Valpak
a Reconomy Group company

PackFlow Covid-19 Phase I: **Glass**

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

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In partnership with

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Industry Council for Packaging and the Environment

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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:

1. 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.

2. 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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J729 Glass Version 2

Executive Summary

Introduction

The PackFlow Covid-19 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 potential implications of lockdown and the ensuing recession on packaging materials flows, packaging materials collections & recycling, and to assess potential compliance risks versus the packaging recycling 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 intelligence on impact of the Covid-19 lockdown (packaging materials flow, collections, recycling and end markets)
- Develops scenarios for packaging materials flow and recycling 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 glass packaging placed on the market (POM)[2] that are as accurate as is reasonably possible. The report also considers the quantities of glass packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by packaging glass recyclers in the UK.

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

Glass Packaging POM

This report estimates glass packaging POM in 2019 to be 2,574k tonnes (+/- 6%) in 2019: an increase[3] of 3% from the previous estimate in 2017.

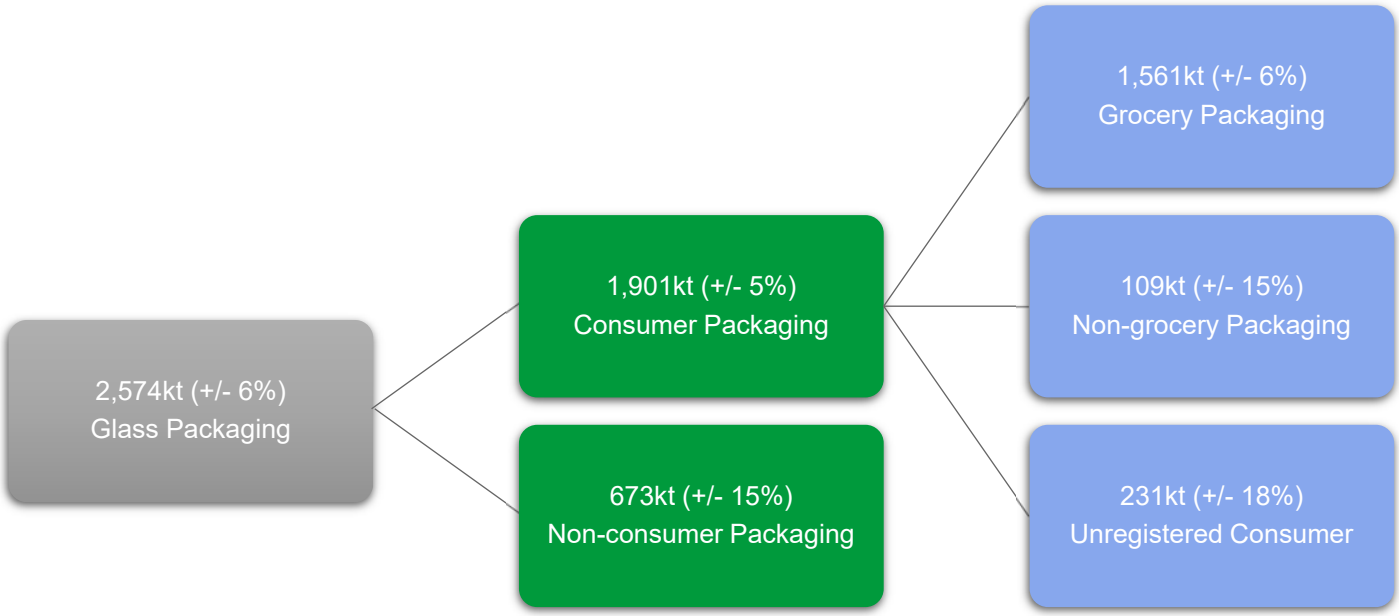
The glass packaging POM estimate is established using a methodology that identifies UK production of glass packaging, adds imports of glass packaging and removes exports of glass packaging. Data from a variety of sources is used for each sector and the results combined. The POM figure is cross-checked with reported obligated data on NPWD and with this project's industry Steering Group.

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

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

[3] The error margin indicates that the two wood packaging POM figures are not substantially different.

Figure ES1 Glass Packaging POM by Sector, 2019 (k tonnes)[6]



The estimate for glass packaging POM in the consumer sector is 1,901k tonnes (+/- 5%)

The methodology for consumer POM is based on primary sales data from a sample of UK supermarkets alongside reliable market share data. No other method is used for deriving consumer data as this method is considered the most robust available and is accepted as such by industry.

The estimate for glass packaging POM in the non-consumer sector is 673k tonnes (+/- 15%)

Non-consumer glass packaging POM is derived by subtracting the consumer POM estimate from the total POM estimate for glass packaging. The estimates are reviewed and sense-checked by the project Steering Group including representatives from the Scotch Whisky Association and UK Hospitality.

The non-obligated or unregistered flow estimate for glass packaging POM accounts for 9% of total POM in 2019 – this represents a slight increase of 1% from the figure for 2017 reported in GlassFlow 2025[4].

The estimate of the unobligated/unreported tonnage (231k tonnes, 9%) in 2019 uses NPWD data to calculate a net pack fill figure of 2,342k tonnes, which is then subtracted from this reports total glass packaging POM estimate of 2,574k tonnes. The unobligated proportion of 9% is a slight increase from the 8% identified in the GlassFlow 2025[4] report.

The estimates of glass packaging POM by format type are: 2,174k tonnes (84%) glass bottles, 390k tonnes (15%) glass jars, 10k tonnes (0.4%) other glass packaging.

The format types for glass packaging are established primarily using information from Valpak's EPIC database and sense-checked by British Glass. Across glass packaging formats on the market, glass bottles make up the vast majority (by weight) of glass packaging.

[4] https://www.valpak.co.uk/more/material-flow-reports/glassflow-2025

Glass Packaging Recycling

The total quantity of UK glass packaging recycled is estimated to be 1,824k tonnes in 2019.

This includes NPWD reported glass packaging recycling (1,753k tonnes) and an estimate of unreported glass packaging recycling (71k tonnes). Based on the POM calculated as part of this project, this gives an overall glass packaging recycling rate of 71% in 2019, of which the accredited recycling rate for glass packaging is 68%.

The total quantity of consumer[5] UK glass packaging recycled is estimated to be 1,371k tonnes.

Based on WDF collection figures and the consumer POM calculated in this project, the consumer glass packaging recycling rate is estimated to be 72%.

The total quantity of non-consumer[6] UK glass packaging recycled is estimated to be 453k tonnes.

Non-consumer glass packaging recycling is calculated by removing the consumer recycling tonnage from the figure for total glass packaging recycling. Based on the non-consumer POM estimate in this project, the non-consumer glass packaging recycling rate is 67% in 2019.

Of the total 750k tonnes of glass packaging not recycled, 483k tonnes (64%) is sent for energy recovery and 266k tonnes to landfill (36%) in 2019.

This is based on an estimated total of 530k tonnes of consumer glass packaging not being recycled and 220k tonnes of non-consumer not being recycled, both of which are derived using WDF and published statistics on UK disposal routes for glass packaging.

End Markets

In 2019 84% of glass collected was recycled in the UK

In 2019, 84% of the recorded glass packaging recycling took place in the UK with the remaining 16% occurring overseas.

Glass is primarily recycled in remelt end markets in the UK

Of the glass packaging recycled in the UK, 69% went into remelt applications and 31% into ‘other’ applications.

Of the remelt fraction, industry suggests 10-15% is used to produce glass mineral wool and the remainder is used by the container industry. For non-remelt applications, typically glass is used as an aggregate substitute, which includes glass used in road construction, concrete products, as a shot blasting abrasive or filtration media.

The EU is the main export market for glass packaging exported from the UK

Nearly all glass packaging exports in 2019 were destined for remelt applications with the container sector believed to take the majority. The key export destinations were Portugal (63%), Belgium (24%), Netherlands (13%) and Spain (<1%).

Recommendations for Further Work

Future updates of this work should revise the estimate of unaccredited glass recycling

Future updates of this work should revise the estimate of unaccredited glass recycling for the glass recycled in the Ceramic, Stone and Porcelain (CSP) output material from glass recycling facilities. Research conducted

[5] *Consumer packaging is packaging consumed in the household*
[6] *Non-consumer packaging is packaging consumed in the commercial/industrial sector*

during this project indicated that going forward this will be increasingly be recycled in accredited facilities and therefore will be captured in the published accredited recycling data.

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Glossary

BBPA – British Beer and Pub Association

bn – Billion

C&I – Commercial and Industrial

Consumer Packaging – Packaging consumed in the household

CSP – Ceramics, Stones and Porcelain

Cullet – Crushed glass prepared for use in the glass manufacturing process

DAERA – Department of Agriculture, Environment and Rural Affairs

DRS – Deposit Return System

EA – Environment Agency

EfW – Energy from Waste

EPIC – Environmental Product Information Centre

GDP – Gross Domestic Product

Glass Recycler / Reprocessor – Organisation which processes glass to prepare it for end markets such as remelt (container and fibreglass manufacturing), filtration, shotblasting, aggregates and export

HMRC – Her Majesty's Revenue and Customs

INCPEN – Industry Council for Packaging & the Environment

k – Thousand

kt – Thousand tonnes

LA – Local Authority

Non-consumer Packaging – Packaging consumed in the commercial/industrial sector (away from home or on the go in hotels, bars, restaurants and businesses

NPWD – National Packaging Waste Database

ONS – Office of National Statistics

PERN – Packaging Export Recovery Note

POM – Placed on Market

PRN – Packaging Recovery Note

PRODCOM – "Production Communautaire" (Community Production)

RDF – Refuse Derived Fuel

SEPA – Scottish Environment Protection Agency

VDS – Valpak Data Solutions

WDF – WasteDataFlow

WRAP – Waste and Resources Action Programme

WSTA – Wine and Spirit Trade Association

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Valpak, the Industry Council for Packaging and the Environment (INCPEN) and the Waste and Resources Action Programme (WRAP) would like to thank the following organisations for their contribution to the PackFlow Covid-19 project for glass packaging:

- The Advisory Committee on Packaging (ACP)
- British Glass
- The Department of Agriculture, Environment and Rural Affairs (DAERA)
- The Department for Environment, Food and Rural Affairs (DEFRA)
- The Environment Agency (EA)
- Nipak
- The Scotch Whisky Association
- The Scottish Government
- The Scottish Environment Protection Agency (SEPA)
- The Packaging Federation
- UK Hospitality
- Viridor
- Wastepack Ltd
- The Welsh Government
- Zero Waste Scotland (ZWS)

1. Introduction

1.1. Background

The PackFlow Covid-19 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 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[7]).

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, collections and recycling from 2020 to 2022; and
- Assesses potential compliance risks versus targets.

To support Defra and Governments and other industry stakeholders in their packaging policy work and assist other industry stakeholders, this Phase I report focuses on generating robust estimates of UK glass packaging placed on the market (POM) [8] that are as accurate as is reasonably possible. The report also considers the quantities of glass packaging recycling, both in the UK and abroad, and provides insights into the end markets and products that are manufactured by glass packaging recyclers in the UK.

1.2. Phase I Objectives

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

- Provide updated (and cross-checked) baseline estimates of glass packaging placed on the UK market in 2019, by packaging format, stream and source:
    - Format e.g. bottles, jars, other
    - Stream e.g. consumer, non-consumer
    - Source e.g. obligated, non-obligated;
- Estimate the quantities of glass packaging collected through CA sites, kerbside and pick-up collections and other collection types, by stream;
- Estimate the quantities of glass packaging recovered and recycled, sent for incineration with energy recovery, and sent to landfill for both UK and overseas end destinations; and
- Provide estimates of the quantities of glass packaging that is recycled (i.e. is recorded as accredited recycling) and glass packaging that is recycled but does not generate a PRN/PERN (i.e. is unrecorded or unaccredited).

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

1.3. Methodology

1.3.1. POM

Glass packaging POM is estimated using the following methodology:

Total UK Glass Packaging Consumption	=	Total Production	-	Exports (Empty)	-	Exports (Filled)	+	Imports (Empty)	+	Imports (Filled)

This methodology references a variety of data sources of glass packaging products placed on the market combined with cross-checks where possible. The results of this method are cross-checked against an assessment of glass packaging POM reported on a variety of publicly available databases and sense-checked by the project's Steering Group. The baseline year for all data is 2019, where 2019 data are not available the most recent available data are used.

