

Final Report

Plastic Packaging Market Study (Plastic Flow) 2014



Plastic Flow reviews the quantity of plastic packaging being placed on the market (POM) and recycled in 2013

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- Recoup;
- The ACP;
- The British Plastic Federation (BPF);
- BPF RG (British Plastics Federation Recycling Group);
- Wastepack; and
- Zero Waste Scotland.

Glossary

- ACP** – Advisory Committee on Packaging
- BPF** – British Plastics Federation
- BRE** – Building Research Establishment
- C&I** – Commercial & Industrial
- C&D** – Construction & Demolition
- EA** – Environment Agency (EA)
- EPIC** – Environmental Product Information Centre
- GCB** – Green Construction Board
- LA** – Local Authority
- MRF** – Materials Recovery Facility
- NPWD** – National Packaging Waste Database
- ONS** – Office of National Statistics
- PAFA** – Plastics and Films Association
- PERN** – Packaging Export Recovery Note
- POM** – Placed On the Market
- PRN** – Packaging Recovery Note
- PTT** – Pots, Tubs and Trays
- VDS** – Valpak Data Solutions
- WDF** – Waste Data Flow

Executive summary

Background

This project was commissioned by Valpak Limited and Defra, and carried out by Valpak Consulting and WRAP, to provide support for plastic packaging material flow estimates in Defra's packaging policy work. The objective was to review the quantity of plastic packaging being placed on the market (POM) and recycled in 2013. The project also reviewed the implications of various scenarios for future recycling rates out to 2020.

The method to achieve this was primary and secondary research with engagement of a stakeholder steering group. The steering group comprised Defra, the Environment Agency, The British Plastics Federation (BPF), the British Polythene Industries (BPI), Plastics and Film Association (PAFA), Recoup, Plastics Europe, The Advisory Committee on Packaging (ACP), Wastepack, Valpak, WRAP, Zero Waste Scotland (ZWS) and 360 Environmental¹.

Project Key Conclusions: Flow

- The project's final best estimate of UK flow for 2013 is 2,260k tonnes, a reduction of 332k tonnes from the estimated current flow figure.
- The new flow estimate is similar to the 2006 estimated flow of 2,284k tonnes.
- Although the 2006 and 2013 estimates are derived from differing methods, the trend between them indicates 0% growth in flow data. This trend is corroborated by reported data from the National Packaging Waste Database (NPWD) over the same time period and by replicating the method used for estimating the grocery sector packaging usage in 2013 for 2006. Our base case scenario is that this trend will continue².

Project Key Conclusions: Recycling

- Assuming that the new POM figure is adopted, the recycling performance of the UK is a higher percentage than was previously reported.
- Significant increases in recycling are still required in order to meet the current business targets.
- The current business targets (if achieved) will result in the UK exceeding its current policy intention (as set out in Defra 2011 Consultation).
- The recycling rates for plastic are expected to increase through to 2020 if current trends continue.

Data Sources

The amount of plastic packaging POM was calculated using the following methods and data sources:

- Consumer: Packaging used in the consumer sector was estimated using retail sector sales data and packaging usage.
- Non-consumer: Packaging used in the non-consumer sector was taken from a range of sources, including industry estimates of film production, the National Packaging Waste Database (NPWD) and various secondary data sources for rigid plastic packaging usage.

¹ All data sourced is UK based, no data has been scaled up from a devolved administrator level.

² UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks, Recoup and WRAP, November 2006, <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>. In order to try and verify the 2006 flow estimate, Valpak replicated its method for calculating total flow in the consumer supermarket (grocery) sector in 2013 by running the same methodology based on 2006 sales and packaging data and market share information. The methodology, when checked against 2006 data, is comparable to within 3% margin of error.

Data Uncertainties and Appropriate Confidence in Estimates

The data presented in the Plastic Flow report intends to represent the best estimate possible, given the available data. However, owing to uncertainties inherent in many of the data sources and assumptions used, it is important to caveat the robustness of the estimates. Appendix III includes an assessment of the uncertainty and robustness of the estimates.

Plastic Packaging POM

The estimated quantity of plastic packaging POM in 2013 was 2,260k tonnes. The data is accepted by the industry steering group, although there remains an area of uncertainty in the detail of the estimation. The key area of uncertainty is within the non-consumer rigids sector.

In 2013, the level of plastic packaging recycled by accredited organisations (those registered with the Environment Agency) was 714k tonnes; using the revised POM, this would give a recycling rate of 32%.

Meeting the EU Plastic Recycling Target

The estimates of packaging POM and reprocessed quantity shows that the UK recycling target of 27.4% for plastic packaging would have been exceeded in 2013 by 4.6%.

A scenario analysis covering the period 2013 to 2020 was developed. This included quantities POM and reprocessed. A projection for the amount of packaging POM based on historical trends was produced. The plastics packaging industry estimated a flow figure of 2,284k tonnes of plastic packaging in 2006, which means that since then, and using the flow of 2,260k tonnes, there has been no growth in overall plastic packaging consumption (in terms of weight) over the last eight years.

Assuming no growth in flow to 2020 and that plastic packaging recycling expands at the same rate as it has done historically the recycling rates for plastic packaging would be 38% in 2017 and 43% in 2020.

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1.0 Introduction

1.1 Background and Existing Data

Defra is keen to ensure that the estimates being used for its packaging policy work are as accurate as possible. To support Defra, this work focuses on reviewing the estimates of UK plastic packaging placed on the market (POM)³ and the associated compliance implications. Accurate and robust assessments of current and future UK plastic packaging flows are vital to help inform the UK negotiating position in the acceptance of targets. The devolved administrations of Scotland, Wales and Northern Ireland are also interested in the outcome of this research.

The existing Defra estimate for 2013 is 2,592k tonnes of plastic packaging POM. The PackFlow⁴ project and industry assessment formed the basis for this estimate. PackFlow derived estimates of the growth in plastic packaging (and other packaging materials) from a variety of quantitative and qualitative sources including dialogue with key stakeholders. The objective behind the Plastic Flow report is to provide an updated baseline estimate of plastic packaging placed on the market.

1.2 Objectives

The Plastic Flow project had the following key objectives:

- Review of plastic packaging POM and recycling figures for 2013;
- Plastic packaging arisings and recycling rate projection scenarios up to 2020;
- Update the scenario analysis for meeting the plastic targets in 2017 and also 2020;
- Engage with a steering group of relevant key stakeholders; and
- Produce a report for publication, reflecting, where appropriate, the relative degrees of uncertainty between instances where it has been possible to undertake robust statistical analysis and instances where there was very limited data.

1.3 Methodology

1.3.1 POM

Three possible ways to estimate the total plastic packaging POM in the UK were identified. A bottom up approach using a variety of data sources of plastic packaging products placed on the market, a gathering of data and estimates from industry and finally an assessment of the plastic packaging POM reported on the National Packaging Waste Database (NPWD) by obligated producers. The baseline year was 2013. However, where 2013 data was not available the most recent available data was used.

1.3.1.1 POM Method 1 (Bottom Up Approach)

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

- Plastic packaging around food/drinks/other groceries, including body care/clothing/DIY products etc., as sold by supermarkets and other non-grocery retailers;
- Plastic packaging around food/drink as consumed in the hospitality sector;
- Plastic packaging discarded by retailers back of store;
- Plastic packaging used by the construction industry;

³ Plastic packaging placed on the market means all household and non-household plastic packaging used around products within the UK.

⁴http://www.valpak.co.uk/Libraries/Environmental_Consulting_Documents/PackFlow_2017_Final_Report_09_11_12.sflb.ashx

- Plastic packaging used in the manufacturing industry; and
- Plastic packaging used in agricultural sector.

The detail of how the amount of rigid and film plastic were estimated is given in section 2.

1.3.1.2 POM Method 2 (Industry Estimations of Non-consumer Plastic POM)

Engaging industry to provide estimates of UK and overseas production figures for plastic film packaging placed on the UK market for use in the non-consumer sector was the second method of estimating the quantity of plastic packaging POM. This figure was then combined with filled imported packaging, using the NPWD.

To establish data on non-consumer rigids, Valpak asked the British Plastics Federation (BPF) to survey its members. This provided a total production from which consumer rigids would be removed to leave non-consumer rigids.

It was not deemed necessary to use this method for consumer rigids since primary data is available for consumer plastic packaging POM.

1.3.1.3 POM Method 3 (Net Pack Fill)

This method compiled plastic packaging data reported by obligated companies into the NPWD. The estimate is thought to capture the vast majority of the relevant quantity but does omit the plastic packaging handled by non-obligated companies, free-riders (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) and packaging for internal company use, which is non-obligated packaging under the regulations.

To estimate the amount of packaging placed on the UK market by obligated companies, the calculation set out below was applied. This calculation uses the total data reported by obligated packaging producers and is available on the NPWD website⁵:

Net Pack Fill	=	Packing/Filling table 1 - pack/filling	+	Imports table 3A - imported for the purpose of selling	+	Imports table 3B - packaging removed from around imports	-	Exports table 2A + table 2B – pack/filling
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(Note: Tables 1 to 3b relate to the NPWD and are not found within this report).

1.3.1.4 POM Other Data Sources

Other sources of data investigated included Prodcom, UK Trade Info and market research reports. However, further analysis and consideration validated the need to have greater reliance on other data sources for the following reasons:

■ Prodcom

Latest data available at the time of reporting was '2012 Provisional'. The data did not allow for calculating total tonnage and only covers UK manufacturing and empty imports.

■ UK Trade Info

This requires information searches on product types rather than packaging types; i.e., the need to identify key product sectors such as soft drinks. In addition, the SIC codes in UK Trade Info don't extend to packaging material level; i.e., it is possible to look at imports/exports of soft drinks, but not of soft drinks in plastic bottles.

⁵ www.npwd.environment-agency.gov.uk

■ Keynote Market Report 2012 Plastics (Packaging)

The sectors are split by polymer rather than format. The data excludes filled imports of packaging and provides a total only in terms of value not volume.

1.3.2 Recycling

The level of accredited reprocessing (that which is eligible to raise a PRN) was estimated through the number of PRNs that were raised on plastic according to figures submitted to the NPWD. This was then broken down between consumer and non-consumer. This was done first by using Recoup's latest survey (2013)⁶ to quantify the level of plastic recycling from the consumer sector. The non-consumer recycling is assumed to be the residual after the consumer figure has been removed from the total NPWD figure.

Accredited reprocessing is likely to be an underestimation as it is related to the level of PRNs raised; however, some additional recycling may be carried out without a PRN being raised. The unaccredited reprocessing was estimated by using the number of reproprocessors and exporters that were believed to be operational but not accredited between 2011 and 2013, and the packaging they would normally handle as a proxy, providing a minimum quantity.

1.3.3 Projections and Scenario Analysis

The final section of the report documents a historical analysis of the plastic packaging being POM and levels recycled in order to inform the level of material being POM and the possible level of reprocessing from 2013 to 2020. It also includes a scenario development that assumes compliance with the national policy intention as set out by Defra for 2017 and as proposed by the EU Commission for 2020.

⁶ Recoup's most recent survey based on 2013 data was not published at the time of writing this report; however, Recoup provided estimates for the purpose of this project.

2.0 Plastic Packaging POM – Method 1 (Bottom Up Approach)

2.1 Introduction

This section of the report provides an explanation of the method used to review the total plastic packaging POM in the UK in 2013, based on method 1. The baseline year for this analysis was 2013. This method splits the POM into different elements and attempts to build a picture from the bottom to the top. The key elements were as follows:

- Consumer
- Non-consumer
 - Agricultural
 - Construction and Demolition (C&D)
 - Commercial and Industrial (C&I)
 - Hospitality
 - Retail
 - Manufacturing

Packaging is considered plastic if plastic is the predominant material by weight in a composite⁷.

Only elements of this method attribute to the final project flow estimate, as the final estimate is derived from a hybrid of method 1 and method 2.

2.2 Consumer

2.2.1 Grocery Retail

In order to estimate the amount of packaging POM by the grocery retail market, Valpak's Environmental Product Information Centre (EPIC)⁸ was used to provide data on annual sales and packaging weights for all relevant products packaged in plastic. This was taken from a selection of Valpak's supermarket clients representing a cross-section of grocery retailers in the UK. Using volume market share information from Kantar World Panel (not publicly available) for these supermarkets, which represented 56.6% of the grocery retail market by volume for 2013, the resulting quantity of plastic packaging was scaled up to represent an estimate for the UK grocery retail market. An assumption has been made therefore that the plastic packaging profile of the four supermarkets is representative of those not represented. The plastic packaging in the grocery retail sector was estimated to be **981k tonnes in 2013**.

This estimate was cross referenced with aggregated Environment Agency (EA) data to check the validity of the EPIC data for grocery retail. The data provided by the EA was 2013 plastic quantities reported in table 1 selling from NPWD for all the major grocery retailers⁹. Details of this are provided in Appendix I. This shows that either route (EA data or EPIC data,

⁷ The EA definitions of composite and multi-layered packaging are defined in, the 'Agreed position and technical interpretations – producer responsibility for packaging⁷'. Composite packaging is: 'multi-layered sheets of dissimilar materials which are bonded together and cannot be separated by hand', such as laminated paperboard, whereas multi-material packaging is: 'packages constructed of assembled components of different material', such as a blister pack made from cardboard and plastic and can be separated by hand. Within the technical interpretations guidance, the packaging weight for laminate packaging 'should be recorded under the predominant material by weight', compared to multi-material packaging weights, which should be recorded separately, by the different component materials.

⁸ 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). Over 800,000 supermarket products are recorded in EPIC.

