PackFlow Covid-19 Phase I: Paper & Card

A review of the quantity of paper and card packaging placed on the market (POM) and recycled in 2019

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PackFlow Covid-19: Project Remit

This project seeks to estimate the impacts of Covid-19 and the subsequent lockdown measures (in isolation) on the compliance landscape for UK packaging recycling in 2020 and projecting forward to 2022.

This is achieved by:

- Updating estimates for UK packaging POM (placed on the market) and recycling by material and by industry sector in 2019 to provide a baseline for future scenarios.
- Using relevant data sources and industry insights to estimate and provide a narrative, by packaging material type, regarding the impacts of Covid-19 and the subsequent lockdown in 2020-2022 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 by material, and by sector
    - The changes to the level of obligated tonnage by material
        - Including an indicative assessment of the potential impact of the recession on the proportion of POM that is recorded within the obligated tonnage each year.

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

Where requested by stakeholders, further scenarios have been developed to expand on aspects of recycling that may only in-part be attributed to the Covid-19 situation but were not included in the initial project brief.

Valpak, the project funders and the stakeholders acknowledge that there are a myriad of factors that can affect the packaging waste system inside and outside of the current Covid-19 situation. This project seeks to isolate the impacts of the change of consumption patterns, recycling and direct impact on businesses of the Covid-19 situation. All stakeholders acknowledge that the continued evolution of the wider recycling system will also impact on the overall UK compliance position.

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Executive Summary

Introduction

The PackFlow Covid-19 reports https://www.valpak.co.uk/more/material-flow-reports cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

The PackFlow Covid-19 project has two phases:

Phase I

- Updates the baseline year to 2019 for estimates of packaging materials POM, collections, recycling and end markets (from 2017 in the previous flow reports[1]).

Phase II

- Collates data and market intel on impact of the Covid-19 lockdown (materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow and recycling from 2020 to 2022
- 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 Phase I 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.

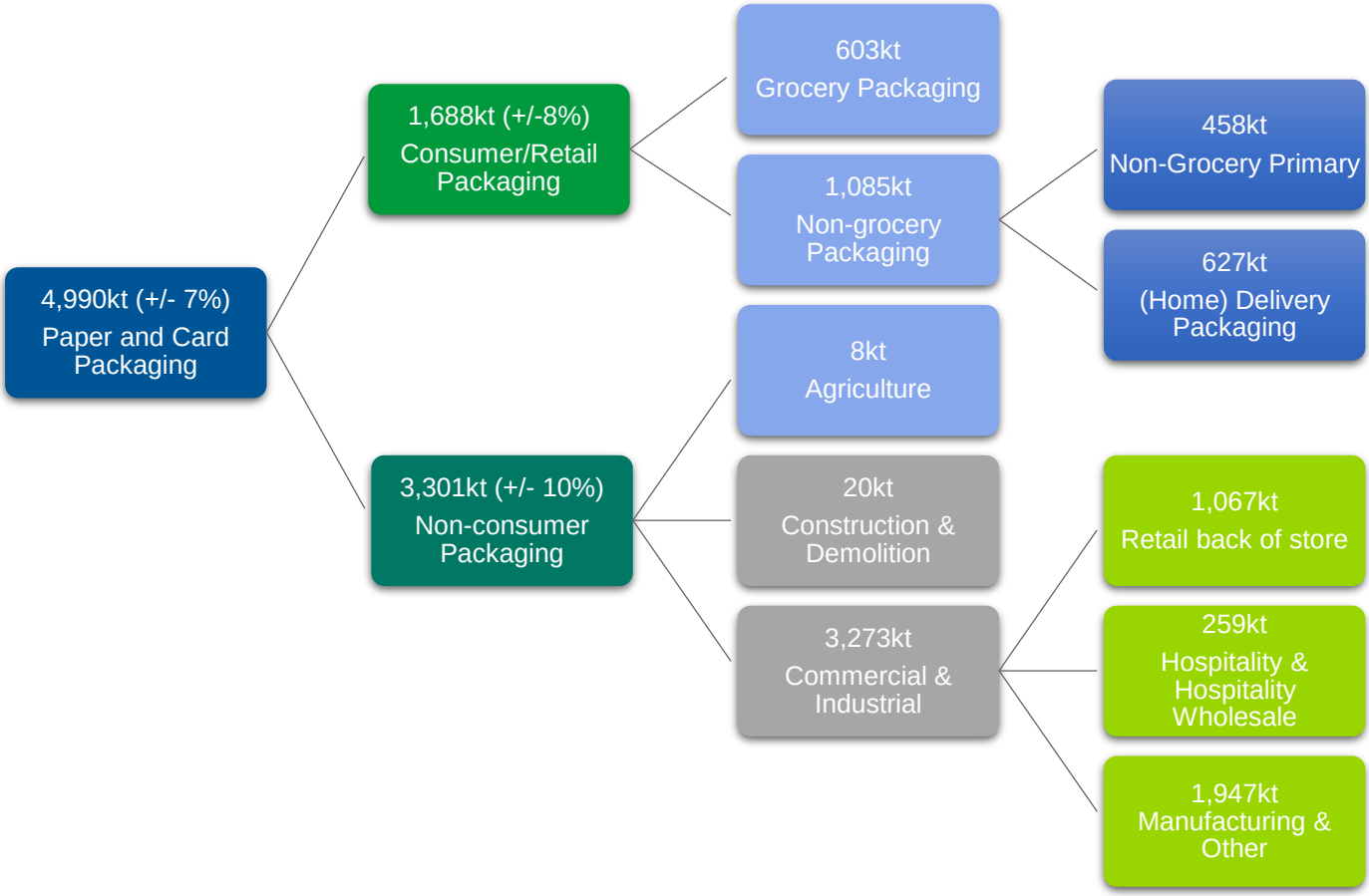
[1] The previous packaging materials flow reports can found at https://www.valpak.co.uk/more/material-flow-reports .
[2] Paper and card packaging placed on the market means all household and non-household paper and card packaging used around products sold and transported within the UK.

Paper and Card Packaging POM

This report estimates paper and card packaging POM in 2019 to be 4,990k tonnes (+/- 7%), an increase of 1% from the estimated current flow figure (2017).

This 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 and with data provided by the project's industry Steering Group. It is likely that a significant part of this increase has come from the growth in online sales, which often uses forms of paper and card packaging.

Figure 1 Paper and Card packaging POM by sector, 2019



The final project estimate for paper and card packaging POM in the consumer sector is 1,688k tonnes (+/- 8%)

This method is based on primary data 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 final project estimate for paper and card packaging POM in the non-consumer sector is 3,301k tonnes (+/- 10%)

This data was derived by applying packaging protocols to the Defra C&I Waste Statistics for 2016. It has been broken down and verified using Valpak EPIC data and that from a retailer survey of back of store waste carried out for this project.

Non-obligated or unregistered flow for paper and card packaging accounted for 22% of POM in 2019 – this represents an increase in that reported in 2017 of 16%

Using data from NPWD, an estimate of the unobligated tonnage (1,075k tonnes, 22%) has been made by subtracting

the net pack fill figure of 3,914k tonnes from the project's final flow estimate of 4,990k tonnes. The unobligated proportion of 22% is an increase from the 16% identified in the 2017 Paper Flow report and aligned to the 21% calculated in the 2014 Paper Flow report. This change could be due to an increase in the disparate nature of UK product supply, but more so the very late registration of businesses in 2020 (submitting 2019 data) on NPWD due to the impact of the societal lockdown brought about by the Covid-19 pandemic. Further historical analysis has been undertaken to estimate a final net pack fill in 2019.

The final project estimate of paper and card packaging POM by type is 3,217k tonnes (65%) corrugated, 1,365k tonnes (27%) cartonboard and other packaging boards, 55k tonnes (1%) liquid beverage cartons and 353k tonnes (7%) other packaging.

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

Paper and Card Recycling

The total tonnage of paper and card packaging recycled in 2019 is estimated to be 3,943k tonnes.

This includes reported (NPWD) and an estimate for unreported recycling (116k tonnes). Based on the POM calculated as part of this project, this gives an overall recycling rate of 79%, up 1% since 2017. Of this, 3,828k tonnes was reported on NPWD, representing a recycling rate of 77%.

The total tonnage of consumer paper and card packaging recycled in 2019 is estimated to be 1,147k tonnes.

This is based on WDF. Based on the POM calculated as part of this project, this gives a consumer recycling rate of 68%, up 1% since 2017.