The details of the estimates for glass packaging POM and the results of the cross-checks that are performed are provided in section 2 of this report.

Other methodologies were considered, such as using waste collection and composition data; however, this was not taken forward as this methodology has several significant limitations and is reliant on the composition of household waste, waste arisings from local authorities and similar data from the non-consumer sector, all of which will vary in terms of robustness. The justification of the use of POM data over alternatives is provided in full in section 1.3.1 of PlasticFlow 2025[9].

1.3.2. POM Cross-check (Net Pack Fill)

The cross-check used glass packaging data reported by obligated companies and made publicly available on NPWD. The net pack fill estimate is thought to capture the vast majority of obligated glass packaging but does omit glass packaging handled by non-obligated companies, free-riders[10] and packaging for internal company use (considered to be non-obligated packaging under the regulations).

To estimate the amount of glass packaging placed on the UK market by obligated companies, the net pack fill calculation set out below is applied. This calculation uses the total data reported by obligated packaging producers and is available on the NPWD website[11]:

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

1.3.3. Recycling

NPWD is used as the source for accredited (recorded) recycling of glass packaging. The glass recycling industry - including those involved in producing cullet and exporting glass – are consulted on the recycling of glass packaging that might not, for whatever reason, be reported on NPWD. The output of these discussions is used to estimate a figure for non-accredited (or unrecorded) recycling of glass packaging.

[9] https://www.valpak.co.uk/information-zone/reports/plastic-flow-2025
[10] *Those companies who are above the packaging obligation threshold by having a turnover of £2 million and handling 50 tonnes of packaging or more but are not registered with the relevant agency.*
[11] www.npwd.environment-agency.gov.uk

The total glass packaging recycling figure, consisting of recorded and unrecorded glass packaging recycling, is then split into consumer and non-consumer recycling. Waste Data Flow (WDF) is used as the source for the consumer recycling data. The difference between this and the figure for total recycling of glass packaging is assumed to be non-consumer glass packaging recycling.

1.3.4. Data Robustness

As there are levels of uncertainty around the data used to establish the various elements that are combined to estimate glass packaging POM, estimates are presented with error margins, providing an indicative range of uncertainty 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[12], as shown in Figure 1. The respective indicative margins of error are provided throughout the report.

Figure 1 - Relating Robustness Scores to Indicative Margins of Error

Robustness Score			Error Margin	
96%	to	100%	+/-	3%
91%	to	95%	+/-	6%
86%	to	90%	+/-	9%
81%	to	85%	+/-	12%
76%	to	80%	+/-	15%
71%	to	75%	+/-	18%
66%	to	70%	+/-	21%
61%	to	65%	+/-	24%
56%	to	60%	+/-	27%

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

[12] *These are assumed to be indicative estimates of error margins and not the outputs of a statistical calculation.*

2. Glass Packaging POM

2.1. Introduction

This section of the report presents estimates for the total quantity of glass packaging POM in the UK in 2019. The POM figure is split between consumer and non-consumer; for the purposes of this report consumer glass packaging is defined as what is consumed in the home and non-consumer glass packaging is defined as glass packaging that is consumed in pubs, clubs, bars and restaurants etc.

It is important to note that the report estimates consumer glass packaging consumption from supermarket grocery sales, i.e. as such all glass packaging around grocery products is counted as consumer glass packaging. This method will, in effect, include some products in glass that are purchased in supermarkets by some of the smaller pubs, clubs, restaurants, etc. for consumption on their premises (and not in the home).

This section includes a series of sense checks against the data used, the details for the majority of these are included as appendices to this report.

The glass packaging recycling targets are currently based on a percentage requirement of what is flowing onto the market: the EU directive target (in place since 2008) is 60% of the total glass packaging waste arising in 2019. To achieve this, companies in the UK that handle over 50 tonnes of packaging annually and have a turnover more than £2m are obligated to contribute to this, with the business recycling target set at 79% of the amount of glass placed on the market by obligated businesses in 2019 rising to 80% in 2020[13]. Of the total amount of glass packaging recycled, an additional requirement is that 67% must be from re-melt.

2.2. UK Production

Historically to identify how much glass packaging is produced in the UK, production data from UK glass manufacturers has been provided via British Glass (2013 to 2017). However, British Glass no longer receive production data from all of the glass manufacturers in the UK but British Glass believe that all glass packaging produced in the UK will be captured on the National Packaging Waste Database (NPWD). In essence, due to the scale of the facility required to operate glass furnaces capable of producing glass packaging in any meaningful quantities, glass packaging manufacturers will be obligated and be included in NPWD. Therefore, in this report glass packaging production figures for 2018 and 2019 are derived from NPWD[14].

As a sense check, in 2017 the British Glass and NPWD production figures were similar with the British Glass figure being only 0.4% higher, with British Glass believing the slight difference being due to reporting errors.

The UK glass packaging production estimates for 2015 to 2019 are provided Figure 2.

Figure 2 - UK Glass Container Production, 2015 - 2019 (k tonnes)

	2015	2016	2017	2018	2019
Glass Container Production	2,194	2,204	2,296	2,372	2,419
% Change from prev. year	-2%	0%	4%	3%	2%

[13] *The business recycling target of 79% was set up with a buffer against the 60% total recovery target. Therefore, 79% of the business flow will be higher than the 60% of total flow.*
[14] *http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, Accessed (10/08/2020)*

Figure 2 shows that over the period 2015 to 2019, UK glass container production increased by approximately 10% (or 225k tonnes). Compared to the previous GlassFlow 2025 estimate for 2017 (2,296k tonnes), it has increased by 5%.

Appendix II provides a sense check against data from PRODCOM[15] (Eurostat statistics on the production of manufactured goods). It is important to note that the NPWD figures in which the 2019 glass production estimate is based are 'live'; i.e. they may change at any point until all submissions are finalised. Therefore, when NPWD data is used it is the latest available at the time of writing and it is not believed the final NPWD data will vary significantly from the figures used in this report.

In this report, the NPWD figure 2,419k (+/- 9%) is used for UK glass container production in 2019.

2.3. Exports (Empty)

Historically British Glass provided estimates for empty exports as a sense check however as they no longer receive data from all glass container manufacturers in the UK, they believe the most robust estimate for empty glass container exports in 2019 is provided by the figures on NPWD.

Figures for exports of empty glass containers from NPWD Table 2a conversion data are shown in Figure 3.

Figure 3 - UK Empty Exports of Glass Packaging, 2015 - 2019 (k tonnes)

	2015	2016	2017	2018	2019
Exports (empty) - Table 2a Conversion	222	186	203	202	200
% Change from prev. year	23%	-17%	10%	0%	-1%

Figure 3 shows there has been an oscillation between positive and negative annual growth between 2015 and 2019. However, over the whole period, empty glass packaging exports are down 3k tonnes (1.5%) in 2019 from 2017 (203k tonnes). Cross referencing the figures against HMRC beverage exports (detailed in Appendix III), shows a similar trend to the NPWD figures, therefore this report uses the NPWD data giving a figure for UK empty exports of glass packaging of 200k (+/- 9%) in 2019.

British Glass stated that their expectation is that there will be only minimal unregistered tonnage as export of empty glass containers tends to be only done by the large glass packaging producers. This is because it is typically done to meet a particular demand due to it being costly, as it is essentially the export of packaging coupled with a lot of void space.

[15] *https://www.ons.gov.uk/businessindustryandtrade/manufacturingandproductionindustry/adhocs/008127prodcomproductlist2019, Accessed (01/07/2020)*

2.4. Exports (Filled)

Estimates for the export of filled glass packaging are taken from NPWD data Table 2b conversion and are shown in Figure 4.

Figure 4 - UK Filled Exports of Glass Packaging, 2015 - 2019 (k tonnes)[16]

	2015	2016	2017	2018	2019
Exports (Filled) – NPWD Table 2b Conversion	731	729	789	812	832
% Change from prev. year	4%	0%	8%	3%	2%

The Steering Group commented that these figures could exclude glass sourced in the UK that is subsequently exported to countries such as Eire or Gibraltar. Using Valpak member data submissions, it was possible to calculate a figure for this; however, as this only applies to Valpak members, it is considered a minimum figure and is shown in Figure 5.

Figure 5 - UK Filled Exports of Glass Packaging with Uplift, 2015 - 2019 (k tonnes)

	2015	2016	2017	2018	2019
Exports (Filled) NPWD -Table 2b Conversion	731	729	789	812	832
Excluded EIRE/Gibraltar Exports	4	4	4	4	2
Exports (Filled)	735	733	793	816	833*

* 833k tonnes due to rounding

The project Steering Group believed that there will be only minimal unregistered tonnage as exports (filled) will tend to be done by large producers. There is a cross referencing exercise against HMRC exports data (detailed in Appendix IV). This shows that the exports (filled) NPWD trend is generally supported by the HMRC trade data trend for beverage exports[17]. However, it is worth noting that this is only partly indicative as this includes beverages exported regardless of packaging types.

This method shows 833k tonnes (+/- 9%) of filled glass packaging exported in 2019.

[16] *http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, Accessed (10/08/2020). Only conversion data was used as the way the data form is submitted, based on Valpak experience, the numbers for raw material manufacture are the same as conversion and so are not included.*

[17] *www.uktradeinfo.com, Accessed (01/07/2020)*

2.5. Imports (Empty)

NPWD data is used to estimate imports of empty glass packaging. British Glass advised that due to their membership not covering the full import/export supply chain, NPWD data is the preferred source of data on empty imports. The NPWD figures for empty import of glass packaging are shown in Figure 6.

Figure 6 - UK Imports of Empty Glass Packaging, 2015 - 2019 (k tonnes)[18]

	2015	2016	2017	2018	2019
Imports (Empty) – NPWD Table 3a Pack / Fill	125	92	95	101	140
% Change from prev. year	33%	-26%	3%	7%	38%

Figure 6 shows that in 2019 there were 140k tonnes (+/- 9%) of glass packaging imported unfilled. Compared to 2017, this is an increase of 45k tonnes (48%) and highlights that that the import/export of empty glass packaging is often done to meet particular demands and can fluctuate significantly. Empty imports/exports of glass containers are likely to be for the following reasons[19]:

- Multi-national glass manufacturers moving products around to meet demand;
- UK glass manufacturers selling glass containers outside of the UK. There are also imports of glass containers from EU and non-EU countries to brand-owners and packer/fillers; and
- Glass container wholesalers in the UK that acquire glass containers from multiple glass manufacturers from around the EU and non-EU countries.

The project Steering Group believed that there will be only minimal unregistered tonnage as imports (empty) also tend to be done by the large producers. This is because they will typically be done in large quantities to meet a specific demand; it can be expensive as it is essentially transporting glass packaging with a lot of air/void space. The exception to this is that empty glass packaging will be imported by small-scale specialist packaging suppliers, but the tonnage is likely to be minimal.

These figures are cross referenced against HMRC import figures with the details shown in Appendix V.

2.6. Imports (Filled)

2.6.1. Introduction

The quantity of filled imports of glass packaging is more complicated to calculate. The estimate for this is based on the following calculation:

Imports (Filled)	**=**	**Obligated Imports**	**+**	**Unobligated / Unregistered Imports**	**+**	**Cross Border Shopping**

2.6.2. Obligated Imports

As shown in the formula above, total filled imports comprise the obligated imports (those covered by the packaging regulations), unobligated/unregistered imports and cross border shopping.

[18] http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, *Accessed (10/08/2020)*
[19] *British Glass correspondence, 02/10/2020*

Obligated (filled) imports are identified from information provided from NPWD: Table 3a: packaging imported into the UK for selling and shown in Figure 7.

Figure 7 - UK Obligated Imports of Filled Glass Packaging, 2015 - 2019 (k tonnes)

	2015	2016	2017	2018	2019
Imports (Filled) - NPWD Table 3a: Imported for Selling	990	979	1,039	987	995
% Change from prev. year	4%	-1%	6%	-5%	1%

Figure 7 shows that obligated filled imports of glass packaging based on the NPWD data is 995k tonnes (+/- 9%) in 2019, a decrease of 4% since 2017.