⁹ The figure does not include free-riders or non-obligated producers.

updated) yield similar results. Given that the project figure is close to official reported data, we have a high confidence in this estimate.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is more robust than alternatives we have explored in methodology 2.

2.2.2 Total Retail (Including Non-grocery)

To scale up the grocery retail result to represent total UK retail, including non-grocery retail, the Office of National Statistics (ONS) retail sales data was used. This shows that the proportion of grocery spend of total UK retail spend was 47% in 2013.¹⁰

However, simply scaling up using market share was not considered robust, since it was likely that packaging usage within both sub-sectors differed. Therefore, this difference in plastic packaging used by the grocery sector and other retail sectors was analysed using Valpak membership's reported data¹¹. Analysis involved the following key stages:

- Identification of grocery and non-grocery retail members;
- Gathering of company reported data and information; and
- Calculation of plastic packaging tonnage per billion pound turnover for grocery and non-grocery retailers representing 32% of reported obligated tonnage of plastic packaging in 2013¹².

The method used assumes the packaging profile of those retailers within the sample is representative of those not in the sample.

Therefore, the following key steps were taken to estimate total retail plastic packaging consumption in the consumer (retail) sector in 2013:

- Total grocery plastic packaging flow in 2013 was 981k tonnes (see section 2.2.1);
- Proportion of grocery spend of total retail spend in the UK was 47% in 2013¹³;
- Total retail plastic packaging flow, assuming like for like packaging was 2,086k tonnes;
- Non-grocery plastic packaging tonnes/£bn turnover is 50.2% of grocery plastic packaging tonnes/£bn turnover¹⁴; and
- Therefore, applying 50% to the difference in tonnage between grocery (981k tonnes) and total retail (2,086k tonnes) means total retail plastic packaging flow in 2013 was **1,534k tonnes**.

To allow for a targeted approach when analysing implications of flow on recycling, the rigid/film split was derived by analysing data within the Valpak EPIC database for both grocery and non-grocery retailers (see Figure 3 for this breakdown). Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on appendix III, this estimate is more robust than alternatives we have explored in methodology 2.

¹⁰ <http://www.ons.gov.uk/ons/datasets-and-tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=retail+sales> - this is predominantly food stores and includes spending on food drink and tobacco.

¹¹ 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.

¹² Assuming this is a random sample, the sample size allows 99% confidence that it represents the population as a whole with an error margin of 0.14%.

¹³ <http://www.ons.gov.uk/ons/datasets-and-tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=retail+sales> - this is predominantly food stores and includes spending on food drink and tobacco.

¹⁴ Appendix VIII provides results of sensitivity analysis on this result.

2.3 Non-consumer

In order to avoid duplication between consumer and non-consumer packaging, i.e. including packaging within the non-consumer sector that has already been included in the consumer sector, waste production is assessed in the bottom-up method¹⁵ for non-consumer.

The non-consumer sector is broken down into sub-sectors:

- Construction and demolition (C&D);
- Agricultural; and
- Commercial and Industrial (C&I).

2.3.1 Construction & Demolition

To quantify plastic packaging consumption within the construction industry, a variety of secondary research sources were used.

Research commissioned by the Green Construction Board¹⁶ (GCB) estimates that 289k tonnes of packaging (all materials) arose in the UK construction sector in 2009. UK construction companies surveyed estimated that approximately 15% of packaging used in the sector is plastic¹⁷. Based on the estimate of total packaging arising in the sector, this would equate to approximately 40k-45k tonnes of plastic packaging.

Focusing first on the private house building sector, the BRE Smartwaste Portal was reviewed. Using information for the 59 relevant private sector new-build projects submitted by contractors, it was possible to conclude that, on average, there are 0.3 tonnes of packaging arising per £100k spend on private new build houses. Scaling this up based on total UK expenditure on new build private sector houses in 2013 (£17 billion¹⁸) equates to 51k tonnes of packaging.

Project stakeholders estimated that for every private sector house built in the UK, 75kg of plastic packaging arises¹⁹. Applying this figure to the 113,703 private house builds started in 2013²⁰ also gives a figure of 8k tonnes for that sector: 16% of estimated packaging from new build private sector.

Total UK construction spend in 2013 is estimated at £112 billion. BRE Smartwaste Portal summary data for projects across all industry sectors (commercial, industrial, houses etc.) also shows an average 0.3 tonnes of packaging per £100k spend²¹. By applying this 0.3 tonnes per £100k spend to total UK spend gives a total packaging usage figure of 333k tonnes of packaging used in the sector, which broadly aligns with the GCB 2009 estimate, especially given that construction waste may have increased since the depths of the recession. Applying estimated plastic composition of 15% equates to around 50k tonnes of plastic packaging arising in the sector in 2013.

Industry experts estimated that all plastic packaging in the sector was film.

¹⁵ It is assumed that waste production is equal to POM in this case. An example would be where retailer sales is included within consumer but retail back of store waste within the non-consumer sector.

¹⁶ Internal research only.

¹⁷ It is recognised that estimating the proportion of plastic packaging used in construction is very challenging, even for those companies active in the sector.

¹⁸ Construction Industry Forecasts 2013-2017, Construction Products Association.

¹⁹ Based on primary research.

²⁰ Construction industry forecasts 2013-2017, Construction Products Association, Spring 2014 Edition.

²¹ Derived independently of the other similar estimate above using different data.

Given that the project team have been able to estimate total packaging and that which is plastic using two different methods for the private house building sector, there is greater confidence in this estimate. There is significantly greater uncertainty when estimating plastic packaging arising from the rest of the construction sector and more research in this area is recommended. Industry feedback suggested that the use of plastic packaging in this part of the sector (infrastructure, C&I etc.) is likely to be of lower intensity. The final project estimate for the construction sector is **50k tonnes**.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is less robust in terms of evidence than the alternatives that have been explored within methodology 2.

2.3.2 Agricultural

For plastic packaging used around goods consumed in the agricultural sector, the EA provided the figures that they use for this sector. These figures are ultimately derived from the Valpak report, 'UK AWP Waste Arisings, Valpak 2007', based on 2006 data.

The total for rigids and film is 13k tonnes. Although this dataset is relatively old, evidence would suggest²² that output has reduced by 4% since 2006. This coupled with light weighting activity means that the figure is likely to be an over-estimation of the actual tonnage.

To split between film and rigid, the EA's Agricultural Waste Survey 2003²³ was used, concluding with 11k tonnes of film and 2k tonnes of rigid plastic packaging in this sector²⁴.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is more robust in terms of evidence than the alternatives that have been explored within methodology 2.

2.3.3 Commercial & Industrial

For the purposes of this work, the commercial and industrial sectors were broken down into three key sub-sectors:

- Hospitality;
- Manufacturing and other; and
- Retail back of store.

2.3.3.1 Hospitality

Hospitality plastic packaging is plastic packaging that is 'household-type', but includes both primary and secondary packaging and is consumed in pubs, cafés, hospitals etc. It is generally similar in type as that consumed at home, but may not be collected by a local authority for recycling or disposal, and may include some non-household type packaging such as large tubs and pales used for items such as oils and sauces.

The amount of plastic packaging POM by the hospitality sector was based on the WRAP report 'Waste in the UK Hospitality and Food Service Sector, 2011'²⁵. This estimates the arisings and composition of waste in the hospitality sector²⁶. The packaging waste arising estimates in the report are used as a proxy for packaging POM. There may be slight

²² <https://www.gov.uk/government/statistical-data-sets/agriculture-in-the-united-kingdom> - volume of cereals harvested has gone down just under 4% since 2006.

²³ This is the most recent data available to the project team for agricultural plastics.

²⁴ This is based on 1998 splits however in the absence of more up to date this has been used.

²⁵ <http://www.wrap.org.uk/content/overview-waste-hospitality-and-food-service-sector>

²⁶ The report covers restaurants, pubs, quick-service restaurants, hotels, leisure, education, healthcare, staff catering and services.

differences occurring between arisings and POM due to some packaging being kept as storage containers or being re-used.

Based on the report, hospitality plastic packaging waste was reported at **164k tonnes**, including 71k tonnes of film and 93k tonnes of rigids.

Members of the steering group raised concerns that this estimate appeared higher than they had expected. The project team suspect that part of this figure will be double-counting because the hospitality sector buys food & drink (and packaging) from retail. Nevertheless, this remains the best available data at the time of report writing.

The error margins around the original report data for the hospitality sector suggest a degree of caution over the plastic packaging estimates. This is because the focus of the report wasn't specifically packaging and particularly because they form a non-negligible proportion of the total. There is less confidence in this estimate than there is in the grocery plastic packaging estimate.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is less robust than the alternatives that have been explored within methodology 2.

2.3.3.2 Manufacturing & Other

The manufacturing sector includes the following sub-sectors²⁷:

- Food, drink & tobacco;
- Textiles/wood/paper/publishing;
- Power and utilities;
- Chemicals/non-metallic minerals manufacturing;
- Metals manufacturing;
- Machinery & equipment (other manufacturing);
- Transport & storage; and
- Other Services.

The manufacturing industry's plastic packaging usage was the most difficult to quantify, and indeed the project failed to provide a robust estimate for the sector. Having attempted to survey companies within the sector, the results were inconclusive for two key reasons:

- Low response rate; and
- Lack of market share information.

As a consequence, and due to no other data being available, the PackFlow figure for 2013 was used, broken down using the data from the Plastic Composition Project²⁸ for this sector. This figure was 483k tonnes; however, anonymised Courtauld data was made available to the project team for the food and drink manufacturing sub-sector, taking the final estimate for the manufacturing sector to 529k tonnes. The original figure was derived in the Plastics Composition Project by breaking down the sector into sub-sectors (agricultural, construction, etc.), based on the agricultural/C&D/C&I proportions from the WRAP report: 'UK Plastic Waste – A review of supplies for recycling, global market demand, future trends and associated risks', researched in 2006.

The sector accounts for 64% of non-consumer plastic packaging; therefore, the manufacturing sector remains an area where further investigations would be beneficial. The final estimate for manufacturing plastic packaging is **529k tonnes**.

²⁷ Commercial and Industrial Waste Survey 2009: Final Report. Defra, 2010.

²⁸ http://www.valpak.co.uk/docs/default-source/environmental-consulting/plastics_composition_2011.pdf?sfvrsn=0

The split of rigid/film were as per the Plastic Composition 2011 report²⁹, established using a variety of data sources. Figure 1 illustrates the splits in each sub-sector and total 247k tonnes film and 282k tonnes rigids.

Figure 1 Manufacturing Sector: Rigid/Film Splits

Manufacturing & Other								
	Chemicals	Transport	Machinery	Textiles	Food & Drink	Other Services	Power	Metals
Film	30%	55%	70%	70%	29%	70%	50%	50%
Rigid	70%	45%	30%	30%	71%	30%	50%	50%

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is less robust than the alternatives that have been explored within methodology 2.

2.3.3.3 Retailer Back of Store

The quantity of plastic packaging discarded by grocery retailers at back of store was derived from surveying retailers during May to July 2014 (seeing a 38% response rate) and researching information in published corporate reports where some retailers report this data³⁰. Data was then scaled up to UK level using market share information, again using Kantar World Panel data. The final figure for retail back of store was **77k tonnes** of plastic packaging. Confidential survey data from one retailer estimated the split between rigid and film packaging³¹ resulting in 1k tonnes film and 76k tonnes rigids.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on appendix III, this estimate is more robust than the alternatives that have been explored within methodology 2.

2.4 Results of Method 1 (Bottom Up Approach)

The estimates for plastic packaging POM using method 1 are summarised in Figure 2.

Figure 2 Method 1 Results – Plastic Packaging in 2013

	Rigid (k tonnes)	Film (k tonnes)	Total (k tonnes)
Grocery Retail	667	314	981
Non-grocery Retail	452	101	553
Total Consumer	1119	414	1534
Construction & Demolition	-	50	50
Agricultural	2	11	13
Commercial and Industrial ³²	376	395	770
Total Non-consumer	378	455	833
Total Method 1	1497	870	2367

²⁹ <http://www.valpak.co.uk/information-zone/white-papers-reports>

³⁰ One retailer had no data available, and three required using data for 2010 – 2012. One corporate report was for 2013.

³¹ Based on survey results of one retailer that provided rigid/film split; however, as only one retailer provided this information the detail of the split cannot be provided.

³² Total of hospitality, retail back of store and manufacturing combined.

Using this method, the total plastic packaging POM is estimated at 2,367k tonnes with film accounting for 37% and rigids 63%. Consumer accounts for 65% of plastic packaging POM and non-consumer 35%.

There is a reasonable degree of confidence in the estimates for the grocery sector and non-grocery retail sectors (consumer)³³. There is, however, a much lower level of confidence in the estimates for the non-consumer sector. This is due to the fact that many of the estimates have been derived from single sources (often with small data sets) and it has not been possible to cross-reference them. Appendix III provides a detailed assessment of relative levels of confidence in the data.

³³ The size of the sample provides 99% confidence that it is representative of the population as a whole within a degree of certainty of +/- 0.14%.

3.0 Plastic Packaging POM – Method 2 (Industry Estimate of Non-Consumer Plastic POM)

This section of the report is the review of the total plastic packaging POM in the UK in 2013, based on method 2. The baseline years for this analysis were 2013 and 2014. The same method is used as method 1 to estimate consumer figures. For the non-consumer element, attempts were made to gain industry data to estimate total non-consumer film and total non-consumer rigids.

Only elements of this method attribute to the final project flow estimate, as the final estimate is derived from a hybrid of method 1 and method 2.

