Report

Plastic Packaging Composition 2011

January 2013
Executive Summary

Introduction

The purpose of this report is to provide a more comprehensive picture of the composition (by packaging format and by plastic polymer type) of plastic packaging flowing onto the UK market in 2011.

A better understanding of the composition of plastic packaging provides a baseline for further work, such as projections of future flows of plastic packaging, analysis of the proportions of each polymer or format currently recycled and assessment of feasible recycling prioritisation strategies.

The research undertaken included both secondary and primary investigations and covered both consumer and non-consumer packaging. However, the work focused mainly on implementing a new methodology for estimating the composition of consumer plastic packaging through sampling supermarket goods packaging use. This was possible using Valpak’s access to supermarkets’ suppliers (for packaging weight/format/polymer data) and product sales data. It is believed that this is a novel way in which to estimate consumer plastic packaging consumption, as previous studies have been based on either UK industry/stakeholder consultations or waste arisings data.

Methodology

The total quantity of UK plastic packaging used in this report, and its breakdown by consumer and non-consumer streams, were estimated in the PackFlow 2017 study as ranges, and are illustrated in Figure ES1 below. For simplicity in this project, the mid-points from the PackFlow 2017 ranges have been used, for instance, 2.5m tonnes of total plastic packaging of which 1.7m tonnes are consumer plastic packaging.

In order to provide information on the composition of these packaging streams by format (e.g. bottle, film, tray, etc.) and by plastic polymer type (e.g. HDPE, PET, PP, etc.), the following methodologies were adopted:

<table>
<thead>
<tr>
<th>FLOW ONTO MARKET</th>
<th>Split</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100%</td>
<td>2,409-2,660k</td>
</tr>
<tr>
<td>Consumer (Total)</td>
<td>68%</td>
<td>1,638-1,809k</td>
</tr>
<tr>
<td>Consumer (Household)</td>
<td>57%</td>
<td>1,373-1,516k</td>
</tr>
<tr>
<td>Consumer (Away from Home)</td>
<td>11%</td>
<td>265-293k</td>
</tr>
<tr>
<td>Non-Consumer</td>
<td>32%</td>
<td>771-851k</td>
</tr>
</tbody>
</table>

1 One of the main advantages of this methodology is that the data inherently includes products and packaging imported for sale in the UK and excludes products and packaging exported.
2 PackFlow 2017 is published and is available on the Valpak website http://www.valpak.co.uk/BuildYourKnowledge/MarketResearchAndAnalysis/ProjectsAndCaseStudies.aspx
Consumer

For the purposes of this project, consumer packaging composition has been established by randomly sampling a specific quantity of the packaging used around products (including food and drink, toiletries, cleaning products, toys, electricals, etc.) found in major UK supermarkets. Whilst it is acknowledged that consumer packaging also arises in retailers other than supermarkets, it is believed this is by far the largest source of consumer packaging and is the best current dataset available for use.

A random survey sample of 467 products was assessed for packaging weight, format and polymer type of primary packaging. The sample of products and their associated suppliers were extracted from Valpak’s EPIC (Environmental Product Information Centre) database and over 3,000 suppliers contacted. Data on weight, format and polymer type were provided by 355 suppliers. The packaging weights data were then multiplied by the respective supermarket product sales data, to provide a dataset that represents the format and polymer composition of UK consumer plastic packaging consumption, in percentages. After the sales weighting, the 467 products sampled represented 421 million products, weighing upwards of 3,000 tonnes.

Broadly speaking, this means the sample is large enough to give 95% confidence that the resulting estimates of the composition of consumer plastic packaging are within +/- 4.5% of their true value (see footnote 7 for a more technical statement). This assumes, as noted before, that supermarket packaging is representative of all consumer packaging.

The composition of this dataset was then applied to the PackFlow estimate of consumer plastic packaging weight (1,724K tonnes in 2011) to derive estimates of UK consumer plastic packaging consumption by polymer type and format, in tonnes.

Consumer packaging can be further broken down, depending on where the packaging is disposed of; at home (household) or away from home (on-the-go):

- Consumer (on-the-go): an analysis of nine local authority litterbin and street sweeping compositions data was considered in order to establish splits and tonnages of away from home formats by rigid, film and bottles. Food and drink data from the random sample detailed above was then used to

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3 Consumer packaging is all packaging found around products that are placed on the market for consumer consumption.

4 The term ‘supermarkets’ is used loosely to refer to sales from companies operating supermarkets (typically with sales area of 3,001 – 25,000 sq ft selling a broad range of grocery items) and superstores (typically with sales areas above 25,000 sq ft selling a broad range of grocery items as well as non-food items). The main companies operating supermarkets in the UK include Tesco, Asda, Sainsbury’s, Morrisons, Waitrose, Iceland and the Co-op, some of which share their sales data with Valpak for packaging regulation purposes and allow Valpak the anonymised use of the associated packaging information. The database in which Valpak holds this information (weight of packaging and, for some packaging also polymer type and/or packaging format) is called ‘EPIC’.

5 Initially a target of 1066 products was set; however, in the limited timescales, the response rate achieved was lower. It has therefore been assumed that the 467 responses received are representative of the 1066 responses aimed for and are non-biased towards any particular packaging formats or polymer types.

6 The random sample of products was taken from the products with known packaging weights within the EPIC database. This is believed to be a fair representation of supermarket packaging.

7 Assuming a worst case scenario of the ratio of the standard deviation (SD) to the corresponding mean being 0.5, a sample size of 467 gives a 95% confidence interval of width +/- 4.5% from the sample mean. This confidence interval gives the range within which the likely true amount of consumer plastic packaging is likely to lie, based on the sample of packaging used and assuming the sample is representative of the population of consumer packaging. These margins of error allow for the uncertainty in using a sample to estimate the amount of packaging that is present in the larger population of products.
provide a breakdown by polymer. The resulting proportions were applied to the PackFlow 2017 midpoint estimate of “away from home” consumer packaging in the UK in 2011 (279k tonnes).

- Consumer (household): the remaining tonnages (after subtracting the on-the-go packaging figures from the total consumer figures) were considered to be packaging disposed of by consumers at home.

**Non-consumer**: The starting point for establishing the recent (2011) levels of non-consumer plastic packaging was the PackFlow 2017 midpoint estimate of 811K tonnes. This was broken down by sub-sector (agricultural, construction & demolition [C&D], and commercial and industrial [C&I]), based on a split obtained from WRAP’s 2006 report ‘UK Plastic Waste – A review of supplies for recycling, global market demand, future trends and associated risks’, which is based on 2005 estimates. In this context, commercial plastic packaging is packaging used in the retail sector, wholesale sector, hospitality sector and offices, but that is not sold with product to consumers. It includes items such as secondary and transit packaging and sacs, pots, crates, etc. that are sold with product to trade customers. Further existing data was gathered from a variety of sources and used to establish format and polymer breakdowns within each sub-sector.

Some of the estimates produced using this methodology differ from existing estimates, arrived at by other methodologies. These differences are highlighted and discussed throughout this report and in this respect, the work brings to light levels of uncertainty surrounding estimates of plastic packaging.

**Key Findings and Conclusions – All Plastic Packaging**

**Figure ES 2** UK Plastic Packaging by Format and by Polymer type, 2011

<table>
<thead>
<tr>
<th>ALL Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Film Total</strong></td>
<td>623k</td>
<td>145k</td>
<td>16k</td>
<td>143k</td>
<td>72k</td>
<td>5k</td>
<td>13k</td>
<td>98k</td>
<td>1119k</td>
<td>44%</td>
</tr>
<tr>
<td><strong>Film</strong></td>
<td>508k</td>
<td>33k</td>
<td>11k</td>
<td>96k</td>
<td>50k</td>
<td>3k</td>
<td>12k</td>
<td>69k</td>
<td>790k</td>
<td>31%</td>
</tr>
<tr>
<td><strong>Film - Bags</strong></td>
<td>120k</td>
<td>112k</td>
<td>5k</td>
<td>45k</td>
<td>9k</td>
<td>1k</td>
<td>1k</td>
<td>29k</td>
<td>321k</td>
<td>13%</td>
</tr>
<tr>
<td><strong>Film - Strapping/Tape/Bands</strong></td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>3k</td>
<td>5k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>8k</td>
<td>0%</td>
</tr>
</tbody>
</table>

| **Rigids Total**     | 11k        | 265k | 4k  | 221k | 730k | 89k | 75k | 15k  | 1415k | 56% |
| **Owens**            | 1k         | 202k | 0k  | 5k  | 331k | 0k  | 3k  | 0k   | 542k  | 22% |
| **Consumer Closures**| 3k         | 32k  | 3k  | 17k | 21k  | 0k  | 1k  | 3k   | 80k   | 3%  |
| **Consumer PTTs**    | 5k         | 0k   | 0k  | 123k | 329k | 53k | 39k | 7k   | 556k  | 22% |
| **Non-Consumer Rigids** | 0k        | 19k  | 76k | 30% | 22% | 0k | 0k   | 147k | 6%    | 0%  |
| **Closures**         | 0k         | 1k   | 0k  | 1k  | 1k  | 0k | 0k   | 0k   | 2k    | 0%  |
| **Injection Moulded Pallets, Crates, etc** | 0k         | 0k   | 0k  | 22k | 0k  | 0k | 0k   | 0k   | 22%   | 1%  |
| **EPS Transit Packaging** | 0k         | 0k   | 0k  | 0k  | 0k  | 0k | 0k   | 0k   | 0k    | 0%  |
| **Pails, Drums, Industrial** | 0k         | 17k  | 0k  | 12k | 0k  | 0k | 0k   | 0k   | 29k   | 1%  |
| **Non-Consumer PTTs** | 0k         | 0k   | 0k  | 41k | 30k | 13k | 0k   | 0k   | 85k   | 3%  |
| **Other**            | 1k         | 12k  | 0k  | 5k  | 14k | 13k | 32k | 5k   | 83k   | 3%  |

**Grand Total (tonnes) 638k 410k 20k 370k 803k 93k 89k 113k 2535k**

**Grand Total (%) 25% 16% 1% 15% 32% 4% 3% 4% 100%**

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8 For the purposes of this study, the non-consumer flow represents all packaging from the commercial and industrial streams as well as agricultural and construction & demolition (C&D) plastic packaging.

9 As is clear in the main body of the report, the analysis relies on a number of assumptions and approximations. As such, there are margins of error around the data. Furthermore, the level of precision presented here (namely, to the nearest thousand tonne) is not meant to represent the level of accuracy attached to the figures: the figures are simply quoted as they arose from the analysis.
Key features of plastic packaging in 2011

The following key features of plastic packaging were highlighted and/or identified as part of this study. They are illustrated in Figures ES2, ES3 and ES4.

1. **UK plastic packaging consumption amounted to 2.5m tonnes in 2011 (PackFlow 2017 Estimation)**
   - 68% of plastic packaging is for consumer consumption (1.7mt)
   - 32% of plastic packaging is for non-consumer consumption (0.8mt)

2. **Rigid packaging (including bottles, PTTs, closures, etc.) account for the majority (56%) of plastic packaging**
   - 45% of rigid plastic packaging is PTTs
   - 39% of rigid plastic packaging is bottles

3. **Plastic film including bags, strapping, tape and bands constitute the next largest proportion of plastic packaging consumed in the UK**
   - 44% of plastic packaging is made of film (1119kt)
   - Of this, 71% is non-bag film (790kt) and 29% is film used as bags (321kt)

4. **Plastic pots, tubs and trays represent 25% of UK plastic packaging**
   - 32% of consumer plastic packaging comprises PTTs (556kt)
   - Only 10% of non-consumer plastic packaging is PTTs (85kt)

5. **Bottles represent 22% of plastic packaging consumption in the UK**
   - 91% of plastic bottles arise in the consumer sector
   - 29% of consumer plastic packaging is bottles

6. **PET is the most commonly used polymer in UK plastic packaging**
   - 32% of UK plastic packaging is made of PET (803kt)
   - 43% of consumer plastic packaging is made of PET (747kt)

7. **LDPE/LLDPE is used to make a quarter of plastic packaging (638kt)**
   - 9% of consumer plastic packaging is made of LDPE/LLDPE (156kt)
   - 60% of non-consumer plastic packaging is made of LDPE/LLDPE (483kt)

8. **HDPE is used to make 16% of UK plastic packaging**
   - HDPE is used to manufacture 410kt of UK plastic packaging
   - 19% of consumer plastic packaging is made of HDPE (333kt)
   - 9% of non-consumer plastic packaging is made of HDPE (77kt)
9. PP is used to make 15% of UK plastic packaging
- PP is used to manufacture 370kt of UK plastic packaging
- 14% of consumer plastic packaging is made of PP (243kt)
- 16% of non-consumer plastic packaging is made of PP (127kt)

10. PET bottles represent the largest single tonnage of consumer plastic packaging
- PET bottles represent 13% of UK plastic packaging (337kt)
- Industry reports a move towards packaging products in PET bottles rather than HDPE due to changes in bottle requirements, improved visual impact, lighter weight and lower cost

11. The 50% HDPE:50% PET composition split of bottles entering the sorting/recycling stream may not necessarily be appropriate for packaging consumption
- The split derived from the survey sample suggests a split for consumer consumption of around two thirds (62%) PET and one third (38%) HDPE bottles.
- Packaging consumption figures and the composition split of bottles entering the sorting/recycling stream can vary due to factors such as disposal of household packaging away from home; as on-the-go bottle collections are still extremely limited and a considerable proportion (around one-third) of PET bottles are potentially disposed of on-the-go (and are therefore unlikely to enter the recycling stream as on the-go recycling is very limited), it is understandable that the quantities of PET and HDPE bottles in household waste arisings and passing through MRFs and PRFs are broadly equivalent.

Key developments in plastic packaging since 2005
These potential trends arise from comparing the data in this report with the previously most comprehensive composition analysis published by WRAP containing 2005 data. It should be noted that the methodologies used to derive the estimates in each report are very different and there is considerable uncertainty over estimates in both reports. Therefore, the comparison data should be treated with caution and as only one means of establishing potential trends. Data for 2005 is detailed in Annex II Figures A5 –A7.