A cross reference against HMRC and NPWD (plastic, steel and aluminium) is included in Appendix VI. This shows that although the HMRC data increased from 2017 to 2019 and follows an overall upward trend, it does not follow the same trend as NPWD data. The NPWD data shows a small decrease for glass, plastic and steel and aluminium from 2017 to 2019, with aluminium having the largest decrease at 10% followed by plastics and steel at 9% and glass at 5%.

2.6.3. Unobligated/ Unregistered Imports

The unobligated importers are those that import filled glass packaging but fall below the packaging regulations threshold for turnover and packaging tonnage handled and are known as *de-minimis*. It is assumed that the majority of those that fall below the packaging regulations threshold are less likely to import filled glass packaging as they are not large enough to benefit from the economies of scale offered. However, the import of some specialist products supplied to local specialist shops for example will still occur. This could also include local wine clubs that import from specific vineyards etc. There are also those that are obligated under the regulations but that are not registered: free-riders. This will include those that do not register either through lack of knowledge of the regulations (where there is confusion around who the importer is, for example) and those that deliberately avoid the regulations.

Valpak made an estimate based on the estimated number of free-riders and their typical tonnages plus the number of *de-minimis* and their typical tonnage. This figure was estimated at 50k tonnes in 2012 and is thought to have remained at this level since then (based on internal Valpak knowledge regarding new registrations and the market not changing significantly over this period); therefore, 50k tonnes (+/- 27%) has been used from 2013 to 2019[20]. This estimate for unobligated/unregistered imports (filled) was sense checked by British Glass, which agreed this figure was in line with their estimate.

2.6.4. Cross Border Shopping

The passenger numbers were taken from a variety of sources: air[21], sea[22], Eurostar[23] and Le Shuttle[24]. As this is by full journeys (return trips), the passenger numbers were halved to determine all inbound journeys. The number of passengers buying alcohol was based on figures from Keynote[25] and it is assumed one glass bottle of alcohol purchased per buying passenger, with an average weight of 0.37kg. This is applied to the proportion of these alcoholic purchases that are packaged in glass, using the retail sales figures from the Valpak Data

[20] *This is based on internal Valpak research. Due to the nature of this estimate i.e. it is unobligated/unregistered tonnage and is not recorded it is difficult to provide a greater level of confidence, and as such, has been given a large error margin.*
[21] *https://www.caa.co.uk/uploadedFiles/CAA/Content/Standard_Content/Data_and_analysis/Datasets/Airport_stats/Airport_data_2019_annual/Table_09_Terminal_and_Transit_Passengers.pdf*
[22] *Source: https://www.gov.uk/government/statistical-data-sets/sea-passenger-statistics-spas#all-uk-international-short-sea-long-sea-and-cruise-passengers, Accessed (05/05/2020)*
[23] *https://mediacentre.eurostar.com/mc_view?language=&article_Id=ka33z0000008h0qAAA, Accessed (05/05/2020)*
[24] *https://www.getlinkgroup.com/uploadedFiles/assets-uk/Shareholders-Investors/Publication/Annual-Review, Accessed (05/05/2020)*
[25] *KeyNote: Cross Border Shopping (2000)*

Solutions (VDS) database. The estimates depend on the assumptions set out above; therefore, there is some uncertainty around the quantities. However, they represent a relatively small proportion of the overall total compared with the more robust estimates of production, exports, etc. Figure 8 summarises the estimate for cross border shopping.

Figure 8 - Cross Border Shopping, 2019

	Air	Sea	Rail - Eurostar	Rail - Le Shuttle	Total
Total Passengers (k)	296,924	21,846	11,100	10,551	340,421
Inbound Passengers (k)	148,462	10,923	5,550	5,276	170,210
Passenger Purchase Ratio	2%	40%	1%	54%	N/A
Passengers Purchasing Duty Free (k)	2,969	4,369	56	2,849	10,243
Proportion Glass Purchases	82%	82%	82%	82%	82%
Av Bottle Weight (kg)	0.37	0.37	0.37	0.37	N/A
Total Imported (k tonnes)	1	1	0	1	3

This shows that there were 3k tonnes (+/- 24%) of glass packaging POM from cross border shopping in 2019.

2.6.5. Total Imports (Filled)

Figure 9 shows the total imports filled for glass packaging entering the UK.

Figure 9 - Total Imports of Filled Glass Packaging, 2019 (k tonnes)

	Obligated Imports	Unobligated / Unregistered Imports	Cross Border Shopping	Total
Imports (Filled)	995	50	3	1,049

This shows that there were 1,049k tonnes (+/- 8%) of imports (filled) of glass packaging in 2019.

2.7.Summary of Glass Packaging POM

Figure 10 shows the total glass packaging POM in 2019.

Figure 10 - Total Glass Packaging POM, 2019 (k tonnes)

Category	Sub-Category	2019
UK Glass Packaging POM	***Glass Packaging***	**2,574**
Production	*UK Production*	2,419
	Total	**2,419**
Exports	*Empty*	200
Exports	*Filled*	833
	Total	**1,033**
Imports	*Empty*	140
	Filled - Obligated	995
	Filled - Unregistered	50
	Filled - Cross border selling	3
	Total	**1,188**

This report estimates a total of 2,574k tonnes (+/- 6%) of glass packaging POM in 2019. This represents an increase in POM of 86k tonnes (3%) since 2017, however given the margin of error this represents little change. The following sections of the report provide further detail by breaking the POM down by sector, colour and format.

2.8. Consumer POM

It is important for policy makers to understand where the glass is placed on the market; therefore, this section breaks down the total glass packing POM in the UK into consumer (packaging consumed in the household) and non-consumer (packaging consumed in the commercial/industrial sector (away from home or on the go in hotels, bars, restaurants and businesses)) sectors.

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

2.8.1 Consumer Type Glass Packaging

It is considered of interest to provide a POM estimate for glass packaging which could be defined as 'consumer-type'. A review of all categories of glass packaging used within the EPIC database for non-consumer glass packaging was conducted by Valpak and British Glass in 2019 to determine the split between 'household-like' and 'non-household like'.

This concluded that all categories of glass packaging used could potentially be considered 'consumer-type', and although there may be the odd item that would be considered a novelty/specialist item of packaging, in terms of overall weight, this would be negligible. Due to the short timeframe between the review and this work it is believed this will be unchanged.

Therefore, the total POM estimate of 2,574k tonnes (+/- 6%) is considered 'consumer-type'.

2.8.2 Grocery Retail

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 glass packaging quantities reported in 'Table 1 Selling' from NPWD for 84% of UK grocery retailers[26]. This data was scaled up to 100% of the UK grocery market and resulted in an estimated glass POM for 2019 of 1,561k tonnes (+/- 6%).

This estimate was cross referenced with Valpak's Environmental Product Information Centre (EPIC)[27], which was assessed to provide data on annual sales and packaging weights for all relevant products packaged in glass. 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 for these supermarkets (representing 43% of the grocery retail market by sales volume for 2019), the resulting quantity of glass packaging was scaled up to represent an estimate for the UK grocery retail market. This method assumes that the glass packaging profile of the supermarkets in EPIC is representative of those not represented in EPIC. Based on this analysis, glass packaging in the grocery retail sector was estimated to be 1,525k tonnes in 2019 which is 35k[28] tonnes (2%) lower than the estimate produced using the EA data.As with previous years this shows that EPIC and EA data is closely aligned.

In previous years EPIC data was used to estimate consumer POM due to it allowing for a greater level of interrogation of the data. However, based on the EA having higher market coverage and coupled with the increasing market share of discount retailers such as Aldi and Lidl in the grocery sector (which are not included in the EPIC database), the EA data was used to estimate consumer POM. The EPIC database was then used to further interrogate the breakdown of the consumer POM estimate product trends, colour and format.

The final grocery retail glass packaging POM for 2019 of 1,561k tonnes (+/- 6%) was used. This is 3% higher than that identified for 2017[29]. Appendix I provides a detailed assessment of relative levels of confidence in the data.

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[26] *The figure does not include non-obligated or unregistered producers.*
[27] *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).*
[28] *Due to rounding*
[29] *https://www.valpak.co.uk/information-zone/reports/glassflow-2012*

2.8.3 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 (compared to non-grocery spend) of total UK retail spend was 43% in 2019[30].

However, simply scaling up using market share was not considered robust, since it was likely that packaging usage within both sub-sectors differ. Therefore, the difference in glass packaging used by the grocery sector and other retail sectors was analysed using Valpak membership's reported data[31]. Analysis involved the following key stages:

- Identification of grocery and non-grocery retail members;
- Gathering of company reported data and information; and
- Calculation of glass packaging tonnage per billion-pound turnover for grocery and non-grocery retailers (using Valpak data).

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. Based on this method, total non-grocery glass POM is estimated at 109k tonnes (+/- 18%).

Adding the grocery and non-grocery estimates provides a consumer POM estimate of 1,670k tonnes (+/- 6%).

However, this is based on obligated producer packaging data and does not include the unobligated/unregistered tonnage. Discussions with the project Steering Group highlighted that they believe the unobligated/unregistered tonnage will most likely relate to small organisations in the consumer sector that are below or unaware of the producer responsibility threshold. Therefore, if the unobligated/unregistered tonnage of 231k (calculated by taking the obligated POM estimate away from the total POM) is added to the consumer grocery and non-grocery estimates, it provides a total for consumer packaging of 1,901k tonnes (+/- 5%). This estimate represents an increase of 4% in consumer POM since 2017.

2.9. Non-Consumer POM

The non-consumer glass packaging estimate can be derived from taking the consumer estimate from the total glass POM as shown in Figure 11.

Figure 11 - Non-consumer Glass Packaging, 2019 (k tonnes)

Non-consumer Packaging	=	Total POM	-	Consumer packaging
673	=	2,574	-	1,901

This shows that non-consumer packaging accounts for 673k tonnes (+/- 15%), which is an increase of 3% since 2017. It also shows that consumer POM accounts for 74% and non-consumer accounts for 26% of the glass packaging POM. This is unchanged from the split estimated in 2017.

[30] https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/poundsdatatotalretailsales
[31] *Valpak membership represents approximately 50% 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.*

2.10. Glass Packaging POM Formats

2.10.1 POM Composition by Colour

The following consumer colour splits provided by British Glass were used in the GlassFlow 2012 report:

- Clear (45%);
- Amber (10%); and
- Green (45%).

The non-consumer splits provided by WRAP[32] for the GlassFlow 2012 report and were sense checked by British Glass to determine if they were still valid. They were:

- Clear (57%);
- Amber (15%); and
- Green (28%).

Both consumer and non-consumer splits were sense-checked in 2019 by British Glass, which believes they still look sensible. In the UK clear glass packaging has traditionally made up a high proportion of glass manufacturing due to demand for products such as whisky. However due to the imports of products such as wine there is a higher proportion of green and amber glass within glass packaging collected for recycling. Using the splits above, Figure 12 shows the quantity of glass packaging POM by colour.

Figure 12 - Glass Packaging POM by Colour, 2019 (k tonnes)

	Quantity
Total Consumption	2,574
Total Consumer Consumption	1,901
Clear	855
Amber	190
Green	855
Total Non-consumer Consumption	673
Clear	383
Amber	101
Green	188

[32] *WRAP, Glass Crushers in hospitality – optimising for re-melt uses (2008): http://www.wrap.org.uk/sites/files/wrap/Glass%20crushers%20in%20hospitality%20optimising%20for%20remelt%20uses.pdf*

2.10.2 POM Composition by Format

By using the EPIC database, the breakdown in format of glass POM can be identified for consumer and non-consumer glass, then using these splits and applying them to the POM estimates for consumer and non-consumer POM, the quantity of glass by format can be derived as shown in Figure 13. This was sense-checked by British Glass in 2019, which agreed the splits were in line with their estimates.

Figure 13 - Glass Packaging POM by Format, 2019 (k tonnes)

	Quantity
Total Consumption	2,574
Total Consumer Consumption	1,901
Bottles	*1,535*
Jars	*366*
Other	*0*
Total Non-consumer Consumption	673
Bottles	*639*
Jars	*23*
Other	*10*

This shows that bottles are the most used format of glass packaging POM in both the consumer and non-consumer sectors, accounting for 81% and 95% respectively. By further interrogating the EPIC database, the percentage of bottles that are beverage bottles can be identified and by applying this to the estimate for bottles POM, it is estimated that 1,440k tonnes of consumer bottles and 631k tonnes of non-consumer bottles are beverage containers.

