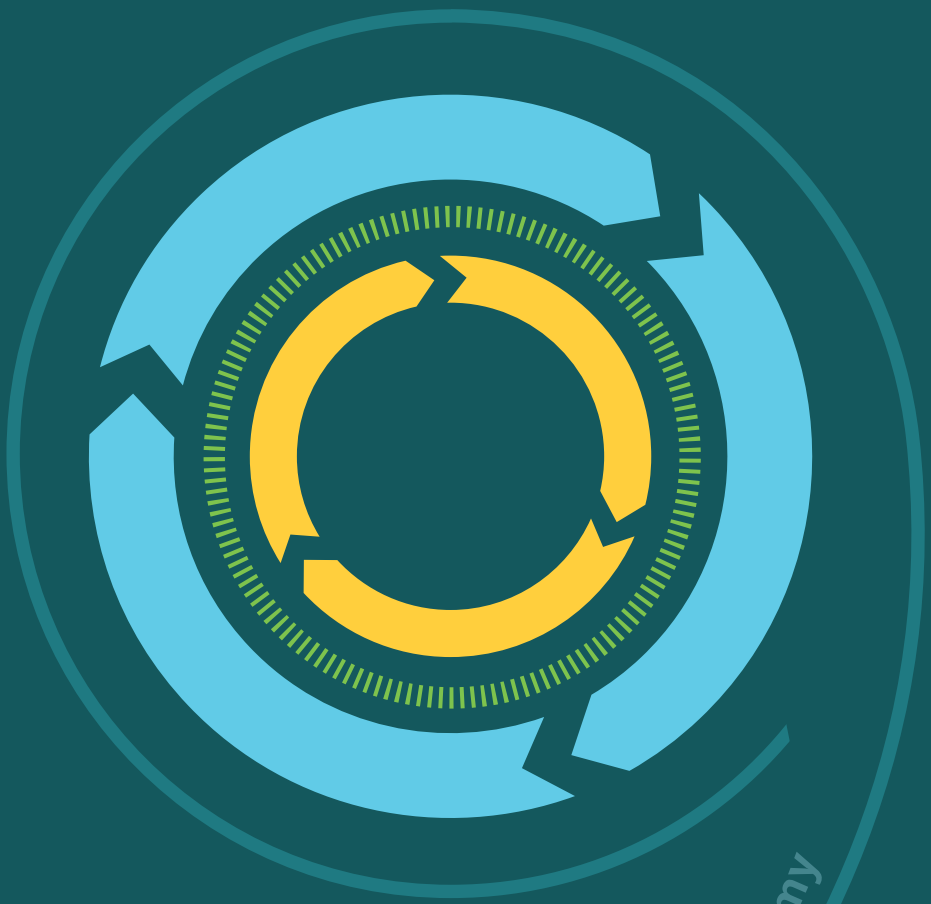
BPF British Plastics Federation



circular economy

sustainability

reuse

mechanical recycling

chemical recycling

RECYCLING ROADMAP

In collaboration with RECOUP

SECOND EDITION

The British Plastics Federation (BPF) is the trade association representing the entire plastic supply chain in the UK, from polymer producers and distributors, to converters, equipment suppliers and recyclers. The BPF works in close collaboration with its member companies and liaises closely with government departments, as well as broad range of non-governmental stakeholders such as customer industries and brand, retailers and charities.

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This report does not necessarily reflect the views of individual companies mentioned in this report and information provided by companies does not necessarily reflect the views of the BPF.

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Foreword

I am delighted to present to you the second edition of the British Plastics Federation's Plastics Recycling Roadmap.

It charts the onward progress of the Uk's plastics recyling industry and examines the potential for future growth to 2030 and 2035.

Plastics have been recycled for a surprisingly long time from industrial and commercial sources of waste but latterly , since the 1980's there has been a considerable focus on how to access and recycle domestic waste, prompted by voluntary initiatives and legislation. It is a story not confined to used packaging. Products as diverse as car components and window frames are recycled in increasing volumes.

The number of companies in plastics searching for recycling solutions for their products is very striking. In the UK we have all the components of a sustainable circular plastics economy in place from the sources of monomers to an array of recycling technologies.

This Roadmap illustrates the conditions in which a fully circular economy for plastics can spring to life. We hope that companies will find inspiration in the success it charts and that government will find a sound statistical base on which to build policies supporting a robust waste management infrastructure for the future.

Philip Law
Director-General
British Plastics Federation

Executive summary

The second edition of the BPF Recycling Roadmap presents the latest data across all plastics sectors. Data is primarily from 2022 but 2023 data is included where available. It builds upon the previous edition, which was published in 2021 and showed what could theoretically be achieved by 2030. Nearly four years after the first edition was published, we are yet to witness many key changes required. There have been multiple delays to policies that the first edition assumed would be implemented well ahead of 2030. A challenging economic environment has also played a role.

Most significantly, there has not been the required level of investment in infrastructure due to a lack of government support. When it comes to chemical recycling, for example, a refusal to accept mass balance within the Plastic Packaging Tax has resulted in investments being made in other countries instead. The forecast for chemically recycled material within the UK in 2030 has had to be reduced from 300kT to 100kT. Achieving the envisioned 69% recycling rate will therefore take longer but still requires urgent collective action from the government, industry and the public.

However, it is important to note that the updated forecast highlights that a lot can still be achieved within a decade. An additional 2,226 kilotonnes of plastic waste could be avoided by recycling all plastic within the residual waste stream. A 55% reuse and recycling rate can be achieved by 2030, increasing to 70% by 2035. By 2035, an extra 23% of total plastic waste could be mechanically recycled in the UK, an extra 6% could be chemically recycled, 15% less plastic could be sent to energy recovery facilities and 13% of the UK's total plastic waste could be reused.[1]

Achieving this requires three things:

- Increasing investment
- Optimising legislation and existing systems
- Improving communication and collection systems

This report goes into more detail regarding the points above, highlighting 16 key changes that are required. The forecasts are achievable, although ambitious. Achieving the goals set out in this report could make the UK one of the leading nations when it comes to the sound management of plastic waste, and potentially save over one million tonnes of carbon emissions.

Abbreviations

AD	Anaerobic Digestion
C&I	Commercial and Industrial
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DRS	Deposit Return Scheme
EPR	Extended Producer Responsibility
EEE	Electronic and Electrical Equipment
EFW	Energy from Waste
ELV	End of Life Vehicles
EPS	Expanded Polystyrene
HDPE	High Density Polyethylene
kT	kilo tonnes
NHS	National Health Service
MT	Mega tonnes
MBT	Mechanical, Biological, Treatment
NPWD	National Packaging Waste Database
PET	Polyethylene Terephthalate
POM	Placed on the Market
PRF	Plastic Recovery Facility
PRN	Packaging Waste Recovery Note
PTT	Pots, tubs and trays
RDF	Refuse Derived Fuel
WEEE	Waste Electronic and Electrical Equipment

Glossary

Consumer packaging	Packaging sold to consumers or used around items sold to consumers
Non-consumer packaging	Packaging consumed in the commercial / industrial sector
Operational throughput	The actual quantities of material going through sites
Post-consumer	Waste-generated by households or by commercial, industrial, and institutional facilities in their role as end-users of the product which can no longer be used for its intended purpose. This includes return of material from the distribution chain or the installation of plastic product (e.g. cut-offs of insultation, flooring or wall-covering boards).[2]

Introduction

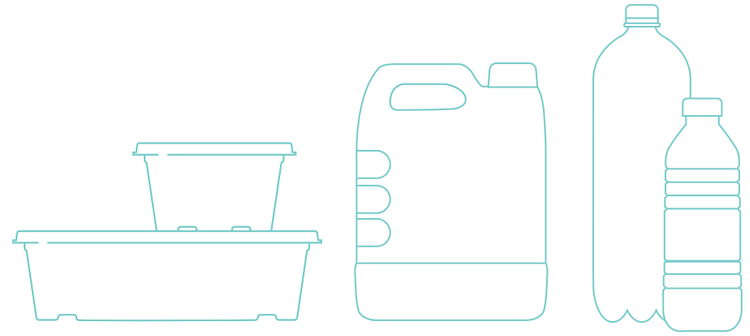
In 2021, the British Plastics Federation (BPF) launched a Recycling Roadmap that examined the plastic waste flow across all sectors, including packaging, automotive, construction and more. Consultation with industry experts alongside the latest available market data was analysed to forecast what could be achieved by the industry by 2030 if several identified key changes took place. Nearly four years on from this, having emerged from a global pandemic, an energy crisis and a cost-of-living crisis, the BPF wanted to update the roadmap to reflect the latest data and to revise the forecast.