3.1 Non-consumer film

A cross-section of industry stakeholders, including members of the steering group and others, collated estimates of non-consumer film production from UK and non-UK producers (which export material to the UK) to provide an overall estimate for 2014. This included all key sectors and all packaging format types including:

- Polythene stretch films;
- Polythene collation shrink films around products; and
- Other C&I films & sacks:
 - Pallet protection
 - Industrial film & bags
 - Heavy duty sacks
 - Ventisack (allows air to flow freely but with minimal moisture ingress)
 - IBC liners
 - Others.

Industry's total estimate for non-consumer plastic packaging film production for the UK market was 235k tonnes in 2014.

An additional 2k tonnes of plastic film packaging was also estimated to be consumed in UK hospitals.

Estimated total non-consumer film figures were combined with estimated filled imports. Plastic packaging associated with filled imports was estimated using NPWD. The following proportions were taken from two of the activity lines within NPWD reported data, including packaging removed from imported goods and packaging around goods being sold on in the UK. These activity lines were broken down into the proportion of the reported total data that was assumed to be plastic film packaging within the non-consumer sector, as the NPWD consists only of total plastic packaging within each activity line. The following proportions were assumed:

- 90% of NPWD Table 3b – Table 3b, packaging removed from imported goods, was assumed to account for mainly film, particularly shrink type wrapping from around pallets and goods. This was supported by company data from Valpak's EPIC database.
- 25% of NPWD table 3a selling – Table 3a selling is goods imported for the purpose of selling. 25% of this was estimated to be film, based on company data from Valpak's EPIC database.

- A third of both figures were assumed to be non-consumer packaging. This proportion is based on previous industry understanding³⁴ of the split between non-consumer and consumer film, and is backed up by the bottom up approach results used in method 1.

By combining the 235k tonnes estimated as being produced, 2k tonnes of hospital packaging, and 111k tonnes of filled imported plastic packaging, the estimated total non-consumer film using this method was **348k tonnes**.

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is more robust than the alternatives that have been explored within methodology 1.

3.2 Non-consumer Rigid

In order to create a similar dataset for the non-consumer rigid stream, the BPF carried out a survey of its members. The survey requested information on the quantity of rigid plastic packaging placed on the UK market in 2013. The survey received a 31% response rate. The result of this survey is provided in Figure 3. The BPF estimated the market share; however, it is recognised that this is largely unknown and is, therefore, affecting the result of this calculation.

Figure 3 Results of BPF Survey on Rigid Plastic Packaging Production 2013

Description	Result	Source
Total tonnes produced by 31% of companies	328k tonnes	Survey data
Market share accounted for by the 31% of BPF members who responded to the survey	66%	BPF estimate (largely unknown)
Total rigid plastic packaging manufactured by the BPF	498k tonnes	Calculation
Total BPF UK market share	85%	BPF estimate (largely unknown)
Total UK production of rigid plastic packaging	585k tonnes	Calculation
Estimate of consumption that is imported empty packaging	25% 146k tonnes	BPF estimate Calculation
Total rigid plastic packaging placed on UK market	843k tonnes	Calculation: UK Produced + Empty Imports + Filled Imports ³⁵

Appendix III provides a detailed assessment of relative levels of confidence in the data. Based on Appendix III, this estimate is less robust than the alternatives that have been explored within methodology 1.

³⁴ Estimated during PackFlow and continued through more recent work such as the Plastics Composition Study 2012.

³⁵ Estimated using NPWD: 10% of NPWD table 3b and 75% of NPWD table 3a selling. The quantity of filled rigid imports is approximately 111kt, however due to rounding the total comes to 843kt.

4.0 Plastic Packaging POM – Method 3 (Net Pack Fill)

4.1 Introduction

This section of the report is a review of the total plastic POM in the UK in 2013, based on the data stored on NPWD, as reported to the EA by obligated organisations.

This method is not used to estimate total flow, but to provide a sense check on the total flow and allow for non-obligated flow to be estimated.

4.2 Net Pack Fill

The 2013 UK flow of plastic packaging was calculated using the packaging weights reported to the EA by registered producers and publicly available on the NPWD website. The calculation used is shown below:

Net Pack Fill	=	Packing/Fillin g table 1 - pack/filling	+	Imports table 3A - imported for the purpose of selling	+	Imports table 3B - packaging removed from around imports	-	Exports table 2A + table 2B – pack/filling
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This methodology took the weight reported at the *packing* stage of the supply chain as opposed to the *selling* stage of the supply chain. This was used as it is believed by stakeholders³⁶ that there would be fewer unobligated packers in comparison to unobligated sellers, due to the likely size of the businesses. In addition raw material manufacturing will include process losses, i.e. not everything manufactured will be converted or pack/filled, so it is expected that the tonnage goes down as we move down the supply chain.

Using this method, the total plastic POM in 2013 is **1,823k tonnes**³⁷ (as shown in Figure 4). At the time of writing the report, the NPWD figure had not been finalised due to the potential for companies to resubmit data should they identify inaccuracies in their original submission. Resubmissions can occur up to December 2014 (for 2013 sales data) and therefore a final figure will not be available until early 2015. However, it is unlikely this figure will vary significantly, based on previous years' experiences.

Figure 4 Method 3 Results – Plastic Packaging in 2013

	Plastic
Table 1 Pack/Fill (UK pack/filling)	1,479k
Imports:	
3A Selling (filled imports)	430k
3B (packaging removed from imports)	88k
Total	1,997k
2A P/F (direct exports)	167k
2B P/F (third party exports)	7k
Total Exported	174k
Net Pack/Fill	1,823k

³⁶ No evidence data is available to support this.

³⁷ At the time of reporting.

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

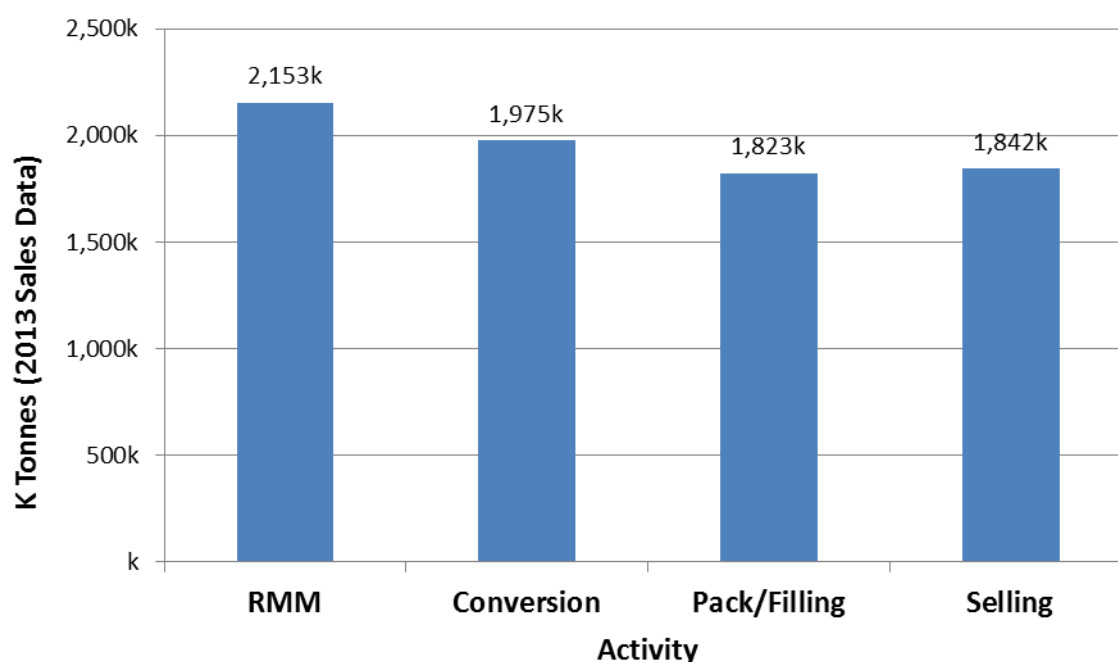
- Non-obligated producers – those below the registration thresholds of 50 tonnes of packaging or £2 million turnover;
- Free-riders – those obligated to register but not doing so; and
- Illegal importers.

There is no way of robustly quantifying the unreported quantity of packaging. Based on feedback from the stakeholder group, it is believed that the number of pack/fillers who are unobligated is small due to the likely volumes handled by the types of companies performing this activity. An estimate of the unobligated tonnage has been made by subtracting the Net Pack Fill figure of 1,823k tonnes from the project's final flow estimate and is provided in section 5 of this report.

4.3 Data Verification

In order to confirm levels of confidence in method 3, checks were made using the data within the producer packaging data tables. The net calculation was applied to other activity lines of the tables: raw material manufacturing, conversion and selling, in addition to pack/filling³⁸. The aim was to identify whether a similar net weight resulted from this calculation being applied to the other activities performed by companies. The results indicated that similar weights are in fact reported, as shown in Figure 5³⁹.

Figure 5 'Net' Producer Data Table Calculations 2013⁴⁰



Raw material manufacturing sees the highest net tonnage; this is because there is believed to be fewer companies operating below the obligation threshold in the raw material manufacture sector, compared to those converting or pack/filling. Nevertheless, the reported tonnage of raw material manufacture does not account for foreign manufacture that is

³⁸ See appendix V for further details on activity lines.

³⁹ Valpak and the steering group believe that there would be fewer non-obligated packer-fillers than of raw material manufacturers and converters, therefore using the net pack/fil calculation is believed to represent the highest proportion of obligated producers, meaning the figure is likely to be the closest to total UK flow. Also, at the time of reporting, the net pack/fill figure is lower than what the final figure is estimated to be once all resubmissions are finalised.

⁴⁰ As reported 29 August 2014.

imported to the UK (for example, packaging converted or pack/filled abroad), therefore this activity is not used to estimate reported obligated flow.

Appendix III provides a detailed assessment of relative levels of confidence in the data.

5.0 Results: Final Project Estimate of 2013 Plastic POM

The final project estimate for plastic POM in 2013 is 2,260k tonnes.

The final plastic packaging POM figure is made up of a combination of the first two methods based on the robustness of individual components within each method. It is also compared to reported obligated data on NPWD.

The final project estimate for plastic packaging POM in the consumer sector is 1,534k tonnes

This estimate is taken from method 1. This method is based on primary data alongside reliable market share data. No other method was used for deriving consumer data as this method is considered the most robust there is available, and is accepted by industry.

The final project estimate for plastic packaging POM in the non-consumer films sector is 348k tonnes

This estimate is taken from method 2. This method has been chosen as it is based on information provided by a number of industry experts and based on previous year sales data, accompanied by an element of reported data for filled imports. Due to the gaps within the non-consumer bottom-up method (method 1), particularly with regard to manufacturing and hospitality sectors, industry data was considered more robust.

The final project estimate for plastic packaging POM in the non-consumer rigids sector is 378k tonnes

There was no equivalent data source available to run alongside the non-consumer film estimate as per method 2 non-consumer film. Taking the BPF survey results from method 2 for rigids (843kt) and combining with film data (763kt) gave a total POM figure of 1605k tonnes⁴¹. This resulting figure is lower than NPWD net pack/fill of 1823k tonnes⁴²; therefore, it is not considered viable to use as this would imply that companies are over-reporting the quantity of plastic packaging they are placing on the market to the NPWD. Since no other data was available to the project team at the time of data collection, 378k tonnes remains the best available data (estimated from method 1). The steering group highlighted the need for further work in this area.

Figure 6 Final Project Estimate of Plastic POM

	Total (k tonnes)	Rigid (k tonnes)	Film (k tonnes)
Consumer	1,534	1,119	414
Non-consumer	726	378	348
Total	2,260	1,497	763

The figure was found to be 437k tonnes higher than data reported by obligated companies under the Packaging Waste Regulations (using the UK net pack fill calculation method). This suggests that non-obligated companies (handling fewer than 50 tonnes of packaging or with lower than £2 million turnover), account for just under half a million tonnes (17%) of plastic packaging in the UK.

It is important to stress that the net pack fill estimates are themselves open to the possibility of a degree of error because they rely on the robustness of the data that is submitted to NPWD. The NPWD data is widely recognised as being the best available as there is a legal

⁴¹ Figures may not sum due to rounding.

⁴² As reported 29 August 2014.

obligation for companies to submit data that is as accurate as reasonably possible to them, which is then audited by the regulating body. This data is used by policy makers and their agencies.

The reported obligated flow of plastic packaging and the project estimated flow of plastic packaging are displayed in Figure 7 alongside Defra’s current flow estimate.