2.11. Glass POM Cross-check (Net Pack Fill)

This section of the report is used as a cross-check of the total glass POM in the UK in 2019, based on the data stored on NPWD as reported to the EA by obligated organisations.

The 2019, UK flow of glass packaging was calculated using the packaging weights reported to the EA by registered producers, which is 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

This methodology took the weight reported at the *packing* stage of the supply chain as opposed to the *selling* stage of the supply chain. This was used as the Steering Group believe[33] that there would typically be fewer unobligated packers in comparison to unobligated sellers, due to the likely size of packers being larger than sellers. 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 obligated tonnage is likely to decline as we move further down the supply chain.

Using this method, the total obligated glass POM in 2019 is 2,342k tonnes (as shown in Figure 14[34]).

Figure 14 - Obligated Glass Packaging (Net Pack Fill), 2019[35] (k tonnes)

	Glass Packaging
Table 1 Pack/Fill (UK pack/filling)	**2,243**
Imports:	
3A Selling (filled imports)	995
3B (packaging removed from imports)	1
Total Imports	**996**
Exports:	
2A P/F (direct exports)	775
2B P/F (third party exports)	123
Total Exports	**897**
Net Pack Fill	**2,342**

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

- Non-obligated producers – those below the registration thresholds of 50 tonnes of packaging 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, except through iteration.

An estimate of the unobligated/unregistered quantity has been made by subtracting the net pack fill figure of 2,342k tonnes from the project's final flow estimate of 2,574k tonnes. This leaves 231k tonnes, or an unobligated proportion of 9%.

[33] *No evidence data is available to support this.*
[34] *As reported by businesses in 2020.*
[35] *http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, Accessed (10/08/2020).*

3. Collection and Reprocessing

3.1. Accredited Recycling of Glass Packaging (Recorded)

The NPWD was used to identify the total accredited (recorded) recycling of glass packaging, both in the UK and of exports for recycling overseas. For 2019, this shows 1,753k tonnes of glass packaging were recycled, of which 1,480k tonnes (84%) took place in the UK.

Of the total (UK and exports), 1,293k tonnes (74%) relates to recycling for remelt applications (i.e. recycled into glass containers) and 460k tonnes (26%) to recycling for other (typically aggregate) applications. Most exports were for recycling in remelt applications, with fewer than 1k tonnes (0.06%) of exports for other applications.

Based on the overall POM calculated in this report, the total recorded recycling figure of 1,753k tonnes gives a recorded recycling level of 68% in 2019.

PRNs and PERNs can be issued at various points of the supply chain depending on whether the glass is recycled in remelt or non-remelt applications, which was revised following the adoption of the EU End of Waste Regulation for Glass Cullet[36]. Appendix VII provides a diagram showing where in the supply chain PRNs and PERNs can be issued.

3.2. Recycling of Glass Packaging (Unrecorded)

It is important to recognise that not all the recycling of glass packaging might be accredited and recorded on NPWD. To try and identify the scale of unrecorded recycling, discussions were held with the project Steering Group as well as UK recyclers and exporters handling recovered glass packaging.

For glass recycled into remelt applications, whether this occurs in the UK or overseas, the view of those consulted was that all of it is being captured on NPWD. The rationale for this conclusion is that glass recycling operations that prepare cullet for the remelt sector are large scale operations that are known to be accredited. For exports, the economic feasibility relies on the revenue generated from the PERNs and so shipments outside of the UK are unlikely to occur through unaccredited exporters. Therefore, the capture on NPWD of recycling for remelt was assumed to be 100%.

For recycling of glass packaging for use in non-remelt applications, it was believed that there is some loss in 2019 (and previous years), related to MRF glass fines used in aggregate applications. The payment of gate fees for glass fines and the potential to use relatively simple processing equipment to produce an aggregate (compared to that required to produce a furnace ready cullet) meant that some non-accredited recycling would likely happen. Following discussions with the GlassFlow 2025 Steering Group and other representatives from industry, it was assumed that 90% of the ‘other’ recycling (non-remelt) was captured on NPWD in 2017 and there is no reason to believe the situation has changed since then. Therefore the 10% that was not captured on MPWD equates to 51k tonnes.

During the production of glass cullet for remelt applications, ceramics, stones and porcelain (CSP) must be removed. This is done using optical sorting equipment that removes this contamination with jets of air. This ejected fraction typically contains high percentages of glass packaging that are removed along with the CSP. As this material is often used in aggregate applications, it is typically captured on NPWD. However, whilst those contacted previously believed that most companies recycling this fraction were accredited, discussions identified that this is not always the case. An unrecorded recycling figure of 20k tonnes (same as GlassFlow 2025) has been used to account for the recycling of this fraction where PRNs were not issued. However, it should be noted that research undertaken for this project indicates this will reduce in the coming years.

In total, it is estimated that there were 71k tonnes of unrecorded glass packaging recycled in 2019 (51k tonnes from ‘other’ recycling not captured on NPWD and 20k tonnes of glass recycled with CSP but not recorded).

[36] https://npwd.environment-agency.gov.uk/filedownload.ashx?fileid=edee7dc6-4249-4187-834e-88fb6a8b5bdd

3.3. Total Recycling (Recorded and Unrecorded)

The total glass packaging recycling can be calculated by combining the recorded recycling on NPWD with the estimate for unrecorded recycling:

Total UK Glass Packaging Recycled	=	Total Recorded Recycling	+	Total Unrecorded Recycling

This gives a total recycling figure for glass packaging of 1,824k tonnes. Based on the POM calculated in this report, this would be a recycling rate of 71%.

3.4. Consumer and Non-consumer Recycling

3.4.1. Consumer Recycling

Consumer recycling data was extracted from Waste Data Flow (WDF) and figures are reported based on the financial year 2018/19 (excluding Scotland where the data relates to 2018). 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[37]. A summary of the glass packaging collections is shown in Figure 15.

Figure 15 - Glass Packaging Collection WDF Data, 2019 (k tonnes)

	Kerbside	Bring	HWRC	Total
Glass Packaging Collected	1,291	157	33	1,480

Adjustments were made to more accurately reflect the actual consumer glass recycling from the collection data reported in WDF by taking into consideration contamination.

Glass PRNs are issued at the point the cullet is produced and so will exclude any contamination, including caps, closures and corks, etc. Exports also need to account for contamination prior to reporting on NPWD. Estimates were made related to contamination in the WDF figures, so they better align with NPWD figures. It was assumed that local authorities (LAs) would report any glass that was separately collected from other materials based on vehicle delivery weights. WDF shows this to be 37% of the glass in 2019, either separately collected at the kerbside or in bring banks, including those at HWRCs. Where the glass is collected separately, a 3% loss is assumed for contamination (primarily caps and closures). Around 7-8% of the glass is ejected during the cullet making process whilst removing CSP (see above); however, this has not been deducted as it is assumed to be recycled (recorded or unrecorded).

The remaining 63% of the glass is collected comingled with other materials. Here, the material will also contain caps and closures, but it is assumed that higher levels of other contamination will be present than for glass collected source separated. Glass is harder to sample at single stream MRFs than other materials due to the presence of small broken fragments that will fall through the sieve used to separate large items and fines during the sampling process. It is contamination in this fines fraction that may impact on contamination levels reported on WDF. If MRFs choose to allocate glass to suppliers based on outputs, then again, contamination will be contained within it at higher levels than source separated glass. For the calculation, it is assumed that glass collected with other materials will be reported with 10% contamination levels.

Based on the above assumptions, it is estimated that the total glass collected as reported on WDF should be reduced by 109k tonnes to account for the presence of contamination (that would not be included in the NPWD

[37] *The figure is approximate, as data is reported in different ways. Most is for the period April 2018 to March 2019; however, the SEPA data reviewed was for 2018. Also, some data was for household waste (used where available) and other data for municipal solid waste.*

figures). By making this reduction it means that 1,371k tonnes of consumer glass packaging was recycled in 2019. Based on the POM calculated in this report, this would give a consumer glass packaging recycling rate of 72%.

It should be noted that whilst no adjustment was made in consumer glass recycling for non-consumer glass in using WDF figures, that it may be present. Non-consumer glass might arrive in the flow from several sources:

- Local authority collections of glass from licensed premises and offices;
- Licensed premises placing glass in bottle banks or domestic kerbside bins;
- Businesses and offices collecting glass and placing it in bottle banks or domestic kerbside bins; and
- Individuals purchasing drinks in glass bottles from small commercial outlets such as takeaways and sandwich shops that they then recycle at home.

3.4.2. Non-consumer Recycling

Non-consumer recycling was estimated as follows:

Non-consumer Recycling	=	Total Recycling	-	Consumer Recycling
453k tonnes	=	1,824k tonnes	-	1,371k tonnes

This gives a non-consumer recycling estimate for glass packaging of 453k tonnes in 2019. Based on this report's estimated non-consumer glass packaging POM, this gives a recycling rate of 67%.

3.5. Glass Packaging Not Recycled

By taking the consumer and non-consumer recycling totals from the respective POMs (see Figure 11) we are left with the non-recycled tonnages.

For consumer glass packaging, the non-recycled total is 530k tonnes. An analysis of data on WDF combined with data from the Scottish Environment Protection Agency (SEPA), StatsWales and the Department of Agriculture, Environment and Rural Affairs (DAERA) was used to estimate the percentage of residual household waste that was sent to Energy from Waste (EfW) and landfill.

This showed that in 2019 approximately 74% of consumer waste was disposed using EfW and 26% to landfill. The 74% to EfW includes refuse derived fuel (RDF) that is exported to EfW plants in mainland Europe. Using these percentages, it is estimated that of the total consumer glass packaging not recycled, 392k tonnes was sent for energy recovery and 138k tonnes to landfill.

For non-consumer glass packaging, the non-recycled total is 220k tonnes. Here, a figure for glass sent for EfW was derived by estimating the average glass packaging content in both commercial and industrial (C&I) waste sent for energy recovery in the UK and in the RDF exported to overseas energy recovery plants. There is limited data available on C&I waste composition and it will also vary depending on the source of the C&I waste. An assumption was therefore made that the glass content of C&I waste entering EfW and RDF plants would be similar to that in MSW waste. A figure of 3% was used, based on DEFRA data from 2011[38]. All glass was assumed to be packaging. For RDF, it was assumed that 50% of the glass content would be removed during processing into the fines fraction and either be landfilled or used in landfill construction applications. A figure of 1.5% was therefore used for glass in RDF delivered to overseas EfW plants. A figure of 2.34M tonnes of C&I waste being sent to UK EfW plants was used. This was based on research by Tolvic[39] on the total quantity of

[38] *DEFRA: Digest of Waste and Resources Statistics, 2018 edition. Composition of MSW sent to landfill in 2011 for England and Wales. For MSW falling under 20.03.01 (3% glass).*
[39] *Tolvic Consulting UK Energy from Waste Statistics 2019*

waste delivered to UK EfW plants in 2019 (12.6M tonnes) and the percentage of this that was C&I waste (18.5%).

For RDF exported, a figure of 2.8M tonnes[40] of UK RDF exports in 2019 was used with the assumption made that 50% of this was produced from C&I waste. Finally, it was assumed that any non-recycled, non-consumer glass packaging remaining was sent for landfill. Using these assumptions, it was estimated that of the total non-recycled, non-consumer glass packaging, 91k tonnes (41%) was sent for energy recovery and 129k tonnes to landfill (59%).

[40] This is based on data relating to England RDF exports for 2017, 2018 and 2019 and then applying the trend as a proxy for the 2017 UK estimate as there is no published 2019 figure. Another method was used to collate figures for all UK nations to make up a total UK figure, however Scotland does not publish RDF export figures, therefore this method was not possible.

