over (i.e. PET flakes from bottles being used to make PET thermoformed trays) then clear PET bottles are thought to account for around 16% recycled content while PET PTTs may have as much as 70% recycled content.

The high recycled content of PET PTTs reflects the commercial driver to only re-process to 'washed flake' stage and sell output into the tray and sheet convertors for the PTT thermoform market. This avoids the capital equipment cost for extruder and IV rebuild equipment and higher power costs involved with closed-loop PET bottles. Competing demand for bottle-flake places extra commercial pressure on the availability of r-PET, food-grade resin material.[33]

The availability of recovered PET will be one of the major barriers to increasing recycled content. The clear r-PET market is currently in a period of excess-demand and short supply; already visible impact upon pricing compared with virgin PET (Chart 5). Food grade PET prices have increased by about 40% since the start of 2016 to £1,075 per tonne in mid-2019, broadly equivalent to virgin PET prices. Upward pressure on r-PET prices could increase as demand grows across the EU in response to recycled content 'pledges' by brands, recycled content targets and other policy levers (see [section 9]).[34]

Chart 5: Virgin PET versus food grade PET pellet



Sources: PIEWEB, Wood Mackenzie

HDPE MARKET

The largest UK end market for recovered HDPE packaging in 2017 was the construction sector (accounting for around 35%). Packaging, in the form of food and non-food grade bottles, account for around one-quarter. Finally, horticulture and other items (garden furniture, buckets, etc.) each account for around 20%.[35]

WRAP analysis estimates that UK natural HDPE bottles (primarily used for milk bottles) contain 20–25% recycled content, smaller dairies are less able to access the limited tonnage of natural HDPE.

A key issue in supporting higher recycled content in natural HDPE bottles will be diverting the recovered HDPE (estimated ~40kt) that currently goes to non-dairy applications and other end markets.

These markets also have high end market demand for recovered HDPE and given the additional cost of producing food-contact material it has resulted in less natural HDPE supply available for closed-loop recycling into natural HDPE milk bottles. Meanwhile, the move by some brands to differentiate milk pack design (through opaque bottles and even switching to PET) make it more challenging to incorporate higher recycled content.

UK natural HDPE bottles (primarily used for milk bottles) contain 20–25% recycled content. Although many of the larger dairies are thought to incorporate around 40% recycled content.

Natural HDPE prices supported by increased demand for recycled content

Natural HDPE bottle prices are currently around £450–£500 per tonne. The last time they were at these levels was mid-2015 around the time that Closed Loop London closed (highlighted in the previous Plastics Market Situation Report).

Virgin HDPE prices have increased by 22% since early 2016 while natural HDPE bottle prices have risen by just over 50% with most of the increase since early 2018. The increase in natural HDPE prices has been driven by higher demand for recycled HDPE content.

In turn this has put pressure on those manufacturers wanting to use more recycled HDPE in their products.

Although there are no published price series for recycled HDPE pellet we can estimate the cost of producing HDPE pellet – based on the typical yield loss, the current plastic PRN price, and an estimate of the cost of washing and compounding. Based on Q1 2019 prices the cost of producing HDPE pellet is estimated at around £1000–£1100 per tonne; around 5–10% lower than virgin HDPE prices.

UK coloured (or jazz) HDPE bottles are estimated to have a recycled content of around 10–15% with much of this thought to be coming from cross-over (i.e. sourced from other HDPE packaging formats) and imported tonnage.

The use of 3-layer (or 2-layer) co-extrusion blow-moulding technology offers a possible route to achieving much higher levels of recycled content in HDPE packaging bottles than current 2018 levels. In California, where there are stringent requirements on the plastic bottles placed on the market in the state, the recycled content of many HDPE bottles placed on the market is estimated to be up to 60%.[36]

LDPE MARKET

Construction films dominate the UK end market for recovered LDPE, accounting for an estimated 40%. LDPE films are used in damp proof membranes and gas barrier protection. The remaining 60% of UK end market demand is split broadly evenly between plastic bags and sacks, agricultural films, and other forms of packaging.[37]

Given the very low collection volumes from households and the lack of domestic recycling capacity for film, the recycled content of LDPE flexible film used in consumer packaging is very low – estimated at just 5%.