The total tonnage of non-consumer paper and card packaging recycled in 2019 is estimated to be 2,796k 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 85%.

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. In order to improve the accuracy of the data, a more recent data source should be used (the most recent available at the time of writing was for 2017) and one that also splits out packaging and non-packaging.

Reviewing elements of the Packaging Regulations to capture more non-obligated or unregistered tonnage

This could form part of Defra's reform of the Packaging Regulations and could include:

- Removal of de minimis - those companies who are below the packaging obligation threshold by having a turnover of under £2 million and handling less than 50 tonnes of packaging.
- If the de minimis is not removed, the following could be considered:
    - Re-introducing the service provider clause;
    - Investigate the potential for unobligated or unregistered tonnage to be supplied through increasing use of internet "marketplace" arrangements, particularly where products are supplied from other countries;

- Currently, packaging used internally by an organisation (for example for transporting between or within sites) is exempt from the Regulations. This may be a significant volume for paper and card and therefore its inclusion within the obligated tonnage could be investigated further; and
- In cases where the brand owner supplies packaging to contract packers free of charge (contract packing), the brand owner is responsible for the obligation. However, it is suspected that this may be overlooked by producers in many cases and as such could be a focus of compliance scheme or enforcement agency auditors to carry out checks and issue reminders.

Recommended accreditation for all recycling activities

If all companies in the UK performing recycling activities on packaging were to become accredited, this would ensure that packaging recovery notes (PRNs) were issued on more of the packaging material recycled, resulting in no unaccredited recycling and simpler compliance for the UK with regulatory targets. All reprocessors becoming accredited for recycling activities could increase the number of PRNs/PERNs generated for recycling, by up to 116k tonnes in 2019.

Furthermore, the mix of packaging and non-packaging within paper and card is constantly changing, with an ongoing decrease in newsprint and other non-packaging papers, and an 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.

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Glossary

bn – Billion

CA – Civic amenity

C&I – Commercial and Industrial

CPI – Confederation of Paper Industries

C&D – Construction and demolition

EA – Environment Agency

EfW – Energy from Waste

EPIC – Environmental Product Information Centre

GDP – Gross Domestic Product

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 that the customer will take home, remove and throw away e.g. aluminium can, plastic bottle

PRN – Packaging Recovery Note

PERN – Packaging Export Recovery Note

RDF – Refuse Derived Fuel

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

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

WDF – Waste Data Flow

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- 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 Packaging Federation
- The Recycling Association
- Wastepack
- The Department for Environment, Food & Rural Affairs (DEFRA)
- The Department of Agriculture, Environment and Rural Affairs (DAERA)
- The Environment Agency (EA)
- The Scottish Government
- The Scottish Environment Protection Agency (SEPA)
- The Welsh Government
- Zero Waste Scotland (ZWS)

1. Introduction

1.1. Background

The PackFlow Covid-19 reports https://www.valpak.co.uk/more/material-flow-reports cover all packaging materials and have been produced to provide industry, Governments, and other stakeholders with evidence to better understand the potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collection & recycling, and to assess potential compliance risks versus the packaging targets.

1.2 Phase I Objectives

The PackFlow Covid-19 project for paper and card packaging has the following key objectives for Phase I:

- Provide an updated (and cross-checked) baseline estimate of paper and card packaging placed on the UK market in 2019, by format, sector and source:
  - Format (e.g. corrugated, cartonboard and other packaging boards, liquid beverage cartons and other such as packaging papers)
  - Sector (e.g. consumer, non-consumer)
  - Source (handled by obligated producers who are registered, non-obligated or free riders)
- Estimate the quantities of paper and card packaging collected through kerbside and other collection types, and by sector;
- Estimate the quantities of paper and card packaging recovered and recycled or sent for disposal 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 arising's. 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.
The justification of the use of POM data over alternatives is provided in full in section 1.3.1 of PlasticFlow 2025[3].

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

1.3.1 POM

Paper and card packaging POM were estimated using a bottom up approach, that 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 2019. However, where 2019 data was not available the most recent available data was used.

[3] *http://www.wrap.org.uk/content/plasticflow-2025-plastic-packaging-flow-data-report*

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/other groceries, including body care/clothing/DIY products etc., as sold by supermarkets and other non-grocery retailers, sourced from the Environment Agency and Valpak's Environmental Product Information Centre (EPIC) database[4];
- Paper and card packaging around food/drink as consumed in the hospitality sector, sourced from Valpak's EPIC database;
- Paper and card packaging discarded by retailers back of store, obtained through a survey undertaken for the purposes of this study; and
- Paper and card packaging used by the non-consumer sector as sourced from Defra's Commercial and Industrial Waste Arising's data publication, relating to 2018[5].

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[6]:

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

1.3.3 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. Waste Data Flow (WDF) was used as the source for the consumer recycling data with the

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[4] *The database is based on information collected direct from suppliers as well as information sourced internally, 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).*

[5] *https://www.gov.uk/government/statistics/uk-waste-data published October 2018*

[6] *www.npwd.environment-agency.gov.uk*

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[7], as shown below in Figure 2. The indicative margins of error are provided throughout the report.

Figure 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.

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

2. Paper and Card Packaging POM (Bottom-up Approach)

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 final project estimates of the POM for 2019.

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.

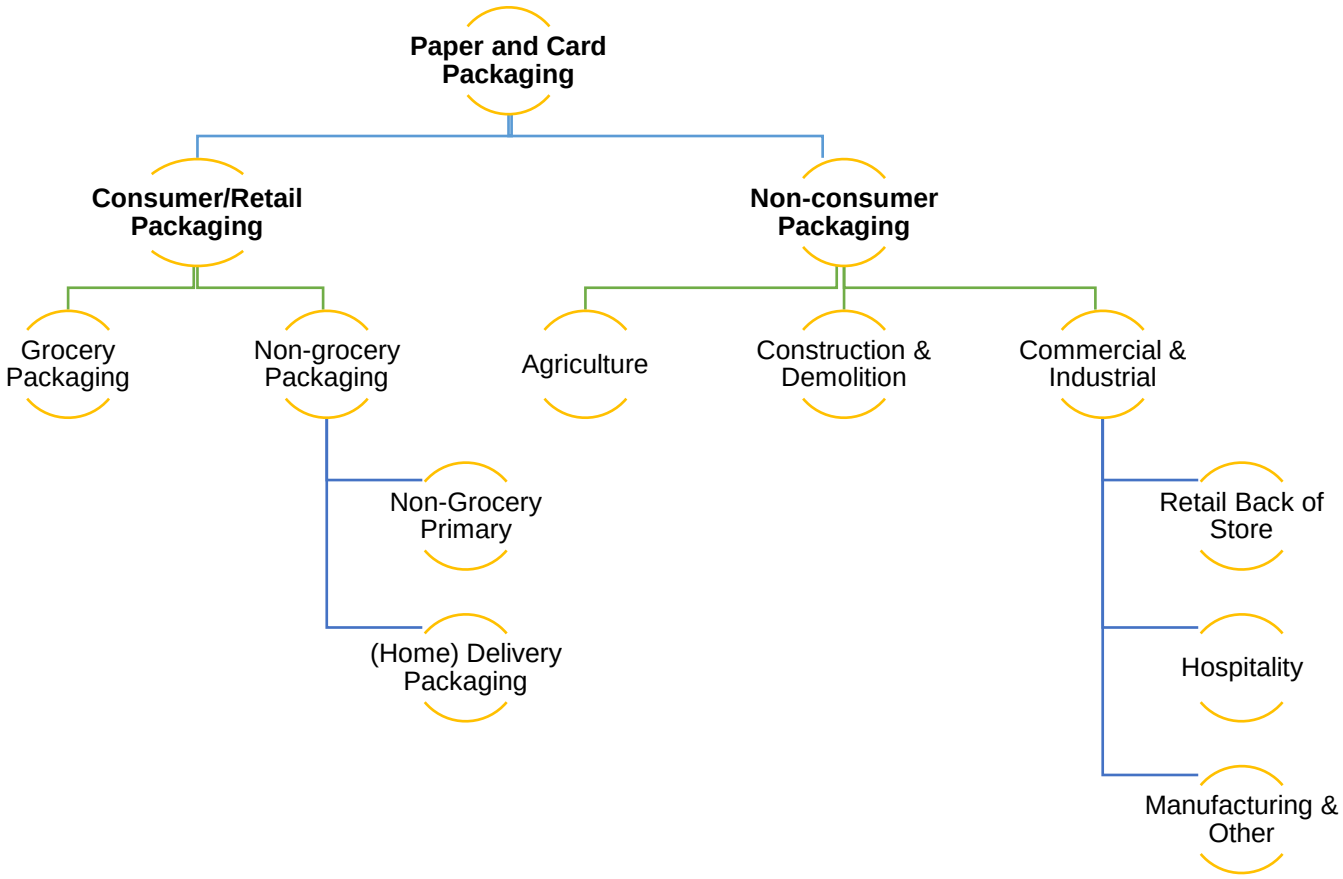
Paper and card packaging typically enters the market in the following formats, which have been adopted for the purposes of this report;

- **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[8].
- **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.
- **Liquid beverage cartons** – often called beverage cartons or Tetrapak (although other brands exist), these multi-layered cartons generally include paper, plastic and aluminium but tend to be categorised as paper and card due to this being the principal material by weight[9]. They are widely used to package fresh food and increasingly used in the ambient aisle[10].
- **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 3.