4. Glass Packaging End Markets

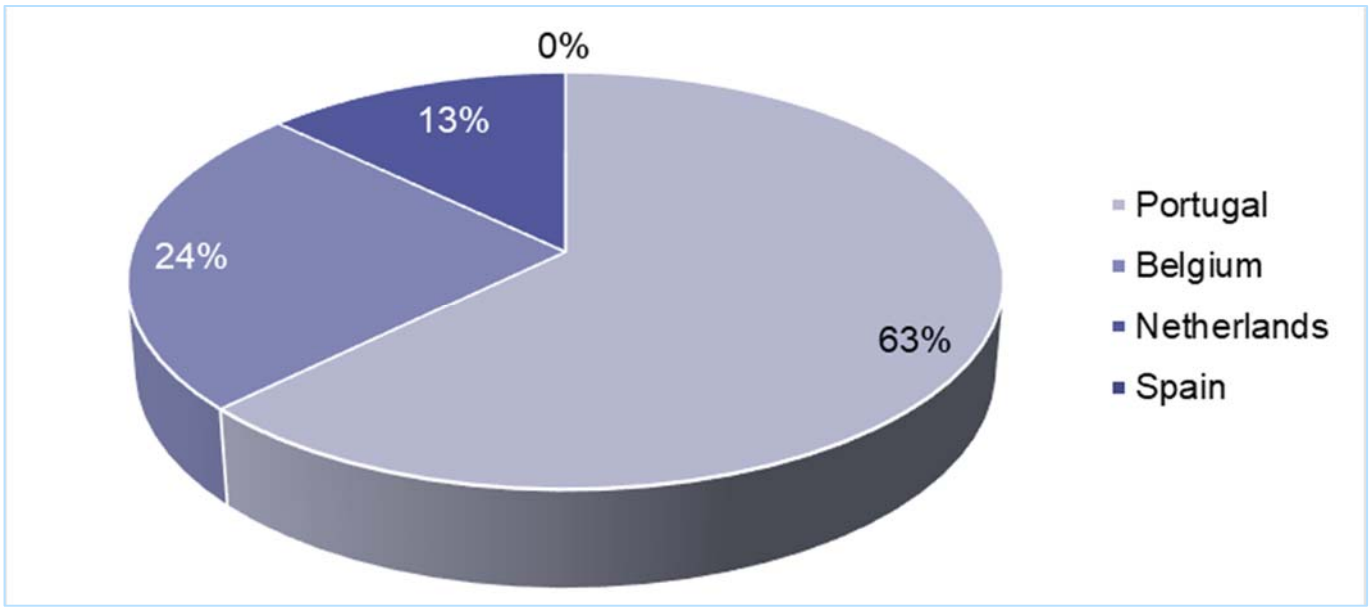
Based on NPWD figures for 2019, 84% of the recorded glass packaging recycling took place in the UK and 16% overseas. Of the glass packaging recycled in the UK, 1,022k tonnes (69%) went into remelt applications and 459k tonnes (31%) into 'other' applications.

Of the remelt fraction, input from industry suggests 10-15% is used to produce glass mineral wool and the remainder is used by the container industry. The 'other' category on NPWD is used for non-remelt applications, typically the use of glass in some form of aggregate substitute application. This includes glass used in road construction, concrete products, as a shot blasting abrasive or filtration media.

A freedom of information request was made to the EA to determine where glass packaging was exported to for recycling. It can be seen from the breakdown given below that it is all exported to other EU countries. Exports tend to be focused on either wine making regions, such as Portugal, or countries in North West Europe where logistics costs are relatively low. As mentioned earlier, nearly all the exports in 2019 were destined for remelt applications with the container sector believed to take the majority.

Figure 16 - Glass Packaging Export Destinations, 2019[41] (k tonnes)

Country	Export	% of exports
Portugal	170	63%
Belgium	66	24%
Netherlands	35	13%
Spain	<1	0%



[41] *Data source: UK Environment Agency. Freedom of Information request. Data Manipulation: Verde Research and Consulting Ltd. Contains public sector information licensed under the Open Government License v3.0. http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/*

5. Conclusions

5.1. Conclusions: POM

There were 2,574k tonnes (+/- 6%) of glass packaging POM in 2019: an increase of 3% from the previous estimate in 2017.

This has been derived using a methodology consisting of identifying UK production and adding imports and removing exports. Data was used from a variety of sources for each sector with the results combined. It has been cross-checked with reported obligated data on NPWD and with the project's Steering Group.

The estimate of glass packaging POM in the consumer sector is 1,901k tonnes (+/- 5%) in 2019.

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 available and is accepted by industry.

The estimate for glass packaging POM in the non-consumer sector is 673k tonnes (+/- 15%) in 2019.

This data was derived by taking the consumer sector tonnage away from the total POM estimate. Sense checks were made by the project Steering Group including Scotch Whisky Association and UKHospitality.

Non-obligated or unregistered flow for glass packaging accounted for 9% of POM in 2019 – this represents a slight increase of 1% from that reported in GlassFlow 2025.

The estimate of the unobligated tonnage (232k tonnes, 9%) has been made by subtracting the net pack fill figure of 2,342k tonnes from the project's final flow estimate of 2,574k tonnes. The unobligated proportion of 9% is a slight increase from the 8% identified in the GlassFlow 2025 report.

The estimates of glass packaging POM by type are: 2,174k tonnes (84%) bottles, 390k tonnes (15%) jars, 10k tonnes (0.4%) other glass packaging.

Primarily using information derived from Valpak's EPIC database and sense-checked by British Glass, the final project estimate by format has been made. This indicates that bottles make up most of the glass packaging.

5.2. Recycling

The total quantity of UK glass packaging recycled is estimated to be 1,824k tonnes in 2019.

This includes reported (NPWD) and an estimate for unreported recycling (71k tonnes). Based on the POM calculated as part of this project, this gives an overall recycling rate of 71%. Of this, 1,753k tonnes was reported on NPWD, representing a recycling rate of 68%.

The total quantity of consumer UK glass packaging recycled is estimated to be 1,371k tonnes in 2019.

Based on WDF and the consumer POM calculated as part of this project, this gives a consumer recycling rate of 72%.

The total quantity of non-consumer UK glass packaging recycled is estimated to be 453k tonnes in 2019.

This is calculated by removing the consumer recycling tonnage from the total tonnage recycled figure. Based on the non-consumer POM calculated as part of this project, this gives a non-consumer recycling rate of 67%.

Of the total 750k tonnes of glass packaging not recycled, 483k tonnes (64%) was sent to energy recovery and 266k tonnes (26%) was sent to landfill.

This was based on an estimated total of 530k tonnes of consumer and 220k tonnes of non-consumer glass packaging not being recycled, which was derived using WDF and published statistics on UK disposal routes.

5.3. End Markets

In 2019 84% of glass collected was recycled in the UK

In 2019, 84% of the recorded glass packaging recycling took place in the UK with the remaining 16% occurring overseas.

Glass is primarily recycled in remelt end markets in the UK

Of the glass packaging recycled in the UK, 69% went into remelt applications and 31% into 'other' applications.

Of the remelt fraction, industry suggests 10-15% is used to produce glass mineral wool and the remainder is used by the container industry. For non-remelt applications, typically glass is used as an aggregate substitute, which includes glass used in road construction, concrete products, as a shot blasting abrasive or filtration media.

The EU is the main export market for glass packaging exported from the UK

Nearly all glass packaging exports in 2019 were destined for remelt applications with the container sector believed to take the majority. The key export destinations were Portugal (63%), Belgium (24%), Netherlands (13%) and Spain (<1%).

5.4. Recommendations for Further Work

Future updates of this work should revise the estimate of unaccredited glass recycling

Future updates of this work should revise the estimate of unaccredited glass recycling for the glass recycled in the Ceramic, Stone and Porcelain (CSP) output material from glass recycling facilities. Research conducted during this project indicated that going forward this will be increasingly be recycled in accredited facilities and therefore will be captured in the published accredited recycling data.

Appendix I

Data Robustness Assessment

A robustness analysis was completed on the key data sources used. This was developed to highlight the level of uncertainty for each data source by scoring them 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 17 (POM), Figure 18 (Recycling) and a summary in Figure 19 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 it is answered 'No' then a score of 0 is given.