PP MARKET

The automotive sector and packaging each account for an estimated 40% of UK end market demand for recovered PP packaging in 2017. The remaining 20% is used in the production of plant pots as well as in a wide range of other items.[38]

The recycled content of PP PTTs and film used in consumer packaging is estimated at 5%. The major barrier to increasing the recycled content is that the majority of PP PTTs are used in direct food contact (e.g. mushroom and fruit punnets) and it is not technically possible to make a food-contact approved recycled PP in the current mechanical recycling system. European Food Safety Authority (EFSA) requires that >98% of infeed packs come from the food-contact market. PP containers from DIY and chemical cleaning products will be in the mix of input packs and it is not economically feasible to sort them out to the required level of confidence needed to meet legislative requirements.

NON-PACKAGING PLASTIC END MARKETS

According to WRAP analysis the main end market for recycled waste electrical and electronic equipment (WEEE) and end-of-life vehicles (ELV) plastic is construction and accounts for around ~50kt (36%) of end market demand (Chart 6).

Meanwhile, the automotive, electrical, packaging and furniture sectors each comprise around 10%.

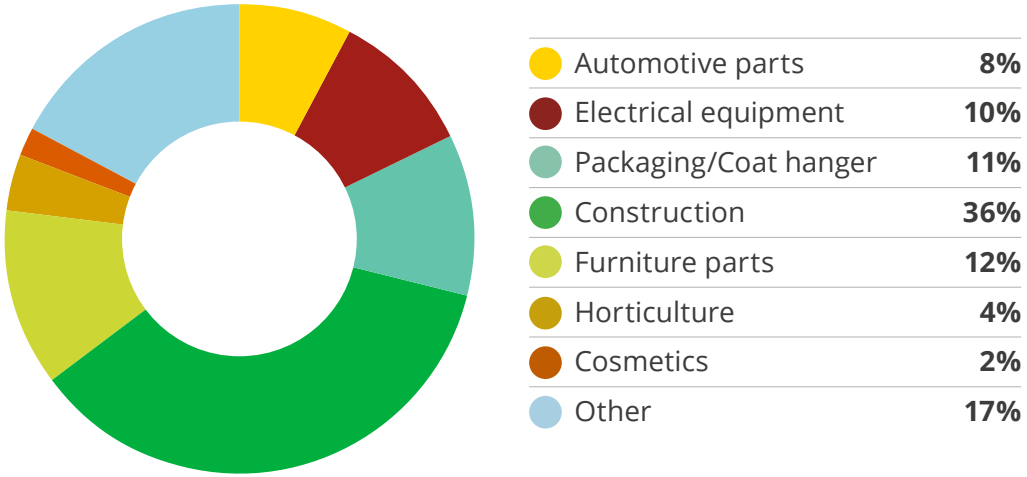
The end markets for plastics recovered from UK ELV/WEEE are estimated to have been evenly split between UK and export markets (especially China). However, since the introduction of import bans by China and other countries as well future restrictions on international trade in mixed plastics the focus is likely to be on ensuring sufficient recycling capacity exists in the UK and Europe.

The typical cost of recovered WEEE plastics (part-recovered rough shredded flakes of mixed polymer types arising from primary treatment processing) range from £40–£60 per tonne for small display appliance (SDA) plastics and £150–£250 per tonne for fridge plastic.

Mixed ELV shred is estimated to cost between minus £40 per tonne (i.e. a gate fee) to as high as £40 per tonne.[39]

The amount of recycled content used in non-packaging plastic applications is thought to be low. WRAP estimates point to less than 5% recycled content being used in the automotive, electrical and agricultural sectors. The amount used in the construction sector is thought to be higher (10–15%) and be largely present in the sectors use of PVC (for example PVC recovered from profiles are recycled in a closed loop system).