1. The largest growth in plastic packaging format appears to have been in PTTs
- Results from the current study estimate 641k tonnes of plastic PTTs
- This is more than double the quantity of PTTs reported in this report compared to the quantity reported back in 2005

2. Film and Bottle tonnages appear to have remained relatively stable since 2005
- Results from the current study estimate 1119k tonnes of plastic film packaging
- This is similar to the 897k tonnes (plus assumed 227kt imports) reported in 2005
- A wider range of polymers are now used in film and bag manufacture (new polymers representing ~33% and ~28% respectively)
- Results from the current study estimate 548k tonnes of plastic bottles
- This is similar to the 548k tonne (plus assumed 11kt imports) reported in 2005
3. The largest growth in plastic packaging polymer appears to have been in PET
- Results from the current study estimate 803k tonnes of plastic PET packaging
- This is almost double the quantity reported in 2005 (96% growth)
- The majority of this growth is in PTTs (around 300kt)
- PET is becoming a preferred polymer due to favourable properties such as visual impact, barrier properties, food-grade recyclability and price (relative to HDPE)

The largest decline in plastic packaging format appears to have been in plastic bags
- Consumer bag (carrier bags and other bags) tonnages have reduced by approximately one third since 2005
- Carrier bags look to have reduced by about one quarter
- There has been growth in non-carrier bags such as fresh produce and bread bags

4. The largest decline in plastic packaging polymer appears to have been in LDPE/LLDPE
- Results from the current study estimate 638k tonnes of plastic LDPE/LLDPE packaging
- This represents a 34% decrease (322kt) on reported 2005 figures
- This is likely due to a shift from LDPE bags to HDPE bags and the switching to alternative film polymers with different technical capabilities (e.g. storage in ambient instead of chilled environment, closures on ready meals)
- HDPE bags have experienced significant growth at the expense of LDPE bags

Key Findings and Conclusions – Consumer Plastic Packaging

<table>
<thead>
<tr>
<th>Film Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Total</td>
<td>145k</td>
<td>140k</td>
<td>16k</td>
<td>93k</td>
<td>95k</td>
<td>1k</td>
<td>6k</td>
<td>95k</td>
<td>556k</td>
<td>32%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>69k</td>
<td>112k</td>
<td>5k</td>
<td>35k</td>
<td>9k</td>
<td>1k</td>
<td>1k</td>
<td>29k</td>
<td>277k</td>
<td>16%</td>
</tr>
<tr>
<td>Rigid Total</td>
<td>10k</td>
<td>193k</td>
<td>4k</td>
<td>150k</td>
<td>688k</td>
<td>66k</td>
<td>42k</td>
<td>15k</td>
<td>1167k</td>
<td>68%</td>
</tr>
<tr>
<td>Bottles</td>
<td>1k</td>
<td>158k</td>
<td>0k</td>
<td>4k</td>
<td>333k</td>
<td>0k</td>
<td>2k</td>
<td>0k</td>
<td>469k</td>
<td>29%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>5k</td>
<td>0k</td>
<td>0k</td>
<td>123k</td>
<td>329k</td>
<td>53k</td>
<td>39k</td>
<td>7k</td>
<td>556k</td>
<td>32%</td>
</tr>
<tr>
<td>Thermoformed Packs</td>
<td>3k</td>
<td>0k</td>
<td>0k</td>
<td>23k</td>
<td>293k</td>
<td>8k</td>
<td>39k</td>
<td>2k</td>
<td>368k</td>
<td>21%</td>
</tr>
<tr>
<td>Injection Moulded Rigid</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>100k</td>
<td>35k</td>
<td>45k</td>
<td>0k</td>
<td>5k</td>
<td>188k</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>1k</td>
<td>2k</td>
<td>0k</td>
<td>5k</td>
<td>6k</td>
<td>13k</td>
<td>0k</td>
<td>5k</td>
<td>33k</td>
<td>2%</td>
</tr>
<tr>
<td>Grand Total (tonnes)</td>
<td>156k</td>
<td>333k</td>
<td>20k</td>
<td>243k</td>
<td>747k</td>
<td>69k</td>
<td>48k</td>
<td>110k</td>
<td>1724k</td>
<td></td>
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<td>Grand Total (%)</td>
<td>9%</td>
<td>19%</td>
<td>1%</td>
<td>14%</td>
<td>43%</td>
<td>4%</td>
<td>3%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• 498k tonnes of plastic bottles were purchased/consumed by consumers in the UK, in 2011

• 556k tonnes of PTTs were purchased/consumed by consumers in the UK, in 2011

• Consumer plastic packaging is split broadly evenly between three main packaging formats: films (32%, 556k tonnes), PTTs (32%, 556k tonnes) and bottles (29%, 498k tonnes)

• Combined, rigid plastic packaging accounts for approximately two-thirds (68%) of consumer plastic packaging and film accounts for one-third (32%)

• The most common polymer found in plastic consumer packaging is PET, which represents 43% of the total tonnage, or 747k tonnes

• Key consumer packaging made from PET is bottles, typically containing soft drinks/water/cordials/energy drinks, and PTTs

• The second most prominent polymer is HDPE (19%, 333k tonnes), which is mainly found in the form of milk bottles and vest-style carrier bags

Key Findings and Conclusions – Non-consumer Plastic Packaging

Some figures do not add due to rounding (Non-consumer PET Rigid, for example)
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABS</td>
<td>Acrylonitrile Butadiene Styrene</td>
</tr>
<tr>
<td>BPF</td>
<td>British Plastics Federation</td>
</tr>
<tr>
<td>C&amp;I</td>
<td>Commercial &amp; Industrial</td>
</tr>
<tr>
<td>DIY</td>
<td>Do It Yourself</td>
</tr>
<tr>
<td>EA</td>
<td>Environment Agency</td>
</tr>
<tr>
<td>EPIC</td>
<td>Environmental Product Information Centre</td>
</tr>
<tr>
<td>EPS</td>
<td>Expanded Polystyrene</td>
</tr>
<tr>
<td>HDPE</td>
<td>High Density Polyethylene</td>
</tr>
<tr>
<td>k</td>
<td>Thousand</td>
</tr>
<tr>
<td>kt</td>
<td>Thousand tonnes</td>
</tr>
<tr>
<td>LDPE</td>
<td>Low Density Polyethylene</td>
</tr>
<tr>
<td>LLDPE</td>
<td>Linear Low Density Polyethylene</td>
</tr>
<tr>
<td>NPWD</td>
<td>National Packaging Waste Database</td>
</tr>
<tr>
<td>OPP</td>
<td>Oriented Polypropylene</td>
</tr>
<tr>
<td>PA</td>
<td>Polyacrylate</td>
</tr>
<tr>
<td>PAFA</td>
<td>Packaging and Films Association</td>
</tr>
<tr>
<td>PC</td>
<td>Polycarbonate</td>
</tr>
<tr>
<td>PE</td>
<td>Polyethylene</td>
</tr>
<tr>
<td>PET</td>
<td>Polyethylene Terephthalate</td>
</tr>
<tr>
<td>PO</td>
<td>Polyolefin</td>
</tr>
<tr>
<td>POM</td>
<td>Polyoxyethylmethylen (Acetal)</td>
</tr>
<tr>
<td>PP</td>
<td>Polypropylene</td>
</tr>
<tr>
<td>Primary Packaging</td>
<td>Any packaging that the customer will take home, remove and throw away e.g. aluminium can, plastic bottle</td>
</tr>
<tr>
<td>PRF</td>
<td>Plastics Recovery Facility</td>
</tr>
<tr>
<td>PRN</td>
<td>Packaging Recovery Note</td>
</tr>
<tr>
<td>PRODCOM</td>
<td>PRODuction COMmunautaire</td>
</tr>
<tr>
<td>PS</td>
<td>Polystyrene</td>
</tr>
<tr>
<td>PTT</td>
<td>Pots, tubs and trays</td>
</tr>
<tr>
<td>PVC</td>
<td>Polyvinyl Chloride</td>
</tr>
<tr>
<td>RTP</td>
<td>Returnable Transit Packaging</td>
</tr>
<tr>
<td>Secondary Packaging</td>
<td>Inner packaging used to transport or display goods to/in store, usually cardboard boxes or shelf-ready packaging</td>
</tr>
<tr>
<td>Transit/Tertiary Packaging</td>
<td>Any transit packaging e.g. pallets, shrink wrap, staples or strapping</td>
</tr>
<tr>
<td>WRAP</td>
<td>Waste and Resources Action Programme</td>
</tr>
</tbody>
</table>
Acknowledgments

This study has been jointly funded by Valpak Ltd and the Waste and Resources Action Programme (WRAP), who would both like to thank all those who have contributed to the study by providing and/or reviewing key data.

- All attendees of WRAP’s Plastics Round Table
- British Plastics Federation (BPF)
- British Polythene Industries (BPI)
- DEFRA
- Innovia Films Ltd
- LINPAC Packaging Limited
- Nampak Plastics Europe Ltd
- Plastics Europe
- Recoup and their Board of Directors
- RPC Containers Ltd
- The Advisory Committee on Packaging (ACP)
- The Packaging and Films Association (PAFA)
- Verde Recycling Solutions

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      2.3.3 Sample Size Representation  
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      2.4.2 C&D Plastic Packaging  
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1. Introduction

The purpose of this report is to provide a comprehensive picture of the composition (format and polymer) of plastic packaging flowing onto the UK market in 2011.

A better understanding of the composition of plastic packaging provides a baseline for further work, such as projections of future flows of plastic packaging, analysis of the proportions of each polymer or format currently recycled and assessment of feasible recycling prioritisation strategies.

1.1 Background

This report is the result of research undertaken over an eighteen month period to establish a more detailed and up-to-date breakdown of the format and polymer splits of UK plastic packaging. The research undertaken included both secondary and primary investigations, and covered both consumer and non-consumer packaging. The work focused mainly on implementing a new methodology for estimating the composition of consumer plastic packaging through the use of plastic packaging data of supermarket products (weight, format, polymer and sales data). It is believed that this is a novel way in which to estimate consumer plastic packaging consumption, as previous studies have been based on either UK industry/stakeholder consultations or waste arisings data.

1.2 Objectives

The final phase of this project had the following key objectives, as addressed in this report:

- Establish a sampling methodology and undertake a data specification exercise to understand the proportions of plastic packaging on the UK market;
- Present five plastic packaging composition summary tables: Total, Total Consumer\textsuperscript{11}, Consumer Household, Consumer On-the-Go and Non-consumer\textsuperscript{12};
- Produce a breakdown of the types of products to be found in key packaging formats; and
- Consult with industry on key polymer/format arisings.

1.3 Deliverables

The final deliverable from the project is this report, which presents the composition estimates and provides associated commentary and analysis.

---

\textsuperscript{11} Consumer packaging is all packaging found around products that are placed on the market for consumer consumption
\textsuperscript{12} For the purposes of this study, the non-consumer flow represents all packaging from the commercial and industrial streams as well as agricultural and construction & demolition (C&D) plastic packaging
2. **Methodology**

2.1 **Introduction**

2.1.1 **Composition of Plastic Packaging**

The composition of plastic packaging consumed in the UK has been estimated using a variety of methods and data sources. The section below outlines the methodologies adopted to estimate the breakdown of all plastic packaging consumed, but also those used to provide a breakdown of consumer (including household and on-the-go packaging) and non-consumer packaging.

2.1.2 **Quantity of Plastic Packaging**

The quantities of plastic packaging flowing onto the UK market in 2011, and a breakdown of these by the various subsets, have been adopted from PackFlow 2017\(^{13}\) as illustrated in Figure 1, below:

<table>
<thead>
<tr>
<th>FLOW ONTO MARKET</th>
<th>Split</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100%</td>
<td>2,409-2,660k</td>
</tr>
<tr>
<td>Consumer (Total)</td>
<td>68%</td>
<td>1,638-1,809k</td>
</tr>
<tr>
<td>Consumer (Household)</td>
<td>57%</td>
<td>1,373-1,516k</td>
</tr>
<tr>
<td>Consumer (Away from Home)</td>
<td>11%</td>
<td>265-293k</td>
</tr>
<tr>
<td>Non-Consumer</td>
<td>32%</td>
<td>771-851k</td>
</tr>
</tbody>
</table>

Please see section 3.2.2 of this report for a definition of these subsets, along with further details of PackFlow 2017 (Section 3.2) and other reports and information used in the compilation of this report (Section 3.1).

2.2 **Total UK Consumption of Plastic Packaging**

The total consumption data is simply an addition of the consumer and non-consumer data sets as described below.

---

\(^{13}\) PackFlow 2017 is published and is available on the Valpak website  
http://www.valpak.co.uk/BuildYourKnowledge/MarketResearchAndAnalysis/ProjectsAndCaseStudies.aspx
2.3 Consumer Plastic Packaging

2.3.1 Introduction

Consumer packaging is all packaging found around products that are placed on the market for consumer consumption. This includes the primary packaging around groceries, toiletries, electronics and toys, for example. Consumer packaging can be further broken down, depending on where the packaging is disposed of; at home (household) or away from home (on-the-go).

2.3.2 Data Sampling

For the purposes of this project, consumer packaging composition has been established by randomly sampling a specific quantity of the primary packaging used around products found in major UK supermarkets. Whilst it is acknowledged that consumer packaging also arises in retailers other than supermarkets, it is believed this is by far the largest source of consumer packaging and is the best current dataset available for use.

A random survey sample of 467\textsuperscript{14} products, including items such as margarine tubs, packs of water, toys, etc., was assessed for packaging weight, format and polymer type. The sample of products and their associated suppliers were extracted from Valpak’s EPIC (Environmental Product Information Centre) database\textsuperscript{15}. Throughout autumn 2012, over 3000 different supermarket suppliers were contacted for information. Data on weight, format and polymer type were provided by 355 suppliers, and were then sense checked and analysed for the purpose of this study.

The packaging weights data were then multiplied by the respective product sales data to provide a dataset that represents the format and polymer composition of UK consumer plastic packaging consumption, in percentages. The composition of this dataset was then applied to the PackFlow estimate of consumer plastic packaging weight (1,724K in 2011) to derive estimates of UK consumer plastic packaging consumption by polymer type and format, in tonnes.

2.3.3 Sample Size Representation

It has been assumed that supermarket packaging is representative of all consumer packaging. Assuming a worst case scenario of the ratio of the standard deviation (SD) to the corresponding mean being 0.5, a sample size of 467\textsuperscript{14} gives a 95% confidence interval of width +/-4.5% from the sample mean. This

---

14 Initially a target of 1066 products was set; however, in the limited timescales the response rate achieved was lower. It has therefore been assumed that the 467 responses received are representative of the 1066 responses aimed for and are non-biased towards any particular packaging formats or polymer types.
15 The random sample of products was taken from the products with known packaging weights within the EPIC database. This is believed to be a fair representation of supermarket packaging.
16 It should be noted that once the sample size is multiplied by the number of sales of those products, the number of products for which weights, formats and polymers were identified increases to 421 million, weighing upwards of 3,000 tonnes.
confidence interval gives the range within which the likely true amount of consumer plastic packaging is likely to lie, based on our sample of packaging, assuming the sample is representative of the population of consumer packaging. These margins of error allow for the uncertainty in using a sample to estimate the amount of packaging that is present in the larger population of products.