[8] *CPI 2014: Descriptions of Paper and Board Fact Sheet: http://www.paper.org.uk/information/factsheets/descriptions.pdf*
[9] *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.*
[10] *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 3 POM Breakdown by Sector



2.3. Consumer

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 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 2019 paper and card quantities reported in table 1 selling from NPWD for 84%[11] of UK grocery retailers[12]. This data was scaled up to 100% of the UK grocery market and resulted in an estimated paper and card POM for 2019 of 603k 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 43% of the grocery retail market by sales volume for 2019, the resulting quantity of paper and card packaging was scaled up to represent an estimate for the UK grocery retail market. This method assumes that the paper and card packaging profile of the supermarkets in EPIC is representative of those not

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

represented. The paper and card packaging in the grocery retail sector was estimated to be 539k tonnes in 2019. This represents 2% increase on the consumer grocery retail figures identified for 2017 of 530k tonnes.

The scaled-up EA data was found to be 12% higher than that produced using EPIC (11.8% compared to 11.3% 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 in 2017 and 2019 and the increasing market share in the grocery sector of discount retailers (which are all not included in the Valpak data but could have greater packaging use per item) the EA data was selected for use in 2019 as it was in 2017.

The final grocery retail paper and card packaging POM for 2019 of 603k tonnes (+/-6%[13]) was therefore used. This is a tonnage increase of 2% of that identified for 2017 – the same level of increase as was seen between 2014 and 2017. Appendix I provides a detailed assessment of relative levels of confidence in the data.

2.3.2 Non-grocery Retail

To scale up the grocery retail result to represent total UK retail, including non-grocery retail, the Office of National Statistics (ONS) retail sales data was used. This shows that the proportion of grocery spend of total UK retail spend was 42.6% in 2019 (compared to 43.2% in 2017).[14]

However, simply scaling up using market share was not considered robust, since it was likely that packaging usage within both sub-sectors differed. Therefore, this difference in paper and card packaging used by the grocery sector and other retail sectors was analysed using Valpak membership's reported data[15]. Analysis involved the following key stages:

- Identification of grocery and non-grocery retail members;
- Gathering of company reported data and information; and
- Calculation of paper and card packaging tonnage per billion-pound turnover for grocery and non-grocery retailers representing 33% of reported tonnage of paper and card packaging in 2019.

The method used assumes the packaging profile of those retailers within the sample is representative of those not in the sample and that turnover is a suitable scaling factor for packaging usage.

The total estimate of consumer non-grocery POM is 1,085k tonnes (+/- 12%)[16].

2.3.3 Total Consumer POM

In summary the following key steps were taken to estimate total retail paper and card packaging POM (consumer grocery retail + consumer non-grocery retail) in the consumer retail sector in 2019[17]:

- Total grocery paper and card packaging flow in 2019 was 603k tonnes (see section 2.3.1);
- Proportion of grocery spend of total retail spend in the UK was 43% in 2019[18];
- Total retail paper and card packaging flow, assuming like for like packaging was 1,366k tonnes;
- Paper and card packaging usage calculated as: grocery 3,597 tonnes /£bn and non-grocery as 4,801 tonnes /£bn;

[13] *As described in Figure 2*
[14] *https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/poundsdatatotalretailsales*
[15] *Valpak membership represents approximately 30% of all obligated companies, by obligation. The entire NPWD database was considered for analysis; however, for confidentiality reasons it was not possible to gain access to NPWD to conduct the same analysis on the complete dataset.*
[16] *As described in Figure 2*
[17] *All figures subject to rounding*
[18] *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 133% of grocery paper and card packaging tonnes/£bn turnover; and
- Applied 133% to the difference in tonnage between grocery (603k tonnes) and total retail (1,688k tonnes).

Therefore, total retail (to consumer) paper and card packaging POM in 2019 was estimated at 1,688k tonnes (+/- 8%[19]). This is an increase of 11% on the 2017 estimate for consumer paper and card packaging POM of 1,524k tonnes (1,423k in 2014) and supports the project Steering Group's view that there has been growth in paper and card consumer POM, based particularly on an significant increase in online sales and associated delivery packaging for non-grocery products, although not necessarily the only reason.

2.3.4 Assigning Non-grocery Paper and Card Packaging to Primary and Home Delivery Packaging

It is assumed and verified with the Steering Group that the that the growth in non-grocery consumer paper and card packaging of 155k tonnes has come primarily from delivery boxes and associated packaging from online retail, with a small increase in the total primary packaging for non-grocery. To split this growth, the total increase in non-grocery was scaled in line with both online sales (excluding grocery) and total non-grocery sales, from ONS data. This growth split the increase in sales of 155k tonnes of card to:

18k tonnes of grocery primary packaging
- Aligned to a 4.2% growth in non-grocery sales from ONS data, and
- 137k tonnes of grocery of (home) delivery packaging.
- Aligned to a 27% growth in internet sales from ONS data.

137k tonnes of home delivery packaging was then scaled up using total market size in 2017 and 2019, again according to ONS data, to suggest total of 627k tonnes of home delivery packaging in 2019 (compared to 491k tonnes in 2017 by the same method). The remainder (458k tonnes in 2019) is therefore assumed to be non-grocery packaging. These numbers were agreed with the Steering Group, who agreed that a sensible split of packaging types for home delivery packaging would be 90% corrugated and 10% packaging papers.

Within this calculation, packaging manufacturers and online retailers were approached to verify these numbers and provide a more accurate composition breakdown – however no response was forthcoming.

2.3.5 Consumer POM Composition

To provide a breakdown by card/paper type of consumer packaging within the PackFlow Covid-19 project, supermarket 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 2019 sales data and is shown below in Figure 4.

Figure 4 Consumer Grocery and Non-Grocery Packaging by Format, 2019

	Grocery Proportion	Non-Grocery Proportion	Total Retail (k tonnes)
Retail Corrugated	2.3%	52.7%	586
Retail Cartonboard and other packaging boards	80.5%	35.6%	871
Retail Liquid Beverage Cartons	7.0%	0.4%	46
Retail Other	10.2%	11.3%	185

[19] *As described in Figure 2.*

2.4. Non-consumer

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[20].

In the Paper and Card Flow 2025 report[21] Defra's complete set of C&I data[22] 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 Covid-19, the updated waste generation data for 2018 has been used.

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[23] and identified that for C&I waste collected, approximately 57% of paper and card is packaging. For PackFlow Covid-19, the Natural Resources Wales weighted average[24] has been used, and an average packaging 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[25] and agricultural[26] sectors, which identified that almost 100% of the paper and card from these sectors is packaging. The results of this analysis are provided in Figure 5.