Chart 6: End markets for recycled WEEE and ELV plastics



Source: WRAP estimates

In contrast to the plastic packaging sector and apart from a small selection of car manufacturers, there are currently few examples of commitments to increase the amount of recycled content.

There could be a substantial opportunity to increase the amount of recycled content used by these non-packaging plastic applications. For example, non-critical components (e.g. interior moulded section in vehicles and drainage pipes and damp proof membranes in buildings) could potentially take much higher levels of recycled content, perhaps as high as 50%.

Other potential opportunities include using heavy plastic chippings on road surfaces (either as a replacement for stone-chips or to improve the bitumen properties) and wood replacement applications.

Increasing the proportion of recycled content in non-packaging plastic may result in greater competition for recycled plastic from the packaging sector. Nevertheless, non-packaging applications potentially offer the potential to increase the amount of plastic packaging that is effectively recycled, helping to meet one of The UK Plastics Pact targets.

WRAP estimates point to less than 5% recycled content being used in the automotive, electrical and agricultural sectors. The amount used in the construction sector is thought to be higher (10–15%).

GLOBAL

Plastic is a global issue that requires global and national level action. According to the World Economic Forum (WEF), global plastic production and use is projected to grow by 3.8% per annum through to 2030 before slowing to 3.5% per annum in the period to 2050. However, these estimates may prove conservative (particularly up to 2030) should growth in petrochemical capacity be realised in line with industry plans. Petrochemicals can be used to manufacture many everyday industrial and consumer products, including fertilisers, solvents, dyes as well as plastic.[40]

The growth in plastics production is being fuelled by an expansion in petrochemical capacity. The shale oil and gas boom in the US has incentivised the construction of ethylene and propylene capacity – the two most important plastic feedstocks. Oil companies in the US, the Middle East and elsewhere are also planning to invest in new petrochemical plants in the coming decades, betting on rising demand for plastics in emerging economies.

According to the International Energy Agency (IEA) despite substantial increases in recycling and efforts to curb single-use plastics, these efforts will be far outweighed by the sharp increase in plastic consumption by developing economies.[41]

The UK Plastics Pact was the first of a global network of national initiatives. Plastics Pacts have subsequently been launched in France, the Netherlands and Chile. Numerous other countries are in the process of developing national plastics initiatives with the common focus on tackling problem plastics and developing a circular economy for plastic packaging. These countries include Canada, South Africa, Malaysia, and elsewhere.[42]

Helping countries reduce the impact of plastics can never be a uniform response, since each country is very different. Developed economies typically have highly developed waste management systems and domestic manufacturing sector that can potentially increase its use of recycled plastic. That isn't necessarily the case for small, emerging economies or ones that are a significant distance away from recycling end markets.

A common global drive towards increased plastics circularity has three benefits: the impact of global brands can be leveraged, businesses can embed best practice along common principles and in turn attract greater investment in infrastructure.

Nevertheless, emerging economies who have historically been the recipient of waste plastics from overseas are looking at developing a solution for their own plastic waste in a drive to replace imported feedstock with domestic feedstock. These same economies can benefit from very low cost and flexible recycling and sorting systems, while increasing jobs in recycling and domestic end markets.

A common global drive towards increased plastics circularity has three benefits: the impact of global brands can be leveraged, businesses can embed best practice along common principles and in turn attract greater investment in infrastructure.

ENVIRONMENTAL IMPACT

There are clear environmental benefits to producing plastic products from recovered plastics, compared with using virgin polymers and disposing of the product post-use via EfW or landfill.

The main quantifiable environmental benefit lies in the energy saved by avoiding the processes of oil refining and polymerisation of monomers.

These are estimated to account for over 95% of the total energy consumed in plastics production.[43]

The estimated average net CO_2 saving from recycling one tonne of plastic compared with landfill and EfW is lowest for PTTs, equivalent to 0.62 tonnes CO_2. Film separately collected saves the equivalent of 0.83 tonnes CO_2.