Figure 17 - Data Robustness Assessment Results – POM

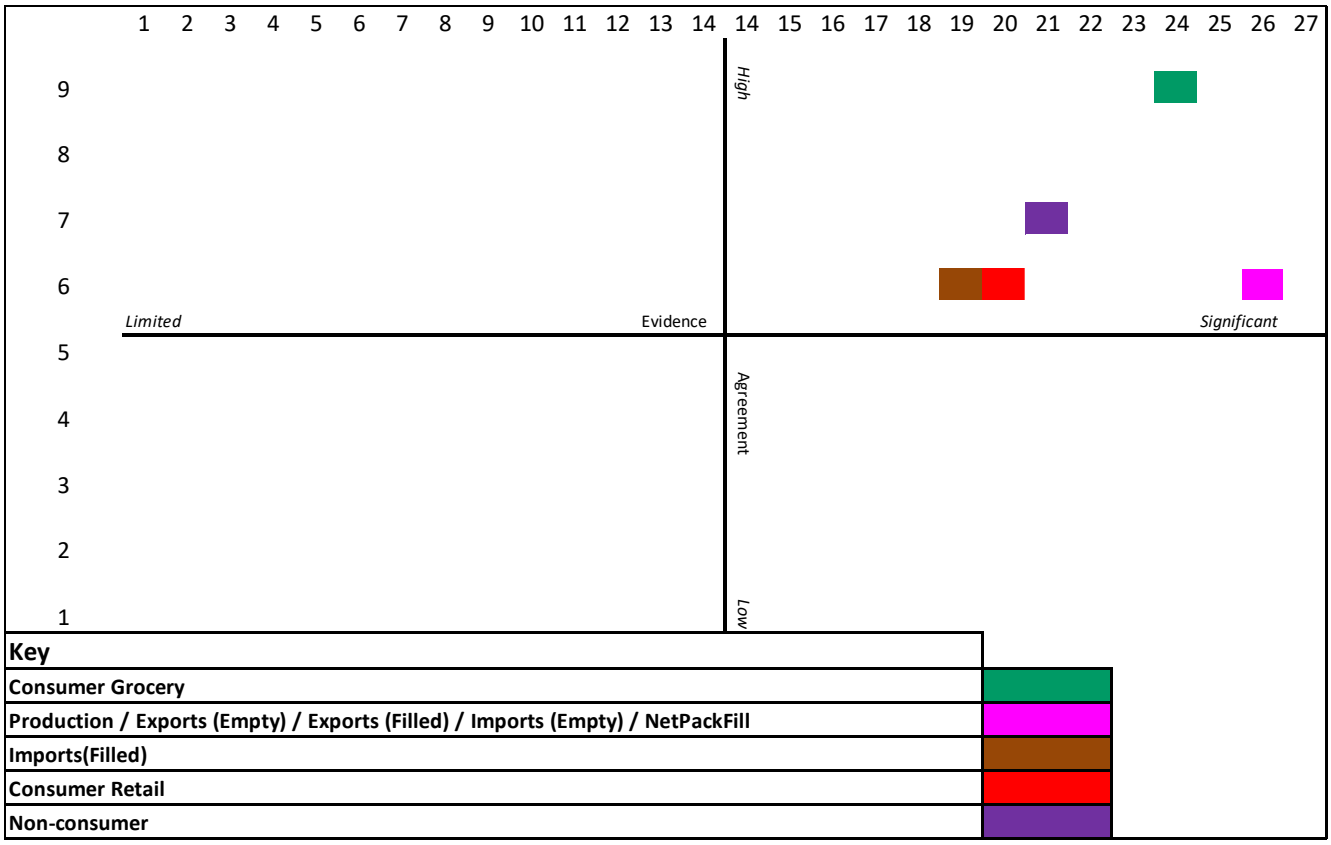


Figure 18 - Data Robustness Assessment Results – Recycling

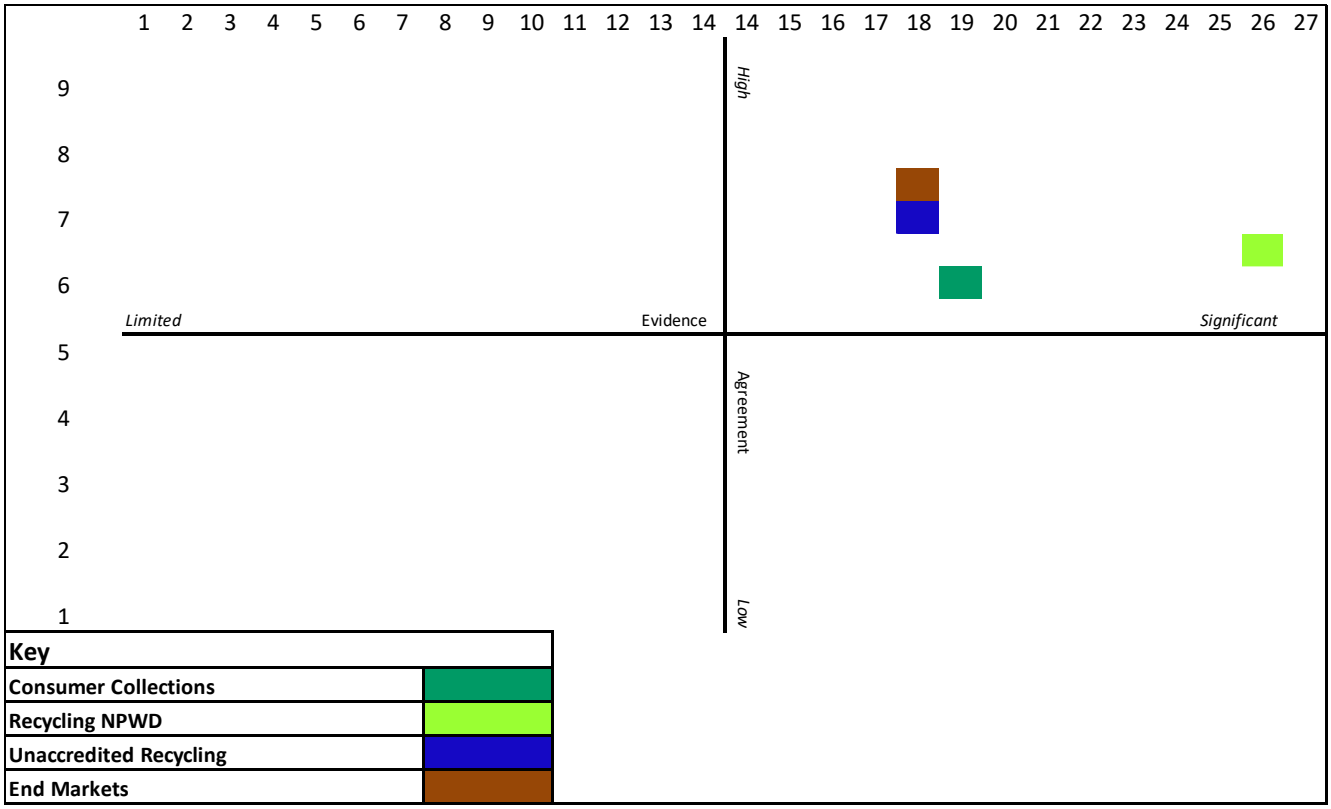


Figure 19 - Data Robustness Assessment Results – Summary

		Robustness Scores		Error Margin
	Data & Source	**Evidence (Robustness and completeness, max 27):**	**Degree of agreement around the findings (max 9):**	**Error Margin (+/-)**
1	NPWD Producer Data	26	6	9%
2	Valpak & British Glass - Imports (Filled) Unregistered	14	6	27%
3	Various Transport Data - Imports (Filled) Cross Border Selling	16	6	24%
4	Environment Agency Grocery Retailer Packaging Handled	24	9	6%
5	Valpak Turnover & Packaging Handled Data	20	6	18%
6	Valpak EPIC Data	22	6	15%
7	NPWD Recycling Data	26	6	9%
8	Verde Research and Consulting Ltd Survey of Recyclers and Exporters	18	7	21%
9	WDF	19	6	21%
10	Bricks & Mortar Retail	16	6	24%
11	Impact of Recession Analysis	15	6	27%

Figure 20 - British Glass Production Data

Data
British Glass production data from UK glass manufacturers (members of British Glass)
Source
British Glass
Data Used In:
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?	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	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		**24**

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

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 21 - NPWD Producer Data 2019

Data
NPWD Producer Data 2019
Source
NPWD
Data Used In:
Import, Export and POM Sense-check

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**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 22 - Valpak and British Glass - Imports (Filled) Unregistered

Data
Valpak & British Glass estimates based in internal analysis
Source
Valpak & British Glass
Data Used In:
Imports (Filled) Unregistered

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 with some reservations	2
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	No	0
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	More yes than no, but equivocal	1
Have the methodology/calculations been independently checked (internally or externally)?	Yes with some reservations	2
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes with some reservations	2
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	More yes than no, but equivocal	1
Total		**14**

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 with some reservations	2
Total		**6**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 23 - Various Transport Data - Imports (Filled) Cross Border Selling

Data
Transport Data
Source
Various incl. Civil Aviation Authority, GOV Maritime Shipping Statistics and Eurostar
Data Used In:
Imports (Filled) Cross Border Shopping

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 with some reservations	2
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Yes with some reservations	2
Have the findings been independently peer-reviewed?	More yes than no, but equivocal	1
Is the methodology/calculation reasonably free from concerns?	More yes than no, but equivocal	1
Have the methodology/calculations been independently checked (internally or externally)?	Yes with some reservations	2
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes with some reservations	2
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	More yes than no, but equivocal	1
Total		**16**

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 with some reservations	2
Total		**6**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 24 - Environment Agency – Grocery Retailer Packaging Handled

Data
Environment Agency Grocery Retailer Packaging Handled
Source
Environment Agency Data
Data Used In:
Consumer 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 with some reservations	2
Is the methodology/calculation reasonably free from concerns?	Yes with some reservations	2
Have the methodology/calculations been independently checked (internally or externally)?	Yes	3
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Yes	3
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Yes	3
Total		**24**

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

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 25 - Turnover and Packaging Handled Data

Data
Valpak Turnover & Packaging Handled Data
Source
Valpak
Data Used In:
Consumer 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?	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**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 26 - Valpak – Hospitality EPIC Data

Data
Valpak Hospitality EPIC Data
Source
Valpak
Data Used In:
Non-consumer 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?	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**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 27 - NPWD – Recycling Data 2019

Data
NPWD Recycling Data 2019
Source
NPWD
Data Used In:
Recycling and 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**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 28 - Verde Research and Consulting Ltd – Survey of Recyclers and Exporters 2020

Data
Survey of Recyclers and Exporters 2020
Source
Verde Research and Consulting Ltd
Data Used In:
Recycling and End Markets

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**

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Figure 29 - WDF 2018/19

Data
WDF Local Authority Collection Data
Source
WDF 2016/17
Data Used In:
Consumer Recycling

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

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

Scoring	Score
Yes	3
Yes with some reservations	2
More yes than no, but equivocal	1
No	0

Appendix II

Production Data Cross Reference

The production data was cross referenced with data from PRODCOM[42] (Eurostat statistics on the production of manufactured goods).

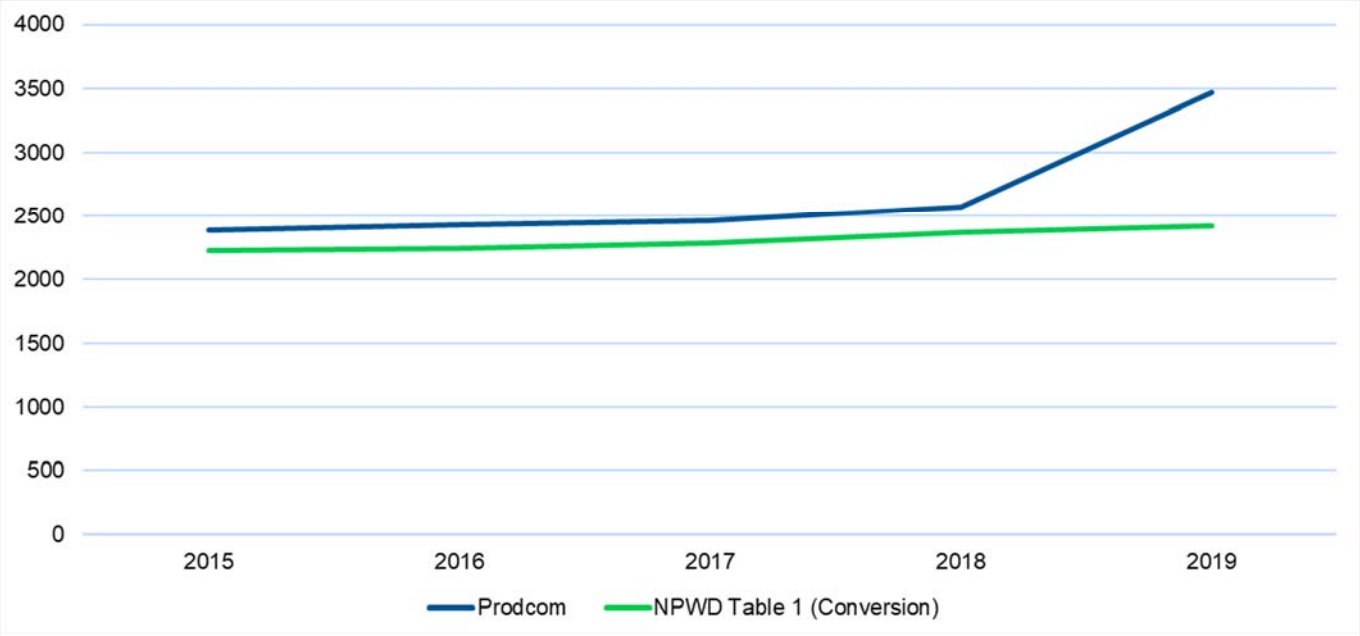
The latest available PRODCOM data is from 2019 (released 01/07/2020) and only gives the number of container units produced. Therefore, an average weight was applied to the number of units and this was calculated using the average weight of glass packaging (taken from the Valpak Data Solutions database[43]) which was 0.377kg. The PRODCOM data is summarised in Figure 30. Previously British Glass provided estimates for UK production, however they believe that their estimates are in line with NPWD and as such NPWD data was used.

Figure 30 - PRODCOM and NPWD – UK Glass Container Production 2015 – 2019 (k tonnes)

	2015	2016	2017	2018	2019
PRODCOM – No. of Items	6,435	6,551	6,645	6,818	9,195
Estimated Tonnage	2,382	2,424	2,459	2,570	3,466
NPWD - Table 1 Conversion	2,228	2,243	2,288	2,372	2,419

The NPWD and PRODCOM data are summarised in Figure 31 with a graphical representation of the trends.

Figure 31 - UK Glass Container Production 2015 – 2019 (k tonnes)



[42] https://www.ons.gov.uk/businessindustryandtrade/retailindustry/datasets/poundsdatatotalretailsales, *Accessed (01/07/2020)*

[43] *Valpak's Data Solutions database is one of the largest packaging databases in the country. Valpak work with over 70 companies including Tesco, Sainsbury's, Marks & Spencer and Mothercare and hold significant market coverage across many top retail sectors as well as distributors, brand owners and the retail supply chain. Data Solutions collect information direct from customers, suppliers as well as source information in house meaning that they hold 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 their bespoke innovative software Environmental Product Information Centre (EPIC).*

This shows that PRODCOM has been a useful proxy for UK production estimates previously closely following NPWD estimates that there has been a sharp increase in the 2019 estimate that seems a departure from the historic trend. This could be due to errors in the figures and due to them only being published recently may go through a further iteration before the figures are final. Also, the figure is sensitive to the average weight applied and therefore the NPWD figure is considered the most robust estimate of glass packaging production in the UK.