This second edition of the Recycling Roadmap updates the 'placed on the market' (POM) figures for all key sectors of the plastic industry as well as the recycling figures for this material. It introduces additional sectors that were not included in the previous edition, including 'Household, Leisure and Sports'[3] and has expanded both the construction and medical sections to give a wider perspective on these industries. It also explores the environmental impact of the plastic waste sector and the benefits to be derived if more plastic waste was moved further up the waste hierarchy.

The roadmap uses best available data, cross-verified with other sources. The report also uses sector-specific sources, e.g. NHS statistics. Where no data was available, expert estimates were relied upon.

The roadmap updates the previous 2030 forecast in light of changes that have occurred since 2021. This includes multiple delays to policies that were initially assumed to be implemented well ahead of 2030. The forecast is then extended to 2035. As was the case previously, the forecast is only achievable with essential measures taking place that have been highlighted in the report. This roadmap incorporates reuse into the forecast for the first time, recognising its anticipated role.

Government policy prioritises the development of a zero waste economy. This is vital for the UK resources sector, which can help the government to achieve this aim. This report highlights some of the key enablers needed to achieve this and the scale of the investment in infrastructure that is required.



Where are we now?

The Recycling Roadmap sets out all the current data available for plastic recycling in the UK in all sectors. In most cases 2022 data has been used as this is the most up to date available data. It also looks at the material which is placed on the market (POM) and in the waste arising to show the opportunity to increase recycling. This report has found there are areas where data is limited, and expert views have been sought to make estimates where this is possible. Below is an overview of the key data.

CONSUMPTION

3,700 kT

UK plastic demand by converters[4]

Packaging

2022

2082kT

POM*[5]

Consumer and non-consumer

1154kT

Plastic packaging recycled[6]

55% Recycled[7]

Of which 46% is exported for recycling[8]

Non-consumer packaging

815kT

POM[9]

679kT

Recycled[10]

Household

1267 kT

POM*[11]

COLLECTED FOR RECYCLING, 2022

578 kT
Household packaging[12]

76%
PET Plastic bottles[13]

78%
HDPE Plastic bottles[14]

Kerbside services provided by UK local authorities

Bottles **100%**

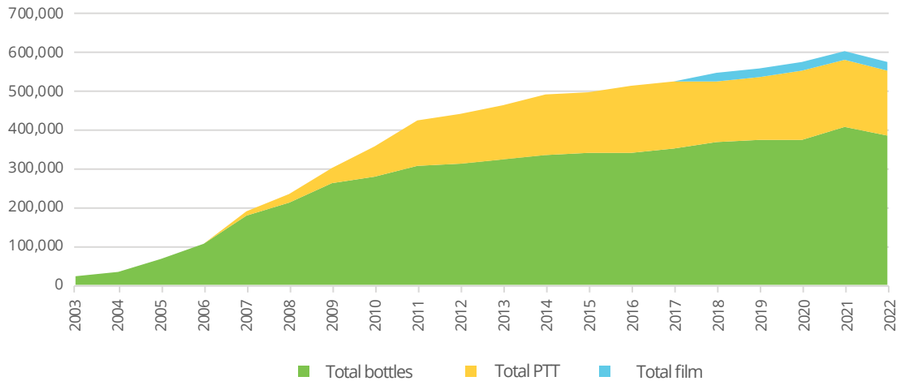
Pots, tubs and trays **88%**

Film **12%**

Source: RECOUP, 2023 Household Waste Collection Survey

*Assumed to become waste within the same year

Figure 2: UK households plastics collected



Source: RECOUP, 2023 Household Waste Collection Survey

Figure 3: Plastic packaging POM by sector, 2022

Source: Valpak, PackFlow Refresh 2023: Plastic, 2024 https://www.valpak.co.uk/knowledge-hub-post/packflow-refresh-2023-plastic/

Agriculture

2022

20-25% Recycled[15]

70kT Collected for recycling[16] **2023**

40kT Agricultural plastic POM (excluding packaging) [17,18]

41kT Agricultural packaging POM [19]

Building and construction

2022

144kT
PVC recycled in the UK
62% pre-consumer
38% post-consumer [20]

989kT Demand by converters[21]

26% recycled[22]

404kT Plastic post-consumer waste[23]

End-of-life vehicles (ELVs) - cars

2022

≈ 15%
Plastic content of a passenger car
≈ 225 kg of plastics per car[47]

363kT Plastics in cars POM[49]

9% recycled[48]

395kT Plastic waste arising from ELV [50]

EPS packaging

2023

13kT Recycled/ collected[52]

66% Recycled[51]

14kT[53] Produced in UK

17kT Disposed of in UK[54]

Recycling capacity[24]

2022

21kT pa
Chemical recycling[25]

1.1 Mt
Total capacity[26]

120-140kT pa
ELV and WEEE capacity[27]

Mechanical recycling capacity

456kT pa
Household packaging[28]

515kT pa
Commercial packaging[29]

Operational throughput

288kT pa[32]
16 sites[33]

347kT pa[35]
78 sites[36]

900 – 1.1 Mt
Sorting capacity
Household plastics
123 sites[30]

335kT pa
PRF capacity
for sorting of plastics
7 sites[31]

102kT pa
Food grade material
70kt rPET; 32kt rHDPE[34]

220-270kT pa
Film capacity[37]

Environmental impact[55]

2022

5589kT Total plastic waste

3104kT CO_2e

3939kT Plastic in residual waste

4028kT CO_2e

924kT* CO_2e

1635kT Total recycling

If all plastics which end up in residual waste
were captured and recycled
it would help to **avoid** an additional
2226kT CO_2e

Source: *924 kT of Co_2 emissions is an estimated average and savings for well-establish recycling streams can be significantly higher.

Household, leisure and sports[38]

2022

6% post-consumer waste recycled[39]

134kT Demand by converters [40]

206kT Plastic post-consumer waste generated[41]

Medical – NHS

2022

TOP 15 plastic items procured by NHS are responsible for **30kT**[42]

≈74kT Medical plastic demand by converters[44]

5% Recycled [43]

132kT NHS Plastic Waste INC. NON-MEDICAL APPLICATIONS [45,46] 2022-23

Residual waste

2022

3939kT
TOTAL PLASTIC WASTE
in residual waste [56]

2299kT Plastic waste treated Energy From Waste (EfW)[58]

Est 15% Of total residual waste is plastics[57]

1239kT Plastic waste landfilled [59]

401kT Plastic waste other treatments[60]

Waste electrical and electronic equipment (WEEE)

2023

103kT Total plastic from WEEE recycled[62]

26% Recycled[61]

397kT Plastic in EEE POM[63]

≈ 25% Plastic content of EEE[64]

Plastic waste flows

This section looks at the overall amount of UK plastic waste generated in 2020 and 2022 and the split between recycling, recovery, and other disposal routes.

Figure 5 shows a summary made by combining the various estimates. As in the previous report, this estimate is based on the best available data and cross-verified with other sources for increased credibility. Reports by Tolvik Consulting are used to calculate the residual waste component of total waste. Defra, National Packaging Waste Database (NPWD), Plastic Europe, and RECOUP data form the foundation for the recycling and export figures.

The BPF Recycling Roadmap 2021 edition estimated the UK Plastic Waste Flows for 2020. As no real-time data was collected when the report was published, the calculation was based on forecasted and estimated amounts using 2018 data. The data for 2020 and 2022 in this edition are based on reported data for residual waste, plastic recycling, and export; for other categories, such as chemical recycling, Anaerobic Digestion (AD) and composting, the best available estimate was used.

The BPF Recycling Roadmap 2021 estimated that the total amount of plastic waste for 2020 ranged from 3765 kT to 5420 kT. Based on actual reported data, the total plastic waste figure for 2020 is 5657 kT. This is in line with the higher estimate from the 2021 roadmap edition.