It should be noted that once the sample size is multiplied by the number of sales of those products, the number of products for which weights, formats and polymers were identified increases to 421 million, weighing upwards of 3,000 tonnes.

### 2.3.4 Household Plastic Packaging

The consumer (household) dataset was calculated by subtracting the consumer (on-the-go) elements from the complete consumer dataset. Consumer (on-the-go) packaging composition was established as described below.

### 2.3.5 On-the-Go Plastic Packaging

In order to establish the format and polymer breakdown of consumer (on-the-go) plastic packaging, further secondary research was undertaken. This established an average split of plastic bottles, plastic film and other plastic packaging as reported in a number of litterbin and street sweeping analyses undertaken in different parts of the UK over the last ten years. Litterbin and street sweeping compositions were deemed to be a fair reflection of the mix of consumer plastic packaging disposed of on-the-go. The average splits adopted were (see section 3.1 for data sources):

- Plastic Bottles: 42%;
- Plastic Film: 37%; and
- Other Rigid Plastic Packaging: 20%.

The formats and polymer types of the plastic packaging and the composition of ‘other rigid plastics’ were estimated using the format splits of food and drink products derived from the survey sample (see above). The exception to this was plastic bottles, which has been assumed to be all PET soft drink/water/energy drink bottles only, rather than a wider mix of HDPE milk bottles and PP/PVC cleaning or toiletry bottles.

### 2.4 Non-consumer Plastic Packaging

For the purposes of this study, the non-consumer flow represents all packaging from the commercial and industrial streams as well as agricultural and construction & demolition (C&D) plastic packaging. Commercial plastic packaging includes that which arises from the retail, wholesale, hospitality, offices and similar operations. Non-consumer plastic packaging accounts for all three layers of packaging, including primary (from trades sales, not consumer sales), secondary and transit.
The starting point for establishing the recent (2011) levels of non-consumer plastic packaging was the PackFlow 2017 estimate of 811K tonnes.

This was broken down by sub-sector (agricultural, construction, etc.), based on the Agri/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.

Whilst being six years old, this report remains the latest, most comprehensive breakdown of non-consumer plastic packaging arisings publicly available\(^{17}\). Figure 2 has been adapted from this report to show the estimated breakdown of non-consumer plastic packaging:

![Figure 2 - Breakdown of Sectors included in Non-consumer Packaging](image)

Each of the three key non-consumer sectors is discussed in turn below.

### 2.4.1 Agricultural Plastic Packaging

The results of the Environment Agency’s Agricultural Waste Survey 2003\(^{18}\) provide a breakdown by packaging format type of annual plastic packaging arisings from UK farms. These results have been used within various plastic reports since 2003, including WRAP\(^{19}\) and Zero Waste Scotland (ZWS)\(^{20}\).

Using this data, WRAP (2006)\(^{21}\) identified that around 32k tonnes of plastic packaging arises from UK farms, which equated to 4.5% of the Agri/C&D/C&I proportions. Using this 4.5% and applying it to the

---

17 It is important to note that this report is fairly dated now, particularly with regard to non-consumer data, which is up to 14 years old.
2011 data calculated by Valpak/WRAP (2012)\textsuperscript{22}, the flow of agricultural plastic packaging is estimated to be around 37k tonnes, and as such, is in line with earlier estimates.

ZWS\textsuperscript{23} estimates that agricultural plastic packaging in Scotland in 2009 equated to around 2,200 tonnes, which if scaled up to represent UK arisings, would equate to around 25k tonnes\textsuperscript{24}. However, as Scottish agriculture may have differing characteristics to the rest of the UK, it was considered more suitable to use the estimate of around 37k tonnes to represent the flow of agricultural plastics onto the UK market. Using this and the breakdown of formats/polymers provided by the Environment Agency results\textsuperscript{25} in the arisings displayed in Figure 3 below.

<table>
<thead>
<tr>
<th>Polymer</th>
<th>Format</th>
<th>% of Arisings</th>
<th>Approximate Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>Film</td>
<td>56%</td>
<td>21k</td>
</tr>
<tr>
<td>PP</td>
<td>Film</td>
<td>26%</td>
<td>10k</td>
</tr>
<tr>
<td>HDPE</td>
<td>Bottles</td>
<td>14%</td>
<td>5k</td>
</tr>
<tr>
<td>HDPE</td>
<td>Cores</td>
<td>4%</td>
<td>1k</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>37k</td>
</tr>
</tbody>
</table>

\textbf{2.4.2 C&D Plastic Packaging}

WRAP (2006)\textsuperscript{26} identified that around 10k tonnes of plastic packaging arises from C&D in the UK, which represents around 1.4% of the Agri/C&D/C\&I proportions. Using this 1.4% and applying it to data calculated by Valpak/WRAP (2012)\textsuperscript{27}, the flow of C&D plastic packaging in 2011 is estimated to also be around 11.4k tonnes, and as such, is broadly in line with earlier estimates.

Wider sources were also used to investigate the flow of C&D plastic packaging, including the European Council of Vinyl Manufacturers, which estimates that the total C&D plastic use in the UK by the sector in 2011, is around 158k\textsuperscript{28}. It is believed that around 5% of total C&D plastic consumption is packaging\textsuperscript{29}. This would result in around 8k tonnes of C&D plastic packaging arisings, which is broadly consistent with the WRAP and Valpak estimates.

ZWS (2012)\textsuperscript{30} data were also used to assess C&D arisings, and estimated those occurring in Scotland to be around 2k tonnes. If this volume is scaled up to represent UK arisings, this would equate to around 22k tonnes\textsuperscript{31}. This figure is much larger than those produced from the three alternative sources

\begin{itemize}
\item 22 PackFlow 2017.
\item 23 Developing the Evidence Base for Plastics Recycling in Scotland. ZWS, 2012.
\item 24 Assuming Scotland represents 8.8% of UK total employment.
\item 27 PackFlow 2017 is published and is available on the Valpak website http://www.valpak.co.uk/BuildYourKnowledge/MarketResearchAndAnalysis/ProjectsAndCaseStudies.aspx
\item 30 Developing the Evidence Base for Plastics Recycling in Scotland. ZWS, 2012.
\item 31 Assuming Scotland represents 8.8% of UK total employment.
\end{itemize}
investigated and is potentially an over-estimation as Scottish C&D may have differing characteristics to the rest of the UK. As a result, the estimate of 11k tonnes was considered the most suitable for use in this project.

In order to break down the 11k tonnes into format and polymer type, splits were taken from the WRAP report ‘Establish Tonnages, and Cost Effectiveness of Collection, of Construction Site Packaging Waste’, March 2004\(^\text{32}\). Although this research is fairly dated, it still contains the most recent publically available information on splits on construction plastic packaging. It should be noted that the splits are only indicative and were established from packaging audits carried out on 25 construction sites. The results are shown in Figure 4.

![C&D Plastic Packaging Arisings](image)

<table>
<thead>
<tr>
<th>Polymer</th>
<th>Format</th>
<th>% of Arisings</th>
<th>Approximate Tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>PE</td>
<td>Film</td>
<td>86%</td>
<td>9k</td>
</tr>
<tr>
<td>PP</td>
<td>Pots</td>
<td>10%</td>
<td>1k</td>
</tr>
<tr>
<td>HDPE</td>
<td>Pots &amp; Bags</td>
<td>4%</td>
<td>0k</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>11k</td>
</tr>
</tbody>
</table>

### 2.4.3 C&I Plastic Packaging

To estimate the remaining tonnage from the non-consumer stream and break this down by key sector, polymer and format, various data sources could be used. Each of these sources is described here.

Firstly, using PackFlow 2017 and accounting for the 48k tonnes of agricultural and C&D packaging identified above, an estimate of the remaining non-consumer packaging could be made. This would result in a 2011 flow of approximately 763k tonnes of plastic packaging. To assess this tonnage by format and polymer type, the data displayed by WRAP (2006)\(^\text{33}\) could be used; however, alternative more up-to-date data sources were researched.

Various C&I waste surveys have been undertaken over the past 10 years, the most recent of which was published by Defra in 2010. This survey covered businesses in England, excluding the agricultural and C&D sectors\(^\text{34}\). The data available from this survey allow for plastic waste arisings to be assessed by key business sector, but not specifically by plastic packaging. Using the Defra data provides a breakdown of the proportion of plastic waste arising from each sector, which in turn has been used as an indication of the plastic packaging arisings\(^\text{35}\) in each key business sector, as shown in Figure 5 below.

---


\(^{35}\) In the absence of any other data the simplified assumptions that the proportions of plastic waste arisings in each sector are a proxy for plastic packaging waste arisings, and in turn plastic packaging waste arisings are a proxy for plastic packaging consumption.
In order to estimate the format split of this C&I packaging, various additional sources of information and assumptions have been made. The table below illustrates the initial splits found for rigid and film. Below this, the assumptions made to fill the gaps and provide further format and polymer splits are described.

<table>
<thead>
<tr>
<th>Business Type</th>
<th>proportion of total UK Plastic (Defra tonnage)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, drink &amp; tobacco</td>
<td>6%</td>
</tr>
<tr>
<td>Textiles/wood/paper/publishing</td>
<td>7%</td>
</tr>
<tr>
<td>Power and utilities</td>
<td>2%</td>
</tr>
<tr>
<td>Chemicals/non-metallic minerals manuf.</td>
<td>20%</td>
</tr>
<tr>
<td>Metals manufacturing</td>
<td>1%</td>
</tr>
<tr>
<td>Machinery &amp; equipment (other manuf.)</td>
<td>8%</td>
</tr>
<tr>
<td>Retail &amp; wholesale</td>
<td>32%</td>
</tr>
<tr>
<td>Hotels &amp; catering</td>
<td>2%</td>
</tr>
<tr>
<td>Public administration &amp; social work</td>
<td>3%</td>
</tr>
<tr>
<td>Education</td>
<td>2%</td>
</tr>
<tr>
<td>Transport &amp; storage</td>
<td>13%</td>
</tr>
<tr>
<td>Other Services</td>
<td>3%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

Where data was unavailable to determine the film/rigid composition and in order to estimate polymer splits, the following methodology was used:
• Business types were grouped into either ‘retail’, ‘hospitality’ (Hotels & catering, Public admin. & social work, and Education) or ‘manufacturing’ (all remaining types);
• For simplicity, all business types in ‘hospitality’ were given the 57%/43% film/rigid split; and
• All ‘manufacturing’ business types were given the 60%/40% film/rigid split.

• For retail & wholesale, the following assumptions were also made:
  • The weight of strapping was taken as 5% of the weight of all film;  
  • Bags were assumed to be 1% of total film;  
  • The polymer split of strapping was 67% PP and 33% PET;  
  • The split of bags by polymer was taken from 2011 Epic secondary and tertiary data;  
  • The split of film by polymer was taken from 2011 Epic secondary and tertiary data; and
  • No representative split of PTTs by polymer was available; therefore, a 50:50 split was applied to PP and PET: the most likely polymers.

• For hospitality, the following assumptions were also made:
  • The 5% strapping proportion was adopted as above;  
  • All film was assumed to be LDPE;  
  • The polymer split for bottles was taken from the consumer plastic bottle splits;  
  • The proportion of closures reflects the ratio of closures to bottles/PTTs split in the consumer data (10%); and
  • No representative split of PTTs by polymer was available; therefore, a 50:50 split was applied to PP and PET: the most likely polymers.

• For manufacturing the following assumptions were also made:
  • All film was assumed to be LDPE;  
  • The breakdown of rigid into packaging formats (Closures, Pallets/Crates, EPS Transit Packaging, Pails/Drums/Industrial, PTTs) and polymer types was adopted from the 2006 WRAP report, excluding imports and films as shown below:

<table>
<thead>
<tr>
<th>Packaging Format</th>
<th>EPS transit packaging</th>
<th>Palets, crates, etc</th>
<th>PaIs, drums &amp; industrial</th>
<th>Thermoformed packs</th>
<th>Injected moulded rigid</th>
<th>Bottles</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5% (PS 100%)</td>
<td>12% (PP 100%)</td>
<td>16% (PP 40%, HDPE 60%)</td>
<td>22% (PP 44%, PS 33%, PET 23%)</td>
<td>1% (100% PP)</td>
<td>18% (100% HDPE)</td>
<td>26% (66% PVC, 17% HDPE, 16% PET, 1% Other)</td>
<td></td>
</tr>
</tbody>
</table>

36 This estimate was made as the average proportion of strapping to Non-bag Film in the WRAP report ‘UK Plastic Waste – A review of supplies for recycling, global market demand, future trends and associated risks’ and in Epic secondary and tertiary data was 5%.
37 This estimate was made using 2011 Epic secondary and tertiary data.
38 This estimate was made using 2010 Epic secondary and tertiary data as insufficient polymer splits were available in the 2011 dataset.
39 Split of bags by polymer: LDPE 75%, PET 4%, PP 17%, PS 2%, PVC 2%.
40 Split of film by polymer: HDPE 2%, LDPE 69%, PET 4%, PP 18%, PS 2%, PVC, 3%, Other Plastic 1%.
41 In the absence of any other data, this was deemed the most suitable for use: PVC 52%, PP 29%, LDPE 19%.
3. Overview of Plastic Packaging Data Sources

The overview of data sources used in the methodologies described in Section 2, is separated into the following sections:

- Data Sources;
- PackFlow 2017; and
- Valpak’s EPIC Database.

3.1 Data Sources

Three main data sources were used in the production of this report:

- PackFlow 2017 is a report on the flows of UK packaging (see section 3.2 below);
- Valpak’s EPIC (Environmental Product Information Centre) database: contains information on over 400,000 packaging items, including packaging weights and formats, and in the case of plastic packaging, polymer types (see section 3.3 below); and

In addition, following the secondary research phase of the project, the following reports and information sources were used:

- Key Note 2010 Packaging (Food & Drink);
- UK Household Plastics Packaging Collection Survey 2011, Recoup;
- Environment Agency’s Agricultural Waste Survey 2003;
- The Agricultural Waste Plastic Programme;
- Establish Tonnages, and Cost Effectiveness of Collection, of Construction Site Packaging Waste, WRAP, March 2004;
- Environment Agency NPWD Public Reports;
- National Statistics’ PRODCOM data;
- North London Waste Authority Waste Composition Analysis Project, October 2010;
- Plymouth City Council, Municipal Solid Waste Composition Analysis, November 2005.

