PackFlow Refresh 2023: Aluminium

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.

J959 Aluminium Version 2.0

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 packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow 2023 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

- Collates data and market intel on the impact of recent changes (materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow and recycling from 2023 to 2027.
- 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 aluminium packaging placed on the market (POM)[2] that are as accurate as is reasonably possible. The report also considers the quantities of aluminium packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by packaging aluminium recyclers in the UK.

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

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

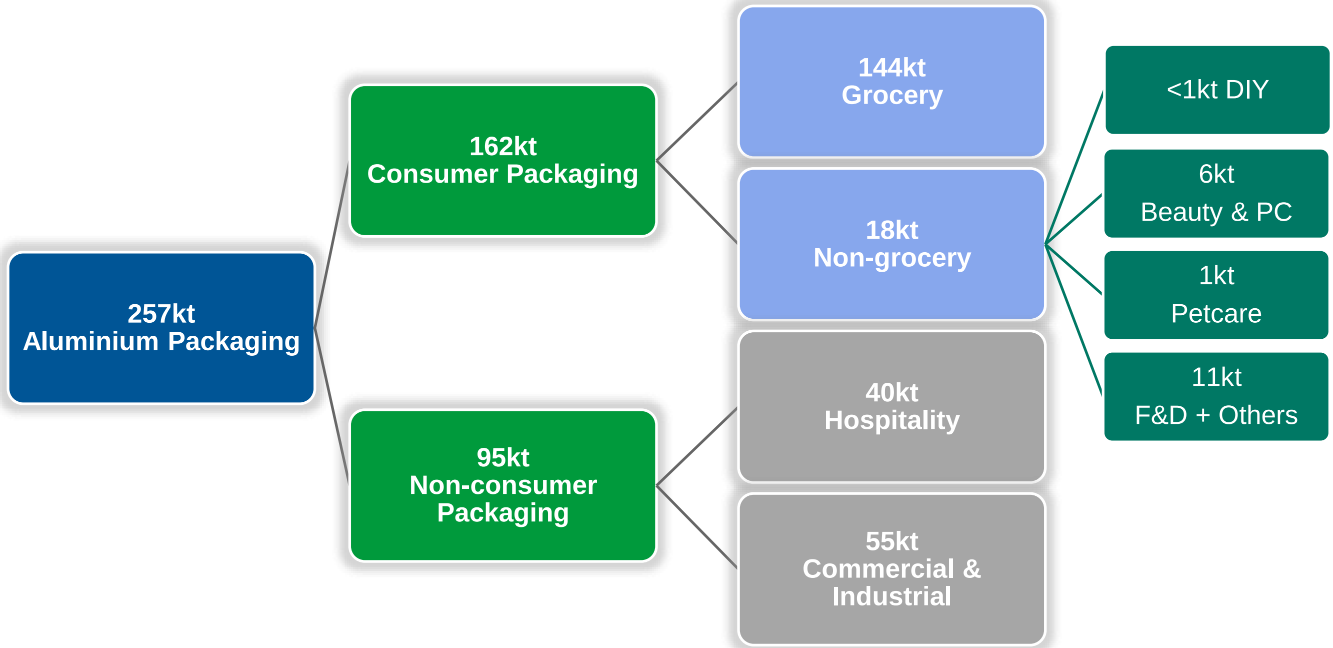
[2] Aluminium packaging placed on the market means all household and non-household aluminium packaging used around products sold and transported within the UK.

Aluminium Packaging POM

This report estimates aluminium packaging POM in 2022 to be 257k tonnes (+/- 5%)[3].

This estimate is derived by calculating obligated aluminium packaging POM from data reported in the National Packaging Waste Database (NPWD) by obligated producers using the net pack fill method. Estimates of 1% non-obligated packaging for aluminium are added to the obligated packaging POM to generate the total aluminium POM estimate. The results of this method are cross-checked against secondary research and data/information provided by the project's industry Stakeholder Group.

Figure 1: Aluminium Packaging POM by Sector, 2019 (k tonnes)



The estimate for aluminium packaging POM in the consumer sector is 162k tonnes 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 Stakeholder Group supporting the aluminium project.

The estimate for aluminium packaging POM in the non-consumer sector is 95k tonnes in 2022.

This estimate comprises an estimate of aluminium packaging in the hospitality sector based on primary and market share data and separate estimates of the amounts of direct sales of soft and alcoholic drinks based on industry sales figures. C&I aluminium packaging comprises the remaining part of non-consumer POM and is the residual tonnage once consumer and hospitality POM are deducted from total POM. There are no figures available to cross-check this data which may therefore include any missed tonnages of consumer grocery, consumer non-grocery and/or hospitality POM.

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 175kt, of which would fall to 39kt when material included in a DRS is removed.

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

Consumer Packaging in the Household Waste Stream

The total proportion of consumer aluminium packaging from Grocery retailers that is disposed of in the household waste stream is 67%. The total proportion consumer aluminium packaging from Non-Grocery retailers that is disposed of in the household waste stream is 70%. This is based on the same sample of retailers as us used in the rest of this report and equates to 109kt (67%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer aluminium packaging from Grocery retailers within the 'litterable' categories (as described in the material specific reports) is 85%. The total proportion of consumer aluminium packaging from non-Grocery retailers within the 'litterable' categories is 77%. This is based on the same sample of retailers as is used in the rest of this report and equates to 136kt of packaging in total.

Recycling

Aluminium packaging recycling (recorded & unrecorded) is estimated to be 157k tonnes in 2022.

This includes accredited (or recorded) recycling of 144k tonnes (NPWD) and an estimate for unrecorded recycling of 13k tonnes. Based on the POM estimate in this project, the overall aluminium recycling rate is 61% in 2022. The accredited (or recorded) aluminium packaging recycling rate is 56% in 2022.

Consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 141k tonnes in 2022.

Based on this project's POM estimate the consumer aluminium packaging recycling rate is 87% in 2022.

Non-consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 16k tonnes in 2022.

This is calculated by subtracting the consumer recycling tonnage from total aluminium packaging recycled. Based on this project's POM the non-consumer aluminium packaging recycling rate is 17% in 2022.

It is estimated that 98k tonnes of aluminium packaging is not recycled, of which 12k tonnes (13%) is estimated to be lost during energy recovery and 85k tonnes (87%) goes to landfill.

This is based on an estimated total of 21k tonnes of consumer aluminium packaging and 77k tonnes of non-consumer aluminium packaging not being recycled.

End Markets

In 2022 36% of aluminium packaging collected was recycled in the UK.

Based on NPWD figures for 2022, 36% of recorded aluminium packaging recycling took place in the UK and 64% overseas.

EU27+2 countries were the key markets for aluminium packaging exported from the UK.

EU27+2 countries were the key export destinations in 2022 (78% of exports), the largest markets being Germany (35%), Netherlands (15%) and Greece (9%). 16% of UK exports went to non-OECD Asian countries, notably Thailand (8% of exports). OCED countries received 6% of exported UK aluminium, the largest market being Korea (4% of exports).

Packaging Future Trends and Scenarios

Two EPR scenarios relevant to aluminium 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

Aluminium 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 69%. The POM projection is reflected in the projection of obligated tonnage for aluminium packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, aluminium packaging is projected to be higher relative to the business target 2024 to 2028.

EPR Scenario 2

Aluminium POM tonnage is projected to decrease in 2023 compared to 2022, with continuous year-on-year declines to 2026. 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 aluminium 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 aluminium 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

Aluminium Packaging POM

The area of greatest uncertainty around aluminium packaging POM estimates is around the quantities of 'other C&I' packaging in the non-consumer streams (i.e. C&I packaging, excluding hospitality packaging).

Aluminium Packaging POM Recycling

The data from the report shows the greatest source of unrecycled aluminium comes from non-consumer sources, with a significant number going to landfill. From here. Efforts should be places to investigate how much of this aluminium can be recycled and increase efforts to recycle aluminium coming from hospitality and C&I sources.

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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 for National Statistics

OTG – On-the-Go

PERN – Packaging Export 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 Recovery 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

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- The Aluminium Packaging Recycling Organisation (Alupro)
- The Metal Packaging Manufacturers Association (MPMA)
- The Advisory Committee on Packaging (ACP)
- The Packaging Federation
- The Recycling Association
- Wastepack
- 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 2022 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 2022 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[4]).

Phase 2

- Collates data and market intel on impact of the upcoming EPR changes (materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow 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 aluminium packaging placed on the market (POM) [5] in the UK that are as accurate as is reasonably possible. The report also considers the quantities of aluminium packaging recycled, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by aluminium recyclers in the UK.

1.2. Phase 1 Objectives

The PackFlow 2023 Refresh Project for aluminium packaging has the following key objectives for Phase 1:

- Provide updated (and cross-checked) baseline estimates of aluminium packaging placed on the UK market in 2022, by packaging format, polymer type, region, stream and source:
  - Format (e.g. drinks can, food can, aerosol)
  - Stream (e.g. consumer, non-consumer)
  - Source (e.g. obligated, non-obligated producer)
- Estimate the amount of packaging POM that could be disposed of within the DRS;
- Identify household (HH) and household-like (HH-like) categories;
- Identify commonly littered items;
- Estimate the quantities of aluminium packaging collected through CA sites, kerbside and pick-up collections and other collection types, by stream;
- Estimate the quantities of aluminium packaging recovered and recycled, sent for incineration with energy recovery, and sent to landfill for both UK and overseas end destinations; and
- Provide estimates of the quantities of aluminium packaging that is recycled (i.e. is recorded as accredited recycling) and aluminium packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).

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

1.3. Methodology

Recycling rates for aluminium packaging can be calculated as the quantity of aluminium packaging recycled divided by the quantity of aluminium 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[6]. An overview of how the POM and recycling rates for aluminium packaging are calculated in this project are provided below.

1.3.1. Aluminium Packaging – Obligated Total POM

Aluminium packaging POM is estimated using an assessment of the aluminium 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 Stakeholder Group. The baseline year is 2022, where 2022 data is not available the most recent available data is used.

1.3.1.1. Aluminium Packaging POM – Net Pack Fill

The net pack fill calculation is based on data reported to NPWD by registered, obligated producers. It is thought to capture the vast majority of the quantity of aluminium packaging that is obligated. But it does not cover aluminium packaging handled by non-obligated companies (who are below one or both of the thresholds of a turnover of £2m and handling 50 tonnes of packaging or more), free-riders (companies who are above the thresholds 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[7].

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

1.3.2. Aluminium Packaging Recycling

NPWD is the source of accredited (or recorded) recycling of aluminium packaging. Representatives from industry (including those involved in sorting, smelting and exporting metal) are also consulted on the amount of recycled aluminium 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 aluminium packaging.