[20] *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.*
[21] *https://www.wrap.org.uk/content/paper-card-flow-2025-%E2%80%93-paper-packaging-flow-data-report*
[22] *https://www.gov.uk/government/statistics/uk-waste-data published October 2018*
[23] *http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18237#RelatedDocuments 2010/11*
[24] *http://www.wrapcymru.org.uk/sites/files/wrap/Wales%20Municipal%20Waste%20Composition%202015-16%20FINAL.pdf*
[25] *http://www2.wrap.org.uk/downloads/ConstructionSitePackagingWaste.250ebeab.1592.pdf - Establish Tonnages, and Cost Effectiveness of Collection, of Construction Site Packaging Waste, 2005*
[26] *Agricultural Waste Survey 2003, Environment Agency*

Figure 5 Non-consumer Paper and Card Packaging POM, 2019

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%	1
Manufacture of food products, beverages and tobacco products	99	45.95%	45
Manufacture of textiles, wearing apparel, leather and related products	10	45.95%	5
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	1,023	45.95%	470
Manufacture of coke and refined petroleum products	1	45.95%	0
Manufacture of chemical, pharmaceutical, rubber and plastic products	55	45.95%	25
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	60	45.95%	27
Manufacture of furniture, jewellery, musical instruments, toys, repair and installation or machinery and equipment	48	45.95%	22
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	20	100.00%	20
Services excl retail (except wholesale of waste and scrap)*	3,468	45.95%	1,594
Retail	1,067	100.00%	1,067
Total	5,895	55.00%	3,301

**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.*

This analysis resulted in a non-consumer paper and card packaging total of 3,301 tonnes (+/-10% error margin[27]), which represents a 3% decrease from that reported in 2017. In order to compare the composition provided above with data from 2017 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.

[27] *As outlined in Figure 2.*

The quantity of paper and card packaging discarded by grocery retailers at back of store was derived from surveying retailers during May and June 2019, with data collected representing 43% of the grocery retail market and a small sample from the non-grocery sector. Data was then scaled up to UK level using Kantar World Panel market share information. The final figure for retail back of store was 1,067k tonnes (+/-15% error margin[28]) of paper and card packaging, which represents a 1% increase on 2017 data.

Within these calculations, Valpak have also considered aggregated anonymised data submitted to WRAP by signatories of the Courtauld 2025 agreement. This data produced a back of store cardboard figure of 687-829k tonnes. As this is not a core measurable figure within Courtauld 2025, Valpak and the Steering Group have taken a decision to exclude this figure from the final calculation.

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[29]. 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 259k tonnes **(**+/- 15% error margin[30]) of paper and card packaging. This is 142k tonnes or 121% higher than the 117k tonnes reported in PackFlow 2025 for the hospitality (primary) alone.

2.4.1. Non-Consumer 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 Figure 6.

Figure 6 Non-Consumer Paper and Card Packaging by Format, 2019

	Non-Consumer Proportion	Non-Consumer Total (k tonnes)
Corrugated	85%	2,817
Cartonboard and Other Pkg Board	9%	307
Liquid Beverage Cartons	0%	9
Other	5%	168
Overall	**100%**	**3,301**

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 2014 and 2017 data in Figure 7.

[28] *As outlined in Figure 2.*
[29] *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.*
[30] *As outlined in Figure 2.*

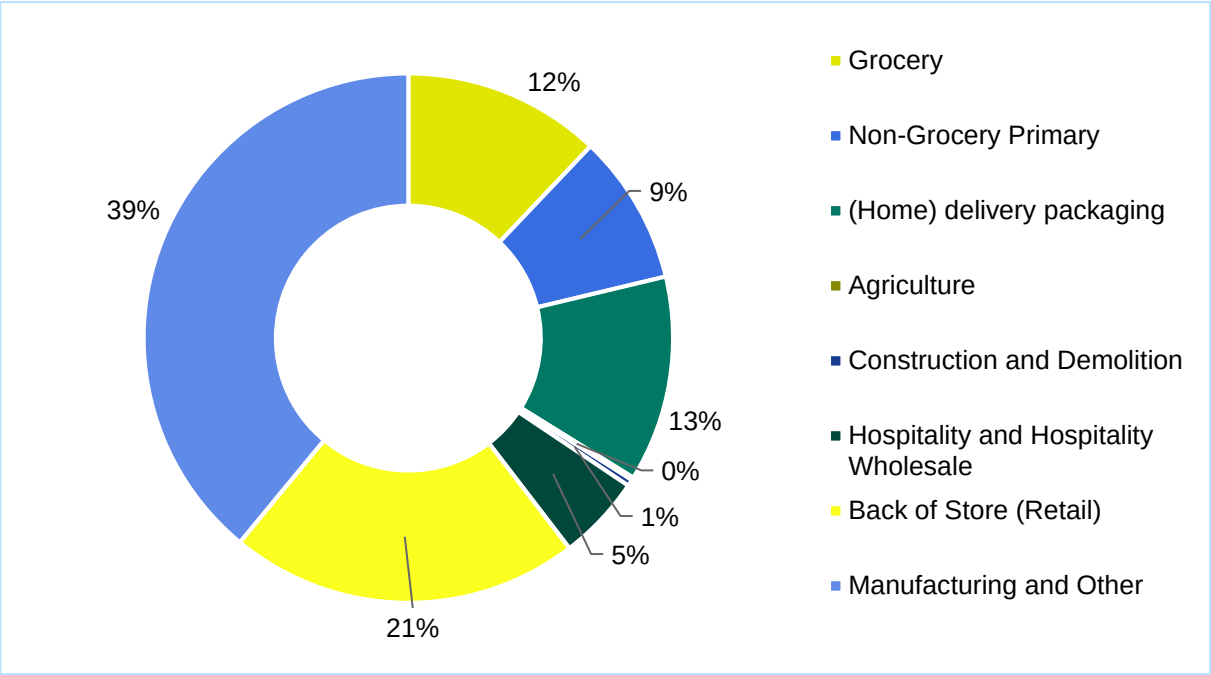
Figure 7 Total UK Paper and Card Packaging POM, 2014 – 2019 (k tonnes)

Stream	Sub-Stream	Total Quantity			% Change 2019 vs 2017
		2014	2017	2019	
Consumer (retail)	Paper and Card packaging	1,423	1,524	1,688	11%
Non-consumer	Paper and Card packaging	3,326	3,405	3,301	-3%
Full Market	Paper and Card packaging	4,749	4,929	4,990	1%
Consumer (Retail)	Grocery	578	590	603	2%
Consumer (Retail)	Non-Grocery Primary	845	934	458	16%
Consumer (Retail)	(Home) Delivery Packaging			627	
Consumer (Retail)	Full Market	1,423	1,524	1,688	11%
Non-Consumer	Agriculture	10	9	8	-6%
Non-Consumer	Construction and Demolition	71	19	20	5%
Non-Consumer	Hospitality and Hospitality Wholesale*	71	117	259	121%*
Non-Consumer	Back of Store (Retail)	1,209	1,057	1,067	1%
Non-Consumer	Manufacturing and Other*	1,966	2,209	1,947	-12%
Non-Consumer	Full Market	3,326	3,405	3,301	-3%

**note that, for the purposes of projecting sector impacts of Covid-19 in phase 2 of this project, hospitality primary and secondary/tertiary and wholesale packaging has been combined within this study. In 2014 and 2017, the focus was on primary packaging that was 'on the go' or consumed within hospitality, which was aligned to the objectives of those projects. For PackFlow Covid-19 it was agreed that the projected changes would be applicable to all cardboard and paper packaging within the sector, from the wholesale into hospitality through to the sale of the product contained within the primary packaging. As such, that packaging throughout the supply chain has been moved from 'Other' to the expanded category of 'Hospitality and Hospitality Wholesale'.*

The breakdown of the 2019 paper and card packaging POM by sector is provided in Figure 8.

Figure 8 Total UK Paper and Card Packaging POM by sector, 2019 (%)



The 2019 paper and card packaging POM is estimated to be 4,990k tonnes (+/- 7% error margin[31]), which is an increase of 1% on that reported in 2017 of 4,929k tonnes.

This has been driven by an increase in consumer paper and card packaging of 11% to 1,688k tonnes POM in 2019. This increase in paper and card packaging usage results from a growth in online sales, which tend to use a large amount of paper and card outer delivery packaging. According to the Office of National Statistics (ONS), online sales as a proportion of total retail has increased from 11.3% in 2014 to 16.3% in 2017, to 19.2% in 2019[32]. Statistics such as these support the increase in POM for paper and card packaging identified here.

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[33]. As a result, non-consumer paper and card packaging is now estimated at 3,301k tonnes POM in 2019.

