PackFlow Refresh 2023: Paper & Card

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

Zoe Goodman, Peter Mitchell and James Skidmore

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; and
- 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 Paper Version 2.0

Executive Summary

Introduction

The PackFlow 2023 reports (available here: 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 and 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 reports1).

Phase 2

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

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

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

Paper and Card Packaging POM

This report estimates paper and card packaging POM in 2022 to be 4,843k tonnes (+/- 7%)[3,4], a decrease of 3% from the previous estimate in 2019.

The paper and card packaging POM estimate is derived using a bottom-up methodology, taking data from various sources for each sector and combining the results. It is cross-checked with reported obligated data on NPWD (National Packaging Waste Database) and with data provided by the project's industry Steering Group. Figure 1 on the next page provides an overview of the paper and card packaging POM by sector in 2022. The total POM is the sum of the consumer[5] and non-consumer[6] packaging.

The estimate for paper and card packaging POM in the consumer sector is 1,647k tonnes (+/- 8%).

The methodology for consumer POM is based on primary sales data from a sample of UK supermarkets selling both grocery and non-grocery items, alongside reliable market share data. This method is considered the most robust there is available and is accepted by industry. Home delivery packaging was also estimated and added to the consumer packaging total.

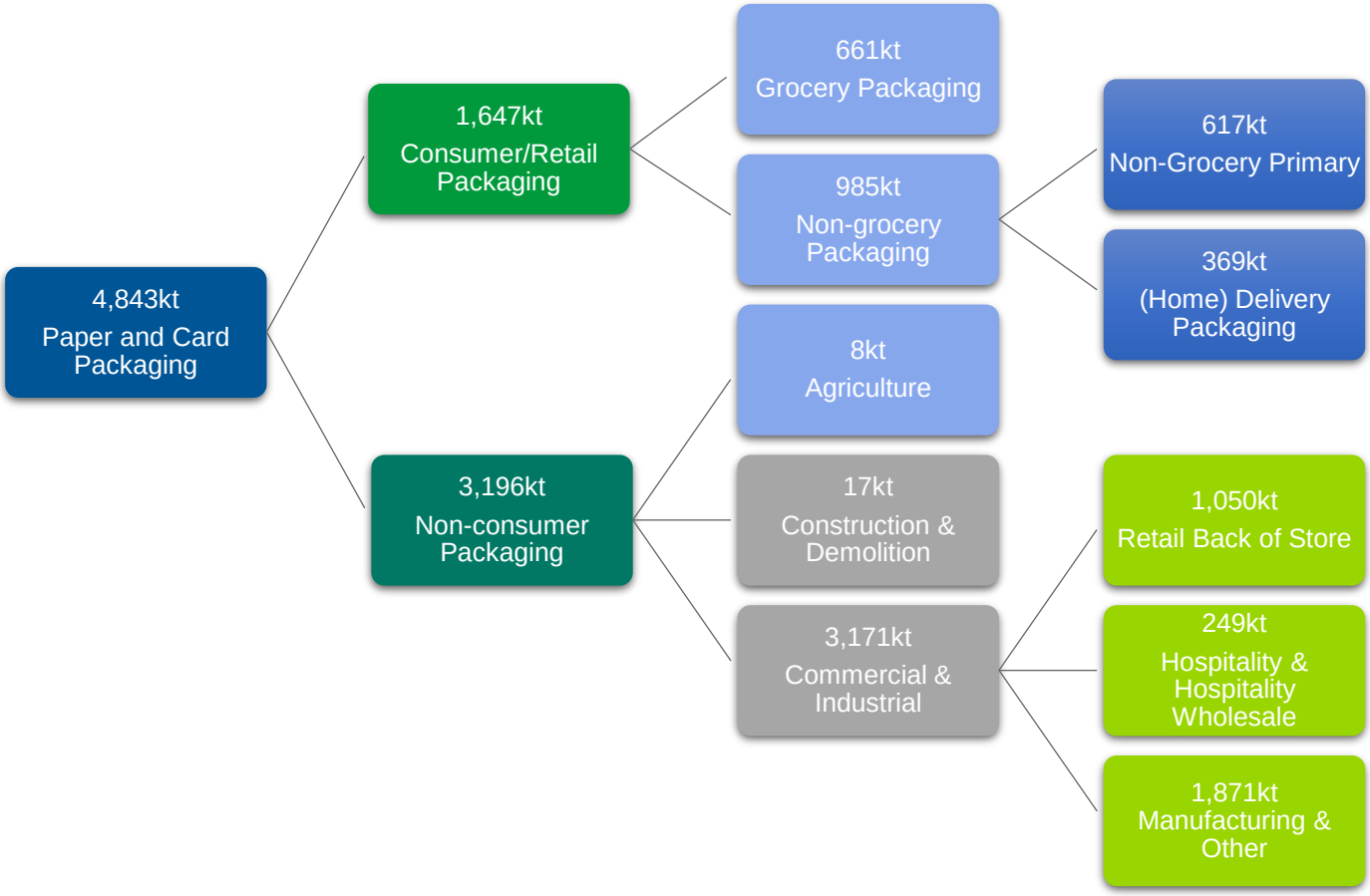
The estimate for paper and card packaging POM in the non-consumer sector is 3,196k tonnes (+/- 10%).

Retailer back of store data was estimated based on data provided directly by retailers. Hospitality data was scaled up from Valpak EPIC data[7] for the sector. The remaining data was derived by applying packaging protocols to the Defra

[1] *The previous packaging materials flow reports can be found at https://www.valpak.co.uk/knowledge-hub/?category=flow-reports.*
[2] *Paper and card packaging placed on the market means all household and non-household paper and card packaging used around products sold and transported within the UK.*
[3] *The error margins are assumed estimates based on the robustness assessment and are not the outputs of statistical calculation.*
[4] *This error margin indicates that the two paper and card packaging POM figures are not substantially different.*
[5] *Consumer packaging is packaging around products for personal, family, household or social use (i.e. not for commercial/ industrial use).*
[6] *Non-consumer packaging is packaging used in the commercial, industrial, agricultural, or construction and demolition sectors.*
[7] *Valpak's EPIC database holds sales data and packaging weights information for clients signed up for the fully managed service. It holds data for 34 million products and related packaging.*

C&I (Commercial & Industrial) Waste Statistics and adjusting for growth/reductions. It was broken down and verified using Valpak EPIC data where appropriate.

Figure 1: Paper and Card Packaging POM by Sector, 2022 (k tonnes)



Non-obligated or unregistered flow for paper and card packaging accounted for 14% of POM in 2022 – this represents a decrease from 2019, when it was 19%[8].

Using data from NPWD, an estimate of the unobligated tonnage (664k tonnes, 14%) has been made by subtracting the net pack fill[9] figure of 4,179k tonnes from the project's final flow estimate of 4,843k tonnes. The unobligated proportion of 14% is a decrease from the 19% in 2019[8] but is more similar to the 16% calculated in the 2017 Paper Flow report.

The final project estimate of paper and card packaging POM by type is 3,175k tonnes (66%) corrugated, 887k tonnes (18%) cartonboard and other packaging boards, 144k tonnes (3%) fibre-based composites and 638k tonnes (13%) other packaging.

The format types for paper and card packaging are established primarily using information from Valpak's EPIC database. This was compared with data provided by industry experts. Stakeholder feedback anticipated a split of 64%

[8] *Note that the Covid-19 PackFlow report gave a figure of 3,914kt for net pack fill for 2019 tonnage (2020 obligation year), based on NPWD reported tonnages in October 2020, giving a 22% non-obligated/ unregistered percentage. Late registrants added 149kt, increasing the final net pack fill for 2019 POM to 4,063kt, giving a 19% non-obligated/ unregistered percentage.*

[9] *The net pack fill figure is used to estimate the amount of packaging placed on the UK market by obligated companies. It is obtained from the total data reported by obligated packaging producers that is available on the NPWD website. The calculation is as follows:*

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))

corrugated, 27% cartonboard and other packaging boards, 2% liquid packaging board (not including other fibre-based composites) and 6% other packaging (such as packaging paper and moulded fibres). This implies that some of the packaging identified as 'other' will likely be cartonboard.

Paper and Card Recycling

The total quantity of paper and card packaging recycled in 2022 is estimated to be 3,934k tonnes.

This includes reported (NPWD) recycling of 3,695k tonnes and an estimate for unreported recycling (239k tonnes). Based on the POM calculated as part of this project, this gives an overall recycling rate of 82%, up 3% since 2019. Of this, 3,695k tonnes was reported on NPWD, representing a recycling rate of 77% (unchanged from 2019).

The total quantity of consumer paper and card packaging recycled[10] in 2022 is estimated to be 1,313k tonnes.

This is based on WasteDataFlow (WDF), the database for local authority collected waste. Based on the POM calculated as part of this project, this gives a consumer recycling rate of 80%, up 12% since 2019.

The total quantity of non-consumer paper and card packaging recycled[11] in 2022 is estimated to be 2,622k tonnes.

This is calculated by subtracting the consumer recycling tonnage from the total tonnage recycled figure. Based on the POM calculated as part of this project, this gives a non-consumer recycling rate of 83%.

Paper and Card Disposal

The total quantity of consumer paper and card packaging sent to EfW or RDF in 2022 is estimated to be 267k tonnes, with 67kt sent to landfill.

This was calculated by subtracting the consumer recycling tonnage from the consumer POM tonnage to leave a residual tonnage. This was then split between EfW (80%) and landfill (20%), based on official government-reported data on destination of residual municipal waste.

The total quantity of non-consumer paper and card packaging sent to EfW or RDF in 2022 is estimated to be at least 440k tonnes, with less than 110kt sent to landfill.

This was calculated by subtracting the non-consumer recycling tonnage from the non-consumer POM tonnage to leave a residual tonnage. In the absence of robust data for disposal routes for commercial waste, the municipal proportions were applied for a split between EfW and landfill for illustrative purposes.

End Markets

In 2022 32% of paper and card packaging collected was recycled in the UK

Based on NPWD figures for 2022, 32% of the recorded paper and card packaging recycling took place in the UK and 68% overseas.

Non-OECD-member countries in Asia were the key export markets for paper and card packaging exported from the UK

Non-OECD-member countries in Asia were the key export destinations in 2022, with Vietnam (17% of exports), India (17%), Malaysia (14%), Indonesia (12%) and Thailand (9%) taking most of the material within that category. Turkey took 13% of exports, Germany 10%, the Netherlands 4% and France 3%.

Changes in methodology from 2019

There have been no significant changes to the PackFlow overarching methodology for the development of the paper and card flow. Minor changes and revised data sources are detailed in this report.

[10] *Consumer packaging recycling is equated to packaging recycled by households.*
[11] *Non-consumer packaging recycling is equated to packaging recycled in the commercial, industrial, agricultural, or construction and demolition sectors.*

Scheme Administrator Submissions

The total tonnage of packaging POM that is likely to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 1,732kt, of which 123kt is 'fibre-based composite'.

Table 1: Total Expected Scheme Administrator Submissions

Material / Situation	Total POM	Total Consumer	Total Non-consumer	Total Hospitality	Total Hospitality: Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Paper and Card (All)	**4,843**	1,647	3,196	249	85	**1,732**
Paper and Card (Exc. Fibre-based Composite)	**4,699**	1,574	3,125	180	35	**1,609**
Fibre-based Composite	**144**	73	71	69	50	**123**

Consumer Packaging in the Household Waste Stream

The total proportion of consumer paper and card packaging from grocery retailers that is disposed of in the household waste stream is 77%. The total proportion of consumer paper and card packaging from non-grocery retailers that is disposed of in the household waste stream is 92%. This is based on the same sample of retailers as is used in the rest of this report and equates to 1,426kt (87%) of packaging in total across both grocery and non-grocery retail packaging.

Consumer Packaging in the 'Litterable' Categories

The total proportion of consumer paper and card packaging from grocery retailers within the 'litterable' categories is 21%. The total proportion of consumer paper and card packaging from non-grocery retailers within the 'litterable' categories is 0%. This is based on the same sample of retailers as is used in the rest of this report and equates to 139kt (8%) of packaging in total.

Packaging Future Trends and Scenarios

Paper and card POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it is projected to remain below its 2022 level until 2027. Business targets are projected as constant at 2024 level of 83%. The POM projection is reflected in the projection of obligated tonnage for paper and card packaging, and (with assumed constant collection rates) the projection of accredited recycling.

Paper and card packaging is not an in-scope DRS material, and its projection is not impacted by the removal of DRS drinks containers from recycling obligations under EPR. Based on this paper and card packaging is projected to be in a surplus relative to the business target from 2023 to 2028.

Recommendations for Further Work

Further surveying of non-consumer POM

The most uncertain element of the POM estimate is that relating to non-consumer paper and card packaging, which is obtained by amalgamating data from various sources and years, adjusted where required for estimated growth or reductions in more recent years. In order to improve the accuracy of the data, a more recent comprehensive data source would need to be used that also splits out packaging and non-packaging. This is reliant on the commissioning

of large-scale analyses of packaging use in the commercial and industrial, construction and demolition, and agricultural sectors.

Quantification of Home Delivery Packaging

It is currently difficult to accurately calculate the amount of corrugated board and cartonboard used for home delivery packaging and further work to quantify these amounts would be beneficial.

Ongoing review of the mixed grade protocols

The mix of packaging and non-packaging within paper and card is constantly changing, with an ongoing percentage decrease in newsprint and other non-packaging papers, and a percentage increase in cardboard and packaging paper use in the household, particularly in relation to (online) home deliveries. Ongoing review of the mixed grade protocols would ensure that all packaging recycling is captured within the system.

Contents

Executive Summary 3
Figures 10
Tables 10
Appendices 12
Glossary 13
Acknowledgements 14
1. Introduction 15
1.1. Background 15
1.2. Phase 1 Objectives 15
1.3. Methodology 15
1.3.1. Paper and Card Packaging POM 16
1.3.2. POM Cross-check (Net Pack Fill) 16
1.3.3. Paper and Card Packaging Recycling 17
1.3.4. Data Robustness 17
2. Phase 1: Paper and Card Packaging POM 18
2.1. Introduction 18
2.2. Placed on the Market (POM) 18
2.3. Consumer Paper and Card Packaging POM 19
2.3.1. Consumer Grocery Retail 19
2.3.2. Consumer Non-grocery Retail 20
2.3.3. Total Consumer POM 21
2.3.4. Consumer POM Composition 22
2.4. Non-consumer Paper and Card Packaging POM 22
2.4.1. Non-consumer Paper and Card Packaging POM Composition 24
2.5. Total Paper and Card Packaging POM 24
2.5.1. Total Paper and Card Packaging POM Composition 26
2.5.2. Fibre-Based Composites 27
2.5.3. Consumer-Type Paper and Card Packaging 29
2.6. POM Cross-check (Net Pack Fill) 29
2.6.1. Net Pack Fill 29
2.6.2. Steering Group Data 30
2.7. Summary of Paper and Card Packaging POM 31
3. Scheme Administrator Submissions (formally referred to as 'household/household-like') 32
4. Consumer Packaging in the Household Waste Stream 33
4.1. Introduction 33
4.2. Methodology 33
4.3. First Iteration – Indicative Disposal Routes 33

4.4. Second Iteration – Sensitivity Analysis 33
4.5. Third Iteration – Consumer Engagement 34
4.6. Fourth Iteration – Similar Categories 35
4.7. Application to 2022 POM 35
4.8. Proportion of Packaging Disposed of Within the Household Waste Stream 35
5. Consumer Packaging in the 'Litterable' Categories 37
5.1. Introduction 37
5.2. Proportion of Packaging that Falls Within the Litterable Categories 37
6. By Nation Reporting 38
6.1. Introduction 38
6.2. Scaling Factors – Background 38
6.2.1. Agriculture 38
6.2.2. Population 39
6.2.3. Construction 39
6.2.4. GDP 40
6.2.5. Hospitality 40
6.3. Sector Scaling Factors Used 41
6.4. POM by Nation: Paper and Card 41
7. Phase 1: Collection and Recycling 43
7.1. Introduction 43
7.2. Recorded (Accredited) UK Paper and Card Packaging Recycled 43
7.3. Total UK Paper and Card Packaging Recycled 43
7.4. Consumer Recycling 44
7.5. Non-consumer Recycling 45
7.6. Recycling of Fibre-Based Composites 45
7.7. Summary of Paper and Card Packaging Recycling and Disposal 46
7.8. End Markets 47
8. Phase 2: Packaging Future Trends and Scenarios 49
8.1. Phase 2 Objectives 49
8.2. Methodology 49
8.2.1. Net Pack Fill 49
9. Trends in Packaging POM by Material 50
10. Packaging Recycling 52
11. Paper and Card Market Trends 53
11.1. Legislation 53
11.2. POM Trends 53
11.3. Waste Management 54
11.3.1. Recycling: Past Trends 54
11.3.2. Recycling: Future Trends 55

12. Projections and EPR Scenarios 57
12.1. POM Projections 57
12.2. EPR Scenarios 59
12.3. EPR Scenario 1 59
12.3. EPR Scenario 2 60
12.4. EPR Scenario 3 60
13. Conclusions 61
13.1. Conclusions: POM 61
13.2. Conclusions: Recycling 61
13.3. Conclusions: Disposal 61
13.4. Projections and EPR Scenarios 62
13.5. Recommendations for Further Work 62
Appendix I 63
Appendix II 71

Figures

Figure 1: Paper and Card Packaging POM by Sector, 2022 (k tonnes) 4
Figure 2: POM Breakdown by Sector 19
Figure 3: Total UK Paper and Card Packaging POM by Sector, 2022 (%) 25
Figure 4: Total UK Paper and Card Packaging POM Composition, 2022 (%) 27
Figure 5: POM by Nation: Paper and Card 42
Figure 6: Export End Markets: Destination by Weight, 2022 (%) 48
Figure 7: Packaging POM by Material, 2017, 2019 and 2022 (k tonnes) 50
Figure 8: Packaging POM Trends by Material, 1997–2021 (Indexed 1997=100) 51
Figure 9: Trends in Accredited Packaging Recycling, Paper and Card 2004–2023 (k tonnes) 52
Figure 10: Trends in Paper and Card Recycling Rates, 2017–2022 (%) 55
Figure 11: Data Robustness Assessment Results: POM 64
Figure 12: Data Robustness Assessment Results: Recycling 65