The total aluminium 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 aluminium packaging in IBA and RDF, is the source for consumer aluminium recycling data with the difference between the WDF total and the overall total assumed to be non-consumer aluminium packaging recycling.

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

1.3.3. Data robustness

There are levels of uncertainty around the data used to establish the various elements that are combined to cross-check the total aluminium POM. Consumer aluminium packaging POM, Non-Consumer POM and total aluminium 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[8], as shown in Table 1. The respective margins of error are provided throughout the report.

Table 1: 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).

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

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2. Phase 1: Aluminium Packaging POM

2.1. Introduction

This section of the report presents estimates of aluminium 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 aluminium packaging onto the UK market. Consumption of goods using aluminium packaging can occur both in the consumer (in the home and on the move) and non-consumer (by business) streams.

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

- Drinks containers – most cans with aluminium formats are used for soft and alcoholic drinks.
- Food cans – mainly steel but some aluminium 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 aluminium packaging such as foil containers and trays, plain foils, tins and closures.

2.2. Aluminium POM (Net Pack Fill)

The 2022 UK flow of aluminium 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 1.3.1.1 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 Stakeholder Group believe[9] 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 pack 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 aluminium POM in 2022 is 254k tonnes for aluminium packaging (as shown in table 1)[10].

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.

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

Table 2: Obligated Packaging (Net Pack Fill Total), 2022 (k tonnes) – Using NPWD Data from September 2023

	Aluminium
Table 1 Pack fill (UK pack filling)	219
Imports	50
3A Selling (filled imports)	49
3B (packaging removed from imports)	1
Total	**269**
2A P/F (direct exports)	28
2B P/F (third party exports)	4
Total Exported	**32**
Net Pack Fill	**236**

This method does not account for aluminium 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 aluminium packaging. Based on the feedback from this project's Stakeholder Group, it is believed the majority of unobligated producers import aluminium packaging. Estimates of the unobligated quantities are ~3k tonnes (or 1% of aluminium packaging POM) are carried forward to this report from the previous MetalFlow[11] project.

Combining the estimates of obligated and non-obligated packaging gives 2022 estimates of 257k tonnes (+/- 5%) for aluminium packaging POM.

2.2.1. Stakeholder Group Data

Members of this project's Stakeholder Group[12] and wider industry stakeholders provided confidential data on the flows of aluminium packaging onto the UK market. All data received was considered to be broadly in line with this project's 2022 estimates of POM for aluminium packaging.

2.2.2. Aluminium POM Cross-check

This section of the report provides an overview of how aluminium packaging flows onto the UK market and provides a cross-check for the net pack fill methodology used in section 1.3.1.1.

[11] https://www.wrap.org.uk/content/metal-flow-2025-%E2%80%93-metal-packaging-flow-data-report

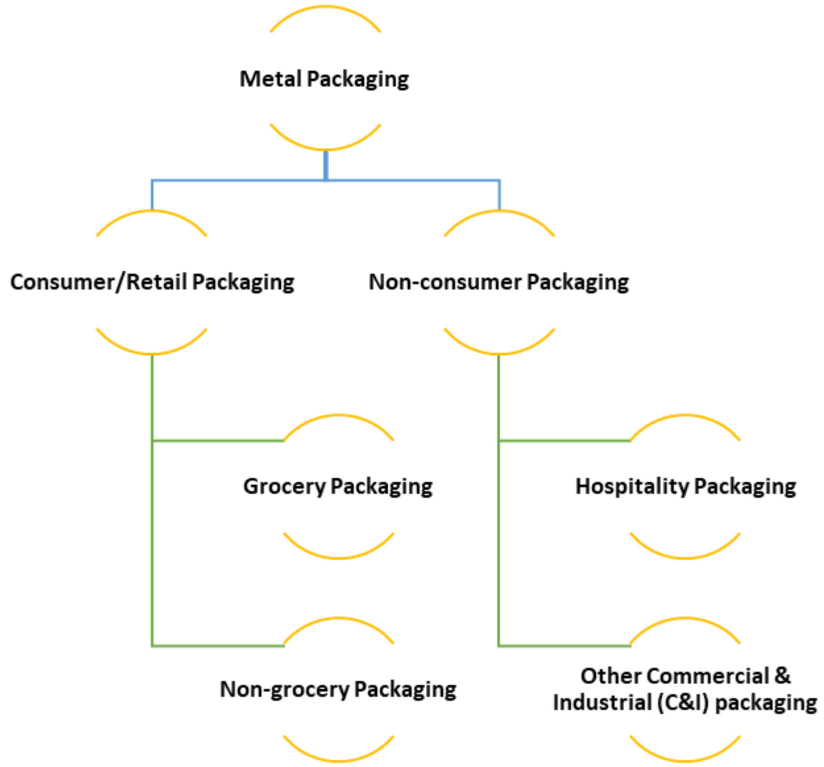
[12] *A list of Stakeholder Group members can be found in the acknowledgements section of this report.*

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/retail packaging POM for aluminium packaging.

For each material non-consumer packaging is established by subtracting the consumer/retail 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 aluminium packaging that have been missed in those sectors.

Figure 2: Aluminium POM Breakdown by Sector



A composite packaging item is considered to be aluminium if aluminium is the predominant material by weight in the composite[13].

2.3. Consumer Aluminium Packaging POM

For the purposes of this report, the consumer sector is divided into consumer grocery and consumer non-grocery packaging separately for aluminium packaging. The addition of these two sub-sectors equates to the total consumer sector POM for each material.

[13] The EA definitions of composite and multi-layered packaging are defined in, the 'Agreed position and technical interpretations – producer responsibility for packaging'. Composite packaging is: 'multi-layered sheets of dissimilar materials which are bonded together and cannot be separated by hand', such as laminated paperboard, whereas multi-material packaging is: 'packages constructed of assembled components of different material', such as a blister pack made from cardboard and plastic and can be separated by hand. Within the technical interpretations guidance, the packaging weight for laminate packaging 'should be recorded under the predominant material by weight', compared to multi-material packaging weights, which should be recorded separately, by the different component materials.

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 aluminium 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.

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).

2.3.1. Consumer Grocery Aluminium POM

A dataset provided by the Environment Agency (EA) is used to estimate consumer grocery POM for aluminium packaging. The EA data is the 2022 sales quantities of aluminium packaging reported in table 1 selling from NPWD (less export) for a sample for UK grocery retailers representing 54% of all UK grocery retail sales. The figures for this sample of UK grocery retailers are scaled to 100% of the UK grocery market.

Aluminium packaging POM in the consumer grocery sector is estimated to be 144k tonnes (+/-6%) in 2022.

The aluminium packaging POM figure in the consumer grocery sector for 2022 is ~18% higher compared to the 2019 estimate of 122k tonnes.

2.3.2. Consumer Non-Grocery Aluminium POM

Key categories of products using aluminium packaging sold through non-grocery retailers are identified and the associated tonnage of aluminium packaging estimated. These categories are: Beauty & personal care (B&PC), DIY, and Petcare, as per the previous MetalFlow 2022, and a Food, drink and other grocery category. 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.

Aluminium packaging POM in the consumer non-grocery sector is estimated to be 18k tonnes (+/-6%) in 2022.

The aluminium packaging POM figure in the consumer grocery sector for 2022 is ~33% lower compared to the 2019 estimate of 27k tonnes.

2.3.2.1. Beauty and Personal Care

Valpak's EPIC data suggests that 4% of aluminium packaging (by weight) is used to package beauty and personal care products. Applied to total consumer grocery POM (see section 2.3.1) this gives 11k tonnes of aluminium packaging. Using 2022 market data[14] that 39% of beauty and personal care items are purchased at supermarkets (consumer grocery retail), this suggests the remaining 61% or 7k tonnes of aluminium are purchased from non-grocery retail stores.

It is possible that the 39% supermarket share is an underestimate for aluminium packaged beauty and personal care products which are predominantly deodorant aerosols; 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 deodorant aerosols.

Table 3: Beauty & Personal Care – Aluminium Packaging, 2022 (k tonnes)

	Grocery retail	Non-grocery retail	**Total retail**
Aluminium	4	6	**11**

2.3.2.2 DIY

There is a negligible amount of aluminium packaging used in DIY retail stores.

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[15]. The quantity of pet food packaging sold outside of grocery retail uses this split and the quantity of aluminium pet food packaging sold in grocery retail (proportion of petcare packaging in EPIC applied to scaled-up EA grocery data, see section 2.3.1. Estimates of aluminium in the petcare sector are shown in Table 4.

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[14] *Sourced from Mintel*
[15] *Euromonitor International/Mintel*

Table 4: Petcare – Aluminium Packaging POM, 2019 (k tonnes)

	Grocery retail	Non-grocery retail	Total retail
Aluminium	3	1	**4**

In comparison to the 2022 petcare data reported in the previous report MetalFlow 2025[16], the quantities of petcare products using aluminium packaging appear to have decreased slightly in consumer and non-consumer sections.

2.3.2.4. Food, Drink and Other Grocery Products[17]

In order to estimate the sales of food, drink and other grocery products through non-grocery stores, 2022 IGD market data is used. This suggests that around 86% of food and grocery products are bought from supermarkets and around 14% are bought from non-grocery outlets.

Using this split and the quantity of aluminium pet food packaging sold in grocery retail (proportion of food, drin3k and grocery packaging in EPIC applied to scaled-up EA grocery data, see section 2.3.1, minus any Petcare or B&PC products), the quantity of food, drink and other grocery products sold outside of grocery retail is calculated and shown in Table 5.

Table 5: Food, Drink & other Grocery – Aluminium Packaging, 2022 (k tonnes)

	Grocery retail	Non-grocery retail	Total retail
Aluminium	136	11	**147**

2.3.3. Summary of Consumer Aluminium Packaging POM

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

- Total aluminium consumer packaging POM is 162k tonnes in 2022
    - 144k tonnes is aluminium packaging in consumer grocery retail
    - 18k tonnes is non-grocery retail aluminium packaging.