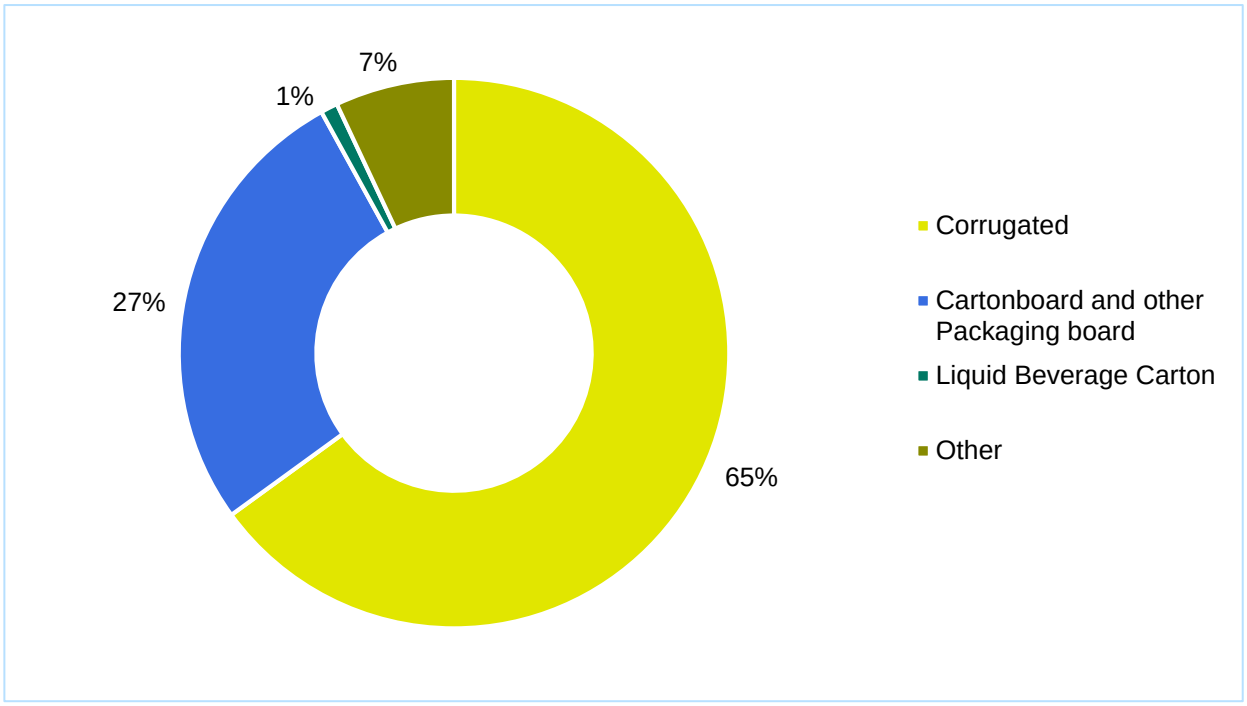
The composition of the 2019 paper and card packaging POM is provided in Figures 9 and 10.

[31] *As described in Figure 2.*
[32] https://www.ons.gov.uk/businessindustryandtrade/retailindustry/timeseries/j4mc/drsi
[33] https://www.wrap.org.uk/content/quantifying-composition-municipal-waste

Figure 9 Total UK Paper and Card Packaging POM Composition, 2019

		Total Quantity			
Stream	Packaging Type	2014	2017	2019	Change
Consumer (Retail)	Paper and Card Packaging	1,423	1,524	1,688	11%
Non-Consumer	Paper and Card Packaging	3,326	3,405	3,301	-3%
Full Market	Paper and Card Packaging	4,749	4,929	4,990	1%
Consumer (Retail)	Corrugated	418	443	400	-10%
Non-Consumer	Corrugated	2,960	3,027	2,817	-7%
Full Market	Corrugated	3,378	3,470	3,217	-7%
Consumer (Retail)	Cartonboard & other pkg board	779	836	1,058	27%
Non-Consumer	Cartonboard & other pkg board	133	193	307	59%
Full Market	Cartonboard & other pkg board	912	1,028	1,365	33%
Consumer (Retail)	Liquid Beverage Carton	48	46	46	0%
Non-Consumer	Liquid Beverage Carton	3	5	9	71%
Full Market	Liquid Beverage Carton	51	51	55	7%
Consumer (Retail)	Other	178	195	185	-5%
Non-Consumer	Other	229	180	168	-7%
Full Market	Other	407	375	353	-6%

Figure 10 Total UK Paper and Card Packaging POM Composition, 2019 (%)



As can be seen in Figure 10, around 65% of the total paper and card packaging POM is corrugated, with about 27% being cartonboard and other packaging boards. Since 2017, the amount of corrugated cardboard placed on the market has decreased by 7%, despite a sizeable increase in the amount of corrugated used for home delivery packaging from online sales. The POM has increased by 33% for cartonboard and other packaging boards. Much of this change is likely to be attributable to an increase in data quality and accuracy. This is reflected by the decline in 'other' packaging (by 6%), which in part is due to an improved data quality within the dataset and being able to identify more items as either corrugated or carton board and other packaging boards.

This breakdown has been compared against production figures provided by the CPI in Figure 11.

Figure 11 Cross-check of Total Paper and Card Packaging POM composition, 2019

	Corrugated	Cartonboard and other packaging boards	Liquid Beverage	Other
PackFlow Covid-19	64%	27%	1%	7%
CPI	65%	29%	1%	5%

2.5.1 Consumer Type Paper and Card Packaging

Clearly in the case of cardboard, there is no distinction between the use of corrugated, cartonboard and other packaging boards, paper or liquid beverage cartons for household or commercial applications, 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 2.4 (127k tonnes). This is because hospitality packaging is primarily 'household-like' in its nature. This would result in a consumer-type POM of 1,815k tonnes (+/- 9% error margin[34]).

[34] *As described in Figure 2.*

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 2019, 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.

2.6.1 Net Pack Fill

The 2019 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 the purpose of 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[35] 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.

Due to the impacts of Covid-19 and the lockdown, there has been an unprecedented number of late registrants in 2020 meaning that submissions based 2019 packaging POM is incomplete. Valpak therefore undertook two methods to adjust the aggregated data tables provided by the Environment Agency under FOI. These methodologies are outlined in PackFlow Covid-19 Phase II reports – on discussion with the Steering Group, Valpak selected 'method 2' as the most appropriate for card and paper packaging.

Using this method, the total obligated paper and card POM in 2019 is 3,914k tonnes (as shown in Figure 12)[36].

Figure 12 Obligated Paper and Card Packaging (Net Pack Fill), 2019 (k tonnes)

	Paper and Card
Table 1 Pack/Fill (UK pack/filling)	2,466,932
Imports:	
3A Selling (filled imports)	1,263,577
3B (packaging removed from imports)	596,424
Total	**4,326,933**
2A P/F (direct exports)	390,225
2B P/F (third party exports)	22,645
Total Exported	**412,870**
Net Pack Fill	**3,914,063**

[35] *No evidence data is available to support this.*
[36] *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.

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 could be large due to the proportion of small importers and online sellers. An estimate of the unobligated tonnage (1,075k tonnes, 22%) has been made by subtracting the net pack fill figure of 3,914k tonnes from the project's final POM estimate of 4,990k tonnes. The unobligated proportion of 22% is an increase from the 16% identified in PaperFlow 2025 report. 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[37] 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 of packaging 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% and was used with Steering Group data to compare to the overall project POM conclusions.

All data received by the Steering Group was provided early on in the project and following the project's conclusions was compared and considered in line with the project's estimate of 2019 POM of 4,501k tonnes and 2019 net pack fill of 3,914k Tonnes, one estimate being within 2.0% of the projects total POM[38]. The draft results of the project were also shared with and agreed by the Steering Group in July 2019.

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[39]. Based on the project POM, consumption of paper and card packaging in the UK is 75.1kg/capita, this compares to a European average of 69.3kg/capita[40], with data ranging from 20kg to 98kg/capita. This therefore puts the UK slightly above 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 2019 is 4,990k 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 1,688k tonnes (+/-8%) in 2019.

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 3,301k tonnes (+/-10%) in 2019.

[37] *A list of Steering Group members can be found in the acknowledgements of this report*
[38] *Due to the confidential nature of the data provided to the project team, full details of the comparisons were not able to be published*
[39] *https://ec.europa.eu/eurostat/statistics-explained/index.php/Packaging_waste_statistics#Waste_generation_by_packaging_material.*
[40] *In 2017*

This data was derived by applying revised packaging protocols to the Defra C&I Waste Statistics for 2016. It has been broken down and verified using Valpak EPIC data and that from a retailer survey of back of store waste carried out for this project.