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43 PackFlow 2017 is published and is available on the Valpak website http://www.valpak.co.uk/BuildYourKnowledge/MarketResearchAndAnalysis/ProjectsAndCaseStudies.aspx
45 http://www.keynote.co.uk/
48 The results of The Agricultural Waste Plastics Collection and Recovery Programme trials were reported in the Final Report of this project, which remains unpublished. Please see http://webarchive.nationalarchives.gov.uk/20110407094538/http://www.agwasteplastics.org.uk/agri/about.html for further details of the Agricultural Waste Plastic Programme.
49 www.wrap.org.uk/document.rm?id=1592
50 http://npwd.environment-agency.gov.uk/Public/PublicSummaryData.aspx accessed 08/01/2012
51 National Statistics, Product Sales and Trade, Final Estimates 2009, Division 22, Manufacture Of Rubber and Plastic Products
54 http://www2.wrap.org.uk/downloads/Plymouth_Trade_Waste_Analysis_05.399cdb9c.8740.pdf
• Greater London Authority, Waste Composition Scoping Study, October 200455;
• Zero Waste Scotland, The composition of municipal solid waste in Scotland, April 201057; and
• UK market composition data of polypropylene packaging, WRAP, 201258.

Gaps in current secondary data were identified in the areas of consumer (on-the-go), agricultural, construction and manufacturing plastic packaging. Specifically, this pertained to an up-to-date breakdown by format and polymer type. Also, no supportive/comparative data was found for non-consumer plastic packaging in general.

3.2 PackFlow 2017

3.2.1 Introduction

PackFlow 2017 is the latest edition of the PackFlow Project, which seeks to understand the flow of packaging materials onto the UK market, the quantity of packaging materials collected for recycling and from this, the potential for achieving UK recycling targets.

As the PackFlow 2017 high level estimates of UK plastic packaging tonnes form the baseline for this composition project, key points from that report are summarised below to explain the definitions, consultation process, assumptions and findings.

All figures representing the flow of packaging material onto the UK market (or ‘consumption’ of packaging) are estimates: past, present and future. This is due to the way packaging data is reported in the UK. Whilst this serves the purpose of demonstrating compliance with packaging regulations for obligated companies, it does not lend itself to providing actual quantities of packaging flowing onto the market in the UK.

For example, only obligated packaging is covered (companies handling fewer than 50 tonnes of packaging or with a turnover of less than £2 million do not report any packaging data); ‘free rider’ companies that are unaware that they are obligated do not report any packaging data. Further, packaging data can be reported multiple times by a number of obligated companies and data is only reported to the level of material type (e.g. not by format, polymer type, consumer or non-consumer use, etc.).

This report has adopted the midpoint of the latest PackFlow estimates to provide totals for plastic packaging consumption in 2011 (2,535k tonnes), and suggests the proportion of this that is consumer (68%) and non-consumer packaging (32%). These categories are explained in more detail below.

56 http://warr.org/971/
58 http://www.wrap.org.uk/sites/files/wrap/Phase%203%20Food%20Grade%20rPP%20Market%20Final%20Report.pdf
3.2.2 Definitions: Consumer & Non-Consumer Packaging

For the purposes of PackFlow, consumption has been divided into three key streams, as detailed below:

**Consumer Packaging (Household)**

In this report, consumer packaging likely to end up in the household waste stream, and as such collected by the local authority for disposal or recycling, is termed ‘consumer packaging (household)’. This typically includes key primary packaging formats such as drinks bottles; plastic film and bags; and plastic pots, tubs and trays.

**Consumer Packaging (On-the-Go)**

Household-type primary packaging consumed on-the-go and disposed of away from home.

**Non-Consumer Packaging**

Packaging consumed by industry is considered to be non-consumer packaging and includes items such as drums and pallets along with most secondary and tertiary packaging.

These streams have been reported separately due to their differences in terms of ease of recovery, levels of contamination and potential as untapped material for recycling.

3.2.3 PackFlow Industry Consultation

In order to review UK consumption figures of plastic packaging, an industry consultation was undertaken. This was carried out using a topic guide to ensure relevant stakeholders were asked a consistent and comprehensive set of questions.

The industry consultation involved relevant stakeholders being sent an introductory email outlining the intention to revise PackFlow, a request for their support and a copy of the topic guide. Each stakeholder was then contacted by phone to discuss packaging flow for their particular material.

All information collated was analysed and organised and presented back to the relevant stakeholders for agreement. The plastic consultation results are summarised in Figure 8.

<table>
<thead>
<tr>
<th>FLOW INTO MARKET</th>
<th>Split</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>100%</td>
<td>2,295k</td>
<td>2,318-2,387k</td>
<td>2,341-2,458k</td>
<td>2,363-2,520k</td>
<td>2,385-2,583k</td>
<td>2,409-2,660k</td>
</tr>
<tr>
<td>Consumer (Household)</td>
<td>57%</td>
<td>1,308k</td>
<td>1,321-1,360k</td>
<td>1,334-1,401k</td>
<td>1,347-1,436k</td>
<td>1,359-1,472k</td>
<td>1,373-1,516k</td>
</tr>
<tr>
<td>Consumer (Away From Home)</td>
<td>11%</td>
<td>255k</td>
<td>255-263k</td>
<td>258-270k</td>
<td>260-277k</td>
<td>262-284k</td>
<td>265-293k</td>
</tr>
<tr>
<td>Non-Consumer</td>
<td>32%</td>
<td>734k</td>
<td>742-764k</td>
<td>749-787k</td>
<td>756-806k</td>
<td>763-827k</td>
<td>771-851k</td>
</tr>
</tbody>
</table>

---

59 It should be noted that the PackFlow figures are estimates and not necessarily accurate to the nearest one thousand tonnes. The data is also illustrated as a range to highlight the uncertainty around precise flow estimates.
3.2.4 Key Findings

The latest estimations for packaging consumption are for 2011, which suggest that the total quantity of plastic packaging placed on the market was between 2.4M and 2.6M tonnes. Of this, it is estimated that 57% is consumer (household) plastic packaging, which amounts to between 1.4M and 1.5M tonnes.

Consumer (on-the-go) plastic packaging accounts for 11% of all plastic packaging, which equates to approximately 0.3M tonnes. Non-consumer plastic packaging accounts for 32% of all plastic packaging, or around 0.8M tonnes.

3.2.5 PackFlow 2017 Assumptions

The following assumptions were made in calculating the PackFlow 2017 plastic packaging projections:

- Consumer (household) plastic packaging, likely to be collected by local authority bring or kerb collections, is 57% of the total flow onto the market;
- Consumer (on-the-go) plastic packaging, consisting of both plastic bottles and mixed plastics, equates to 11% of the total flow onto the market;
- Non-consumer plastic packaging, most likely to be film, equates to 32% of the total flow onto the market;
- These splits were established from pooled WRAP /Recoup/BPF and Valpak knowledge;
- All three categories of flow will grow at the same rate; and
- Growth rates take into consideration further potential light-weighting of plastic packaging.
3.3 Valpak’s EPIC Database

Valpak’s EPIC database holds considerable data on consumer and non-consumer packaging. This includes packaging weights, sales volumes and, for many products, either the format, the polymer or both. Data on various retail, hospitality, clothing, electrical, etc., packaging is held. However, the largest volumes of plastic packaging are associated with supermarket supply chains, which account for over 90% of consumer plastic packaging sales by weight recorded in EPIC.

In the earlier part of the study, additional data from EPIC was interrogated, covering any available relevant consumer household data (for example, from clothing, toy and electrical retailers); however, the total additional tonnage, the majority of which was not specified by format or polymer type, represented less than 3% of supermarket tonnage and its inclusion would have had very little impact on the coverage of consumer household data or its breakdown by format or polymer type. As a result, the analysis focused on packaging from supermarket goods.

Supermarket packaging covers a wide variety of goods, including not only food and drink products but many other products too: 56% of the EPIC supermarket data relates to food and drink packaging, with the remaining 44% covering products such as cosmetics, health & hygiene products, cleaning products, clothing, toys and electricals.

The working assumption of this report has therefore been that the analysed supermarket data sufficiently represents consumer packaging and is referred to from here on as ‘consumer data’. Whilst it is acknowledged that it is not an exact representation, no further data was found that provided more accurate or detailed results, or proved the working assumption to be inappropriate.
## 3.4 Packaging Formats

Figure 9 provides an overview of some key packaging formats discussed in this report.

<table>
<thead>
<tr>
<th>Category</th>
<th>Packaging Type</th>
<th>Typical Polymer Types</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottle</td>
<td>Milk bottles</td>
<td>HDPE</td>
<td></td>
</tr>
<tr>
<td>Bottle</td>
<td>Soft drinks &amp; water bottles</td>
<td>PET</td>
<td></td>
</tr>
<tr>
<td>Bottle</td>
<td>Cleaning/chemical products</td>
<td>HDPE or PET</td>
<td></td>
</tr>
<tr>
<td>Bottle</td>
<td>Personal hygiene bottles</td>
<td>HDPE, PET</td>
<td></td>
</tr>
<tr>
<td>Film</td>
<td>Vest carrier bags &amp; bags for life</td>
<td>HOPE, LDPE/LLDPE</td>
<td></td>
</tr>
<tr>
<td>Film</td>
<td>Bread, fruit &amp; vegetable, cheese,</td>
<td>HOPE, LDPE or PP</td>
<td></td>
</tr>
<tr>
<td></td>
<td>toilet roll, cereal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Film</td>
<td>Stretch wrap</td>
<td>LDPE/LLDPE or PP</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Margarine &amp; ice cream tubs</td>
<td>PP</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Meat &amp; ready meal trays</td>
<td>PP or PET</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Fruit &amp; vegetable punnets/trays</td>
<td>PET, PP or PS</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Cleaning products</td>
<td>HDPE or PP</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Yoghurt &amp; dairy pots</td>
<td>PP or PS</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Deli fillers</td>
<td>PP or PET</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics/PTT</td>
<td>Bakery good trays</td>
<td>PET or PS</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics</td>
<td>Cores</td>
<td>HDPE</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics</td>
<td>Strapping</td>
<td>PP or PE</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics</td>
<td>Closures</td>
<td>HDPE, PP or PET</td>
<td></td>
</tr>
<tr>
<td>Mixed plastics</td>
<td>Drums, pallets, crates</td>
<td>HDPE, PP or PET</td>
<td></td>
</tr>
</tbody>
</table>
4. **Total UK Consumption of Plastic Packaging**

The next three sections of this report provide a detailed understanding of the consumption of plastic packaging in the UK. UK plastic packaging consumption has been analysed and reported in two parts: consumer plastic packaging (Section 5) and non-consumer plastic packaging (Section 6). This section covers the totality (consumer and non-consumer) of plastic packaging. This is a simple summation of the two estimated data sets. However, consumer plastic packaging accounts for the majority (68%) of total packaging and the methodology developed for this report offers most insight into this area, compared with non-consumer packaging, where data is sparser and fragmented.

Consumer plastic packaging composition has been estimated using primary research. A significant sample of consumer packaging data was sought from major retailer suppliers, and the proportions of packaging formats and polymers were established by using retailer sales figures. Please see Section 2.3 of this report for further details on methodology. Where possible, results have been informed using comparative data from secondary research.

Non-consumer plastic packaging has been estimated using a combination of secondary research data and data from Valpak’s EPIC database. The key documents consulted are given in Section 3.1 of this report and further details on methodology are provided in Section 2.3.

A small selection of key stakeholders were invited to participate in a consultation, to sense-check the orders of magnitude of the findings and help provide context and industry insight into the analysis. Where discrepancies with existing data or knowledge were identified, they are reported in the text.

4.1 **Introduction**

Combining the datasets for consumer and non-consumer plastic packaging generates format and polymer splits for all plastic packaging, as can be seen in Figure 10 below. This represents an updated version of WRAP’s Table 2.1 from the report: “UK Plastics Waste – A review of supplies for recycling, global market demand, future trends and associated risks”.

Figure 10 differs slightly from this table due to the following:

- The column ‘Unspecified OP’ (other polyolefins) was not required/able to be defined;
- The column ‘Bio Plastic’ has been excluded;
- The row ‘HDPE Other’ was not required;
- The row ‘Semi-rigid Sheet’ was unable to be defined;
- The row ‘Fibre for Packing’ was unable to be defined; and
- Imports of plastic packaging are inherently included throughout the estimates, but have not been separately identified\(^\text{60}\). Annex 2 reports some estimates of imports of packaging for completeness, although not by format or polymer type.

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\(^{60}\) For consumer packaging, the survey sample included imported products, but did not identify them or have any statistical analysis undertaken. For non-consumer estimates, this level of data was not available from secondary research. All quantities of plastic packaging used are based on PackFlow 2017 estimates and these include both UK and imported packaging placed on the UK market.
Figure 10  UK Plastic Packaging Consumption by Format & Polymer Type\textsuperscript{61} (Tonnes)