Meanwhile, the environmental gains from recycling are higher for HDPE bottles (1 tonne CO_2) than PET bottles (0.89 tonne CO_2). The environmental gains are, however, heavily dependent on the level of contamination of the recovered plastics.[44,45]

Meanwhile, plastic that is unmanaged may end up in the environment; either on land, in our rivers and onwards to our oceans. The visible signs are obvious – blockages to waste management infrastructure in many emerging economies, disamenity from littering on beaches and other public spaces, and ingestion by sea creatures.

The environmental impact may go much further. Although at an early stage, some research suggests that plastic may continue to have climate impacts as it degrades, i.e. by releasing methane. In addition, micro-plastic may also interfere with the ocean's capacity to absorb and sequester carbon dioxide.[46]

If projections of rising plastics consumption in emerging economies materialise, then the potential benefit from recovering and recycling plastic (and the downside cost from not doing so) is likely to grow significantly over the next few decades.

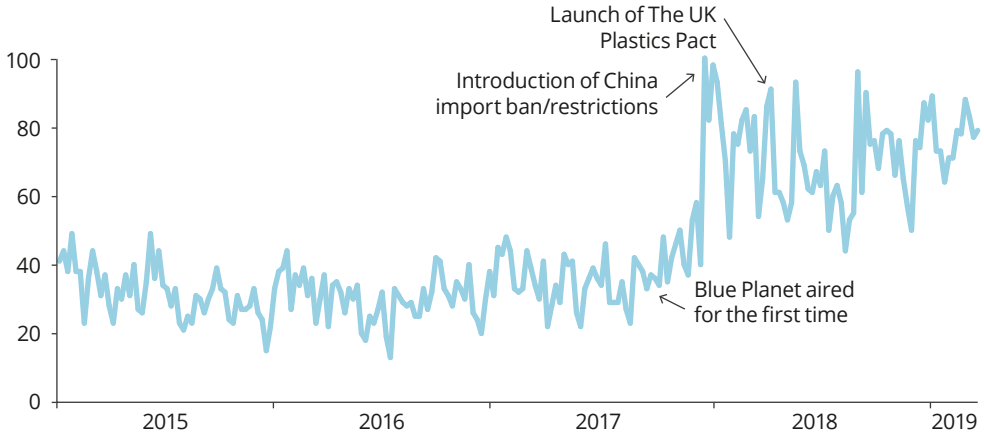
STRONG NARRATIVE FOR CHANGE

The impact that the mismanagement of plastic waste is having on the environment is now a central issue of public concern. Using data from Google Trends we can see that the UK public's interest in 'plastics recycling' has grown significantly since late 2017 (Chart 7).

The impact that the mismanagement of plastic waste is having on the environment is now a central issue of public concern.

The initial increase coincided with the BBC Blue Planet documentary and was quickly followed by the introduction of China's import ban and restrictions and then the launch of The UK Plastics Pact. Interest has remained strong through the rest of 2018 and into 2019.

Chart 7: UK search interest 'plastic recycling'
Maximum interest = 100



Source: Google Trends

POLICY ENVIRONMENT

UK AND EUROPEAN UNION

Individuals and businesses have responded to these concerns by changing their behaviour and pledging to do more. Government has also taken steps to accelerate that change.

Long term clarity over policies affecting the plastics recycling sector are vital to ensuring businesses have confidence to invest in improved product and packaging design and the required infrastructure capacity.

Defra's Resources and Waste Strategy (RWS), published in late 2018, proposes a number of policy measures that could impact the supply and demand for recovered plastic packaging and other materials in the UK. The policies include consistency across local authority collections in England, extended producer responsibility (EPR), and a deposit return scheme (DRS). The UK Treasury also announced the introduction of a tax on plastic packaging that has less than 30% recycled content.[47]

These policies could result in a more consistent and higher quality supply of recovered plastics available to be recycled. This should reduce the yield loss that plastics recyclers typically suffer as a result of non-target material and contamination. Meanwhile, the demand for recycled plastics is likely to rise as companies increase demand for recycled content in plastic packaging and other products. Together with the actions of consumers and business this should enable a circular economy for plastics.