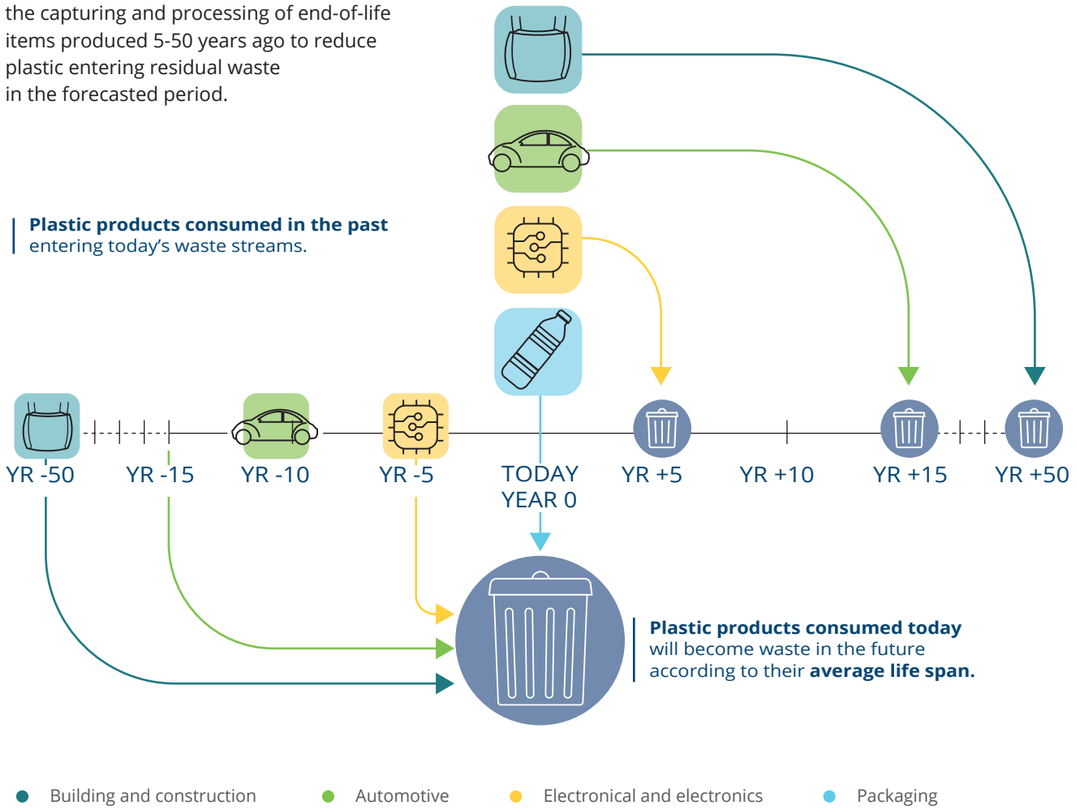
Previous estimates for mechanically recycled material and material exported for recycling align with the reported data. Once again, the export market plays a significant part in the recycling tonnages reported, representing 17% (2020) and 13% (2022) of total waste. Reliance on export will continue until there are sufficient UK recycling facilities available to recycle the material domestically.

The higher residual waste reported is due to several reasons. As discussed in the previous report, packaging waste flow is predicted to follow a relatively stable pattern while the percentage of packaging being captured from residual waste and recycled steadily rises. At the same time, there is a recognised trend of more plastic products designed for long-lasting applications in construction, automotive, and household sectors, reaching their end of life and entering the residual waste stream (see figure 4). Therefore, the total plastic in residual waste and the total plastic waste flows are desired to continue to rise. Some of the increased recycled and residual amounts for 2020 can be attributed to the COVID-19 pandemic, as the data for 2022 already demonstrates a slight decline in total waste.

There is a recognised trend of more plastic products designed for long-lasting applications in construction, automotive, and household sectors, reaching their end-of-life and entering the residual waste stream.

FIGURE 4: Adapted from Plastics Europe Circular Economy Report

Design decisions made now will help mitigate plastic waste growth in the 5-50 years to come; however, they won't help with the waste streams projected for the coming 10-15 years. There is a need for both circular designs to avoid plastic waste in the future, and technologies and legislative support for the capturing and processing of end-of-life items produced 5-50 years ago to reduce plastic entering residual waste in the forecasted period.



Total mechanical recycling tonnages are increasing, but energy from waste tonnages also continue to rise.

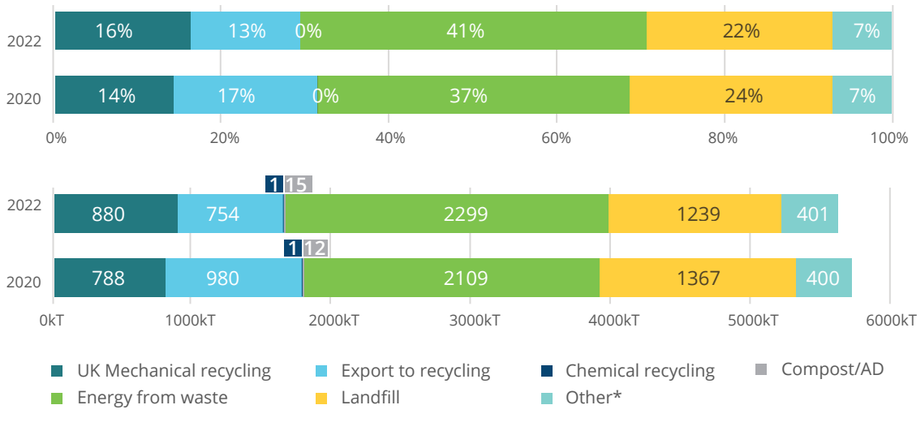
The UK government's 2018 Waste and Resource strategy sets a valid direction for decreasing the total amount of waste. As discussed further in the forecast chapter, this reduction can only be achieved if efficient systems help prevent plastic waste generation and capture this precious resource before it becomes waste. Please refer to the BPF Recycling Roadmap 2021 for a detailed overview of data and trends in packaging, automotive, WEEE, and other sectors.

FIGURE 5: UK Plastic Waste Flow for 2020 and 2022

	UK PLASTICS WASTE FLOWS			
	2020		2022	
	kT	%	kT	%
Total Plastic Waste	**5657**		**5589**	
UK Mechanical recycling	788	14%	880	16%
Export to recycling	980	17%	754	13%
Chemical recycling	1	0%	1	0%
Total recycling	**1769**	**31%**	**1635**	**29%**
Compost/AD	12	0%	15	0%
Total Reuse and Recycling	**1781**	**31%**	**1650**	**29%**
Compost/AD	12	0%	15	0%
Energy from waste	2109	37%	2299	41%
Landfill	1367	24%	1239	22%
Other*	400	7%	401	7%
Total Residual	**3876**	**69%**	**3939**	**71%**

Source: Other* Co-incineration, MBT diversion, RDF export, mismanaged waste

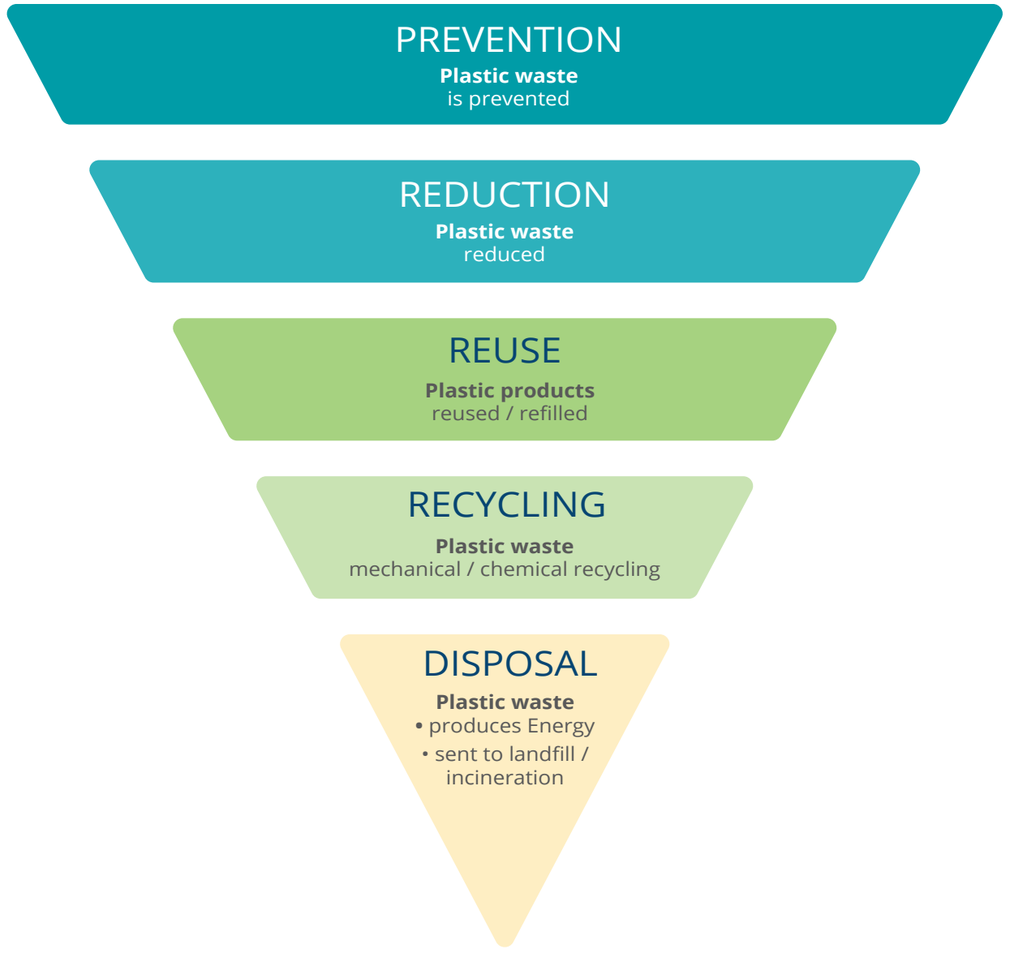
FIGURE 6: Plastic flows in 2020 and 2022 in percentage and tonnage