2.4. Non-consumer Aluminium Packaging POM

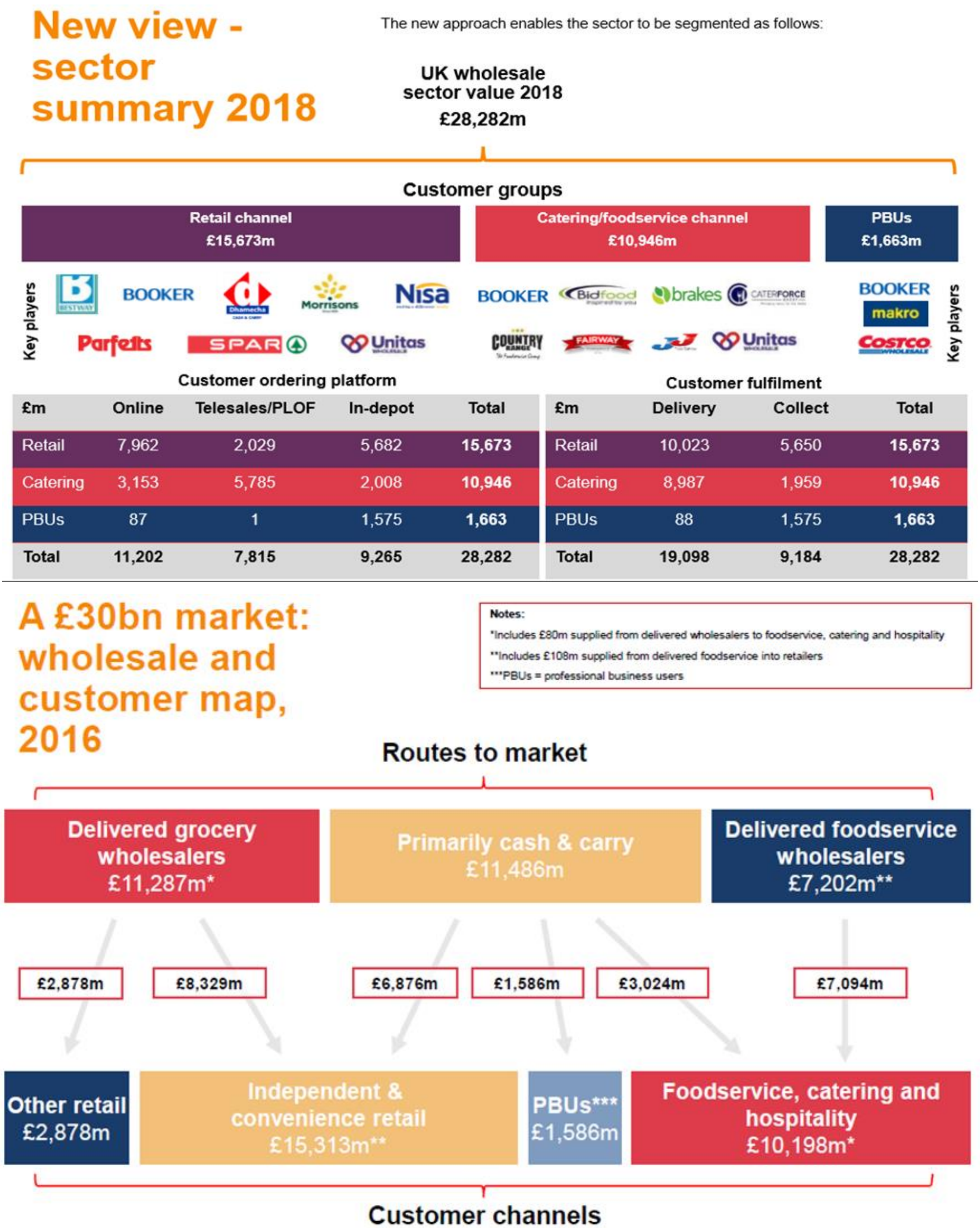
To complete the breakdown of POM totals for aluminium packaging requires an estimate of non-consumer packaging POM. Non-consumer packaging has been split into the two key sectors in the non-consumer sector: hospitality and other C&I.

2.4.1. Hospitality POM

Estimates of aluminium packaging used in the hospitality industry are made using newly available Valpak EPIC data relating to 34% of the cash and carry and delivered foodservice industry[18]. 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.

[16] https://www.valpak.co.uk/more/material-flow-reports/metalflow-2025
[17] *Other grocery products excludes beauty and personal care and petcare products which are estimated separately*
[18] *Valpak's EPIC database holds sales data and packaging weights information for clients signed up for the fully managed service.*

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



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

This method estimates 17k tonnes of aluminium 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 6.

Table 6: Breakdown of Hospitality Packaging by Source, 2022 (k tonnes)

	Aluminium
Wholesale and Foodservice (scaled-up from EPIC)	17
Additional direct sales of soft drinks	5
Additional direct sales of alcoholic drinks	8
Additional adjusted tonnage [19]	10
Total Aluminium Packaging in Hospitality	**40**

Additional direct sales of soft drink cans are estimated by taking the total volume sales of soft drinks and the proportion sold in aluminium packaging. Valpak's EPIC grocery split of aluminium to steel drinks cans is used as a proxy to apportion the aluminium soft drinks cans, giving the total volume (litres) of aluminium soft drink cans. EPIC data is also used to provide a proxy for the litres per gram of packaging, which gave a total of 65k tonnes aluminium soft drinks packaging. Subtracting the already identified quantities of packaging from these totals, left the 'missing' packaging of 5k tonnes aluminium soft drinks packaging.

Additional direct sales of alcoholic drinks packaging are 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 are subtracted. The hospitality aluminium/steel can unit split established in the Drinks Recycling OTG[20] report is used to estimate the number of aluminium cans, and an average hospitality can weight was applied[20] to each. This generated an estimate of 8k tonnes of 'missing' alcoholic aluminium drinks cans. These estimates are considered low/minimum as they relate only to beer, and only to pubs, and therefore not to all alcoholic drinks sold in hospitality outlets.

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.
For aluminium, the initial estimate was 63k tonnes, but the Stakeholder Group agreed that it would make better sense to transfer 10k tonnes from other C&I to hospitality to align with Alupro's 2022 estimates for aluminium cans and also provide a more realistic balance between hospitality and other C&I.
Minimal data exists on C&I packaging outside of hospitality, in particular for aluminium. It is known that aluminium is used to some extent in the manufacture of gas canisters, drums and industrial aerosols, but no figures to illustrate the respective quantities are available.

The total other C&I POM estimate for aluminium packaging is 55k tonnes in 2022.

To establish the other C&I indicative error margin, the combined error margins of consumer grocery, consumer non-grocery and hospitality POM are used, as other C&I is the residual figure once these three streams are subtracted from total aluminium packaging POM.

2.5. Scheme Administrator Submissions

[19] *The Stakeholder Group agreed to adjust split between hospitality and C&I.*
[20] *WRAP Drinks Recycling On-the-Go 2018, http://www.wrap.org.uk/consumption-recycling-and-disposal-go-drinks-containers.*

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 175kt, of which would fall to 39kt when material included in a DRS is removed.

Table 7: Total Expected Scheme Administrator Submissions (kt)

	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Aluminium - All	257	162	95	40	13	175
Aluminium - excluding DRS	62	39	23	0	0	39

3. POM Cross-check (Net Pack Fill)

3.1. Introduction

This section of the report is used as a cross-check of the total aluminium POM in the UK in 2022, based on the data stored on NPWD, as reported to the EA by obligated organisations.

This method is not used to estimate total flow as it does not include non-obligated businesses or those not reporting in the system as described below, but to provide a sense check on the total flow and allow for non-obligated flow to be estimated.

3.2. Net Pack Fill

The 2022 UK flow of aluminium packaging was calculated using the packaging weights reported to the EA by registered producers and is made publicly available on the NPWD website. On discussion with the Steering Group, Valpak selected the below methodology as the most appropriate for aluminium.

The net pack fill calculation used is shown 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

This methodology took the weight reported at the *packing* stage of the supply chain as opposed to the *selling* stage of the supply chain. This was used as it is believed by stakeholders[21] that there would be fewer unobligated packers in comparison to unobligated sellers, due to the likely size of the businesses. In addition, raw material manufacturing will include process losses, i.e. not everything manufactured will be converted or pack/filled, so it is expected that the tonnage goes down moving down the supply chain.

Using this method, the total obligated aluminium POM in 2022 is 213k tonnes.

Table 8: Obligated Aluminium Packaging (Net Pack Fill), 2022 (k tonnes) Registrations to Date[22]

	Aluminium
Table 1 Pack/Fill (UK pack/filling)	184
Imports:	
3A Selling (filled imports)	42
3B (packaging removed from imports)	1
Total	**227**
2A P/F (direct exports)	12
2B P/F (third party exports)	2
Total Exported	13
Net Pack Fill	**213**

This method does not account for aluminium packaging handled by:

- Producers who are yet to register in 2023
  - Valpak have made an estimate as to the additional tonnage that will be added – this takes the full projected net pack fill to tonnes.
  - This projection has been shared with stakeholders throughout the process.

[21] *No evidence data is available to support this.*

[22] *Consolidated tables for all activities extracted from NPWD on 28th September 2023.*

- Unregistered producers, which was likely to include the following:
    - Non-obligated producers – those below the registration thresholds of 50 tonnes of packaging or £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 packaging. Based on feedback from the stakeholder group, it is believed that the number of pack/fillers who are unobligated is small due to the likely volumes handled by the types of companies performing this activity.

4. Summary of Aluminium Packaging POM

Aluminium packaging POM is estimated in 2022 to be 257k tonnes.
This estimate is derived by calculating obligated aluminium packaging POM from data reported in the National Packaging Waste Database (NPWD) by obligated producers using the net pack fill method. Estimates of 1% non-obligated packaging for aluminium are added to the obligated packaging POM to generate the total aluminium POM estimate. The results of this method are cross-checked against secondary research and data/information provided by the project's industry Stakeholder Group.

Aluminium packaging POM in the consumer sector is estimated to be 162k tonnes 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 Stakeholder Group supporting the aluminium project.

Aluminium packaging POM in the non-consumer sector is estimated to be 95k tonnes in 2022.
This estimate comprises of an estimate of aluminium packaging in the hospitality sector based on primary and market share data to which separate estimates of the amounts of direct sales of soft and alcoholic drinks based on industry sales figures are added. C&I aluminium packaging comprises the remaining part of non-consumer POM and is the residual tonnage once consumer and hospitality POM are deducted from total POM. There are no figures available to cross-check this data which may therefore include any missed tonnages of consumer grocery, consumer non-grocery and/or hospitality POM.