Defra's Resource and Waste Strategy (RWS), published in late 2018, proposes a number of policy measures that could impact the supply and demand for recovered plastic packaging and other materials in the UK.

The UK doesn't operate in a vacuum. EU member states will have to incorporate at least 25% recycled content in all plastic bottles from 2025, increasing to 30% from 2030. In addition the EU has a 77% collection target for plastic bottles by 2025; 90% by 2029. This will result in increased competition for recovered plastic in the years to come and will mean that the UK cannot rely on recycling capacity in Europe to meet its plastic recycling and recycled content demand.

INTERNATIONAL – EX EUROPE

The global policy context is important too. This report has already highlighted the impact that China's decision to restrict the import of recovered plastics had on the market for recovered plastics. A number of other major recovered plastic importing countries have followed China's lead. The trend towards tighter import standards is likely to continue to increase – no country will want to be the lowest common denominator.

Globally perhaps the most important policy change will be the way in which global shipments of recovered plastic are regulated. The Basel Convention is an international treaty designed to reduce the movements of hazardous waste between nations and specifically to prevent transfer of hazardous waste from developed to less developed countries.

Currently "solid plastic waste" is exempt from any Basel controls. Those rules allow virtually all commonly recycled plastic resins, or a mixture of plastic resins, to be shipped without having to meet any specific requirements.

In May 2019, over 180 UN nations backed amendments to the Basel Convention that make it illegal for waste exporters to ship plastic waste overseas without permission from the competent authority. Exemptions will only be made for shipments "almost exclusively consisting" of a single resin type. The list of allowable resins includes most common recyclables, but it excludes PVC.

The new entry for exemptions also includes a note about certain types of mixed plastic shipments that will be allowed. Containers will be exempt from the rules if they contain "mixtures of plastic wastes, consisting of PE, PP or PET, provided they are destined for separate recycling of each material and in an environmentally sound manner, and almost free from contamination and other types of wastes."

The Basel Convention is an international treaty designed to reduce the movements of hazardous waste between nations.

Shipments that don't meet the above criteria will become subject to new "prior informed consent" requirements. For countries that have ratified the convention this requires special notification of the destination country before the shipment is approved, as well as additional documentation of how the material is processed. The amendments come into force on 1st January 2021, with countries that are parties to the Basel Convention required to adopt the Convention changes into their own national laws.[48]

Putting aside doubts about how the rules will be enforced, the longer term impact of the amendments could be to incentivise more investment in domestic recycling capacity. In the past exporters could rely on a dependable buyer (China) for the UK's recovered plastics, one that often paid a premium over that which domestic recyclers were willing to pay. Now, following China's decision to restrict the import of recovered plastics and once the Basel Convention amendments are passed into law, the UK and other large exporters of recovered plastics will no longer have that option available. Countries, including those that have imported recovered plastic since the China ban, may seek to introduce the measures ahead of the introduction of the Basel amendments.[49]

CONCLUSION AND OUTLOOK

Since the last Plastics Market Situation Report was published in 2016, concerns about plastics have evolved significantly. The impact that the mismanagement of plastic waste is having on the world's oceans and habitats is now a central issue of public concern.

As China's economy grew and its demand for resources surged, the UK and other economies relied on China to recycle much of its recovered plastic. However, Chinese concerns over the quality of material it was being sent and efforts to grow its own recycling sector eventually led it to call a halt.

In mid-2017 China announced that it would ban or heavily restrict plastics and other materials from the start of 2018. Other countries in SE Asia have followed China's lead.

In April 2018 WRAP launched The UK Plastics Pact, a world leading initiative in support of The Ellen MacArthur Foundation's New Plastics Economy. The targets are a strong driver of change through which to increase the recycling of plastic packaging and to create more sustainable end markets for plastic packaging.

In the UK, the EU, and further afield, governments are consulting on policies that could enable both improved supply of quality recovered plastics, but also demand-pull mechanisms that, up until recently, have largely been absent. Together with the actions of industry, the market for recovered and recycled plastic is likely to grow over the next 5–10 years as all sections of the supply chain – from brands to consumers – recognising the value that it brings and the reduced likelihood of harm to the environment.