Forecast methodology, key assumptions and changes

This roadmap updates the previous forecast for 2030 with projections extended to 2035. The forecast reflects the BPF Plastics Waste Hierarchy and has been put together considering the views of industry experts, market data and global trends. It is ambitious but shows what can be achieved with the right investment and drivers in place. Key assumptions used to develop the forecast are outlined below.

FIGURE 7: BPF plastics waste hierarchy



Assumptions

The following has been assumed within the calculations of this forecast.

1. Packaging waste entering the plastic waste stream will remain stable over the next few years, while plastic waste from long-life products (manufactured 5-50 years ago) not designed for recycling (from construction, household, WEEE, ELV) will steadily increase.
2. Export is used only in instances where this is the best environmental outcome and is not used at the expense of developing domestic infrastructure in the UK.
3. UK infrastructure for chemical recycling continues to develop and chemical recycling is used as a complementary technology to mechanical recycling.
4. Biodegradable and compostable polymers are only used in applications where there is a clear benefit and where there is no risk of contaminating other recycling streams.
5. Policy changes, including the UK Emissions Trading Scheme, the drive to net zero and recycling legislation, bring about systemic changes that reduce the amount of plastic in residual waste.
6. Plastic waste is only sent to energy from waste or landfill where recycling options are not currently possible. The most appropriate waste disposal options should be found for each product in line with the BPF Plastic Waste Hierarchy shown above (Figure 7).
7. Mechanical recycling in advanced UK-based sorting, cleaning and reprocessing plants is operating to industry standards and is used for all suitable plastic waste materials.
8. High-quality UK-produced plastic recyclate is used in both closed-loop and open-loop applications with a significant increase in the amount of recyclate used. This will deliver environmentally sustainable benefits to the UK manufacturing industry.
9. EPR, Simpler Recycling and DRS are implemented within the planned timescale, including flexible collections from the kerbside and binary labelling.
10. There is an increase in WEEE collection as per the WEEE consultation proposal.
11. Introduction of Digital Waste Tracking will have taken place from 2025, highlighting gaps in data and avenues where waste crime can take and is taking place, enabling enforcement bodies to tackle the issues and reduce it more effectively.

EPR, **Simpler Recycling** and **DRS** are implemented within the planned timescale

DRS October 2027
EPR Data reporting has started with Payments from 2025

Simpler Recycling

31 March 2025 non-household municipal premises
31 March 2026 local authorities to collect **6 waste streams**
31 March 2027 kerbside film collection for municipal premises and households

Key changes

Below lists the key changes needed to achieve the 2030 and 2035 forecast.

1. Increasing investment

- Government recognition that Waste and Resource management is critical infrastructure.
- Funds from the plastic packaging tax invested into developing recycling infrastructure.
- Support for innovative and effective sorting and recycling technologies and their commercialisation in the UK to drive recycling rates and increase the quality of recyclate.

2. Optimising legislation and existing systems

- Reform of the PRN system to encourage domestic recycling.
- Review of the UK's food contact regulations to allow more use of recycled content in contact-sensitive applications, where appropriate.
- Acceptance of mass balance within the UK Plastic Packaging Tax.
- Requirements for well-designed verification and traceability for recycled content.
- Significant increase in the use of recyclate where legislation allows.
- Legislative and financial support for infrastructure for reuse and repair.
- Appropriate 'end of waste' definitions and assistance with accreditation.
- Quality standard for bales of recycled plastic material.
- Unified design guidance for both reuse and recycling.

3. Improving communication and collection systems

- Clear, concise communication to residents and businesses with regular campaigns funded in part via EPR.
- Consistent collection of the same plastic packaging formats in all local authorities in the UK.
- Increase in the collection of plastics by setting up recycling opportunities for all items not collected kerbside.
- Maximise separation of waste for recycling from long-life applications, e.g. construction and demolition, household appliances, and vehicles, with clear requirements and guidelines. Ensure a shift to refurbishment and reuse.

Projected forecast

Figure 8 shows the overall picture for predicted UK plastic waste flows in 2030 and 2035. Achieving this vision for 2030 and 2035 will require significant changes across the whole value chain and, most importantly, investment in UK recycling infrastructure to diminish the reliance on export. Without drivers outlined in this roadmap, the forecast will not be achievable.

In the vision for 2030 and 2035, it is assumed that there will be significant increases in the capture rates for all materials. This will allow 55 % of plastics to be captured for reuse and recycling in 2030, reaching 70% in 2035.

Plastic packaging waste flow will continue to follow a stable pattern. This is desired due to improved and unified design, encouraging resource efficiency and recyclability, and further development of the packaging collection, sorting and reprocessing infrastructure.

Plastic products designed up to 50 years ago by various industries, including construction, EEE, households and automotive are desired to reach their end of life and enter the waste stream. These products were not designed for recycling and without interventions and systems in place to capture, sort and reprocess the materials, they will end up in the residual waste stream, almost doubling the residual waste amount compared to the amount forecasted. (Total plastic in residual waste with relevant measures is 1888kT; total plastic in residual waste with a 'business as usual' scenario is 3787kT).

FIGURE 8: Plastic waste flows

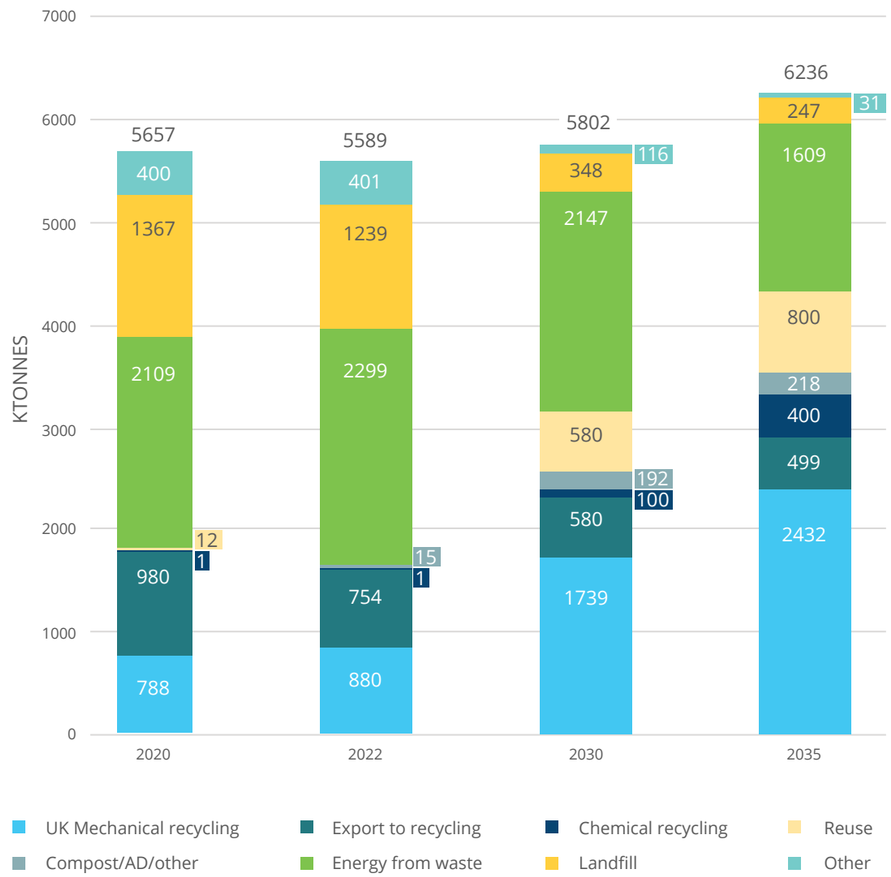
	UK PLASTICS WASTE FLOWS				UK PLASTICS WASTE FLOWS - FORECAST			
	2020		2022		2030		2035	
	kT	%	kT	%	kT	%	kT	%
Total plastic waste	**5657**		**5589**		**5802**		**6236**	
UK mechanical recycling	788	14%	880	16%	1739	30%	2432	39%
Export to recycling	980	17%	754	13%	580	10%	499	8%
Chemical recycling	1	0%	1	0%	100	2%	400	6%
Total recycling	**1769**	**31%**	**1635**	**29%**	**2419**	**42%**	**3331**	**53%**
Compost/AD/other*	12	0%	15	0%	192	3%	218	4%
Reuse					580	10%	800	13%
Total reuse and recycling	**1781**	**31%**	**1650**	**29%**	**3191**	**55%**	**4349**	**70%**
Energy from waste	2109	37%	2299	41%	2147	37%	1609	26%
Landfill	1367	24%	1239	22%	348	6%	247	4%
Other*	400	7%	401	7%	116	2%	31	0%
Total residual	**3876**	**69%**	**3939**	**71%**	**2611**	**45%**	**1888**	**30%**