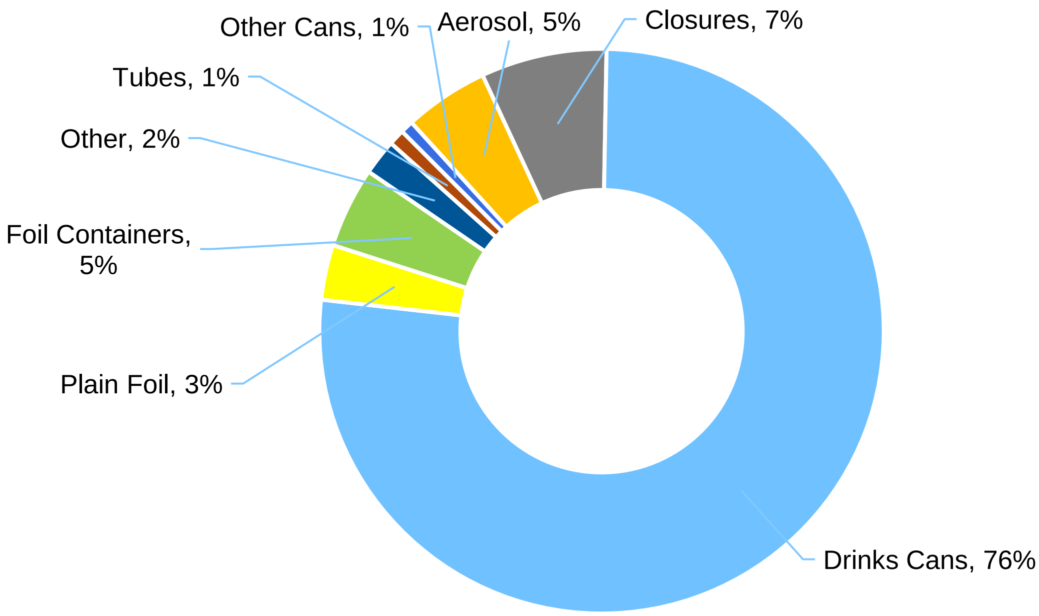
Table 9: Total Aluminium Packaging POM Breakdown by Stream, 2022 (k tonnes)

	Aluminium
Consumer grocery retail	144
Consumer non-grocery retail	18
Total consumer retail	**162**
Non-consumer hospitality	40
Non-consumer other C&I	55
Total non-consumer	**95**
Total aluminium packaging POM	**257**

4.1. Aluminium Packaging POM by format

The composition of aluminium packaging in the consumer grocery stream in 2019, as identified through Valpak's EPIC database, are illustrated in Figure 4.

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



A note about the aerosols is that the weight of the can is slightly higher than expected. This is because there was noted to be a small amount of steel, which may have increased the overall weight of the can by 5-10%. However, after discussion with the stakeholders, the tonnage is listed as correct, as the primary material in the cans is aluminium, so listing these items as aluminium aerosols is correct.

Table 10: Total Aluminium in Hospitality

	Aluminium (t)
Wholesale and Foodservice (scaled-up from EPIC)	17
Additional direct sales of soft drinks	5
Additional direct sales of alcoholic drinks	8
Additional adjusted tonnage [23]	10
Total Aluminium Packaging in Hospitality	**40**

[23] *The Stakeholder Group agreed to adjust split between hospitality and C&I.*

5. Scheme Administrator Submissions (formally 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 UKs 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 like 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 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 bricks and mortar) or from takeaway hospitality.

In most instances, it is fairly clear as to whether products are provided for public/consumers or not. One such specific nuance is around some products that are bought within a hospitality setting but that could be consumed within premises or could be taken away. Particularly prevalent 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 11: Total Expected Scheme Administrator Submissions

	Total POM	Total Consumer	Total Non-Consumer	Total Hospitality	Total Hospitality - Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Aluminium - All	257	162	95	40	13	175
Aluminium - excluding DRS	62	39	23	0	0	39

6. Consumer Packaging in 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.

6.1. 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.

6.2. 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[24] [25].
- 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.

6.3. 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.

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

6.4. 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:

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.

6.5. 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.

6.6. 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).

6.7. Household Waste – Anticipated Composition: Aluminium

Based on the methodology detailed above, the total proportion of consumer aluminium packaging from Grocery retailers that is disposed of in the household waste stream is 67%. The total proportion consumer aluminium packaging from Non-Grocery retailers that is disposed of in the household waste stream is 70%. This is based on same sample of retailers as us used in the rest of this report and equates to 109kt (67%) of packaging in total across both Grocery and Non-Grocery retail (consumer packaging).

The proportion of Grocery and non-grocery aluminium packaging within the household waste stream is detailed in Table 12 below.

Table 12: Proportion of aluminium packaging disposed of within the household waste stream, 2022 (%)

	Grocery	Non-Grocery
Other	71.4%	71.4%
Aerosol	78.3%	78.3%
Closures	70.4%	70.4%
Drinks Cans	63.9%	63.7%
Foil Containers	78.2%	78.2%
Other Cans	85.9%	85.9%
Plain foil	77.8%	77.8%
Tubes	93.3%	94%

7. 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[26] 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 the 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.

7.1. Litterable Packaging – Anticipated Composition: Aluminium

Based on the methodology detailed above, the total proportion of consumer aluminium packaging from Grocery retailers that falls within the 'litterable' categories detailed above is 85%. The total proportion consumer aluminium packaging from non-Grocery retailers that falls within the 'litterable' categories is 77%. This is based on same sample of retailers as is used in the rest of this report and equates to 136kt of packaging in total.

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

Table 13: Proportion of aluminium packaging that falls within the litterable categories, 2022 (%)

	Grocery	Non-Grocery
Other	18.9%	18.8%
Closures	71.6%	71.5%
Drinks Cans	98%	99%
Foil Containers	18%	1%
Plain foil	58.2%	59.9%
Tubes	7.3%	7.8%

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

8. By Nation Reporting

8.1. Introduction

In this section of the report, the POM (placed on market) was separated 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.

8.2. 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.

8.2.1. Agriculture

Valpak considered national statistics for agriculture relating to employment[27], income, the number of holdings and the total hectares[28] 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 / 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

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

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

8.2.2. 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	67,026,000	84%
Northern Ireland	1,905,000	3%
Scotland	3,105,000	8%
Wales	56,536,000	5%

8.2.3. Construction

Various factors were considered within construction sector, however, as is the case in agriculture, the total employment[29] [30] 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%

8.2.4. GDP

Those aspects of POM in the Non-Consumer (manufacturing) sectors were scaled by GDP[31] to represent manufacturing output.

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

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

[31] 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

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%

8.2.5. 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[32]. 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%

8.3. 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 2022 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

32 https://assets.publishing.service.gov.uk/media/5d67a363ed915d53b4904899/Hospitality_and_Tourism_Workforce_Landscape.pdf

8.4. POM by Nation – Aluminium

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

Figure 5: POM by Nation – Aluminium

Aluminium Packaging	
2022 POM	255 kT
England	215 kt
Wales	12 kt
Scotland	20 kt
Northern Ireland	8 kt

Consumer / Retailer packaging	
2022 POM	162 kt
England	137 kt
Wales	8 kt
Scotland	13 kt
Northern Ireland	5 kt

Non-Consumer Packaging	
2022 POM	93 kt
England	78 kt
Wales	5 kt
Scotland	7 kt
Northern Ireland	3 kt

Grocery Packaging	
2022 POM	144 kt
England	121 kt
Wales	7 kt
Scotland	12 kt
Northern Ireland	4 kt

Non Grocery packaging	
2022 POM	18 kt
England	15 kt
Wales	1 kt
Scotland	1 kt
Northern Ireland	1 kt

Hospitality	
2022 POM	40 kt
England	33 kt
Wales	3 kt
Scotland	3 kt
Northern Ireland	2 kt

Other C&I	
2022 POM	53 kt
England	46 kt
Wales	2 kt
Scotland	4 kt
Northern Ireland	1 kt

DIY	
2022 POM	0 kt
England	0 kt
Wales	0 kt
Scotland	0 kt
Northern Ireland	0 kt

Beauty & Personal Care	
2022 POM	6 kt
England	5 kt
Wales	0 kt
Scotland	1 kt
Northern Ireland	0 kt

Petcare	
2022 POM	1 kt
England	1 kt
Wales	0 kt
Scotland	0 kt
Northern Ireland	0 kt

F&D + Others	
2022 POM	11 kt
England	9 kt
Wales	0 kt
Scotland	1 kt
Northern Ireland	0 kt

9. Phase 1: Collection & Reprocessing of Aluminium Packaging

9.1. Aluminium Packaging Recycling

This section of the report examines the levels of aluminium packaging waste collected in the UK and then recycled, either in UK domestic smelters or overseas. The collection streams are split between consumer (Local Authority managed collections from households) and non-consumer collections. Waste Data Flow (WDF), combined with adjustments for consumer aluminium in incinerator bottom ash (IBA) and refuse derived fuel (RDF), is used to estimate household recycling and data from NPWD is used for total accredited (or recorded) recycling. However, NPWD figures do not account for unaccredited (unrecorded) aluminium packaging recycling, therefore this project provides a separate analysis on this element to estimate a total (recorded + unrecorded) aluminium packaging recycling figure.

9.1.1. Recorded Recycling of Aluminium Packaging

NPWD is used to identify the total recorded recycling of aluminium packaging, for both UK domestic recycling and export recycling. For 2022, this shows 157k tonnes of recycling of aluminium packaging, of which 57k tonnes (36%) took place in the UK. Of the total (UK and exports), 121k tonnes (77%) relates to the recycling of aluminium cans and associated packaging, 35k tonnes (22%) is from the recycling of aluminium packaging in incinerator bottom ash (IBA) and 3k tonnes (2%) is from other protocols agreed with the regulators.

Based on the total aluminium POM estimated in this report (257k tonnes), the total recorded recycling figure of 144k tonnes gives a recorded recycling rate for aluminium packaging of 56% in 2022.

9.1.2. Unrecorded Recycling of Aluminium Packaging

It is important to recognise that not all aluminium recycling is captured on NPWD. To identify the scale of unrecorded recycling, conversations were held with the Stakeholder Group as well as UK operators and exporters handling recovered aluminium packaging. Firstly, conversations focused on any unaccredited recycling or export of the key grades of aluminium packaging (excluding IBA). This relates to the recycling of aluminium cans and associated packaging (e.g., aerosols and foils), but also to other grades, such as caps and closures generated from the glass recycling sector.

The general feeling was that much of the aluminium packaging recycling of this type is being captured because key players specialising in packaging recycling are accredited and there is an economic incentive to keep grades, such as used beverage cans (UBCs), separate from other streams of aluminium. However, it was felt that some aluminium packaging is being lost (in terms of data capture), for example, at large metal yards where smaller quantities of aluminium packaging might be accepted, but where the scale of the operation means that it is not practical to keep it as a separate grade and so it is mixed with non-packaging aluminium.

Based on input from industry, it is estimated that the recorded recycling of key grades of aluminium packaging (excluding IBA) on NPWD in 2022 is 98%. That is to say that the data on NPWD accounts for 98% of the actual recycling of these grades of aluminium. For exports, the estimate was the same. This equates to 1k tonnes of unrecorded aluminium packaging recycling occurring in the UK and k tonnes for exports.