<table>
<thead>
<tr>
<th>ALL Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (Tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Total</td>
<td>628k</td>
<td>145k</td>
<td>16k</td>
<td>143k</td>
<td>72k</td>
<td>5k</td>
<td>13k</td>
<td>98k</td>
<td>1119k</td>
<td>44%</td>
</tr>
<tr>
<td>Film</td>
<td>508k</td>
<td>33k</td>
<td>11k</td>
<td>96k</td>
<td>58k</td>
<td>3k</td>
<td>12k</td>
<td>69k</td>
<td>780k</td>
<td>31%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>120k</td>
<td>112k</td>
<td>5k</td>
<td>45k</td>
<td>9k</td>
<td>1k</td>
<td>1k</td>
<td>29k</td>
<td>321k</td>
<td>3.3%</td>
</tr>
<tr>
<td>Film - Strapping/Tape/Bands</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>3k</td>
<td>5k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0%</td>
</tr>
<tr>
<td>Rigid Total</td>
<td>11k</td>
<td>265k</td>
<td>4k</td>
<td>227k</td>
<td>730k</td>
<td>89k</td>
<td>75k</td>
<td>15k</td>
<td>1415k</td>
<td>56%</td>
</tr>
<tr>
<td>Bottles</td>
<td>1k</td>
<td>202k</td>
<td>0k</td>
<td>5k</td>
<td>337k</td>
<td>0k</td>
<td>3k</td>
<td>0k</td>
<td>548k</td>
<td>22%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>3k</td>
<td>32k</td>
<td>3k</td>
<td>17k</td>
<td>21k</td>
<td>0k</td>
<td>1k</td>
<td>3k</td>
<td>80k</td>
<td>3%</td>
</tr>
<tr>
<td>Consumer PTTs</td>
<td>5k</td>
<td>0k</td>
<td>0k</td>
<td>123k</td>
<td>329k</td>
<td>53k</td>
<td>39k</td>
<td>7k</td>
<td>566k</td>
<td>22%</td>
</tr>
<tr>
<td>Thermofomed Pallets</td>
<td>3k</td>
<td>0k</td>
<td>0k</td>
<td>2k</td>
<td>2k</td>
<td>8k</td>
<td>33k</td>
<td>2k</td>
<td>566k</td>
<td>15%</td>
</tr>
<tr>
<td>Injection Moulded Rigid</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>700k</td>
<td>36k</td>
<td>46k</td>
<td>0k</td>
<td>5k</td>
<td>188k</td>
<td>7%</td>
</tr>
<tr>
<td>Non-Consumer Rigid</td>
<td>0k</td>
<td>19k</td>
<td>0k</td>
<td>76k</td>
<td>30k</td>
<td>22k</td>
<td>0k</td>
<td>0k</td>
<td>147k</td>
<td>6%</td>
</tr>
<tr>
<td>Closures</td>
<td>0k</td>
<td>1k</td>
<td>0k</td>
<td>1k</td>
<td>1k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>2k</td>
<td>0%</td>
</tr>
<tr>
<td>Injection Moulded Pallets, Crates, etc</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>22k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>22k</td>
<td>0%</td>
</tr>
<tr>
<td>EPS Translated Packaging</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0%</td>
</tr>
<tr>
<td>Dolly, Drums, Industrial</td>
<td>0k</td>
<td>17k</td>
<td>0k</td>
<td>12k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>29k</td>
<td>1%</td>
</tr>
<tr>
<td>Non-Consumer PTTs</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>4k</td>
<td>30k</td>
<td>13k</td>
<td>0k</td>
<td>0k</td>
<td>85k</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>1k</td>
<td>12k</td>
<td>0k</td>
<td>5k</td>
<td>14k</td>
<td>13k</td>
<td>32k</td>
<td>5k</td>
<td>83k</td>
<td>3%</td>
</tr>
<tr>
<td>Grand Total (Tonnes)</td>
<td>638k</td>
<td>410k</td>
<td>20k</td>
<td>370k</td>
<td>803k</td>
<td>93k</td>
<td>88k</td>
<td>113k</td>
<td>2535k</td>
<td></td>
</tr>
<tr>
<td>Grand Total (%)</td>
<td>25%</td>
<td>16%</td>
<td>1%</td>
<td>15%</td>
<td>32%</td>
<td>4%</td>
<td>3%</td>
<td>4%</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

\textsuperscript{61}The analysis relies on a number of assumptions and approximations. As such, there are margins of error around the data, and the level of precision presented here (namely, to the nearest thousand tonne) is not meant to represent the level of accuracy attached to the figures: the figures are simply quoted as they arose from the analysis.
4.2 Plastic Packaging Formats

As can be seen in Figure 11 below, the most commonly found packaging format in the UK is film, followed by consumer pots, tubs and trays and plastic bottles.

![Figure 11: UK Consumption of Plastic Packaging by Format](image)

4.3 Plastic Packaging Polymer Types

As can be seen in Figure 12 below, the most commonly found packaging polymer in the UK is PET, principally in the format of consumer drinks bottles and pots, tubs and trays. This is followed by LDPE/LLDPE, typically used as film for tertiary packaging and transportation.

![Figure 12: UK Consumption of Plastic Packaging by Polymer](image)
4.4 Trends in Plastic Packaging

The following paragraphs describe the trends that emerge from comparing the data in this report with the previously most comprehensive composition analysis published by WRAP, containing 2005 data\(^\text{19}\). It should be noted that the methodologies used to derive the estimates in each report are very different and there is uncertainty over these estimates in both reports. Therefore, the comparison data should be treated with caution and as only one means of establishing potential trends.

Furthermore, assumptions have been made as to the split of non-consumer/consumer tonnages and the allocation of imports to the 2005 data. These are detailed in footnotes and in Annex II.

4.4.1 Film

Overall

Overall, the data suggests that the consumption of film (bag, non-bag and strapping) has remained stable at around 1,119k tonnes. In 2005 this was reported at 927k tonnes excluding imports, which if included\(^\text{62}\), brings the 2005 figure to around 1,155k tonnes. Bags separately appear to have decreased, balanced by an increase in non-bag films (please see below).

A wider variety of polymers exists in the 2011 non-bag film composition, including previously unreported tonnages of HDPE, PP, PET, PS and Other. These represent a third of the 2011 composition (259kt, 33%). Likewise with bag film, additional tonnages of PP, PET, OPP, PS, PVC and Other film are reported, representing 28% of the 2011 composition (90kt).

Innovia\(^\text{63}\) Films agrees with the finding of a split between more polymers in 2011, since retailers have moved products from frozen, to chilled, to ambient. The reason for this trend is that retailers are trying to reduce their carbon footprint, and chilling and freezer cabinets account for relatively high carbon emissions. To facilitate this without increased food waste has required more technical products e.g. barrier films, requiring new polymers to be used. Also, at the same time, retailers have been focusing on reducing food waste, which has required more technical films.

The data shows that the split of all film arisings for consumer and non-consumer is 50:50, this is in line with industry understanding of a relatively balanced split.

Approximately two-thirds (65%) of non-bag film arises in the non-consumer sector, leaving a substantial proportion (35%) of non-bag film arising in the consumer sector. This split is in line with WRAP’s 2005 estimates (65% and 35% respectively) and suggests that, whilst the tonnages have increased, the proportional split has remained similar.

From discussions with a small number of stakeholders, it emerges that industry believes there has been little shift in film tonnages since 2005. This is because film usage has increased in line with lightweighting activity. This view therefore supports the trend of no overall increase in film tonnages.

\(^{19}\) 2005 WRAP figures were broken down by polymer type only; therefore, for the purposes of this comparison it has been assumed that all imported PE and OPP are film and 1/3 of imported HDPE is film.

\(^{62}\) Taken from consultation carried out by Valpak October 2012.
**Film – Bags**

The total tonnage of film-bags appears to have reduced by approximately a third\(^64\) since 2005 to 321k tonnes in 2011.

The tonnage of consumer bags appears to have reduced by up to a quarter\(^65\) to 277k tonnes. There were an estimated 60kt of supermarket thin-gauge carrier bags in the UK in 2011, down from 110K tonnes in 2006\(^66\) (55%). However, there has been an increase in fresh produce and bread bags, which would counter some of the reduction in carrier bags.

The results of the EPIC 2011 survey sample indicate a large swing in tonnage from LDPE bags (350k, 74% decrease)\(^67\) to HDPE Bags (81K, 261% increase)\(^68\). This is likely to have been caused by many single-use LDPE carrier bags switching to the commonly found ‘vest-style’ HDPE bags. This switch is recognised due to the fact that HDPE bags can be made thinner; using less material and costing less.

### 4.4.2 Strapping

The reported tonnage has decreased by 23k tonnes (74%)\(^69\). This is mainly due to a reduction of PP and PET strapping. Again, this may be due to strapping not being specifically recorded in EPIC or separately reported in secondary research, rather than a real reduction in tonnages.

### 4.4.3 Plastic Bottles

Overall, bottle tonnages have remained broadly the same (559kt in 2005, 548k t in 2011)\(^70\); this fits with industry’s view that any growth in consumption has been negated through light weighting of bottles. Looking at bottles by polymer type shows an increase in PET bottles (26kt, 8% increase), broadly matched by a decrease in the other polymer type bottles of HDPE, PVC, PP and PS (28k tonnes combined). This potentially illustrates a trend of ‘switching’ to PET bottles, away from other polymer type bottles.

The lower reported tonnage of HDPE and increase in PET bottles could reflect the following:

- **A shift from HDPE to PET bottles.** According to Nampak\(^71\), there has been a shift from HDPE to PET bottles over the last five years or so. Other than milk\(^72\), there has been a move towards packaging products in PET bottles rather than HDPE, for example, detergents. This is mainly due to changes in

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\(^64\) This assumes that 2005 imports of PE and HDPE are allocated as follows - PE: 49% bags; HDPE: 31% bags.

\(^65\) The 2005 consumer bag estimate does not include any imports, therefore the 25% is a maximum and would be less if any tonnage of consumer bags were imported.

\(^66\) [http://www.wrap.org.uk/content/new-figures-carrier-bags-use-released-wrap](http://www.wrap.org.uk/content/new-figures-carrier-bags-use-released-wrap), based on data from participating retailers (Asda (including ex-Netto stores), Co-operative Group, Marks & Spencer, Morrison’s, Sainsbury’s Supermarkets Ltd, Tesco and Waitrose)

\(^67\) The reduction in LDPE/LLDPE assumes a 2005 figure of 470kt including imports.

\(^68\) The increase in HDPE assumes a 2005 figure of 31kt including imports.

\(^69\) This assumes an additional 1kt for imported strapping.

\(^70\) This assumes an additional 11kt for imported PET bottles.

\(^71\) Taken from consultation carried out by Valpak October 2012.

\(^72\) The exception to this is one litre bottles of Cravendale milk, which were switched from HDPE to PET bottles in 2012.
bottle requirements. Detergents are becoming more concentrated and smaller so there is no need for a handle. The visual impact of PET is also regarded as more attractive than HDPE, which can influence sales of detergent products. Finally, the price of PET has reduced relative to HDPE. Other industry representatives suggest the HDPE tonnage, particularly that representing non-food consumer and non-consumer HDPE bottles, is low. A proxy of 50% food/drink, 50% non-food/drink HDPE bottles of a total around 220tonnes was indicated, which implies the food/drink figure derived from the survey sample is a little high (~153kt) and the non-food consumer and non-consumer tonnage figure is a little low (59kt). However, taken in combination, the total HDPE bottle figure is broadly aligned with industry views.

• **Light-weighting.** There has been significant work done on the light-weighting of PET and HDPE bottles (potentially as much as 20% in the last 5 or six years).

• **The 50% HDPE:50% PET composition split of bottles entering the sorting/recycling stream may not necessarily be appropriate for packaging consumption.**

  According to waste industry discussions, the split of PET to HDPE bottles entering the sorting/recycling stream sits at around 50% each. The split derived from the EPIC data sample suggests a different split for consumption: 62% PET and 38% HDPE. As ‘on-the-go’ bottle collections are still extremely limited and a considerable proportion (around one-third, please see section 5.4 for more details) of PET bottles are potentially disposed of on-the-go, and are therefore unlikely to enter the recycling stream, it is understandable that the quantities of PET and HDPE bottles passing through MRFs and PRFs are more similar. Furthermore, data from Wales shows 50:50 for recyclates, but 60/40 (PET/HDPE) for residual waste.

4.4.4 **Consumer Plastic Pots, Tubs and Trays (PTTs)**

Due to the difficulty in distinguishing between consumer thermoformed packs and injection moulded packaging from the packaging description (format and polymer types requested in the survey sample and/or stored in the EPIC database) the breakdown of consumer PTTs into thermoformed packs and IMRs provided is at best indicative, and should be treated with caution.

Overall, it would appear that there has been a dramatic increase in consumer PTTs over the last six years, potentially doubling in weight, bringing current levels to 556k tonnes. This increase is discussed below, in terms of thermoformed and IMR packaging. (Please see Annex II for estimates of 2005 splits by Non-consumer, from which the Consumer figures have been calculated).

**Thermoformed Packs**

Overall tonnage of consumer thermoformed packs has increased by over 100k tonnes (40-50%). This is due to a very large increase of around 250k tonnes in consumer PET packs. Although some increase is in line with industry expectations, this level of increase is very high. According to industry, thermoformed packaging in food has grown around 2% per annum since 2005 i.e. only around 13% in total since 2005. Industry believes increases are primarily due to PP and PET growth because of their:

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73 Conversation with Stuart Foster, CEO, Recoup, December 2012.
74 The composition of MSW in Wales, WRAP, 2010.
75 This assumes an approximate import tonnage of 19k in 2005.
76 The split of consumer/non-consumer figures by polymer type was not included in the WRAP 2006 report.
• Barrier properties (extending shelf life of perishable goods);
• Suitability for recycling; and
• Clarity, strength and robust nature as polymers.

Once again, it should be noted that industry views contradict the potential size in growth trend, rather than the current tonnages presented or the polymer splits. As highlighted at the beginning of this section, the arisings figures in the two reports were derived in very different ways and comparisons in data should be done so cautiously. It may well be that there has been a lesser trend in increasing quantities of consumer PTTs or that inaccuracies in either/both the 2005 or the current dataset exist.

Industry believes that there is more PP & PET replacing PS & PVC. This is not totally in line with the current results presented here, since PVC was not reported at all in 2005 and represents a tonnage of 39k tonnes in 2011. PP has also seen a reduction of around 80k tonnes.

**Injected Moulded Rigid (IMRs)**

The total reported tonnage has increased by approximately 170k tonnes (over 1000%, from a low base of an estimated 14K⁷⁷ tonnes in 2005). This is due to an increase in PP IMRs (86k tonnes) and new tonnages of PET (36k tonnes) and PS (46k tonnes).

This growth has most likely been driven by increased demand for convenience foods, itself driven by portion control packs such as Heinz snap pots and Heinz fridge packs, both of which have substituted tin cans.

Industry suggests a minimum increase of about 10% - 15% per year; however, current figures suggest a much larger growth of around 35% per year.

Industry also suggests that PS has declined because retailers have sought to reduce the number of polymers in the market place, in line with WRAP’s guidelines. PET has definitely grown as this material is seen as aesthetically better for point of sale attributes. This growth has also been a quick response to the incorporation of food grade recycled materials (as a system exists for PET and such a system is still several years away for rPP food grade). PET is a new IMR polymer, recorded after the 2005 table was produced.

**4.4.5 Non-consumer Rigid Packaging**

For the purpose of this report, non-consumer rigid packaging formats were broken down into:

• Closures;
• Injection Moulded RTPS, Crates, etc.;
• EPS Transit Packaging;
• Pails, Drums & Industrial; and
• PTTs.

This breakdown was not available in any of the secondary research found, other than the WRAP 2006 report. Therefore, the proportions of non-consumer rigid format were transposed onto the non-consumer rigid total (derived from a variety of secondary research - please see section 2 and 3 of this paper).

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⁷⁷ Assumes 2k tonnes of 2005 tonnage is non-consumer and 1kt is imported
report for methodologies and data sources used). The splits presented are therefore only indicative and should be treated with caution.

**EPS Transit Packaging**
Overall tonnage has decreased by around 20k (~70%) for this packaging format. This may be due to:

- The assumptions made in defining EPS transit packaging in the non-consumer table;
- Alternative forms of protective packing being adopted, such as use of corrugated card, shredded paper and blown LDPE pouches;
- Packaging reduction initiatives in the supply chain; and
- Data inaccuracies.

