PackFlow Refresh 2023: Steel

A review of the quantity of packaging placed on the market and recycled in 2022 with compliance projections to 2028.

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Packflow Refresh 2023: Project Remit

This project seeks to estimate packaging POM and recycling figures, observe changes in packaging flow trends, and assess the UK's compliance position in 2022, and projecting forward to 2028.

This has been achieved by:

- Calculating UK packaging POM (placed on the market) and recycling by material and by industry sector in 2022 to provide a baseline for future scenarios.
- Using relevant data sources and industry insight to estimate by packaging material type on:
    - The total amount of material that is likely to be placed on the market (POM) by sector
    - The impact of the change in POM on the UK recycling rate
    - The changes to the level of obligated tonnage
    - The scenarios for packaging materials flow and recycling up to 2028

Scenarios, assumptions, and data sources have been agreed with the steering committee made up of key industry stakeholders representing individual materials and sectors.

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Executive Summary

Introduction

The PackFlow 2023 reports (https://www.valpak.co.uk/more/material-flow-reports) cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow update project has two phases:

Phase 1

- Updates the baseline year to 2022 for estimates of packaging materials POM collections, recycling and end markets (from 2019 in the previous flow reports[1]).

Phase 2

- Develops scenarios for packaging materials flow and recycling up to 2028.
- Assesses potential compliance risks versus recycling targets for packaging materials.

To support Defra and the Devolved Administrations in their packaging policy work and assist other industry stakeholders, this report focuses on generating robust estimates of UK steel packaging placed on the market (POM)[2] that are as accurate as is reasonably possible. The report also considers the quantities of steel packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by packaging steel recyclers in the UK.

Data robustness assessments have been conducted and error margins are calculated and provided wherever possible throughout report.

Steel Packaging POM

This report estimates steel packaging POM in 2022 to be 474k tonnes (+/- 6%)[3].

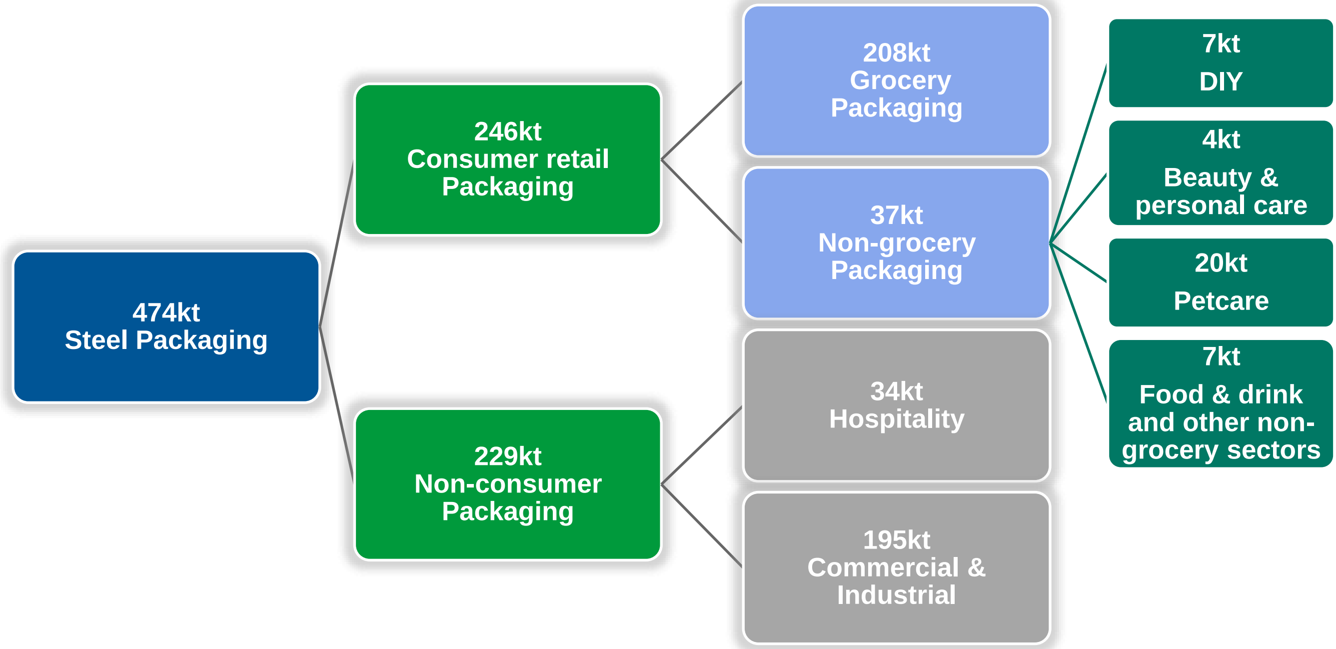
This estimate is derived from reported obligated data (EA (Environment Agency) and NPWD (National Packaging Waste Database)) and cross-checked as far as is possible using a bottom-up methodology combining data from various sources for each sector and data provided by the project's industry Steering Group.

[1] The previous packaging materials flow reports can found at https://www.valpak.co.uk/more/material-flow-reports .

[2] Steel packaging placed on the market means all household and non-household steel packaging used around products sold and transported within the UK.

[3] The error margins are assumed estimates based on the robustness assessment and are not the outputs of statistical calculation

Figure 1: Steel Packaging POM by Sector, 2022 (k tonnes)



The estimate for steel packaging POM in the Consumer sector is 246k tonnes (+/-5%) in 2022.

This estimate is based on primary data alongside reliable market share data. No other method is used for deriving Consumer data as this method is considered the most robust available and is accepted by the industry Steering Group supporting this steel flow project.

The estimate for steel packaging POM in the Non-Consumer sector is 229k tonnes (+/-11%) in 2022.

This estimate comprises an estimate of Hospitality packaging based on primary and market share data, to which separate quantities of direct sales of soft and alcoholic drinks using steel packaging (calculated based on industry figures) are added. C&I steel packaging is estimated as the remaining part of Non-Consumer POM and is the residual tonnage once Consumer and Hospitality POM are deducted from Total steel packaging POM. This figure is cross-checked using a bottom-up approach based on estimates of industrial packaging types using secondary research and industry/Steering Group knowledge. The cross-check figure is within 8% of the residual tonnage estimate (despite some steel packaging that could not be quantified).

Scheme Administrator Submissions

The total tonnage of packaging POM that is like to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as ‘household / household like’) is 248kt, of which 4kt would be included in a DRS. Of the material relevant to DRS, 2 kt is from non-consumer sources and 2 kt is from hospitality (takeaway only)(Table 1). The DRS applies to drinks that come in containers between the sizes of 50mL – 3L[4]. This includes steel cans used as drinks containers[5].

[4] *Within Scotland container sizes in scope of the DRS are proposed to be between 100ml-3L since an announcement made by the Minister for Green Skills on 20th April 2023. Prior to this announcement container sizes in scope of the DRS were 50ml-3L..*

[5] *https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1130296/DRS_Government_response_Jan_2023.pdf*

Table 1: Total Expected Scheme Administrator Submissions (kt)

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Steel - All	**474**	246	229	34	2	**248**
Steel - excluding DRS	**470**	244	227	32	0	**244**

Consumer Packaging in the Household Waste Stream

The total proportion of consumer steel packaging from Grocery retailers that is disposed of in the household waste stream is 81.5%. The total proportion of consumer steel packaging from Non-Grocery retailers that is disposed of in the household waste stream is 95.3%. This is based on the same sample of retailers as is used in the rest of this report and equates to 98.8kt (83.5%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer steel packaging from Grocery retailers that falls within the 'litterable' categories (as described in the material specific reports) is 2.3%. The total proportion of consumer steel packaging from Non-Grocery retailers that falls within the 'litterable' categories is 1.7%. This is based on the same sample of retailers as is used in the rest of this report, and equates to 2.62kt of packaging in total.

Steel Packaging Recycling

Steel packaging recycling (recorded & unrecorded) is estimated to be 506k tonnes in 2022.

This includes accredited (or recorded) recycling of 366k tonnes (NPWD) and an estimate for unrecorded recycling of 140k tonnes. Based on this project's POM an overall steel packaging recycling rate of 100% is estimated, reasons for this are explored further in the report. The total recycling rate for steel packaging is dependent on applying protocols for the quantity of packaging within the recycling streams for ferrous steels. The accredited (or recorded) recycling rate for steel packaging is 77% in 2022.

Consumer steel packaging recycled is estimated to be 285k tonnes in 2022.

Based on this project's POM estimate a Consumer recycling rate of over 100% is estimated (the figure is 116% and reasons for this are explored further in the report). Inclusion of Non-Consumer steel packaging recycling recorded on Waste Data Flow (WDF) or included within MSW supplied to EfW plants is likely to be a factor in the overstatement of Consumer steel packaging recycling.

Non-Consumer steel packaging recycled is estimated to be 221k tonnes in 2022.

This is estimated by subtracting Consumer steel packaging recycling from total steel packaging recycling. Based on this project's POM the Non-Consumer steel packaging recycling rate is 97% in 2022.

It is assumed that all steel packaging is ultimately recovered from incinerator bottom ash (IBA), either in the UK, or overseas via exports of refuse derived fuel (RDF). Up to 8k tonnes of steel packaging not recycled may be landfilled. Assuming 7% of IBA is ferrous content, this amounts to 137k tonnes of steel packaging.

Whilst this does not tally with the 100% steel packaging recycling rate, it falls within the error margins calculated for steel packaging POM and recycling. It is clear that the amount of steel within RDF, and the amount of steel packaging within ferrous steel grades, both being sent for recycling and for RDF, is an extremely sensitive metric for defining steel packaging recycling.

Based on NPWD figures for 2022, 47% of the recorded steel packaging recycling took place in the UK and 53% overseas.

Recycled steel packaging is used in a wide range of different products once recycled, including in construction, automotive and packaging applications. Non-OECD member countries in Asia were the key export destinations, including India, Pakistan and Bangladesh. Turkey (ROW:OECD) received the second highest tonnage in 2022.

End Markets for UK Steel Packaging

In 2022, 47% of steel packaging collected was recycled in the UK.

Based on NPWD figures for 2022, 47% of the recorded steel packaging recycling took place in the UK and 53% overseas.

Non-OECD countries were the key markets for steel packaging exported from the UK

Non-OECD Asian countries were the key export destinations in 2022 (53% of export), the largest markets being India (34%), Pakistan (14%) and Bangladesh (5%). 25% of UK exports went to EU27+2 countries, notably Portugal (11%) and Spain (5%). OECD countries received 20% of exported UK steel, the largest market being Turkey (16%).

Packaging Future Trends and Scenarios

Two EPR scenarios relevant to steel are:

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025)
- EPR scenario 2: DRS drinks containers excluding glass removed from recycling obligations under EPR in 2027 onwards

EPR Scenario 1

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2028. Business targets are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, steel packaging is projected to have a small shortfall relative to the business target 2024 to 2028.

EPR Scenario 2

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2026. Steel drinks containers are removed from EPR from 2027 onwards (~2k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, a surplus relative to the business target 2024 to 2028 is projected for steel packaging. However, the surplus indicates that either the business target and/or the modelled collection rates could be adjusted downwards whilst still achieving the target.

Recommendations for Further Work

Steel Packaging POM

The area of greatest uncertainty around steel packaging POM estimates is around the quantities of ‘other C&I’ packaging in the non-Consumer sectors (i.e. C&I packaging, excluding hospitality packaging). This project progresses the quantification of ‘other C&I’ packaging for steel packaging.

Steel Packaging Recycling

It is apparent from the comprehensive analysis for steel packaging in this project that there is a considerable amount of unaccredited (or unrecorded) steel packaging recycling. If such quantities were able to become accredited (i.e. recorded) this would boost steel packaging recycling rates and performance versus UK recycling targets. Further work to promote the benefits or need for the industry to obtain accreditation and to support the regulators or environment agencies in assessing and providing accreditation is therefore recommended.

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Glossary

AFH – Away-from-home

BAMA – British Aerosol Manufacturers Association

BBPA – British Beer & Pub Association

BCGA – British Compressed Gas Association

BSDA – British Soft Drinks Association

C&I – Commercial & Industrial

CA – Civic Amenity

DAERA – Department of Agriculture, Environment and Rural Affairs

DRS – Deposit Return Scheme

EA – Environment Agency (EA)

EfW – Energy from Waste

EPIC – Environmental Product Information Centre

HWRC – Household waste recycling centre

IBA – Incinerator Bottom Ash

IPA – Industrial Packaging Association

k – Thousand

kt – Thousand tonnes

LA – Local Authority

M – Million

MPMA – Metal Packaging Manufacturing Association

MRF – Materials Recovery Facility

MSW – Municipal solid waste

NPWD – National Packaging Waste Database

ONS – Office of National Statistics

OTG – On-the-Go

PERN – Packaging Export Recycling Note

PRN – Packaging Recovery Note

POM – Placed on the Market

Primary Packaging – Any packaging that the customer will take home, remove and throw away e.g. aluminium can, plastic bottle

PRN – Packaging Recycling Note

RDF – Refuse Derived Fuel

Secondary Packaging – Inner packaging used to transport or display goods to/in store, usually cardboard boxes or shelf-ready packaging

t – Tonnes

Transit/Tertiary Packaging – Any transit packaging e.g. pallets, shrink wrap, staples or strapping

UBCs – Used Beverage Cans

WDF – Waste Data Flow

Acknowledgements

Valpak Limited and the Waste Resources Action Programme (WRAP) would like to thank the following organisations for their contributions to the PackFlow Refresh 2023 project for steel:

- Tata Steel
- The Metal Packaging Manufacturers Association (MPMA)
- The British Aerosol Manufacturers' Association (BAMA)
- The Advisory Committee on Packaging (ACP)
- Incpen
- The Packaging Federation
- The Recycling Association
- The Department for the Environment, Food & Rural Affairs (Defra)
- The Department of Agriculture, Environment and Rural Affairs (DAERA)
- The Environment Agency (EA)
- The Scottish Government
- The Scottish Environmental Protection Agency SEPA
- The Welsh Government
- Zero Waste Scotland (ZWS)

1. Introduction

1.1. Background

The PackFlow reports (https://www.valpak.co.uk/more/material-flow-reports) cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow update project has two phases:

Phase 1

- Updates the baseline year to 2022 for estimates of packaging materials POM collections, recycling and end markets (from 2019 in the previous flow reports[6]).

Phase 2

- Develops scenarios for packaging materials flow, collections and recycling from 2023 to 2027
- Assesses potential compliance risks versus targets.

To support Defra and Governments and other industry stakeholders in their packaging policy work and assist other industry stakeholders, this Phase 1 report focuses on generating robust estimates of steel packaging placed on the market (POM) [7] in the UK that are as accurate as is reasonably possible. The report also considers the quantities of steel packaging recycled, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by steel recyclers in the UK.

1.2. Phase 1 Objectives

The Packflow Refresh 2023 project for steel packaging has the following objectives for Phase 1:

- Provide updated (and cross-checked) baseline estimates of steel packaging placed on the UK market, by packaging format, sector and source:
    - Format (e.g. drinks can, food can, aerosol)
    - Sector (e.g. Consumer, Non-Consumer)
    - Source (e.g. handled by obligated producers who are registered, non-obligated producers, or free riders)
    - POM split by nation (England, Northern Ireland, Scotland and Wales).
- Estimate the amount of packaging POM that could be disposed of within the DRS
- Identify scheme administrator submissions
- Identify commonly littered items
- Estimate the quantities of steel packaging collected through kerbside and other collection types, by sector
- Estimate the quantities of steel packaging recovered and recycled; sent for incineration with energy recovery; sent to landfill, for both UK and overseas end destinations
- Provide estimates of the quantities of steel packaging that is recycled (i.e. is recorded as accredited recycling) and steel packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).

[6] *The previous packaging materials flow reports can found at https://www.valpak.co.uk/more/material-flow-reports.*
[7] *Steel packaging placed on the market means all household and non-household steel packaging used around products within the UK.*

1.3. Methodology

Recycling rates for steel packaging can be calculated as the quantity of steel packaging recycled divided by the quantity of steel packaging waste arisings. However, it is commonly accepted, and indeed is accepted by the EU, that establishing packaging POM is an appropriate method of estimating packaging waste arisings.

While estimates of recycling rates based on packaging waste arisings are valid, like any methodology they are subject to a number of significant limitations since they critically rely on accurate data for:

- The composition of household waste;
- Waste arisings from local authorities; and
- Waste arisings and composition from commerce and industry.

The justification of the use of POM data over alternatives is provided in full in section 1.3.1 of Metal Flow 2025[8]. An overview of how the POM and recycling rates for steel packaging are calculated in this project are provided below.

1.3.1. Steel Packaging – Obligated Total POM

Steel packaging POM is estimated using an assessment of the steel packaging POM reported on the National Packaging Waste Database (NPWD) by obligated producers. The results of this method are cross-checked against secondary research and data/information provided by the project's industry Steering Group. The baseline year is 2022, where 2022 data is not available the most recent available data is used.