A second area investigated the recycling of the non-ferrous metal fraction recovered from IBA. For this grade of non-ferrous metal there are two national PRN protocols in place: one for unprocessed non-ferrous IBA metal, where there is a protocol of 70% aluminium packaging in place, and the other for part processed non-ferrous IBA metal, where an 87.5% protocol is used. Conversations with industry suggested that not all recycling of this grade was captured on NPWD in 2022 and so an estimate of the missing tonnage was made.

On the assumption that all IBA is treated, and the non-ferrous content recovered, there was 12k tonnes of unrecorded aluminium packaging recycling related to IBA processing in 2022.

Finally, UK RDF exports and the aluminium packaging content was investigated. As with Energy from Waste Plants (EfW) in the UK, this analysis assumes that any RDF exported to mainland Europe is treated in a plant where the IBA is processed, and the non-ferrous metal content recycled. In 2022 1,448k tonnes of RDF was exported from the UK[33] with an estimated aluminium packaging content of 0.75%[34]. However, there is a loss of aluminium packaging during incineration which must be taken into consideration. This loss varies depending on the thickness of the aluminium and therefore the mix of packaging that makes up the 0.75%. It is assumed here that the transfer rate during incineration is 80% with a loss of 20%. This figure is approximate but takes into consideration research on transfer rates by the European Aluminium Association and Alufoil[35] and input from Alupro.

Based on these assumptions, the unrecorded recycling estimate of aluminium packaging in RDF is 9k tonnes in 2022. Taking into consideration the aforementioned factors, the total unrecorded (unaccredited) recycling of aluminium packaging in 2022 is estimated to be 13k tonnes.

9.1.3. Total Recycling of Aluminium Packaging

Total aluminium packaging recycling (recorded + unrecorded) can be calculated by combining the recorded recycling on NPWD with estimates of unrecorded aluminium packaging recycling:

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

This methodology estimates the total tonnage of aluminium packaging recycled to be 157k tonnes in 2022. Based on this project's aluminium packaging POM (254k tonnes), the total aluminium packaging recycling rate is 61% in 2022.

9.2. Aluminium Packaging Recycling by Sector

9.2.1. Consumer Recycling of Aluminium Packaging

Consumer recycling data is extracted from WDF where the latest available reported figures are for the financial year 2021/22. This means there is a degree of inconsistency between the collection figures for April 2021 - March 2022 and the consumption figures for January 2022 - December 2022[36]. A summary of aluminium packaging collections is shown in Table 21.

Table 21: Aluminium Packaging Collection, WDF Data 2021/22 (k tonnes)

	Total	Kerbside	Bring	CA
Aluminium packaging collected	101	99	0.9	0.6

A significant proportion of the aluminium packaging in the total in Table 21 is generated from *mixed cans;* it has been assumed, based on WDF analysis, that the aluminium content of mixed cans is 35%, with the remainder being steel tins and cans.

The WDF data in Table 21 does not include figures for consumer aluminium packaging that is recycled from IBA or RDF processes and so estimates are made for these. For IBA, Tolvik[33] reports that of the 15.32m tonnes of waste inputs to UK energy from waste plants in 2022, 76.3% was MSW and the remainder C&I. This 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 aluminium content in both the MSW and C&I is similar.

Assuming that 76.3% of the aluminium packaging recycled from IBA is consumer then consumer recycling of aluminium packaging amounts to approximately 32k tonnes in 2022. RDF is typically produced with a mix of

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[33] *UK Energy from Waste Statistics – 2022, Tolvik Consulting.*

[34] *Metal content percentages in RDF were based on in-house information and conversations with industry.*
[35] *European Aluminium Association / Alufoil: Fact Sheet (February 201) More aluminium packaging recovered from incinerator bottom ashes than expected!*
[36] *Cleansed and partially analysed WDF data.*

household and C&I waste to achieve target specifications for EfW plants. Here it is assumed that 100% of the aluminium recycled is from consumer sources, which amounts to approximately 9k tonnes.
Combining the above, it is estimated here that in total there is 141k tonnes of aluminium packaging recycling from consumer sources. Based on this project's consumer POM figure (162k tonnes), this is a recycling rate of 87% for consumer aluminium packaging.

9.2.1. Non-consumer Recycling of Aluminium Packaging

Non-consumer aluminium packaging recycling is estimated as follows:

Table 22: Non-consumer Aluminium Packaging Recycling, 2022 (k tonnes)

Non-consumer recycling	=	Total aluminium packaging recycled	-	Consumer recycling

Total UK aluminium packaging recycling	157t
Aluminium consumer recycling	141t
Aluminium non-consumer recycling	16t

Table 22 gives the amount of non-consumer aluminium packaging recycling as 16k tonnes in 2022. Based on this project's non-consumer POM estimate, this is a recycling rate of 17%. It should be noted that this figure is likely to be low due to the presence of some non-consumer aluminium packaging both in that reported on WDF and in the MSW supplied to UK EfW plants.

9.3. Aluminium Packaging Not Recycled

Subtracting the consumer and non-consumer recycling totals from the respective total packaging POMs gives estimates of the quantities of aluminium not recycled for each of the consumer and non-consumer streams.
For consumer aluminium packaging, it is estimated that a total of 21k tonnes is not recycled in 2022. An analysis of municipal waste data from the Department for Environment, Food & Rural Affairs (Defra, for England), the Scottish Environment Protection Agency (SEPA), StatsWales and the Department of Agriculture, Environment and Rural Affairs (DAERA, for Northern Ireland) was used to estimate the percentage of residual household waste that was sent to Energy from Waste (EfW) and landfill.

For aluminium not recycled, the method here includes an estimate for the aluminium lost during incineration both in UK EfW plants and those overseas accepting UK derived RDF. A transfer rate of 80% is assumed, with a loss of 20% of the aluminium during the process. This accounts for 10k tonnes of the total. The remaining 11k tonnes is an estimate of consumer aluminium packaging contained in residual waste sent to landfill.

For non-consumer aluminium packaging, the non-recycled total is 77k tonnes in 2022. As for consumer aluminium packaging, an estimate is made for loss during incineration both in the UK and overseas using the same methodology.

This accounts for approximately 2k tonnes of the total. The remainder 74k tonnes is an estimate of non-consumer aluminium packaging contained in residual waste sent for landfill. Overall, the total aluminium that was not recycled was 98k tonnes.

10. Phase 1: End Markets for Aluminium Packaging

10.1. Aluminium Packaging End Markets

Recycled aluminium from used beverage cans (UBCs) packaging typically goes back into rolled aluminium products, including new cans. Most other grades of recycled aluminium, such as that derived from IBA or from foils or from caps and closures, is currently used in cast applications (for example). Based on NPWD figures for 2022, 36% of recorded aluminium packaging recycling took place in the UK and 64% overseas. A freedom of information request was made to the Environment Agency to determine where aluminium packaging was exported to for recycling, by tonnage.

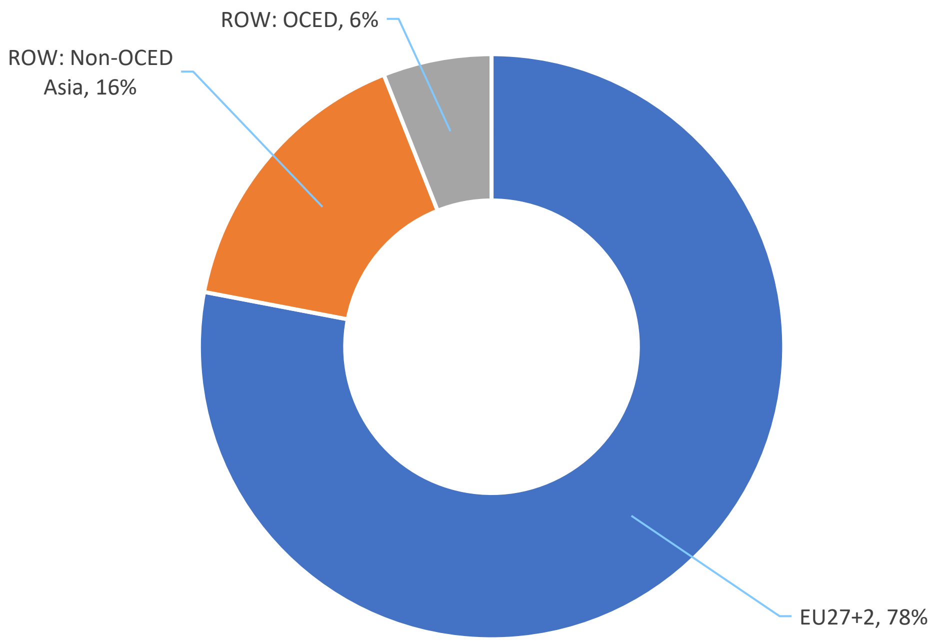
These figures exclude any non-aluminium packaging that might be present.

It can be seen from the breakdowns given in Table 23 that a large proportion of exports were to the EU+2 countries (78%) with the remainder primarily sent to non-OCED Asian countries.

Table 23: Destination of UK Aluminium Packaging Exports by Region, 2022 (k tonnes)

Export Regions	
Region	**Export Tonnage**
EU+2	78
ROW: Non -OCED Asia	16
ROW :OECD	6

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



A Freedom of Information Act request was made to the Environment Agency for information on where UK waste packaging was exported to in 2022.In terms of the destination country for aluminium packaging exported from the UK in 2019, 59% went to the top 3 destinations, namely, Germany, the Netherlands and Belgium. 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.

Table 24: Aluminium Packaging Exports – Top 10 Destination Countries, 2022 (%)

Top 10 export destinations	
Country	**% of exports**
Germany	35%
Netherlands	15%
Greece	9%
Thailand	8%
Norway	7%
Korea	4%
Belgium	3%
Poland	3%
Saudi Arabia	3%
India	3%

Data source: UK Environment Agency. Freedom of Information request

11. Phase 2: Packaging Future Trends and Scenarios

11.1. 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 the 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[37]).

Phase 2

- Develop scenarios for packaging materials flow and recycling from 2022 to 2028[38]
- Assess likely future recycling performance.

11.2. 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[38] 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.