Figure 13 Paper and Card Packaging POM, 2019 (k tonnes)

	Total	Corrugated	Cartonboard & Other Packaging Boards	Liquid Beverage Cartons	Other
Consumer	1,688 +/-8%	400	1,058	46	185
Non-consumer	3,301 +/-10%	2,817	307	9	168
Total	**4,990** +/-8%	3,217	1,365	55	353

The total paper and card packaging POM estimate is 1,075k tonnes higher than data 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), account for 22% of paper and card packaging in the UK. This has increased from the 21% non-obligated POM identified in 2014 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 to them, which is then audited by the regulating body. This data is used by policy makers and their agencies

3. Collection & Recycling

3.1. Introduction

This section of the report examines the levels of paper and card packaging waste collected in the UK and then recycled, either in domestic mills or outside of the UK. The collections are split between consumer (Local Authority managed collections from households) and non-consumer collections. As in the previous PaperFlow project (PaperFlow 2025), the data on Local Authority collections, reported on Waste Data Flow (WDF), is used as a proxy for household recycling and data from NPWD is taken as the total accredited (recorded) recycling. However, NPWD figures do not account for unaccredited reprocessing[41], therefore this project has also completed a separate analysis on this element in order to provide an estimate of the total recycling, accounting for that which is unaccredited.

3.2. 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. Although the PackFlow Covid-19 reports assessed 2019 data, assumptions and conclusions from the PackFlow 2025 reporting were assumed as 'null-hypothesis' and tested with the Steering Group.

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.

Given the change in end market destinations (detailed in section 3.4), the Steering Group maintained the position that some unrecorded recycling 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. In the latter scenario and in light of significant change in end market destinations through 2018 and 2019, 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 2020 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 PackFlow 2025 for the export of recovered cardboard for recycling was maintained, as was the 95% capture rate for mixed papers exported for recycling.

For PackFlow 2025, 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

[41] *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.*

packaging materials during the sortation of mixed fibre streams at MRFs. The assumed packaging content used in the modelling for this report is 7%, 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[42]. 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 7%.

Taking into consideration all of the aforementioned factors, the total unrecorded (unaccredited) recycling of paper and card packaging in 2019 was estimated to be 116k tonnes. This is a slightly larger figure than when the last PaperFlow report was completed (111k tonnes).

3.3. Consumer Recycling

Consumer recycling data was extracted from Waste Data Flow (WDF) and figures are reported based on the financial year 2018/19. This means there is some degree of inconsistency between the collection figures for April 2018 - March 2019 and the consumption figures for January 2019 - December 2019[43]. A summary of the UK LA paper and card packaging collections are shown in Figure 14.

Figure 14 Paper and Card Packaging WDF data, 2018/19 & 2016/17 (k tonnes)

	Total	Kerbside	Bring	CA
Consumer Paper and Card Packaging Collected	1,092 (1,027)	965 (821)	17 (17)	110 (188)

As shown in the table**,** 1,092k tonnes of paper and card packaging is reported on WDF by LAs as being collected. However, it should be noted that some (70k tonnes) of the paper and card collected is recorded by Local Authorities on WDF as *mixed paper and card*. This grade includes a mixture of packaging and non-packaging materials and an Environment Agency protocol has been used to estimate the volume of packaging collected within this. The packaging content protocol in this grade was increased by the Environment Agency from 12.5% to 34.5% packaging content from the start of 2017 due to a year-on-year decrease in newsprint grades entering the market and increased packaging content, in particular from online shopping. In fact, it was generally observed by the Steering Group and reported in the media based on Defra statistics[44] that household collections of paper and card have reduced between 2013 and 2019, although it is likely that this is driven by the decline in newsprint and other non-packaging paper than by packaging but no data was available to support this.

3.4. Non-consumer Recycling

Non-consumer collections were estimated as follows:

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

As covered in section 3.2, total UK paper and card packaging recycling consists of the total tonnage of paper and card packaging recycled and recorded on NPWD[45] combined with the project's estimate for unrecorded recycling.

[42] https://wrap.org.uk/content/quantifying-composition-municipal-waste
[43] *At the time of writing 2018/19 was the most recent full set of WDF data available.*
[44] https://www.rebnews.com/defra-stats-show-90000-tonnes-less-of-paper-and-card-were-collected-from-households/
[45] http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx

The total consumer paper and card packaging, taken from WDF as per section 3.3, is removed from the total recycling figure and what remains is assumed to be non-consumer paper and card packaging. The estimate for non-consumer collections is shown in Figure 15[46]. It should be noted that the use of WDF as a recycled figure is a simplification as there will be some process loss during sorting at the MRF (where this occurs). This in turn may lead to a slight overstating of the consumer recycling figure and, by the nature of the calculation, a slight understating of the non-consumer recycling figure.

Figure 15 Paper and Card Packaging Collections WDF data 2018/19

	Total		Consumer		Non-Consumer	
	Tonnes	Recycling Rate	Tonnes	Recycling Rate	Tonnes	Recycling Rate
Unrecorded	116k		56k		60k	
NPWD / Recorded	3,828k	77%	1,092k	65%	2,735k	83%
Total Recycled	3,944k	79%	1,149k	68%	2,795k	85%

Based on the tonnages in section 2.7 and the conclusions around consumer and non-consumer paper and card packaging POM made earlier in the report, it is possible to estimate that 68% of consumer and 85% of non-consumer paper and card packaging was recycled in 2019, with an overall recycling rate of 79%. However, when the unrecorded paper and card packaging recycling is removed, this recycling rate drops to 77%.

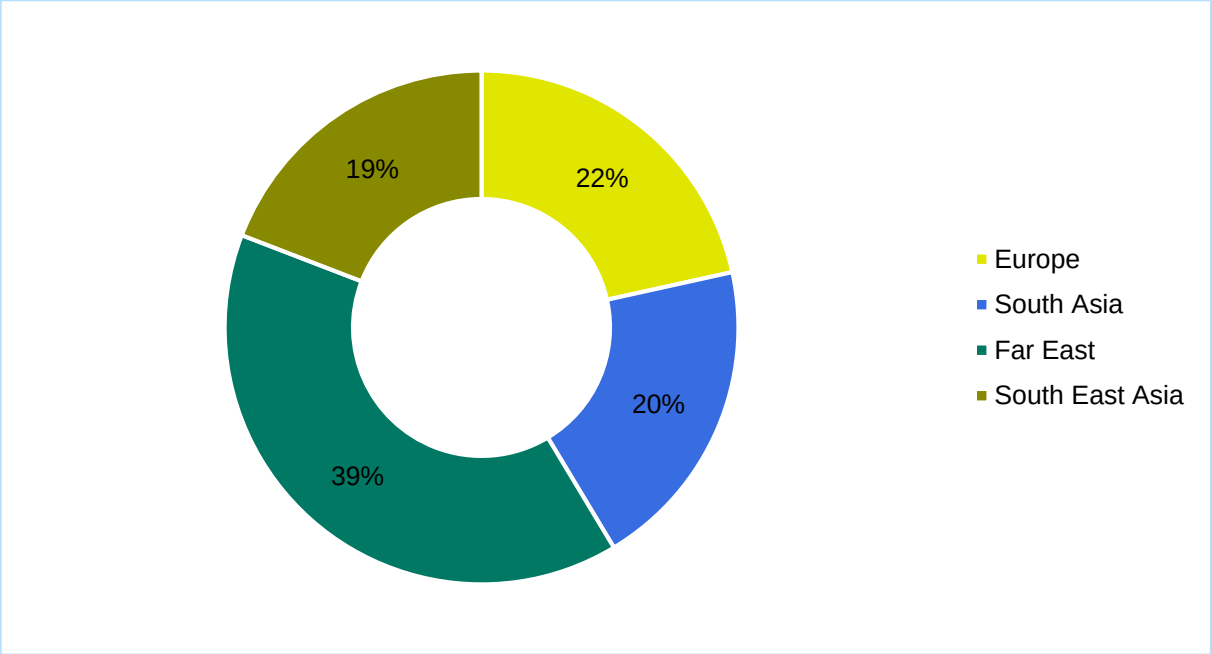
3.5. End Markets

Recovered paper and card packaging is used for the production of new board and cardboard products. Based on NPWD figures for 2019, 32% of the recorded recycling took place in the UK and 68% overseas, representing a 2 percentage point shift away from domestic recycling from 2017. This is based on the tonnage of packaging received for recycling in the UK or exported for recycling. So, note for mixed papers this is after the packaging content protocol has been applied.