1.3.2. Steel Packaging POM – Net Pack Fill

The net pack fill calculation is based on data reported to NPWD by obligated producers (who are registered). It is thought to capture the vast majority of the quantity of steel packaging that is obligated. But it does not cover steel packaging handled by non-obligated companies (who are below the threshold), free-riders (companies who are above the thresholds of a turnover of £2m and handling 50 tonnes of packaging or more but are not registered with the relevant agency), and packaging for internal company use which is non-obligated packaging under the regulations.

To estimate the amount of packaging placed on the UK market by obligated companies, the net pack fill calculation set out below is applied. This calculation uses the total data reported by business obligated under the packaging regulations and is available on the NPWD website[9].

Net Pack Fill	**=**	**Packing/Filling** Table 1 - pack/filling	**+**	**Imports** Table 3A - imported for selling	**+**	**Imports** Table 3B - packaging removed from around imports	**-**	**Exports** Table 2A + Table 2B – pack/filling

NPWD Net Pack Fill reported in 2023 (using 2022 data) was incomplete due to a number of late registrants; therefore, to estimate the total amount of obligated tonnage, the number of Valpak registrants for 2021 compared to 2022 was used to scale-up the data, to obtain a 2022 estimate for Net Pack Fill.

1.3.3. Changes in Methodology: Non-Grocery Total Tonnage

To scale up the grocery retail sales figure to represent total UK retail sales, including non-grocery retail, the Office of National Statistics (ONS) retail sales figures are used. The ONS retail sales figures show grocery retail sales accounted for 42% of total UK retail sales in 2022.

However, simply scaling up using market shares is not considered robust, since it is likely that steel packaging usage in the grocery and non-grocery sectors is very different. The difference in usage of packaging in the grocery sector and the non-grocery retail sector is analysed using Valpak members in the non-grocery retail sector reported packaging data and reported turnover, total grocery packaging POM (calculated using existing PackFlow methodology) and ONS retail sales data.

[8] https://www.valpak.co.uk/knowledge-hub-post/metalflow-2025/
[9] www.npwd.environment-agency.gov.uk

The analysis involved the following key stages:

- Calculation of non-grocery packaging POM (tonnes) per billion-pound retail sales by:
  - Identification of non-grocery retail members within Valpak's membership and extraction of data from the 2023 packaging submission detailing per business:
    - Retail sales data (turnover) and
    - Total (non-grocery) packaging POM
- Calculation of total grocery packaging POM (tonnes) per billion-pound retail sales from:
  - Existing PackFlow methodology (as detailed previously in this report), and
  - ONS data detailing *Total Sales made by Predominantly Food Stores* from *All Retailing Excluding Automotive Fuel*

In previous iterations of PackFlow, data provided by Valpak's grocery retailer members has been used alongside stated turnover in their packaging returns.

This was deemed an improved methodology due to concerns about stated turnover as it is not a compulsory field in a packing submission (a long as the turnover is over £2m, a business meets the relevant threshold for participation). Some of the issues include:

- Use of historic or estimated turnover values.
- Use of rounding
- for example, input in thousands of pounds.
- Sometimes turnover is included twice.
- for example, where a supermarket completes a GB registration and an NI registration and includes total UK turnover on both submissions (double counting).
- Inclusion of non-packaging related turnover, such as
- fuel (petrol stations).
- and, potentially, sale of assets like land.

Instead, this iteration of PackFlow calculates the Grocery tonnes per £bn of turnover using total Grocery POM from existing PackFlow methodology (relating to 92% of the grocery market) and the ONS total sales in stores specialising in food, derived by taking *Total Sales made by Predominantly Food Stores* from *All Retailing Excluding Automotive Fuel.*

Non-Grocery tonnes per £bn of turnover is calculated in the same way as in previous iterations of PackFlow, using checked and cleansed data submissions from non-grocery retailers within the Valpak membership base (excluding petrol retailers from the sample).

1.3.4. Steel Packaging Recycling

NPWD is the source for accredited (or recorded) recycling of steel packaging. Representatives from industry (including those involved in sorting, smelting and exporting steel) are also consulted on the amount of recycled steel packaging that might not, for whatever reason, be reported to NPWD. The output of these discussions is used to estimate a figure for unaccredited (or unrecorded) recycling of steel packaging.

The total steel recycling figures, the aggregation of recorded and unrecorded recycling, are then split into Consumer and Non-Consumer recycling. Waste Data Flow (WDF), with adjustments applied to account for Consumer steel packaging in IBA and RDF, is the source for Consumer steel recycling data with the difference between the WDF total and the overall total assumed to be Non-Consumer steel packaging recycling.

1.3.5. Data robustness

There are levels of uncertainty around the data used to establish the various elements that are combined to cross-check the total steel POM. Consumer steel packaging POM, Non-Consumer POM and total steel packaging POM estimates are presented with error margins to provide an indicative range of uncertainty. The robustness scores established for each dataset used in estimates are presented in Appendix I. These have been converted into a percentage and related to an appropriate margin of error[10], as shown in Table 2. The respective margins of error are provided throughout the report.

Table 2: Relating Robustness Scores to Indicative Margins of Error

Robustness Score			Error Margin	
96%	to	100%	+/-	3%
91%	to	95%	+/-	6%
86%	to	90%	+/-	9%
81%	to	85%	+/-	12%
76%	to	80%	+/-	15%
71%	to	75%	+/-	18%
66%	to	70%	+/-	21%

To calculate an indicative margin of error for the total POM, the margins of error for the sub-elements that make up the total are converted to tonnages and then expressed as an overall percentage using a Root of Sum of Squares calculation (to approximate the overall error of a summation of subcategories with different error margins).

[10] *These are assumed to be indicative estimates of the degree of uncertainty and are not the outputs of a statistical calculation.*

2. Phase 1: Steel Packaging POM

2.1. Introduction

This section of the report presents estimates of steel packaging POM derived using the net pack fill methodology and cross-checked against available industry data using a 'bottom-up approach'.

Placed on the market (POM) refers to the flow of steel packaging onto the UK market. Consumption of goods using steel packaging can occur both in the Consumer (in the home and on the move) and Non-Consumer (by business) streams.

Steel packaging is typically placed on the market in the following formats:

- Drinks containers – mainly cans used for soft and alcoholic drinks. Production of drinks in steel cans ceased in the UK in 2019, but imports of drinks in steel containers continue;
- Food cans – mainly steel, used to package a wide range of products such as soups, meats, vegetables and pet food;
- Aerosol cans – used predominantly to package beauty & personal care and cleaning products;
- Other – all other forms of steel packaging such as foil containers and trays, plain foils, tins and closures.

2.2. POM Cross-Check (Net Pack Fill)

The 2022 UK flow of steel packaging is calculated using the packaging weights reported by registered producers that are publicly available on the NPWD website. The net pack fill calculation is shown in section 1.3.2 of this report.

This methodology focusses on the packaging weights reported at the *packing/filling* stage of the supply chain as opposed to the *selling* stage of the supply chain. Due to the larger size and fewer numbers of UK businesses that are packer fillers, the Steering Group believe[11] that there are few (or no) unobligated packer/filler businesses in the UK in comparison to unobligated sellers. In addition, raw material manufacturing includes process losses, i.e., not everything manufactured will be converted or packed/filled, so it is expected that obligated tonnage is likely to decline as we move further down the supply chain.

Using this method, the total obligated steel POM in 2022 is 431k tonnes (as shown in Table 3).[12]

It is important to stress that the Net Pack Fill estimates are open to the possibility of a degree of error because they rely on the robustness of the data that is submitted to NPWD. The NPWD data is widely recognised as being the best available. The NPWD data is used by policy makers and their agencies, and there is a legal obligation for companies to submit data to NPWD that is as accurate as is reasonably possible. The data is also audited by the regulating body.

[11] *Based on their knowledge of the industry. No other specific evidence data is available to support this.*
[12] *As reported by businesses in 2022.*

Table 3: Obligated Packaging (Net Pack Fill Total), 2022 (k tonnes)

	Steel (k tonnes)
Table 1 Pack fill (UK pack filling)	319
Imports	
3A Selling (filled imports)	169
3B (packaging removed from imports)	33
Total	**522**
2A P/F (direct exports)	86
2B P/F (third party exports)	5
Total Exported	**91**
Net Pack Fill	**431**

This method does not account for steel packaging handled by unregistered producers, which was likely to include the following:

- Non-obligated producers – those below the registration thresholds of 50 tonnes of packaging and £2 million turnover
- Free-riders – those obligated to register but not doing so, and
- Illegal importers.

There is no way of robustly quantifying the unreported quantity of steel packaging. Based on the feedback from this project's Steering Group, it is believed the majority of unobligated producers import filled steel packaging. Estimates of the unobligated quantities are ~43k tonnes (or 9.15% of steel packaging POM) are carried forward to this report from the previous SteelFlow[13] project. The Steering Group agreed with the current unobligated percentage estimate of 9.15%.

Combining the estimates of obligated and non-obligated packaging gives 2022 estimates of 474k tonnes (+/- 6%) for steel packaging POM.

2.2.1. Steering Group Data

Members of this project's Steering Group[14] and wider industry stakeholders provided confidential information on the flows of steel packaging onto the UK market. All data received was considered to be broadly in line with this project's 2022 estimates of POM for steel packaging.

2.2.2. Steel POM Cross-check

This section of the report provides an overview of how steel packaging flows onto the UK market and provides a cross-check for the Net Pack Fill methodology used in section 1.3.2.

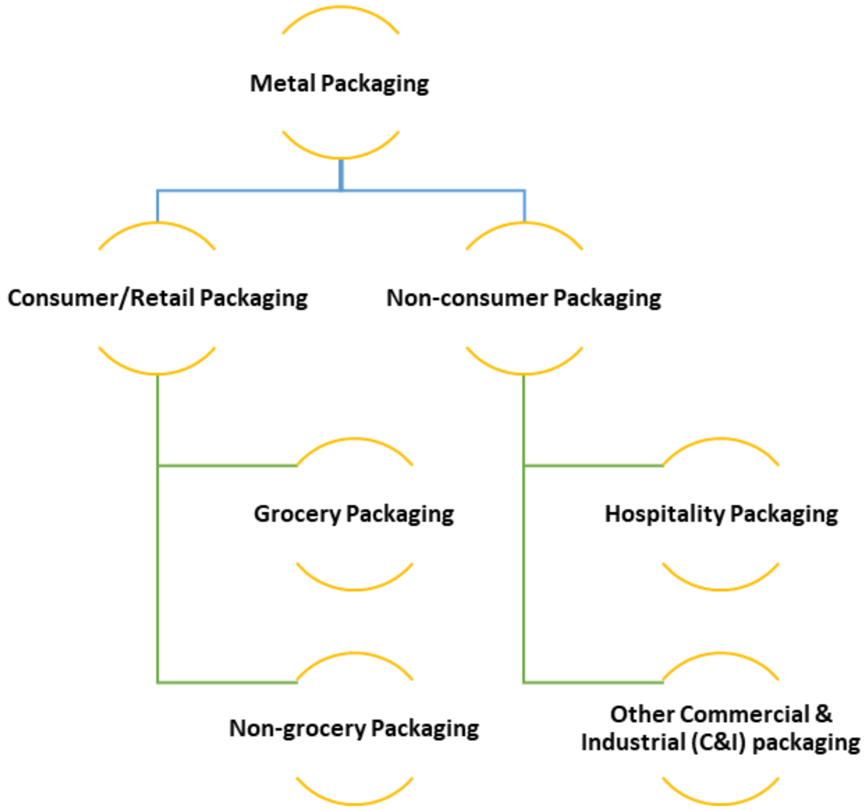
The cross-check splits the POM into different elements as shown in Figure 2. The first step is to estimate Consumer Grocery packaging as this dataset is believed to be the most robust. Next Consumer Non-grocery packaging element is identified (using a bottom-up approach in which individual sector tonnages are identified and combined).

The Consumer Grocery and Consumer Non-grocery figures are then combined to establish a total Consumer packaging POM for steel packaging.

[13] https://www.wrap.org.uk/content/steel-flow-2025-%E2%80%93-steel-packaging-flow-data-report
[14] *A list of Steering Group members can be found in the acknowledgements section of this report.*

For each material, Non-Consumer packaging is estimated by subtracting the Consumer packaging figure from the total POM figure. Within the Non-Consumer sector packaging in the Hospitality sector is estimated (based on the availability of data for this sector) and subtracted from the Non-Consumer figure to establish an ‘Other C&I’ category. The Other C&I estimate is therefore a residual figure and as such may contain any tonnages of Consumer Grocery, Consumer Non-grocery or Hospitality steel packaging that have been missed in those sectors.

Figure 2: Steel POM Breakdown by Sector



2.3. Consumer Steel Packaging POM

2.3.1. Consumer Grocery Steel POM

A dataset provided by the Environment Agency (EA) is used to estimate Consumer grocery POM for steel packaging. The EA data is the 2022 sales quantities of steel packaging reported in Table 1 selling from NPWD (minus exports) for a sample of UK grocery retailers representing 84% of all UK grocery retail sales. The figures for this sample of UK grocery retailers are scaled to 100% of the UK grocery market.

Steel packaging POM in the Consumer Grocery sector is estimated to be 208k tonnes (+/-6%) in 2022[15].
Steel packaging in the Consumer Grocery retail sector has declined ~3% since 2019, when it was estimated to be 216k tonnes. This decline is most likely due to loss of market share i.e., switching to other packaging materials such as aluminium beverage cans, pouches and trays. Some light-weighting of steel packaging may have occurred but this is believed to be less significant in accounting for the decline.

2.3.2. Consumer Non-Grocery Steel POM

Key categories of products using steel packaging sold through non-grocery retailers are identified and the associated tonnage of steel packaging estimated. These categories are: ‘Beauty & Personal care’ (B&PC), ‘DIY’, ‘Petcare’, and ‘Food, Drink and Other’, as per the previous SteelFlow 2019 report. The latter is included in this report due to the quantity of food and drink and other (e.g. cleaning) products that are also sold through non-grocery retailers such as chemists and discounters.

[15] *Appendix I provides a detailed assessment of relative levels of confidence in the data.*

2.3.2.1. Beauty and Personal Care

Valpak's EPIC data suggests 9% of steel packaging (by weight) is used to package Beauty and Personal Care products. Applied to total Non-Consumer Grocery POM (see section 2.3) this gives ~4k tonnes steel packaging POM in the Beauty and Personal Care sector. Using 2019 market data[16] that 39% of Beauty and Personal Care items are purchased at supermarkets (Consumer Grocery), this suggests the remaining 61% or ~4k tonnes of steel are purchased from Non-Grocery retail stores. This gives a total Consumer B&PC POM of ~6k tonnes, as shown in Table 4.

Table 4: Beauty & Personal Care – Steel Packaging, 2022 (k tonnes)

	Grocery retail	Non-grocery retail	**Total Consumer**
Steel Packaging	2	4	**6**

It is possible that the 39% supermarket share is an underestimate for steel-packaged beauty and personal care products which are predominantly aerosol deodorants; many glass -and plastic- packaged beauty and personal care products hold a considerably higher sales value, such as perfume and make-up. These types of products are more commonly bought in non-Grocery outlets (such as department stores, chemists and duty-free shops), than are aerosol deodorants.

2.3.2.2. DIY

To estimate Non-Grocery DIY steel packaging, EPIC data from Valpak members and POM data from DIY retailers' 2022 data submissions are used. This provides an estimate of 7k tonnes of steel packaging from DIY stores in 2019, ~6k tonnes lower than the previous estimate for 2019. This is likely due to a decrease in DIY due to the increase in inflation and UK cost of living in 2022[17].

2.3.2.3. Petcare

Market data suggests that 75% of pet food is purchased in supermarkets (grocery retail) with the remaining 25% being purchased from specialist stores, garden centres or from vets and breeders[18]. Applying these percentages to the Non-Grocery estimate of ~20k tonnes gives a total consumer Petcare estimate of 79k tonnes. Estimates of steel packaging in the Petcare sector are shown in Table 5.

Table 5: Petcare – Steel Packaging POM, 2022 (k tonnes)

	Grocery retail	Non-grocery retail	**Total retail**
Steel Packaging	59	20	**79**

In comparison to the 2019 Petcare data reported in the previous report SteelFlow 2025[19], the quantities of non-grocery steel Petcare packaging have increased substantially, from ~9k tonnes in 2019 to ~20k tonnes in 2022. This is likely due to an increase in pet ownership during and after the Covid-19 pandemic. Secondary research indicates that the pet food industry typically manufactures dog food tins from steel[20]. Research also showed that the UK dog population increased from around 9 million in 2019 to around 13 million in 2022, an increase of 44%[21]. Additionally, UK annual spending on pets increased from £7.5 million in 2019 to £9.9 million in 2022, an increase of 32%[22]. This may indicate a desire from consumers to purchase more from specialist Petcare stores instead of grocery stores, suggesting the tonnages for grocery steel Petcare may be an overestimate.