Appendix III

Exports (Empty) Cross Reference

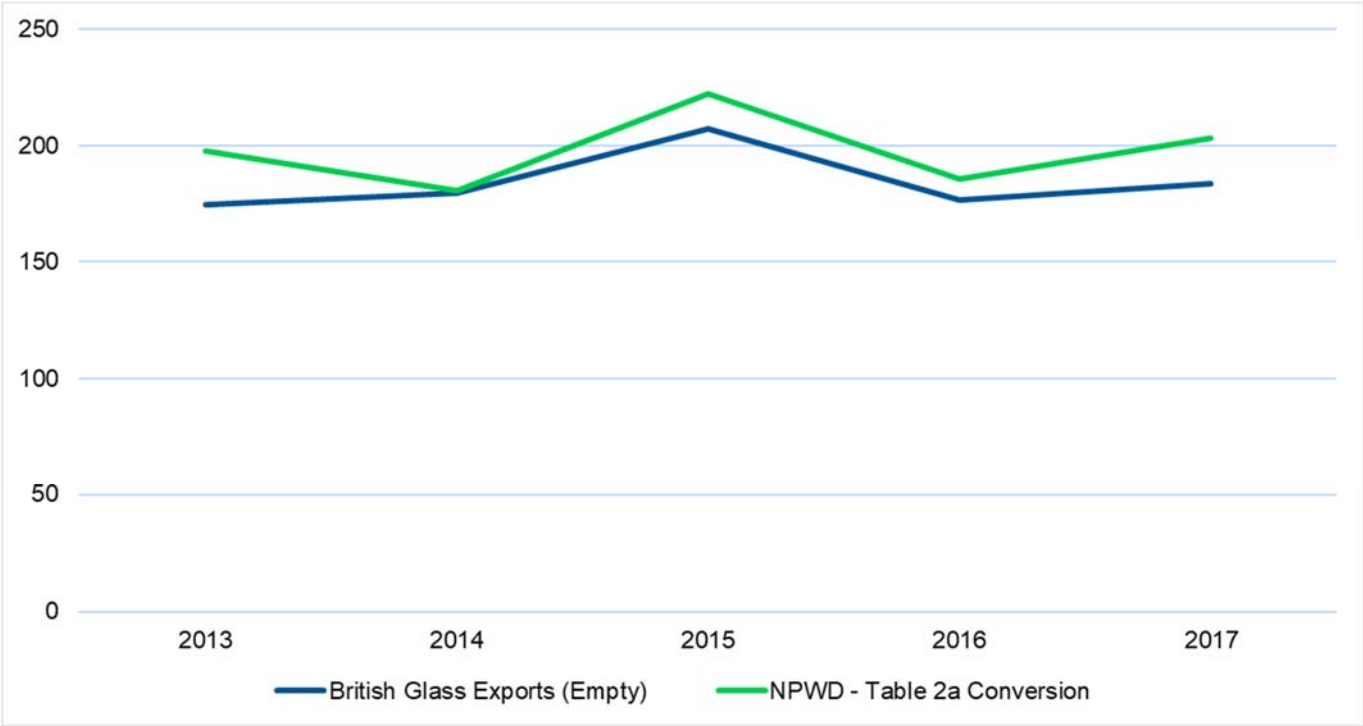
Previously the empty export figures were cross referenced against British Glass Exports (Empty) data, shown in Figure 32.

Figure 32 - British Glass – UK Exports (Empty) 2013 – 2017 (k tonnes)

	2013	2014	2015	2016	2017
Exports (Empty)	175	180	207	177	184
% Change from prev. year	N/A	3%	15%	-15%	4%

As with the NPWD figures, these oscillate between positive and negative growth; however, the 2008 figure is higher than the 2012 figure. A graphical representation of the trends is provided in Figure 33.

Figure 33 - UK Exports (Empty) 2013 – 2017 (k tonnes)



As shown, historically the British Glass figures follow a similar trend to NPWD. Following discussions with British Glass it was agreed NPWD data should be used as it ss considered more complete in terms of the import/export supply chain. British Glass also stated that there will be only minimal unregistered tonnage, as Exports (Empty) tend to be done by the large producers. At the time of writing British Glass were surveying their members and did not have an estimate for empty exports in 2018 or 2019, however they reiterated that the NPWD figure should be used.

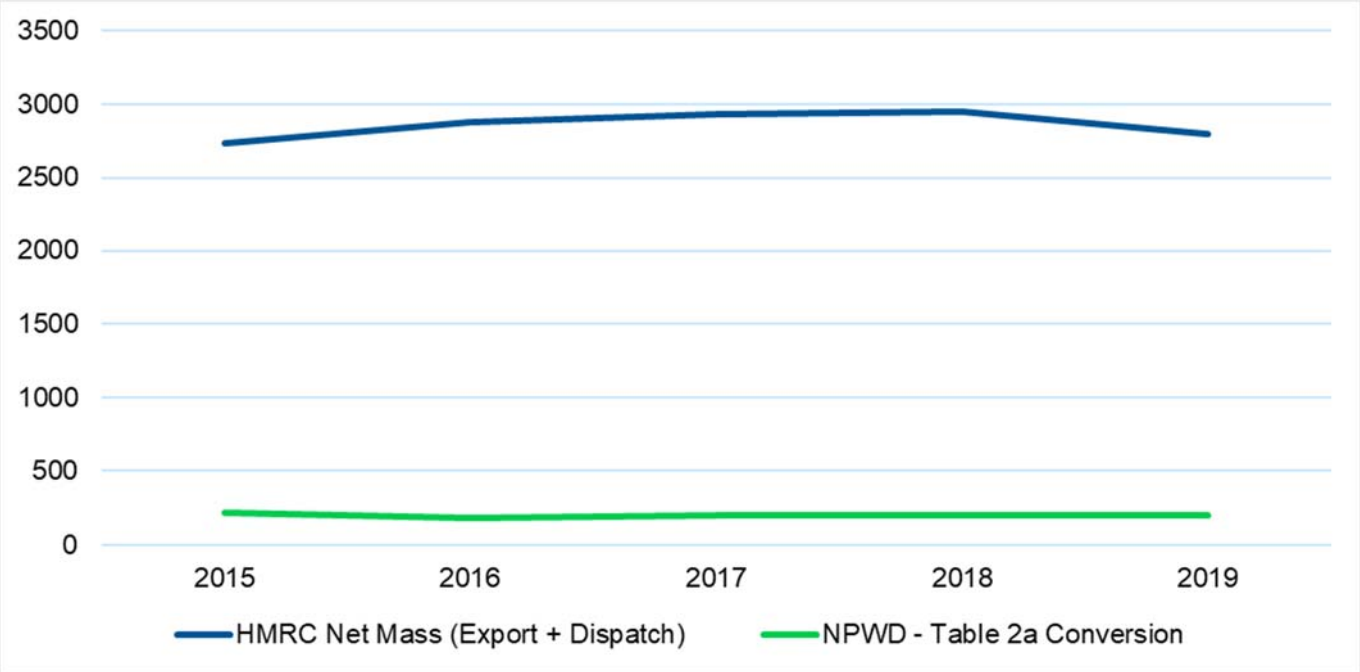
The export trends were checked against the HMRC trade data[44] for beverage exports, as shown in Figure 34. It is worth noting that this is only partly indicative as it includes beverages exported regardless of packaging types; i.e. including beverages exported in glass bottles, but also cans, etc. This shows exports rising between 2015 and 2018 whereas both the NPWD and British Glass figures oscillate between positive and negative growth.

Figure 34 - HMRC – Beverage Exports 2015 – 2019 (k tonnes)

	2015	2016	2017	2018	2019
Net Mass (Export + Dispatch)	2,731	2,879	2,934	2,953	2,794
% Change from prev. year	N/A	5%	2%	1%	-5%

The HMRC and NPWD data is show in the figure below and shows that HMRC export data loosely follows the NPWD although there is a slight departure from the trend in 2019.

Figure 35 - NPWD and HMRC Beverage Exports 2015 – 2019 (k tonnes)



Based on this and feedback from British Glass the NPWD data is considered the most robust for estimating exports of empty glass packaging.

[44] *www.uktradeinfo.com, Accessed (01/05/2020)*

Appendix IV

Exports (Filled) Cross Reference

For exports (filled) the NPWD Table 2b Conversion (with an uplift for glass sourced in the UK that is subsequently exported to countries) was used as shown in Figure 36.

Figure 36 - UK Exports (Filled) 2015 – 2019 with Uplift (k tonnes)

	2015	2016	2017	2018	2019
Exports (Filled) NPWD -Table 2b Conversion	731	729	789	812	832
Excluded EIRE/Gibraltar Exports	4	4	4	4	2
Exports (Filled)	735	733	793	816	833

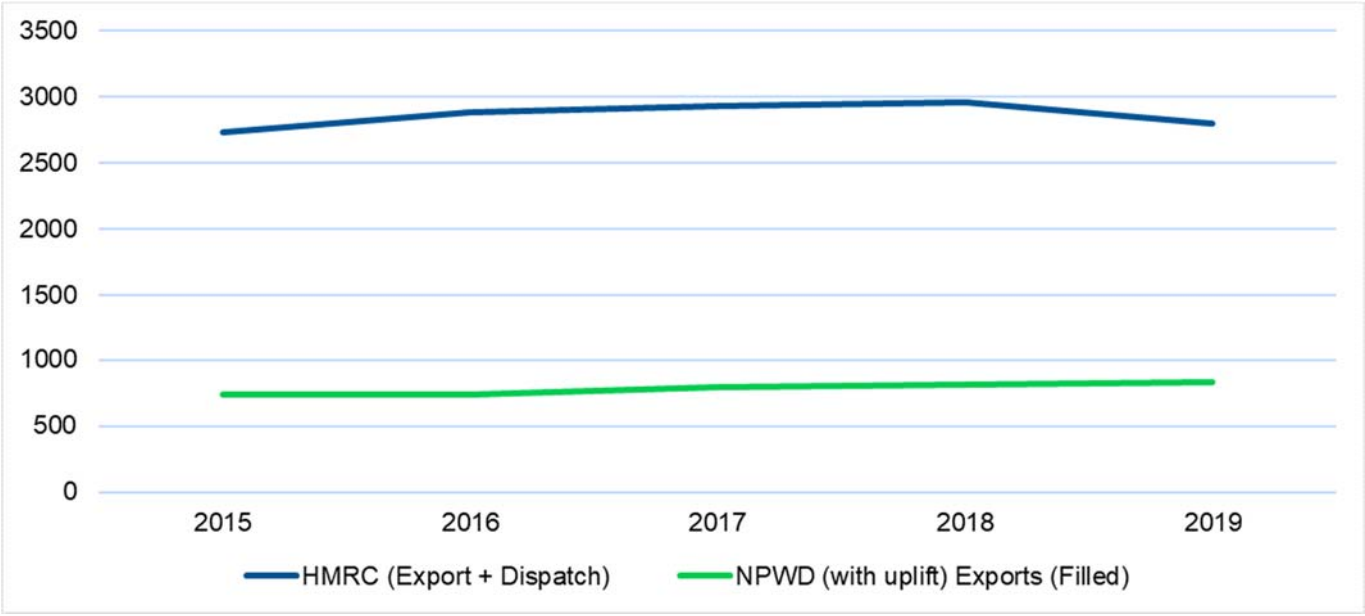
As British Glass no longer collects exports (filled) data from its members the NPWD (with uplift) data was sense checked against HMRC trade data[45] for beverage exports shown in Figure 37.

Figure 37 - HMRC – Beverage Exports 2015 – 2019 (k tonnes)

	2015	2016	2017	2018	2019
Net Mass (Export + Dispatch)	2,731	2,879	2,934	2,953	2,794
% Change from prev. year	0%	5%	2%	1%	-5%

Figure 38 shows a graphical representation of the data and trends.

Figure 38 - NPWD (Filled with uplift) and HMRC Beverage Exports 2015 – 2019 (k tonnes)



[45] www.uktradeinfo.com, *Accessed (01/05/2020)*

The exports (filled) NPWD trend is generally supported by the HMRC trade data trend for beverage exports[46], as shown in Figure 38. It is worth noting that this is only partly indicative as this includes beverages exported regardless of packaging types; i.e. including beverages exported in glass bottles, but also cans, etc.