Tables

Table 1: Total Expected Scheme Administrator Submissions 6
Table 2: Relating Robustness Scores to Indicative Error Margins 17
Table 3: Consumer Grocery and Non-grocery Packaging by Format, 2022 22
Table 4: Non-consumer Paper and Card Packaging POM, 2022 23
Table 5: Non-consumer Paper and Card Packaging by Format, 2022 24
Table 6: Total UK Paper and Card Packaging POM, 2017–2022 (k tonnes) 25

Table 7: Total UK Paper and Card Packaging POM Composition, 2017–2022 (k tonnes) 26
Table 8: Cross-check of Total Paper and Card Packaging POM Composition, 2022 27
Table 9: Total UK Paper and Card Packaging POM Composition, 2022 (k tonnes) 28
Table 10: Fibre-Based Composite Packaging POM Composition, 2022 (k tonnes) 28
Table 11: Summary of Fibre-Based Composite Packaging POM Composition, 2022 (%) 29
Table 12: Obligated Paper and Card Packaging (Net Pack Fill), 2022 (k tonnes) 30
Table 13: Paper and Card Packaging POM, 2022 (k tonnes) 31
Table 14: Total Expected Scheme Administrator Submissions 32
Table 15: Proportion of Grocery and Non-Grocery Packaging Disposed of Within the Household Waste Stream 36
Table 16: Proportion of Grocery and Non-Grocery Packaging that Falls Within the Litterable Categories 37
Table 17: Metrics Relating to Agriculture in the Nations of the UK in 2022 38
Table 18: Proportion of Key Metrics Relating to Agriculture in the Nations of the UK 39
Table 19: Proportion of the Population Living in Each of the Nations of the UK 39
Table 20: Proportion of the Employees Within the Construction Sector in Each of the Nations of the UK 40
Table 21: Proportion of Total UK GDP by UK Nation 40
Table 22: Proportion of Total UK Hospitality by UK Nation 40
Table 23: Scaling Factors Used for Each Sector in the By-nation 2022 POM Reporting 41
Table 24: Paper and Card WDF Data, 2021/22 44
Table 25: Recycling of Fibre-based Composite Packaging, 2022 (%, k tonnes) 45
Table 26: Paper and Card Packaging Collections, 2022 46
Table 27: Paper and Card Disposal, 2022 46
Table 28: Export End Markets: Top 10 Destination Countries by Weight, 2022, k tonnes and % 47
Table 29: Paper and Card Packaging POM, 2017–2022 (k tonnes, %) 54
Table 30: A Selection of Indicators 57
Table 31: Levels Correlation Analysis of Packaging Materials and Indicator Measures, 1997–2021 58
Table 32: Growth Correlation Analysis of Packaging Materials and Indicator Measures, 1998–2021 58
Table 33: Summary of Linking Packaging POM to Indicator Measures 59
Table 34: Projected Growth in Indicator Measures, 2024–2028 59
Table 35: POM Projections 2022–2028 60
Table 36: Data Robustness Assessment Results – Summary 65
Table 37: Environment Agency Grocery Retailer Packaging Handled 66
Table 38: Valpak Turnover & Packaging Handled Data 66
Table 39: Valpak Hospitality EPIC Data 67
Table 40: NPWD Producer Data 2023 67
Table 41: NPWD Recycling Data 2023 68
Table 42: Survey of Recyclers and Exporters 2023 68
Table 43: Survey of Grocery Retailers 2023 69
Table 44: DEFRA C&I Waste Survey 2017 69
Table 45: WDF 2021/22 70

Table 46: A Selection of Indicators 72
Table 47: Correlation Analysis for Paper and Card Packaging and Indicator Measures, Levels 1997–2021 74
Table 48: Correlation Analysis for Packaging Materials and Indicator Measures, Growth 1998–2021 75
Table 49: Levels Correlation Analysis of Packaging Materials and Indicator Measures, 1997–2021 76
Table 50: Growth Correlation Analysis of Packaging Materials and Indicator Measures, 1998–2021 76
Table 51: Summary of Linking Packaging POM to Indicator Measures 76
Table 52: Projected Growth in Indicator Measures, 2024 to 2028 76

Appendices

Appendix I: Data Robustness Assessment
Appendix II: Technical Appendix

Glossary

bn – Billion

CA – Civic amenity

C&I – Commercial and Industrial

CPI – Confederation of Paper Industries

C&D – Construction and demolition

EA – Environment Agency

EPIC – Environmental Product Information Centre, Valpak's packaging database

Fibre-based composite packaging –paperboard or paper fibres that are laminated with plastic (on one or both sides); the packaging may include other material such as aluminium foil. Examples of fibre-based composite packaging are food and drink cartons, disposable drinks cups, sandwich boxes (skillets), crisps tubes, and powdered drinks tubs.

HWRC – Household waste recycling centre

k – Thousand

kt – Thousand tonnes

LA – Local authority

NPWD – National Packaging Waste Database

POM – Placed on the market

Primary Packaging – Any packaging used to contain a single 'sales unit' to sell to customers, e.g. aluminium cans, plastic bottles, drinks cartons. For multipacks, this includes all of the packaging on the items, including the outer bag, box etc. Primary packaging is taken home by customers, removed/opened and thrown away after consuming the contents.

PRN – Packaging Recovery Note

PERN – Packaging Export Recovery Note

RDF – Refuse Derived Fuel

Secondary Packaging – Outer packaging used to group several 'sales units' to transport them or display them in store; usually cardboard boxes or shelf-ready packaging, and labels on these, not usually taken home by customers

Shipment Packaging – Packaging used for shipping single or multiple sales units directly to consumers e.g. corrugated boxes, card envelopes, moulded protective inserts, paper filler, bubble wrap and mail bags

Transit/Tertiary Packaging – Any transit packaging used to group secondary packaging units together to protect them while being transported or handled through the supply chain e.g. pallets, shrink wrap, staples or strapping, and labels on these

WDF – WasteDataFlow

Acknowledgements

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

- The Alliance for Beverage Cartons and the Environment (ACE) UK
- The Advisory Committee on Packaging (ACP)
- The British Printing Industries Federation (BPIF) Cartons
- The Confederation of Paper Industries (CPI)
- The Department for Environment, Food & Rural Affairs (DEFRA)
- The Department of Agriculture, Environment and Rural Affairs (DAERA)
- The Environment Agency (EA)
- Flexographic Industries Association
- Incpen
- Natural Resources Wales
- The Packaging Federation
- Paper and Board Association
- The Recycling Association
- The Scottish Government
- Scottish Environment Protection Agency (SEPA)
- Wastepack
- The Welsh Government
- Zero Waste Scotland (ZWS)

1. Introduction

1.1. Background

The PackFlow Refresh 2023 reports (available here: 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 flows of packaging in the UK in terms of material Placed on the Market (POM) [12], collections and recycling, and to assess potential compliance risks versus the packaging targets.

1.2. Phase 1 Objectives

The PackFlow 2023 project for paper and card packaging has the following key objectives for Phase 1:

- Provide updated (and cross-checked) baseline estimates of paper and card packaging placed on the UK market in 2022, by packaging format, sector, source and nation:
  - Format (e.g. corrugated, cartonboard and other packaging boards, fibre-based composites (including beverage cartons) and other such as packaging papers);
  - Sector (e.g. consumer, non-consumer);
  - Source (handled by obligated producers who are registered, non-obligated producers, or free riders);
  - Nation (England, Northern Ireland, Scotland and Wales);
- 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 paper and card packaging collected through kerbside and other collection types, by sector;
- Estimate the quantities of paper and card packaging recovered and recycled, sent for incineration with energy recovery, and sent to landfill, for both UK and overseas end destinations;
- Provide estimates of the quantities of paper and card packaging that is recycled (i.e. is recorded as accredited recycling) and paper and card packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).

1.3. Methodology

In order to calculate paper and card packaging recycling rates, the quantity of paper and card packaging recycled is divided by the quantity of 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.

Other methodologies have been considered and discounted, such as waste composition analysis. Whilst this approach is valid, it has several significant limitations, relying on accurate and representative data for:

- The composition of household waste, undistorted by seasonality;
- 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 Paper and Card Flow 2025[13].

An overview of how the POM and recycling rates were calculated for this project is provided below.

[12] *Packaging placed on the market means all household and non-household packaging used around products sold.*
[13] *https://www.valpak.co.uk/knowledge-hub-post/paper-and-card-flow-2025/*

1.3.1. Paper and Card Packaging POM

Paper and card packaging POM were estimated using a bottom-up approach, which references a variety of data sources of paper and card packaging products placed on the market combined with a gathering of data and estimates from industry. The results of this method have been cross-checked against an assessment of the paper and card packaging POM reported on the National Packaging Waste Database (NPWD) by obligated producers and data provided by the project's industry Steering Group. The baseline year was 2022. However, where 2022 data was not available, the most recent available data was used.

1.3.1.1. POM (Bottom-up Approach)

This approach built up the POM figure using a variety of components, based on the key sectors for paper and card packaging including:

- Paper and card packaging around food, drinks, groceries and other goods, including body care, clothing, DIY products etc., as sold by supermarkets and non-grocery retailers, sourced from the Environment Agency and Valpak's Environmental Product Information Centre (EPIC) database[14];
- Paper and card packaging around food and drink as consumed in the hospitality sector, sourced from Valpak's EPIC database;
- Paper and card packaging discarded by retailers at back of store, estimated based on data provided directly by retailers; and
- Paper and card packaging used by the non-consumer sector as sourced from Defra's Commercial and Industrial Waste Arisings data publication, relating to 2018[15] and adjusting for growth/reductions.

Where necessary, data was then cross checked against industry sources provided by the Steering Group.

1.3.2. POM Cross-check (Net Pack Fill)

The cross-check compiled paper and card packaging data reported by obligated companies into the NPWD. The estimate is thought to capture the vast majority of the relevant quantity but does omit the paper and card packaging handled by non-obligated companies, free-riders (those companies who are above the packaging obligation threshold by having an annual turnover of £2 million and handling 50 tonnes of packaging or more per year 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 calculation set out below was applied. This calculation uses the total data reported by obligated packaging producers and is available on the NPWD website[16]:

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 report uses NPWD data estimates for 2023 submissions to reflect obligated packaging POM in 2022. At the time of publication of this report, full year submissions of 2022 packaging were not available, so estimates are obtained by using NPWD data for data year 2021 and applying an estimate of the percentage change in obligated packaging by material between 2022 and 2021. The estimate of the percentage change is informed by changes in packaging flow for each material between the data years 2021 and 2022 arising from approximately 1600 Valpak members who had

[14] *The database is based on information collected direct from suppliers as well as information sourced by Valpak, meaning that it holds a wide coverage of information across multiple product ranges. Product-specific data collection is completed through site visits, supplier mailings and weighing in-house (purchasing product and collecting used product from staff). All data goes through a comprehensive checking process on receipt and is stored in Valpak's bespoke software Environmental Product Information Centre (EPIC).*
[15] *https://www.gov.uk/government/statistics/uk-waste-data published October 2018*
[16] *www.npwd.environment-agency.gov.uk*

registered in 2022 and 2023 under the same registrations and were still registered with the same agencies as of July 2023.

On a regular basis throughout the PackFlow process, Valpak also downloaded the live 2023 submission position from NPWD (for the 2022 data year) and analysed the change in number of registrations and aggregated data to cross reference against forecast position and identify any large divergence from the expected outcomes.

1.3.3. Paper and Card Packaging Recycling

NPWD was used as the source for accredited (recorded) recycling of paper packaging and card. Industry, including paper mills and exporters, were consulted on the recycling of paper and card packaging that might not, for whatever reason, be reported on NPWD. The output of these discussions was used to estimate a figure for non-accredited (unrecorded) recycling.

The total recycling figure, consisting of recorded and unrecorded recycling, was then split into consumer and non-consumer recycling. WasteDataFlow (WDF) was used as the source for the consumer recycling data, with the difference between the WDF total and the overall total assumed to be non-consumer recycling. WDF was considered by the Steering Group to be the best available source of consumer paper and card recycling data, as it is the most comprehensive and is believed by the Group to not suffer from the significant losses as seen with plastics collections.

1.3.4. Data Robustness

As there are levels of uncertainty around the data used to establish the various elements that are combined to make the total POM, consumer, non-consumer and total paper and card packaging POM are presented with indicative error margins, providing a range around the estimate. The robustness scores established for each data piece used are presented in Appendix I and these have been converted into a percentage and related to appropriate margins of error[17], as shown below in Table 2. The indicative margins of error are provided throughout the report.

Table 2: Relating Robustness Scores to Indicative Error Margins

Robustness Score			Indicative 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%

The method used to calculate the margin of error for the total POM used the margins of error for the elements that made up the total POM to convert this to a tonnage, and then using the Root of Sum of Squares (since we are dealing with the error of a sum) it was expressed as a percentage.

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

2. Phase 1: Paper and Card Packaging POM

2.1. Introduction

This section of the report provides an overview of how paper and card packaging flows onto the UK market. It details the data sources used and estimates of the POM for 2022.

2.2. Placed on the Market (POM)

POM refers to the flow of new paper and card packaging onto the UK market. Consumption of goods using paper and card as packaging can occur both in the consumer (in the home and on the move) and non-consumer (by business) streams.

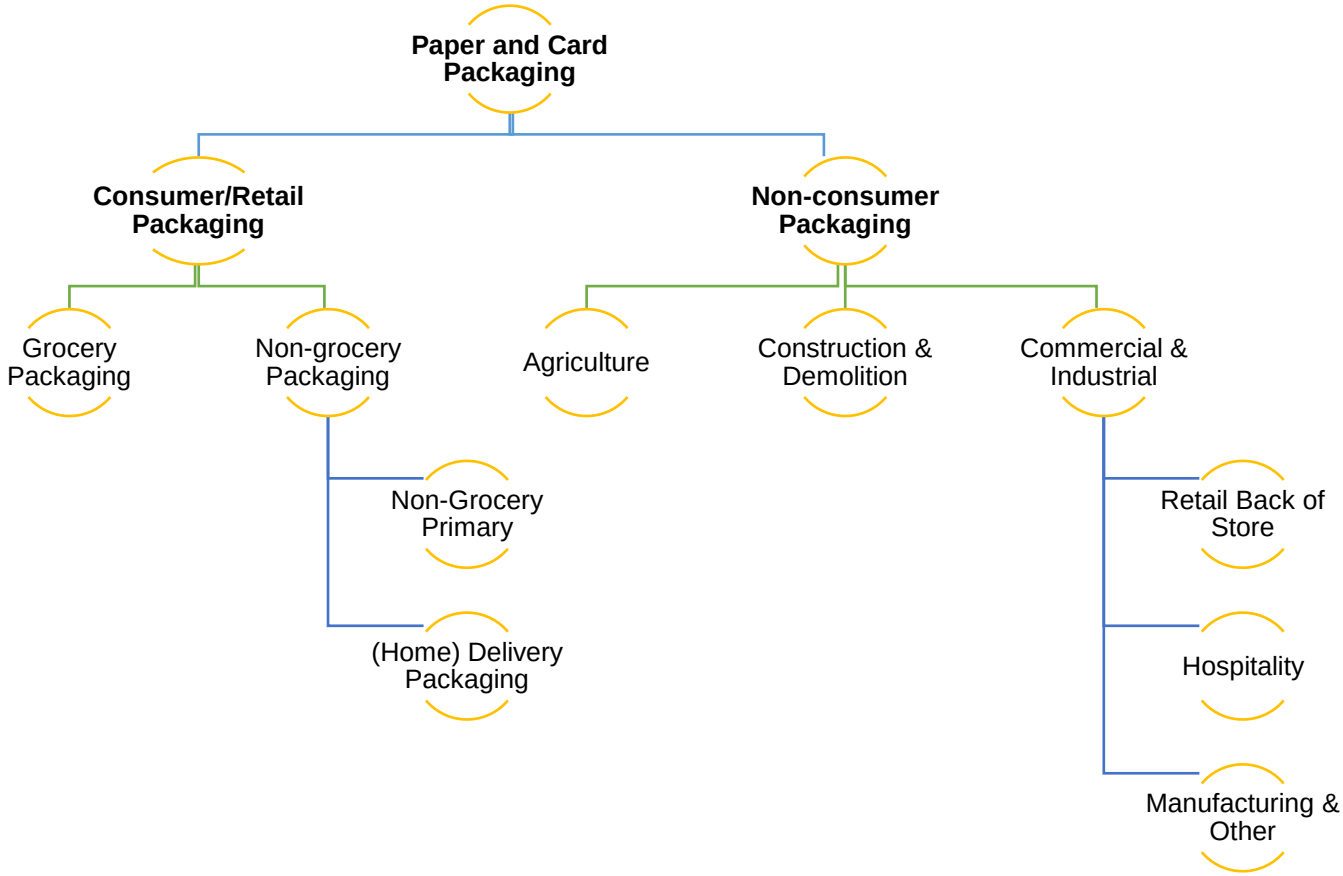
Paper and card packaging typically enters the market in the following formats, which have been adopted for the purposes of this report:

- **Corrugated board** – used widely as secondary packaging and include Kraftliner and test liners. They are made by a conversion process in which three layers of paper (or paperboard) are corrugated during the process and the outer layers (liners) are glued to the peaks[18].
- **Cartonboard and other packaging boards** – used as solid board cases and graphic board. Generally, scores, folds, bends without splitting and has good printability. Widely used for food packaging, pharmaceuticals and other end-uses requiring a high quality, fast running print.
- **Fibre-based composite**[19] – these are packaging materials where the main material is paperboard or paper fibres and the material is laminated with plastic:
    - From 2023, these materials should be classed in packaging returns as 'fibre-based composite' rather than paper or cardboard.
    - This includes **Liquid packaging board** – often called liquid food and drink cartons or Tetrapak (although other brands exist), these multi-layered cartons generally include paper, plastic and aluminium but until 2023 have tended to be categorised as paper and card due to this being the principal material by weight[20]. They are widely used to package fresh food and alternatives to milk and are increasingly used in the ambient aisle[21].
    - Other fibre-based composites include crisps tubes, powdered drinks tubs, sandwich packs and drinks cups.
- **Other** – all other forms of paper and card packaging such as wrappings, paper, shredded paper fillers and mouldings.

The method used for the project splits the POM into different elements and builds a picture from the bottom to the top. The key elements are shown in Figure 2.