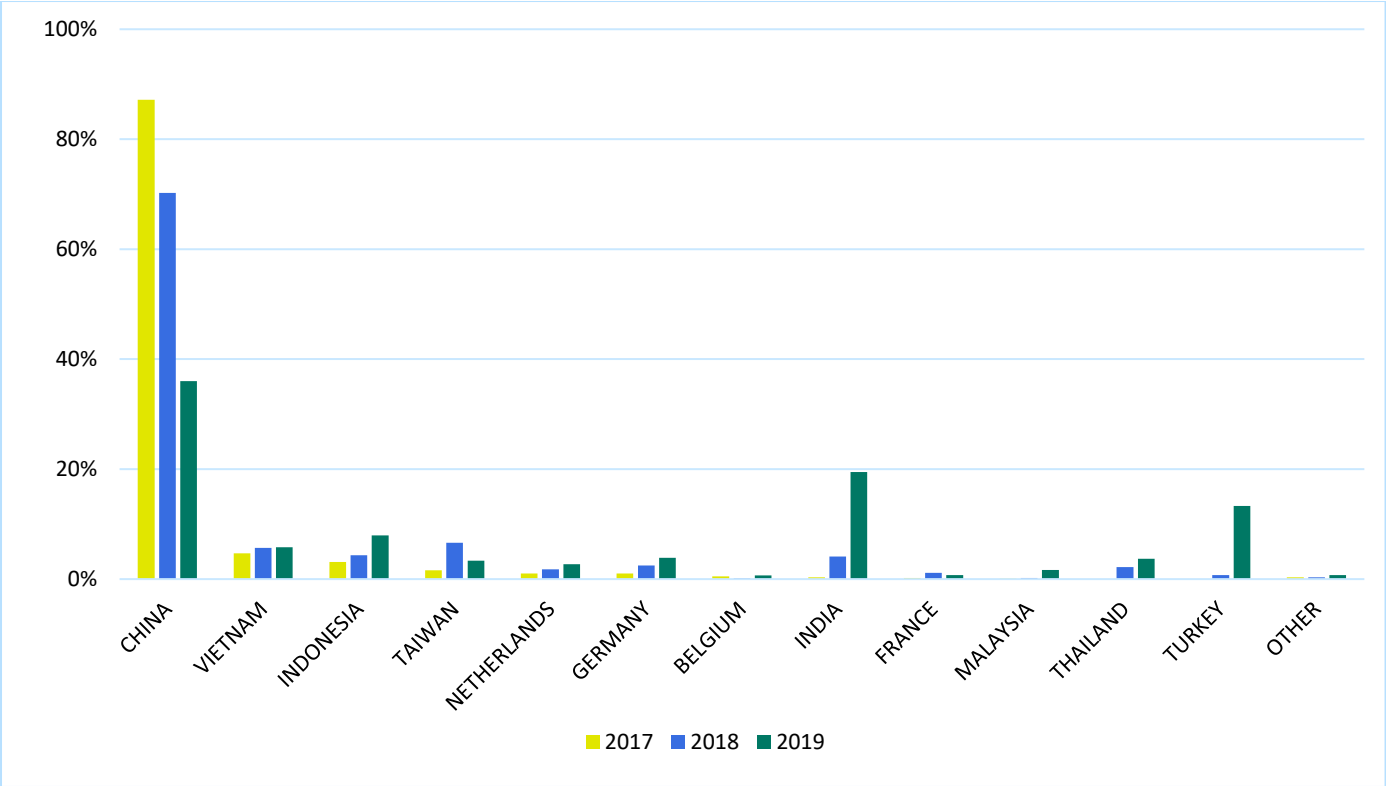
A freedom of information request was made to the Environment Agency to determine where the paper and card packaging was exported to for recycling. It can be seen from the breakdowns given below that 36% of exports of recovered paper and card packaging for recycling overseas were to mainland China in 2019. This has decreased significantly from the data reported in 2017 (from 87.2% of exports) when China banned the import of mixed paper at the end of 2017 and also reduced import quotas for other grades of recovered paper and so the percentage of paper and packaging going to China for recycling has therefore reduced, although it remains a key market. Other countries, such as India, Turkey, Vietnam and Indonesia.

[46] *There is a time difference between the NPWD figures (calendar year 2019) and the local authority figures (2018/19 financial year); however, this was the best available data.*

Figure 16 Export End Markets – Destination by weight, 2019 (%)



	% of exports		
Region	**2017**	**2018**	**2019**
Europe	2.9%	6.7%	21.5%
South Asia	0.3%	4.1%	19.8%
Far East	88.8%	76.8%	39.5%
South East Asia	7.9%	12.4%	19.2%



Data source: UK Environment Agency. Freedom of Information request

3.6. Protocols – sensitivity analysis

The current packaging protocol for mixed paper and card is packaging is 34.5%. Stakeholders are of the view that the proportion of packaging within mixed paper and card should increase over time as less newsprint is consumed, less correspondence is paper based and less printing occurs - whist at the same time there is an increase in card in the household, especially boxes and packaging papers around online deliveries (further exacerbated by the move away from bubble wrap).

The WRAP UK Waste Composition analysis (HH) suggests that 42.4% to 43.8% of mixed papers in the household is packaging. If the protocol were to increase to 42.4% this would add c.85k tonnes of packaging recycling to the total and increase the recycling rate by 1.7% from 76.7% to 78.4% in terms of accredited recycling and from 79.0% to 80.7% for all recycling.

4. Conclusions

4.1 Conclusions: POM

This project's estimate for paper and card packaging POM in 2019 is 4,990k tonnes (+/- 7%): an increase of 1% from the previous POM figure for 2017.

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 1,688k tonnes (+/- 8%) in 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 3,301k tonnes (+/- 10%) in 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 22% of POM in 2019 – this represents a 16% increase from the previous reported figure for 2017.

Using data from NPWD, an estimate of the unobligated tonnage (1,075k tonnes, 22%) has been made by subtracting the net pack fill figure of 3,914k tonnes from the project's final POM estimate of 4,990k tonnes. The unobligated proportion of 22% is an increase from the 16% identified in 2017.

The estimates of paper and card packaging POM by type are: 3,217k tonnes (65%) corrugated, 1,365k tonnes (27%) carton board and other packaging boards, 55k tonnes (1%) liquid beverage cartons and 353k tonnes (7%) other packaging.

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

4.2 Conclusions: Recycling

The total tonnage of paper and card packaging recycled in 2019 is estimated to be 3,944k tonnes.

This includes reported (NPWD) and an estimate for unreported recycling (116k tonnes). Based on the POM calculated as part of this project, this gives an overall recycling rate of 79%. Of this, 3,754k 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 2019 is estimated to be 1,149k tonnes.

This is based on WDF and an estimate for unreported recycling (56k tonnes). Based on the POM calculated as part of this project the consumer recycling rate is estimated at 68%, up 1% since 2017.

The total tonnage of non-consumer paper and card packaging recycled is estimated to be 2,795k 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 85%.