**Injected Moulded RTPS, Crates**
The reported tonnage of PP returnable plastic transit packaging has decreased by around 50k tonnes (~67%) since 2005.

**Pails, Drums & Industrial**
The overall tonnage of pails, drums and industrial has reduced by around 70k tonnes (~70%), with HDPE now seeing the highest tonnage compared to PP in 2005.

**Closures**
It is not possible to identify the proportion of non-consumer from the 2005 figures. Therefore, no comparison can be made.

### 4.4.6 Consumer Packaging Closures

Reported total tonnage for consumer closures has approximately doubled\(^{78}\) (~30k increase) since 2005, which according to RPC Containers, is reasonable. In 2005, polymers for closures were not specified. In 2011, polymers have been identified and the key ones are HDPE (32k tonnes), PET (21k tonnes) and PP (17k tonnes). However, RPC believes that the majority of caps are made of PP, which isn’t in line with what has been found here. Differences in the definition of what is included as lids/caps\(^{79}\) in each report and the assumptions made in estimating non-consumer data most likely contribute to the discrepancies in polymer breakdown.

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\(^{78}\) The split of consumer/non-consumer figures for closures was not included in the previous WRAP report and therefore the 60% is a minimum, as the 2005 baseline figure includes a proportion of non-consumer closures.

\(^{79}\) For this report, any packaging item described by suppliers as a cap or closure or lid in its own right has been included. Where the lid is part of the body of the packaging it has not been included as a cap but rather with the remainder of the packaging format.
5. Consumer Consumption of Plastic Packaging

5.1 Introduction

Consumer packaging (including household and on-the-go) has been estimated by taking a significant random sample of consumer (supermarket) packaging gathered for Valpak’s EPIC database (please see section 3.3 above), determining its weight, format and polymer type and applying the appropriate sales quantities. The proportions of packaging formats and polymers found have then been applied to the PackFlow consumer packaging quantity of 1724k tonnes, to estimate scaled-up quantities. Please see section 2.3 of this report for further details on the methodology.

The following tables provide a breakdown of the consumer element of UK plastic packaging by format and polymer type, and is discussed below. The remainder of this section then presents a further breakdown of consumer data by packaging that is disposed of at home (consumer household) and consumer packaging disposed of away from the home (consumer on-the-go).

Figure 13 Consumer Plastic Packaging (Tonnes & Percent)

<table>
<thead>
<tr>
<th>Consumer Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Film Total</strong></td>
<td>145k</td>
<td>140k</td>
<td>16k</td>
<td>93k</td>
<td>59k</td>
<td>1k</td>
<td>6k</td>
<td>95k</td>
<td>556k</td>
<td>32%</td>
</tr>
<tr>
<td>Film</td>
<td>59k</td>
<td>29k</td>
<td>11k</td>
<td>58k</td>
<td>50k</td>
<td>6k</td>
<td>5k</td>
<td>67k</td>
<td>279k</td>
<td>16%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>86k</td>
<td>113k</td>
<td>5k</td>
<td>35k</td>
<td>9k</td>
<td>1k</td>
<td>1k</td>
<td>29k</td>
<td>277k</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Rigid Total</strong></td>
<td>10k</td>
<td>193k</td>
<td>4k</td>
<td>150k</td>
<td>688k</td>
<td>66k</td>
<td>42k</td>
<td>15k</td>
<td>1167k</td>
<td>68%</td>
</tr>
<tr>
<td>Bottles</td>
<td>1k</td>
<td>158k</td>
<td>0k</td>
<td>4k</td>
<td>333k</td>
<td>0k</td>
<td>2k</td>
<td>0k</td>
<td>488k</td>
<td>29%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>3k</td>
<td>32k</td>
<td>3k</td>
<td>17k</td>
<td>21k</td>
<td>6k</td>
<td>5k</td>
<td>3k</td>
<td>68k</td>
<td>5%</td>
</tr>
<tr>
<td>Consumer PTTs</td>
<td>5k</td>
<td>0k</td>
<td>0k</td>
<td>123k</td>
<td>329k</td>
<td>53k</td>
<td>39k</td>
<td>7k</td>
<td>556k</td>
<td>32%</td>
</tr>
<tr>
<td>Thermoformed Packs</td>
<td>3k</td>
<td>0k</td>
<td>0k</td>
<td>23k</td>
<td>293k</td>
<td>8k</td>
<td>39k</td>
<td>2k</td>
<td>356k</td>
<td>21%</td>
</tr>
<tr>
<td>Injection Moulded Rigid</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>700k</td>
<td>35k</td>
<td>46k</td>
<td>0k</td>
<td>5k</td>
<td>188k</td>
<td>11%</td>
</tr>
<tr>
<td>Other</td>
<td>1k</td>
<td>2k</td>
<td>0k</td>
<td>5k</td>
<td>6k</td>
<td>13k</td>
<td>5k</td>
<td>5k</td>
<td>33k</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Grand Total (tonnes)</strong></td>
<td>156k</td>
<td>333k</td>
<td>20k</td>
<td>243k</td>
<td>747k</td>
<td>68k</td>
<td>48k</td>
<td>110k</td>
<td>1724k</td>
<td></td>
</tr>
<tr>
<td>Grand Total (%)</td>
<td>9%</td>
<td>19%</td>
<td>1%</td>
<td>14%</td>
<td>43%</td>
<td>4%</td>
<td>3%</td>
<td></td>
<td></td>
<td>6%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Consumer Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Film Total</strong></td>
<td>8.4%</td>
<td>8.1%</td>
<td>0.9%</td>
<td>5.4%</td>
<td>3.4%</td>
<td>0.1%</td>
<td>0.3%</td>
<td>5.5%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Film</td>
<td>3.4%</td>
<td>1.6%</td>
<td>0.6%</td>
<td>3.4%</td>
<td>2.9%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>3.9%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>5.0%</td>
<td>6.5%</td>
<td>0.3%</td>
<td>2.0%</td>
<td>0.5%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>1.7%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Film - Strapping/Tape/Bands</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Rigid Total</strong></td>
<td>6.6%</td>
<td>11.2%</td>
<td>0.2%</td>
<td>8.7%</td>
<td>39.9%</td>
<td>3.9%</td>
<td>2.4%</td>
<td>0.8%</td>
<td>67.7%</td>
</tr>
<tr>
<td>Bottles</td>
<td>0.1%</td>
<td>9.2%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>19.3%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>0.2%</td>
<td>1.9%</td>
<td>0.2%</td>
<td>1.0%</td>
<td>1.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.2%</td>
<td>4.7%</td>
</tr>
<tr>
<td>Consumer PTTs</td>
<td>0.3%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>7.1%</td>
<td>19.1%</td>
<td>3.1%</td>
<td>2.3%</td>
<td>0.4%</td>
<td>32.3%</td>
</tr>
<tr>
<td>Thermoformed Packs</td>
<td>0.2%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>7.4%</td>
<td>17.0%</td>
<td>0.4%</td>
<td>2.3%</td>
<td>0.1%</td>
<td>21.3%</td>
</tr>
<tr>
<td>Injection Moulded Rigid</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>5.8%</td>
<td>2.1%</td>
<td>2.7%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>10.9%</td>
</tr>
<tr>
<td>Other</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>0.4%</td>
<td>0.8%</td>
<td>0.0%</td>
<td>0.3%</td>
<td>1.9%</td>
</tr>
<tr>
<td><strong>Grand Total (%)</strong></td>
<td>9.0%</td>
<td>19.3%</td>
<td>1.1%</td>
<td>14.1%</td>
<td>43.3%</td>
<td>3.9%</td>
<td>2.8%</td>
<td>6.4%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>
5.2 **Plastic Packaging by Format and Polymer**

Consumer plastic packaging is split broadly evenly between three main packaging formats: films (32%, 556k tonnes), PTTs (32%, 556k tonnes) and bottles (29%, 498k tonnes). When combined, rigid plastic packaging accounts for approximately two-thirds (68%) of consumer plastic packaging and film one-third (32%).

The most common polymer found in plastic consumer packaging is PET, which represents 43% of the total tonnage, or 747k tonnes. Key consumer packaging made from PET is bottles, typically containing soft drinks/water/cordials/energy drinks, and PTTs. The second most common polymer is HDPE (19%, 333k tonnes), which is mainly found in the form of milk bottles and vest-style carrier bags. The third most significant polymer is PP (14%, 243k tonnes), which is principally used to make PTTs.

The three main packaging formats, and their associated polymers, are discussed below.

5.2.1 **Consumer Films (32% of Consumer Plastic Packaging)**

Film packaging can be further broken down into bag and non-bag films, and the analysis suggests they stand in fairly equal proportions. The distinctions between some types of bags and some types of non-bag film can be blurry, and accordingly there is some uncertainty around the exact split.

The estimated split of bag and non-bag film is shown in Figure 14 below, which also illustrates the proportion of carrier bags and the breakdown of non-bag film by polymer type.

![Figure 14: Consumer Plastic Film by Polymer](image-url)
Film- bags
The data does not distinguish between carrier bags and other bags. Nevertheless, according to the WRAP UK Supermarket Retailers Voluntary Carrier Bag Agreement, in 2011 the weight of single use carrier bags used by the major supermarkets was just over 60k tonnes. Based on this, and the total bags tonnage in our analysis, up to 200k tonnes of plastic bags are used to package products such as fruit and vegetables, bread, etc. Figure 15 illustrates the specific uses, based on detailed analysis of EPIC data, mapping the type of products associated with ‘other bags’ (other than single use carrier bags).

Figure 15 Typical Product Types for Consumer Bags

<table>
<thead>
<tr>
<th>Bags</th>
<th>% of Bags</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit &amp; Veg</td>
<td>27%</td>
</tr>
<tr>
<td>Bread</td>
<td>21%</td>
</tr>
<tr>
<td>Crisps</td>
<td>15%</td>
</tr>
<tr>
<td>Potatoes</td>
<td>14%</td>
</tr>
<tr>
<td>Breakfast Cereal</td>
<td>10%</td>
</tr>
<tr>
<td>Tissue/Kitchen Roll</td>
<td>3%</td>
</tr>
<tr>
<td>Meat Products</td>
<td>2%</td>
</tr>
<tr>
<td>Pet Food</td>
<td>2%</td>
</tr>
<tr>
<td>Cheese</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>5%</td>
</tr>
</tbody>
</table>

The breakdown in Figure 15 was confirmed as ‘reasonable’ in the industry consultation. Generally, HDPE is used for single use carrier bags, LDPE/LLDPE for long life carrier bags or as plastic wrap and PP more commonly as a general film, wrap, lining or label.

Please see section 4.4.1 of this report for further commentary on the proportion of all plastic bags that is consumer packaging and the potential growth and polymer substitution trends identified.

Non-bag Film
A wide variety of polymer types were identified for non-bag films in this report; the larger share comprising LDPE/LLDPE (21% of non-bag film, 26% of all film), PP (21%, 17%) and PET (18%, 11%). It is believed by industry that the range of polymers currently used in non-bag films has grown in recent years due to a number of factors:

- Reducing carbon footprints has led to less chilling and freezer cabinets and more technical barrier films that aid longevity in ambient temperatures, requiring different polymers;
- The focus on reducing food waste has required more technical films; and
- The growth in consumer PTTs and the associated film lids/seals required.

Please see section 4.4.1 of this report for further commentary on potential consumer plastic film trends.

80 UK Supermarket Retailers Voluntary Carrier Bag Agreement, 2011 Carrier Bag Use, WRAP July 2012
5.2.2 PTTs (32% Consumer Plastic Packaging)

The analysis suggests that PTTs are mainly in the form of thermoformed packs (approximately two-thirds of PTTs), with the remainder being injection moulded rigid packs. This is illustrated in Figure 16 below, along with the polymer splits of thermoformed packs.

Please note due to the difficulty in distinguishing between consumer thermoformed packs and injection moulded packaging from the packaging description, format and polymer types requested in the survey sample and/or stored in the EPIC database, the breakdown of consumer PTTs into thermoformed packs and IMRs provided is at best indicative and should be treated with caution.

![Figure 16: Consumer Plastic Pots, Tubs and Trays by Polymer](image)

The majority of thermoformed packs are made of PET (80% of Thermoformed Packs, 53% of all PTTs). Detailed analysis of the packaging formats suggests that nearly all thermoformed packs are trays, with small quantities of boxes and blister packs. Similarly, PP thermoformed packaging is nearly all trays with some boxes. PVC thermoformed packaging is mainly trays.

The majority of injection moulded rigid packaging is PP (53%) and includes pots, punnets and tubs. PS constitutes 24% of injection moulded rigid packaging, mainly as pots and tubs and PET constitutes a further 19% of this type of packaging.

Please see section 4.4.4 of this report for further analysis of consumer PTTs and commentary on potential consumer PTTs trends.

5.2.3 Bottles (29% Consumer Plastic Packaging)

The analysis suggests that bottles account for 29% of Consumer plastic packaging, amounting to 498K tonnes. This proportion is lower than that presented in the PackFlow 2017 report (40%); however, this

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81 The split of thermoformed packs and injection moulded rigid packs relies on the description of the packaging as entered into EPIC – certain terms such as plastic boxes, containers, etc. could be either type of packaging. Therefore, the data is presented combined as PTTs with greater confidence; the split provided for thermoformed packs and injection moulded rigid packs is indicative.
current piece of work succeeds PackFlow and has followed a more statistically robust method in order to determine the proportion of consumer plastic packaging that is bottles. The consumer bottle proportion consists of plastic bottles disposed of at home (consumer household) and away from home (consumer on-the-go). If the proportion that is consumer plastic bottles from all consumer plastic packaging disposed of at home (26%) is compared to Wrap and Defra’s most recent estimate\(^2\) (23%), then the figures are broadly comparable and suggest that the overall consumer bottle proportion is also fairly consistent with current views.

What is less consistent with industry perception to date is the quantity of consumer plastic bottles reported as part of this study (498kt), due to this being considerably lower than the 605k tonnes of consumer plastic bottle consumption adopted by Recoup\(^4\). However, it should be noted that the two estimates have been derived in very different ways: this study through sampling 2011 supermarket packaging data weights/formats/polymers and Recoup’s through industry consultation supporting an approximate 2% year-on-year bottle growth rate between 2005 and 2011, based on a higher 2005 total plastic packaging tonnage.

Discussions with Recoup\(^3\) have highlighted the sensitivity of applying growth rates and estimating import and C&I tonnages of plastic bottles. The principal difference in the two figures arises from this study recognising an average 2% annual increase in plastic packaging overall, in which there has been no growth in the weight of bottle and film packaging (due to light weighting and down gauging of materials), but substantial growth in other rigid plastic packaging such as PTTs. It is possible that the bottle tonnage figure presented in this report may be adopted by Recoup in the future, if it is agreed by industry and becomes accepted as the best available bottle arising figure.