[18] *CPI 2014: Descriptions of Paper and Board Fact Sheet: http://www.paper.org.uk/information/factsheets/descriptions.pdf*
[19] *Under EPR guidance effective from 2023 (https://www.gov.uk/guidance/how-to-collect-your-packaging-data-for-extended-producer-responsibility#packaging-class-data), a material should be classed as 'fibre-based composite' (rather than paper or cardboard) "if both of the following are true: the main material is paperboard or paper fibres and the material is laminated with plastic. It may also have layers of other materials."*
[20] *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.*
[21] *Ambient (shelf-stable) food can be safely stored at room temperature in a sealed container. This includes foods that would normally be stored refrigerated, but which have been processed so that they can be stored at room temperature.*

Figure 2: POM Breakdown by Sector



2.3. Consumer Paper and Card Packaging POM

For the purposes of this report, the consumer sector has been broken down into grocery retail and non-grocery retail. The addition of these two sub-sectors equates to the total consumer sector.

2.3.1. Consumer Grocery Retail

In order to estimate the amount of packaging POM by the grocery retail market, aggregated Environment Agency (EA) data was used. The data provided by the EA was 2022 paper and card quantities reported in table 1 selling from NPWD for 92%[22] of UK grocery retailers[23]. This data was scaled up to 100% of the UK grocery market and resulted in an estimated paper and card POM for 2022 of 661k tonnes.

This estimate was cross referenced with Valpak's Environmental Product Information Centre (EPIC) which was assessed to provide data on annual sales and packaging weights for all relevant products packaged in paper and card. This was taken from a selection of Valpak's supermarket clients representing a cross-section of grocery retailers in the UK. Using volume market share information from Kantar World Panel (not publicly available) for these supermarkets, which represented 46% of the grocery retail market by sales volume for 2022, the resulting quantity of paper and card packaging was scaled up to represent an estimate for the UK grocery retail market. In 2019 the supermarkets made up 43% of the grocery retail market. This method assumes that the paper and card packaging profile of the supermarkets chosen in EPIC is representative of all supermarkets overall. Via this method, the paper

[22] *Based on grocery retail market share data as published by Kantar.*
[23] *The figure does not include free-riders or non-obligated producers.*

and card packaging in the grocery retail sector was estimated to be 615k tonnes in 2022. This represents 14% increase on the consumer grocery retail figures identified using this method for 2019 of 539k tonnes. This increase may have been caused by the difference in the selection of supermarket clients for the 2022 that may have a different paper and card packaging composition than the supermarkets previously selected.

The scaled-up EA data was found to be 8% higher than that produced using EPIC (compared to 12% in 2019 and 11% in 2017). In 2014 the EPIC and EA data was much more closely aligned and as such EPIC was used, due to a greater confidence in the quality of the data, greater detail of paper and card packaging composition and its representation of the full grocery market.

However, based on the EA having higher market coverage than EPIC, the EA data was selected for use. This was also the approach taken in the Plastic Flow 2017, 2019 and 2025 projects.

The final grocery retail paper and card packaging POM for 2022 of 661k tonnes (+/-6%[24]) was therefore used. This is a tonnage increase of 10% of that identified for 2019 – higher than the 2% increases seen between 2014 and 2017, and 2017 and 2019. Appendix I provides a detailed assessment of relative levels of confidence in the data.

This increase is outside the margin of error so does indicate that there has been a significant increase in the amount of paper and card packaging POM in 2022. At least some of this increase is likely to have come from the switch from plastic to paper and card and other materials – such as card sleeves for multi-packs of food cans, card replacements for drinks can ring holders and card sleeving on yogurt pots enabling thinner plastic pots.

2.3.2. Consumer Non-grocery Retail

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 alone is not considered robust, since it is likely that paper and card 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, extracting 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 2022 tonnages 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 in section 2.3.1 of this report), and
    - ONS data detailing Total Sales made by Predominantly Food Stores from All Retailing Excluding Automotive Fuel.

In previous iterations of PackFlow, POM data provided by Valpak's grocery retailer members was used alongside stated turnover in their packaging returns rather than total grocery packaging and total grocery sales. This had various issues, primarily due to turnover not being a compulsory field in a packing submission (as long as the turnover is over £2m, a business meets the relevant threshold for participation). Other issues include:

- Use of historic or estimated turnover values;
- Use of rounding, for example, input in thousands of pounds;
- Sometimes turnover is included twice:

[24] *As described in Figure 2.*

  - 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).

The method used assumes the packaging profile of those retailers within the Valpak 'non-grocery' sample is representative of those not in the sample and that turnover is a suitable scaling factor for packaging usage. Based on this method, non-grocery paper and card primary packaging POM is estimated at 617k tonnes.

2.3.2.1. Home Delivery Packaging

Home delivery (shipment) packaging is an additional part of non-grocery retail packaging. It was estimated based on:

- Number of parcels shipped in 2022;
- The split of packaging types for home delivery between plastic and paper and card, and within paper and card;
- An estimate of the average weight of paper and card home delivery packaging.

This produced an estimate of 369k tonnes of home delivery packaging paper and card. This was a significant increase on the 627k tonnes estimated in 2019, but was felt to be a more robust estimate and it is likely that the 2019 estimate was too high. There will have been a reduction in home delivery packaging in 2022 compared with 2019 (although not large enough to cause this drop): while there were significant increases in online sales and hence home delivery packaging during the peak Covid pandemic and lockdowns in 2020 and 2021, deliveries decreased in 2022, there was a slowdown in many parts of the economy in the latter part of 2022 and corrugated board densities have continued to steadily decrease.

2.3.3. Total Consumer POM

The total non-grocery POM is the sum of non-grocery primary packaging, 617k tonnes, and home delivery (shipment) packaging, 369k tonnes, totalling 985 k tonnes.

Adding the grocery and non-grocery estimates provides a consumer POM estimate of 1,647k tonnes (+/- 6%).

In summary the following key steps were taken to estimate total consumer paper and card packaging POM (primary packaging from consumer grocery and non-grocery retail + home delivery shipment packaging) in 2022[25]:

- Total consumer grocery paper and card packaging flow in 2022 was 661k tonnes (see section 2.3.1);
- Proportion of grocery spend of total retail spend in the UK was 42% in 2022[26];
- Total retail paper and card packaging flow, assuming like-for-like packaging was 1,569k tonnes;
- Paper and card primary packaging usage calculated as: grocery 3,562 tonnes per £bn turnover and non-grocery as 2,420 tonnes per £bn turnover;

[25] *All figures subject to rounding.*
[26] *https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/poundsdatatotalretailsales In 2013 this was 47%, as whilst both the grocery and non-grocery retail sectors have seen increased sales since 2013, the non-grocery sales have increased to a greater extent. Much of this growth is as a result of an increase in online sales.*

- Non-grocery paper and card packaging tonnes/£bn turnover is 68% of grocery paper and card packaging tonnes/£bn turnover;
- Applied 68%% to the difference in tonnage between consumer grocery (661k tonnes) and like-for-like total retail (1,569k tonnes) to obtain the consumer non-grocery estimate of 617k tonnes; and
- Adding grocery primary (661k tonnes), non-grocery primary (617k tonnes) and home delivery (shipment) packaging (369k tonnes) to obtain total consumer paper and card packaging POM of 1,647k tonnes.

Therefore, total retail (to consumer) paper and card packaging POM in 2022 was estimated at 1,647k tonnes (+/- 8%[27]). This is a decrease of 2.5% on the 2019 estimate for consumer paper and card packaging POM of 1,688k tonnes (1,524k tonnes in 2017 and 1,423k in 2014) and supports the project Steering Group's view that there was a small drop in paper and card consumer POM in 2022 compared with 2019.

2.3.4. Consumer POM Composition

To provide a breakdown by card/paper type of consumer packaging within the PackFlow 2023 project, supermarket grocery packaging composition was used as a proxy for grocery packaging, and a sample of non-grocery retailers used as a proxy for non-grocery packaging within Valpak's EPIC database. This was based on 2022 sales data and is shown below in Table 3.

Table 3: Consumer Grocery and Non-grocery Packaging by Format, 2022

	Grocery Proportion	Non-Grocery Proportion	**Total Retail (k tonnes)**
Retail Corrugated	5.1%	34.3%	**372**
Retail Cartonboard and Other Packaging Boards	70.3%	25.6%	**717**
Retail Fibre-Based Composite	11.0%	0.0%	**73**
Retail Other	13.6%	40.1%	**485**

2.4. Non-consumer Paper and Card Packaging POM

In order to avoid duplication between consumer and non-consumer packaging (i.e. including packaging within the non-consumer sector that has already been included in the consumer sector) non-consumer waste production is assessed using the bottom-up method[28].

In the Paper and Card Flow 2025 report[29] Defra's complete set of C&I data[30] was used which includes that produced from the C&D and agricultural sectors. This was selected for use for this work because it ensures one single source of data for all non-consumer sectors and provided the most up to date dataset. For PackFlow 2023, the waste generation data was adjusted for 2022.

The data provided by Defra is assessed per key industry sector and by material type (paper and card for the purposes of this report), however it does not provide an assessment of the packaging waste and non-packaging waste produced separately. As a result, appropriate protocols needed to be applied to the data to assess the quantity of paper and card packaging waste generated. For PackFlow 2025, these were obtained from waste composition analysis[31] and identified that for C&I waste collected, approximately 57% of paper and card is packaging. For PackFlow 2023, the Natural Resources Wales weighted average[32] has been used, and an average packaging

[27] *As described in Figure 2.*
[28] *It is assumed that waste production is equal to POM in this case. An example would be where retailer sales is included within consumer but retail back of store waste within the non-consumer sector.*
[29] *https://www.wrap.org.uk/content/paper-card-flow-2025-%E2%80%93-paper-packaging-flow-data-report*
[30] *https://www.gov.uk/government/statistics/uk-waste-data published October 2018.*
[31] *http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18237#RelatedDocuments 2010/11.*
[32] *http://www.wrapcymru.org.uk/sites/files/wrap/Wales%20Municipal%20Waste%20Composition%202015-16%20FINAL.pdf*

percentage of 45.95% calculated by removing the high packaging content of retailer back of store, Agriculture, forestry and fishing and construction material. As the waste composition study in question was an assessment of C&I waste collected by Local Authorities, separate studies were used and applied to the C&D[33] and agricultural[34] sectors, which identified that almost 100% of the paper and card from these sectors is packaging. The results of this analysis are provided in Table 4.

Table 4: Non-consumer Paper and Card Packaging POM, 2022

C&I Sector - for adjusted application	Total Paper & Card Waste (k tonnes)	% Packaging	Total Paper and Card Packaging Waste (k tonnes)
Agriculture, forestry and fishing	8	100.00%	8
Mining and quarrying	1	45.95%	0
Manufacture of food products, beverages and tobacco products	95	45.95%	44
Manufacture of textiles, wearing apparel, leather and related products	9	45.95%	4
Manufacture of wood and of products of wood and cork, except furniture, manufacture of articles of straw and plaiting materials	5	45.95%	2
Manufacture of paper and paper products, printing and reproduction or recorded media	983	45.95%	452
Manufacture of coke and refined petroleum products	1	45.95%	0
Manufacture of chemical, pharmaceutical, rubber and plastic products	53	45.95%	24
Manufacture of other non-metallic mineral products	8	45.95%	4
Manufacture of basic metals and fabricated metal products, except machinery and equipment	17	45.95%	8
Manufacture of computer, electronic and optical products, electrical equipment, motor vehicles and other transport equipment	57	45.95%	26
Manufacture of furniture, jewellery, musical instruments, toys, repair and installation or machinery and equipment	46	45.95%	21
Electricity, gas, steam and air conditioning supply	3	45.95%	1
Water collection, treatment and supply, sewerage, remediation activities and other waste management services	2	45.95%	1
Construction	17	100.00%	17
Services exc. retail (except wholesale of waste and scrap)*	3,334	45.95%	1,532
Retail	1,050	100.00%	1,050
Total	**5,690**	**56.2%**	**3,196**

**It should be noted that the Defra figure for 'services' includes retail, wholesale, transport and storage and hospitality. Further disaggregation of this figure follows, and as such retail and hospitality 'back of premises' material will be removed to avoid double counting.*

[33] http://www2.wrap.org.uk/downloads/ConstructionSitePackagingWaste.250ebeab.1592.pdf - *Establish Tonnages, and Cost Effectiveness of Collection, of Construction Site Packaging Waste, 2005.*
[34] *Agricultural Waste Survey 2003, Environment Agency.*

This analysis resulted in a non-consumer paper and card packaging total of 3,196k tonnes (+/-10% error margin[35]), which represents a 3% decrease from that reported in 2019. In order to compare the composition provided above with data from 2019 and cross check this data, wider sources were also used to assess the quantity of paper and card packaging used by retailers back of store and the hospitality sectors.

The quantity of paper and card packaging discarded by retailers at back of store was estimated based on data provided directly by retailers in August 2023 for the 2022 calendar year. Data was then scaled up to UK level using Kantar World Panel market share information. The final figure for retail back of store was 1,050 k tonnes (+/-15% error margin[35]) of paper and card packaging, which represents a 2% decrease on 2019 data.

Data for the hospitality sector was extracted from Valpak's EPIC database which relates to 33% of the cash and carry (subset of data supplied into hospitality) and delivered foodservice industry[36]. Market share information for the companies included in the sample were used to scale up the resulting tonnage to represent the whole. Furthermore, the Cash and Carry market share of foodservice, catering and hospitality (87% from IGD) was used to scale up to the whole hospitality sector. This resulted in an estimate for the 'hospitality and hospitality wholesale' sector of 249k tonnes **(**+/- 15% error margin[35]) of paper and card packaging. This is 10k tonnes, or 4% lower than the 259k tonnes reported in PackFlow 2019.

2.4.1. Non-consumer Paper and Card Packaging POM Composition

To provide a breakdown by card/paper type of non-consumer packaging, data from Valpak's EPIC database was used and the proportions applied to the appropriate sub-sectors. This included supermarket secondary/tertiary packaging, hospitality packaging and manufacturing. This resulted in the estimate provided in Table 5.

Table 5: Non-consumer Paper and Card Packaging by Format, 2022

	Non-consumer Proportion	Non-consumer Total (k tonnes)
Corrugated	88%	2,803
Cartonboard and Other Packaging Board	5%	169
Fibre-based composite	2%	71
Other	5%	153
Overall	**100%**	**3,196**

2.5. Total Paper and Card Packaging POM

The combined consumer and non-consumer paper and card packaging POM are summarised and compared to the 2017 and 2019 data in Table 6.

The breakdown of the 2022 paper and card packaging POM by sector is provided in Table 3.

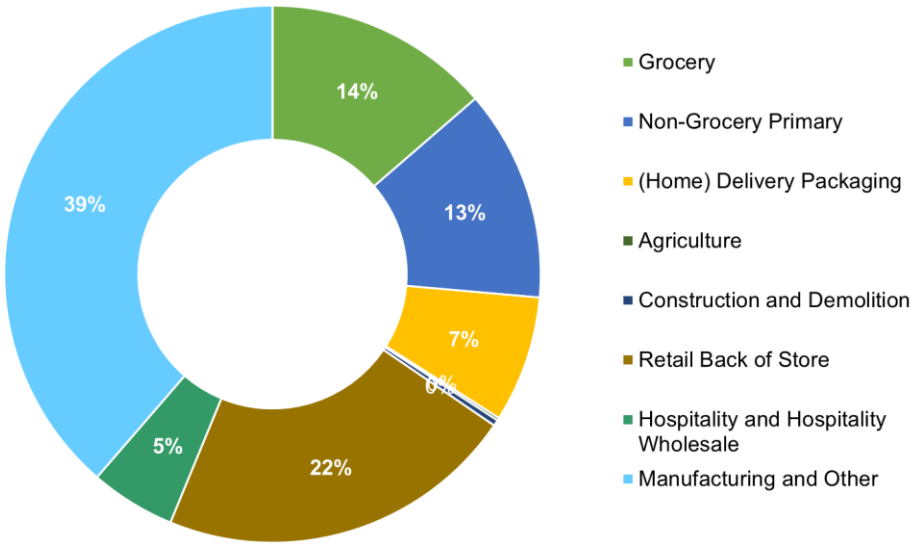
[35] *As outlined in Figure 2.*
[36] *Valpak's EPIC database holds sales data and packaging weights information for clients signed up for the fully managed service. In the 2014 Paper Flow report only data from the cash and carry sector was available but since this time additional data is now available to Valpak to cover the delivered foodservice sector and as such represents an improvement in the robustness of this assessment.*

Table 6: Total UK Paper and Card Packaging POM, 2017–2022 (k tonnes)

Stream	Sub-Stream	Total Quantity			% Change 2022 vs 2019
		2017	2019	2022	
Consumer (retail)	Consumer (retail) Total	1,524	1,688	1,647	-2%
Non-consumer	Non-consumer Total	3,405	3,301	3,196	-3%
Full Market	**Full Market Total**	**4,929**	**4,990**	**4,843**	**-3%**
Consumer (Retail)	Grocery	590	603	661	10%
	Non-Grocery Primary	934	458	617	35%
	(Home) Delivery Packaging		627	369	-41%
	Consumer (Retail) Total	**1,524**	**1,688**	**1,647**	**-2%**
Non-consumer	Agriculture	9	8	8	0%
	Construction and Demolition	19	20	17	-13%
	Retail Back of Store	1,057	1,067	1,050	1%
	Hospitality and Hospitality Wholesale	117	259	249	121%
	Manufacturing and Other	2,209	1,947	1,871	-4%
	Non-consumer Total	**3,405***	**3,301**	**3,196**	**-3%**

**It should be noted that the full-market non-consumer total for 2017 was 3,405k tonnes, but there was 237k tonnes of missing tonnage.*

Figure 3: Total UK Paper and Card Packaging POM by Sector, 2022 (%)



The 2022 paper and card packaging POM is estimated to be 4,843k tonnes (+/- 7% error margin[37]), which is a decrease of 3% on that reported in 2019 of 4,063k tonnes[8].

This has been driven by a decrease in consumer paper and card packaging of 2% to 1,647k tonnes POM in 2022. This decrease in paper and card packaging usage results from a decrease in non-grocery packaging of 9%, although some of this could be due to an estimate for home delivery packaging being too high in 2019. There was also a significant increase in grocery packaging of 10%, possibly due to substitution from plastic packaging to paper and card packaging.