11.3. Methodology

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

11.3.1. Net Pack Fill

This report uses historic NPWD[39] 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

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

12. Trends in Packaging POM by Material

12.1. Introduction

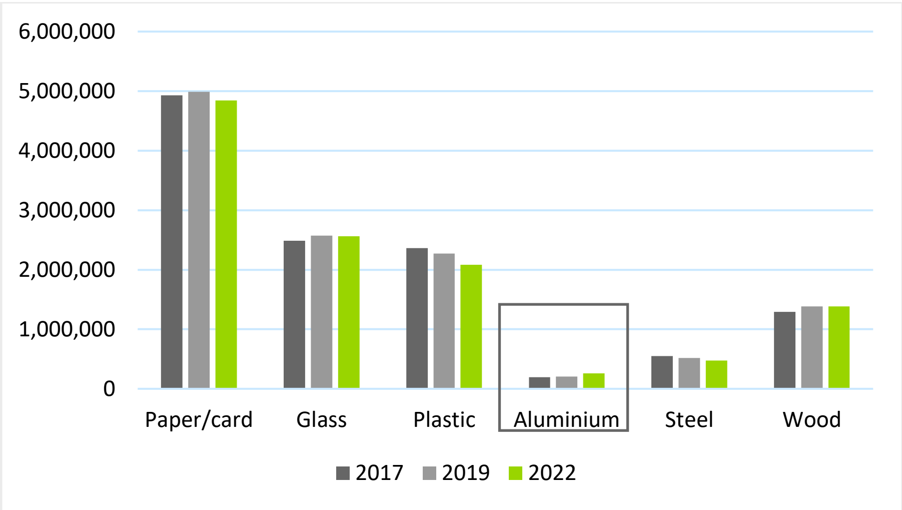
This section of the report uses NPWD time-series data on packaging handled by obligated producers, by type of packaging material, from 1998 to 2021 – this dataset represents the maximum number of annual observations available.

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 7 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 7: 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 8 shows the estimates of trend in packaging materials POM (by weight) by material type from 1997 to 2021. In general, POM[40] 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.

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[40] 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.

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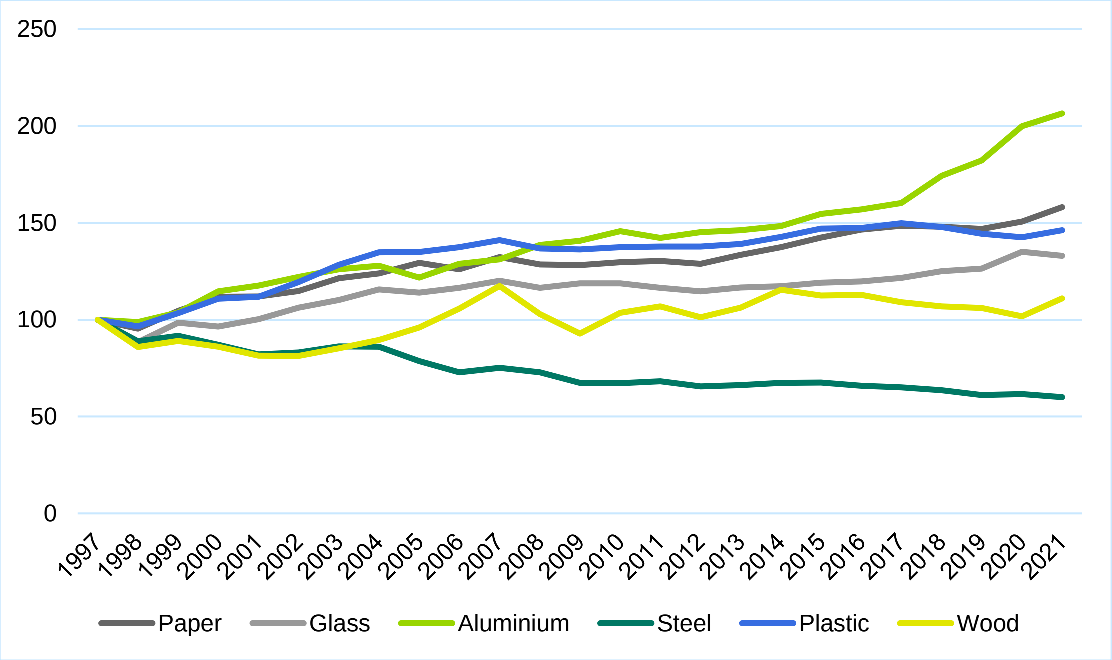
Figure 8: Packaging POM trends by material, 1997 - 2021 (indexed 1997=100)

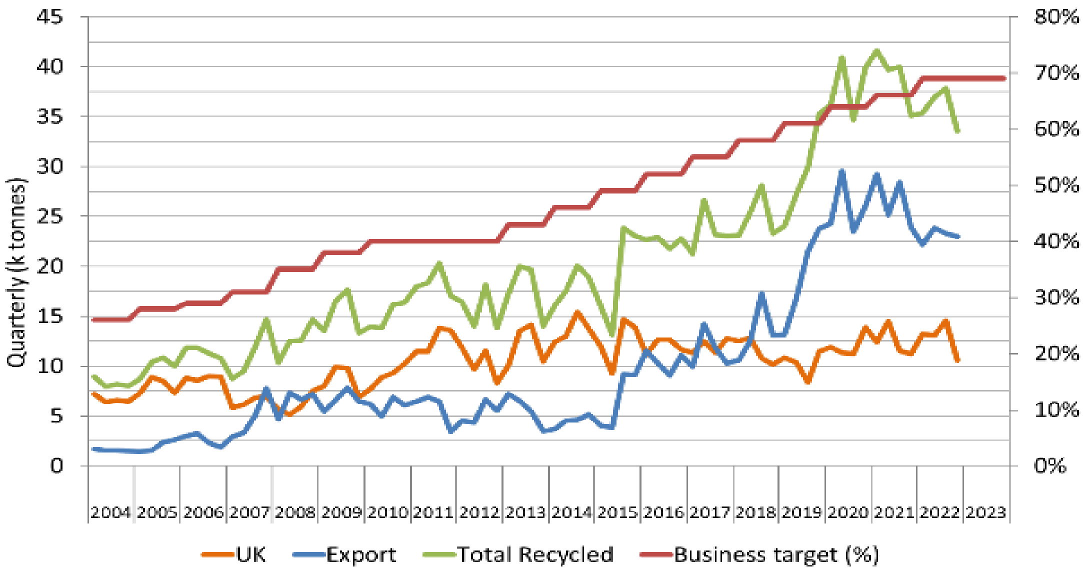


13. Packaging Recycling

13.1. 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 9 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 9: Trends in accredited aluminium packaging recycling 2004 – 2023 (k tonnes)



Aluminium shows a slight upward trend in UK domestic recycling over the whole sample period. But UK domestic recycling does not appear to be trended since around 2012. During the period 2004 – 2015 recycling target increases were met by increases in UK domestic recycling of aluminium packaging, exports contributed but were broadly flat. Since 2015 the situation has reversed. UK domestic recycling has been broadly static (no indication of a trend) while export of waste aluminium packaging has grown rapidly, exceeding UK recycling in 2018, and in 2022, 64% of aluminium packaging waste was exported, mostly to Europe (Germany, Netherlands). Aluminium packaging recycling targets have flat-lined.

14. Aluminium Market trends

14.1. Legislation

The DRS scheme means that a refundable deposit will be charged for every beverage container sold in these countries by the end of 2024. However, the government has indicated that in England and Northern Ireland, this will not include glass. The government hopes this will increase the beverage collection rate and may promote sellers to move to beverage cans from glass bottles.

14.2. UK POM

In the absence of a DRS, beverages, both alcoholic and non-alcoholic, will continue to increase. Companies pledge to improve sustainability will drive the reduction in plastic bottles, which will increase the number of cans. The tonnage of cans for alcoholic beverages will also increase, as cans are lighter and cheaper to manufacture than glass bottles and recycling cans saves more energy. However, due to less pressure from environmental and sustainability legislation, this increase will be slower than for non-alcoholic beverages.

14.3. Waste

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. This has caused manufacturers to switch from heavier metals, such as steel, to aluminium. The recycling rates for aluminium are likely to increase, as business and aluminium packaging bodies are look towards a 100% recycling rate. One of the ways they are aiming to do this is to increase the awareness and knowledge of younger groups on how aluminium should be recycled, as these are the major users of the biggest contributors of aluminium packaging, drinks cans and aerosols. The recycling rate for non-consumer will likely increase slightly, as there is no changing legislation for this and this packaging mostly comes from businesses and hospitality, who still benefit from recycling but are required to do it on a larger scale.

15. Projections and EPR Scenarios

15.1. POM Projections

The Phase 1 baseline data year for aluminium 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 Figure 10: A Selection of Indicators 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.

Figure 10: 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 Figure 11 and Figure 12. In each of these the top three correlations are ranked. All packaging materials are shown for comparison.

Figure 11: Levels correlation analysis of packaging materials and indicator measures, 1997 – 2021

Material	Highest correlations	Suggested activity indicator to link to
Aluminium	1. Retail sales, all stores excl. automotive 2. Population 3. Retail sales in other stores	Retail sales

Figure 12: Growth correlation analysis of packaging materials and indicator measures, 1998 – 2021

Material	Highest correlations	Suggested activity indicator to link to?
Aluminium	1. Retail sales, predominantly foods stores 2. Retail sales, household goods stores 3. Retail sales, none store retailing.	Retail sales

The correlation analysis of trends in packaging materials POM supports developing a projection for aluminium by linking to projections of retail sales. 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.

Figure 13: Summary of linking packaging POM to indicator measures.

Material	Levels analysis	Growth analysis	Projection based on
Aluminium	Retail sales	Retail sales	Retail sales

Figure 14: 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

15.2. 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 aluminium 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; and
- 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 aluminium packaging. Only scenarios 1 and 2 are included from the list above.

15.3. 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 aluminium packaging.

Table 25: Aluminium Projection EPR Scenario 1

Aluminium	Units	2022	2023	2024	2025	2026	2027	2028
Business target	%	69%	69%	69%	69%	69%	69%	69%
POM	k tonnes	257	249	250	253	257	262	267
Obligated tonnage	k tonnes	217	222	246	249	253	258	263
Level of non-obligated tonnage	%	8%	2%	2%	2%	2%	2%	2%

Business target	k tonnes	150	153	170	171	174	178	181
Accredited recycling	k tonnes	144	164	169	171	173	177	180
Surplus (+) / shortfall (-)	k tonnes	-6	11	-1	-1	-1	-1	-1
Business recycling rate	%	66%	74%	69%	69%	69%	69%	69%
Recycling rate performance	%	56%	66%	67%	67%	67%	67%	67%
UK recycling rate	%	58%	61%	68%	68%	68%	68%	68%

Aluminium POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it remains below its 2022 level until 2026. Business targets are projected as constant at 2024 level of 69%. The POM projection is reflected in the projection of obligated tonnage for aluminium packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this a slight shortfall relative to the business target 2024 to 2028 is projected for aluminium packaging.