[16] *Sourced from Mintel*
[17] *https://www.ons.gov.uk/economy/inflationandpriceindices/articles/overviewofinflationandthecostoflivingforukconsumers/june2022*
[18] *Euromonitor International/Mintel*
[19] *https://www.valpak.co.uk/more/material-flow-reports/steelflow-2025*
[20] *https://www.petfoodprocessing.net/articles/17434-purina-calls-on-consumers-to-recycle-pet-food-cans*
[21] *https://www.statista.com/statistics/515379/dogs-population-in-the-united-kingdom-uk/*
[22] *https://www.statista.com/statistics/308266/consumer-spending-on-pets-and-related-products-in-the-united-kingdom-uk/*

2.3.2.4. Food, Drink and Other Grocery Products[23]

In order to estimate the sales of Food, Drink and Other grocery products through non-grocery stores, 2019 IGD market data was used, which suggests that around 86% of food and grocery products are bought from supermarkets and around 14% are bought from non-grocery outlets.

This percentage was applied to the total non-grocery tonnages to obtain an estimated total consumer tonnage (Table 6).

Table 6: Food, Drink & other Grocery – Steel Packaging, 2022 (k tonnes)

	Consumer Grocery	Consumer Non-grocery	**Total Consumer**
Total Steel Packaging	40	7	**47**

2.3.3. Summary of Consumer Steel Packaging POM

In summary, the following key estimates were established for retail steel packaging consumption in the Consumer sector in 2022:

- Total steel Consumer packaging POM is 246k tonnes (+/- 6%) in 2022
    - 208k tonnes (+/- 6%) is steel packaging in the Consumer grocery sector
    - 37k tonnes (+/- 10%) is Consumer non-grocery steel packaging.

[23] *'Other' grocery products excludes beauty and personal care and petcare products which are estimated separately*

2.4. Non-Consumer Steel Packaging POM

To complete the breakdown of POM totals for steel packaging requires an estimate of Non-Consumer packaging POM. Non-Consumer packaging has been split into the two key sectors in the Non-Consumer sector: Hospitality and Other C&I.

2.4.1. Hospitality POM

Estimates of steel packaging used in the hospitality industry are made using Valpak EPIC data relating to 34% of the cash and carry and delivered foodservice industry[24]. Market share information for the companies included in the sample is used to scale up the resulting tonnage to represent the whole Foodservice, Catering and Hospitality sector, as depicted in Figure 3.

This method estimates 32k tonnes of steel packaging in hospitality. However, considerable quantities of soft and alcoholic drinks sold directly to bars and restaurants need to be added to this figure. Further research identified the additional tonnages, and the full total and breakdown is shown in Table 7.

Table 7: Breakdown of Hospitality Packaging by Source, 2022 (k tonnes)

	Steel
Wholesale and Foodservice (scaled-up from EPIC)	32
Additional direct sales of soft drinks	1
Additional direct sales of alcoholic drinks	1
Additional adjusted tonnage [25]	-
Total Steel Packaging in Hospitality	**34**

Additional direct sales of soft drink cans were estimated by taking the total volume sales of soft drinks and the proportion sold in steel packaging. Valpak's EPIC grocery split of aluminium to steel drinks cans was used as a proxy to apportion the steel soft drinks cans, giving the total volume (litres) of steel soft drink cans. EPIC data was also used to provide a proxy for the litres per gram of packaging, which gave a total of 1k tonnes steel soft drinks packaging. Subtracting the already identified quantities of packaging from these totals, left the 'missing' packaging of 1k tonnes steel soft drinks packaging.

Additional direct sales of alcoholic drinks packaging were estimated using figures for the total number of beer cans sold into pubs in 2022 provided by the British Beer & Pub Association, from which the number of alcoholic drinks cans units already accounted for were subtracted. The hospitality aluminium/steel can unit split established in the Drinks Recycling OTG report[26] was used to estimate the number of steel cans, and an average hospitality can weight was applied to each. This generated estimates of 8k tonnes of 'missing' alcoholic aluminium drinks cans and 1k tonnes of 'missing' alcoholic drinks in steel cans. These estimates were considered low/minimum as they relate only to beer, and only to pubs, and therefore not to all alcoholic drinks sold in hospitality outlets.

[24] *Valpak's EPIC database holds sales data and packaging weights information for clients signed up for the fully managed service.*
[23] *The Steering Group agreed to adjust split between hospitality and C&I.*
[26] https://wrap.org.uk/resources/report/drinks-recycling-go

Figure 3: Overview of the Foodservice, Catering & Hospitality Sector

New view - sector summary 2018

The new approach enables the sector to be segmented as follows:

UK wholesale sector value 2018
£28,282m

Customer groups

Retail channel	Catering/foodservice channel	PBUs
£15,673m	£10,946m	£1,663m

Key players

Customer ordering platform

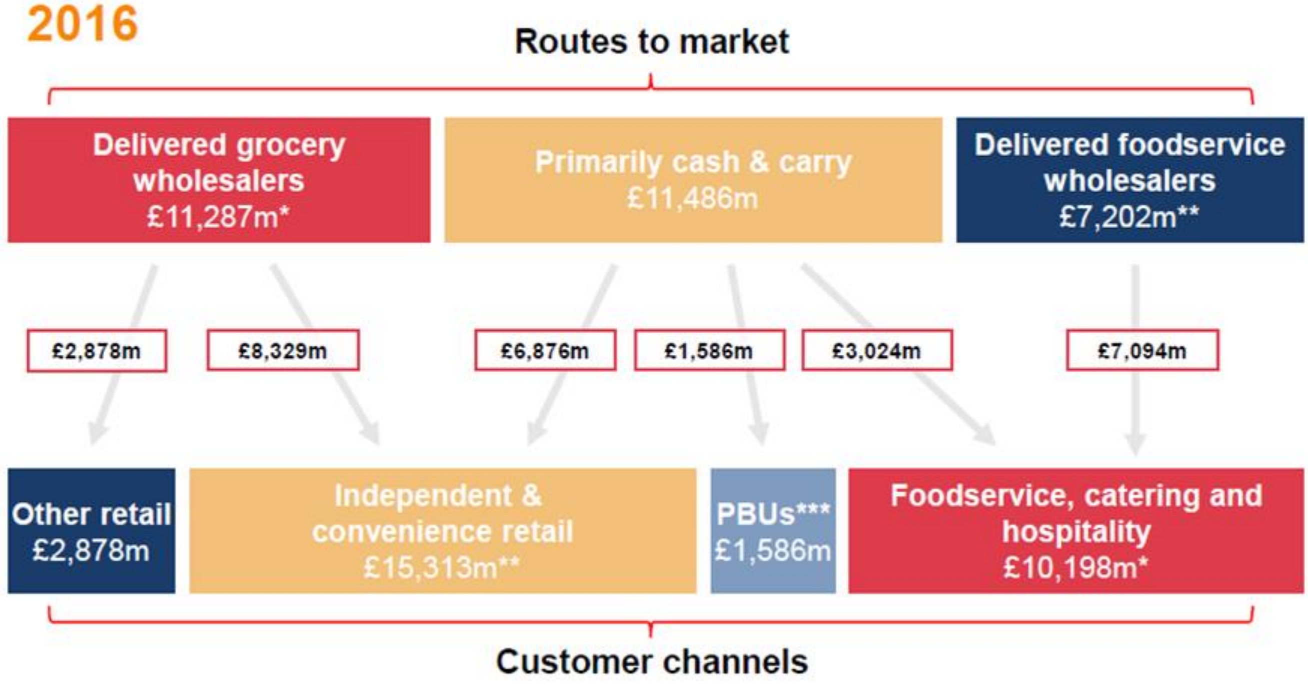
£m	Online	Telesales/PLOF	In-depot	Total
Retail	7,962	2,029	5,682	**15,673**
Catering	3,153	5,785	2,008	**10,946**
PBUs	87	1	1,575	**1,663**
Total	**11,202**	**7,815**	**9,265**	**28,282**

Customer fulfilment

£m	Delivery	Collect	Total
Retail	10,023	5,650	**15,673**
Catering	8,987	1,959	**10,946**
PBUs	88	1,575	**1,663**
Total	**19,098**	**9,184**	**28,282**

A £30bn market: wholesale and customer map, 2016

Notes:
*Includes £80m supplied from delivered wholesalers to foodservice, catering and hospitality
**Includes £108m supplied from delivered foodservice into retailers
***PBUs = professional business users



2.4.2. Other C&I POM

The Other C&I POM is the residual tonnage once the Consumer grocery, Consumer non-grocery and hospitality streams are subtracted from total POM. It should be noted that as this stream is a residual tonnage, it may include any missed tonnages of Consumer grocery, Consumer non-grocery and hospitality packaging and not entirely be all Other C&I.

The total Other C&I steel packaging POM estimate is 195k tonnes. The stakeholder group agreed with this estimate.

2.5. Summary of Steel Packaging POM

Steel packaging POM in 2022 is estimated to be 474k tonnes.

This estimate is derived from reported obligated data (EA, NPWD) and cross-checked as far as is possible using a bottom-up methodology combining data from various sources for each sector and data provided by the project's industry Steering Group.

The estimate for steel packaging POM in the Consumer sector is 246k tonnes (+/-5%) in 2022.

This estimate is based on primary data alongside reliable market share data. No other method is used for deriving Consumer data as this method is considered the most robust available and is accepted by the industry Steering Group supporting this steel flow project.

The estimate for steel packaging POM in the Non-Consumer sector is 229k tonnes (+/-11%) in 2022.

This estimate comprises of an estimate of hospitality packaging based on primary and market share data to which separate quantities of direct sales of soft and alcoholic drinks using steel packaging are calculated based on industry figures. C&I steel packaging is estimated as the remaining part of Non-Consumer POM and is the residual tonnage once Consumer and hospitality POM are deducted from total steel packaging POM.

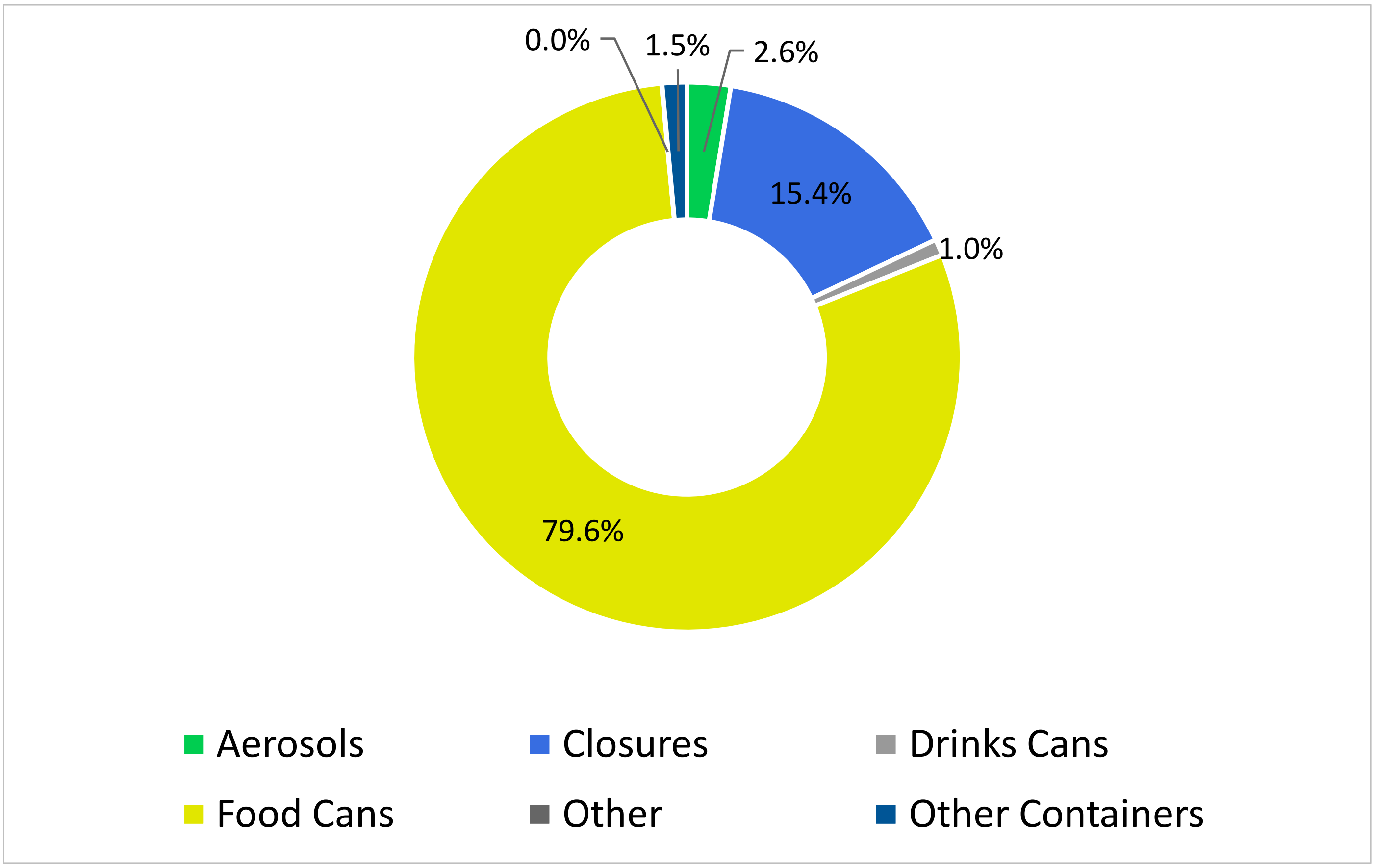
Table 8: Total Steel Packaging POM Breakdown by Sector, 2022

	Steel	
	K tonnes	Error margin
Consumer grocery POM	208	+/-6%
Consumer non-grocery POM	37	+/-10%
Total Consumer POM	**246**	**+/-5%**
Non-Consumer hospitality	34	+/-18%
Non-Consumer other C&I	195	+/-12%
Total Non-Consumer POM	**229**	**+/-11%**
Total Steel Packaging POM	**474**	**+/-6%**

2.6. Steel Packaging POM by format

The composition of steel packaging in the Consumer grocery sector in 2022, as identified through Valpak's EPIC database, is illustrated in Figure 4. Aerosols account for 2.6% (5.3k tonnes); closures account for 15.4% (32.1k tonnes); drinks cans account for 1.0% (1.9k tonnes); food cans account for 79.6% (165.7k tonnes); other containers account for 1.5% (3.0k tonnes) and other accounts for less than 0.04% (56.1 tonnes).

Figure 4: Composition of Steel Grocery Packaging POM, 2022 (%)



3. Scheme Administrator Submissions (formerly referred to as ‘household/household-like’)

Through the course of the Packflow projects, the definition of that subset of the total packaging POM which will attract additional fees to meet the costs of collecting packaging from households has evolved. Previously through the development of the UK’s EPR system this had been referred to as ‘household/household-like’ packaging placed on the market.

This section of the report details the latest interpretation of this requirement, referred to here as Scheme Administrator Submissions (that is to say, the total tonnage of packaging POM that is likely to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use. Within this analysis, the packaging that should be included in the scheme administrator submissions is that around products which are ‘consumed’ by citizens as a part of their daily lives, as opposed that which goes to businesses for use as part of their commercial operations. With this in mind, the way citizens buy products (and therefore get packaging) within the packaging flow breakdown identified in the PackFlow reports is through retail only (be that online or brick-and-mortar) or from takeaway hospitality.

In most instances, it is fairly clear as to whether products are provided for the public (consumers) or not. One such specific nuance is around some products that are bought within a hospitality setting that could be consumed within the premises or could be taken away. Particularly relevant to the final tonnage of material that could (or could not) fall within Scheme Administrator Submissions is products within the HORECA sector, such as wine bottles in restaurants and beer bottles or cans in pubs. These packs are intended for public/consumers and may or may not be sold in a hospitality setting, and when they are, may or may not leave the business setting and corresponding private waste stream. As such these packs have been included in Scheme Administrator Submissions within this analysis.

Table 9: Total Expected Scheme Administrator Submissions

Material / Situation	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Steel - All	**474**	246	229	34	2	**248**
Steel - excluding DRS	**470**	244	227	32	0	**244**

4. Consumer Packaging in the Household Waste Stream

In July 2022, Valpak delivered a report to WRAP and Defra entitled 'Producer Reporting of Household Vs Household-Like Packaging' (POS101-030). Within this project, Valpak developed a methodology for estimating the quantity of consumer packaging that entered the household waste stream.

4.1. Methodology

The process of mapping retail packaging POM to household waste streams was to first assign a ruleset based on likely disposal location against each of the 2,655 EPIC product categories. The end goal was to assign each EPIC category a robust percentage 'likelihood of being disposed of in a household bin'.

For consumer packaging, it was assumed that consumer packaging that was not disposed of within the household waste stream would instead be disposed of within a household-like waste stream, such as 'on the go' litter bins, mixed recycling in business premises such as work, leisure venues, hospitality / HORECA settings (including hotels) or other destination locations.