Conversely, there has been a small decrease of 3% in the amount of packaging recorded within the waste mix from commercial premises, based on WRAP waste composition analysis[38] and subsequent adjustments. As a result, non-consumer paper and card packaging is now estimated at 3,196k tonnes POM in 2022.

2.5.1. Total Paper and Card Packaging POM Composition

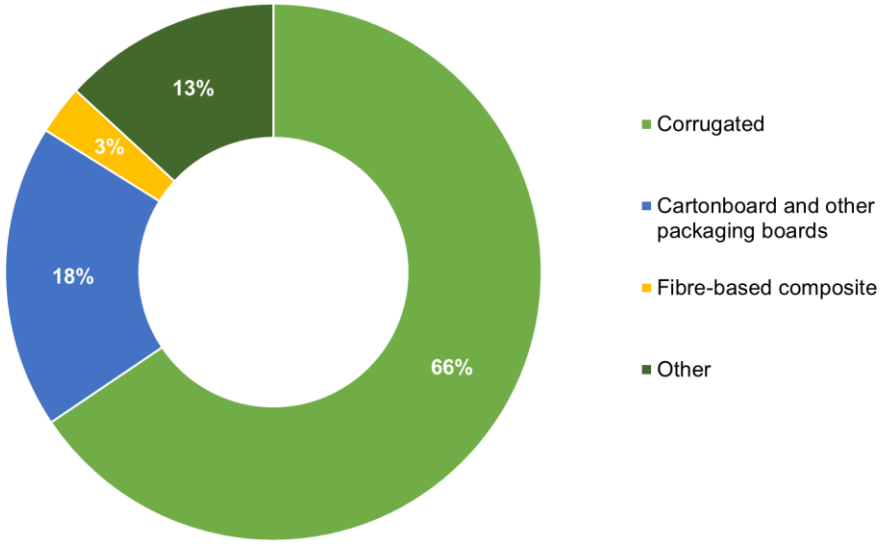
The composition of the 2022 paper and card packaging POM is provided in Table 7, compared to the compositions in 2017 and 2019, and shown in Figure 4.

Table 7: Total UK Paper and Card Packaging POM Composition, 2017–2022 (k tonnes)

Stream	Packaging Type	2017	2019	2022	Change
Consumer (Retail)	Paper and Card Packaging	1,524	1,688	1,647	-2%
Non-consumer	Paper and Card Packaging	3,405	3,301	3,196	-3%
Full Market	**Paper and Card Packaging**	**4,929**	**4,990**	**4,843**	**-3%**
Consumer (Retail)	Corrugated	443	400	372	-7%
Non-consumer	Corrugated	3,027	2,817	2,803	0%
Full Market	**Corrugated**	**3,470**	**3,217**	**3,175**	**-1%**
Consumer (Retail)	Cartonboard & other pkg board	836	1,058	717	-32%
Non-consumer	Cartonboard & other pkg board	193	307	169	-45%
Full Market	**Cartonboard & other pkg board**	**1,029**	**1,365**	**887**	**-35%**
Consumer (Retail)	Fibre-based composite	46	46	73	59%
Non-consumer	Fibre-based composite	5	9	71	686%
Full Market	**Fibre-based composite**	**51**	**55**	**144**	**161%**
Consumer (Retail)	Other	195	185	485	162%
Non-consumer	Other	180	168	153	-9%
Full Market	**Other**	**375**	**353**	**638**	**81%**

[37] *As described in Figure 2.*
[38] *https://www.wrap.org.uk/content/quantifying-composition-municipal-waste*

Figure 4: Total UK Paper and Card Packaging POM Composition, 2022 (%)



As can be seen in Figure 4, around 66% of the total paper and card packaging POM is corrugated, with about 18% being cartonboard and other packaging boards, 3% fibre-based composites and 13% other. This breakdown has been compared against production figures provided by the CPI in Table 8. This indicated a split of 64% corrugated, 27% cartonboard and other packaging boards, 2% liquid packaging board (not including other fibre-based composites) and 6% other packaging (such as packaging paper and moulded fibres). Thus some of the packaging identified as 'other' will likely be cartonboard.

Table 8: Cross-check of Total Paper and Card Packaging POM Composition, 2022

	PackFlow 2023	CPI
Corrugated	66%	64%
Cartonboard and other packaging boards	18%	27%
Fibre-based composite	3%	2%
Other	13%	6%

2.5.2. Fibre-Based Composites

Table 9 provides another view of the composition of the paper and card packaging POM in 2022. The fibre-based composites are further broken down in Table 10.

Table 9: Total UK Paper and Card Packaging POM Composition, 2022 (k tonnes)

Stream	Sub-Stream	Corrugated	Carton Board	Fibre-based composite	Other	Total
Consumer (retail)	Consumer (retail) Total	372	717	73	485	**1,647**
Non-consumer	Non-consumer Total	2,803	169	71	153	**3,196**
Full Market	**Full Market Total**	**3,175**	**887**	**144**	**638**	**4,843**
Consumer (Retail)	Grocery Packaging	34	465	73	90	**661**
	Non-Grocery Primary	338	252	0	395	**985**
	Consumer (Retail) Total	**372**	**717**	**73**	**485**	**1,647**
Non-consumer	Agriculture	7	0	0	1	**8**
	Construction and Demolition	15	1	0	1	**17**
	Retail Back of Store	1,034	15	0	2	**1,050**
	Hospitality	81	79	69	21	**249**
	Manufacturing and Other	1,666	75	2	129	**1,871**
	Non-consumer Total	**2,803**	**169**	**71**	**153**	**3,196**

Table 10: Fibre-Based Composite Packaging POM Composition, 2022 (k tonnes)

Stream	Sub-Stream	Coated/ other	Foil-lined	Liquid Paper Board	Total composite
Consumer (retail)	Consumer (retail) Total	4	14	55	**73**
Non-consumer	Non-consumer Total	50	0	18	**71**
Full Market	**Full Market Total**	**54**	**15**	**73**	**144**
Consumer (Retail)	Grocery Packaging	4	14	55	**73**
	Non-Grocery Primary	0	0	0	**0**
	Consumer (Retail) Total	**4**	**14**	**55**	**73**
Non-consumer	Agriculture	0	0	0	**0**
	Construction and Demolition	0	0	0	**0**
	Retail Back of Store	0	0	0	**0**
	Hospitality	50	0	18	**69**
	Manufacturing and Other	0	0	0	**2**
	Non-consumer Total	**50**	**0**	**18**	**71**

The Hospitality Coated/ other category includes 32 kt of cups as well as other coated take-away packaging. No reliable data is available for foil-lined hospitality (takeaway) packaging and if identified this would add to the fibre-based composite total.

Table 11 summarises the fibre-based composite packaging POM percentage composition in 2022.

Table 11: Summary of Fibre-Based Composite Packaging POM Composition, 2022 (%)

Fibre-based composite	Coated/ other	Foil-lined	Liquid Paper Board	**Total composite**
Proportion of Total POM	1.1%	0.3%	1.5%	**3.0%**

2.5.3. Consumer-Type Paper and Card Packaging

Clearly in the case of cardboard, there is no distinction between household and commercial applications in the use of corrugated, cartonboard and other packaging boards, paper or fibre-based composite, other than physical size (although it should be noted that even very large corrugated boxes can arise in the household, for example from the delivery of furniture) – and as such it could be argued that all cardboard packaging is 'household like' in its nature. For PackFlow 2025, it was considered of interest to provide a POM estimate for that which could be defined as 'consumer-type' paper and card packaging. This would include the total consumer packaging POM identified in section 2.3, plus that identified as primary hospitality packaging within the calculations in section 0 (249k tonnes). This is because hospitality packaging is primarily 'household-like' in its nature. This would result in a consumer-type POM of 1,895k tonnes (+/- 9% error margin[39]).

2.6. POM Cross-check (Net Pack Fill)

This section of the report is used as a cross-check of the total paper and card POM in the UK in 2022, based on the data stored on NPWD, as reported to the EA by obligated organisations and that provided by the Paper and Card Steering Group.

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.

2.6.1. Net Pack Fill

The 2022 UK flow of paper and card packaging was calculated using the packaging weights reported to the EA by registered producers and publicly available on the NPWD website. The 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)

The subsequent 'Net Pack Fill' 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[40] 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 as we move down the supply chain.

Using this method, the total obligated paper and card POM in 2022 is currently[41] 4,117k tonnes (as shown in Table 12)[42]. This dataset is still incomplete, as there are still some late registrants who have not yet submitted their data for 2022.

[39] *As described in Figure 2.*
[40] *No evidence data is available to support this.*
[41] *As of 22 October 2023.*
[42] *As reported by businesses in 2020.*

This method does not account for paper and card packaging handled by unregistered 'packer fillers' or importers, 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.

Table 12: Obligated Paper and Card Packaging (Net Pack Fill), 2022 (k tonnes)

	Paper and Card
Table 1 Pack/Fill (UK pack/filling)	**2,611**
3A Selling (filled imports)	1,406
3B (packaging removed from imports)	551
Total UK Pack/Fill + Imports	**4,567**
2A P/F (direct exports)	419
2B P/F (third party exports)	32
Total Exported	**450**
Net Pack Fill	**4,117**

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 for paper and card could be large due to the proportion of small importers and online sellers. An estimate of the unobligated tonnage (726k tonnes, 15%) has been made by subtracting the current net pack fill figure of 4,117 k tonnes from the project's final POM estimate of 4,843k tonnes. The unobligated proportion of 15% is a decrease from the 22% identified in PaperFlow Covid-19 report, and a decrease from the estimated unobligated tonnage obtained by subtracting the final full year tonnage (19%[8]).

To allow for the impact of late registrants, an alternative method was used to estimate the full-year total obligated paper and card POM for 2022, as detailed in section 1.3.2. This gave a total POM estimate of 4,179k tonnes, 62k tonnes (1.5%) higher than the live net pack fill estimate: i.e. 62k tonnes more are expected to be registered eventually for 2022. The difference between this full year POM estimate and the project's final bottom-up POM estimate of 4,843k tonnes gives an estimate of the unobligated tonnage, 664k tonnes, 14%. This proportion was considered appropriate by the paper and card packaging Steering Group.

2.6.2. Steering Group Data

Members of the Paper and Card Steering Group[43] were able to provide confidential data on the flow of paper and card packaging onto the UK market. In some cases, this data related to the UK production only and as such had to be combined with an estimate of paper and card packaging imported into the UK. Using NPWD data, the proportion of paper and card packaging placed on the market that was imported was estimated to be around 48%.

Following the project's conclusions, data received from Steering Group members was compared and considered in line with the project's estimate of 2022 POM of 4,843k tonnes and 2022 net pack fill of 4,179 k tonnes. one estimate being within 2% of the project's total POM[44]. The draft results of the project were also shared with and agreed by the Steering Group in September 2023. Concerns were raised about comparisons with other POM estimates, but subsequent discussions with key industry stakeholders confirmed that the total POM estimate generated by this project is believed to be the most accurate.

[43] *A list of Steering Group members can be found in the acknowledgements of this report.*
[44] *Due to the confidential nature of the data provided to the project team, full details of the comparisons were not able to be published.*

It was also possible to compare paper and card packaging consumption per person in the UK with equivalent data reported (although based on varying methodologies in each country) from other European countries on Eurostat[45]. Based on the project POM, consumption of paper and card packaging in the UK is 72.3kg/capita, this compares to a European average of 76.0kg/capita[46]. This therefore puts the UK slightly below the European average based on this data source, but within a similar range.

2.7. Summary of Paper and Card Packaging POM

The project estimate for paper and card packaging POM in 2022 is 4,843k tonnes (+/- 7%).

This has been derived using a bottom-up methodology, taking data from various sources for each sector and combining the results. It has been cross-checked with reported obligated data on NPWD and with data provided by the project's Steering Group.

The estimate for paper and card packaging POM in the consumer sector is 1,647k tonnes (+/-8%) in 2022.

This method is based on primary data from the EA alongside reliable market share data. No other method was used for deriving consumer data as this method is considered the most robust there is available and is accepted by industry.

The estimate for paper and card packaging POM in the non-consumer sector is 3,196k tonnes (+/-10%) in 2022.

This data was derived by applying revised packaging protocols to the Defra C&I Waste Statistics for 2018, adjusted to 2022. It has been broken down and verified using Valpak EPIC data and back of store data provided directly by retailers.

Table 13: Paper and Card Packaging POM, 2022 (k tonnes)

Sub-Stream	Corrugated	Carton Board	Fibre-based composite	Other	Total
Consumer (retail) Total	372	717	73	485	**1,647**
Non-consumer Total	2,803	169	71	153	**3,196**
Full Market Total	**3,175**	**887**	**144**	**638**	**4,843**
Proportion of total POM	66%	18%	3%	13%	**100%**

The total paper and card packaging POM estimate is 664k tonnes higher than data expected to be reported by obligated companies under the packaging waste regulations (using the net pack fill method).

This suggests that non-obligated companies (handling fewer than 50 tonnes of packaging or with lower than £2 million turnover) and free-riders (companies above the thresholds but not registered with the relevant agency) account for 14% of paper and card packaging in the UK. This has decreased from the 19%[8] non-obligated POM identified in 2019 and 16% in 2017.

It is important to stress that the net pack fill estimates are themselves open to the possibility of a degree of error because they rely on the robustness and, in this case, the timeliness of the data that is submitted to NPWD. The NPWD data is widely recognised as being the best available as there is a legal obligation for companies to submit data that is as accurate as reasonably possible, which is then audited by the regulating body. This data is used by policy makers and their agencies.

[45] *https://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics#Waste_generation_by_packaging_material.*
[46] *In 2017.*

3. 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 UK's EPR system this had been referred to as 'household/household-like' packaging placed on the market.

This section of the report details the latest interpretation of this requirement, referred to here as *Scheme Administrator Submissions* (that is to say, the total tonnage of packaging POM that is 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 are 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 14 below shows total expected Scheme Administrator Submissions for paper and card. It also splits out fibre-based composites to indicate the significance of the takeaway sector for this stream.

Paper and card containers are not currently included in DRS proposals, so there is no impact of DRS on Scheme Administrator Submissions.

The total tonnage of packaging POM that is likely to be declared by obligated business to the scheme administrator as meeting the criteria of being for public/consumer use (formally referred to as 'household / household like') is 1,732kt, of which 123kt is 'fibre-based composite'.

Table 14: Total Expected Scheme Administrator Submissions

Material / Situation	Total POM	Total Consumer	Total Non-consumer	Total Hospitality	Total Hospitality: Takeaway Only	Estimate of total scheme administrator submissions (consumer in scope)
Paper and Card (All)	**4,843**	1,647	3,196	249	85	**1,732**
Paper and Card (Exc. Fibre-based Composite)	**4,699**	1,574	3,125	180	35	**1,609**
Fibre-based Composite	**144**	73	71	69	50	**123**

4. Consumer Packaging in the Household Waste Stream

4.1. Introduction

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

4.2. 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 product categories in Valpak's EPIC database. 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' recycling or litter bins, or mixed recycling or general waste in business premises such as work, leisure venues, hospitality / HORECA settings (including hotels) or other destination locations.

4.3. 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[47] [48].
- 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 (household), 50% HH-L (household-like) default, or
    - 25% HH, 75% HH-L by exception, or
    - 75% HH, 25% HH-L by exception

4.4. 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.

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

4.5. 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; and
- I/We don't use this type of product, or I can't remember the last time I/we used this product.

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

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

4.6. Fourth Iteration – Similar Categories

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

4.7. Application to 2022 POM

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

4.8. Proportion of Packaging Disposed of Within the Household Waste Stream

Based on the methodology detailed above, the total proportion consumer paper and card packaging from grocery retailers that is disposed of in the household waste stream is 77%. The total proportion consumer paper and card packaging from non-grocery retailers that is disposed of in the household waste stream is 92%. This is based on

same sample of retailers as is used in the rest of this report and equates to 1,426kt (87%) of packaging in total across both grocery and non-grocery retail packaging.

The proportion of grocery and non-grocery paper and card packaging that gets disposed of within the household waste stream is detailed in Table 15.

Table 15: Proportion of Grocery and Non-Grocery Packaging Disposed of Within the Household Waste Stream

	Corrugated	Cartonboard and other packaging boards	Fibre-based composite	Other	**Total**
Grocery	76%	77%	73%	86%	**77%**
Non-grocery	94%	93%		91%	**92%**
Average all retail	**92%**	**82%**	**73%**	**90%**	**87%**

5. Consumer Packaging in the 'Litterable' Categories

5.1. Introduction

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[49] 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 EIPC categories to identify proportion of sales (by weight of packaging) that did fall within the KBT categories. In these instances, these proportions were used in place of a binary 1 (in a litterable category) or 0 (not in a litterable category) to give a true indication of the total weight of packaging material that falls within these category types.

5.2. Proportion of Packaging that Falls Within the Litterable Categories

Based on the methodology detailed above, the total proportion of consumer paper and card packaging from grocery retailers that falls within the 'litterable' categories detailed above is 21%. The total proportion of consumer paper and card packaging from non-grocery retailers that falls within the 'litterable' categories is 0%. This is based on same sample of retailers as is used in the rest of this report and equates to 139kt (8%) of packaging in total.

The proportion of grocery paper and card packaging that falls within the litterable categories is detailed in Table 16.

Table 16: Proportion of Grocery and Non-Grocery Packaging that Falls Within the Litterable Categories

	Corrugated	Cartonboard and other packaging boards	Fibre-based composite	Other	**Total**
Grocery	46%	20%	30%	12%	**21%**
Non-grocery	0%	0%	0%	0%	0%
Average all retail	**4%**	**13%**	**30%**	**2%**	**8%**

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

6. By Nation Reporting

6.1. Introduction

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

6.2. Scaling Factors – Background

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

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

6.2.1. Agriculture

Valpak considered national statistics for agriculture relating to employment[50], income, the number of holdings and the total hectares[51] in each of the nations as follows.

Table 17: Metrics Relating to Agriculture in the Nations of the UK in 2022

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

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

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

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

Table 18: 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 an inappropriate factors to use because these are likely to be skewed by very large farms for grazing livestock (for which the packaging may not be proportional to the size or number of farms). As such employment and total income were then considered. Whilst neither is likely to be entirely accurate, employment was chosen as the reasonable metric on the basis that total income again could be skewed by the relative value of the output of the farm itself. Instead, the assumption is that a farm worker is equally likely to open packaged product as any other as a farm work on their or any other farm during the course of their day-to-day duties. As such, it was decided that the most appropriate figure for this calculation was to use employment.