Figure 7 Reported Obligated Flow and Project Final Estimate of Placed on the Market (POM) for 2013⁴³

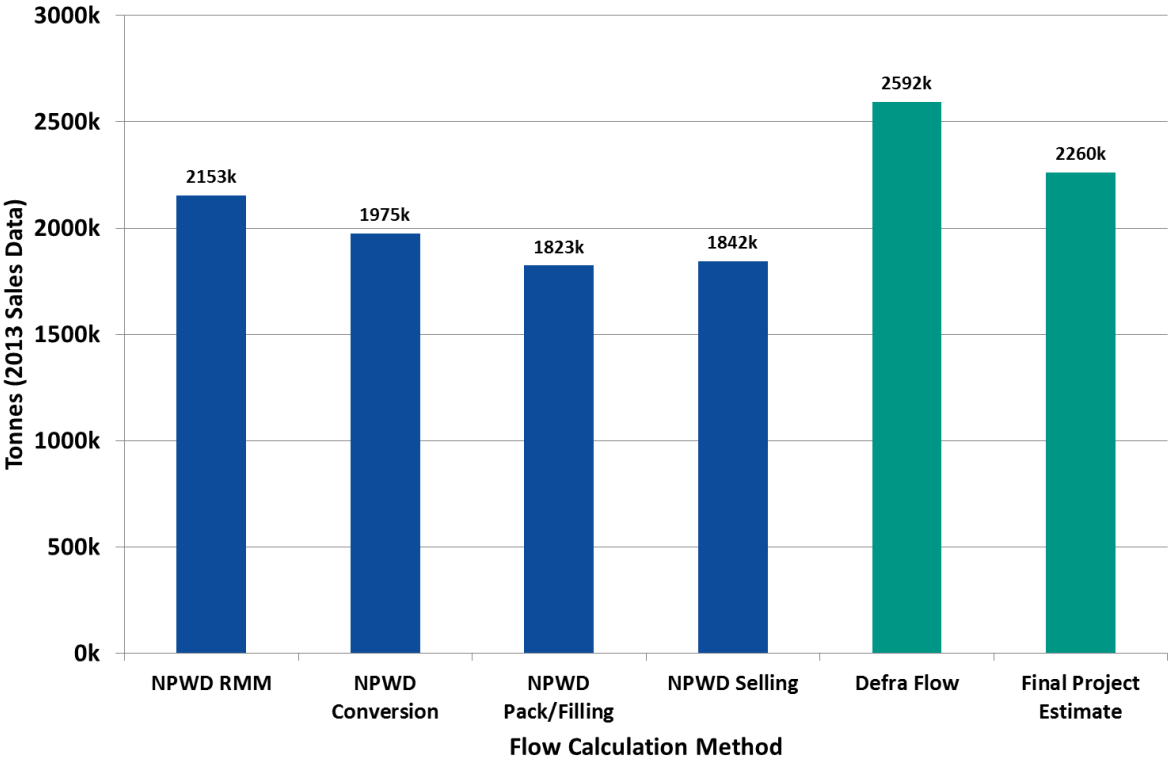


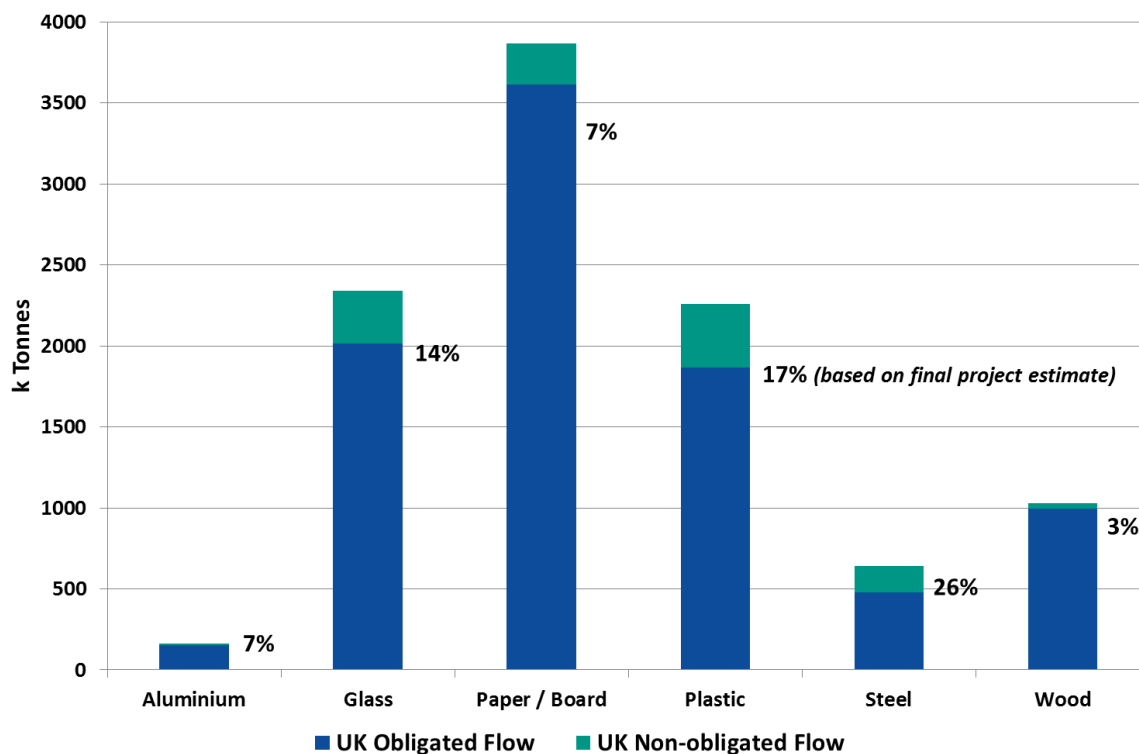
Figure 8 illustrates the obligated versus non-obligated flow for all reported materials. Although each packaging type is characterised by different market structures, the project results highlight that non-obligated flow for plastic is consistent with other reported materials, in particular glass.

The project investigated the average plastic packaging usage by the lowest turnover band for Valpak members (£2-3 million) and found that the average tonnage handled was 40 tonnes⁴⁴. By dividing this figure with the tonnage difference between reported obligated flow and total flow, this relates to 9,850 businesses. This number of businesses equates to less than 1% of the non-service sector micro and small businesses. This is considered a reasonable proportion of companies that handle plastic packaging, but are not obligated under the regulations or are free riding.

⁴³ See appendix V for further details on activity lines.

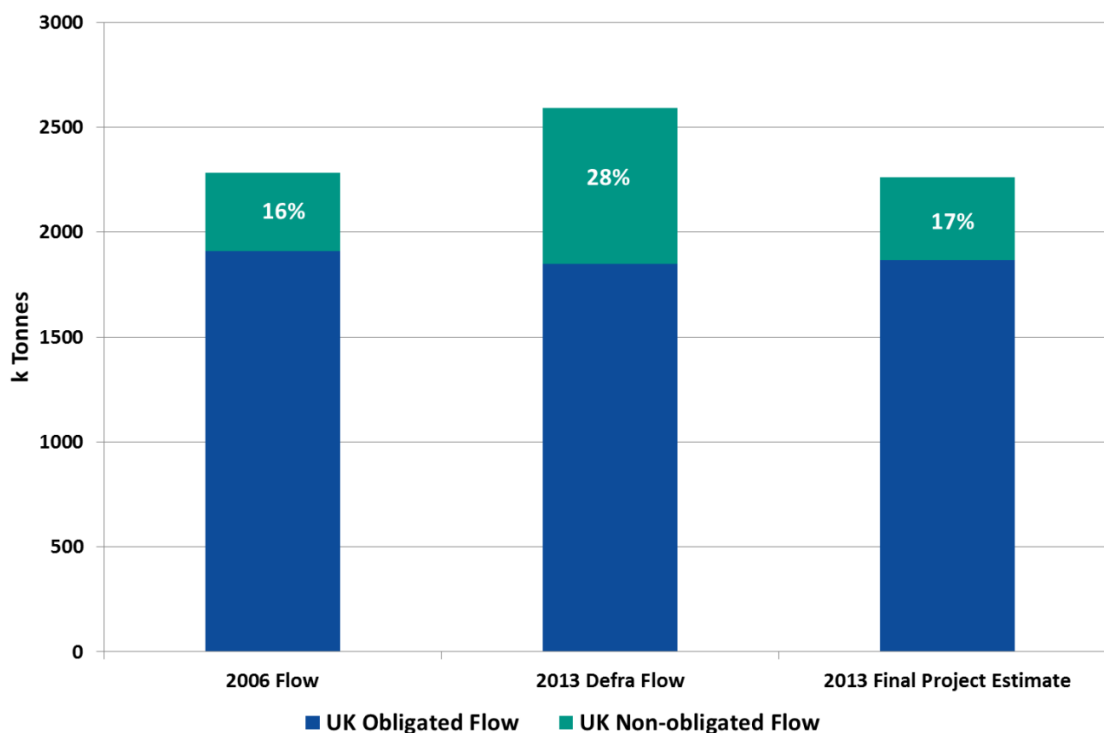
⁴⁴ The companies within this sample are obligated but this is the nearest sample size available.

Figure 8 Obligated Versus Non-Obligated Placed on the Market (POM) for Packaging Materials 2013⁴⁵



Using Defra's obligated flow figure, the new flow estimate leads to a similar non-obligated proportion as was found in 2006 figures, as seen in Figure 9 below⁴⁶.

Figure 9 Obligated versus Non-obligated Plastic Packaging Placed on the Market (POM): 2006 and 2013



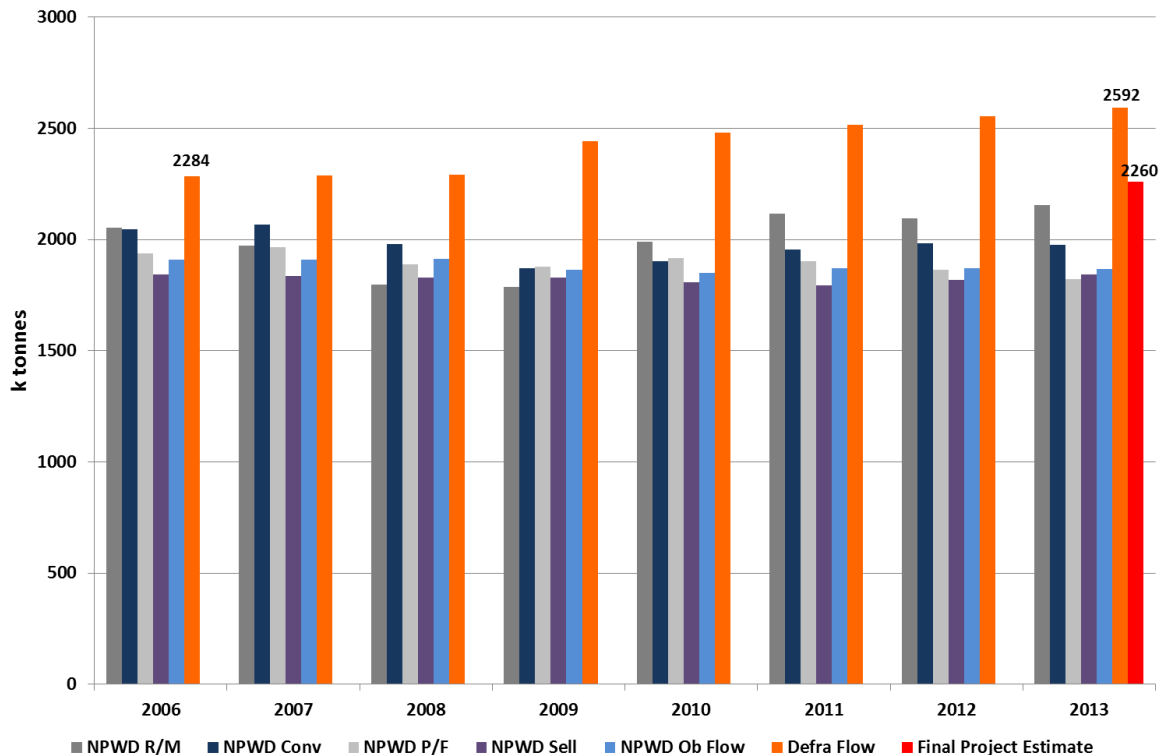
⁴⁵ Aluminium and steel are based on Defra flow estimates.

⁴⁶ Assuming the 2006 flow figure, which was derived using a different methodology, is accepted as correct.

Figure 10 illustrates that the historical trend in reported data shows relative consistency between NPWD reported activities, apart from in 2013 where the net pack/filling figure is lower due to it not being based on the final dataset for the year.

Although the 2006 and 2013 estimates are derived from differing methods, the trend between them indicates 0% growth in flow data. This trend is corroborated by NPWD reported data over the same time period and by replicating the method used for estimating the grocery sector packaging usage in 2013 for 2006. Our base case scenario is that this trend will continue⁴⁷

Figure 10 Plastic Packaging Handled and Flow Trends⁴⁸



If we accept the 2006 and 2013 flow figures, it would suggest that the previously estimated 1.5% – 2% annual growth rate estimated and agreed by industry during PackFlow appears to be too optimistic on growth in packaging tonnage compared to the 2006 baseline POM estimated by Recoup and WRAP⁴⁹. In order to try and verify the 2006 flow estimate, Valpak replicated its method for calculating total flow in the consumer supermarket (grocery) sector in 2013 by running the same methodology based on 2006 sales and packaging data and market share information. When checked against 2006 data, the methodology is comparable to within 3% margin of error.

It is likely that increased sales have been counteracted by light-weighting activity, the Courtauld commitment is one factor driving change in this area⁵⁰. Industry members have provided evidence of this to the project team; however, the information is considered to be commercially sensitive and therefore cannot be provided in this report.

⁴⁷ 2006 figure as established in: UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks, Recoup and WRAP, November 2006, <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>. In order to try and verify the 2006 flow estimate, Valpak replicated its method for calculating total flow in the consumer supermarket (grocery) sector in 2013 by running the same methodology based on 2006 sales and packaging data and market share information. The methodology, when checked against 2006 data is comparable to within 3% margin of error.

⁴⁸ See appendix V for further details on activity lines.

⁴⁹ UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks, Recoup and WRAP, November 2006, <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>.

⁵⁰ Light weighting includes down-gauging.

6.0 Collection and Reprocessing of Plastic Packaging in 2013

6.1 Introduction

The levels of plastic packaging collected for recycling within the UK in 2013 was assessed. The collections are split between consumer and non-consumer. Each sector is then broken down into the following key plastic packaging streams:

- Consumer bottles;
- Consumer PTTs;
- Consumer film;
- Non-consumer bottles;
- Non-consumer other rigids; and
- Non-consumer film.