15.4. 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 26: Aluminium Projection EPR Scenario 2

Aluminium	Units	2022	2023	2024	2025	2026	2027	2028
Business target	%	69%	69%	69%	69%	69%	69%	69%
POM	k tonnes	257	249	250	253	257	150	153
Obligated tonnage	k tonnes	217	222	246	249	253	147	150
Level of non-obligated tonnage	%	8%	2%	2%	2%	2%	2%	2%
Business target	k tonnes	150	153	170	171	174	102	104
Accredited recycling	k tonnes	144	164	169	171	173	177	180
Surplus (+) / shortfall (-)	k tonnes	-6	11	-1	-1	-1	75	77
Business recycling rate	%	66%	74%	69%	69%	69%	120%	120%
Recycling rate performance	%	56%	66%	67%	67%	67%	118%	118%
UK recycling rate	%	58%	61%	68%	68%	68%	68%	68%

Aluminium POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it remains below its 2022 level until 2026. In this scenario, aluminium drinks containers are removed from EPR from 2027 onwards (~112k tonnes). The business targets for the remaining material are projected as constant at 2024 level of 69% to 2026. The POM projection (with DRS materials removed) is reflected in the projection of obligated tonnage for the remaining aluminium packaging, and (with assumed collection rates) the projection of accredited recycling. Based on this a slight shortfall relative to the business target 2024 to 2026 is projected for aluminium packaging. The projection for accredited recycling results in a surplus relative to the business target from 2027 onwards. However, the magnitude of 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.

16. Conclusions and Recommendations for Further Work

16.1. Conclusions: POM

This report estimates aluminium packaging POM in 2022 to be 257k tonnes.
This estimate is derived by calculating obligated aluminium packaging POM from data reported in the National Packaging Waste Database (NPWD) by obligated producers using the net pack fill method. Estimates of 1% non-obligated packaging for aluminium are added to the obligated packaging POM to generate the total aluminium POM estimate. The results of this method are cross-checked against secondary research and data/information provided by the project's industry Stakeholder Group.

The estimate for aluminium packaging POM in the consumer sector is 162k tonnes 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 Stakeholder Group supporting the aluminium project.

The estimate for aluminium packaging POM in the non-consumer sector is 93k tonnes in 2022.
This estimate comprises of an estimate of aluminium packaging in the hospitality sector based on primary and market share data to which separate estimates of the amounts of direct sales of soft and alcoholic drinks based on industry sales figures are added. C&I aluminium packaging comprises the remaining part of non-consumer POM and is the residual tonnage once consumer and hospitality POM are deducted from total POM. There are no figures available to cross-check this data which may therefore include any missed tonnages of consumer grocery, consumer non-grocery and/or hospitality POM.

16.2. Conclusions: Recycling

Aluminium packaging recycling (recorded & unrecorded) is estimated to be 157k tonnes in 2022.
This includes accredited (or recorded) recycling of 144k tonnes (NPWD) and an estimate for unrecorded recycling of 13k tonnes. Based on the POM estimate in this project, the overall aluminium recycling rate is 61% in 2022. The accredited (or recorded) aluminium packaging recycling rate is 56% in 2022.

Consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 141k tonnes in 2022.
Based on this project's POM estimate the consumer aluminium packaging recycling rate is 87% in 2022.

Non-consumer aluminium packaging recycling (recorded & unrecorded) is estimated to be 16k tonnes in 2022.
This is calculated by subtracting the consumer recycling tonnage from total aluminium packaging recycled. Based on this project's POM the non-consumer aluminium packaging recycling rate is 17% in 2022.

It is estimated that 98k tonnes of aluminium packaging is not recycled, of which 13k tonnes (13%) is estimated to be lost during energy recovery and 85k tonnes (87%) goes to landfill.
This is based on an estimated total of 21k tonnes of consumer aluminium packaging and 77k tonnes of non-consumer aluminium packaging not being recycled.

16.3. Conclusions: Projections & EPR Scenarios

EPR Scenario 1

Aluminium 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 69%. The POM projection is reflected in the projection of obligated tonnage for aluminium packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this, aluminium packaging is projected to be higher relative to the business target 2024 to 2028.

EPR Scenario 2

Aluminium POM tonnage is projected to decrease in 2023 compared to 2022, with continuous year-on-year declines to 2026. 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 aluminium 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 aluminium 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.

16.4. Recommendations for Further Work

Aluminium Packaging POM

The area of greatest uncertainty around aluminium packaging POM estimates is around the quantities of 'other C&I' packaging in the non-consumer streams (i.e. C&I packaging, excluding hospitality packaging). This project progresses the quantification of 'other C&I' packaging for steel packaging but is unable to find much data or evidence of this type of packaging for aluminium. The latter therefore remains an area recommended for further research.

Aluminium Packaging POM Recycling

The data from the report shows the greatest source of unrecycled aluminium comes from non-consumer sources, with a significant number going to landfill. From here. Efforts should be places to investigate how much of this aluminium can be recycled and increase efforts to recycle aluminium coming from hospitality and C&I sources.

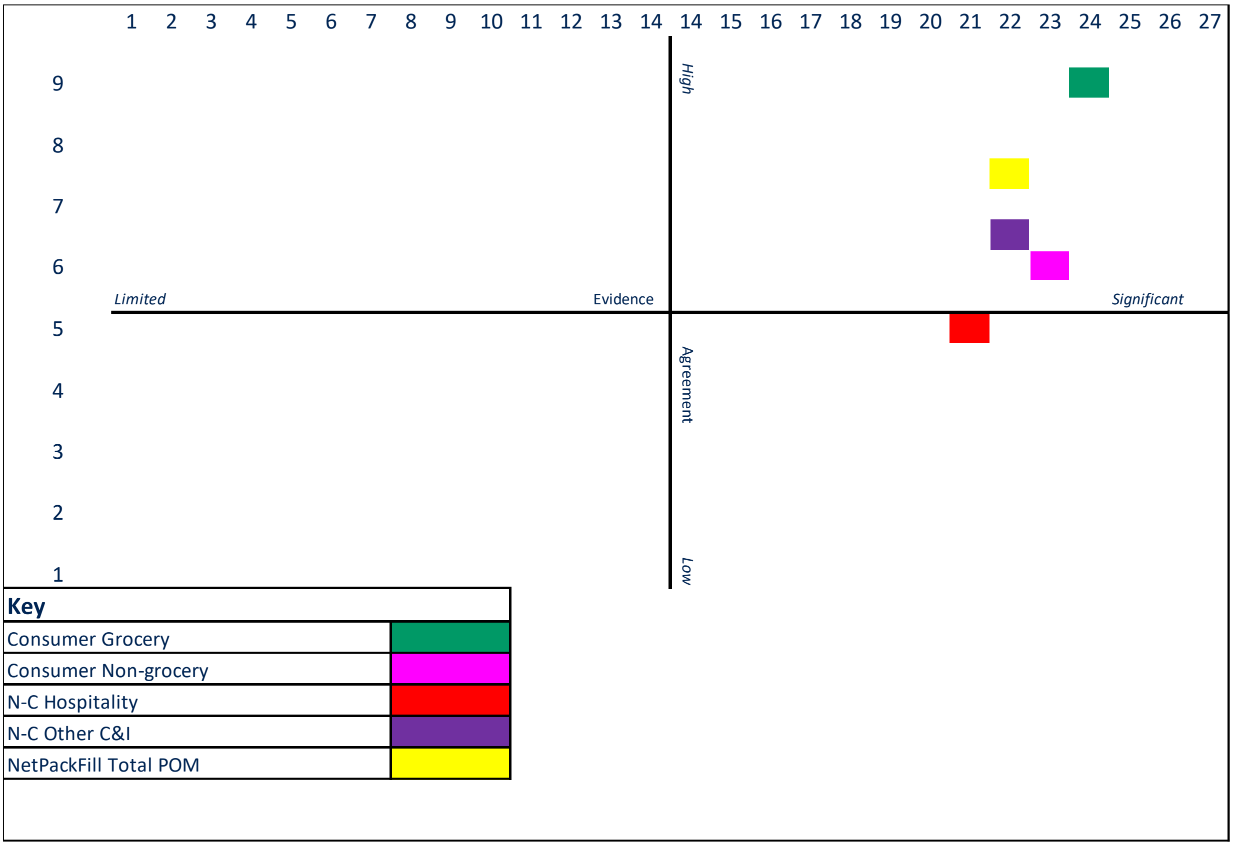
Appendix I

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 figures: Figure 15 (Aluminium POM), Figure 16 (Aluminium Recycling) and a summary in Figure 17, 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 15: Data Robustness Assessment Results – Aluminium POM



To convert scores to a percentage that could be used to relate to an appropriate error margin[41], the evidence and agreement levels scores were added and the percentage of the total possible score taken.