4.2. First Iteration – Indicative Disposal Routes

The first iteration of the analysis used Valpak staff judgement to assign an indicative disposal route to each EPIC category as follows:

- 100% likely disposed of in households (default)
    - These are product categories that are deemed to always be consumed in the home.
- 92.15% disposed of in households
    - This acknowledged that there are some products that are distinctly household in nature, but for which it would not be surprising to see such items in a commercial general waste or recycling bin.
    - 92.15% is used as a proxy as this is the proportion of households to commercial properties, excluding those properties at which there are unlikely to be any employees, such as residential or other buildings registered as businesses due to hosting advertising.
    - This assumption is based on ONS data[27] [28].
- Estimates of split where products are deemed to be consumed away from the household as a matter of course, applying an arbitrary split of:
    - 50% HH, 50% HH-L default, or
    - 25% HH, 75% HH-L by exception, or
    - 75% HH, 25% HH-L by exception

4.3. Second Iteration – Sensitivity Analysis

These percentages were subject to a sensitivity analysis to define which product categories (and associated assumptions as to point of disposal) had the highest impact on the final split of POM between household and household-like disposal. Categories with the highest impact were included in the consumer engagement exercise detailed below, generating increased levels of accuracy as to the likely disposal point.

4.4. Third Iteration - Consumer Engagement

Valpak identified 23 key product types which were the most sensitive in defining the overall outcome of the HH and HH-L waste stream split by weight, across all materials. 2,007 consumers, selected across all age ranges, demographics and nations within the UK, were surveyed for each product type.

The questions posed were as follows:

[27] www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/families/datasets/householdsbyhouseholdsizeregionsofenglandandukconstituentcountries
[28] www.gov.uk/government/statistics/non-domestic-rating-stock-of-properties-2020

1. **Small Milk** - Think about the last time you finished a small bottle (approx. 1 pint or less) or carton of milk or non-dairy alternative. Where was that bottle or carton thrown away?
2. **Medium Milk** - Think about the last time you finished a medium size (1-4 pints) bottle or carton of milk or non-dairy alternative. Where was that bottle or carton thrown away?
3. **Large Milk** - Think about the last time you finished a very large (4 or 6 pints) bottle or carton of milk or non-dairy alternative. Where was that bottle or carton thrown away?
4. **Tinned Food** - Think about the last time you consumed canned food – e.g. baked beans or soup. Where was the can thrown away?
5. **Multipack Ice Cream** - Think about the last time you unwrapped an ice cream cone, ice lolly, ice pop, choc ice or similar that was bought as a part of a multipack. Where was the plastic or paper wrapper (not the multipack box) thrown away?
6. **Large Soft Drink** - Think about the last time you finished a large (greater than one serving / greater than 500ml) bottle or carton of soft drink (fizzy or still prepared drinks, juice carton etc). Where was the bottle or carton thrown away?
7. **Large Snacking (Not Singles)** - Think about the last time you finished a large (greater than one serving) snack product (for example a multiple serving packet or tube of crisps, crackers or nuts, or packet of biscuits). Where was the packaging thrown away?
8. **Deodorant** - Think about the last time you finished a deodorant or anti-perspirant (spray, stick, roll on or other). Where was the empty packaging thrown away?
9. **Ready Meal** - Think about the last time you ate a small hot ready meal (serves one or two people). Where was the packaging thrown away?
10. **Cereal** - Think about the last time you finished a box or bag of cereal, porridge or Muesli. Where was the packaging thrown away?
11. **Spread** - Think about the last time you finished a pack of spread such as, jar of jam, marmalade or curd, peanut butter, honey, yeast extract, chocolate spread or similar (excluding butter, margarine and similar). Where was the packaging thrown away?
12. **Fruit Packs** - Think about the last time you bought packaged fruit from the supermarket (bags, nets or boxes, excluding the purchase of loose products). Where was the packaging thrown away?
13. **Soft Drink Multipack** - Think about the last time a single serve soft drink (cans, bottles or single serve cartons) that you purchased as a part of a multipack was consumed. Where was that packaging (can, bottle or single serve cartons) thrown away?
14. **Single Soft Drink** - Think about the last time you purchased a single unit of soft drink (a single can, bottle or carton). Where was the packaging thrown away?
15. **Snack Multipack** - Think about the last time that a snack item that you bought as part of a multipack (such as a 6-pack of crisps, cereal bars, small raisin boxes, chocolate bars) was consumed. Where was the packaging thrown away?
16. **Single Snack** - Think about the last time you purchased a single serve snack item (such as a single packet of crisps or a single chocolate bar – this would include where such items are sold as part of a 'meal deal'). Where was the packaging thrown away?
17. **Pot Noodle** - Think about the last time you ate a snack pot or a similar item requires the addition of boiling water, such as a noodle pot, instant soup or instant pasta and sauce. Where was the packaging thrown away?
18. **Smoking** - Think about the last time you bought smoking items (such as cigarettes, cigars, matches, cigarette papers, vape liquid or single use vape sticks). Where was the packaging thrown away the last time one such item was finished?
19. **Supermarket Sandwich Etc** - Think about the last time you bought 'food on the go' items from a supermarket, such as pre-packed sandwiches, potted salads, sushi, sausage rolls etc. Where was the packaging thrown away?
20. **Fast Food (Non-Supermarket)** - Think about the last time you ate 'food on the go' items that were purchased from somewhere other than a supermarket (for example a coffee shop, sandwich shop or fast-food outlet). This may include but is not limited to sandwiches, sushi and rolls or hot and cold fast food. Where was the packaging thrown away?
21. **Takeaway** - Think about the last time you ate a takeaway meal. Where was the packaging thrown away?
22. **Wine** - Think about the last time you finished wine bought from a retailer (supermarket, off licence or local store). Where was the packaging thrown away?
23. **Beer/Cider** - Think about the last time you consumed beer or cider (with or without alcohol) bought from a supermarket, off licence of local independent store (whether that is cans or bottles, singles or multipacks). Where was the last can or bottle that you finished thrown away?

The Response options given were as follows (where required, the language was adapted to best suit the product in question):

- In the bin at my home (into recycling or general waste)

- In the bin at my work (into recycling or general waste)
- Into a litter bin in a public space
- Somewhere else
- I/We don't use this type of product, or I can't remember the last time I/we used this product

Analysis was undertaken to check the logic of responses, for example to make sure that no participants provided the same answer to all questions.

Results suggested a range of values to represent the probability of disposal within the household (and, therefore, household-like) waste streams for those categories for which any inaccuracy would have a high impact on the overall result. These values ranged from 21.2% to 78.4% and were shared in full with both WRAP and Defra within the Producer Reporting of Household Vs Household-Like Packaging report.

4.5. Fourth Iteration – Similar Categories

Finally, Valpak undertook an analysis to establish similar categories in terms of likely consumption, such that insight from the consumer engagement could be shared across a wider set of categories. Where appropriate, the indicative disposal routes from the first iteration of this exercise were updated to provide a more robust probability of ending up in the household waste stream.

4.6. Application to 2022 POM

Valpak have applied the same probabilities to the 2022 POM figures as calculated within this project to create the total amount of consumer packaging disposed of in the household waste stream (household bins).

4.7. Household Waste – Anticipated Composition: Steel

Based on the methodology detailed above, the total proportion of consumer steel packaging from Grocery retailers that is disposed of in the household waste stream is 81.5%. The total proportion consumer steel packaging from Non-Grocery retailers that is disposed of in the household waste stream is 95.3%. This is based on the same sample of retailers as was used in the rest of this report and equates to 98.8kt (83.5%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

The proportion of Grocery steel packaging within the household waste stream is detailed in Table 10 below.

Table 10: Proportion (%) of steel grocery packaging disposed of within the household waste stream

Packaging Category	Proportion
Aerosols	81%
Closures	82%
Drinks Cans	76%
Food Cans	81%
Other	79%
Other Containers	93%

The proportion of Non-Grocery steel packaging within the household waste stream is detailed in Table 11 below.

Table 11: Proportion (%) of steel non-grocery packaging disposed of within the household waste stream

Packaging Category	Proportion
Beauty & Personal Care	94%
DIY	17%
Food, drink & Other	82%
Petcare	100%

5. Consumer Packaging in the 'Litterable' Categories

In the project entitled Producer Reporting of Household Vs Household-Like Packaging (POS101-030), delivered to WRAP and Defra in July 2022, Valpak developed a methodology for estimating the total quantity of consumer packaging that fell within the 'litterable' categories as defined by WRAP using analysis outlined in a corresponding report[29] produced by Keep Britain Tidy (KBT).

Flagging was applied to product categories within the Valpak EPIC database to align to those product and packaging types identified by KBT. Where the boundaries of inclusion within the litterable categories did not align to EPIC categories, for example but not limited to where the size thresholds within EPIC spanned over the size threshold identified by KBT, additional analysis was undertaken on the EPIC categories to identify proportion of sales (by weight of packaging) that did fall within the KBT categories. In these instances, these proportions were used in place of a binary 1 (in a litterable category) or 0 (not in a litterable category) to give a true indication of the total weight of packaging material that falls within these category types.

5.1. Litterable Packaging – Anticipated Composition: Steel

Based on the methodology detailed above, the total proportion of consumer steel packaging from Grocery retailers that falls within the 'litterable' categories detailed above is 2.3%. The total proportion of consumer steel packaging from Non-Grocery retailers that falls within the 'litterable' categories is 1.7%. This is based on same sample of retailers as is used in the rest of this report, and equates to 2.62kt of packaging in total.

The proportion of Grocery steel packaging within the litterable categories is detailed in Table 12 below.

Table 12: Proportion (%) of steel grocery packaging that falls within the litterable categories

Packaging Category	Proportion
Aerosols	0%
Closures	14%
Drinks Cans	2%
Food Cans	0%
Other	4%
Other Containers	2%

The proportion of Non-Grocery steel packaging within the litterable categories is detailed in Table 13 below.

Table 13: Proportion (%) of steel non-grocery packaging that falls within the litterable categories

Packaging Category	Proportion
Beauty & Personal Care	0%
DIY	0%
Food, drink & Other	8%
Petcare	0%

29 www.keepbritaintidy.org/sites/default/files/resources/20200330%20KBT%20Litter%20Composition%20Report%20-%20FINAL.pdf

6. By Nation Reporting

6.1. Introduction

The section of the report separates the total amount of packaging placed on the market (POM) by the four nations of the UK (England, Northern Ireland, Scotland and Wales). These indices are intended to be indicative of the total amount of packaging placed on the market in each of the nations and consider each sector identified as a source of packaging for each material in isolation. Appropriate economic indicators are then applied to each of the sectors. At this time, neither Valpak nor Government have access to data from obligated businesses which describes accurately the total POM by nation (although 'by nation reporting' from 2024 will provide such insight) and as such this is proposed to be an appropriate method of estimating such a split by apportioning total POM by sector to each nation by a suitable scaling factor.

6.2. Scaling factors - background

An appropriate scaling factor for each of the sectors identified in the reports are detailed below, along with alternative factors which were also considered where appropriate.

Factors were found and applied to the sectors identified in the PackFlow reports by material. The sectors identified and the associated factors are detailed below.

6.2.1. Agriculture

Valpak considered national statistics for agriculture relating to employment[30], income, the number of holdings and the total hectares[31] in each of the nations as follows.

Table 14: Metrics relating to Agriculture in the nations of the UK in 2022

	Employment	No. of Holdings	Income per farm 21/22	Total Income	Hectares
England	297,400	104,476	448,500	£46,857,486,000	9,098,253
Northern Ireland	52,200	25,952	83,500	£2,166,992,000	1,035,642
Scotland	67,400	23,345	332,000	£7,750,540,000	5,012,957
Wales	50,400	37,116	113,000	£4,194,108,000	1,765,566

Note, that in this instance, the total income was calculated using the total income per farm multiplied by the number of holdings.

These metrics were then calculated as proportions of the UK packaging sector to be assigned to each nation as follows.

Table 15: Proportion of key metrics relating to Agriculture in the nations of the UK

	Employment	No of Holdings	Total income	Hectares
England	64%	55%	77%	54%
Northern Ireland	11%	19%	7%	10%
Scotland	14%	12%	13%	30%
Wales	11%	14%	4%	6%

In this instance, it was decided that the proportion of total holdings and total hectares were inappropriate factors to use because these are likely to be skewed by very large farms for grazing livestock (for which the packaging may not be proportional to the size or number of farms). As such employment and total income were then considered. Whilst neither is likely to be entirely accurate, employment was chosen as the reasonable metric on the basis that total income again could be skewed by the relative value of the output of the farm itself. Instead, the assumption is that a farm worker is equally likely to open packaged product as any other as a farm work on their or any other farm during

[30] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1106562/AUK_Evidence_Pack_2021_Sept22.pdf
[31] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1088518/AUK-Chapter2-14jul22.ods

the course of their day-to-day duties. As such, it was decided that the most appropriate figure for this calculation was to use employment.

6.2.2. Population

Population statistics were obtained from ONS from census data in 2021. Whilst there are some estimates of 2022 populations, it was decided that actual numbers in 2021 would be a reasonable proxy for working out the proportion of residents across the UK that live in each country in 2022 (when applied and reported in kt).

Table 16: Proportion of the population living in each of the nations of the UK

	Population mid-2021	Population proportion
England	56,536,000	84%
Northern Ireland	1,905,000	3%
Scotland	5,480,000	8%
Wales	3,105,000	5%

6.2.3. Construction

Various factors were considered within construction sector, however as is the case in agriculture, the total employment[32] [33] was deemed to be a suitable factor for defining the relative size of the corresponding sector in each of the nations. This removes issues such as the relative size of the individual business, cost and availability of materials and value of the building, any discrepancies over land value that may exist and any other issues around other cost complexities or differences in the sizes of building.

Table 17: Proportion of the employees within the construction sector in each of the nations of the UK

	Employment in construction	Employment proportion
England	1,213,614	85%
Northern Ireland	35,135	2%
Scotland	123,000	9%
Wales	54,500	4%

6.2.4. GDP

Those aspects of POM in the Non-Consumer (manufacturing) sectors were scaled by GDP[34] to represent manufacturing output.

Table 18: Proportion of total UK GDP by UK nation

	GDP (£ bn)	GDP Proportion
England	1,961,238	87%
Northern Ireland	51,717	2%
Scotland	169,162	7%
Wales	79,699	4%

[32] GB data: https://www.ons.gov.uk/file?uri=/businessindustryandtrade/constructionindustry/datasets/constructionstatisticsannualtables/2021/constructionsannualtables2021.xlsx

[33] Northern Ireland Data: https://www.nisra.gov.uk/system/files/statistics/2022q2soti.xlsx

[34] https://www.ons.gov.uk/economy/grossdomesticproductgdp/bulletins/gdpukregionsandcountries/januarytomarch2022, https://www.gov.scot/publications/gdp-quarterly-national-accounts-2022-q2/, https://www.nisra.gov.uk/statistics/economic-output-statistics/ni-composite-economic-index

6.2.5. Hospitality

Data as to the relative size of the hospitality sector in each of the nations is available from Government statistics in terms of the number of establishments in 2017[35]. This data was used as a proxy for the size of the relative markets in 2022. Number of establishments was used instead of other metrics such as sales due to the potential for the outcome to be skewed by high-cost establishments.

Table 19: Proportion of total UK hospitality by UK nation

	Number of establishments (From 2017)	Proportion of hospitality
England	71,527	82%
Northern Ireland	3,973	5%
Scotland	6,017	7%
Wales	5,913	7%

6.3. Sector scaling factors used

The scaling factors used for each sector in the by nation 2022 POM reporting is shown below in Table *20*.

Table 20: Scaling Factors used for each sector in the By-Nation 202 POM reporting

Sector	Scaling Factor
Grocery	Population
Non-Grocery	Population
Shipment	Population
Agriculture	Agriculture
Construction and demolition	Construction
Retail Back of Store	Population
Hospitality	Hospitality
Manufacturing and Other / Other C&I	GDP
Non consumer Packaging (glass)	Hospitality
Non consumer Packaging (wood)	Construction

[35] https://assets.publishing.service.gov.uk/media/5d67a363ed915d53b4904899/Hospitality_and_Tourism_Workforce_Landscape.pdf

6.4. POM by Nation – Steel

Applying the scaling factors detailed above, the total POM in 2022 broken down by nation for Steel is as follows:

Figure 5: POM by Nation – Steel

Steel Packaging	
2022 POM	474 kT
England	404 kt
Wales	21 kt
Scotland	37 kt
Northern Ireland	13 kt

Consumer / Retailer packaging	
2022 POM	246 kt
England	207 kt
Wales	11 kt
Scotland	20 kt
Northern Ireland	7 kt

Grocery Packaging	
2022 POM	208 kt
England	176 kt
Wales	10 kt
Scotland	17 kt
Northern Ireland	6 kt

Non Grocery packaging	
2022 POM	37 kt
England	31 kt
Wales	2 kt
Scotland	3 kt
Northern Ireland	1 kt

DIY	
2022 POM	7 kt
England	6 kt
Wales	0 kt
Scotland	1 kt
Northern Ireland	0 kt

Beauty & Personal Care	
2022 POM	4 kt
England	3 kt
Wales	0 kt
Scotland	0 kt
Northern Ireland	0 kt

Petcare	
2022 POM	20 kt
England	17 kt
Wales	1 kt
Scotland	2 kt
Northern Ireland	1 kt

F&D + Others	
2022 POM	7 kt
England	6 kt
Wales	0 kt
Scotland	1 kt
Northern Ireland	0 kt

Non-Consumer Packaging	
2022 POM	229 kt
England	197 kt
Wales	9 kt
Scotland	17 kt
Northern Ireland	6 kt

Hospitality	
2022 POM	34 kt
England	27 kt
Wales	2 kt
Scotland	2 kt
Northern Ireland	2 kt

Other C&I	
2022 POM	195 kt
England	169 kt
Wales	7 kt
Scotland	15 kt
Northern Ireland	4 kt

7. Phase 1: Collection & Reprocessing of Steel Packaging

7.1. Steel Packaging Recycling

7.1.1. Recorded Recycling of Steel Packaging

NPWD is used to identify total recorded recycling of steel packaging both in the UK and that exported for recycling. For 2022, NPWD shows 366k tonnes of recycling of steel packaging, of which 173k tonnes (47%) took place in the UK.