The amount of plastic packaging collected is assumed to be equivalent to the levels of reprocessing; the data on local authority (LA) recycle collections (from Recoup) being used as a proxy for household recycling and the number of PRNs being raised as the total recycling level. However, it is important to bear in mind that these figures do not account for process loss from collection to recycling⁵¹ or the amount of unaccredited reprocessing.

6.1.1 Consumer Collections 2013

The consumer (local authority) collection figure of plastic packaging in the UK in 2013 was provided as an estimate by Recoup.⁵² Details of the collection figures can be found in Figure 11.

Figure 11 Consumer Plastic Packaging Collected 2013⁵³

	Total (k tonnes)
UK Total Bottles	330
UK Total Mixed Plastics ⁵⁴	140

The figure above splits the consumer collections into bottles and mixed plastics, as in the Recoup studies. It is believed that the majority of mixed plastics are pots, tubs and trays (PTTs); however, it is likely that a small amount of this material is consumer film as some local authorities are now collecting this stream. Using data available from a small sample of local authorities⁵⁵ and supermarkets⁵⁶, it has been estimated that up to 16k tonnes of the mixed plastics collected in 2013 could have been consumer film: this represents around a 4% recycling rate for this stream⁵⁷.

⁵¹ In the case of recycling polythene film process loss is minimal, as roughly for every tonne collected only a couple of kilos of non polythene contamination is lost (Source: BPI).

⁵² At the time of report writing the Recoup 2014 survey was not published, therefore Recoup provided estimates for the purpose of this report.

⁵³ Estimations from Recoup LA collection Survey 2013, not published at time of report writing.

⁵⁴ Including PTTs and household film.

⁵⁵ As calculated during Plastics 2017 extension project, December 2013.

⁵⁶ Supermarket back of store data, Valpak surveys, 2014.

⁵⁷ This is based on local authority data, including <http://www.wrapcymru.org.uk/content/composition-municipal-solid-waste-wales-0> and that provided directly by local authorities and supermarkets for this project. This has then been scaled up to represent UK collections based on supermarket market share data for front of store collections and the number of households with a film collection service for kerbside collections. Based on some data being provided in confidence, detailed calculations cannot be provided here.

Based on this, Figure 12 shows the recycled tonnages, with PTTs and film split out, and the associated recycling rates of all consumer streams in 2013.

Figure 12 Consumer Plastic Packaging Recycling Rates 2013

Stream	2013		
	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)
Consumer Total	1534k	31%	470k
<i>Consumer Bottles</i>	<i>594k</i>	<i>56%</i>	<i>330k</i>
<i>Consumer PTTs</i>	<i>525k</i>	<i>24%</i>	<i>124k</i>
<i>Consumer Film</i>	<i>414k</i>	<i>4%</i>	<i>16k</i>

6.1.2 Non-consumer Recycling

Non-consumer collections were estimated as follows:

Total UK Plastic Packaging Collected (NPWD)	-	Local Authority Collections (Recoup)	=	Non-consumer Collections
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The total quantity of plastic packaging recycled is taken from NPWD⁵⁸ for 2013 and is used as a proxy for the total quantity collected. Consumer collection quantities are taken from Recoup's latest survey of 2013. Non-consumer collection quantities are calculated as the residual from the total quantity, which is reported as recycled on NPWD minus the Recoup estimate. With a total of 714k tonnes collected for recycling in 2013 and 470k tonnes identified as being consumer packaging, this leaves a balance of 244k tonnes, which is therefore considered to be the amount of plastic packaging recycled from the non-consumer stream in 2013.

The recycling rates of each stream is determined by using the same proportions as set out in PlasFlow 2017, which was based on secondary research reports to estimate the quantity of recycling carried out in each sector and applying these rates to the sectors accordingly (see Appendix II for more details).

The estimate for non-consumer collections is shown in Figure 13.

Figure 13 Non-consumer Plastic Packaging Recycling Rates 2013

Stream	2013		
	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)
Non-Consumer Total	726k	34%	244k
<i>Non-Consumer Bottles</i>	<i>68k</i>	<i>14%</i>	<i>10k</i>
<i>Non-Consumer Other Rigids</i>	<i>310k</i>	<i>7%</i>	<i>21k</i>
<i>Non-Consumer Film</i>	<i>348k</i>	<i>61%</i>	<i>213k</i>

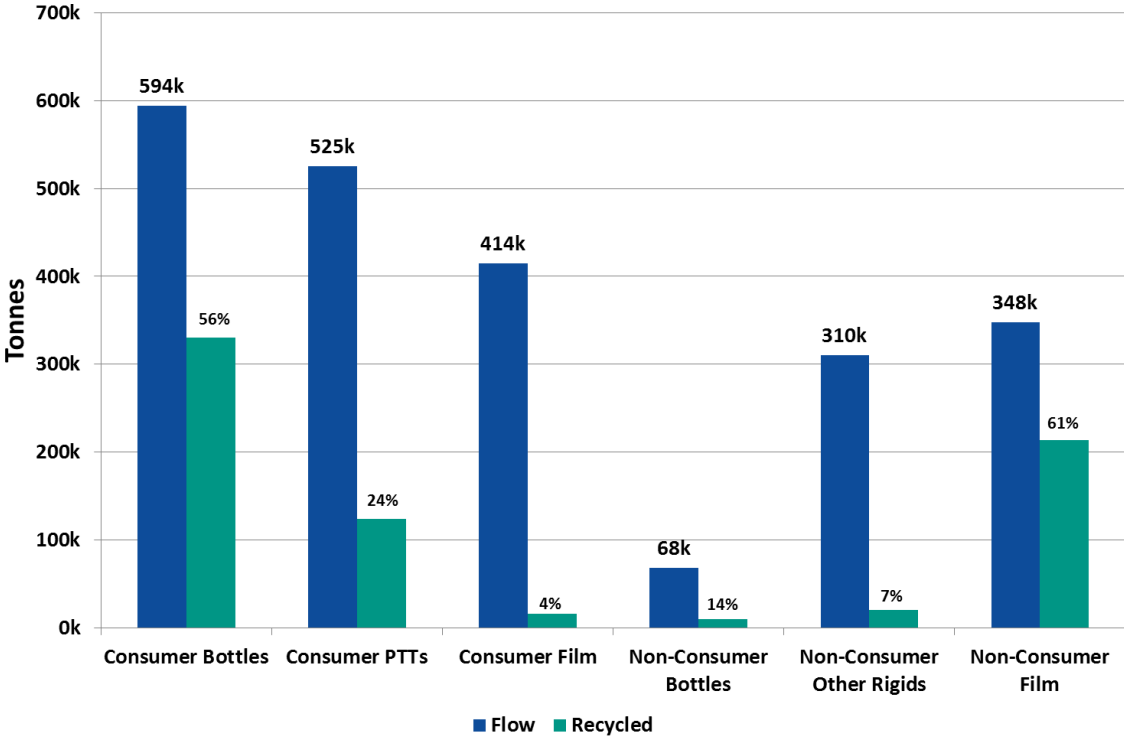
The Recoup survey collection figures will not exactly equal the amount collected for recycling owing to some losses as materials travel through the supply chain.

⁵⁸ <http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx>

The NPWD collection figures only cover obligated waste by accredited agents, and do not include quantities recycled without a PRN/PERN being generated.

Figure 14 provides a summary of the current level of recycling by plastic packaging material format. It does not take into account quantities recycled without a PRN/PERN being issued⁵⁹. Overall, the results suggest the UK achieved a recycling rate of 32% in 2013, as shown in Figure 14.

Figure 14 Plastic Packaging Recycling Rates 2013



Stream	2013		
	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)
Total	2260k	32%	714k
Consumer Total	1534k	31%	470k
<i>Consumer Bottles</i>	<i>594k</i>	<i>56%</i>	<i>330k</i>
<i>Consumer PTTs</i>	<i>525k</i>	<i>24%</i>	<i>124k</i>
<i>Consumer Film</i>	<i>414k</i>	<i>4%</i>	<i>16k</i>
Non-Consumer Total	726k	34%	244k
<i>Non-Consumer Bottles</i>	<i>68k</i>	<i>14%</i>	<i>10k</i>
<i>Non-Consumer Other Rigid</i>	<i>310k</i>	<i>7%</i>	<i>21k</i>
<i>Non-Consumer Film</i>	<i>348k</i>	<i>61%</i>	<i>213k</i>

Appendix III provides a detailed assessment of relative levels of confidence in the data.

⁵⁹ Details of how much plastic packaging may be being recycled without a PRN being raised can be found in Appendix VI

7.0 Flow & Recycling Scenario

7.1 Introduction

This section looks at the historical (2008 – 2013) POM figures for plastic packaging in the UK. This is achieved using the previous estimated flow figure for 2006 and comparing it to the latest figure, as well as using the net pack fill figure (as detailed in Section 4) and seeing how this compares with the flow figures over the same period.

7.2 Flow Scenario

From the results detailed in section 5, plastic packaging placed on the market between 2006 and 2013 has been effectively stable based on producer reported data. Although the exact reason for the flat growth rate is unknown, it is considered feasible by the stakeholder group because any increase in consumption is likely to have been negated by packaging light weighting activity⁶⁰. One of the key factors driving light-weighting has been the increase in virgin plastic prices.

Given the aforementioned trends (and in the absence of any data regarding future plastic packaging consumption vs likely trends in consumer expenditure), this project's base case scenario is for POM to continue to be flat through to 2020. This project therefore assumes that the 0% growth rate will continue up to 2020, but highlights that the steering group noted the need for a review in two years' time to verify this trend; some suspect this could instead be a decline in overall consumption.

7.3 Recycling Scenario

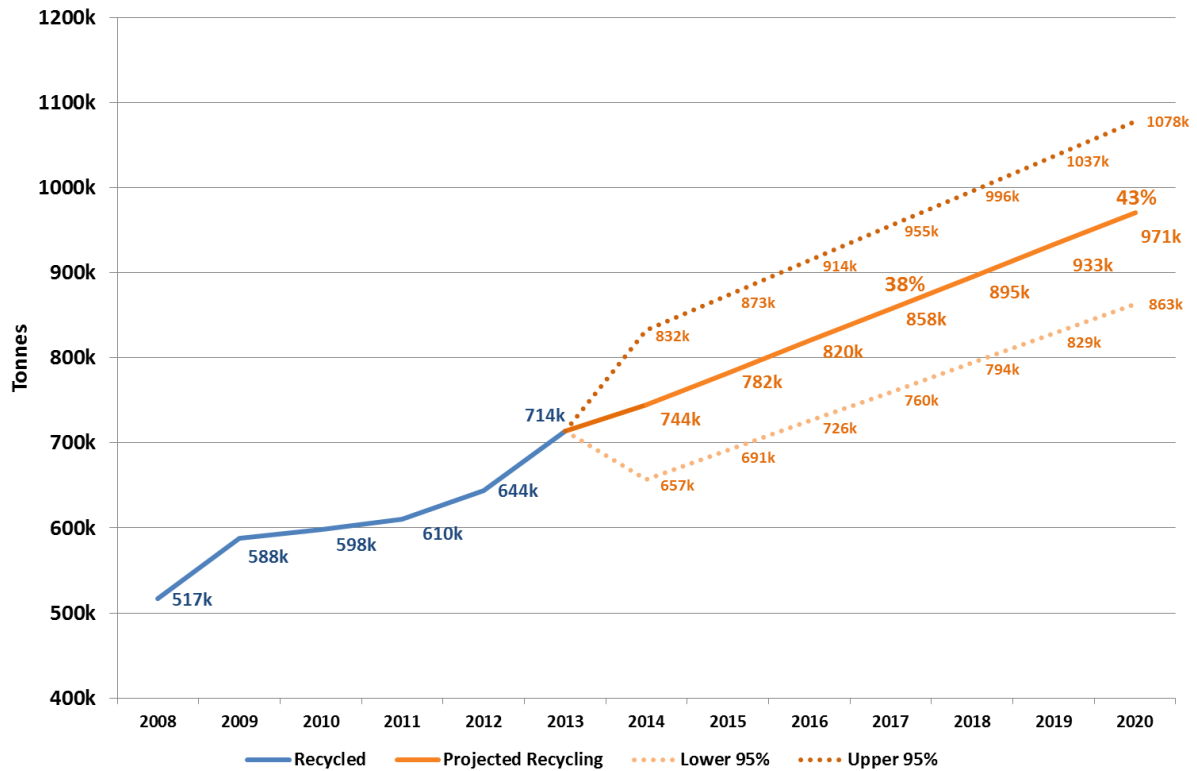
The base case recycling scenario was calculated using linear regression analysis. This method extends the trend observed in historical reprocessing figures into the future. By assumption, factors driving past performance are projected into the future. The projection is based on accredited reprocessing tonnages reported by NPWD for 15 previous years (between 1998 and 2013).

This method does not provide a particularly sophisticated scenario analysis and ignores factors such as developments of the collection system (if collection systems were believed to be mature, then growth would be expected to level off), the timing of potential future policy interventions in recycling markets, the timing of possible changes in legislation, the impact of a future carrier bag levy (see Appendix VII) and any other potential external influences that might impact on the plastic reprocessing market.

Figure 15 illustrates historical recycling activity (actual reported figures) and the results of the linear regression up to 2020, including a lower and upper limit using 95% confidence intervals.

⁶⁰ As reported by the grocery sector under the Courtauld commitment. In addition, industry members provided separate evidence of light-weighting to the project team; however, the information is considered commercially sensitive and therefore cannot be provided in this report.