6.2.2. Population

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

Table 19: Proportion of the Population Living in Each of the Nations of the UK

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

6.2.3. Construction

Various factors were considered within construction sector, however as is the case in agriculture, the total employment[52] [53] was deemed to be a suitable factor for defining the relative size of the corresponding sector in each 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.

[52] *GB data: https://www.ons.gov.uk/file?uri=/businessindustryandtrade/constructionindustry/datasets/constructionstatisticsannualtables/2021/constructionsannualtables2021.xlsx*
[53] *Northern Ireland Data: https://www.nisra.gov.uk/system/files/statistics/2022g2soti.xlsx*

Table 20: Proportion of the Employees Within the Construction Sector in Each of the Nations of the UK

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

6.2.4. GDP

Those aspects of POM in the non-consumer (manufacturing) sectors were scaled by GDP54 to represent manufacturing output.

Table 21: 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%**

6.2.5. Hospitality

Data as to the relative size of the hospitality sector in each of the regions is available from Government statistics in terms of the number of establishments in 2017[55]. 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 22: 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%**

[54] 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
[55] https://assets.publishing.service.gov.uk/media/5d67a363ed915d53b4904899/Hospitality_and_Tourism_Workforce_Landscape.pdf

6.3. Sector Scaling Factors Used

The scaling factors used for each sector in the by-nation 2022 POM reporting is shown below in Table 23.

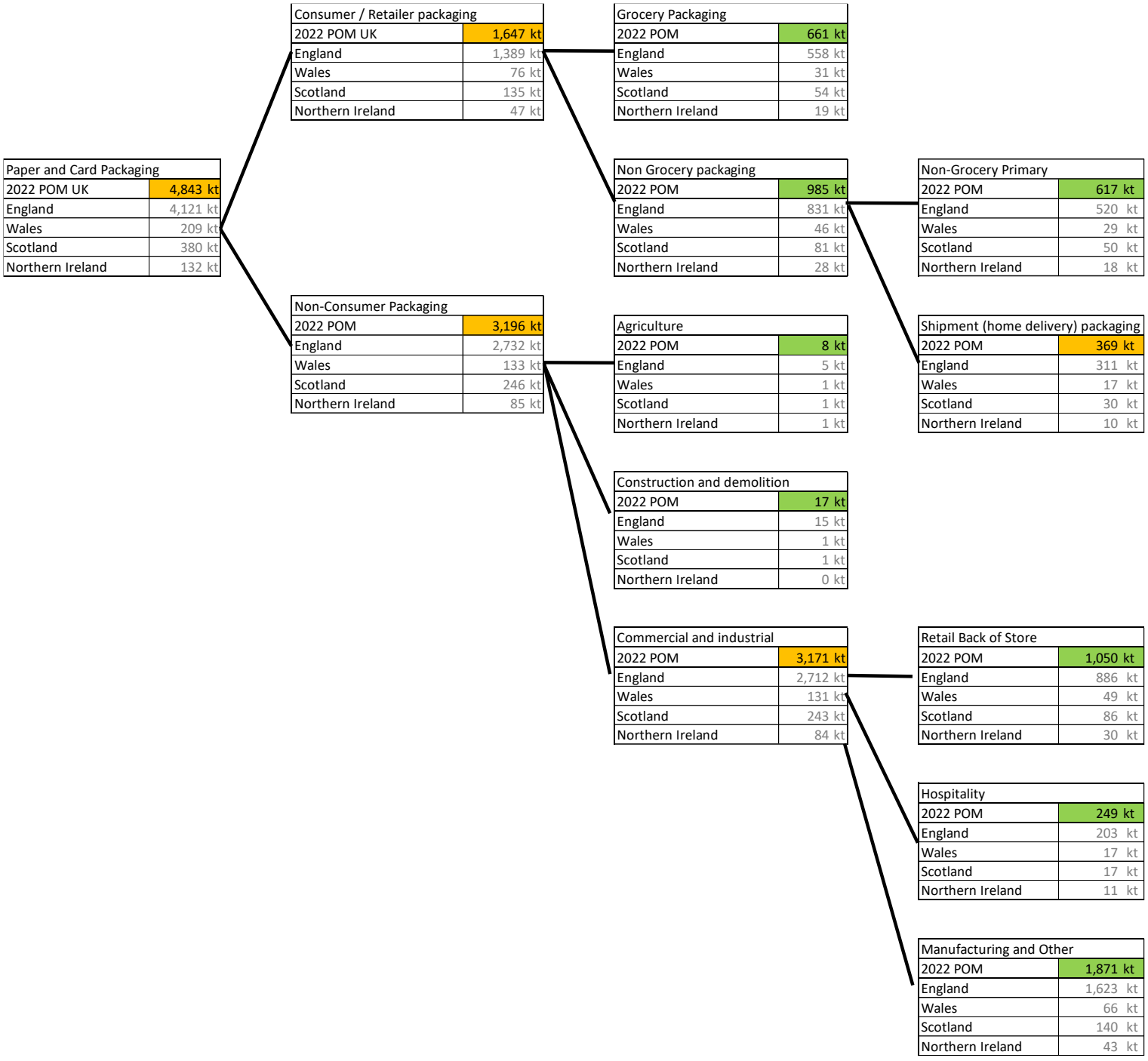
Table 23: Scaling Factors Used for Each Sector in the By-nation 2022 POM Reporting

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

6.4. POM by Nation: Paper and Card

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

Figure 5: POM by Nation: Paper and Card



7. Phase 1: Collection and Recycling

7.1. Introduction

This section of the report examines the levels of paper and card packaging waste collected in the UK and recycled either in domestic mills or outside of the UK. Data from NPWD is taken as the total accredited (recorded) recycling. Since NPWD figures do not account for unaccredited reprocessing[56], this project has also completed analysis on the unaccredited element to provide an estimate of the total recycling.

The collections are split between consumer (Local Authority managed collections from households) and non-consumer collections. Data on Local Authority collections, reported on WasteDataFlow (WDF) is used as a proxy for household collections, and the remainder is assumed to be non-consumer collections.

7.2. Recorded (Accredited) UK Paper and Card Packaging Recycled

NPWD is used to identify total recorded recycling of paper and card packaging both in the UK and that exported for recycling. For 2022, NPWD shows that 3,695k tonnes of paper and card packaging was reported as recycled, of which 1,171k tonnes (32%) took place in the UK.

Based on the total POM estimated in this report, the total recorded paper and card packaging recycling of 3,695k tonnes in 2022 represents a recorded recycling rate of 77% in 2022.

7.3. Total UK Paper and Card Packaging Recycled

NPWD is used to identify the total recorded recycling of paper and card packaging, both in the UK and of exports for recycling overseas. However, not all of the paper and card packaging might be captured on NPWD.

Total UK paper and card packaging recycled	**=**	**Total recorded recycling**	**+**	**Total unrecorded recycling**

For key grades that contained packaging materials, cardboard, and mixed paper, the Steering Group felt that very little recycling was occurring in UK mills that was not captured and recorded on NPWD. This is due to there being a small number of key industry players, all of whom are known to be accredited. Recycling of packaging grades in some small pulping mills that exist was felt to be at or close to zero. As any unrecorded recycling in UK mills was felt to be minimal, it was assumed in calculations that there was no unaccredited recycling at UK mills.

The Steering Group maintained the position that some unrecorded recycling was occurring with exports, where those exporting relatively small tonnages of recovered packaging grades may not always have an incentive to register overseas mills. This may happen if volumes being shipped are small one-offs or if a new mill (from the perspective of the exporter) is supplied towards the end of an accreditation year, where there may be insufficient time to register the mill with the Regulator and / or the administrative burden and cost of registering the mill may not be worthwhile compared to the additional revenue from PERN sales, although the high PRN price in 2022 would mitigate much of this risk as it would provide a significantly added incentive for timely accreditation. The loss was felt to be greater with the export of mixed paper as the revenue received by the exporter is only on the packaging content (34.5% of the bale based on an Environment Agency protocol) which reduces the revenue per tonne of recovered fibre shipped. Despite a belief amongst those consulted that some unaccredited recycling in export markets was occurring, it was generally felt to be small as the majority of the recovered fibre exports are through a relatively small number of large companies to specific mills or mill groups. The 98% accredited tonnage capture rate estimated in the previous PackFlow project for the export of recovered cardboard for recycling was increased to 99.5%, and the capture rate for mixed papers exported for recycling was increased to 97.5% (from 95%). The increases are due to the higher PRN/PERN prices seen in 2022 compared to 2019, giving more incentive to be accredited.

[56] *That which is reprocessed or exported for reprocessing by a company that is not accredited/registered with the EA to raise PRNs/PERNs on packaging reprocessed/exported.*

Members of industry believed that some material will be unrecorded due to the current EA mixed paper protocol proportion that is packaging being too low. The proportion is currently set at 34.5% of the bale. This project has assessed how much tonnage might have been missed if the protocol was set at a higher packaging proportion of 55%, which is believed by industry to better reflect the current packaging content of those bales. A tonnage of 204k tonnes is estimated to be not PRN/PERNed because of this low protocol.

The recycling of paper and board packaging materials in grades of recovered fibres where there is no national protocol was also discussed with industry, in particular any packaging content in deinking grades such as newspapers and magazines. Whilst packaging materials are not targeted in these grades, and mills typically have maximum tolerance levels of 1.5% in their specifications, feedback from industry suggests that the actual levels of packaging content present are higher than desired. This can occur due to contamination of deinking grades with packaging materials during the sortation of mixed fibre streams at MRFs. The assumed packaging content used in the modelling for this report is 6%, based on the feedback received from industry, including those with experience in buying and selling this grade. Furthermore, a WRAP compositional analysis from 2017 found that 8% of papers collected within recycling collections at the kerbside were packaging[57]. The total unrecorded figure for packaging recycled within deinking grades was calculated by taking the total estimated flow of newspapers and magazines and removing the percentage of the flow believed to have packaging content picked up and recorded on NPWD through local protocols agreed with the Regulator. It was then multiplied by 6%.

Taking into consideration all of the aforementioned factors, the total unrecorded (unaccredited) recycling of paper and card packaging in 2022 was estimated to be 239k tonnes. This is considerably higher than the estimation presented in the previous report of 116kt. This is due to the adjustment made this time to account for the EA protocol, which is believed to be too low.

The total quantity of paper and card packaging recycled in 2022 is thus estimated to be 3,934k tonnes, including recorded and unrecorded recycling, giving a total recycling rate of 82% in 2022 based on the project's total POM estimate.

7.4. Consumer Recycling

Consumer recycling data was extracted from WasteDataFlow (WDF), and figures are reported based on the financial year 2021/22 (2021 for Scotland). This means there is some degree of inconsistency between the collection figures for April 2021 - March 2022 and the consumption figures for January 2022 - December 2022[58]. A summary of the UK local authority (LA) paper and card recycling collections are shown in Table 24.

Table 24: Paper and Card WDF Data, 2021/22

	Total	Kerbside	Bring	CA
Consumer Paper and Card Collected for Recycling	**2,535**	2,311	25	200

As shown in the table**,** 2,535k tonnes of paper and card is reported on WDF by LAs as being collected for recycling.

However, some of the WDF data will include non-packaging content. To account for this, further calculations were made to remove possible non-packaging tonnage from the WDF numbers.

Firstly, the cardboard grade was reduced by 2.5% to align with the 97.5% protocol. In addition, the 55% assumed packaging proportion, as discussed in section 7.3 above, was applied to mixed paper and card tonnage. All of the packaging where PRNs were not claimed in the News & Pams grade (newspapers, magazines, pamphlets and leaflets) (see section 7.3 above) was allocated to the consumer collections.

The total consumer recycling tonnes after these adjustments have been made to WDF collections data amounts to 1,313k tonnes representing a consumer recycling rate of 80%, based on the project's consumer POM estimate.

[57] https://wrap.org.uk/content/quantifying-composition-municipal-waste
[58] *At the time of writing 2021/22 was the most recent full set of WDF data available for England, Wales and Northern Ireland, and 2021 for Scotland.*

7.5. Non-consumer Recycling

Non-consumer collections were estimated as follows:

Non-consumer recycling	=	Total UK paper and card packaging recycled	-	Consumer recycling

Total UK paper and card packaging recycling consists of the total tonnage of paper and card packaging recycled and recorded on NPWD[59] combined with the project's estimate for unrecorded recycling.

The total consumer paper and card packaging, as discussed in section 7.4 of this report, is removed from the total recycling figure to leave an assumed non-consumer paper and card packaging recycling tonnage for 2022.

This project's best estimate for non-consumer recycling in 2022 is 2,622k tonnes, giving a non-consumer recycling rate of 83% based on the project's non-consumer POM estimate.

7.6. Recycling of Fibre-Based Composites

Actual collection and recycling rates for liquid paper cartons in the UK are difficult to establish from published data. The Alliance for Beverage Cartons and the Environment (ACE) publish a report for all of Europe[60] that states that in 2019, around 450,000 tons of beverage cartons (51%) were recycled. Some systems were stated to be high achieving, such as Belgium (90%), Germany (75%) and France (59%), and the Netherlands was stated to be achieving close to 50%. Specific UK data is hard to come by, however high achieving countries tend to have widespread segregated collections which is not the case for the UK, where many kerbside recycling collections are commingled. For the purposes of this report, it is assumed that UK collection rate is 51% (aligned to the published European recycling rate) and the recycling rate is 35% (assuming a c.70% yield).

Cup collections in the UK are deemed to be limited to the National Cup Recycling Scheme (NCRS) plus other regional and local initiatives, and collections of non-target cups in other waste streams. Whilst other schemes are in place, those are typically geographically restricted and time bound, thereby limiting the impactfulness when considered on a national and annual basis. Whilst prior to the COVID pandemic the level of cup collections through he NCRS and other initiatives was seen to be at around 6% of total POM[61], it is believed that this has fallen in recent years to c.2%. This is based on interpolation from NCRS collection rates and comparing this against stated results by the Paper Cup Recovery and Recycling Group (PCRRG) in 2019. This is expected to increase in the coming years through the introduction of mandatory collections and a continuing return to the scale of consumer offer in place before the pandemic.

Table 25: Recycling of Fibre-based Composite Packaging, 2022 (%, k tonnes)

Stream	Units	Cups	Coated exc. cups[8]	Foil-lined[62]	Liquid Paper Board	Total composite
Recycling rates	%	2	0%	0%	35%	10
Recycled	k tonnes	0.6	0	0	6.4	7.0

[59] http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx
[60] https://www.beveragecarton.eu/wp-content/uploads/2021/10/ACE-Recycling_BROCHURE_September-2021.pdf
[61] https://www.foodservicefootprint.com/disposable-cup-recycling-group-misses-8-target/
[62] *It is assumed that there is zero recycling of coated and foil-lined materials. It is acknowledged that some will be accidentally/ incidentally recycled where they're not removed at the kerbside, in the MRF or at the reprocessor, but this is assumed negligible and is ignored.*

7.7. Summary of Paper and Card Packaging Recycling and Disposal

The recorded, unrecorded and total recycling tonnages are recorded in Table 26[63] together with the consumer and non-consumer tonnages, and the corresponding recycling rates based on the POM estimates.

Table 26: Paper and Card Packaging Collections, 2022

	k tonnes	Recycling Rate
NPWD / Recorded	3,695	77%
Unrecorded	239	
Total Recycled	**3,934**	**82%**
Consumer	1,313	80%
Non-consumer	2,622	83%

Based on the POM estimate of 4,819k tonnes, the project estimates that therefore 885k tonnes was not recycled in 2022. We estimate that 38% of this unrecycled material was from the consumer sector and 62% from the non-consumer sector. This is estimated by removing the consumer recycled tonnage from the consumer POM tonnage to leave a residual tonnage and doing the same with the non-consumer tonnages.

Based on 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, and Environment and Rural Affairs (DAERA, for Northern Ireland), the project estimated the proportion of the residual tonnage that may have been sent to landfill compared to that sent to energy from waste or the production of RDF. The majority from both consumer and non-consumer streams are sent to EfW or RDF and less sent to landfill from each stream. The project estimated non-consumer data based on the consumer methodology and should only be taken as a indication, not the final figure. An alternative method was applied initially, but due to the sensitivities around assumptions on the packaging C&I element of EfW inputs and RDF exports, this likely overstated EfW and understated landfill leading us to reject the figure.

This data is summarised in Table 27. It is estimated that, of the 334kt of paper and card not recycled from the consumer sector, 267kt was sent to EfW or RDF and 67kt to landfill. For the 550kt of paper and card not recycled from the non-consumer sector, at least 440kt was sent to EfW or RDF and less than 110kt to landfill.

Table 27: Paper and Card Disposal, 2022

	Consumer	Non-consumer*	Comments
Total not recycled	334	550	POM minus recycled
EfW (including RDF)	267	>440	Consumer - split between EfW (80%) and landfill (20%) based on official government-reported data on destination of residual municipal waste. *Non-consumer split (EfW:Landfill) based on consumer proportions as above for illustrative purposes. Note that modelling non-consumer packaging C&I element of EfW inputs and RDF exports produces a significantly lower level (negligible) of landfilled material.
Landfill	67	<110	

[63] *There is a time difference between the NPWD figures (calendar year 2022) and the local authority figures (2021/22 financial year); however, this was the best available data.*

7.8. End Markets

Recovered paper and card packaging is used for the production of new board and cardboard products.

Based on NPWD figures for 2022, 32% of the recorded recycling took place in the UK and 68% overseas. This is based on the tonnage of packaging received for recycling in the UK or exported for recycling. Therefore, for mixed papers this is after the packaging content protocol has been applied.

A freedom of information request was made to the Environment Agency to determine where the paper and card packaging was exported for recycling in 2022[64]. It can be seen from the data presented in

Table 28 that 17% of exports of recovered paper and card packaging for recycling overseas were sent to Vietnam and 17% to India. Malaysia, Turkey and Indonesia also received over 10% of the material each. In 2019, 36% of exports of recovered paper and card packaging for recycling overseas were to mainland China. There has been a significant decrease in exports to China since the country banned the import of mixed paper at the end of 2017 and reduced import quotas for other grades of recovered paper, to a reported zero tonnage sent to China in 2022.