Of the total (UK and exports), 234k tonnes (64%) relates to the recycling of steel cans and associated packaging, 120k tonnes (33%) is from the recycling of other steel grades with national protocols (where it is expected one might find mainly Non-Consumer packaging, such as UK ferrous grades 1, 2 and 3b) and the remaining 11k tonnes (3%) is for ferrous grades where individual protocols have been agreed with the regulators.

Based on the total POM estimated in this report, the total recorded steel packaging recycling of 366k tonnes in 2022 represents a recorded recycling rate of 77% in 2022.

7.1.2. Unrecorded Recycling of Steel Packaging

It is important to recognise that not all of the recycling of steel packaging is captured (as recorded recycling) on NPWD. To identify the scale of unrecorded steel packaging recycling, conversations were held with the Steering Group as well as with UK operators and exporters handling recovered steel packaging.

Firstly, conversations focused on any unaccredited recycling or export of the key grades of steel packaging (excluding IBA). Discussions focused on the recycling of steel cans and associated packaging (e.g., aerosols) and also other grades where a national protocol exists (for example for UK ferrous grades 1 & 2 and fragmentised light steel). The general feeling was that a high percentage of the steel packaging recycling falling into these categorises is being captured. For steel cans, this was due to the main UK steel mills being accredited and exports being limited. For other grades, it was felt that the data on NPWD suggests much is being captured and that the size of shipments means there is a strong incentive for exporters to get accredited.

Based on input from industry, it is estimated that the recorded recycling of key grades of steel packaging (excluding IBA) on NPWD in 2022 was 98.5%. The same percentage figure is used for exports. This leaves 4k tonnes of unrecorded steel packaging recycling from these sources.

A second area of investigation was the recycling of the ferrous steel fraction recovered from IBA. Unlike aluminium, there is no national protocol for steel packaging recovered from IBA and so individual agreements must be made between UK mills or exporters and the regulators.

In 2022, approximately 11k tonnes of PRNs were issued based on local protocols from a flow of steel scrap of just under 17k tonnes. The average rate of the protocol is therefore 68%. There were no locally agreed protocols on exports in 2022. Discussions with industry suggest the PRNs issued based on locally agreed protocols are primarily generated on the ferrous fraction from IBA and ferrous scrap recovered at the front end of waste treatment plants, for example from EfW / MBT / RDF plants. It was estimated that the packaging content in the IBA ferrous fraction is around 66% and also that 100% of the PRNs generated from locally agreed protocols came from the IBA ferrous fraction in 2022.

Despite all PRNs on these local protocols coming from the IBA ferrous fraction, there would be a small percentage of this IBA ferrous fraction not having PRNs issued on it and so an attempt was made to calculate how much might be missing. To do this, a figure of 2.9m tonnes[36] of IBA generation in 2022 was used and combined with an assumed ferrous steel content of 7%[37].

This gives a total ferrous generation from IBA of 207k tonnes in 2022.

As we estimate that 100% of the PRNs issued using a local protocol came from the IBA ferrous fraction, it is concluded that PRNs are being issued on just under 17k tonnes of the total ferrous scrap generated of 207k tonnes. This leaves 190k tonnes where PRNs have not been issued. The unrecorded recycling of steel could be calculated by multiplying the 190k tonnes by the estimate for the packaging content in this fraction, 68%. However, discussions with industry suggested that some of the ferrous IBA fraction may be finding its way into fragmentised steel. Whilst IBA ferrous is technically not permitted in this grade, there is an economic incentive for this to happen. As the protocol on

[36] *UK Energy from Waste Statistics – 2022, Tolvik Consulting.*
[37] *Verde estimate based on input from industry*

this grade is low as a percent (4.1%) and this figure would not account for any IBA content (as the protocol was developed prior to any significant recovery of ferrous from IBA) the inclusion of some IBA ferrous would increase the tonnage of this grade and therefore have some very marginal impact on PRNs issued (*i.e.*, they are not all 'lost').

As a result, the 68% figure was reduced slightly to 66%. This is the figure used as the average unrecorded steel packaging content in the ferrous IBA fraction where a local protocol is not being used. This gives an estimate of total unrecorded steel packaging from the ferrous IBA route of 126k tonnes.

Finally, the export of RDF from the UK and its steel packaging content was investigated. As with Energy from Waste Plants (EfW) in the UK, it is assumed that any RDF exported to mainland Europe will be treated in a plant where the IBA is processed, and the ferrous steel content recycled. In 2022, 1,448k tonnes of RDF were exported from the UK[36] and it is estimated that within the RDF the steel packaging content is 0.60%[37], on average. This gives an unrecorded recycling tonnage for steel packaging from RDF of 9k tonnes in 2022.

Taking into consideration all of the aforementioned factors, the total unrecorded (unaccredited) recycling of steel packaging in 2022 was estimated to be 140k tonnes.

7.1.3. Total Recycling of Steel Packaging

Total steel packaging recycling (recorded + unrecorded) is calculated by combining the recorded recycling on NPWD with the estimate for unrecorded steel packaging recycling:

Total steel packaging recycled	**=**	**Total recorded recycling**	**+**	**Total unrecorded recycling**

This gives a total recycling of steel packaging in 2022 of 506k tonnes. Based on this project's steel packaging POM this represents a steel packaging recycling rate of over 100% depending on the accuracy of the protocols used.

Valpak and the Steering Group acknowledge that although the protocols, sampling activity and other assumptions examined here suggest otherwise, it is not possible to achieve over 100% recycling rate for consumer steel packaging. Up to a maximum of 8k tonnes of steel packaging has been identified that may be going to landfill (see section 7.3). A further explanation of how steel packaging recycling is captured and why the recycling rate is extremely high is explored in more detail in section 7.4.

7.2. Steel Packaging Recycling by Sector

7.2.1. Consumer Recycling of Steel Packaging

Consumer recycling data based on the financial year 2021/22 (2021 for Scotland) is extracted from WDF. This means there is some degree of inconsistency between the collection figures for April 2021 - March 2022 and the consumption figures for January 2022 - December 2022. A summary of steel packaging collections is shown in Table *21*.

Table 21: Steel Packaging Collected for Recycling, WDF Data 2021/22 (k tonnes)

	Total	Kerbside	Bring	CA
Steel packaging collected	**174**	168	1	5

The WDF data in Table *21* above does not include figures for Consumer steel packaging recycled from IBA or RDF. Estimates were made for these. For IBA, Tolvic reports[36] that of the 2.9m tonnes of waste inputs to UK energy for waste plants in 2022, 76.3% was MSW and the remainder C&I. The 76.3% is used as a proxy for Consumer waste, although it is recognised that it will include some *household like* waste from non-households. It is also assumed that the steel content in both the MSW and C&I is similar. It is therefore assumed that 76.3% of steel packaging recycled from IBA is Consumer, which amounts to approximately 104k tonnes. RDF is typically produced with a mix of household and C&I waste to achieve target specifications for EfW plants. Here it is assumed that an average of 75% of the steel recycled from RDF is from Consumer sources, which amounts to approximately 7k tonnes.

Combining the above (Local Authority collected steel packaging + IBA + RDF), it is estimated that there is approximately 285k tonnes of steel packaging recycling from Consumer sources. Based on the estimated Consumer steel POM figure in this report (246k tonnes), the Consumer recycling rate for steel packaging in 2022 is 116%. Clearly this cannot be correct and possible reasons for this figure are explored in section 7.4.

7.2.2. Non-Consumer Recycling of Steel Packaging

Non-Consumer steel packaging recycling is estimated as follows:

Table 22: Non-Consumer Steel Packaging Recycling, 2022 (k tonnes)

Non-Consumer recycling	=	Total steel packaging recycled	-	Consumer recycling

Total UK steel packaging recycling	**506**
Steel Consumer recycling	285
Steel Non-Consumer recycling	221

This gives a Non-Consumer recycling tonnage for steel packaging of 221k tonnes in 2022. Based on this project's estimate of Non-Consumer steel packaging POM (229k tonnes), the Non-Consumer steel packaging recycling rate is 97% for 2022.

7.3. Steel Packaging Not Recycled

Subtracting the Consumer and Non-Consumer steel packaging recycling totals from the respective sector POMs gives estimates of the tonnages of steel packaging that is not recycled.

For Consumer steel packaging, the non-recycled steel packaging total is *negative* due to the Consumer steel packaging recycling rate being over 100%. This is explored further in the next section.

For Non-Consumer steel packaging, the non-recycled total for steel packaging is 8k tonnes. Assumed that all of the steel packaging in IBA is recycled, both in the UK and via RDF overseas, then this is the figure for steel packaging going to landfill and not being recycled.

7.4. Explanations for the High Steel Packaging Recycling Rates

Combining the estimates of recorded and unrecorded steel packaging recycling gives a total figure over 100%. Whilst figures over 100% are clearly not correct, it is expected here that steel packaging has very high recycling rates because:

- Capture through household recycling systems is already high prior to making adjustments for unrecorded recycling. Based only on WDF data and the estimated POM, the Consumer recycling rate is already 71%.
- Even when steel is not separated for recycling at source and remains in residual waste it is often captured for recycling at some point in the supply chain. For example, at an MBT plant, during production of RDF, at a waste transfer station prior to incineration (less common than historically but it occurs), or from IBA processing.
- Capture rates of steel once it is collected in household collections will be relatively high as losses at MRFs are lower than for some other materials as over-band magnets are generally efficient.
- There is no transfer loss for steel packaging, as there is for aluminium, during incineration at EFW facilities.

Possible reasons why the overall recycling rate may be too high could relate to inaccuracies in the protocols. For example, steel cans & associated packaging grades (classed as 6E on NPWD) has a protocol of 97.5%, which may be achieved at some MRFs but not at others. As an observation, WDF has a total figure of 174k tonnes for steel (which one would expect to be nearly all steel cans or packaging that would be included with cans, such as aerosols).

On NPWD the steel can total is 234k tonnes. Of course, some of this difference will relate to C&I collections of steel packaging. For the C&I protocols, fragmentised ferrous generate 78k tonnes of steel packaging evidence (16% of POM, 21% of all recorded recycling, 65% of the C&I protocol total). The total recycling rate is therefore sensitive to the percentage used in the protocol, currently 4.1%.

Of particular note here, it is clear that the recycling rate for Consumer steel recycling is incorrect at 116%. Possible reasons for this are:

- Non-Consumer household like steel will be entering household collection systems. For example, restaurants may choose to separate steel tins and place them in communal bins or take them home and add them to kerbside collected materials.
- The steel packaging from Consumer sources in IBA is estimated using the percentage of municipal waste inputs to EfW as a proxy for Consumer waste. Municipal waste includes household like packaging from C&I sources and so this figure will be overstated. These points are particularly important for Consumer recycling as 76.3% of EfW inputs are assumed to be Consumer.

It is also recognised that assumptions have had to be made when analysing unrecorded recycling, and minor changes to them can impact the numbers. For example, assuming a 7% ferrous content in IBA that is 100% packaging. Of 2.94m tonnes of IBA this makes 137k tonnes of steel packaging, or 29% of POM. To put this in context, NPWD has total steel packaging recycling at 366k tonnes in 2022. The importance of the assumption is increased as it is estimated that only 8% of IBA is currently appearing in the NPWD numbers and so here a further 92% in unrecorded is added, 76.3% of which is assumed to be Consumer steel packaging.

Separately, it is calculated that 8k tonnes of steel packaging not being recycled may be landfilled. Whilst this does not tally with the 100% recycling rate, it falls within the error margins calculated for POM and recycling. It is clear that the amount of steel within RDF, and the amount of packaging within ferrous material, both being sent for recycling and for RDF, is an extremely sensitive metric for defining packaging recycling.

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8. End Markets for Steel Packaging

8.1. Steel Packaging End Markets

Recycled steel packaging is used in a wide range of different products once recycled, including in construction, automotive and packaging applications. Based on NPWD figures for 2022, 47% of the recorded steel packaging recycling took place in the UK and 53% overseas.

A freedom of information request was made to the Environment Agency to determine where steel packaging was exported to in 2022, by tonnage[38]. These figures exclude any non-steel packaging that might be present. The countries have been grouped into the EU27+2, Rest of the World (ROW) OECD, ROW Non-OECD Asia, and ROW Non-OECD Other.

It can be seen from the breakdowns given in Figure 6 and Figure 7 that Non-OECD member countries in Asia were the key export destinations, including India, Pakistan and Bangladesh. Turkey (ROW:OECD) received the second highest tonnage in 2022.

Referring to NPWD, it can be seen that the majority of exports (55% in 2022) are of protocol grades that do not typically contain household packaging. These include fragmentised old light steel and old steel grades 1 & 2. Steel tins and cans tend to be recycled in the UK (64% in 2022).

Figure 6: Steel Packaging Exports - Destination Regions, 2022 (%)

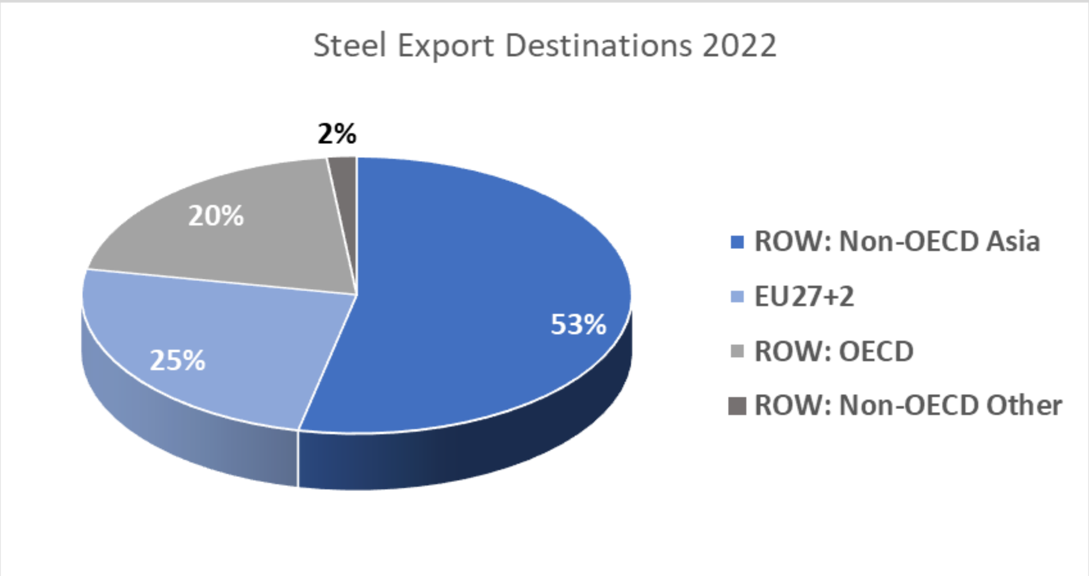


Figure 7: Steel Packaging Exports - Top 10 Destination Countries, 2022

Country	Export	% of Exports
INDIA	65k	34%
TURKEY	31k	16%
PAKISTAN	27k	14%
PORTUGAL	22k	11%
SPAIN	10k	5%
BANGLADESH	10k	5%
ITALY	8k	4%
UNITED STATES	8k	4%
MOROCCO	3k	2%
FRANCE	2k	1%

[38] Destination information is provided basis of a Freedom of Information request from the Environment Agency. Entities raising PERNS should report the location as being the place that the material is recycled. Enforcement and data accuracy is managed by the Environment Agencies.

9. Phase 2: Packaging Future Trends and Scenarios

9.1. Background

The PackFlow Refresh 2023 reports (https://www.valpak.co.uk/more/material-flow-reports) cover all packaging materials and have been produced to provide industry, governments, and other stakeholders with evidence to better understand packaging materials flows, packaging materials collection & recycling, and to assess likely future recycling performance.

The PackFlow Refresh 2023 project has two phases:

Phase 1

- Updates baseline data year to 2022 for estimates of packaging materials POM collections, recycling and end markets (from data years 2019 & 2017 in the previous PackFlow reports[39]).

Phase 2

- Develop scenarios for packaging materials flow and recycling from 2022 to 2028[40]
- Assess likely future recycling performance.