Figure 15 UK Plastic Packaging Recycling Scenario



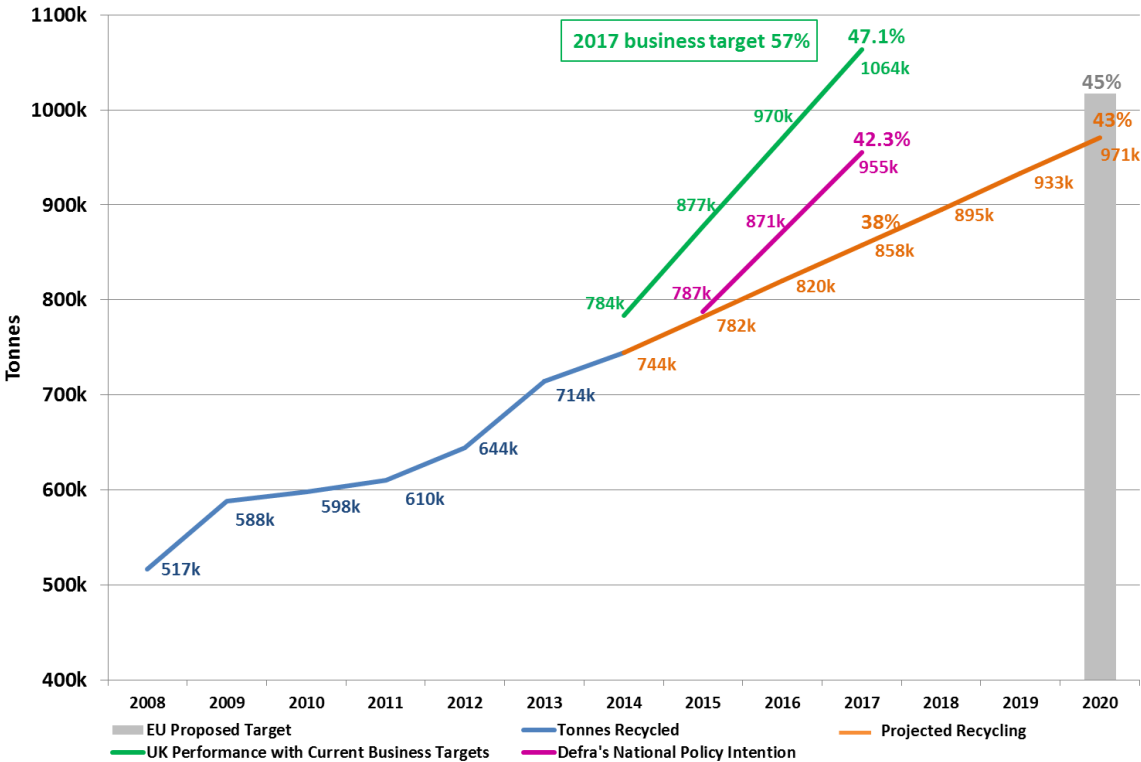
The recycling rate of 38% in 2017 assumes zero growth in POM from the project final estimate of 2,260k tonnes in 2013. This result suggests the UK would fall short of meeting the current policy intention set by Defra in 2011, of 42% in 2017, if the new POM figure were to be adopted. It also suggests that the UK would slightly underachieve from meeting the current proposed EU target of 45% in 2020. In addition, the UK would not meet current business targets up to 2017 (see Appendix IV for current business targets).

Figure 16 illustrates where the UK would need to be if it were to meet current business targets⁶¹. Meeting the current business target would see the UK achieve a national recycling rate of 47.1% in 2017 using the new flow estimate. It also illustrates the quantities required to be recycled nationally in order to just meet the current national policy intention of 42.3% in 2017 as set out in set out in Defra’s 2011 consultation on recovery and recycling targets for packaging waste for 2013-2017⁶².

⁶¹ The business targets are only applicable to obligated companies and based on current Defra flow estimate would equate to a national average recycling rate of 42.3% in 2017. They are set higher than the UK national achievement policy intention as they are only applicable to obligated companies; therefore, they need to account for non-obligated companies’ packaging handled.

⁶² https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82440/packaging-consult-doc.pdf

Figure 16 UK Plastic Packaging Recycling versus Compliance⁶³



Based on the results of the linear regression (and using the new project flow estimate) there is a suggested gap of 206k tonnes between the 2017 recycling rate of the projection scenario and the tonnage required to meet the business target in 2017 (if the revised POM were adopted). This gap closes to 46k tonnes between projection scenario and current proposed targets in 2020⁶⁴.

If the UK met its current business targets in 2017, and based on the flow figure of 2,260k tonnes and assuming no growth in flow up to 2017, meeting the current business targets would result in the UK exceeding the current national policy intention by five percentage points.

⁶³ Using the project final flow estimate.

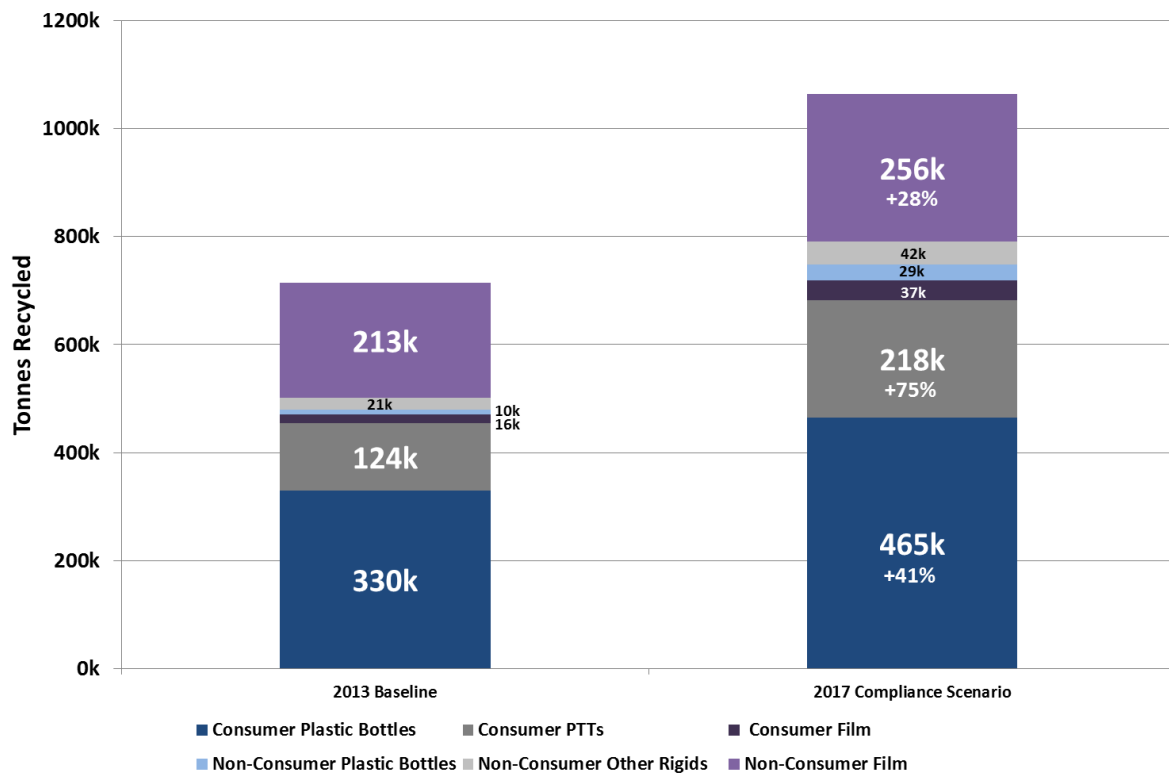
⁶⁴ Linear regression does not consider intervention activities or market influences on the rate of recycling, but is based on historical trend only.

8.0 Scenario Analysis

This section is an update of the scenarios developed for PlasFlow 2017, using the new project estimated flow figures of 2,260k tonnes. The scenario analysis firstly assumes compliance with 2017 business targets and secondly with Defra's current national policy intention for 2017 and the EU proposed target for 2020.

The first scenario (figure 17) calculates the gap between required recycling and projected recycling (using linear regression) and closes the gap by proportioning one third of the difference in tonnage to consumer bottles, one third to consumer PTTs and the final third split equally between the other four streams. The key data from the scenarios is also provided in the figures, which provides the tonnage required per format.

Figure 17 2017 Compliance Scenario: Meeting Business Targets

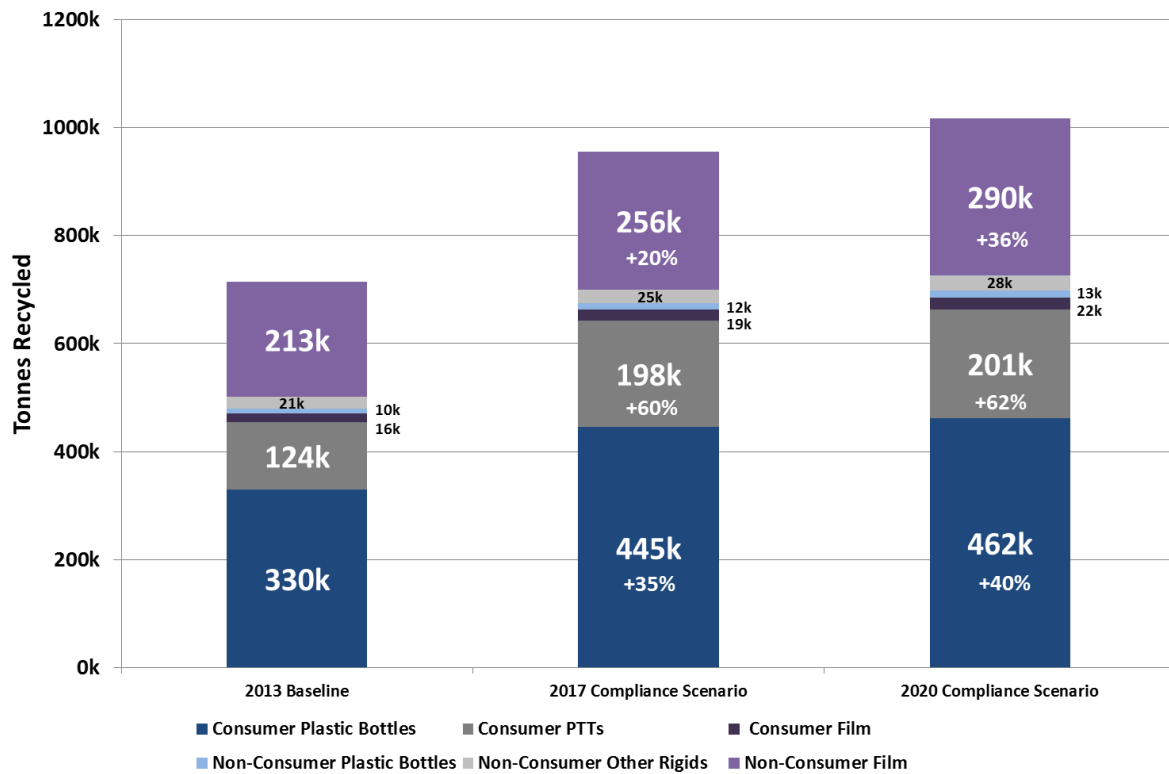


Stream	2013			2017		
	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)
Total	2260k	32%	714k	2260k	47%	1064k
Consumer Total	1534k	31%	470k	1534k	47%	719k
<i>Consumer Bottles</i>	<i>594k</i>	<i>56%</i>	<i>330k</i>	<i>594k</i>	<i>78%</i>	<i>465k</i>
<i>Consumer PTTs</i>	<i>525k</i>	<i>24%</i>	<i>124k</i>	<i>525k</i>	<i>41%</i>	<i>218k</i>
<i>Consumer Film</i>	<i>414k</i>	<i>4%</i>	<i>16k</i>	<i>414k</i>	<i>9%</i>	<i>37k</i>
Non-Consumer Total	726k	34%	244k	726k	47%	345k
<i>Non-Consumer Bottles</i>	<i>68k</i>	<i>14%</i>	<i>10k</i>	<i>68k</i>	<i>43%</i>	<i>29k</i>
<i>Non-Consumer Other Rigid</i>	<i>310k</i>	<i>7%</i>	<i>21k</i>	<i>310k</i>	<i>14%</i>	<i>42k</i>
<i>Non-Consumer Film</i>	<i>348k</i>	<i>61%</i>	<i>213k</i>	<i>348k</i>	<i>79%</i>	<i>273k</i>

The following scenario assumes compliance with Defra's current national policy intention for 2017 and the EU proposed target for 2020. Additional material required to be recycled to

meet the intentions has been attributed equally to consumer bottles and consumer PTTs (the other four streams follow linear regression as per figure 15).

Figure 18 2017 and 2020 Compliance Scenarios: Meeting National Policy Intention



Stream	2013			2017			2020		
	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)	Consumed (Tonnes)	Recycling Rate	Recycled (Tonnes)
Total	2260k	32%	714k	2260k	42%	955k	2260k	45%	1017k
Consumer Total	1534k	31%	470k	1534k	43%	662k	1534k	45%	685k
Consumer Bottles	594k	56%	330k	594k	75%	445k	594k	78%	462k
Consumer PTTs	525k	24%	124k	525k	38%	198k	525k	38%	201k
Consumer Film	414k	4%	16k	414k	5%	19k	414k	5%	22k
Non-Consumer Total	726k	34%	244k	726k	40%	293k	726k	46%	332k
Non-Consumer Bottles	68k	14%	10k	68k	17%	12k	68k	20%	13k
Non-Consumer Other Rigid	310k	7%	21k	310k	8%	25k	310k	9%	28k
Non-Consumer Film	348k	61%	213k	348k	74%	256k	348k	83%	290k

9.0 Conclusions & Recommendations

This section details the conclusions of the project and details the main areas recommended for further work.