Due to rounding, % the sum can be over/under

* Co-incineration, MBT diversion, RDF export, mismanaged waste

A scenario-based approach was used to calculate this data – see Annex 1. The scenario-based approach shows that if the UK continues in Business as Usual by 2030 the reuse and recycling rate would be 40% with 48% by 2035 which is significantly below the ambitions of the industry. This would also prevent the zero waste economy the government is aiming for. The worse case scenario signifies the urgent need for action on the key changes set out as in this situation by 2035 the plastic recycling would only reach 35%.

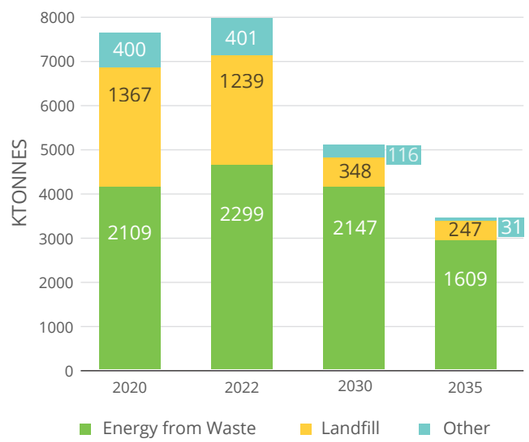
FIGURE 9: Plastic waste flows



Total plastic waste disposal

Energy from waste and landfills will only be used when no other options higher up the waste hierarchy are available (see the BPF plastic waste hierarchy, figure 7). Plastic waste volume destined for EFW plants (including Refuse-Derived Fuel (RDF) and Solid Recovered Fuel (SRF)) drops by over 30%.

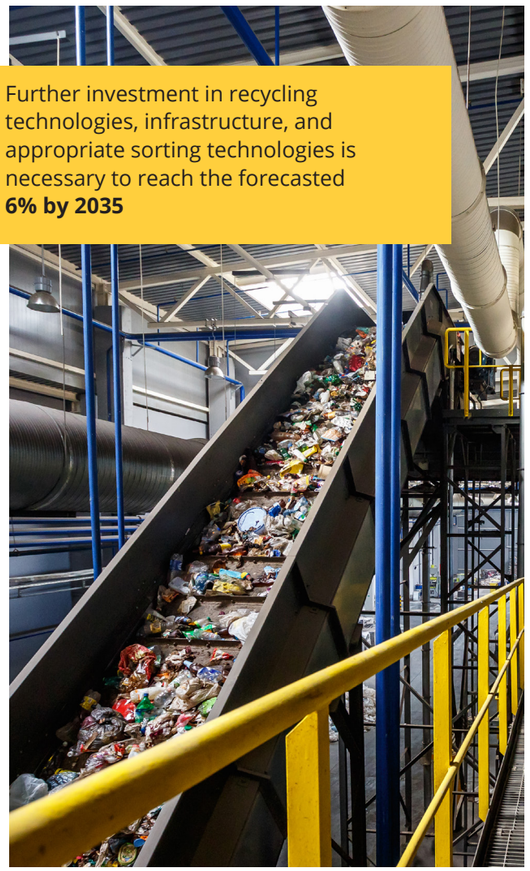
FIGURE 10: Total plastic waste disposal



Recycling

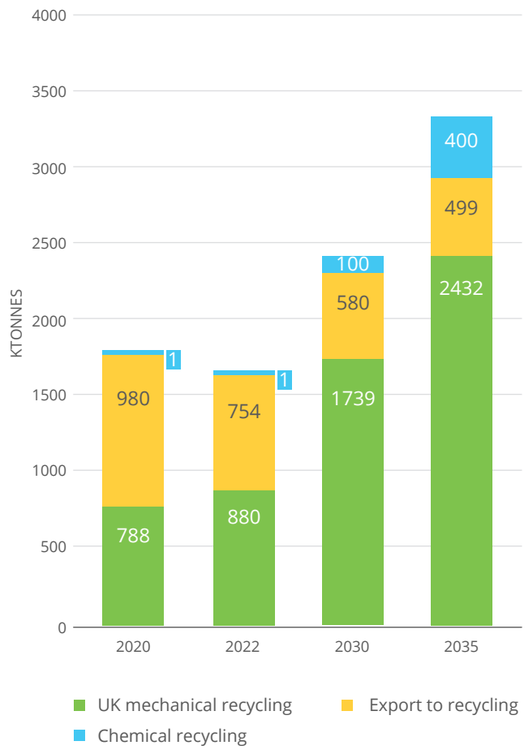
Mechanical recycling technologies advance in capability and efficiency to deliver more than three times the 2020 capacity. Additional volumes will be achieved partially by using spare capacity. At the same time, support and investment measures need to be introduced as soon as possible to allow new facilities to meet the demand created by legislative measures and handle additional material captured through improved collection systems. There is a need for a variety of new facilities to recycle plastic applications, not only from packaging but also from other sectors, offering high-quality secondary material, including food-grade. An additional 1.3MT of extra capacity would be needed, which is estimated to cost about £1.3 billion.

Export rates will be reduced. However, exporting recyclable material that does not have relevant technology available to recycle it within the UK — but can be reprocessed into high-quality recyclate abroad — is considered a preferable option over disposing of it domestically. Export should not be a route for low quality material.



Further investment in recycling technologies, infrastructure, and appropriate sorting technologies is necessary to reach the forecasted **6% by 2035**