9.2. Phase 2 Objectives

The key objectives in Phase 2 are, for each of the packaging material types, to:

- Project packaging POM by year from 2022 to 2028[40] based on robust assumptions and techniques.
- Estimate packaging recycling rates for 2022 for various scenarios based on robust assumptions and techniques, and provide a narrative up to 2028 focusing on recycling capacity, end markets, key outlets, and recycling rate trends.

To complement the above a trend analysis is undertaken comparing packaging POM data, by packaging material type, with a range of a priori suitable economic/ industry activity indicator data (e.g. consumer spending, growth in home shopping deliveries). The indicator measures are material-specific and linked to appropriate growth projections to provide plausible indications of future developments in packaging POM tonnages.

Key outputs of the Phase 2 analysis are: an updated analytical Excel-based tool enabling its users to easily make/present estimates of, and future projections of packaging POM quantities for the UK, and a report discussing the methodologies, results and conclusions.

9.3. Methodology

An overview of the approach to assess trends in packaging materials POM for this project is provided below.

9.3.1. Net Pack Fill

This report uses historic NPWD[41] data - 'Packaging handled by activity' – from 1997 to 2023 submissions to represent trends in packaging materials POM by weight (more accurately this is trends in packaging materials POM reported by obligated producers).

The net pack fill calculation applied in each year, to each packaging material type, is set out below:

Net Pack Fill	=	Packing/Filling Table 1 - pack/filling	+	Imports Table 3A - imported for selling	+	Imports Table 3B - packaging removed from around imports	-	Exports Table 2A + Table 2B – pack/filling

[39] *The previous packaging materials flow reports can be found at https://www.valpak.co.uk/more/material-flow-reports .*
[40] *The POM projections extend to 2040 but beyond 2028 should be regarded as highly uncertain.*
[41] *www.npwd.environment-agency.gov.uk*

10. Trends in Packaging POM by Material

10.1. Introduction

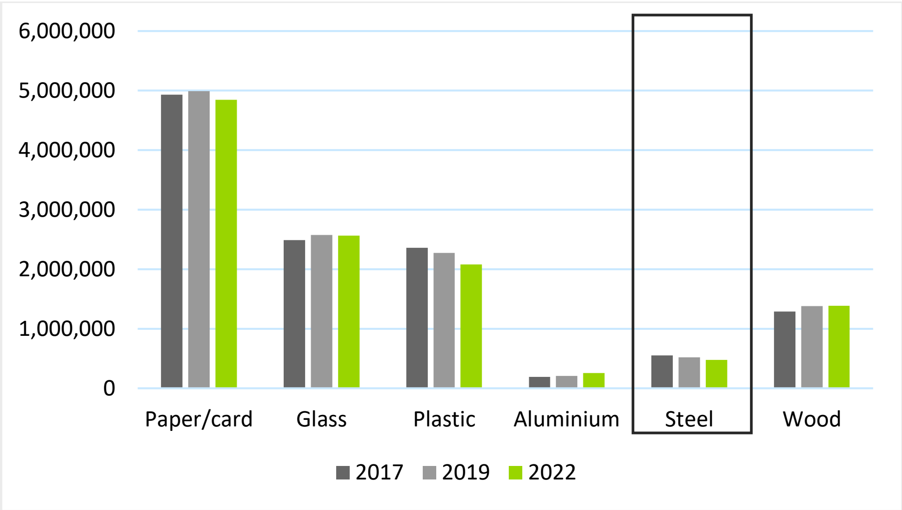
This section of the report uses NPWD time-series data on packaging handled by obligated producers, by type of packaging material, from 1998 to 2021 – this dataset represents the maximum number of annual observations available.

PackFlow's most recent quantifications of packaging POM are for 2017, 2019 and in the current project 2022 (Figure 1). The main takeaways from Figure 8 for packaging materials POM in 2022 compared to earlier years are:

- Paper and card has reduced compared to 2019 and 2017.
- Glass is down from 2019.
- Plastic is down from 2019 and 2017.
- Aluminium has increased compared to 2019 and 2017.
- Steel has reduced compared to 2019 and 2017.
- Wood is down compared to 2019 but higher compared to 2017.

While these POM estimates are regarded by industry and Government as being the best available, they are not repeated on an annual basis, so there isn't a sufficiently long run of annual time-series observations available for a robust analysis of trends.

Figure 8: Packaging POM by material, 2017, 2019 and 2022 (k tonnes)



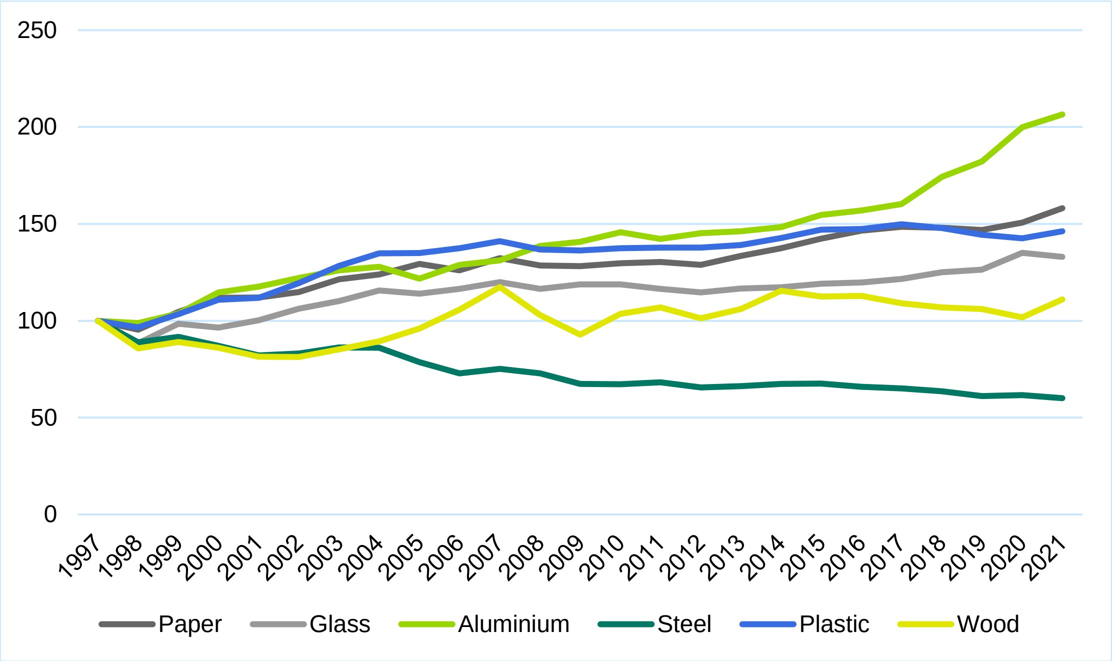
Instead, to inform trends by packaging material type the NPWD dataset is used to calculate the measure 'Net Pack/Fill' which is regarded as the best approximation or proxy to trends in POM by type of material.

Figure 9 shows the estimates of trend in packaging materials POM (by weight) by material type from 1997 to 2021. In general, POM[42] for all materials (apart from steel packaging) has increased though clearly there are year-to-year fluctuations. Aluminium packaging has grown the fastest, followed by paper, plastic and glass. Wood packaging has seen modest growth overall, and steel packaging has experienced year-on-year declines in most years over this period.

Since 2017 growth in aluminium and glass packaging POM has picked up relative to trend and plastic packaging POM has reduced. Since 2019, paper packaging POM has increased relative to plastic packaging POM.

[42] Strictly speaking this is obligated POM as represented by the net pack fill measure. The % of total POM as measured by the PackFlow reports varies by material and over time.

Figure 9: Packaging POM trends by material, 1997 - 2021 (indexed 1997=100)

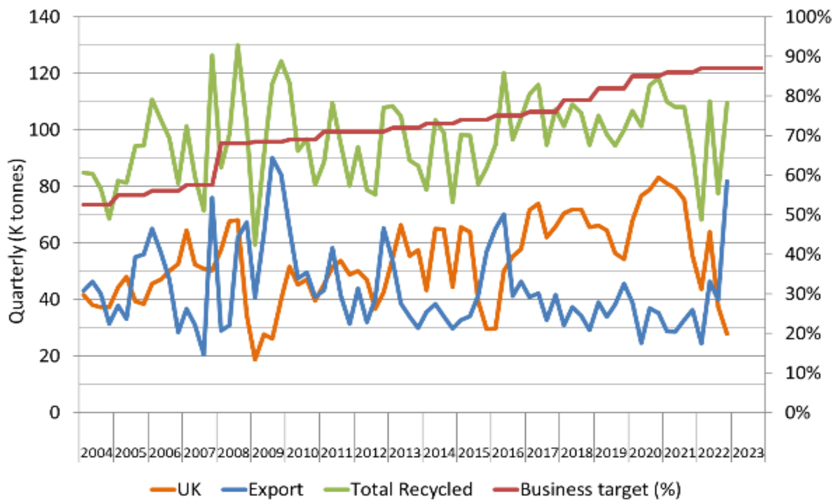


11. Packaging Recycling

11.1. Introduction

A key objective of this report is to provide an understanding of the trends in the recycling of packaging materials. To inform the recycling projections in the baseline scenario NPWD accredited recycling data (i.e.PRN/PERN) is used as a proxy for the assessment of recycling trends. Note that non-accredited recycling and export (i.e. tonnages not recorded by PRN/PERN) also takes place which has an impact on overall recycling performance. Figure 10 illustrates quarterly data on total accredited recycling, UK domestic accredited recycling and accredited exports by packaging material from 2004 to 2023. A key driver of packaging recycling is the material specific business targets, which for each material are shown on the left-hand-scale of the charts.

Figure 10: Trends in accredited steel packaging recycling 2004 – 2023 (k tonnes)



Substantial volatility over the period 2004 – 2022 in the amounts of steel packaging waste recycled either in the UK or exported but with no strong indication of any trends. Steel packaging recycling targets have flat-lined.

12. Steel Market Trends

Legislation

Regulations will limit the global trade of scrap and incentivise domestic consumption. Governments are increasingly moving towards scrap as a source of low-carbon domestic supply, especially in regions that lack raw materials and have large requirements for steel[43]. For example, as the second-largest producer of steel worldwide, India's National Steel Policy 2017 aims to produce 300M tonnes steel p.a. by 2030, with 35-40% coming from EAFs; this initiative requires high quantities of good quality scrap steel to be available at competitive prices[44]. The world's largest steel producer, China, also plans to increase its share of EAFs to 15% by 2025[45].

Policies designed to 'onshore' the supply of scrap and disincentivise exports are becoming ever more frequent, notably in the shape of tighter quality standards and import restrictions[50]. Globally, moves towards decarbonisation are encouraging greater use of scrap steel, meaning more and more countries are imposing export bans on scrap steel to keep scrap steel supplies within the country. In 2022, the majority of the UK's steel was exported to India (65kt, 34%) followed by Turkey (31kt, 16%) and Pakistan (27kt, 14%)[49].

UK POM

British Steel plan to close two blast furnaces (also known as Basic Oxygen Furnaces, BOFs) in 2025 and replace with Electric Arc Furnaces (EAFs), the latter of which are used for secondary steelmaking, a technique which relies mainly on scrap iron as an input. Tata Steel have indicated they may be closing their two UK blast furnaces – some argue that this will make the UK solely reliant on imports for primary steel, which uses iron ore as a raw material[46]. While EAFs are far more climate-friendly than BOFs, they are not able to produce the higher grades of steel required for certain applications, such as car manufacturing, as is produced with primary steelmaking[47]. However, EAFs would be able to make far better use of the UK's large reserves of scrap steel (10m tonnes pa), of which only 20% is currently recycled onshore each year[48].

Generating enough feedstock for the proposed EAFs will require higher rates and better collection, separation and enhancement of scrap metal, along with manufacturing and design changes to improve efficiency; most of the UK's exported scrap could be recycled at home if handled correctly.[49]

Overall steel packaging consumption has decreased by 8% across the UK between 2019 and 2022.[50]

"The UK steel industry is set to produce at a record low this year, its lowest since World War II, and it's hard to say if 2023 will see an upturn", an official with the UK-based International Steel Statistics Bureau said Sept. 22. "Output is set to fall to below 7 mt of crude steel in 2022, from 7.2 mt in 2021 and 7 mt in 2020 when it suffered a COVID-19-related markets slump", said Steve Andrews, the bureau's commercial manager, at the first UK Steel Forum.

"UK steel production has been falling for decades," Andrews said at the event, convened by the six associations with a view to enhancing mutual cooperation to the benefit of the overall industry. "In 2000 UK production was 15 million mt, and now it's half that level."[51] "In the UK, the second half of the year will be "subdued" in terms of market demand, particularly in the automotive sector, while "rampant" inflation — currently hovering around 10% on an annual basis — will have a knock-on effect on consumer confidence and spending, Andrews said."[48]

Consumer steel packaging consumption is down by 11% from 2019 to 2022.[46]

Non-Consumer steel packaging consumption is down by 5% from 2019 to 2022.[46]

Waste Management

Lightweighting has been a leading trend within the metal packaging industry over the past decade, in sectors ranging from food and beverage cans to aerosols. Reductions in weight have been achieved via measures such as switching from steel to lighter-weight aluminium, a trend which is being led by leading metal packaging manufacturers, such as Crown and Ardagh.[52]

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[43] https://www.woodmac.com/news/opinion/scrap-metal-opportunity/
[44] https://steel.gov.in/sites/default/files/Steel%20Scrap%20Recycling%20Policy%2006.11.2019.pdf
[45] https://think.ing.com/articles/why-is-ferrous-scrap-a-strategic-raw-material
[46] https://monroeengineering.com/blog/primary-vs-secondary-steelmaking-whats-the-difference/
[47] https://www.ft.com/content/1d6bb8ed-754e-4243-97a3-9b818566d81c
[48] https://romcometals.com/recycling-bringing-back-the-uk-steel-industry/
[49] https://www.ft.com/content/178a3398-66c5-4d73-82fd-a7590bcc0775
[50] Packflow Refresh 2023
[51] https://bssa.org.uk/uk-steel-output-to-hit-record-low-this-year-2023-prospects-uncertain-uk-steel-forum/
[52] https://www.smithers.com/en-gb/resources/2018/jul/sustainability-to-boost-metal-packaging-market

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13. Projections and EPR Scenarios

13.1. POM Projections

The Phase 1 baseline data year for steel packaging POM is calendar year 2022. The projected tonnages from 2022 to 2040 are developed with the following considerations (note that the report tables show a summary of the scenarios to 2028).

1. Near term. Profile shaped based on market intelligence and datasets that are available for year to date in 2023. Typically, in the near term there's more information available on which to base projections, and make assumptions. For example, qualitative commentaries on current market conditions are used. The current cost of living crisis – energy bubble – is a key source of uncertainty distorting purchasing decisions and, to the extent that this is reflected in indicator data, it is built into the profile of the projections.
2. Medium term. The scenario projections link to growth projections to inform the scenario profiles 2024 to 2040. Official published economic projections to 2028 are used, namely the Office for Budget Responsibility (OBR)'s forecast published in November 2023 to accompany the Chancellor's Autumn 2023 Statement.
3. Long term. As the projection horizon extends further out there's inevitably greater uncertainty. The scenario projections adopt a 'return to trend or steady state' growth approach.

The POM projections are linked to indicators (and projections of these indicators). The indicators considered are selected through analysis of historical relationships with packaging POM. Therefore, they are (statistically) *a priori* deemed potentially useful in describing the evolution of packaging POM. The indicators shown in Table 23 are grouped according to level/growth in; economic activity (GDP, GVA by sector, construction, imports), spending (consumer spending and retail sales), and population. Data for all indicators is sourced from the ONS and is adjusted by the ONS to remove the effects of changes in prices, so they are indicators of activity potentially related to the tonnage of packaging POM in real terms.

Table 23: A Selection of Indicators

Indicator group	Indicator and data source
Consumer spending	Household final consumption expenditure : National concept CVM SA - £m
Consumer spending	Total goods :Total CVM NA Year SA £m
Gross Domestic Product	GDP
Retail sales	Retail in non-specialised stores IV2X
Retail sales	Retail in predominantly food stores IV3G
Retail sales	Retail in non-food stores IV3I
Retail sales	Retail in other stores IW6U
Retail sales	Retail in textile, clothing and footwear stores IW6X
Retail sales	Retail in household goods stores IW6Y
Retail sales	Non-store retailing J58P
Retail sales	All retail excl. automotive
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles
GVA	G47: Retail trade, except of motor vehicles and motorcycles
GVA	G56: Food and beverage service activities
GVA	A: Agriculture
GVA	B: Mining and quarrying
GVA	C: Manufacturing
GVA	D: Electricity, gas, steam and air conditioning supply

GVA	F: Construction
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles
GVA	Total GVA
Construction	Public new housing
Construction	Private new housing
Construction	Total new housing
Imports	CPA 08:WW:IM:CVM:BOP:SA: C. Manufactured products
Imports	CPA 08:WW:IM:CVM:BOP:SA: 10. Food products
Population	POP

A chart-based correlation analysis for a selection of these indicators versus POM by packaging material type and a detailed statistical correlation analysis is reported in Appendix I. A summary is shown in Table 24 and Table 25. In each of these the top three correlations are ranked. All packaging materials are shown for comparison.