9.1 Conclusions: Flow

The project's final best estimate of UK flow for 2013 is 2,260k tonnes: a reduction of 332k tonnes from the estimated current flow figure

The most robust estimate that could be derived, using a variety of the most authoritative methods, including industry estimates, Valpak data and publicly available data, suggests that the quantity of plastic packaging POM in 2013 was 2,260k tonnes. This figure comes out 332k tonnes lower than the current industry estimate of 2,592k tonnes for 2013.

The new flow estimate is similar to the 2006 estimated flow of 2,284k tonnes

The final project estimate of 2,260k tonnes is found to be similar to the previous baseline estimate that was made by industry, of 2,284k tonnes. Although these two flow estimates were based on different methodologies, having replicated its method for calculating total flow in the consumer supermarket (grocery) sector in 2013 by running the same methodology based on 2006 sales and packaging data and market share information; the methodology, when checked against 2006 data, is comparable to within 3% margin of error.

Although the 2006 and 2013 estimates are derived from differing methods, the trend between them indicates 0% growth in flow data

Trend in total flow indicates no growth in overall plastic packaging over the last seven years. This trend is corroborated by reported obligated consumption over the same time period and also by replicating the method used for estimating the grocery sector packaging usage in 2013 for 2006. This trend is projected to continue; nevertheless, it was recommended during the final steering group meeting for further work to be carried out in two years' time to verify this assumption.

It is likely that increased sales has been counteracted by light-weighting activity

The plastics packaging industry has believed for some time that packaging producer activity to light-weight plastic packaging⁶⁵ has negated any potential growth in consumption and the results of this work would seem to support this assumption. Industry members have provided evidence of this to the project team; however, the information is considered to be commercially sensitive and therefore cannot be provided in this report.

There was uncertainty around the final estimation for non-consumer rigids

An estimate of the plastic packaging being POM highlighted gaps in the data. These gaps were to be found in plastic packaging within the hospitality sector and manufacturing sector, using the bottom up approach (method 1). As the non-consumer rigids' final estimate is derived from the bottom-up approach, the steering group felt this area would require further work in future to verify the non-consumer rigids POM.

9.2 Conclusions: Recycling

The recycling performance of the UK is a higher percentage than was previously reported

The results of this work indicate the UK would have achieved a 32% recycling rate in 2013 if the revised POM was adopted, which is higher than the current rate of 27% in 2013. The

⁶⁵ Including down-gauging activity.

change is due to a reduction in the estimated flow; reported tonnages recycled remain the same.

Significant increases in recycling are still required in order to meet the current business targets

If the new POM figure is adopted the UK will need an additional 349k tonnes of plastic packaging recycling between 2013 and 2017 to deliver the 2017 business target.

Assuming that the UK continues to increase recycling at the same rate as the 1998-2013 average and that the new POM figure is adopted, the UK will still fall short of meeting compliance in 2017. Based on these assumptions the UK will require an additional 206k tonnes in 2017 to meet the current business target.

The current business targets will result in the UK exceeding its current policy intention (as set out in Defra's 2011 consultation on recovery and recycling targets for packaging waste for 2013-2017⁶⁶)

If Government adopts the revised POM figure then achieving the current business target of 57% in 2017 would mean the UK would achieve a national recycling rate of 47%, which is 5% higher than intended achievement.

There is an estimated 50k tonnes of unaccredited plastic reprocessing⁶⁷

The project estimated some 50k tonnes of plastic packaging that is reprocessed but does not have a PRN/PERN issued against it. This appears to be less significant in terms of quantity of recycling being conducted without a PRN being raised in 2013, than was previously estimated in PlasFlow 2017 for 2011 (of up to 100k tonnes).

By including the estimated unaccredited reprocessing, the recycling rate increases

The recycling rate for plastic packaging increases to 34% if the level of unaccredited recycling is included (and assuming the revised POM figure is adopted).

The recycling rates for plastic are expected to increase through to 2020 if the current trends continue

The plastic recycling rate could reach 43% in 2020. These rates are based on the assumption that historical trends will continue.

There was uncertainty around the final recycling rates for non-consumer rigids

The steering group considered the recycling rate for non-consumer rigids to be low. This could either be due to the flow figure being overestimated or could be attributable to the impact of unaccredited recycling.

9.3 Possible Areas for Further Work

Further investigation into NPWD in order to provide a POM figure that is comparable with other estimates

A more thorough analysis of the NPWD, assessed by sector, may provide insight into the non-consumer rigids sector by way of confirming whether it is a reasonable estimate or not. Discrepancies between reported data within sectors and the bottom-up figures may be highlighted using this method.

⁶⁶ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82440/packaging-consult-doc.pdf

⁶⁷ See Appendix VI for details.

Packaging is considered plastic if plastic is the predominant material by weight in a composite. It is not clear how sellers and packer/fillers declare this information and so it would be beneficial to investigate this further with producers.

Further surveying of BPF members to establish non-consumer rigids POM

There is uncertainty around the quantity of non-consumer rigids on the market and quantity being recycled. This was highlighted as a key area of uncertainty when trying to construct the level of packaging being POM for plastic. A possible way forward might include another survey of BPF members, to build on the one undertaken as part of this project, with an aim to achieve a higher response rate and an understanding of market share information.

Verification of likely growth or no growth in flow up to 2017

The work highlighted a likely zero growth in flow up to 2017. This was based on historical trends; however, there is scope to revisit the flow estimate in two years' time to re-evaluate whether the trend continues. Whilst the steering group thought it may decline in future due to light weighting higher consumption through potential economic growth could negate this.

Appendix I Grocery Retail Cross Reference

To sense-check the validity of the EPIC data for grocery retail, Valpak requested aggregated data from the EA for selected retailers. Table 1 selling data were requested for plastic packaging handled in 2013 (2013 sales) for the following retailers:

- Tesco;
- Asda;
- Sainsbury;
- Morrisons;
- Iceland;
- Co-Op;
- Boots;
- M&S;
- Aldi;
- Lidl;
- Nisa; and
- Musgrave (Budgens).

The table below shows the information supplied by the EA.

Figure 19 Aggregated EA Grocery Retail Packaging Handled (2013)

	Plastic (k tonnes)
Grocery Retail	951 ⁶⁸

EPIC data was scaled up to account for the above retailers (using market share information by volume sales, provided by Kantar). Figure 20, below, compares the scaled-up EA figures to the scaled-up EPIC data.

Figure 20 Aggregated Grocery Retail Packaging Handled (2013)

	Plastic (k tonnes)
EA Grocery Retail	951 ⁶⁹
EPIC Grocery Retail	981
Difference	30 (3%)

Figure 20 shows the tonnage difference between the scaled up EA grocery retail and EPIC grocery retail tonnage. As the EPIC grocery retail tonnage is only 3% higher than the EA data, Valpak is confident with the data and market share information used in this calculation and would suggest the EPIC data is a good approximation for grocery retail packaging.

⁶⁸ As reported in May 2014

⁶⁹ As reported in May 2014

Appendix II Non-consumer Recycling Rates

This section is an extract of the breakdown method for non-consumer recycling. It has been taken directly from PlasFlow 2017.

The PlasFlow research identified the recycling rates for each sector, but only in aggregate across all types of waste (including packaging and non-packaging, plastic and other materials). The research did not yield recycling rates specific to plastic packaging, so it was assumed the overall sector recycling rates also applied to plastic packaging within that sector, with the main assumptions made being:

- Agricultural sector has a 32% recycling rate, it was assumed that this could also be applied to plastics packaging as a single stream⁷⁰;
- Construction & Demolition waste overall has a 33% recycling rate. It was assumed that this could also be applied to plastics packaging as a single stream⁷¹;
- Hospitality sector has a recycling rate of 47%, it was assumed that this could also be applied to plastics packaging as a single stream⁷²; and
- The tonnage balance recycled was that from other businesses within the C&I stream, including manufacturers.

Based on these assumptions the levels of plastic recycling in the non-consumer sector saw 13% considered to be rigid plastics and 87% film.

⁷⁰ <http://www.wrap.org.uk/sites/files/wrap/UK%20Plastics%20Waste.pdf>

⁷¹ European Council for Vinyl Manufacturers 2011

⁷² http://www.wrap.org.uk/sites/files/wrap/The_Compotion_of_Waste_Disposed_of_by_the_UK_Hospitality_Industry_FINAL_JU_LY_2011_GP_EDIT.54efe0c9.11675.pdf

Appendix III Data Robustness

A robustness analysis was completed on the data sources used. This was developed to highlight the level of uncertainty for each data source by scoring the data sources on the evidence and agreement level from stakeholders. The results are shown in Figure 21, which has been constructed based on analysis completed for each project estimate. Questions were created relating to the evidence and agreement levels of the data used.

The tables thereafter provide a full breakdown for each project estimate. If the question is answered 'Yes' then a score of 3 is given, if 'No' then a score of 0. Where a partial score is given, a score 1 or 2 is made and a comment is added to justify this decision. An example of this is in figure 32 where the NPWD net pack/fill data scores a partial score for coverage as the data misses unobligated tonnage.

Figure 21 Data Robustness Assessment Results

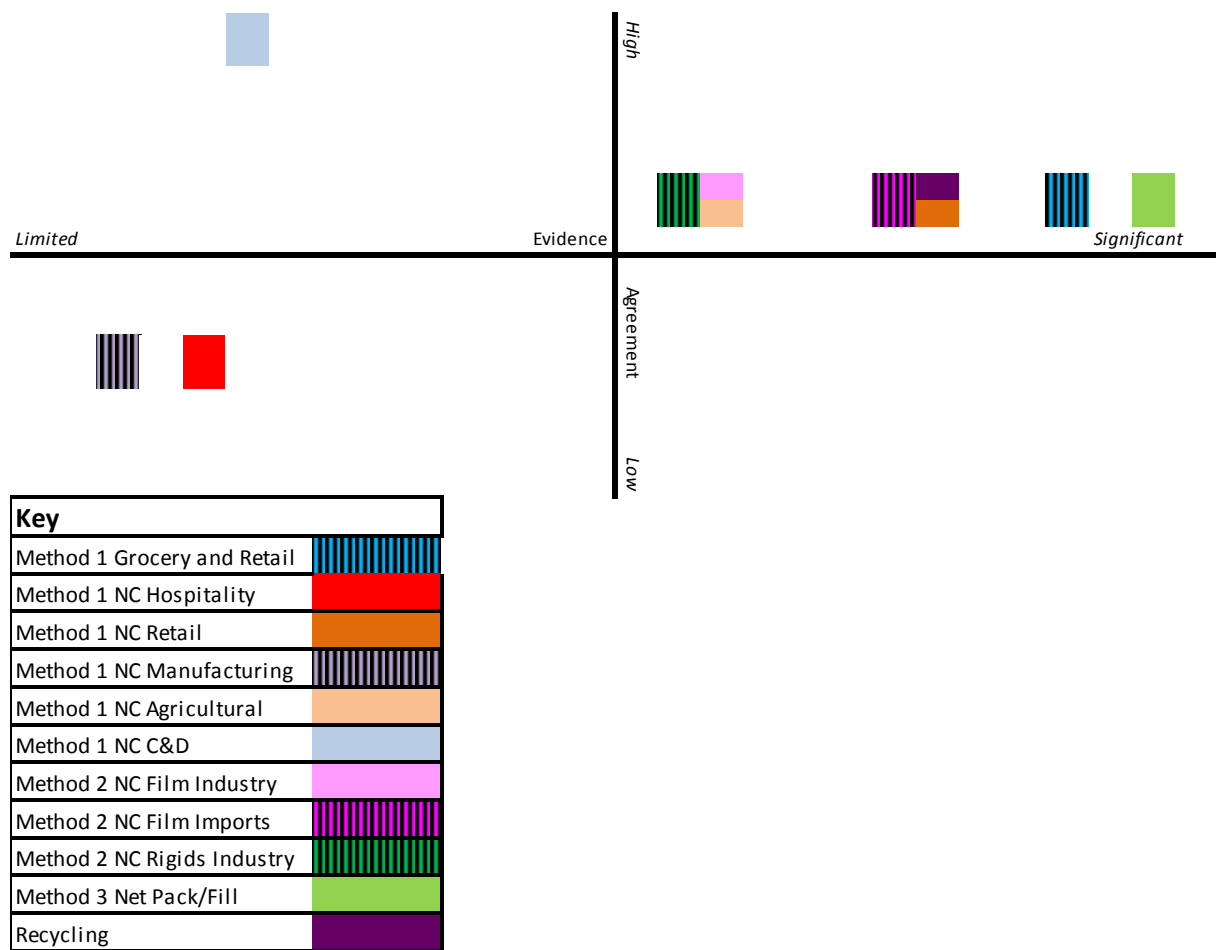


Figure 22 Data Robustness Assessment: Method 1 Consumer - Grocery Retail

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	Y	3	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Y	3	Checked against EA reported Data
Total	24		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 23 Data Robustness Assessment: Method 1 Total Retail

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	Y	3	ONS and Valpak member data
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	Y	3	
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	24		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 24 Data Robustness Assessment: Method 1 Non-consumer – Hospitality Sector