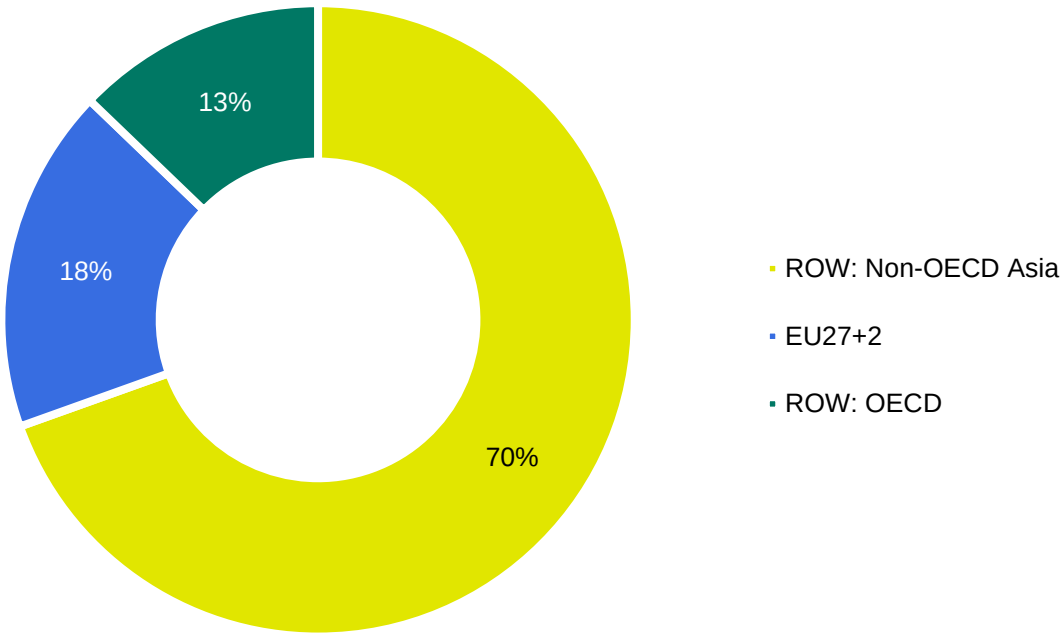
This data is summarised in Figure 6, which shows that 70% of exports end markets in 2022 were in Non-OECD Asia (mainly Vietnam, India, Malaysia, Indonesia, Thailand, Philippines), 18% were in EU27+2 countries (mainly Germany, Netherlands and France) and 13% in OECD countries (mainly Turkey).

Table 28: Export End Markets: Top 10 Destination Countries by Weight, 2022, k tonnes and %

Country	Export (k tonnes)	% of Exports
Vietnam	424	16.7%
India	423	16.7%
Malaysia	361	14.3%
Turkey	324	12.8%
Indonesia	292	11.6%
Germany	242	9.6%
Thailand	220	8.7%
Netherlands	92	3.6%
France	65	2.6%
Philippines	22	0.9%

[64] *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.*

Figure 6: Export End Markets: Destination by Weight, 2022 (%)



Data source: UK Environment Agency. Freedom of Information request

8. Phase 2: Packaging Future Trends and Scenarios

8.1. 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[2] 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.

8.2. Methodology

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

8.2.1. Net Pack Fill

This report uses historic NPWD65 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 the purpose of for selling	+	**Imports** Table 3B - packaging removed from around imports	-	**Exports** Table 2A + Table 2B – pack/filling

[65] www.npwd.environment-agency.gov.uk

9. Trends in Packaging POM by Material

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.

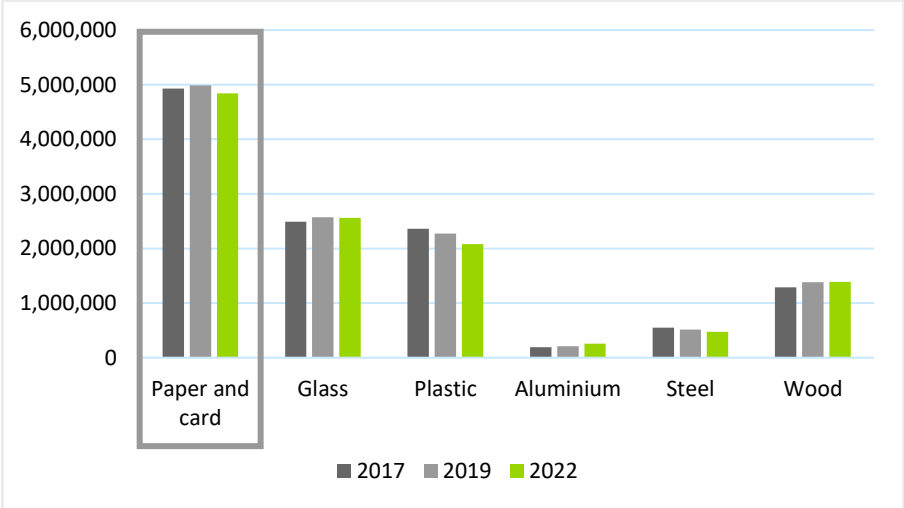
PackFlow's most recent quantifications of packaging POM are for 2017, 2019 and in the current project 2022 (Figure 7). The main takeaways from Figure 7 for packaging materials POM in 2022 compared to earlier years are;

- Paper and card (including fibre-based composites) 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, and
- Wood is stable between 2019 and 2022 but higher compared to 2017.

The data for paper and card is highlighted with a box in Figure 7.

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)



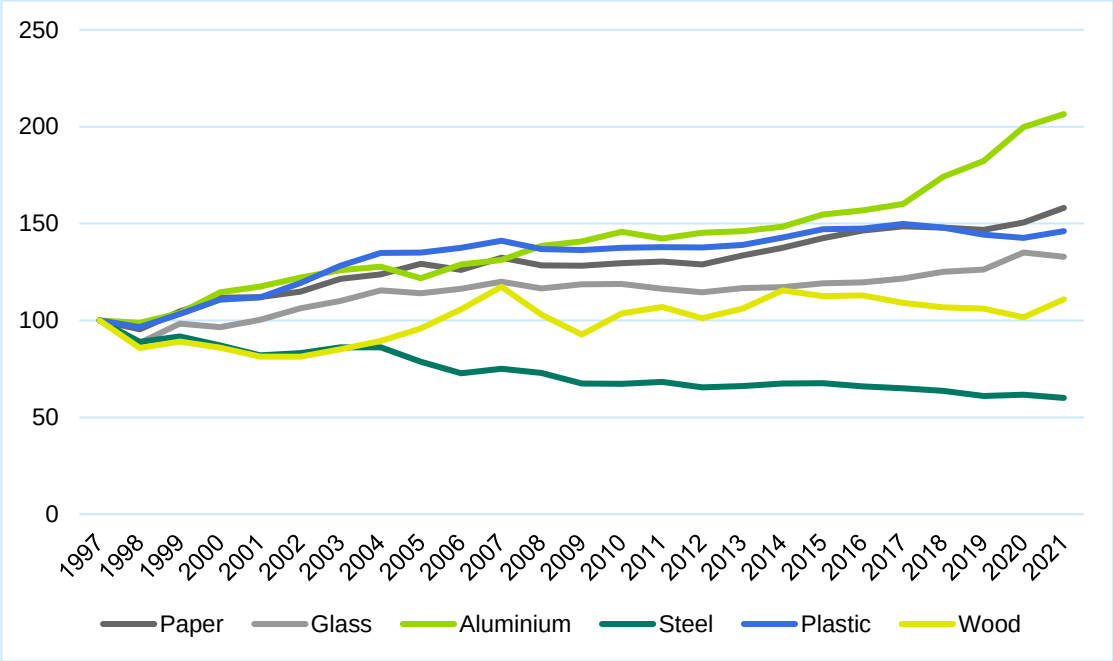
Instead, to inform trends by packaging material type the NPWD dataset is used to calculate the measure 'net pack fill' which is regarded as the best approximation or proxy to trends in POM by type of material.

Figure 8 shows the estimates of trend in packaging materials POM (by weight) by material type from 1997 to 2021. In general, POM[66] 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.

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

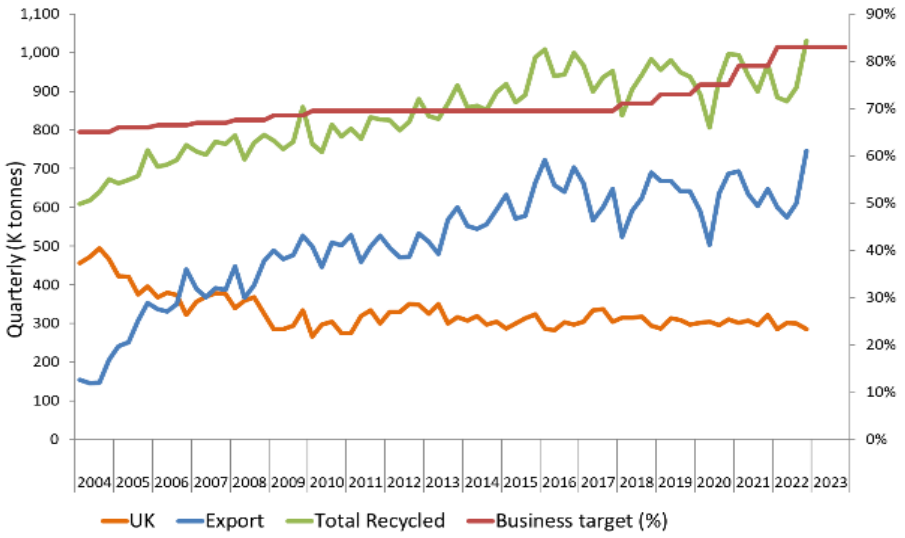
Figure 8: Packaging POM Trends by Material, 1997–2021 (Indexed 1997=100)



10.Packaging Recycling

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 from 2004 to 2023 for paper and card packaging (including fibre-based composites). A key driver of packaging recycling is the material specific business targets, which are shown on the right-hand-scale of the chart.

Figure 9: Trends in Accredited Packaging Recycling, Paper and Card 2004–2023 (k tonnes)



A summary of the trends in packaging recycling of paper and card is as follows:

UK domestic recycling of paper and card declined 2004 – 2010 with modest increases in the targets being met by export. While there have been fluctuations since 2010, there is no indication of a trend. All the growth in paper and card packaging recycling has been in export of paper and card waste over the period 2004 – 2017. But that overall upward trend appears to have stabilised (despite increases in the targets) with export tonnages fluctuating since 2017 in a range between 500 – 700k tonnes per quarter, and total paper and card recycling in a range of 850 – 1,000k tonnes per quarter. Paper and card packaging recycling targets have flat-lined.

11. Paper and Card Market Trends

11.1. Legislation

There are several pieces of upcoming legislation that are due to be implemented in the UK: Extended Producer Responsibility (EPR), Simpler Recycling and Deposit Return Schemes (DRS)

Extended Producer Responsibility (EPR)[67]: this is starting to be introduced in 2024 and will make packaging producers responsible for more of the costs associated with packaging at the end of its life. It aims to ensure that greater quantities of recyclable materials are reprocessed into valuable, high quality secondary resources. The aim is to encourage greater engagement in the lifecycle of packaging products, from design to recycling. The increase in compliance fees should encourage producers to increase the accuracy of reporting as well as reduce the amount of paper and card POM.

The EPR reforms will also introduce eco-modulation, whereby the fees paid by producers are increased or decreased based on the recyclability of packaging; more easily recycled material will incur a lower fee than packaging deemed difficult to recycled[68]. This is likely to impact on fibre-composite materials, depending on their recyclability.

Simpler Recycling[69]**:** This mandates all local authorities in England to collect an expanded and standardised list of recyclable materials from households, with an implementation date of 1 April 2026. This will require all English local authorities to collect food and drinks cartons in addition to paper and card, with a recommendation to collect them in the plastic and cans stream if collecting via kerbside sort. Simpler Recycling will also require businesses in England needing to ensure that same set of materials are recycled from their premises. This will affect businesses with more than ten FTEs from April 2025, and small business from April 2027. Increased recycling from businesses should also increase the quantity and quality of paper and card packaging collected for recycling.

Deposit Return Schemes (DRS)[70]: This aims to boost the recycling of single-use drinks containers by adding a deposit to in-scope products at the point of purchase. It is due to be implemented in 2025 and aims to collect 90% of the eligible containers placed on the respective national markets within three years of implementation. Paper and card packaging is not an in-scope DRS material so the projection for paper and card will not be directly affected by this legislation, although it may be affected indirectly by material substitution to drinks cartons from in-scope materials: polyethylene terephthalate (PET) bottles; steel and aluminium cans, and possibly glass in Scotland and Wales.

Recycling target for fibre-based composites[71]**:** The government has proposed the introduction of recycling targets for fibre-based composites from 2026. This is due to them having low recycling rates, as they are more difficult to recycle: many fibre-based composites cannot be reprocessed in paper packaging mills with standard reprocessing technology[72]. From October 2023, obligated companies have been obliged to report fibre-based composites separately from paper and card, to enable monitoring of amounts placed on the market and recycled to inform the setting of targets. A mandatory take-back scheme for disposable paper cups is also due to be introduced.

The government has defined fibre-based composite packaging to mean laminated paperboard; either single-sided plastic laminate or two-sided plastic laminate, and the packaging may include other material such as aluminium foil. They provide the examples of disposable drinks cups, sandwich boxes (skillets) and food and drink cartons.

11.2. POM Trends

Paper and card POM increased by 1% between 2017 and 2019, and then decreased by 3% between 2019 and 2022 (Table 29). The increase from 2017 to 2019 was likely driven by growth in home delivery packaging, which increased markedly.

Consumer packaging decreased by 2% between 2019 and 2022, probably due to lightweighting. There was however an increase in grocery packaging of 10% between 2019 and 2022, which may be due to switching away from plastics associated with Plastic Pact commitments.

[67] https://www.gov.uk/government/collections/extended-producer-responsibility-for-packaging-report-packaging-data
[68] https://www.valpak.co.uk/the-importance-of-eco-modulation-for-epr/
[69] https://www.gov.uk/government/consultations/consistency-in-household-and-business-recycling-in-england/outcome/government-response
[70] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1130296/DRS_Government_response_Jan_2023.pdf
[71] https://consult.defra.gov.uk/extended-producer-responsibility/extended-producer-responsibility-for-packaging/user_uploads/1-1.-targets.pdf
[72] *Confederation of Paper Industries; Paper and Board Packaging Recyclability Guidelines, Revision One, January 2020.*

Non-consumer packaging decreased by 3% between 2019 and 2022, largely driven by decreases in retail back of store (possibly due to lightweighting) and manufacturing, although there were decreases in all sectors.

Insight from industry stakeholders suggests that the total paper and card POM (of which obligated packaging is a majority subset) in 2023 may fall by as much as 7% against 2022 levels for a variety of reasons relating to consumption. There will likely be some recovery going forward, particularly in hospitality and retail, although manufacturing output is less certain.

Future POM trends are difficult to predict due to the uncertain economic outlook and the variable responses in the different sectors. Overall, it may be safest to assume no change in POM or to link non-consumer POM to predicted GDP and consumer POM to predicted population changes.

Table 29: Paper and Card Packaging POM, 2017–2022 (k tonnes, %)

Stream	Sub-Stream	Total Quantity			% Change 2019 vs 2017	% Change 2022 vs 2019
		2017	2019	2022		
Consumer (retail)	Paper and Card packaging	1,524	1,688	1,647	11%	-2%
Non-consumer	Paper and Card packaging	3,405	3,301	3,196	-3%	-3%
Full Market	**Paper and Card packaging**	**4,929**	**4,990**	**4,843**	**1%**	**-3%**
Consumer (Retail)	Grocery	590	603	661	2%	10%
	Non-Grocery Primary	934	458	617	16%	-9%
	(Home) Delivery Packaging		627	369		
	Full Market	**1,524**	**1,688**	**1,647**	**11%**	**-2%**
Non-consumer	Agriculture	9	8	8	-11%	0%
	Construction and Demolition	19	20	17	5%	-13%
	Hospitality and Hospitality Wholesale	117	259	249	121%	-4%
	Back of Store (Retail)	1,057	1,067	1,050	1%	-2%
	Manufacturing and Other	1,966	1,947	1,871	-1%	-4%
	Full Market	**3,405**	**3,301**	**3,196**	**-3%**	**-3%**

11.3. Waste Management

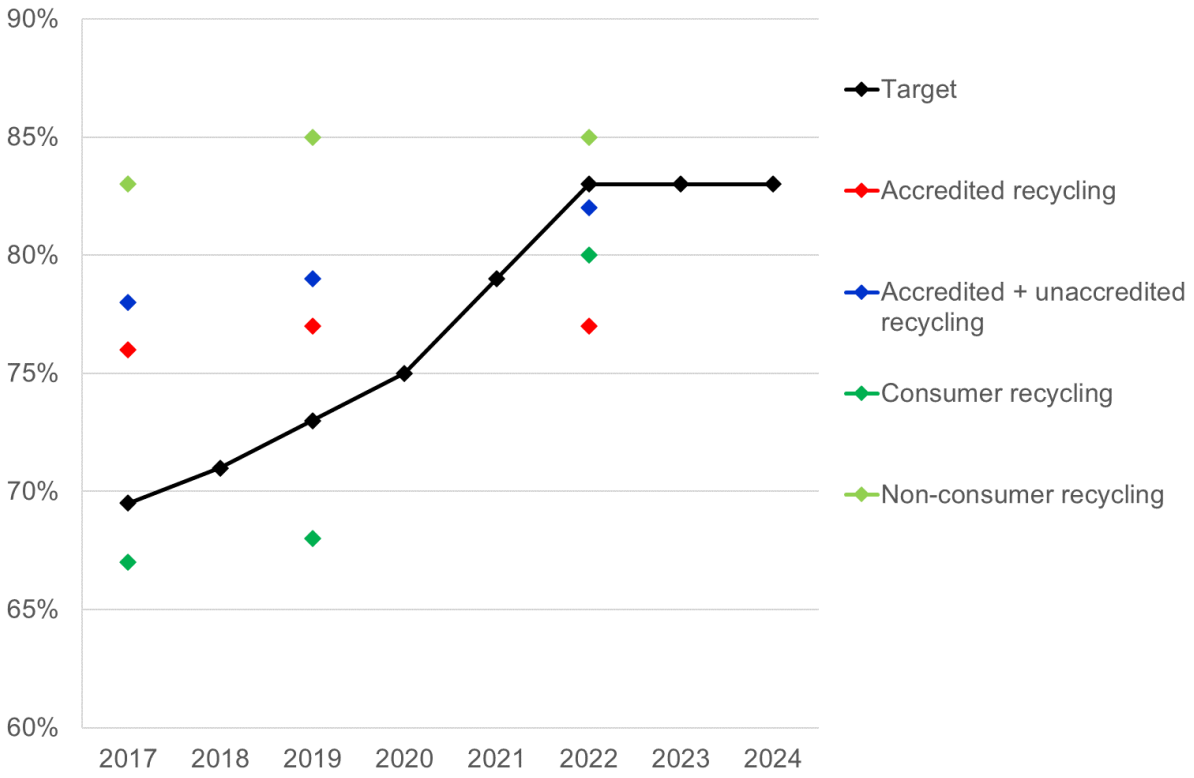
11.3.1. Recycling: Past Trends

Figure 10 shows current targets for recycling of packaging paper and card and performance in 2017, 2019 and 2022, from the PackFlow reports.