The impact that the mismanagement of plastic waste is having on the world's oceans and habitats is now a central issue of public concern.

Greater competition for recycled plastic and the loss of traditional export markets mean that levels of domestic recycling in the UK must increase. The lesson from the past is that plastics recycling infrastructure must be able to weather economic volatility and be adaptable to changes in the market.

This isn't just a UK or even a European story. Global plastic consumption is likely to continue to grow as emerging economies develop. Ensuring that all countries have the necessary waste management infrastructure in place to deal with plastic waste responsibly will be central to ensuring that it does not end up in the environment.

GLOSSARY

ABS Acrylonitrile butadiene styrene

ASR Automotive shredder residue

C&I Commercial and industrial

C&D Construction and demolition

CO_2 Carbon dioxide

DRS Deposit return scheme

EA Environment Agency

EEE Electrical and electronic equipment

EFSA European Food Safety Authority

ELV End-of-life vehicle

EMF Ellen MacArthur Foundation

EPR Extended producer responsibility

HDPE High density polyethylene

HMRC HM Revenue and Customs

HWRC Household waste recycling centre

IEA International Energy Agency

LA Local authority

LDPE Low density polyethylene

LLDPE Linear low density polyethylene

NAWDO National Association of Waste Disposal Officers

NPWD National Packaging Waste Database

PE Polyethylene

PET Polyethylene terephthalate

PRN Packaging recovery note

PERN Packaging export recovery note

PST Post shredder treatment

PP Polypropylene

PS Polystyrene

PTT Pots, tubs and trays

PVC Polyvinylchloride

POM Placed on the market

RDF Refuse derived fuel

rHDPE Recycled HDPE

rPET Recycled PET

rPP Recycled PP

SRF Solid recovered fuel

WDF Waste data flow

WEEE Waste electrical and electronic equipment

WEF World Economic Forum

WTO World Trade Organisation

ENDNOTES

1 WRAP (2016): Plastics Market Situation Report.

2 WRAP (2018): PlasticsFlow 2025.

3 Estimating packaging placed on the market involves combining several data sources, each with varying degrees of uncertainty. The robustness of each data source is scored based on its robustness and a margin of error is applied. The overall plastic POM estimate carries a 6% error margin. However, with fewer data sources to estimate non-consumer the error margin of overall non-consumer POM and format/polymer composition is higher.

4 WRAP estimates.

5 Many of the products using coloured HDPE make use of significantly thicker walled containers in comparison with thinner walled milk bottles. For example, a 2 litre detergent liquid bottle could weigh more than double the mass of plastic used in a thin-walled 2 litre milk bottle.

6 WRAP (2014): Plastic Flow 2014.

7 WRAP (2019): Eliminating problem plastics.

8 The UK Plastics Pact.

9 Note that it is much more challenging to estimate non-packaging arisings. This is due to the longer lifetime of the products, lack of any regulatory requirement to report by material for WEEE and ELV and the lack of data showing the domestic production placed on the UK market versus imported non-packaging plastics.

10 This is based on a typical plastic proportion in WEEE of 25% (varies from 5% to 45% based on the WEEE category) and UK WEEE POM of 1.6Mt.

11 Construction and other non-packaging plastic arisings (including agriculture for example) are based on data on EU converter demand by sector from Plastics Europe, and assuming that the UK proportion remains constant by sector.

12 Not all LAs that have a collection for PTTs collect all of the different types of PTT placed on the market.

13 Collection rate calculated as a percentage of bottle or PTTs tonnage placed on the consumer market.

14 Recoup (2018): UK Household Plastics Collection Survey 2018.

15 Defra (2019): Consultation outcome: Introducing a Deposit Return Scheme (DRS) in England, Wales and Northern Ireland: Executive summary and next steps.

16 Scottish Government (2019): The Deposit and Return Scheme for Scotland Regulations 2020: Accompanying Statement and Proposed Regulations.