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

Figure 16: Data Robustness Assessment Results – Aluminium Recycling

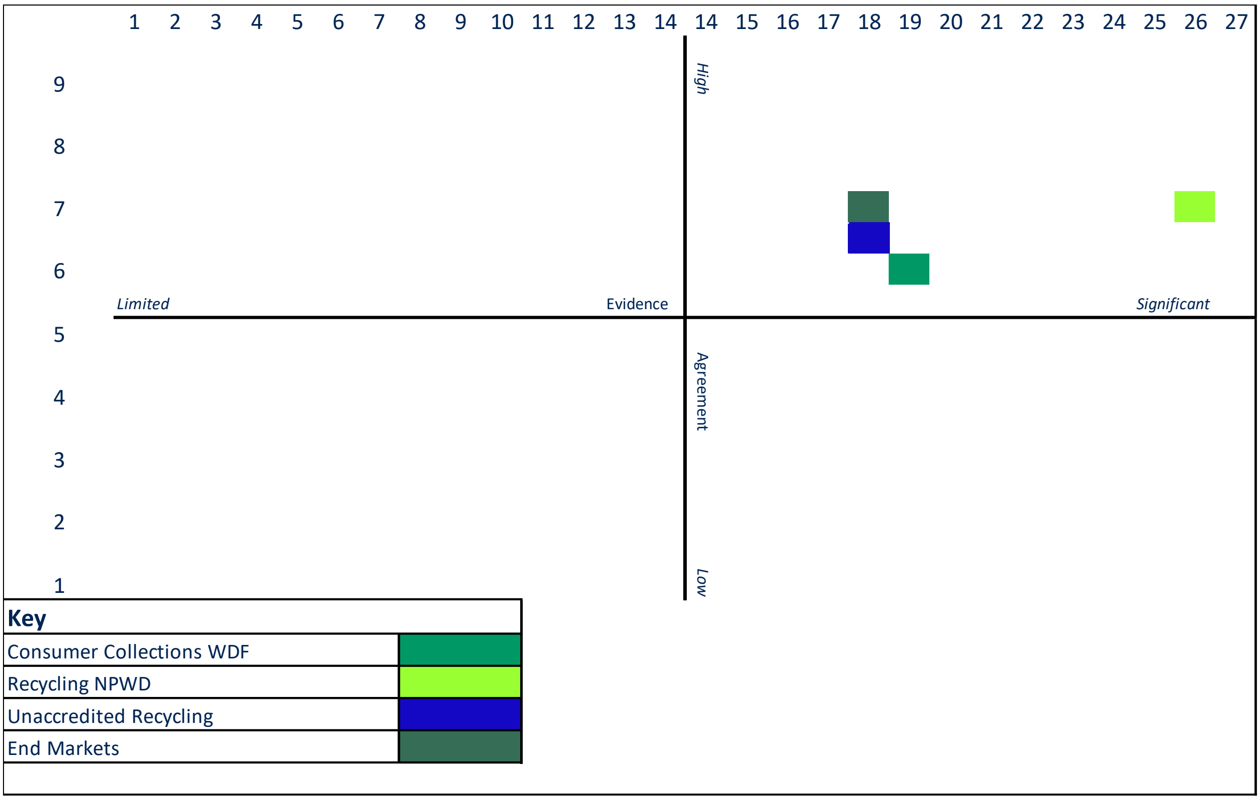


Figure 17: Data Robustness Assessment Results – Summary

		Robustness Scores		Error Margin
	Data & Source	Evidence (Robustness and completeness, max 27):	Degree of agreement around the findings (max 9):	+/-
1	Environment Agency Grocery Retailer Packaging Handled	24	9	6%
3	Mintel Beauty & Personal Care Value Sales by Sales Channel	23	6	12%
4	IGD Grocery Sales Channels	23	6	12%
5	Valpak DIY Compliance submissions 2023 (2022 data)	21	6	18%
6	Insight? Article Mkt share	21	4	21%
7	Euromoniter/Mintel Dog Food Value Sales by Sales Channel	24	6	12%
9	Valpak EPIC Data	22	6	15%
10	IGD Hospitality Sales Channels	23	6	12%
11	British Soft Drinks Association	20	4	21%
12	British Beer & Pub Association	19	3	24%
13	NPWD Producer Data 2022	26	6	9%
14	Project Team & Advisory Group Non-obligated estimate Aluminium	18	8	18%
16	British Aerosol Manufacturers Association (BAMA)	14	3	33%
17	Drum POM: Tata Steel, HMRC & NPWD	21	4	21%
18	HMRC TradeInfo	23	5	15%
19	Baling Wire News article	16	3	30%
20	British Compressed Gas Association (BCGA)	18	4	24%
21	Industrial Packaging Association	18	4	24%
22	House of Commons Library Briefing Paper	14	2	36%
24	NPWD Recycling Data 2022	26	6	9%
25	Verde Research and Consulting Ltd Survey of Recyclers and Exporters 201	18	7	21%
26	WDF 2021/22	19	6	21%

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**

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

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Data		
Estimated Distribution of Spending on Beauty & Personal Care Products 2022		
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		
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		
UK Food & Grocery Value 2022		
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**

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**

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		
Estimating Household/C&I split of Aerosols		
Source		
British Aerosol Manufacturers Association		
Data Used In:		
Non-grocery		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	More yes than no, but equivocal	1
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes with some reservations	2
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	
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)?	No	0
Total		**14**

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 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		**3**

Data		
TradeInfo Import/Arrivals Data 2022		
Source		
HMRC		
Data Used In:		
Other C&I		

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 with some reservations	2
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	More yes than no, but equivocal	1
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 with some reservations	2
Total		**5**

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		
Non-obligated estimate Aluminium		
Source		
Project Team & Advisory Group		
Data Used In:		
NPF 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?	More yes than no, but equivocal	1
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?	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	3
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	3
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		**8**

Data		
BARNSLEY BALING WIRE MANUFACTURER EXPANDS WITH BOOMING WASTE PROCESSING INDUSTRY		
Source		
CAPITAL B Media / D R Baling supplies		
Data Used In:		
Other C&I		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	More yes than no, but equivocal	1
Does the data provide complete coverage?	Yes with some reservations	2
Has the data been sourced from credible, up-to-date sources?	Yes with some reservations	2
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 with some reservations	2
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**16**

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 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		**3**

Data		
UK POM estimate of Steel Gas Cylinders		
Source		
British Compressed Gas Association		
Data Used In:		
Other C&I		

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	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)?	No	0
Total		**18**

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 with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes with some reservations	2
Total		**4**

Data		
UK POM estimate of Steel IBCs		
Source		
Industrial Packaging Association		
Data Used In:		
Other C&I		

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	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)?	No	0
Total		**18**

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 with some reservations	2
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes with some reservations	2
Total		**4**

Data		
UK Share of European Steel Production		
Source		
House of Commons Library Briefing Paper		
Data Used In:		
Other C&I		

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?	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?	No	0
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?	More yes than no, but equivocal	1
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	No	0
Total		**14**

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?	More yes than no, but equivocal	1
Has feedback from the key stakeholders been incorporated in the reporting of findings?	More yes than no, but equivocal	1
Total		**2**

Data		
WDF Local Authority Collection Data		
Source		
WDF 2018/19		
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

Technical appendix

This short technical appendix details the methodology underlying the projections for packaging materials POM discussed in section 15.1 of the report, and recycling discussed in section 13 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 the Figure 1, 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 27: 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.

Figure 18: Aluminium 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 28: Correlation Analysis for Packaging Materials and Indicator Measures, Levels 1997 – 2021

Level		ALUMINIUM	Prob. t
Consumer spending	Household final consumption Expenditure CVM SA - £m	84.7%	0.00%
Consumer spending	Total goods :Total CVM NA Year SA £m	92.4%	0.00%
Gross Domestic Product	GDP	88.0%	0.00%
Retail sales	Retail in non-specialised stores IV2X	90.0%	0.00%
Retail sales	Retail in predominantly food stores IV3G	85.3%	0.00%
Retail sales	Retail in non-food stores IV3I	88.0%	0.00%
Retail sales	Retail in other stores IW6U	92.9%	0.00%
Retail sales	Retail in textile, clothing and footwear stores IW6X	74.7%	0.00%
Retail sales	Retail in household goods stores IW6Y	40.8%	0.74%
Retail sales	Non-store retailing J58P	92.8%	0.02%
Retail sales	All retail excl. automotive	96.5%	0.00%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	78.2%	0.00%
GVA	G47: Retail trade, Except of motor vehicles and motorcycles	53.5%	0.00%
GVA	G56: Food and beverage service activities	-38.0%	64.83 %
GVA	A: Agriculture	41.7%	0.17%
GVA	B: Mining and quarrying	-83.5%	0.00%
GVA	C: Manufacturing	87.7%	0.00%
GVA	D: Electricity, gas, steam and air conditioning supply	-31.4%	17.56 %
GVA	F: Construction	-21.1%	77.77 %
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	70.2%	0.00%
GVA	Total GVA	88.7%	0.00%
Construction	Public new housing	76.1%	0.00%
Construction	Private new housing	75.0%	0.00%
Construction	Total new housing	80.0%	0.00%
Imports	CPA 08:WW:IM: CVM:BOP:SA: C. Manufactured products	87.6%	0.00%

Imports	CPA 08:WW:IM: CVM:BOP:SA: 10. Food products	89.8%	0.00%
Population	POP	94.3%	0.00%

Table 29: Correlation Analysis for Packaging Materials and Indicator Measures, Growth 1998 – 2021

Growth		**ALUMINIUM**	**Prob. t**
Consumer spending	Household final consumption Expenditure CVM SA - £m	-0.295	16%
Consumer spending	Total goods :Total CVM NA Year SA £m	-0.119	58%
Gross Domestic Product	GDP	-0.255	23%
Retail sales	Retail in non-specialised stores IV2X	-0.007	97%
Retail sales	Retail in predominantly food stores IV3G	0.213	32%
Retail sales	Retail in non-food stores IV3I	-0.095	66%
Retail sales	Retail in other stores IW6U	-0.170	43%
Retail sales	Retail in textile, clothing and footwear stores IW6X	-0.198	35%
Retail sales	Retail in household goods stores IW6Y	0.249	24%
Retail sales	Non-store retailing J58P	0.268	21%
Retail sales	All retail excl. automotive	-0.102	63%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	-0.131	54%
GVA	G47: Retail trade, Except of motor vehicles and motorcycles	-0.384	6%
GVA	G56: Food and beverage service activities	-0.179	40%
GVA	A: Agriculture		15%
GVA	B: Mining and quarrying		26%
GVA	C: Manufacturing		59%
GVA	D: Electricity, gas, steam and air conditioning supply	-0.261	22%
GVA	F: Construction	-0.112	60%
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	-0.259	22%
GVA	Total GVA	-0.001	100%
Construction	Public new housing	-0.163	45%
Construction	Private new housing	-0.152	48%
Construction	Total new housing	-0.192	37%
Imports	CPA 08:WW:IM: CVM:BOP:SA: C. Manufactured products	-0.313	14%
Imports	CPA 08:WW:IM: CVM:BOP:SA: 10. Food products	-0.275	19%
Population	POP	0.211	32%

From the tables above Table 30 and Table 31list the top three correlations ranked in order from the highest correlation observed.

Table 30: Levels correlation analysis of packaging materials and indicator measures, 1997 – 2021

Material	Highest correlations	Suggested activity indicator to link to
Aluminium	1. Retail sales, all stores excl. automotive 2. Population 3. Retail sales in other stores	Retail sales

Table 31: Growth correlation analysis of packaging materials and indicator measures, 1998 – 2021

Material	Highest correlations	Suggested activity indicator to link to?
Aluminium	1. Retail sales, predominantly foods stores 2. Retail sales, household goods stores 3. Retail sales, none store retailing.	Retail sales

Based on the statistical correlation analysis above Table 32 provides a summary of the choice of indicator measure to link to by packaging material type. This supports developing a POM projection for aluminium by linking to projections of retail sales. The POM was multiplied by the change over time in the selected correlated indicator to obtain the level for each subsequent year.

Table 32: Summary of linking packaging POM to indicator measures

Material	Levels analysis	Growth analysis	Projection based on
Aluminium	Retail sales	Retail sales	Retail sales

Table 33 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 33: 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 2023Q1 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 14 of the report for a discussion). For 2023 NPWD data for 2023Q1 to Q3 is used to approximate a full year figure for 2023.

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

Export recycling

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