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	N	0	
Does the data provide complete coverage?	N	0	
Has the data been sourced from credible, up-to-date sources?	with reservations	2	Packaging is not key focus of the research - best available data only
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	N	0	Packaging is not key focus of the research - best available data only
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	N	0	Packaging is not key focus of the research - best available data only
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	N	0	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	5		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	No other data available
Do the key stakeholders/experts actively agree with the findings?	N	0	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	3		

Figure 25 Data Robustness Assessment: Method 1 Non-consumer – Retail Back of Store

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	Y	3	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	21		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 26 Data Robustness Assessment: Method 1 Non-consumer – Manufacturing Sector

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	N	0	
Does the data provide complete coverage?	N	0	
Has the data been sourced from credible, up-to-date sources?	N	0	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	N	0	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	N	0	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	N	0	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	3		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	N	0	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	3		

Figure 27 Data Robustness Assessment: Method 1 Non-consumer – Agricultural Sector

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	N	0	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	with reservations	2	Credible source but not up-to-date
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	with reservations	2	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	16		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 28 Data Robustness Assessment: Method 1 Non-consumer – Construction & Demolition Sector

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	N	0	
Does the data provide complete coverage?	N	0	
Has the data been sourced from credible, up-to-date sources?	most, not all	2	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	most, not all	2	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	most, not all	2	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	12		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 29 Data Robustness Assessment: Method 2 Non-consumer Film Industry Estimations

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	Y	3	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	with reservations	2	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	with reservations	2	
Have the methodology/calculations been independently checked (internally or externally)?	N	0	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	16		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 30 Data Robustness Assessment: Method 2 Non-consumer Film Filled Imports

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	most, not all	2	Missing unobligated tonnages but reasonably strong evidence and industry agreement this isn't a large amount
Has the data been sourced from credible, up-to-date sources?	Y	3	The EA is an official data source
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	Y	3	
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	N	0	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	20		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 31 Data Robustness Assessment: Method 2 Non-consumer Rigids Survey

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	N	0	31% response rate
Has the data been sourced from credible, up-to-date sources?	Y	3	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	N	0	Market share is an estimation only
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	N	0	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Y	3	
Total	15		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 32 Data Robustness Assessment: Method 3 (NPWD Net Pack/Fill)

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	most, not all	2	Missing unobligated tonnages
Has the data been sourced from credible, up-to-date sources?	Y	3	The EA is an official data source
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	Y	3	By the EA
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	By the EA and 360 Environmental
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	Y	3	Against total flow and gap between obligated and non-obligated is reasonable
Total	26		
Degree of agreement around the findings (max 9):			
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Figure 33 Data Robustness Assessment: Accredited Recycling

Evidence (Robustness and completeness, max 27):	Scoring		Evidence
Does the data cover the correct time-frame?	Y	3	
Does the data provide complete coverage?	Y	3	
Has the data been sourced from credible, up-to-date sources?	Y	3	
Is the underlying data reasonably free from concerns (e.g. official data from the ONS)?	Y	3	
Have the findings been independently peer-reviewed?	N	0	
Is the methodology/calculation reasonably free from concerns?	Y	3	
Have the methodology/calculations been independently checked (internally or externally)?	Y	3	
Is the quantitative evidence well rooted in a wider qualitative understanding of the issue?	Y	3	
Have the findings been sense-checked against credible alternative sources (incl. inconclusively)?	N	0	
Total	21		
Degree of agreement around the findings (max 9):	Scoring		Evidence
Does more than one data source confirm the findings (within +/- 5%)?	N	0	
Do the key stakeholders/experts actively agree with the findings?	Y	3	
Has feedback from the key stakeholders been incorporated in the reporting of findings?	Y	3	
Total	6		

Appendix IV Current UK Business Targets⁷³

Figure 34 Current UK Business Targets for Plastics Packaging

2014	2015	2016	2017
42%	47%	52%	57%

⁷³ <https://www.gov.uk/government/policies/reducing-and-managing-waste/supporting-pages/packaging-waste-producer-responsibility-regimes>

Appendix V Obligation Reporting Activity Lines

Figure 35 The EA's Data Form – Activity Descriptions

Activity	Description
Raw material manufacturing	Production of raw materials that will be made into packaging
Conversion	Conversion of raw materials into packaging
Packing/filling	Applying packaging to goods
Selling	Supplying packaging to an end user i.e. the company/person who removes the packaging

Appendix VI Unaccredited Reprocessing

The accredited reprocessing was estimated from NPWD data using the quantity of PRNs and PERNs issued. However it is understood that there is additional recycling that takes place where a PRN or PERN is not raised on the packaging. This is referred to as unaccredited recycling, and due to it not being reported, does not count towards the UK's achievement.

During the PlasFlow 2017 project an assessment was made into the possible tonnage of plastic packaging that may be being recycled by unaccredited reprocessors. It was estimated that 50 facilities in the UK may be recycling plastics, but were unaccredited in 2011.

The decision to become accredited (or not) was assumed to be based on a financial cost-benefit comparison of gaining accreditation, namely the breakeven point between average PRN revenue and accreditation fees/administration costs. This was based on Valpak's market knowledge, but was corroborated by assessing the number of accredited reprocessors/exporters against the average plastic PRN price. The results did give an indication that following a year with an inflated PRN price, such as 2008, reprocessor accreditations increase, and when the PRN price is depressed, such as 2009 to 2011, the number of facilities becoming accredited decreases. This has been confirmed during 2012 and 2013, whereby more reprocessors have become accredited following a period of high plastic PRN prices.

Based on the analysis conducted as part of PlasFlow, it was identified that a 'small' facility would need to recycle more than 324 tonnes of plastics in 2011 and a 'large' facility 995 tonnes in 2011 to breakeven against accreditation costs. As a result, up to 37k tonnes of plastics could have been recycled by unaccredited recycling facilities in the UK in 2011 but not contributing to the national packaging recycling rates due to the costs of accreditation.

Having recalculated the figures for 2012 and 2013 (based on average PRN prices for those years) and assessing the quantities against the additions to NPWD the project concludes that the PlasFlow 2017 estimated 37k tonnes remains an accurate assessment for 2013. This is due to assessing number of drop offs and add-ons by size over the two years, and although there has been an overall increase in number of accreditations, there has been an increase in the number of smaller registered producers but a decrease in the larger ones, showing no change in the overall tonnage likely to be reprocessed unaccredited.

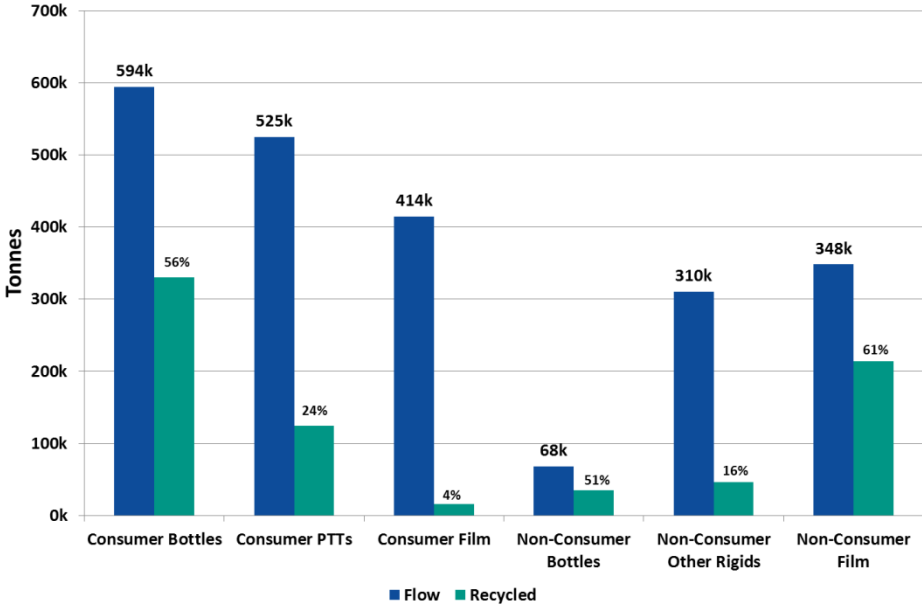
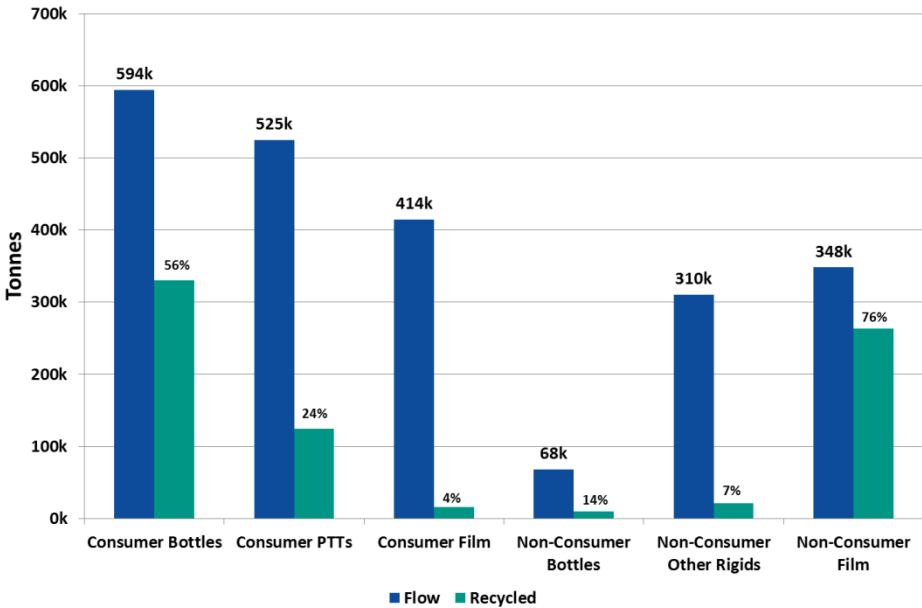
Other examples of plastic packaging recycling being undertaken, but no PRN being raised, include:

- When the appropriate 'paperwork' is not available prior to material export as such they are 'written off' for PERN generation;
- Exporters that sometimes export to factories not registered with the EA therefore losing the PERNs;
- Recyclers receiving a mixture of packaging and non-packaging material that do not issue PRNs as the sampling required is considered too onerous.

This figure of unaccredited export recycling of plastic is not known so this report estimates total unaccredited recycling at ~50k tonnes. Figure 36 below illustrates two scenarios where the additional 50k tonnes has been included and recycling rates calculated. The first graph shows the impact if all the unaccredited recycling was attributed to non-consumer film. The second shows the impact if it was all attributed to non-consumer rigids (split evenly between

bottles and other rigids)⁷⁴. Since unaccredited recycling does not count towards the UK's achievement, encouraging accredited recycling is important in helping to achieve the recycling targets.

Figure 36 Plastic Packaging Recycling Rates 2013, Including Unaccredited Recycling



If the 50k tonnes estimated unaccredited recycling was issued with PRN/PERNs in 2013, UK recycling levels would have achieved 34%.

The non-consumer recycled tonnage of 244k tonnes⁷⁵ is therefore likely to be lower than total recycling, given the discussion above, however as the number of PRN/PERNs raised is the basis on which compliance with the Packaging Regulation targets is assessed, this figure for non-consumer packaging has been maintained.

⁷⁴ The total recycling figure is taken from NPWD, and the consumer recycling figure from Recoup 2014 survey of 2013 data, therefore it is the non-consumer sector that will be affected in terms of tonnage missed by unaccredited recycling.

⁷⁵ NPWD total recycled for 2013 minus consumer recycled tonnages using Recoup LA survey 2013 data

Appendix VII Impact of Carrier Bag Levy

The effect of the carrier bag levy introduced in Scotland in October 2014 and the forthcoming charge planned for England in 2015 was also modelled. Results of the introduction of the levy in Wales have indicated a drop in single use carrier bag usage of around 80%. This percentage has been applied to England and Scotland's carrier bag usage figures. The results of this analysis can be found in Figure 37.⁷⁶

Figure 37 Estimated Impact of Plastic Bag Levy

	Proportion Usage 2013	2013 (tonnes)	80% Reduction (tonnes)
Northern Ireland	1%	382	
Wales	1%	445	
England	90%	50,885	40,708
Scotland	9%	5,088	4,071
Total	100%	56,800	44,778

The analysis suggests there will be a reduction of approximately 45k tonnes (1.98% of overall flow) over the next couple of years. The estimate for England may be an overestimation as the regulations in England will only affect the larger retailers, compared to every retailer in Wales and Northern Ireland. The impact of the levy however has not been accounted for in the projections since we use historical trend only to project future flow.

⁷⁶ <http://www.publications.parliament.uk/pa/cm201314/cmselect/cmenvaud/861/861.pdf>

Appendix VIII Sensitivity Analysis

Assumption 1

In order to assess total retail flow, including non-grocery retailers, analysis was completed on packaging tonnes per £bn turnover (method 1). The result showed that non-grocery plastic packaging tonnes/£bn turnover is 50.2% of grocery plastic packaging tonnes/£bn turnover, based on the average for a number of retailers.

Sensitivity analysis has been carried out to establish the impact on total flow if this percentage was 5% lower or higher. If non-grocery plastic packaging tonnes/£bn turnover was 45.2% of that used in the grocery sector, total flow would be 2,206k tonnes (-2% from final project estimate) and if non-grocery plastic packaging tonnes/£bn turnover was 55.2% of that used in the grocery sector, total flow would be 2,317k tonnes (+3% of current project estimate).

However the retailers used in the calculation account for 32% of reported obligated tonnage of plastic packaging in 2013; assuming this is a random sample, the sample size allows 99% confidence that it represents the population as a whole with an error margin of 0.14%.

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