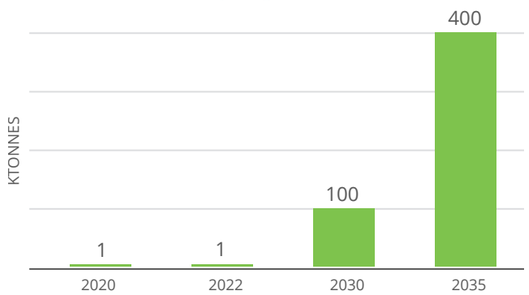
FIGURE 11: Total recycling

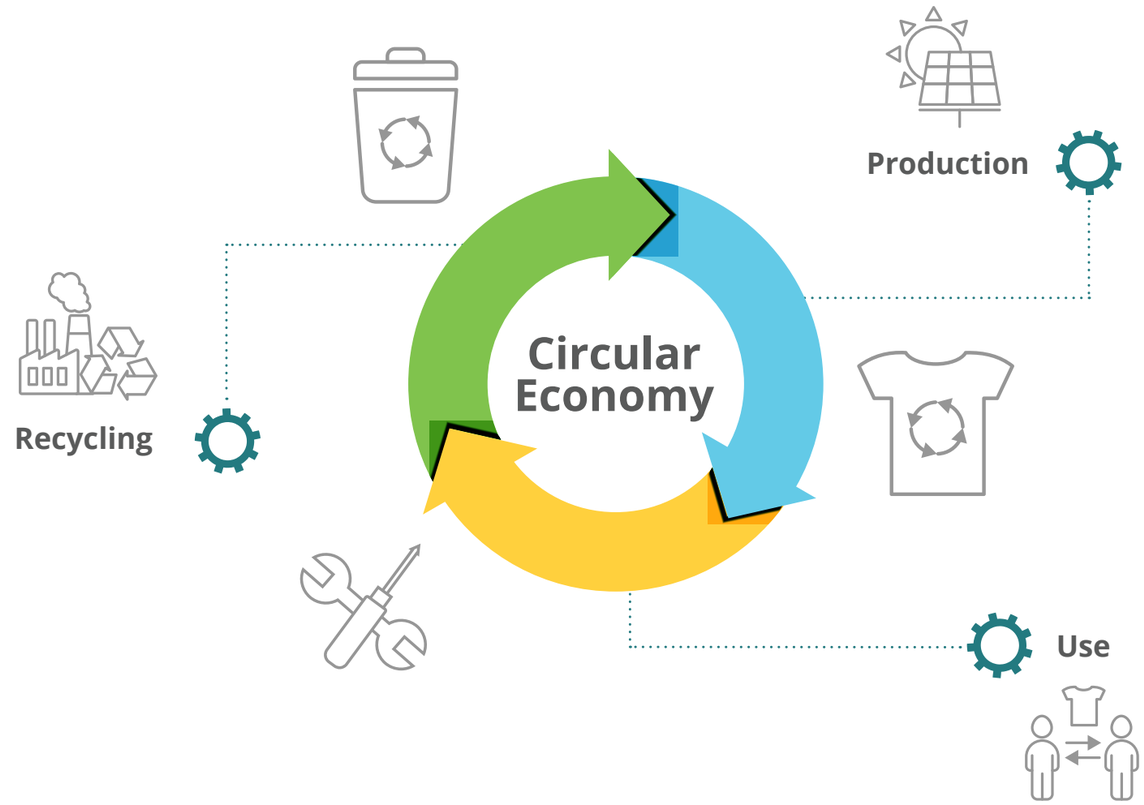


Chemical recycling

Chemical recycling technologies continue to grow and support plastic circularity alongside mechanical recycling technologies. Further investment in recycling technologies, infrastructure, and appropriate sorting technologies is necessary to reach the forecasted 6% by 2035. This will require legislative support for chemical recycling.

FIGURE 12: Chemical recycling

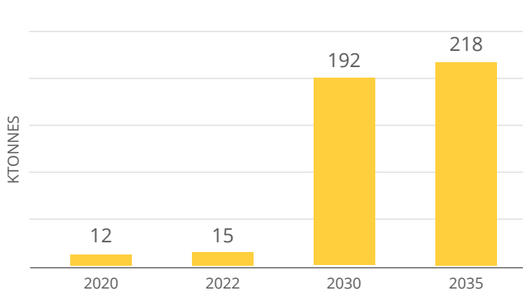




Compost, anaerobic digestion (AD) and other

Composting and anaerobic digestion materials are part of separate collections. These technologies offer sustainable opportunities for specific applications and will develop depending on growth in these areas. The forecast also assumes that novel technologies (e.g. enzyme recycling and Carbon Capture Technologies (CCT)) will continue to emerge and develop to further increase the amount of high-quality recycled plastic material. Support for innovation and its domestic commercialisation is crucial in achieving the forecasted vision.

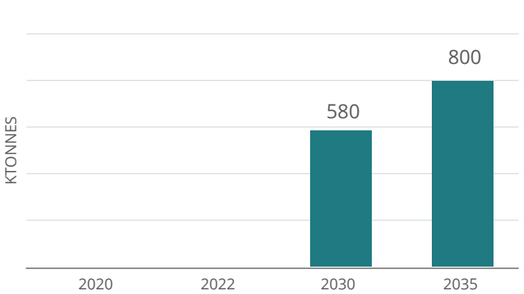
FIGURE 13: Compost, AD and other



Reuse

The adoption of reusable products, including packaging, will significantly increase, reaching at least 13% and keeping material in circulation for longer. Evidence-led, proportionate government measures exist to encourage reuse wherever it is viable and makes sense, and there are more drivers from industry, which support the growth of reuse systems within all relevant sectors. Repair is promoted and plays a significant role in limiting the growth of total plastic waste, which could, without repair and reuse practices, reach as high as 8 Mt by 2035 in the worst-case scenario.

FIGURE 14: Reuse



Repair is promoted and plays a significant role in limiting the growth of total plastic waste, which could, without repair and reuse practices reach as high as **8 Mt by 2035** in the worst-case scenario.

The 2035 forecast can only be achieved with a significant shift towards circularity in new plastic product design and manufacturing practices. This will lay the foundation for changing the rising trend of total plastic waste and guarantee most of the material from new products will be captured at end of life.

The vision for 2030 and 2035 is ambitious and is based upon forecasted systemic changes. It also assumes that the plastic industry worldwide is aligned to adopt these systematic changes, accelerating the transformation. This aligns with other plastic waste models, e.g. from Plastics Europe and OECD, where collaborative effort makes the most ambitious scenarios achievable. The UK is uniquely placed to lead this change and create an example of an efficient and circular system for plastic recycling.

Note about the 2030 forecast from the 2021 report

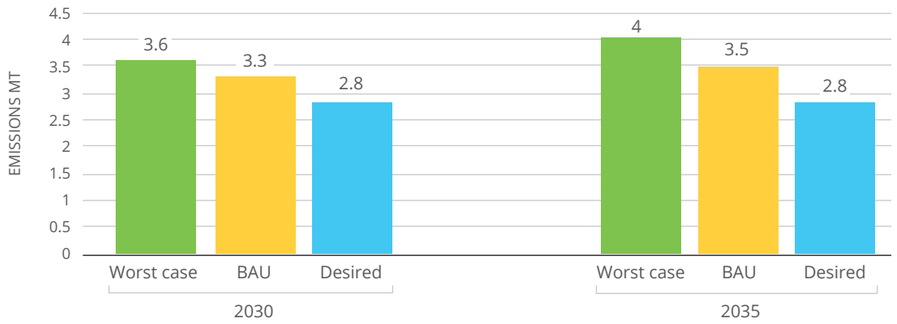
This report updates the previous 2030 forecast. The ambitious scenario suggested in 2021 called for a twofold reduction of plastic in residual waste and an increase in UK mechanical recycling capacity to 2300kT by 2030, as well as a reduction in export and non-mechanical (chemical recycling) increasing to 300kT.

It was only possible if the key assumptions and key changes took place. Nearly four years later, there have been delays and changes to critical milestones. There has not been support for the key changes required and — most significantly — there has not been the much-needed investment in infrastructure, due to a lack of government support. A key example of this is chemical recycling, where lack of acceptance of mass balance within the Plastic Packaging Tax has meant that investments are taking place outside of the UK and the forecast for 2030 has had to be reduced from 300kT to 100kT. Therefore, it is fair to suppose that achieving the envisioned 69% recycling rate will take longer. Achieving it will still be subject to urgent collective action by the government, industry and the public.

The previous assumption that the amount of plastic waste will remain stable no longer seems viable, particularly due to existing long life products reaching the end of their life. Further insights waste growth going forward are now available which have been taken into consideration.

Environmental impact[65]

FIGURE 15: CO_2 emissions associated with each scenario (see Annex 1)



Without the key changes (worse case scenario see annex 1) emission would be **1MT CO_2e higher** (4MT).

Actual savings would be higher when the emissions savings from replacing virgin plastic are taken into account. In the 2035 forecast it could save an additional **6MT** of CO_2.

Recycling around 20 Mt of plastics will **save about 50 million tons** of resources from depletion worldwide.[66]

Plastic products made from recovered plastics offer clear environmental benefits compared to virgin polymers or the disposal of products through EfW or landfills. The main environmental benefit lies in the energy saved by avoiding oil refining and polymerisation of monomers. Recycling one tonne of plastic can save significant amounts of CO_2. Different types of plastic products yield varying levels of environmental gains (1.8 tonnes of CO_2e for a tonne of polymer produced - the average reduction of GHG emissions).[67]

Conclusion

This second roadmap presents the latest data across the diverse range of sectors where plastic is utilised. It shows there has been limited progress made since the first edition of the roadmap published in 2021. This is evident in the revised 2030 forecast, which acknowledges that achieving the original 2030 forecast over the next six years would not be realistic. The absence of key changes, legislative delays leading to uncertainty, and a challenging economic environment have all contributed to this outcome. However, the 2035 forecast highlights that a lot can be achieved within a decade and a significant shift of material up the plastic waste hierarchy can be accomplished. This requires immediate action to create the right conditions to enable this to happen. These changes are set out in the updated key changes, with investment in infrastructure remaining the most critical change needed. The analysis of the environmental impact of the forecast versus 'business as usual' or the worse-case scenario highlights the urgent need for action.