17 Source: National Packaging Waste Database (NPWD).

18 Recycling rate equals annual accredited recycling divided by estimated UK plastic packaging POM; assumes that POM has been stable at 2,361kt. Based on obligated plastic packaging the UK is estimated to have a recycling rate of 51% in 2018.

19 WRAP in partnership with UK Research & Innovation (UKRI) manages a fund in support of innovative projects that reduce the impact of plastics waste.

20 WRAP (2017): Measures of failure and success in the plastic packaging recycling sector, unpublished.

21 The non-metallic materials mixture which results from large-scale metal shredding is called Auto-Shredder Residue (ASR).

22 The complex nature of the polymers, the use of additives in the polymers, the wide range of polymers used and the existence of other sources of contamination contribute to the high yield losses at input to final polymer sorting and recycling process.

23 Source: Recovinyl 2018.

24 This is part of a set of policies under the banner ‘Blue Sky’.

25 The final step in most plastics recycling processes is compounding and involves converting plastic regrinds into pellets. In pellet form, plastic is more easily distributed and remanufactured.

26 Greenpeace (2018): The Recycling Myth: Malaysia and the Broken Recycling System.

27 Note that the export destination recorded by HMRC may not be the point at which the plastic is recycled. For example, a significant proportion of recovered plastics exported to the Netherlands are thought to be transhipped to other countries for recycling.

28 Export data includes both packaging and non-packaging plastics. Monthly export data is volatile with export destination affected by a number of factors including material prices, exchange rates, container shipping rates and import restrictions.

29 World Wildlife Fund (2019): Stop The Flood Of Plastic: How Mediterranean countries can save their sea.

30 Note that recovered plastic prices are also affected by the price of the plastic Packaging Recovery Note (PRN) as recyclers are incentivised to use the value of the PRN to compete for recovered plastic. Plastic PRN prices typically rise when market participants perceive the risk of not meeting annual targets is high. In mid-2019 plastic PRN prices increased in excess of £300 per tonne due to concern over plastic export markets. The impact of higher plastic PRN prices was especially observed in those markets most exposed to reduced demand from export markets, e.g. LDPE film.

31 Recoup (2019): Local Authority Plastics End Market Analysis.

32 See footnote 2.

33 Recycling companies treat the post-consumer PET by shredding the material into small fragments. These are removed by plastic granulation, resulting in pure PET fragments, or "PET flakes".

34 Note that this reflects the average index price; WRAP is aware of clear r-PET trading at a premium to virgin PET but it is not known what size or quality this represents.

35 See footnote 2.

36 Rigid Plastic Packaging Container Law.

37 See footnote 2.

38 See footnote 2.

39 Indicative prices correct as of mid-2019.

40 World Economic Forum (2016): The New Plastics Economy: Rethinking the future of plastics.

41 IEA (2018): The Future of Petrochemicals.

42 Other regional and global initiatives include the EMF Global Commitment, the Alliance to End Plastic Waste, CEFLEX and WWF Take Action on Plastic.

43 Source: US Environmental Protection Agency (EPA).

44 WRAP (2008): LCA of Management Options for Mixed Waste Plastics.

45 WRAP (2010): Environmental Benefits of Recycling.

46 US Center for International Environmental Law (2019): Plastics & Climate: The Hidden Costs Of A Plastic Planet.

47 Consistency, EPR and DRS are scheduled (subject to consultation) to be introduced from 2023. The plastics tax is scheduled (subject to consultation) to be introduced in April 2022.

48 The Basel Convention, which went into effect in 1992 and is supported by the United Nations, has the goal of limiting global trade in hazardous wastes, especially between developed and developing countries. It has 187 signatory countries, including the UK but excluding the USA. Individual countries, however, can dictate their own rules for the classification of waste for import purposes.

49 Note that although the US (as a large exporter of recovered plastics) has not ratified the Basel Convention, the treaty will still restrict the US from sending plastic waste to those countries that have signed the Basel amendment. Meanwhile, if the US were to create bilateral agreements outside of the Basel framework, waste shipments would not be beholden to the same standards.

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