[46] *www.uktradeinfo.com, Accessed (01/05/2020)*

Appendix V

Imports (Empty) Cross Reference

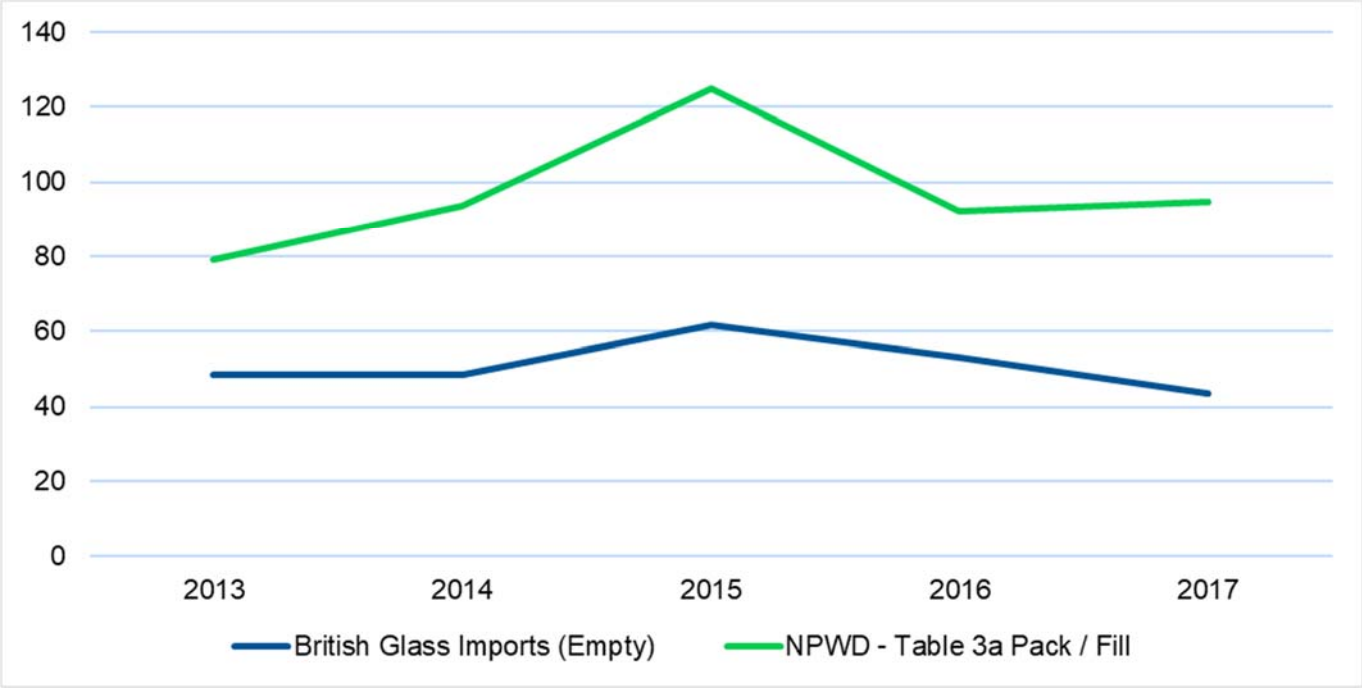
Historically NPWD Table 3a pack/fill[47] was cross referenced against British Glass figures for imports (empty). This is summarised in Figure 39.

Figure 39 - British Glass – Imports (Empty) 2013 – 2017 (k tonnes)

	2013	2014	2015	2016	2017
British Glass Imports (empty)	49	49	62	53	44
% Change from prev. year	N/A	0%	27%	-14%	-18%

Both sources (NPWD and British Glass) are summarised in Figure 40 by a graphical representation of the trends.

Figure 40 - Imports (Empty) 2013 – 2017 (k tonnes)



	2013	2014	2015	2016	2017
British Glass Imports (Empty)	49	49	62	53	44
NPWD - Table 3a Pack / Fill	79	94	125	92	95

As discussed, the British Glass figure is lower than the NPWD figure due to the British Glass data not including all potential importers; however, the trend follows a similar pattern. British Glass do not have an up to date estimate for 2019, however they have stated the NPWD estimate should be used as per previous years.

[47] *http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, Accessed (06/07/2020)*

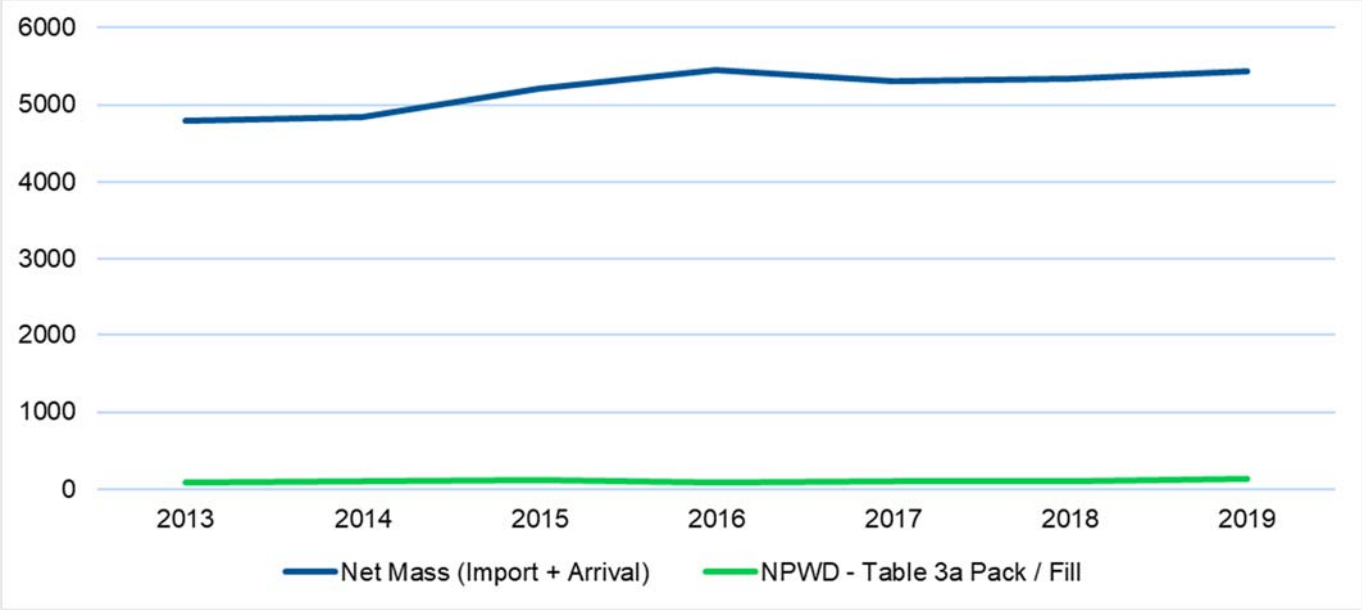
The obligated empty imports estimate was cross referenced against HMRC trade data[48]; however, these figures are only used for a sense check as it is believed they are too broad and had potential consistency issues in terms of categorisation. The HMRC beverage imports are shown below for the years 2015 to 2019.

Figure 41 - HMRC – Beverage Imports 2015 – 2019 (k tonnes)

	2015	2016	2017	2018	2019
Net Mass (Import + Arrival)	5,207	5,454	5,307	5,341	5,435
% Change from prev. year	8%	5%	-3%	1%	2%

This shows an increase from 2015 to 2019, however for several materials in NPWD including plastic, steel and aluminium there is a reduction in 2019 from the previous year. Only glass manages a slight increase (Figure 42). This trend follows the trend in imports of beverages as shown below.

Figure 42 - HMRC – Beverage Imports and NPWD Empty Imports 2013 – 2019 (k tonnes)



[48] www.uktradeinfo.com, *Accessed (01/05/2020)*

Appendix VI

UK Imports (Filled) Cross Reference

The obligated filled imports estimate was cross referenced against HMRC trade data[49]; however, these figures are only used for a sense check as it is believed they are too broad and had potential consistency issues in terms of categorisation. The HMRC beverage imports are shown below for the years 2015 to 2019.

Figure 43 - HMRC – Beverage Imports 2015 – 2019 (k tonnes)

	2015	2016	2017	2018	2019
Net Mass (Import + Arrival)	5,207	5,454	5,307	5,341	5,435
% Change from prev. year	8%	5%	-3%	1%	2%

This shows an increase from 2015 to 2019, however for several materials in NPWD including plastic, steel and aluminium there is a reduction in 2019 from the previous year. Only glass manages a slight increase (Figure 44).

Figure 44 - NPWD – Glass, Plastic, Steel and Aluminium Obligated Imports (Filled) 2015 – 2019 (k tonnes)[50]

	2015	2016	2017	2018	2019
NPWD - Table 3a Glass	990	979	1,039	987	991
NPWD - Table 3a Plastic	494	509	514	518	466
NPWD - Table 3a Steel	164	163	168	167	153
NPWD - Table 3a Aluminium	48	51	50	48	45

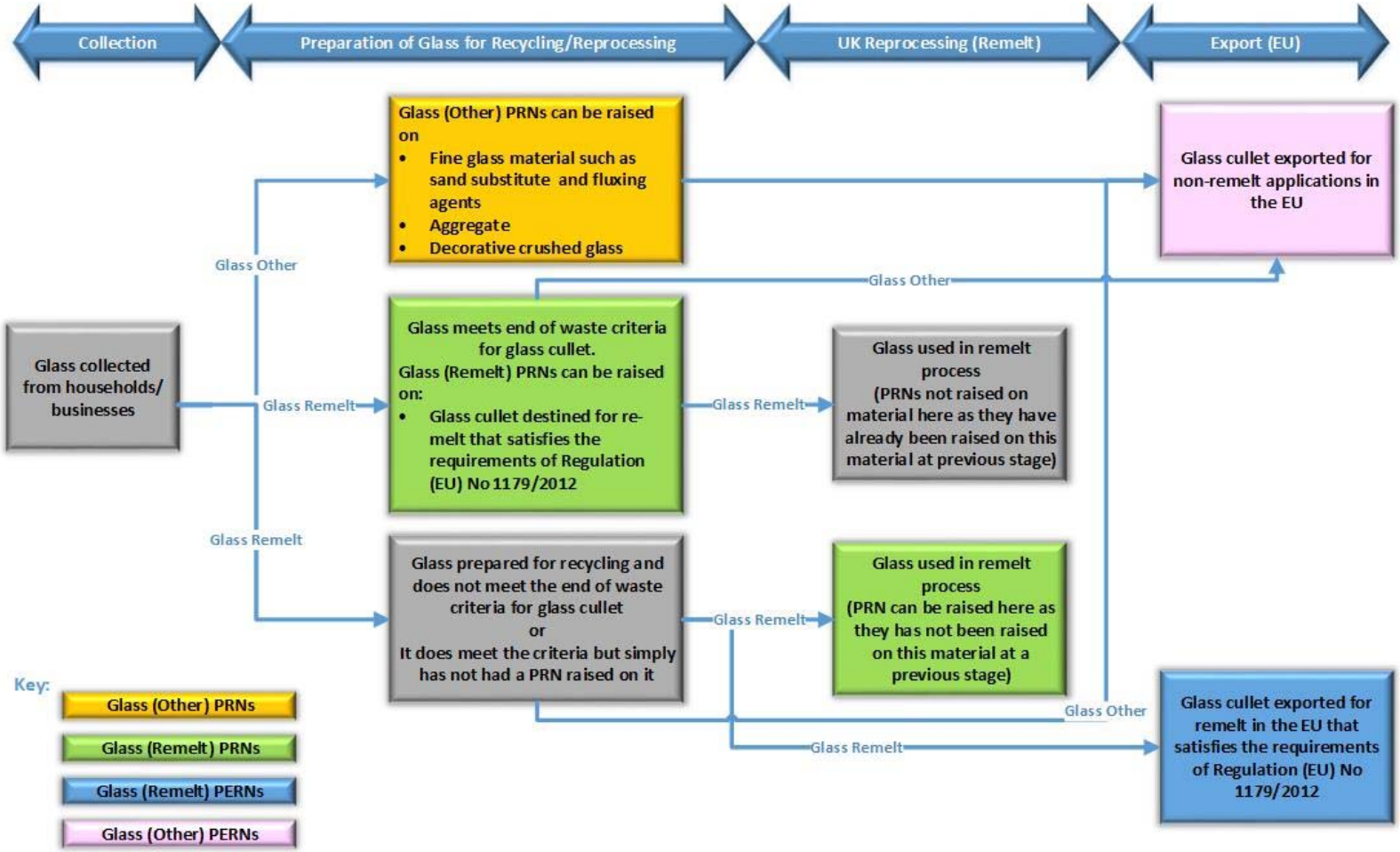
British Glass recommends using the NPWD data for filled imports of glass packaging.

[49] www.uktradeinfo.com, *Accessed (01/05/2020)*
[50] http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx, *Accessed (06/07/2020)*

Appendix VII

Supply Chain Where PRNs/PERNs Can Be Issued

Figure 45 - Supply Chain Where PRNs/PERNs Can Be Issued



Note:
Guidance and criteria required for when glass meets end of waste can be found here:
https://npwd.environment-agency.gov.uk/filedownload.ashx?fileid=edee7dc6-4249-4187-834e-88fb6a8b5bdd