The BPF believes that, although ambitious, the forecasts presented are achievable. The Plastic Packaging Tax remains an unused resource that could be a catalyst for change. Investing funds from the tax could provide the much-needed infrastructure for the waste sector.

Annex 1: Forecast scenarios

The forecast was completed for three scenarios:

Worst-case scenario: This scenario assumes that positive trends that we observe now, such as increased capture of material for recycling, increase in domestic recycling, development of reuse and chemical recycling, only marginally improve over the next 10 years. This scenario assumes that no measures are implemented to reduce plastic waste generation and improve recycling rates.

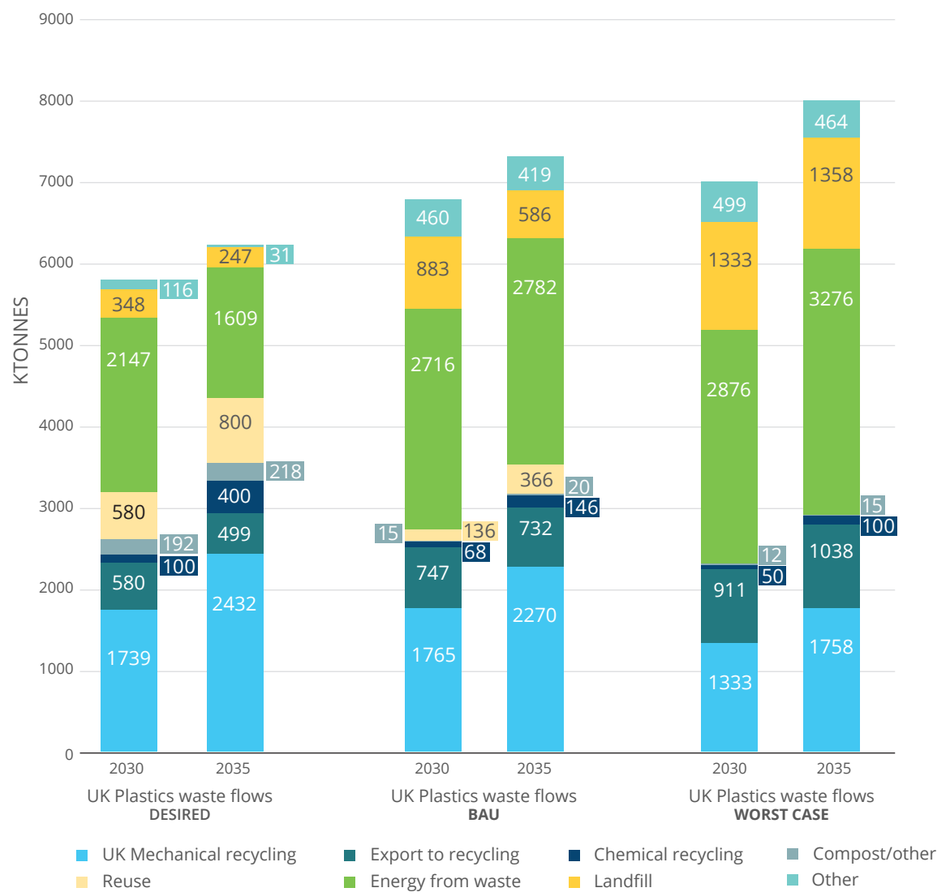
Business as usual scenario: This scenario assumes that positive trends are continuing and supported and that legislative drivers and financial support for the recycling industry are implemented efficiently and on time. Business as usual assumes growth in the recycling rates, lesser reliance on exports- and some growth of reuse. However, it does not include any new measures introduced to support the industry and promote a systemic shift towards higher recycling and reuse rates, as well as a reduction in residual waste.

Desired scenario: This is an ambitious scenario that models the assumption that all declared support measures, e.g. EPR and DRS, are well designed and introduced on time. It also demonstrates what can be achieved if the recycling sector receives the support it needs to shift to maximum material circularity. This includes all the key changes set out below being delivered. The desired scenario suggests that there is:

- Support for local technology development and commercialisation
- Reuse implemented at scale and plastic waste reduction is promoted
- A significant increase in domestic mechanical recycling
- Collection and recycling systems implemented to capture end-of-life plastic from long-lasting applications

This scenario is subject to key assumptions and key changes.

Figure 16: Forecast scenarios



Endnotes

1. All statistics in this sentence are stated in comparison to 2022 data, except the reuse statistic.
2. PlasticsEurope, 2024: The Circular Economy for Plastics – A European Analysis plasticseurope.org/knowledge-hub/the-circular-economy-for-plastics-a-european-analysis-2024
3. Includes tableware and kitchen utensils (e.g. mixing bowls, stirring spoons, spatulas/flippers etc.), bath equipment and toiletries (e.g. toothbrushes, soap dispensers, etc.), combs and hair clasps, housekeeping articles (e.g. boxes/cases for the storage of food or other articles, folding boxes, waste containers), clothes-hangers, decorative articles, sport/leisure/camping accessories, bathing and swimming articles, swimming pools, toys, etc. PlasticsEurope, 2024 The Circular Economy for Plastics. A European Analysis https://plasticseurope.org/knowledge-hub/the-circular-economy-for-plastics-a-european-analysis-2024
4. PlasticsEuropePlastics – the Fast Facts 2023. plasticseurope.org/knowledge-hub/plastics-the-fast-facts-2023
5. Valpak, PackFlow Refresh 2023: Plastic, 2024 www.valpak.co.uk/knowledge-hub-post/packflow-refresh-2023-plastic
6. National Packaging Waste Database, 2024 npwd.environment-agency.gov.uk
7. National Packaging Waste Database, 2024 (npwd.environment-agency.gov.uk) and Valpak, PackFlow Refresh 2023: Plastic, 2024 www.valpak.co.uk/knowledge-hub-post/packflow-refresh-2023-plastic
8. National Packaging Waste Database, 2024 npwd.environment-agency.gov.uk

9-11. Valpak, PackFlow Refresh 2023: Plastic, 2024 www.valpak.co.uk/knowledge-hub-post/packflow-refresh-2023-plastic

12-14. RECOUP, UK HOUSEHOLD PLASTIC PACKAGING COLLECTION SURVEY 2023 www.recoup.org/resources/reports

15. APE UK, 2023 Agricultural Plastics. Collected-for-recycling material in this sector has a 20-150% contamination rate (soil, produce), therefore high collection volumes do not translate into a high recycling rate.
16. WRAP, 2022, Banbury, Review of Plastics in Agriculture, prepared by Thomas Baker, Paddy Duggan, Kelvin Chiu
17. APE UK, 2023 Agricultural Plastics
18. WRAP, 2022, Banbury, Review of Plastics in Agriculture, prepared by Thomas Baker, Paddy Duggan, Kelvin Chiu. Composition: silage bale wrap: 18,000 – 22,000 tonnes, bale twine: 7,000 tonnes, silage bunker film: 3,000 – 5,000 tonnes, net sheeting: 4,000 tonnes, greenhouse/polytunnels: 2,000 – 3,000 tonnes, mulch film: 2,000 tonnes.
19. Valpak, PackFlow Refresh 2023: Plastic, 2024 www.valpak.co.uk/knowledge-hub-post/packflow-refresh-2023-plastic
20. Recovinyl 2022 www.recovinyl.com/post/recovinyl-recycling-results-810-240-tonnes-recycled-in-2022

21-23. PlasticsEurope 2022 Circular Economy for Plastics Data CircularEconomy_nationalinfographics_2024.pdf (plasticseurope.org)

24. Chemical Recycling:
    - One facility online in 2021 ~ 7KT capacity (went into administration and closed, so actual volumes processed unknown).
    - 0 facilities online 2022-2023 ~ 1KT recycled through pilot plants
    - One facility online in 2024 ~ 20KT capacity but is still in commissioning along with pilot plants.
25. Most of the data are for 2022 unless additional capacities were known and added.
26. Total capacity is mechanical capacity for household packaging + Mechanical recycling capacity for commercial packaging + ELV and WEEE + Chemical recycling
27. Estimate using expert input.

28-36. RECOUP, 2023: UK Plastic Packaging Sorting & Reprocessing Infrastructure 2022 Update www.recoup.org/resources/reports

37. RECOUP, 2023: UK Plastic Packaging Sorting & Reprocessing Infrastructure 2022 Update www.recoup.org/resources/reports

    New sites since the above RECOUP report was released at least 70KT of extra capacity has come online.