Accredited recycling (red diamonds) has stalled in recent years, most likely due to the current EA mixed paper protocol proportion of 34.5% of the bale being too low. Thus despite the card proportion of paper and card POM increasing and actually being recycled, this is not reflected in the accredited recycling figures. The actual proportion has been assessed by this project to be 55%. Adjustments were made based on this and other differences from

accredited protocols to obtain the accredited + unaccredited recycling shown by blue diamonds, which can be seen to have increased significantly in this period.

Figure 10: Trends in Paper and Card Recycling Rates, 2017–2022 (%)



Consumer recycling (dark green diamonds) has increased markedly between 2019 and 2022, largely due to the amount of home delivery packaging being consumed and recycled. Non-consumer recycling (light green diamonds) has stalled recently.

11.3.2. Recycling: Future Trends

All paper and card packaging will be in scope of the Extended Producer Responsibility scheme, with drinks cartons not envisioned to be in a DRS. Recycling targets are expected to be increased to encourage additional recycling.

The Government's Simpler Recycling reforms are not expected to impact hugely on household recycling rates for paper and card packaging, since both paper and card are already collected by all local authorities.

Simpler Recycling will also mandate kerbside collections of liquid cartons. Currently 97% of local authorities accept cartons for recycling, with 66% local authorities collecting directly from kerbside. Simpler Recycling will increase this to 100%. However, liquid cartons account for just 3.3% of consumer paper and card packaging POM, 0.9% of non-consumer POM, and 1.7% of total POM, thus even capturing 100% of liquid cartons for recycling will not hugely increase recycling rates.

Under Simpler Recycling, liquid cartons will be included in the plastic recycling stream from both households and non-household municipal premises. Currently, local authorities operating kerbside-sort collections generally collect liquid cartons with card. Removing liquid cartons from the card stream will make it cleaner and likely increase its value. Switching liquid cartons to the plastic stream should increase effective sorting and reprocessing of liquid cartons, although there will be an additional sorting cost. Currently most kerbside-sort authorities collect cans and plastics together then sort them at a mini-MRF at their depot to remove steel and aluminium cans to be left with plastic, with each stream baled and sent to processors. Under Simpler Recycling, liquid cartons will need to be removed by plastics reprocessors and sent for recycling.

Overall, it is anticipated that household recycling of paper and card will increase from the current 80% by up to 5% more by 2028 to reach 85%, due to the contribution from liquid cartons plus more consistent recycling of all paper and card within the household.

Simpler Recycling will require all non-household municipal premises in England (e.g. businesses, schools and hospitals) to make arrangements to have the same set of recyclable waste streams collected for recycling or composting (with the exception of garden waste). This will add significantly to the amount of packaging paper and card collected, with many premises not currently having recycling collections or only certain materials being targeted. Consistency in collections between home and places or work, leisure and study will encourage individuals to separate recycling at source since they will expect the same arrangements and know what materials can be recycled. There will also be an incentive to businesses to ensure effective segregation, since cardboard is a bulky material and collection charges are based on numbers of bins: fewer residual waste bins would be required if card is removed and costs for paper and card recycling collections should be lower than for residual waste collections.

Overall, it is anticipated that non-household recycling of paper and card will increase from the current 85% to at least 90% and possibly up towards 95% due to mandated collections from all municipal premises in England and consistent collections and potential cost benefits encouraging effective segregation at source.

It is anticipated that total recycling of paper and card will approach 90% recycling by 2028.

12. Projections and EPR Scenarios

This section of the report discusses the projections for POM and recycling and three EPR scenarios for the quantity of packaging material which differ by the amount of packaging material *removed* from the POM quantity which is then available to be for recycling. The remaining POM material is assumed to be covered by EPR from 2025 and the quantity removed is assumed to be in scope of a DRS from 2027.

12.1. POM Projections

The Phase 1 baseline data year for all packaging material POM tonnages is calendar year 2022. The scenario projection's 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 for packaging materials.
2. **Medium term.** The scenario projections link to growth projections to inform the scenario profiles 2024 to 2040 ('official' economic projections to 2028 are used, namely the OBR's forecast published in November 2023 that accompany the Chancellor's Autumn 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 by material type are linked to indicators (and projections of these indicators). The indicators considered are selected through analysis of historical relationships with packaging materials POM. Therefore, they are (statistically) *a priori* deemed potentially useful in describing the evolution of packaging materials POM. The indicators shown in Table 30 are grouped according to level/growth in; economic activity (GDP, GVA by sector, construction, imports), spending (consumer spending and retail sales), and population. Data for all indicators is sourced from the ONS and is adjusted by the ONS to remove the effects of changes in prices, so they are indicators of activity potentially related to the tonnage of packaging POM in real-terms.

Table 30: A Selection of Indicators

Indicator group	Indicator and data source
Consumer spending	Household final consumption expenditure : National concept CVM SA - £m
Consumer spending	Total goods : Total CVM NA Year SA £m
Gross Domestic Product	GDP
Retail sales	Retail in non-specialised stores IV2X
Retail sales	Retail in predominantly food stores IV3G
Retail sales	Retail in non-food stores IV3I
Retail sales	Retail in other stores IW6U
Retail sales	Retail in textile, clothing and footwear stores IW6X
Retail sales	Retail in household goods stores IW6Y
Retail sales	Non-store retailing J58P
Retail sales	All retail excl. automotive

Indicator group	Indicator and data source
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

Appendix II provides a chart-based correlation analysis for a selection of these indicators versus paper and card packaging POM (including fibre-based composites) and also a detailed statistical correlation analysis. A summary is shown in Table 31 and Table 32. In each of these the top three correlations are ranked.

Table 31: Levels Correlation Analysis of Packaging Materials and Indicator Measures, 1997–2021

Material	Highest correlations	Suggested activity indicator to link to
Paper and card	1. Retail sales, all stores excl. automotive 2. Import of food products 3. Retail sales in non-food stores	Retail sales

Table 32: Growth Correlation Analysis of Packaging Materials and Indicator Measures, 1998–2021

Material	Highest correlations	Suggested activity indicator to link to
Paper and card	1. Imports of manufactured goods 2. Household final consumption expenditure 3. Retail in non-specialised stores	Retail sales

The correlation analysis of trends in packaging materials POM supports developing a projection for paper and card 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.

Table 33: Summary of Linking Packaging POM to Indicator Measures

Material	Levels analysis	Growth analysis	Projection based on
Paper and card	Retail sales	Retail sales	Retail sales

Table 34: Projected Growth in Indicator Measures, 2024–2028

Indicator	2023	2024	2025	2026	2027	2028	Source: 2023	Source: projections
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

12.2. 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 are no EPR Scenarios 2 and 3 for paper and card packaging. Only scenario 1 is included from the list below.

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

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

The scenarios provide an assessment of likely recycling performance, in each year, to 2028. 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 i.e. 100k tonnes of EPR packaging equates to 100k tonnes of EPR packaging collected for accredited recycling. In reality there will be DRS materials not captured by a DRS which could end up in the waste stream collected for accredited recycling.

Please note there is no EPR Scenario 2 and 3 for paper and card packaging. Only scenario 1 is included from the list above.

12.3. EPR Scenario 1

Paper and card POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it is projected to remain below its 2022 level until 2027. Business targets are projected as constant at 2024 level of 83%. The POM projection is reflected in the projection of obligated tonnage for paper and card packaging, and (with assumed constant collection rates) the projection of accredited recycling. Based on this paper and card packaging is projected to be in a surplus relative to the business target from 2023 to 2028.

Table 35: POM Projections 2022–2028

Paper and card	Units	2022	2023	2024	2025	2026	2027	2028
Business target	%	83%	83%	83%	83%	83%	83%	83%
POM	k tonnes	4,843	4,692	4,715	4,762	4,839	4,940	5,039
Obligated tonnage	k tonnes	4,466	4,294	4,200	4,242	4,310	4,400	4,488
Level of non-obligated tonnage	%	10%	11%	11%	11%	11%	11%	11%
Business target	k tonnes	3,707	3,564	3,486	3,521	3,577	3,652	3,725
Accredited recycling	k tonnes	3,699	4,137	3,918	3,958	4,021	4,105	4,187
Surplus (+) / shortfall (-)	k tonnes	-8	573	432	437	444	453	462
Business recycling rate (for obligated companies)	%	83%	96%	93%	93%	93%	93%	93%
Recycling rate performance	%	76%	88%	83%	83%	83%	83%	83%
UK recycling rate	%	77%	76%	74%	74%	74%	74%	74%

12.3. 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).

Paper and card packaging is not an in-scope DRS material and the projection in this scenario is not impacted by the removal of DRS drinks containers.

12.4. EPR Scenario 3

In this scenario 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.

13. Conclusions

13.1. Conclusions: POM

This project's estimate for paper and card packaging POM in 2022 is 4,843k tonnes (+/- 7%), a decrease of 3% from the previous POM figure for 2019.

This is derived using a bottom-up methodology, taking data from various sources for each sector and combining the results. It has been cross-checked with reported obligated data on NPWD and with data provided by the project's Steering Group.

The estimate for paper and card packaging POM in the consumer sector is 1,647k tonnes (+/- 8%) in 2022, a decrease of 2% from 2019.

This method 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 there is available and is accepted as such by industry.

The estimate for paper and card packaging POM in the non-consumer sector is 3,196k tonnes (+/- 10%) in 2022, a decrease of 3% from 2019.

This is derived by applying packaging protocols to the Defra C&I Waste Statistics for 2017. It is broken down and verified using Valpak EPIC data and data from a retailer survey of back of store waste carried out for this project.

Non-obligated or unregistered POM for paper and card packaging accounted for 14% of POM in 2022 – this represents a 26% decrease from the previous percentage for 2019[8].

Using data from NPWD, an estimate of the unobligated tonnage (664k tonnes, 14%) has been made by subtracting the net pack fill figure of 4,179k tonnes from the project's final POM estimate of 4,843k tonnes. The unobligated proportion of 14% is a decrease from the 19% identified in 2019[8].

The estimates of paper and card packaging POM by type are: 3,175k tonnes (66%) corrugated, 887k tonnes (18%) cartonboard and other packaging boards, 144k tonnes (3%) fibre-based composite and 638k tonnes (13%) other packaging.

Using primarily information derived from Valpak's EPIC database, the estimate by format has been made. This indicates that almost two thirds of paper and card packaging POM is corrugated.

13.2. Conclusions: Recycling

The total tonnage of paper and card packaging recycled in 2022 is estimated to be 3,934k tonnes.

This includes reported (NPWD) and an estimate for unreported recycling (239k tonnes). Based on the POM calculated as part of this project, this gives an overall recycling rate of 82%. Of this, 3,695k tonnes was reported on NPWD, representing an accredited or recorded recycling rate of 77%.

The total tonnage of consumer paper and card packaging recycled in 2022 is estimated to be 1,313k tonnes.

This is based on WDF and an estimate for unreported recycling Based on the POM calculated as part of this project the consumer recycling rate is estimated at 80%, up 12% since 2019.

The total tonnage of non-consumer paper and card packaging recycled is estimated to be 2,622k tonnes.

This is calculated by removing the consumer recycling tonnage from the total tonnage recycled figure. Based on the POM calculated as part of this project, this gives a non-consumer recycling rate of 83%.

13.3. Conclusions: Disposal

The total quantity of consumer paper and card packaging sent to EfW or RDF in 2022 is estimated to be 267k tonnes, with 67kt sent to landfill.

This was calculated by subtracting the consumer recycling tonnage from the consumer POM tonnage to leave a residual tonnage. This was then split between EfW (80%) and landfill (20%), based on official government-reported data on destination of residual municipal waste.

The total quantity of non-consumer paper and card packaging sent to EfW or RDF in 2022 is estimated to be at least 440k tonnes, with less than 110kt sent to landfill.

This was calculated by subtracting the non-consumer recycling tonnage from the non-consumer POM tonnage to leave a residual tonnage. In the absence of robust data for disposal routes for commercial waste, the municipal proportions were applied for a split between EfW and landfill for illustrative purposes.

13.4. Projections and EPR Scenarios

Paper and card POM tonnage is projected to reduce in 2023 compared to 2022, and while growth resumes from 2024 it is projected to remain below its 2022 level until 2027. Business targets are projected as constant at 2024 level of 83%. The POM projection is reflected in the projection of obligated tonnage for paper and card packaging, and (with assumed constant collection rates) the projection of accredited recycling.

Paper and card packaging is not an in-scope DRS material and its projection is not impacted by the removal of DRS drinks containers from recycling obligations under EPR. Based on this, paper and card packaging is projected to be in a surplus relative to the business target from 2023 to 2028.

13.5. Recommendations for Further Work

Further surveying of non-consumer POM

The most uncertain element of the POM estimate is that relating to non-consumer paper and card packaging, which is obtained by amalgamating data from various sources and years, adjusted where required for estimated growth or reductions in more recent years. In order to improve the accuracy of the data, a more recent comprehensive data source would need to be used that also splits out packaging and non-packaging. This is reliant on the commissioning of large-scale analyses of packaging use in the commercial and industrial, construction and demolition, and agricultural sectors.

Quantification of Home Delivery Packaging

It is currently difficult to accurately calculate the amount of corrugated board and cartonboard used for home delivery packaging and further work to quantify these amounts would be beneficial.

Ongoing review of the mixed grade protocols

The mix of packaging and non-packaging within paper and card is constantly changing, with an ongoing percentage decrease in newsprint and other non-packaging papers, and a percentage increase in cardboard and packaging paper use in the household, particularly in relation to (online) home deliveries. Ongoing review of the mixed grade protocols would ensure that all packaging recycling is captured within the system.

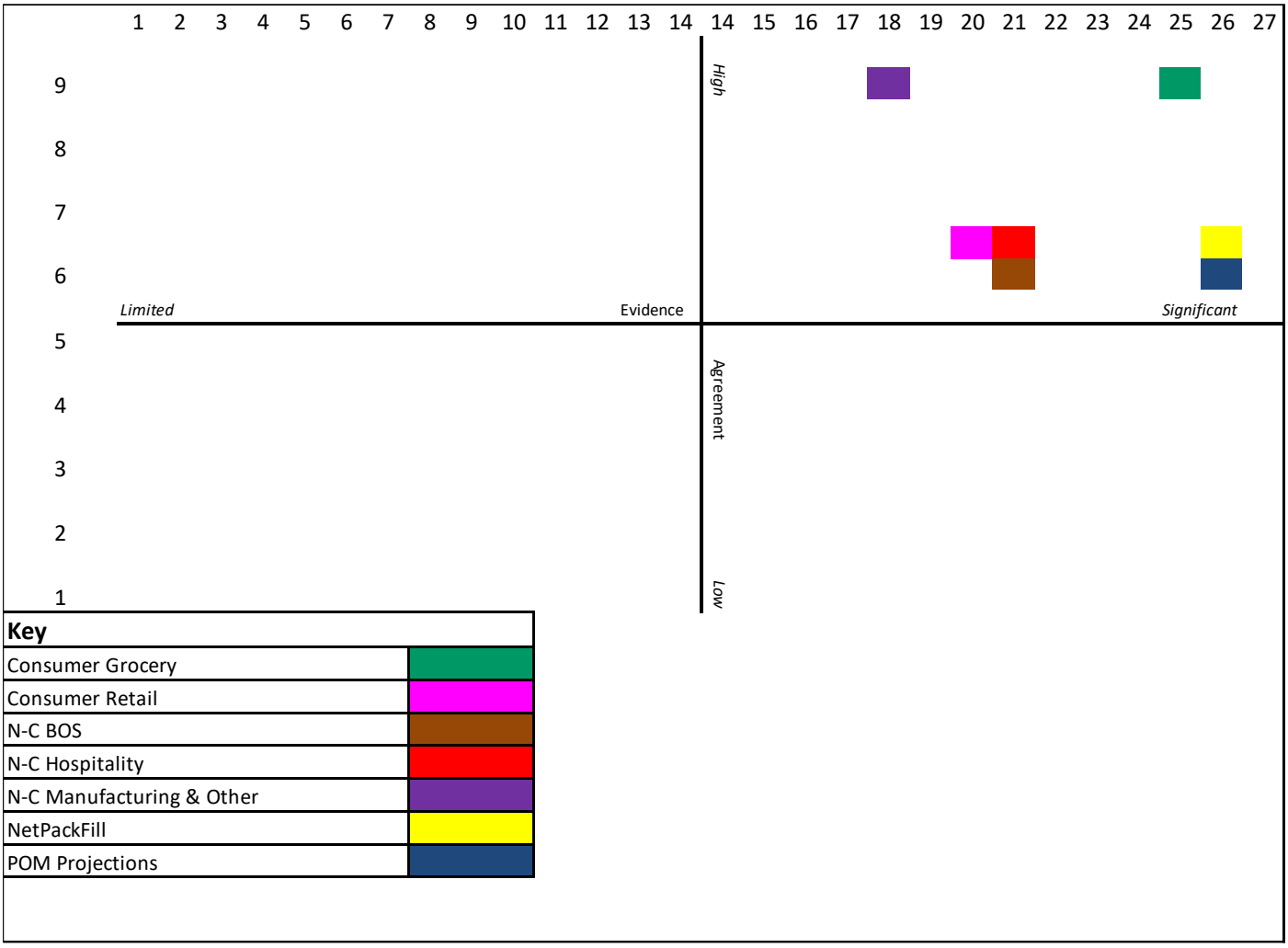
Appendix I

Data Robustness Assessment

A robustness assessment was completed on the data sources used. This was developed to highlight the level of uncertainty for each data source by scoring the data sources on the evidence and agreement level from stakeholders. Questions were asked 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. The results are shown in Figure 11 (POM), Figure 12 (Recycling) and a summary in Table 36, which has been constructed based on analysis completed for each project estimate.