Figure 17 below illustrates the polymer split of consumer plastic bottles consumed in the UK:

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\(^2\) WRAP Market Situation Report, Realising the value of recovered plastic – an update, Spring 2010,
http://www2.wrap.org.uk/downloads/MSR_Redesign_June_2011.6a6e1bc2.10876.pdf

\(^3\) Recoup engaged with Valpak on a number of occasions in the preparation of this report, including presentation/discussion with the Recoup Board and telephone calls regarding the difference in bottle tonnages. Their support and participation is much appreciated and recognised in publishing this report.

\(^4\) Percentages do not sum due to rounding.
The majority of plastic bottles bought by consumers are made of PET (67%, 333kt), commonly used for carbonated drinks, bottled water, cordials and energy drinks. This is followed by HDPE (32%, 158kt), mainly used as milk, cleaning or toiletries bottles. A small proportion of bottles are also made of PP, PVC and LDPE (just over 1% combined).

Nampak\(^{85}\) estimates that 119k\(^{86}\) tonnes of HDPE milk bottles were placed onto the UK market in 2010, the majority of which is consumer, but includes an unknown (small, perhaps 5%) quantity of non-consumer bottles such as those used by cafes, restaurants, etc.. This being the case, it could be estimated that around 113k tonnes (72%) of consumer HDPE bottles are used for milk and the remaining 45k tonnes (28%) are used for consumer non-grocery packaging.

According to industry discussions, the split of PET to HDPE bottles sits at around 50% each, at least as waste arisings. The split derived from the EPIC data sample suggests a different split for consumption: two thirds (68%) PET and one third (32%) HDPE. As on-the-go bottle collections are still limited and a considerable proportion (around one-third, please see section 5.6 for more details) of PET bottles are potentially disposed of on-the-go and are therefore unlikely to enter the recycling stream, it is understandable that the quantities of PET and HDPE bottles passing through MRFs and PRFs are more similar.

### 5.2.4 Other (2% of Consumer Plastic Packaging)

Figure 18 provides a list of the packaging formats that were included in the ‘Other’ packaging format, i.e. not ‘Bottle’, ‘Film’, ‘Closure’ or ‘PTTs’.

<table>
<thead>
<tr>
<th>Other Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actuator</td>
</tr>
<tr>
<td>Applicator</td>
</tr>
<tr>
<td>Base</td>
</tr>
<tr>
<td>Hi Cone</td>
</tr>
<tr>
<td>Pad</td>
</tr>
<tr>
<td>Pump</td>
</tr>
<tr>
<td>Spray Top</td>
</tr>
<tr>
<td>Stem</td>
</tr>
<tr>
<td>Strip</td>
</tr>
<tr>
<td>Tie</td>
</tr>
<tr>
<td>Tube</td>
</tr>
<tr>
<td>Valve</td>
</tr>
</tbody>
</table>

The results calculated a tonnage of 33k tonnes that comprises these packaging formats. This is 2% of the total consumer packaging.

---

85 Taken from consultation carried out by Valpak October 2012.
86 Nampak’s figure is backed by Defra’s milk road map report produced by the Dairy Supply Chain Forum’s Sustainable Consumption & Production Taskforce.
5.3 Consumer (Household) Plastic Packaging

Total consumer plastic packaging can be broken down into consumer household plastic packaging and consumer on-the-go plastic packaging (see Section 2.3). The consumer (household) figures have been calculated by extracting the tonnages of various plastic packaging formats and polymers estimated to be disposed on-the-go, from the total consumer figures, as illustrated below.

Figure 19  Consumer (Household) Plastic Packaging

<table>
<thead>
<tr>
<th>Consumer Household Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Total</td>
<td>127k</td>
<td>105k</td>
<td>13k</td>
<td>77k</td>
<td>47k</td>
<td>1k</td>
<td>3k</td>
<td>77k</td>
<td>452k</td>
<td>31%</td>
</tr>
<tr>
<td>Film</td>
<td>52k</td>
<td>20k</td>
<td>9k</td>
<td>47k</td>
<td>40k</td>
<td>0k</td>
<td>4k</td>
<td>54k</td>
<td>222k</td>
<td>16%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>74k</td>
<td>85k</td>
<td>4k</td>
<td>29k</td>
<td>7k</td>
<td>1k</td>
<td>1k</td>
<td>23k</td>
<td>224k</td>
<td>16%</td>
</tr>
<tr>
<td>Rigid Total</td>
<td>10k</td>
<td>18k</td>
<td>4k</td>
<td>131k</td>
<td>25k</td>
<td>1k</td>
<td>3k</td>
<td>93k</td>
<td>16%</td>
<td>100%</td>
</tr>
<tr>
<td>Bottles</td>
<td>4k</td>
<td>155k</td>
<td>6k</td>
<td>4k</td>
<td>215k</td>
<td>0k</td>
<td>2k</td>
<td>0k</td>
<td>37k</td>
<td>9%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>3k</td>
<td>21k</td>
<td>3k</td>
<td>15k</td>
<td>18k</td>
<td>0k</td>
<td>1k</td>
<td>3k</td>
<td>73k</td>
<td>7%</td>
</tr>
<tr>
<td>Consumer PTTs</td>
<td>4k</td>
<td>0k</td>
<td>0k</td>
<td>113k</td>
<td>0k</td>
<td>0k</td>
<td>1k</td>
<td>6k</td>
<td>509k</td>
<td>35%</td>
</tr>
<tr>
<td>Thermoformed Packs</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>27k</td>
<td>267k</td>
<td>7k</td>
<td>36k</td>
<td>2k</td>
<td>338k</td>
<td>66%</td>
</tr>
<tr>
<td>Injection Moulded Rigid</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>93k</td>
<td>33k</td>
<td>0k</td>
<td>0k</td>
<td>4k</td>
<td>174k</td>
<td>24%</td>
</tr>
<tr>
<td>Other</td>
<td>1k</td>
<td>2k</td>
<td>0k</td>
<td>5k</td>
<td>6k</td>
<td>12k</td>
<td>0k</td>
<td>4k</td>
<td>30k</td>
<td>2%</td>
</tr>
<tr>
<td>Grand Total (tonnes)</td>
<td>137k</td>
<td>294k</td>
<td>16k</td>
<td>215k</td>
<td>386k</td>
<td>62k</td>
<td>43k</td>
<td>91k</td>
<td>144tk</td>
<td></td>
</tr>
<tr>
<td>Grand Total (%)</td>
<td>9%</td>
<td>20%</td>
<td>1%</td>
<td>15%</td>
<td>41%</td>
<td>4%</td>
<td>3%</td>
<td>6%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3.1 Packaging Formats

The most common packaging formats identified are bottles (26%, 381k tonnes), followed by thermoformed packs (23%, 336k tonnes), film non-bags (16%, 228k tonnes) and film bags (16%, 224k tonnes).

Figure 20  Consumer (Household) Plastics Packaging by Packaging Format
5.3.2 Polymer Types

Figure 21 Consumer (Household) Plastics Packaging by Polymer Type

With regard to polymer type, the most common type of plastic packaging used in the household is made up of PET (41% of total Consumer [household] plastic packaging, 586kt).

The largest proportion of PET plastic packaging is thermoformed packs (46%) used to package ready meals, followed by bottles (37%) to package juice drinks.

HDPE is the second most used polymer (20% of total Consumer [household] plastic packaging). The majority of HDPE plastic packaging is bottles (54%) and it is mainly used to package milk and toiletries, due to its chemical resistant properties.

A key format of PP is injection moulded rigid (43%), which is principally made up of pots to package items such as yoghurts, deli fillers, spreads and margarine tubs and ice cream tubs.87

A recent report by WRAP88 on PP packaging (to be used with caution due to the different methodology used89) presents estimates that can be compared with PP consumer household packaging here:

88 UK market composition data of polypropylene packaging, WRAP, 2012
89 The methods used are very different due to WRAP’s report being based on consultation and Volpak’s being based on statistical analysis of consumption data.
• PP consumer household film is consistent between both reports (77K tonnes compared to WRAP: 60-100K tonnes);
• Consumer household PP bottles is much lower in this analysis at 4K tonnes compared to WRAP’s estimate of 60K tonnes; and
• The breakdown of consumer PTTs for PP in both reports differ in style and tonnages, please see PP report\(^{90}\) for details.

5.4 Consumer (On-the-Go) Plastic Packaging

In order to establish the format and polymer splits of the consumer (away-from home) plastic packaging, further secondary research was undertaken to estimate appropriate splits of plastic bottles, plastic film and other plastic packaging as reported in a number of litterbin and street sweeping analyses undertaken in different parts of the UK over the last ten years (See section 2.3.2 for more detail).

**Figure 22** On-the-Go Plastics Packaging by Polymer Type

<table>
<thead>
<tr>
<th>Consumer Away from Home Plastic Packaging</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Other</th>
<th>Grand Total (tonnes)</th>
<th>Grand Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Film Total</td>
<td>18k</td>
<td>35k</td>
<td>3k</td>
<td>17k</td>
<td>12k</td>
<td>0k</td>
<td>1k</td>
<td>18k</td>
<td>105k</td>
<td>37%</td>
</tr>
<tr>
<td>Film</td>
<td>0k</td>
<td>5k</td>
<td>2k</td>
<td>11k</td>
<td>10k</td>
<td>0k</td>
<td>1k</td>
<td>12k</td>
<td>51k</td>
<td>18%</td>
</tr>
<tr>
<td>Film - Bags</td>
<td>12k</td>
<td>27k</td>
<td>1k</td>
<td>6k</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>5k</td>
<td>54k</td>
<td>19%</td>
</tr>
<tr>
<td>Rigid Total</td>
<td>0k</td>
<td>4k</td>
<td>0k</td>
<td>11k</td>
<td>149k</td>
<td>6k</td>
<td>3k</td>
<td>1k</td>
<td>174k</td>
<td>63%</td>
</tr>
<tr>
<td>Bottles</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>118k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>118k</td>
<td>42%</td>
</tr>
<tr>
<td>Consumer Closures</td>
<td>0k</td>
<td>4k</td>
<td>0k</td>
<td>2k</td>
<td>2k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>8k</td>
<td>3%</td>
</tr>
<tr>
<td>Consumer Rigid</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>10k</td>
<td>28k</td>
<td>4k</td>
<td>3k</td>
<td>1k</td>
<td>47k</td>
<td>17%</td>
</tr>
<tr>
<td>Thermoformed packs</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>2k</td>
<td>26k</td>
<td>1k</td>
<td>3k</td>
<td>0k</td>
<td>32k</td>
<td>11%</td>
</tr>
<tr>
<td>Injection Molded Rigid</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>8k</td>
<td>3k</td>
<td>4k</td>
<td>0k</td>
<td>0k</td>
<td>15k</td>
<td>5%</td>
</tr>
<tr>
<td>Various Applications</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>0k</td>
<td>1k</td>
<td>1k</td>
<td>0k</td>
<td>0k</td>
<td>2k</td>
<td>1%</td>
</tr>
<tr>
<td>Grand Total (tonnes)</td>
<td>19k</td>
<td>39k</td>
<td>3k</td>
<td>25k</td>
<td>161k</td>
<td>6k</td>
<td>4k</td>
<td>4k</td>
<td>19k</td>
<td>29%</td>
</tr>
<tr>
<td>Grand Total (%)</td>
<td>7%</td>
<td>14%</td>
<td>1%</td>
<td>10%</td>
<td>58%</td>
<td>2%</td>
<td>2%</td>
<td>7%</td>
<td>7%</td>
<td></td>
</tr>
</tbody>
</table>

The analysis suggests that bottles are the single largest component (42%) of total consumer (on-the-go) packaging and, accordingly, PET (mainly PET bottles) is the most commonly found polymer (58%).

It should be noted that the tonnage of plastic bottles estimated to be disposed of on-the-go in this report (118kt) is far greater than the 25kt estimated in Recoup’s UK Household Plastics Packaging Collection Survey 2011.\(^{46}\) This is an important figure as the vast majority of bottles disposed of on-the-go are not recycled and therefore represent a considerable tonnage of untapped plastic packaging for recycling. Further research in this area is required to establish a more accurate, agreed figure.

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\(^{90}\) UK market composition data of polypropylene packaging, WRAP, 2012
6. Non-consumer Consumption of Plastic Packaging

For the purposes of this study, non-consumer consumption represents all packaging from the commercial and industrial streams as well as agricultural and construction & demolition (C&D) plastic packaging. Commercial plastic packaging includes that which arises from the retail, wholesale, hospitality, offices and similar operations.

The starting point for establishing the recent (2011) levels of non-consumer plastic packaging was the PackFlow 2017 estimate of 811K tonnes. The packaging formats and polymers were broken down using data sourced from a wide range of secondary research findings. It has therefore not been possible to apply any errors of margin and the format and polymer splits should be treated as indicative. For further detail on the methodology followed to establish non-consumer packaging splits, please see Section 2 of this report.

Figure 25 below presents the breakdown of non-consumer plastic packaging by format and polymer, as best estimated in this study.

![Figure 23 Non-Consumer Plastic Packaging Arisings](image)

The majority (69%) of non-consumer plastic packaging is made up of film (563kt), primarily non-bag film made of LLDPE/LDPE (449kt). The remainder is rigid packaging (31%, 248kt).

LLDPE/LDPE makes up the biggest proportion of plastic packaging polymer used in non-consumer applications, at 60% of all polymers. PP constitutes 16% of non-consumer packaging, mainly as pots tubs and trays and pallets/crates. The 77k tonnes total PP non-consumer rigidgs figure from this report broadly equates to the 80k tonnes estimated in WRAP’s UK market composition data of polypropylene packaging report\(^1\); however, the breakdown of non-consumer rigidgs is considerably different. This is most likely due to the assumptions, methodologies and age of data used to provide a breakdown of non-consumer rigidgs in this study.