    Plastic films – Some capacity came online after RECOUP's report but has since closed down. www.recoup.org/resources/reports

    Please note film capacity is included as part of the commercial packaging capacity figures.

38. Includes tableware and kitchen utensils (e.g. mixing bowls, stirring spoons, spatulas/flippers etc.), bath equipment and toiletries (e.g. toothbrushes, soap dispensers, etc.), combs and hair clasps, housekeeping articles (e.g. boxes/cases for the storage of food or other articles, folding boxes, waste containers), clothes-hangers, decorative articles, sport/leisure/camping accessories, bathing and swimming articles, swimming pools, toys, etc. PlasticsEurope, 2024: The Circular Economy for Plastics — A European Analysis plasticseurope.org/knowledge-hub/the-circular-economy-for-plastics-a-european-analysis-2024

39-41. PlasticsEurope 2022 Circular Economy for Plastics Data CircularEconomy_nationalinfographics_2024.pdf (plasticseurope.org)

42. Axion 2021: Opportunities to reduce the environmental impact of plastics in healthcare. Top 15 items: LDPE film, Peel packs, Nitrile gloves, PP syringes, AHP, LDPE (aprons), Non-wovens (wipes), PVC rich, PP (non-woven), Rigid PP, Other rigid polymers, Blister packs, IV bags, Saline bottles, data averaged 2018-2021
43. Rizan C, Mortimer F, Stancliffe R, Bhutta MF. Plastics in Healthcare: Time for a Re-evaluation. J R Soc Med. 2020 Feb;113(2):49-53. doi: 10.1177/0141076819890554. Erratum in: J R Soc Med. 2020 Jul;113(7):288. doi: 10.1177/0141076820942469. PMID: 32031491; PMCID: PMC7068768.
44. PlasticsEurope, 2024: The Circular Economy for Plastics — A European Analysis plasticseurope.org/knowledge-hub/the-circular-economy-for-plastics-a-european-analysis-2024 and estimation of medical sector % from total demand 2%
45. Estates Return Information Collection (ERIC), 2022/2023 digital.nhs.uk/data-and-information/publications/statistical/estates-returns-information-collection/england-2022-23
46. Healthcare Without Harm, 2021: Measuring And Reducing Plastics In The Healthcare Sector
47. Based on a number of sources and expert advice. Plastic in car range for 2022: 195-250 kg, averaged use for calculation 225 kg. Car mass averages 1.25 T, ranging from 1.0 to ~1.5 T per vehicle. Small hatchback = 1.2 tonne/car, modern family SUVs = 1.5 – 2.0 tonne/car. Plastic % of total weight range from 12 to 18 %, average 15%. Ricardo, 2020: Demand-Led Innovation for the Automotive Sector: Materials Requirements in 2030 and Beyond www.ricardo.com/media/d3vatfig/demand-led-innovation-for-the-automotive-sector-material-requirements-for-2030-and-beyond.pdf. Exergy Assessment of Plastic Car Parts, 2023 www.mdpi.com/2624-8921/5/3/67.
48. Expert advice
49. Calculated by using the average plastic content of the car 225 kg and new car registered in 2022 – 1,614,063 new cars registered in 2022 (https://www.smmt.co.uk/wp-content/uploads/SMMT-Motor-Industry-Facts-May-2023.pdf . If use higher estimation of plastic in the car (250 kg): 404 kT (2022)
50. Calculated by using the following numbers. The average life span of a vehicle is 13-14 y.o. Number of cars placed on the market 14 ago (2010) – 2,030,846 – SMMT – https://www.smmt.co.uk/2011/01/new-car-registration-figures-full-year-2010/. % of plastic in cars 2010 – 12-15%. The average car weight is between 1T and 1.5T. Approx amount of plastic per car for 2010 130-150 kg.(alt 128 kg per car https://www.statista.com/statistics/272015/automotive-industry-plastics-and-composites-since-1980/

51-54. BPF EPS Group Data, 2024 – this figure was calculated by collecting raw data from UK convertors alongside UK and EU recyclers of EPS. Raw data and estimates have been used by industry experts to calculate the total recycling rate.

55. To calculate CO_2 figures associated with plastic recycling, energy from waste and landfill conversion factors for different polymers (PET, HDPE, dense plastics and film, closed loop) were averaged and applied to relevant tonnages. Emissions from Energy from Waste, landfills, and recycling were added up to calculate the total emissions associated with plastic waste. These figures were then cross-checked with the sources below to verify that the suggested estimation method gives agreeable results with other models. These figures were calculated to indicate the relationship between different plastic waste fates and calculated with assumptions acceptable for this purpose. Further studies will be required if more accurate data is needed for decision-making or reporting.

    WRAP Carbon Waste and Resource Metrics 2021 https://www.wrap.ngo/resources/report/carbon-waste-and-resources-metric

    WRAP Plastics Market Situation Report 2019 https://www.wrap.ngo/sites/default/files/2020-10/WRAP_Plastics_market_situation_report.pdf

    Environmental effects of plastic waste recycling, JRC Technical Report, Davide Tonini, Pelayo Garcia-Gutierrez, Simone Nessi 2021 https://www.recycletheone.com/wp-content/uploads/2023/04/environmental_savings_from_plastic_waste_recycling_-_jrc_report.pdf

Global Plastics Outlook, © OECD 2022
www.oecd-ilibrary.org/sites/aa1edf33-en/1/3/2/5/index.html?itemId=/content/publication/aa1edf33-en&_csp_=ca738cf5d4f327be3b6fec4af9ce5d12

The 'P' Word –Plastics in the UK: practical and pervasive … but problematic. Cullen JM, Drewniok MP, Cabrera Serrenho A 2020
www.refficiency.org/publications/the-p-word/

Plastics Europe The Plastic Transition 2023
https://plasticseurope.org/changingplasticsforgood/the-plastics-transition/

56. Tolvik Consulting, 2023: UK Energy from Waste Statistics – 2022
57. WRAP, 2019: National municipal waste composition, England 2017
58. Tolvik Consulting, 2023: UK Energy from Waste Statistics – 2022
59. Tolvik Consulting, 2023: UK Energy from Waste Statistics – 2022
60. Other treatments: Co-incineration, Mechanical Biological Treatment (MBT) diversion, Refuse Derived Fuel (RDF) export, etc. Tolvik Consulting, 2023: UK Energy from Waste Statistics – 2022
61. Environmental Agency WEEE database, 2024 www.gov.uk/government/statistical-data-sets/waste-electrical-and-electronic-equipment-weee-in-the-uk and estimated plastic content
62. Environmental Agency WEEE database, 2024 www.gov.uk/government/statistical-data-sets/waste-electrical-and-electronic-equipment-weee-in-the-uk and estimated plastic content
63. Environmental Agency WEEE database, 2024 www.gov.uk/government/statistical-data-sets/waste-electrical-and-electronic-equipment-weee-in-the-uk and estimated plastic content
64. Expert estimation suggests that % of plastic in WEEE ranging from 5 to 45%. 25% is an averaged number
65. The carbon emissions for the forecast scenarios are based on the emission figures suggested by the Global Plastic Outlook dataset for 2030 and 2035. The share of the UK emissions for each scenario was worked out based on available data for current years (2020 and 2022), and this % was applied to the projected emissions associated with each scenario. Figures received were then cross-checked with other models below for relevance. These figures were calculated to indicate the relationship between different plastic waste fates and calculated with assumptions acceptable for this purpose. Additional study will be required for the quantitative data.

    Global Plastics Outlook, © OECD 2022
    www.oecd-ilibrary.org/sites/aa1edf33-en/1/3/2/5/index.html?itemId=/content/publication/aa1edf33-en&_csp_=ca738cf5d4f327be3b6fec4af9ce5d12

    The 'P' Word – Plastics in the UK: practical and pervasive … but problematic. Cullen JM, Drewniok MP, Cabrera Serrenho A 2020
    www.refficiency.org/publications/the-p-word/

    Plastics Europe The Plastic Transition 2023
    https://plasticseurope.org/changingplasticsforgood/the-plastics-transition/

66. Gabisa EW, Ratanatamskul C, Gheewala SH. Recycling of Plastics as a Strategy to Reduce Life Cycle GHG Emission, Microplastics and Resource Depletion. Sustainability. 2023; 15(15):11529. https://doi.org/10.3390/su151511529
67. Global Plastics Outlook, © OECD 2022 www.oecd-ilibrary.org/sites/aa1edf33-en/1/3/2/5/index.html?itemId=/content/publication/aa1edf33-en&_csp_=ca738cf5d4f327be3b6fec4af9ce5d12

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