The tables thereafter provide a full breakdown for each project estimate. If the question is answered 'Yes' then a score of 3 is given, if 'No' then a score of 0.

Figure 11: Data Robustness Assessment Results: POM



To convert scores to a percentage that could be used to relate to an appropriate error margin[73], the evidence and agreement levels scores were added and the percentage of the total possible score taken.

[73] *These are assumed estimates of error margin based on the robustness assessment and not the outputs of statistical calculation.*

Figure 12: Data Robustness Assessment Results: Recycling

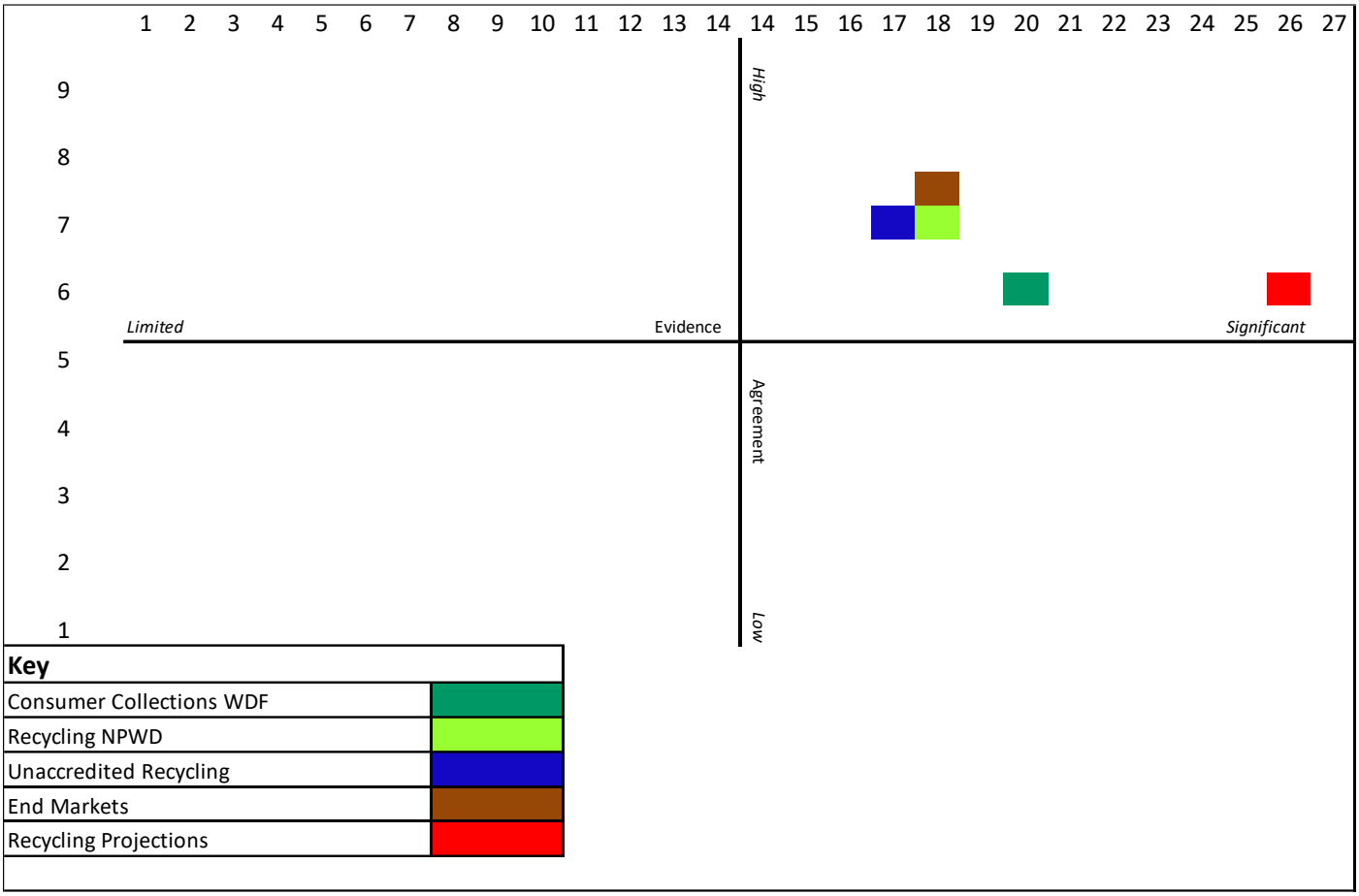


Table 36: Data Robustness Assessment Results – Summary

Data and Source	Evidence (Robustness & completeness, max 27):	Degree of agreement around the findings (max 9):	Robustness	Error Margin (+/-)
Environment Agency Grocery Retailer Packaging Handled	25	9	94.4%	6%
Valpak Turnover & Packaging Handled Data	20	6	72.2%	18%
Valpak Hospitality EPIC Data	21	6	75.0%	18%
NPWD Producer Data 2023	26	6	88.9%	9%
NPWD Recycling Data 2023	26	6	88.9%	9%
Survey of Recyclers and Exporters 2023	18	7	69.4%	21%
Survey of Grocery Retailers 2023	21	6	75.0%	18%
DEFRA C&I Waste Survey 2017	18	9	75.0%	18%
WDF Local Authority Collection Data	20	6	72.2%	18%

Table 37: Environment Agency Grocery Retailer Packaging Handled

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	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		**25**

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**

Table 38: Valpak Turnover & Packaging Handled Data

Data		
Valpak Turnover & Packaging Handled 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)?	No	0
Total		**20**

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**

Table 39: Valpak Hospitality EPIC Data

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 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 with some reservations	2
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**

Table 40: NPWD Producer Data 2023

Data		
NPWD Producer Data 2023		
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**

Table 41: NPWD Recycling Data 2023

Data		
NPWD Recycling Data 2023		
Source		
NPWD		
Data Used In:		
Recycling Projections		
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**

Table 42: Survey of Recyclers and Exporters 2023

Data		
Survey of Recyclers and Exporters 2023		
Source		
Verde Research and Consulting Ltd		
Data Used In:		
Method 1 - Non-consumer Recycling - Agri & Hospitality		
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**

Table 43: Survey of Grocery Retailers 2023

Data		
Survey of Grocery Retailers 2023		
Source		
Valpak		
Data Used In:		
Back-of-store recycling estimates		

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?	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		**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**

Table 44: DEFRA C&I Waste Survey 2017

Data		
DEFRA C&I Waste Survey 2017		
Source		
DEFRA C&I Waste Survey 2017		
Data Used In:		
POM - Manuf.		

Evidence (Robustness and completeness, max 27):	Scoring (Max 27)	
Does the data cover the correct time-frame?	No	0
Does the data provide complete coverage?	Yes	3
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)?	Yes with some reservations	2
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 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		**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	3
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Yes	3
Total		**9**
Error Margin		**18%**

Table 45: WDF 2021/22

Data		
WDF Local Authority Collection Data		
Source		
WDF 2021/22		
Data Used In:		
Consumer Recycling		
Evidence (Robustness and completeness, max 27):	**Scoring (Max 27)**	
Does the data cover the correct time-frame?	Yes with some reservations	2
Does the data provide complete coverage?	Yes	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?	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		**20**
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**

Appendix II

Technical Appendix

This short technical appendix details the methodology underlying the projections for packaging materials POM discussed in section 12.1 of the report, and recycling discussed in section 12.2 of the report.

POM Projections

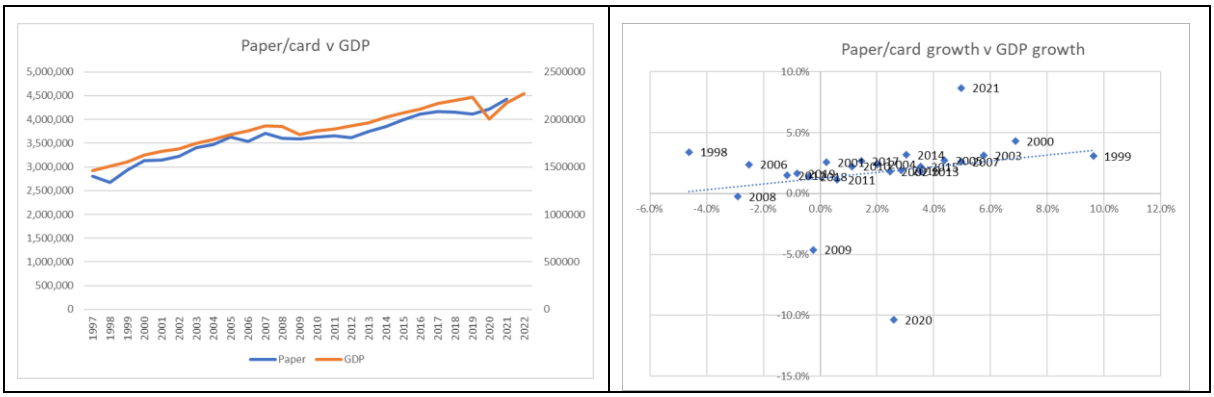
In this methodology, the POM projections by material type are linked to selected indicators, and to projections of these indicators. The indicators considered, through analysis of historical relationships with packaging materials POM, are (statistically) *a priori* deemed potentially useful in describing the evolution of POM quantities for each of the packaging materials. The list of potential indicators, as shown in Table 46, 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.

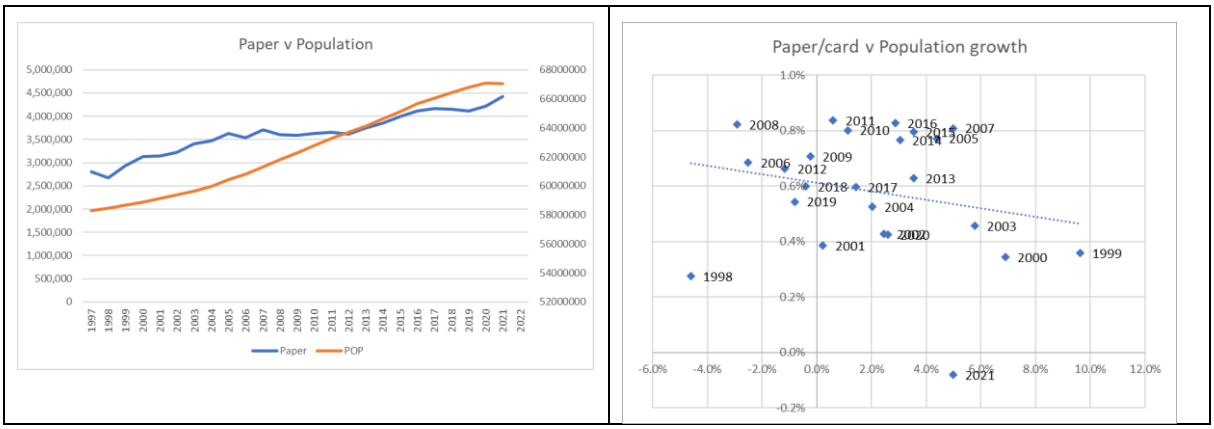
Table 46: A Selection of Indicators

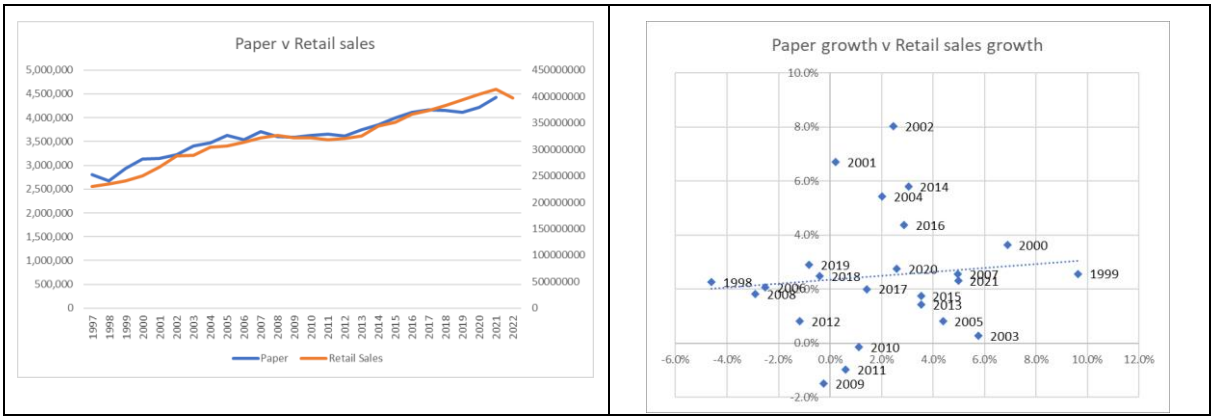
Indicator group	Indicator and data source
Consumer spending	Household final consumption expenditure : National concept CVM SA - £m
Consumer spending	Total goods :Total CVM NA Year SA £m
Gross Domestic Product	GDP
Retail sales	Retail in non-specialised stores IV2X
Retail sales	Retail in predominantly 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.

Paper and Card 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 in red font.

Table 47: Correlation Analysis for Paper and Card Packaging and Indicator Measures, Levels 1997–2021

Level	Indicator	Correlation	Prob. t
Consumer spending	Household final consumption Expenditure CVM SA - £m	95%	0.0%
Consumer spending	Total goods :Total CVM NA Year SA £m	92%	0.0%
Gross Domestic Product	GDP	97%	0.0%
Retail sales	Retail in non-specialised stores IV2X	95%	0.0%
Retail sales	Retail in predominantly food stores IV3G	91%	0.0%
Retail sales	Retail in non-food stores IV3I	97%	0.0%
Retail sales	Retail in other stores IW6U	97%	0.0%
Retail sales	Retail in textile, clothing and footwear stores IW6X	85%	0.0%
Retail sales	Retail in household goods stores IW6Y	54%	0.498%
Retail sales	Non-store retailing J58P	80%	0.0%
Retail sales	All retail excl. automotive	98%	0.0%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	87%	0.0%
GVA	G47: Retail trade, except of motor vehicles and motorcycles	68%	0.018%
GVA	G56: Food and beverage service activities	-14%	50.637%
GVA	A: Agriculture	55%	0.439%
GVA	B: Mining and quarrying	-90%	0.0%
GVA	C: Manufacturing	95%	0.0%
GVA	D: Electricity, gas, steam and air conditioning supply	-30%	14.13%
GVA	F: Construction	-14%	50.41%
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	85%	0.0%
GVA	Total GVA	97%	0.000%
Construction	Public new housing	83%	0.000%
Construction	Private new housing	81%	0.000%
Construction	Total new housing	87%	0.000%
Imports	CPA 08:WW:IM:CVM:BOP:SA: C.Manufactured products	96%	0.000%
Imports	CPA 08:WW:IM:CVM:BOP:SA:10. Food products	97%	0.000%
Population	POP	94%	0.000%

Table 48: Correlation Analysis for Packaging Materials and Indicator Measures, Growth 1998–2021

Level	Indicator	Correlation	Prob. t
Consumer spending	Household final consumption Expenditure CVM SA - £m	0.266	21%
Consumer spending	Total goods :Total CVM NA Year SA £m	-0.249	24%
Gross Domestic Product	GDP	0.232	28%
Retail sales	Retail in non-specialised stores IV2X	0.235	27%
Retail sales	Retail in predominantly food stores IV3G	-0.027	90%
Retail sales	Retail in non-food stores IV3I	0.176	41%
Retail sales	Retail in other stores IW6U	0.071	74%
Retail sales	Retail in textile, clothing and footwear stores IW6X	0.116	59%
Retail sales	Retail in household goods stores IW6Y	0.186	38%
Retail sales	Non-store retailing J58P	-0.106	62%
Retail sales	All retail excl. automotive	0.201	35%
GVA	G46: Wholesale trade, except of motor vehicles and motorcycles	0.197	36%
GVA	G47: Retail trade, except of motor vehicles and motorcycles	0.147	49%
GVA	G56: Food and beverage service activities	-0.077	72%
GVA	A: Agriculture	0.060	78%
GVA	B: Mining and quarrying	0.092	67%
GVA	C: Manufacturing	-0.110	61%
GVA	D: Electricity, gas, steam and air conditioning supply	0.180	40%
GVA	F: Construction	0.226	29%
GVA	G: Wholesale and retail trade and repair of motor vehicles and motorcycles	0.232	28%
GVA	Total GVA	0.099	65%
Construction	Public new housing		16%
Construction	Private new housing		20%
Construction	Total new housing	0.045	83%
Imports	CPA 08:WW:IM:CVM:BOP:SA: C. Manufactured products	0.322	12%
Imports	CPA 08:WW:IM:CVM:BOP:SA:10. Food products	-0.224	29%
Population	POP	0.105	63%

From the tables above, Table 49 and Table 50 list the top three correlations ranked in order from the highest correlation observed.

Table 49: Levels Correlation Analysis of Packaging Materials and Indicator Measures, 1997–2021

Material	Highest correlations	Suggested activity indicator to link to
Paper and card	1. Retail sales, all stores excl. automotive 2. Import of food products 3. Retail sales in non-food stores	Retail sales

Table 50: Growth Correlation Analysis of Packaging Materials and Indicator Measures, 1998–2021

Material	Highest correlations	Suggested activity indicator to link to
Paper and card	1. Imports of manufactured goods 2. Household final consumption expenditure 3. Retail in non-specialised stores	Retail sales

Based on the statistical correlation analysis above, Table 51 provides a summary of the choice of indicator measure to link to by packaging material type. This supports developing a POM projection for paper and card by linking to projections of retail sales.

Table 51: Summary of Linking Packaging POM to Indicator Measures

Material	Levels analysis	Growth analysis	Projection based on
Paper and card	Retail sales	Retail sales	Retail sales

Table 52 shows the projected growth rates for this indicator 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 52: Projected Growth in Indicator Measures, 2024 to 2028

Indicator	2023	2024	2025	2026	2027	2028	Source: 2023	Source: projections
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

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

- Accredited UK domestic recycling of paper and card packaging is projected as constant at the 2023 level.

Export recycling

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