Table 24: Levels correlation analysis of steel packaging materials and indicator measures, 1997 – 2021

Material	Highest correlations	Suggested activity indicator to link to?
Steel	1. GVA - Food beverage and services activities 2. GVA – Construction	GVA

Table 25: Growth correlation analysis of packaging materials and indicator measures, 1998 – 2021

Material	Highest correlations	Suggested activity indicator to link to?
Steel	1. Imports of manufactured goods 2. Retail sales, non-specialised stores 3. Imports of food products	Imports of manufactured good

For steel packaging GVA and imports of manufactured goods are possibilities (though likely spurious). Moreover, linking to projections of these would, in the medium term at least, generate *growth* in steel packaging POM which doesn't make sense given the year-on-year declines in steel packaging POM observed for over two decades. The projection for steel packaging POM is based on an extrapolation of its recent historic trend. The POM was multiplied by the change over time in the selected correlated indicator to obtain the level for each subsequent year. See Appendix II for further details.

Table 26: Summary of linking packaging POM to indicator measures.

Material	Levels analysis	Growth analysis	Projection based on
Steel	GVA	Imports of manufactured good	Extrapolation of historic trend

Table 27: Projected growth in indicator measures, 2024 to 2028

Indicator	2023	2024	2025	2026	2027	2028	Source	
Retail sales	-3.1%	0.5%	1.0%	1.6%	2.1%	2.0%	ONS latest data: Jan - Oct 2023	OBR forecast Nov 2023: Consumer spending

13.2. EPR Scenarios

Three EPR scenarios for each of the packaging materials covered in the Packflow Refresh 2023 where developed and are discussed in the following sections. Please note there is no EPR Scenario 3 for steel packaging. Only scenarios 1 and 2 are included from the list below.

The three scenarios are:

- EPR scenario 1: All packaging materials subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025)
- EPR scenario 2: DRS drinks containers *excluding* glass removed from recycling obligations under EPR in 2027 onwards
- EPR scenario 3: DRS drinks containers *including* glass containers for Scotland and Wales, and *excluding* glass drinks containers in England and Northern Ireland, are removed from EPR POM tonnages from 2027.

In the context of scenarios 2 and 3 'removing DRS drinks containers', (glass as above) from EPR' means removing these materials from EPR recycling obligations. The policy is that they are not subject to disposal cost fees in the period between the new EPR regulations coming into force (from 2025) and DRS 'going live' (from 2027). Note that glass packaging is the *only* material impacted in scenari*o 3*.

The scenarios provide an assessment of likely recycling performance, in each year, to 2028 (note the projections extend to 2040 but data to 2028 is shown as a summary). In each scenario packaging materials are assumed to be under EPR from 2025 and the tables below show (to 2028) the tonnages of packaging placed on the market which would be under EPR. Also shown are the business targets (%, k tonnes), obligated packaging tonnages, the level (%) of non-obligated packaging, accredited packaging recycling (k tonnes), the projected surplus/shortfall of recycling relative to the business target, and a summary of the recycling rate performance over the scenario horizon.

The scenarios calculate the tonnage of accredited recycling based on the amount of packaging POM and an assumed collection rate. The scenarios assume the collection of EPR packaging material is separated from the DRS collection system and no other loss i.e., 100k tonnes of EPR packaging POM equates to 100k tonnes of EPR packaging available to be collected for accredited recycling. In reality there will be loss to residual streams and in handling/sorting, and DRS materials not captured by a DRS could end up in the recycling waste stream collected for accredited recycling.

Please note there is no EPR Scenario 3 for steel packaging. Only scenarios 1 and 2 are included from the list above.

13.3. EPR Scenario 1

In this scenario all packaging materials are subject to recycling obligations under 2007 Regulations for 2024 and under new EPR regulations from 2025 onwards (all packaging is in scope of current producer responsibility obligations from 2022 to 2025). The table below shows the scenario 1 results for steel packaging.

Table 28: Steel Projection EPR Scenario 1

Steel	Units	2022	2023	2024	2025	2026	2027	2028
Business target	%	87%	87%	87%	87%	87%	87%	87%
POM	k tonnes	474	467	459	452	445	438	431
Obligated tonnage	k tonnes	438	431	424	417	411	404	398

Level of non-obligated tonnage	%	5%	8%	8%	8%	8%	8%	8%
Business target	k tonnes	381	375	369	363	357	352	346
Accredited recycling	k tonnes	366	408	360	354	349	343	338
Surplus (+) / shortfall (-)	k tonnes	-16	33	-9	-9	-9	-8	-8
Business recycling rate	%	83%	95%	85%	85%	85%	85%	85%
Recycling rate performance	%	77%	87%	78%	78%	78%	78%	78%
UK recycling rate	%	80%	80%	80%	80%	80%	80%	80%

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2028. Business targets are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, steel packaging is projected to have a small shortfall relative to the business target 2024 to 2028.

13.4. EPR Scenario 2

In this scenario in-scope DRS drinks containers *excluding* glass drinks containers are removed from EPR POM quantities from 2027 onwards. In this context ‘removing DRS drinks containers from EPR’ means removing these materials from recycling obligations. The policy is that they are not subject to disposal cost fees in the period between the new EPR regulations coming into force (from 2025) and DRS ‘going live’ (from 2027). The tables below show the tonnages of packaging placed on the market (to 2028) by material type which would remain under EPR in this scenario. Also shown are the business targets (%, k tonnes), obligated packaging tonnages, the level (%) of non-obligated packaging, accredited packaging recycling (k tonnes), the projected surplus/shortfall of recycling relative to the business target, and a summary of the recycling rate performance over the scenario horizon.

Table 29: Steel Projection EPR Scenario 2

Steel	Units	2022	2023	2024	2025	2026	2027	2028
Business target	%	87%	87%	87%	87%	87%	87%	87%
POM	k tonnes	474	467	459	452	445	436	429
Obligated tonnage	k tonnes	438	431	424	417	411	402	396
Level of non-obligated tonnage	%	5%	8%	8%	8%	8%	8%	8%
Business target	k tonnes	381	375	369	363	357	350	344
Accredited recycling	k tonnes	366	475	459	452	445	438	431
Surplus (+) / shortfall (-)	k tonnes	-16	100	90	89	88	88	86
Business recycling rate	%	83%	110%	108%	108%	108%	109%	109%
Recycling rate performance	%	77%	102%	100%	100%	100%	100%	100%
UK recycling rate	%	80%	80%	80%	80%	80%	80%	80%

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2026. Steel drinks containers are removed from EPR from 2027 onwards (~2k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, a surplus relative to the business target 2024 to 2028 is projected for steel packaging.

However, the surplus indicates that either the business target and/or the modelled collection rates could be adjusted downwards whilst still achieving the target.

15.5. EPR Scenario 3

In EPR scenario 3 in-scope DRS drinks containers including glass containers for Scotland and Wales, and excluding glass drinks containers in England and Northern Ireland, are removed from EPR POM tonnages from 2027. In this context ‘removing DRS drinks containers’, (glass as above) from EPR’ means removing these materials from recycling obligations. The policy is that they are not subject to disposal cost fees in the period between the new EPR regulations coming into force (from 2025) and DRS ‘going live’ (from 2027). Compared to EPR scenario 2 glass packaging is the only material impacted in this scenario.

14. Conclusions and Recommendations for Further Work

14.1. Conclusions: POM

This report estimates steel packaging POM in 2022 to be 474k tonnes (+/- 6%).

This estimate is derived from reported obligated data (EA, NPWD) and cross-checked as far as is possible using a bottom-up methodology combining data from various sources for each sector and data provided by the project's industry Steering Group.

The estimate for steel packaging POM in the Consumer sector is 246k tonnes (+/-5%) in 2022.

This estimate is based on primary data alongside reliable market share data. No other method is used for deriving Consumer data as this method is considered the most robust available and is accepted by the industry Steering Group supporting this steel flow project.

The estimate for steel packaging POM in the Non-Consumer sector is 229k tonnes (+/-11%) in 2022.

This estimate comprises an estimate of Hospitality packaging based on primary and market share data, to which separate quantities of direct sales of soft and alcoholic drinks using steel packaging are added, calculated based on industry figures. C&I steel packaging is estimated as the remaining part of Non-Consumer POM and is the residual tonnage once Consumer and Hospitality POM are deducted from Total steel packaging POM. This figure is cross-checked using a bottom-up approach based on estimates of industrial packaging types using secondary research and industry/Steering Group knowledge. The cross-check figure is within 8% of the residual tonnage estimate (despite some steel packaging that could not be quantified).

14.2. Conclusions: Recycling & End Markets

Steel packaging recycling (recorded & unrecorded) is estimated to be 506k tonnes in 2022.

This includes accredited (or recorded) recycling of 366k tonnes (NPWD) and an estimate for unrecorded recycling of 140k tonnes. Based on this project's POM an overall steel packaging recycling rate of 100% is estimated, reasons for this are explored further in the report. The total recycling rate for steel packaging is dependent on applying protocols for the quantity of packaging within the recycling streams for ferrous steels. The accredited (or recorded) recycling rate for steel packaging is 77% in 2022.

Consumer steel packaging recycled is estimated to be 285k tonnes in 2022.

Based on this project's POM estimate a Consumer recycling rate of over 100% is estimated (the figure is 116% and reasons for this are explored further in the report). Inclusion of Non-Consumer steel packaging recycling recorded on Waste Data Flow (WDF) or included within MSW supplied to EfW plants is likely to be a factor in the overstatement of Consumer steel packaging recycling.

Non-Consumer steel packaging recycled is estimated to be 221k tonnes in 2022.

This is estimated by subtracting Consumer steel packaging recycling from total steel packaging recycling. Based on this project's POM the Non-Consumer steel packaging recycling rate is 97% in 2022.

It is assumed that all steel packaging is ultimately recovered from incinerator bottom ash (IBA), either in the UK, or overseas via exports of refuse derived fuel (RDF). Up to 8k tonnes of steel packaging not recycled may be landfilled.

Whilst this does not tally with the 100% steel packaging recycling rate, it falls within the error margins calculated for steel packaging POM and recycling. It is clear that the amount of steel within RDF, and the amount of steel packaging within ferrous steel grades, both being sent for recycling and for RDF, is an extremely sensitive metric for defining steel packaging recycling.

14.3. Conclusions: Projections & EPR Scenarios

EPR Scenario 1

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2028. Business targets are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, steel packaging is projected to have a small shortfall relative to the business target 2024 to 2028.

EPR Scenario 2

Steel POM tonnage is projected to reduce in 2023 compared to 2022, with continuous year-on-year declines to 2026. Steel drinks containers are removed from EPR from 2027 onwards (~2k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 87%. The POM projection is reflected in the projection of obligated tonnage for steel packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, a surplus relative to the business target 2024 to 2028 is projected for steel packaging. However, the surplus indicates that either the business target and/or the modelled collection rates could be adjusted downwards whilst still achieving the target.

14.4. Recommendations for Further Work

Steel Packaging POM

The area of greatest uncertainty around steel packaging POM estimates is around the quantities of ‘other C&I’ packaging in the non-Consumer sectors (i.e. C&I packaging, excluding hospitality packaging). This project progresses the quantification of ‘other C&I’ packaging for steel packaging.

Steel Packaging Recycling

It is apparent from the comprehensive analysis for steel packaging in this project that there are considerable amounts of unaccredited (or unrecorded) steel packaging being recycled. If such quantities were able to become accredited (i.e., recorded) this would boost steel packaging recycling rates and performance versus UK recycling targets. Further work to promote the benefits or need for the industry to obtain accreditation and to support the EA in assessing and providing accreditation is therefore recommended.

Appendix I

Data Robustness Assessment

A robustness analysis assessment is completed here on the data sources used. This is developed to provide an indicative level of uncertainty for each data source by scoring the data sources on their robustness and the level of agreement amongst stakeholders.

Questions are posed relating to the evidence and agreement levels of the data used (see the tables later in this section for details) and then the data were scored on each axis in the following figures: Figure 11 (Steel POM) and Figure 12 (Steel Recycling) and a summary in Figure 13, which has been constructed based on analysis completed for each project estimate. The tables thereafter provide a full breakdown of the data robustness and agreement assessments for each dataset in the project.

Figure 11: Data Robustness Assessment Results – Steel POM

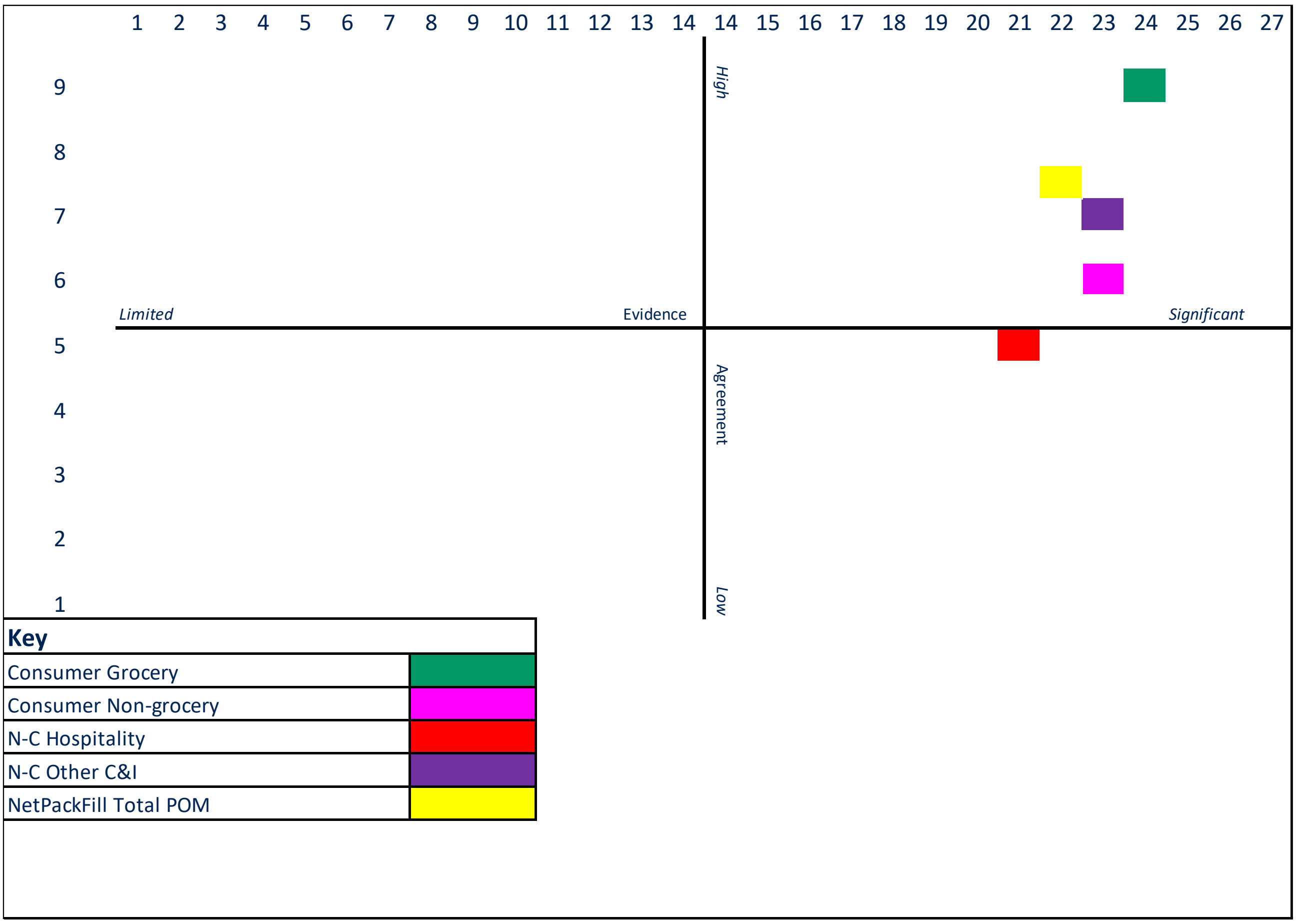
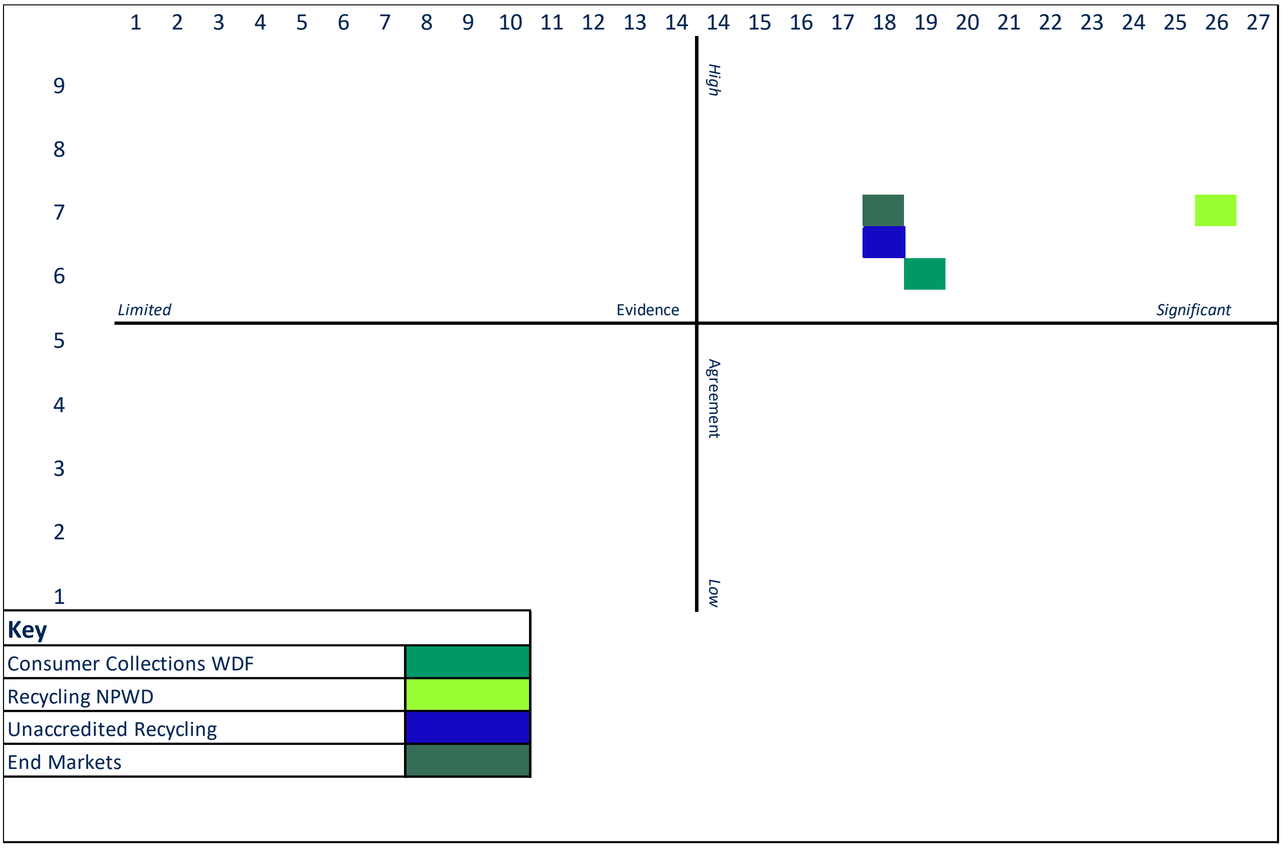