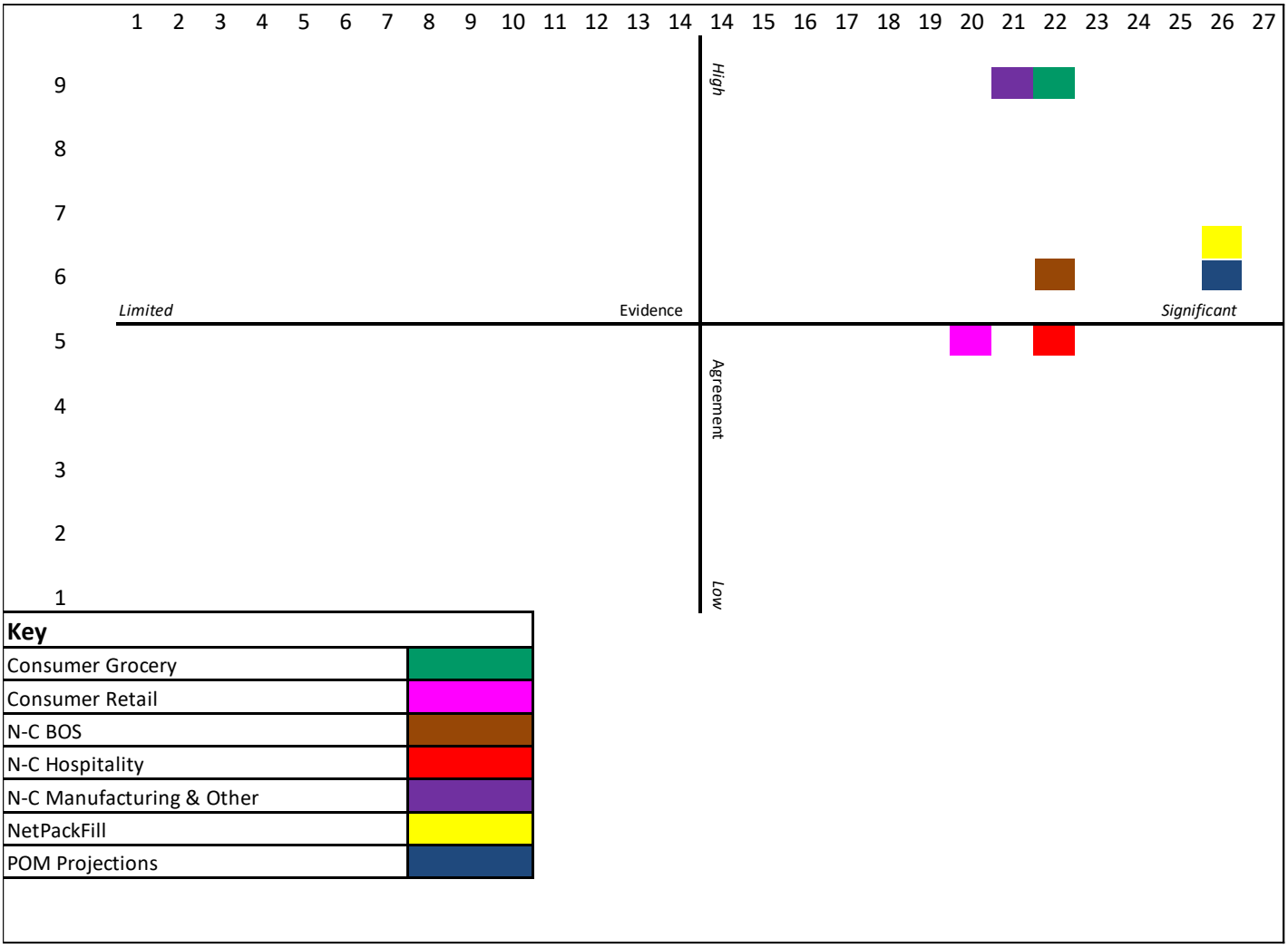
Appendix I

Data Robustness Assessment

A robustness analysis 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 16 (POM), Figure 17 (Recycling) and a summary in Figure 17, which has been constructed based on analysis completed for each project estimate.

The tables thereafter provide a full breakdown 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 17 Data Robustness Assessment Results – POM



To convert scores to a percentage that could be used to relate to an appropriate error margin[47], the evidence and agreement levels scores were added and the percentage of the total possible score taken.

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

Figure 18 Data Robustness Assessment Results – Recycling

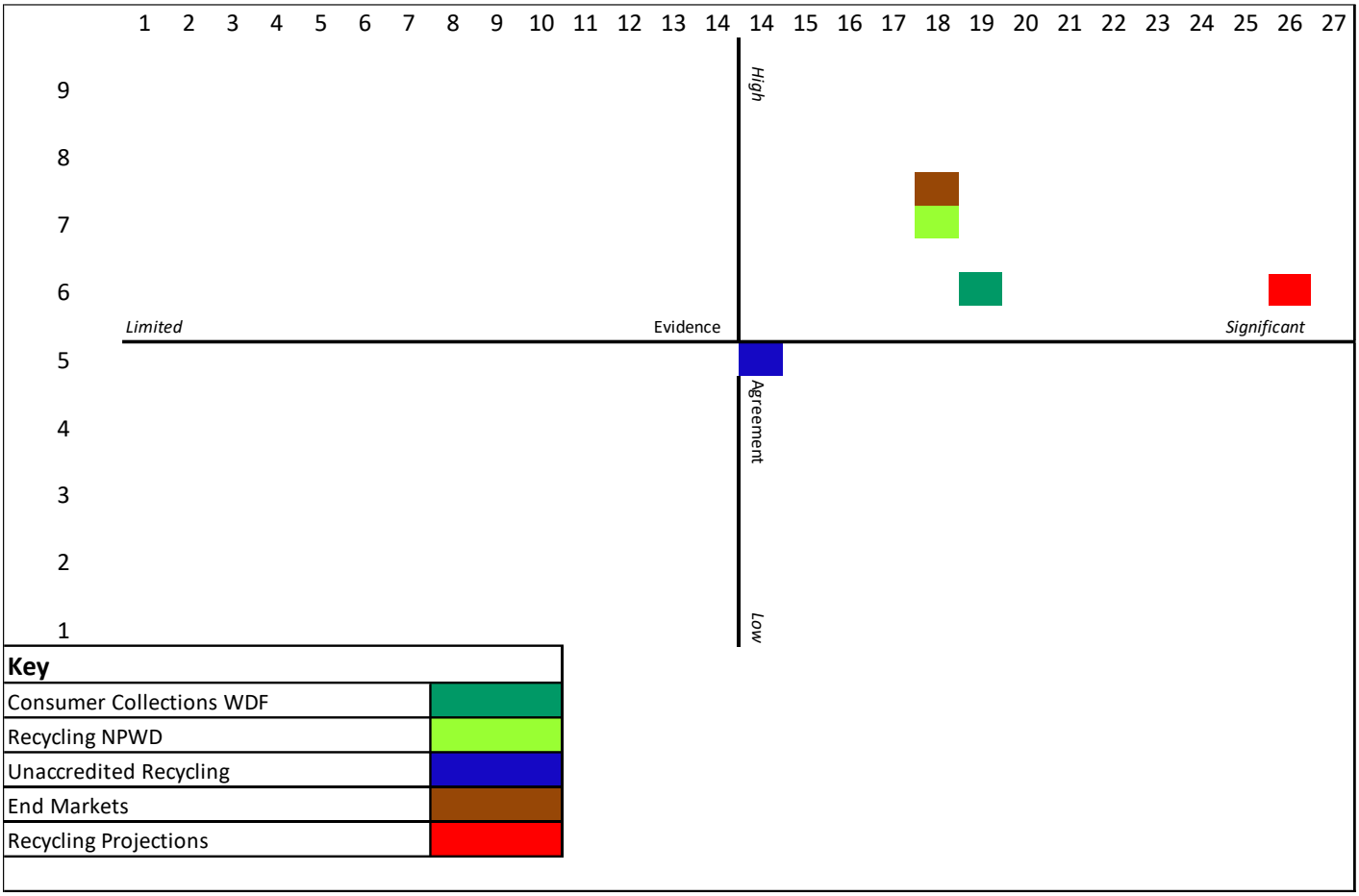


Figure 19 Data Robustness Assessment Results – Summary

	Robustness Scores	
Data & Source	**Evidence (Robustness and completeness, max 27):**	**Degree of agreement around the findings (max 9):**
Environment Agency Grocery Retailer Packaging Handled	24	9
Valpak Turnover & Packaging Handled Data	20	6
Valpak EPIC Data	22	6
UK AWP Waste Arisings, Defra/Valpak	19	6
NPWD Producer Data 2019	26	6
NPWD Recycling Data 2019	26	6
Verde Research and Consulting Ltd Survey of Recyclers and Exporters 2020	18	7
Survey of Grocery Retailers 2020	22	6
DEFRA C&I Waste Survey 2017	21	9
WDF 2018/19	19	6

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?	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 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	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		**22**

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

Valpak 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**

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	3
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes with some reservations	2
Total		**22**

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

UK AWP Waste Arisings, Defra/Valpak 2007

Data
UK AWP Waste Arisings, Defra/Valpak 2007
Source
Defra/Valpak 2007
Data Used In:
Method 1 - POM - Hosp.

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 with some reservations	2
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		**19**

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

NPWD Producer Data 2020

Data		
NPWD Producer Data 2020		
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**

Survey of Recyclers and Exporters 2020

Data		
Survey of Recyclers and Exporters 2020		
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**

Survey of Grocery Retailers 2020

Data		
Survey of Grocery Retailers 2020		
Source		
Valpak		
Data Used In:		
Valpak Recycling Survey 2018		

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?	No	0
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?	Yes with some reservations	2
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	More yes than no, but equivocal	1
Total		**19**

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

NPWD Recycling Data 2019

Data		
NPWD Recycling Data 2020		
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**

DEFRA C&I Waste Survey 2017

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?	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?	yes	3
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		**21**

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**

WDF 2018/19

Data
WDF Local Authority Collection Data
Source
WDF 2018/19
Data Used In:
Consumer Recycling

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