Figure 12: Data Robustness Assessment Results – Steel Recycling



To convert scores to a percentage that could be used to relate to an appropriate error margin[53], the evidence and agreement levels scores were added and the percentage of the total possible score taken.

Figure 13: Data Robustness Assessment Results – Summary

	Robustness Scores		Error Margin
Data & Source	**Evidence (Robustness and completeness, max 27):**	**Degree of agreement around the findings (max 9):**	**+/-**
Environment Agency Grocery Retailer Packaging Handled	24	9	6%
Mintel Beauty & Personal Care Value Sales by Sales Channel	23	6	12%
IGD Grocery Sales Channels	23	6	12%
Valpak DIY Compliance submissions 2022	21	6	18%
Insight Article Mkt share	21	4	21%
Euromoniter/Mintel Dog Food Value Sales by Sales Channel	24	6	12%
Valpak EPIC Data	22	6	15%
IGD Hospitality Sales Channels	23	6	12%
British Soft Drinks Association	20	4	21%
British Beer & Pub Association	19	3	24%
NPWD Producer Data 2022	26	6	9%
HMRC TradeInfo	23	5	15%
NPWD Recycling Data 2022	26	6	9%
Verde Research and Consulting Ltd Survey of Recyclers and Exporters 2022	18	7	21%
WDF 2021/22	19	6	21%

[53] *These are assumed estimates of error margin and not the outputs of statistical calculation.*

Data		
Environment Agency Grocery Retailer Packaging Handled		
Source		
Environment Agency Data		
Data Used In:		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes with some reservations	2
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**24**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	Yes	3
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**9**

Data		
The UK DIY & Gardening Market 2017-2022		
Source		
PR Newswire		
Data Used In:		
Non-grocery Estimate		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	More yes than no, but equivocal	1
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes with some reservations	2
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**21**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	More yes than no, but equivocal	1
Total		**4**

Data		
Estimated Distribution of Spending on Beauty & Personal Care Products 2019		
Source		
Mintel		
Data Used In:		
Non-grocery Estimate		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	More yes than no, but equivocal	1
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**23**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
UK Food & Grocery Value 2019		
Source		
IGD		
Data Used In:		
Non-grocery Estimate		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes with some reservations	2
Total		**23**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
Valpak DIY Annual Compliance Data Submissions 2022		
Source		
Valpak		
Data Used In:		
Non-grocery		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**21**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
Valpak EPIC Grocery Data		
Source		
Valpak		
Data Used In:		
Grocery & Non-grocery		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes	3
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**24**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**7**

Valpak Limited Unit 4, Stratford Business Park, Banbury Road, Stratford-upon-Avon CV37 7GW

03450 682 572 info@valpak.co.uk valpak.co.uk

Data		
Estimated Distribution of Spending on Petcare		
Source		
Mintel/Euromonitor (undefined in credit)		
Data Used In:		
Non-grocery Estimate		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**24**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
IGD Foodservice, Catering & Hospitality Sector Routes to Market		
Source		
IGD		
Data Used In:		
Non-grocery Estimate		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes with some reservations	2
Total		**23**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

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Data		
UK Soft Drinks Report 2017		
Source		
British Soft Drinks Association		
Data Used In:		
Non-grocery		

Evidence (Robustness and completeness, max 27):	**Scoring (Max 27)**	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	More yes than no, but equivocal	1
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes with some reservations	2
Total		**20**

Degree of agreement around the findings (max 9):	**Scoring (Max 09)**	
Does more than one data source confirm the findings (within +/- 5%)?	More yes than no, but equivocal	1
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	No	0
Total		**4**

Data		
Total Volume by Package		
Source		
British Beer & Pub Association		
Data Used In:		
Non-grocery		

Evidence (Robustness and completeness, max 27):	**Scoring (Max 27)**	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	No	0
Total		**19**

Degree of agreement around the findings (max 9):	**Scoring (Max 09)**	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	No	0
Total		**3**

Data		
Valpak Hospitality EPIC Data		
Source		
Valpak		
Data Used In:		
Evidence (Robustness and completeness, max 27):	**Scoring (Max 27)**	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes with some reservations	2
Total		**22**
Degree of agreement around the findings (max 9):	**Scoring (Max 09)**	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
NPWD Producer Data 2022		
Source		
NPWD		
Data Used In:		
Method 2 - POM		
Evidence (Robustness and completeness, max 27):	**Scoring (Max 27)**	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes	3
Have the findings been independently peer-reviewed?	Yes	3
Is the methodology/calculation reasonably free from concerns?	Yes	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**26**
Degree of agreement around the findings (max 9):	**Scoring (Max 09)**	
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
WDF Local Authority Collection Data		
Source		
WDF 2021/22		
Data Used In:		
Consumer Recycling		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes with some reservations	2
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	no	0
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes with some reservations	2
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**19**

Degree of agreement around the findings (max 9):		
Does more than one data source confirm the findings (within +/- 5%)?	No	0
Do the key stakeholders/experts actively agree with the findings?	Yes	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**6**

Data		
Survey of Recyclers and Exporters 2022		
Source		
Verde Research and Consulting Ltd		
Data Used In:		
Recycling & Unaccredited Recycling		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	Yes	3
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes	3
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	More yes than no, but equivocal	1
Have the findings been independently peer-reviewed?	No	0
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	More yes than no, but equivocal	1
Total		**18**

Degree of agreement around the findings (max 9):	Scoring (Max 09)	
Does more than one data source confirm the findings (within +/- 5%)?	Yes with some reservations	2
Do the key stakeholders/experts actively agree with the findings?	Yes with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**7**

Appendix II: Technical appendix

This short technical appendix details the methodology underlying the projections for packaging materials POM discussed in Section 10 of the report, and recycling discussed in Section 11 of the report.

POM projections

In this methodology, the POM projections by material type are linked to selected indicators, and to projections of these indicators. The indicators considered, through analysis of historical relationships with packaging materials POM, are (statistically) *a priori* deemed potentially useful in describing the evolution of POM quantities for each of the packaging materials. The list of potential indicators, as shown in Table 30, are grouped according to level/growth in; economic activity (GDP, GVA by sector, construction, imports), spending (consumer spending and retail sales), and population. Time series data for all indicators is sourced from the ONS and is adjusted by the ONS to remove the effects of changes in prices, so they are indicators of activity potentially related to the tonnage of packaging POM in real-terms.

Table 30: A Selection of Indicators

Indicator group	Indicator and data source
Consumer spending	Household final consumption expenditure : National concept CVM SA - £m
Consumer spending	Total goods :Total CVM NA Year SA £m
Gross Domestic Product	GDP
Retail sales	Retail in non-specialised stores IV2X
Retail sales	Retail in predominantly food stores IV3G
Retail sales	Retail in non-food stores IV3I
Retail sales	Retail in other stores IW6U
Retail sales	Retail in textile, clothing and footwear stores IW6X
Retail sales	Retail in household goods stores IW6Y
Retail sales	Non-store retailing J58P
Retail sales	All retail excl. automotive
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles
GVA	G47: Retail trade, except of motor vehicles and motorcycles
GVA	G56: Food and beverage service activities
GVA	A: Agriculture
GVA	B: Mining and quarrying
GVA	C: Manufacturing
GVA	D: Electricity, gas, steam and air conditioning supply
GVA	F: Construction
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles
GVA	Total GVA
Construction	Public new housing
Construction	Private new housing
Construction	Total new housing

Imports	CPA 08:WW:IM:CVM:BOP:SA: C. Manufactured products
Imports	CPA 08:WW:IM:CVM:BOP:SA: 10. Food products
Population	POP

A chart-based correlation analysis for a selection of these indicators (GDP, population and retail sales) versus POM for each packaging material type is shown below. The figures illustrate from 1997/98 to 2022 the (univariate) relationship, separately for both the levels and growth (annual % change), between the net pack fill measure - which serves as the best approximation to POM by type of material - and GDP, population and retail sales.

Steel packaging

These charts only provide a visual assessment of the degree of association between POM and a selection of indicators. Therefore, the tables below summarise the results of a more detailed statistical (univariate) correlation analysis across a broader range of possible indicators including alternative measures of consumer spending, detailed market segments for retail sales, GVA measures by industry sector, and imports for goods.

The correlations between the trends in each of the activity measures and trends in packaging materials are shown and the strength of the correlation is denoted by the statistical significance of the t-statistic derived (Prob. t). in each case the top three correlations are highlighted.

Table 31: Correlation analysis for packaging materials and indicator measures, levels 1997 – 2021

Level		STEEL	Prob. t
Consumer spending	Household final consumption Expenditure CVM SA - £m	-90.0%	0.00%
Consumer spending	Total goods :Total CVM NA Year SA £m	-90.8%	0.00%
Gross Domestic Product	GDP	-91.5%	0.00%
Retail sales	Retail in non-specialised stores IV2X	-88.5%	0.00%
Retail sales	Retail in predominantly food stores IV3G	-86.4%	0.00%
Retail sales	Retail in non-food stores IV3I	-92.2%	0.00%
Retail sales	Retail in other stores IW6U	-89.6%	0.00%
Retail sales	Retail in textile, clothing and footwear stores IW6X	-89.9%	0.00%
Retail sales	Retail in household goods stores IW6Y	-41.2%	4.07%
Retail sales	Non-store retailing J58P	-69.0%	0.01%
Retail sales	All retail excl. automotive	-91.2%	0.00%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	-89.4%	0.00%
GVA	G47: Retail trade, except of motor vehicles and motorcycles	-50.5%	1.01%
GVA	G56: Food and beverage service activities	14.8%	48.05%
GVA	A: Agriculture	-55.5%	0.40%
GVA	B: Mining and quarrying	96.1%	0.00%
GVA	C: Manufacturing	-86.6%	0.00%
GVA	D: Electricity, gas, steam and air conditioning supply	43.2%	3.10%
GVA	F: Construction	36.4%	7.41%
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	-78.6%	0.00%
GVA	Total GVA	-92.0%	0.00%
Construction	Public new housing	-85.9%	0.00%

Construction	Private new housing	-59.0%	0.19%
Construction	Total new housing	-68.0%	0.02%
Imports	CPA 08:WW:IM:CVM:BOP:SA: C.Manufactured products	-92.8%	0.00%
Imports	CPA 08:WW:IM:CVM:BOP:SA:10. Food products	-93.9%	0.00%
Population	POP	-92.3%	0.00%

Table 32: Correlation analysis for packaging materials and indicator measures, growth 1998 – 2021

Growth		**STEEL**	**Prob. t**
Consumer spending	Household final consumption expenditure CVM SA - £m	-0.048	82%
Consumer spending	Total goods :Total CVM NA Year SA £m	-0.372	7%
Gross Domestic Product	GDP	-0.041	85%
Retail sales	Retail in non-specialised stores IV2X	0.214	32%
Retail sales	Retail in predominantly food stores IV3G	-0.081	71%
Retail sales	Retail in non-food stores IV3I	0.076	73%
Retail sales	Retail in other stores IW6U	0.099	65%
Retail sales	Retail in textile, clothing and footwear stores IW6X	0.003	99%
Retail sales	Retail in household goods stores IW6Y	0.039	86%
Retail sales	Non-store retailing J58P		31%
Retail sales	All retail excl. automotive	-0.098	65%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	0.007	97%
GVA	G47: Retail trade, except of motor vehicles and motorcycles	-0.049	82%
GVA	G56: Food and beverage service activities	0.000	100%
GVA	A: Agriculture	0.095	66%
GVA	B: Mining and quarrying	0.034	88%
GVA	C: Manufacturing	0.013	95%
GVA	D: Electricity, gas, steam and air conditioning supply		47%
GVA	F: Construction	-0.023	92%

GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	-0.051	81%
GVA	Total GVA		39%
Construction	Public new housing		10%
Construction	Private new housing		12%
Construction	Total new housing	-0.263	21%
Imports	CPA 08:WW:IM:CVM:BOP:SA: C.Manufactured products	0.285	18%
Imports	CPA 08:WW:IM:CVM:BOP:SA:10. Food products	0.124	56%
Population	POP	0.113	60%

From the highlighted correlations in the tables above, Table 33 and Table 34 below summarise the top three correlations ranked in order from the highest correlation observed.

Table 33: Levels correlation analysis of steel packaging and indicator measures, 1997 – 2021

Material	Highest correlations	Suggested activity indicator to link to
Steel	1. GVA - Food beverage and services activities 2. GVA – Construction	GVA

Table 34: Growth correlation analysis of packaging materials and indicator measures, 1998 – 2021

Material	Highest correlations	Suggested activity indicator to link to?
Steel	1. Imports of manufactured goods 2. Retail sales, non-specialised stores 3. Imports of food products	Imports of manufactured good

Based on the statistical correlation analysis above, Table 35 provides a summary of the choice of indicator measure to link to by packaging material type. This supports developing a POM projection for by linking to projections of retail sales

For steel packaging, the indicators GVA and imports of manufactured goods are possibilities (though potentially likely to be spurious). Moreover, linking to steel packaging POM to projections of these indicators would, in the medium term at least, generate *growth* in steel packaging POM which doesn't runs counter intuitively to the observed year-on-year declines in steel packaging POM for over two decades. Instead of this, the projection for steel packaging POM is based on an extrapolation of its recent historic growth trend (CAGR 2017 – 2021 of -1.6% per annum for steel packaging).

Table 35: Summary of linking packaging POM to indicator measures

Material	Levels analysis	Growth analysis	Projection based on
Steel	GVA	Imports of manufactured good	Extrapolation of historic trend

Table 36 shows the projected growth rates for the indicators discussed above. The POM was multiplied by the change over time in the selected correlated indicator to obtain the level for each subsequent year.

Table 36: Projected growth in indicator measures, 2024 to 2028.

Indicator	2023	2024	2025	2026	2027	2028	Source	
Retail sales	-3.1%	0.5%	1.0%	1.6%	2.1%	2.0%	2023 annual based on ONS latest data: Jan - Oct 2023	OBR forecast Nov 2023: Consumer spending

Recycling projections

In this methodology, the projections for total accredited recycling depend on the POM projection and the projection of the collection rate (assumed to be constant), apart from 2023 where NPWD data for 2023 Q1 to Q3 is used to approximate a full year figure for 2023.

UK domestic recycling

The projections for accredited UK domestic recycling are extrapolated from observed trends (or absence of trends) in historic NPWD data (see section 11 of the report for a discussion). For 2023 NPWD data for Q1 to Q3 is used to approximate a full year figure for 2023.

- Accredited UK domestic recycling of steel packaging is projected as constant at their 2023 levels.

Export recycling

- Accredited exports for steel packaging is calculated as total accredited recycling *less* accredited UK domestic recycling.