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91 UK market composition data of polypropylene packaging, WRAP, 2012
7. Conclusions

7.1 Formats of Plastic Packaging

Rigid packaging (bottles, PTTs, closures, etc.) account for the majority (56%) of plastic packaging
- 45% of rigid plastic packaging is PTTs
- 39% of rigid plastic packaging is bottles

Plastic film including bags, strapping, tape and bands constitute the next largest proportion of plastic packaging consumed in the UK
- 44% of plastic packaging is made of film (1119kt)
- Of this, 71% is non-bag film (790kt) and 29% is film used as bags (321kt)

Plastic pots, tubs and trays represent 25% of UK plastic packaging
- 32% of consumer plastic packaging is comprised of PTTs (556kt)
- 10% of non-consumer plastic packaging are PTTs (85kt)

Bottles represent 22% of plastic packaging consumption in the UK
- 91% of plastic bottles arise in the consumer sector
- 29% of consumer plastic packaging is bottles

7.2 Polymers used in Plastic Packaging

PET is the most commonly used polymer in UK plastic packaging
- 32% of UK plastic packaging is made of PET (803kt)
- 43% of consumer plastic packaging is made of PET (747kt)

LDPE/LLDPE is used to make a quarter of plastic packaging
- 9% of consumer plastic packaging is made of LDPE/LLDPE (156kt)
- 60% of non-consumer plastic packaging is made of LDPE/LLDPE (483kt)

HDPE is used to make 16% of UK plastic packaging
- HDPE is used to manufacture 410kt of UK plastic packaging
- 19% of consumer plastic packaging is made of HDPE (333kt)
- 9% of non-consumer plastic packaging is made of HDPE (77kt)
PP is used to make 15% of UK plastic packaging

- PP is used to manufacture 370kt of UK plastic packaging
- 14% of consumer plastic packaging is made of PP (243kt)
- 16% of non-consumer plastic packaging is made of PP (127kt)

PET bottles represent the largest single tonnage of consumer plastic packaging

- PET bottles represent 13% of UK plastic packaging (337kt)
- Industry confirms a move towards packaging products in PET bottles rather than HDPE due to changes in bottle requirements, improved visual impact, lighter weight and lower cost

The 50% HDPE:50% PET composition split of bottles entering the sorting/recycling stream may not necessarily be appropriate for packaging consumption

- The split derived from the survey sample suggests a split for consumer consumption of around two thirds (62%) PET and one third (38%) HDPE bottles.
- Packaging consumption figures and the composition split of bottles entering the sorting/recycling stream can vary due to factors such as disposal of household packaging away from home; as on-the-go bottle collections are still extremely limited and a considerable proportion (around one-third) of PET bottles are potentially disposed of on-the-go (and are therefore unlikely to enter the recycling stream as on-the-go recycling is very limited), it is understandable that the quantities of PET and HDPE bottles in household waste arisings and passing through MRFs and PRFs are broadly equivalent.

7.3 Trends in Plastic Packaging

These potential trends arise from comparing the data in this report with the previously most comprehensive composition analysis published by WRAP, containing 2005 data. It should be noted that the methodologies used to derive the estimates in each report are very different and there is considerable uncertainty over these estimates in both reports. Therefore, the comparison data should be treated with caution and as only one means of establishing potential trends. Data for 2005 is detailed in Annex II Figures A5 – A7.

The largest growth in plastic packaging format appears to have been in PTTs

- Results from the current study estimate 641k tonnes of plastic PTTs
- This is more than double the quantity of PTTs reported in this report compared to the quantity reported back in 2005.

Film and Bottle tonnages appear to have remained relatively stable since 2005

- Results from the current study estimate 1119k tonnes of plastic film packaging
- This is similar to the 897k tonne (plus assumed 228kt imports) reported in 2005
- A wider range of polymers are now used in film and bag manufacture (new polymers representing ~33% and ~28% respectively)
- Results from the current study estimate 548k tonnes of plastic bottles
- This is similar to the 548k tonne (plus assumed 11kt imports) reported in 2005
- Industry’s view confirms any growth in consumption has been negated through light weighting of bottles and down gauging of films

The largest growth in plastic packaging polymer appears to have been in PET

- Results from the current study estimate 803k tonnes of plastic PET packaging
- This is almost double the quantity reported in 2005 (96% growth)
- The majority of this growth is in PTTs (around 300kt)
- PET is becoming a preferred polymer due to favourable properties such as visual impact, barrier properties, food-grade recyclability and price (relative to HDPE)

The largest decline in plastic packaging format (in tonnes) appears to have been in plastic bags

- Plastic bag (carrier bags and other bags) tonnages have reduced by approximately one third since 2005 (36%, 181kt)
- Carrier bags look to have reduced by up to one quarter
- There has been growth in non-carrier bags such as fresh produce and bread bags

The largest decline in plastic packaging polymer appears to have been in LDPE/LLDPE

- Results from the current study estimate 638k tonnes of plastic LDPE/LLDPE packaging
- This represents a 34% decrease (322kt) on reported 2005 figures
- This is most likely due to a shift from LDPE bags to HDPE bags and the switching to alternative film polymers with different technical capabilities (e.g. storage in ambient instead of chilled environment, closures on ready meals)
- HDPE Bags have experienced significant growth at the expense of LDPE bags
Annex I: Imports of Plastic Packaging

Imported Obligated Packaging

Using the data reported to the Environment Agency for compliance with the Packaging Regulations, available from the National Packaging Waste Database (NPWD), it was possible to estimate the proportion of obligated plastic packaging sold onto the UK market that was imported, either as empty packaging or packaging filled with product.

These calculations indicate that, in 2011, approximately 32% of all plastic packaging placed on the market was imported obligated tonnage, of which 38% was imported empty (and subsequently filled and sold in the UK) and 62% was imported as pre-packaged products.

![Figure A4 2011 Obligated Plastic Packaging Imports](image)

Imported Non-obligated Packaging

Calculating the non-obligated plastic packaging imported into the UK requires identifying the quantity of plastic packaging imported by companies that are not obligated due to their size, i.e. are excluded from reporting their packaging data as they handle fewer than 50 tonnes of packaging or have a turnover below £2m. This is known as the de-minimus threshold.

If it were possible to calculate the proportion of de-minimus tonnage of all non-obligated plastic packaging, then this proportion could be applied to the above import data to calculate a proxy tonnage of non-obligated plastic packaging imported.

The most commonly used method to calculate the tonnage of non-obligated packaging is to subtract the obligated tonnage for a given year (as reported in NPWD⁴¹) from an estimated packaging flow tonnage. Following this method, adopting the 2011 total plastic packaging flow estimate from PackFlow of 2,535k tonnes (please see Section 3.2 for details on PackFlow) and the NPWD 2011 total obligated plastic packaging figure of 1,868k tonnes, gives a tonnage difference of 667k tonnes or 26%.

However, this 667k tonnes of plastic packaging is not uniquely due to the de-minimus threshold as packaging can be excluded from the packaging regulations for a number of other reasons, for example:

- There are still a number of ‘free-riders’ i.e. companies that are not reporting packaging data that should be. For example, not all leased packaging (plastic crates) appears to have picked up its full obligation yet. Companies leasing this packaging out may still not have registered or are not picking up full obligation. There is no list available of those registered to lease out packaging.
• ‘Internal use packaging’: large amounts of both disposable and re-useable packaging are used ‘internally’ within a legal entity, and because supply to an external company does not take place, no obligation currently exists.
• Packaging used for things like storage/moving crates outside the system may still end up being recycled but never pick up an obligation.
• Ownership of imports:
  • Raw material/conversion sector: this is an issue in the petro chemical industry especially as many companies have moved offices abroad for tax reasons
  • Lots of grey imports missing (free riding)
• Contract packing operations: a lot of packaging operations are performed by contract packers and/or logistics companies. They may add or remove packaging on behalf of clients; for example, they may remove imported transit packaging which the product owner then forgets to account for, and the contractor does not submit data on as they are a de-minimus company.
• Incapacity: when companies go bust their obligation is normally lost, even if the business is taken on by someone else.

Applying the 26% proxy non-obligated plastic packaging figure to the 821k tonnes estimation of obligated imported plastic packaging given in Figure A4 above would therefore give a maximum, but most likely over estimated, 1,053k tonnes of imported plastic packaging in 2011. It could therefore be said that imported plastic packaging represents between 40% and 44% of all UK plastic packaging.

**Imported Empty Packaging by Packaging Format**

National Statistics’ PRODCOM data provides some insight into the proportion of empty packaging formats imported, using either the tonnage or number of items sold.

Calculations made on 2010 data suggest that approximately 59% of empty plastic sacks and bags were imported, along with 46% of plastic boxes, cases and crates, 16% of plastic carboys, bottles and flasks and 29% of bottle caps, capsules, other stoppers & lids.
Annex II: Key Data tables from WRAP’s UK Plastic Waste – A review of supplies for recycling, global market demand, future trends and associated risks’ (Table 2.1 & Table 2.3)

Figure A5    Table 2.1 Polymer demand by application in production of packaging for consumption in the UK (2005), k tonnes

<table>
<thead>
<tr>
<th>Application \ Polymer</th>
<th>LDPE/LLDPE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>Unspecified Polyolefins (PO)</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Bio-polymers</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottles</td>
<td>220</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>300</td>
<td>5</td>
<td>-</td>
<td>13</td>
<td>-</td>
<td>548</td>
</tr>
<tr>
<td>Closures</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>50</td>
</tr>
<tr>
<td>EPS transit packaging</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>28</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>28</td>
</tr>
<tr>
<td>Film</td>
<td>408</td>
<td>68</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>486</td>
</tr>
<tr>
<td>Film: bags</td>
<td>392</td>
<td>19</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>411</td>
</tr>
<tr>
<td>Injection moulded RTP19, crates, etc</td>
<td>-</td>
<td>70</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>Other HDPE packaging</td>
<td>42</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>42</td>
</tr>
<tr>
<td>Pails, drums &amp; industrial</td>
<td>-</td>
<td>37</td>
<td>55</td>
<td>-</td>
<td>101</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>126</td>
</tr>
<tr>
<td>Semi-rigid sheet</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>20</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td>Strapping</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>112</td>
<td>60</td>
<td>85</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>257</td>
</tr>
<tr>
<td>Thermoformed packs20</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>15</td>
</tr>
<tr>
<td>Injection moulded rigid</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Fibre for packaging</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Various applications</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Net packaging imports (estimated)21</td>
<td>160</td>
<td>40</td>
<td>54</td>
<td>20</td>
<td>5</td>
<td>15</td>
<td>10</td>
<td>10</td>
<td>3</td>
<td>314</td>
</tr>
</tbody>
</table>

Total                      | 960        | 321  | 122 | 287| 110                          | 410 | 128| 134 | 3           | 2,474 |
Table 2.3 Characterisation of C&I plastic packaging arisings, exc. ‘domestic-like’ arisings (est. 2005)

<table>
<thead>
<tr>
<th>Arisings</th>
<th>Total kt (2005)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bottles &amp; closures</td>
<td>42</td>
</tr>
<tr>
<td>EPS transit packaging</td>
<td>14</td>
</tr>
<tr>
<td>Fibre</td>
<td>3</td>
</tr>
<tr>
<td>Film</td>
<td>318</td>
</tr>
<tr>
<td>Film - bags</td>
<td>127</td>
</tr>
<tr>
<td>Injection moulded rigid</td>
<td>2</td>
</tr>
<tr>
<td>Injection moulded RTPs, crates, etc</td>
<td>38</td>
</tr>
<tr>
<td>Other HDPE packaging</td>
<td>42</td>
</tr>
<tr>
<td>Pails, drums &amp; industrial</td>
<td>52</td>
</tr>
<tr>
<td>Semi-rigid sheet</td>
<td>48</td>
</tr>
<tr>
<td>Strapping</td>
<td>27</td>
</tr>
<tr>
<td>Thermoformed packs</td>
<td>20</td>
</tr>
<tr>
<td>Various applications</td>
<td>30</td>
</tr>
<tr>
<td>Process loss/supply chain losses not accounted for already in above tonnages</td>
<td>91</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>854</strong></td>
</tr>
</tbody>
</table>

Table 2.1 Polymer demand by application in production of packaging for consumption in the UK (2005), k tonnes with assumed imports allocated and non-consumer/consumer splits

<table>
<thead>
<tr>
<th></th>
<th>PE</th>
<th>HDPE</th>
<th>OPP</th>
<th>PP</th>
<th>Unspec PO</th>
<th>PET</th>
<th>PS</th>
<th>PVC</th>
<th>Bio-plastics</th>
<th>Total (Tonnes)</th>
<th>Total (%)</th>
<th>Assumed C&amp;I</th>
<th>Assumed Consumer</th>
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<tr>
<td>Bottles</td>
<td>220</td>
<td>10k</td>
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<td></td>
<td>311k</td>
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<td>550k</td>
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<td>23%</td>
<td>42k</td>
<td>517k</td>
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<tr>
<td>Closures</td>
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<td></td>
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<td></td>
<td></td>
<td>52k</td>
<td>52k</td>
<td>2%</td>
<td>52k</td>
<td></td>
</tr>
<tr>
<td>EPS transit packaging</td>
<td>31k</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31k</td>
<td>14k</td>
<td>1%</td>
<td>17k</td>
<td></td>
</tr>
<tr>
<td>Film</td>
<td>490k</td>
<td>122k</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>622k</td>
<td>318k</td>
<td>25%</td>
<td>304k</td>
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<tr>
<td>Film - bags</td>
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<td>31k</td>
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<td>502k</td>
<td>127k</td>
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<td>375k</td>
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<td></td>
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<td></td>
<td></td>
<td>75k</td>
<td>38k</td>
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<td></td>
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<td>70k</td>
<td>42k</td>
<td>3%</td>
<td>28k</td>
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<tr>
<td>Pails, drums &amp; industrial</td>
<td>40k</td>
<td>58k</td>
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<td>98k</td>
<td>52k</td>
<td>4%</td>
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<td>26k</td>
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<td>137k</td>
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<td>32k</td>
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<tr>
<td>Thermoformed packs</td>
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<td>93k</td>
<td></td>
<td></td>
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<td>276k</td>
<td>256k</td>
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<td>Injected moulded rigid</td>
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<td>14k</td>
<td>1%</td>
<td>2k</td>
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<tr>
<td>Fibre for packaging</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<td>3k</td>
<td>6k</td>
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<td>0k</td>
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<tr>
<td>Various applications</td>
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<td>3k</td>
<td></td>
<td></td>
<td>3k</td>
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<td></td>
<td></td>
<td>3k</td>
<td>3k</td>
<td>0%</td>
<td>3k</td>
<td></td>
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<tr>
<td>Process/supply chain losses</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td>91k</td>
<td>-91k</td>
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</tr>
<tr>
<td><strong>Total (Tonnes)</strong></td>
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<td>321k</td>
<td>122k</td>
<td>287k</td>
<td>110k</td>
<td>410k</td>
<td>128k</td>
<td>134k</td>
<td>2475k</td>
<td>824k</td>
<td>39%</td>
<td>1651k</td>
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</tr>
<tr>
<td><strong>Total (%)</strong></td>
<td>39%</td>
<td>13%</td>
<td>5%</td>
<td>12%</td>
<td>4%</td>
<td>17%</td>
<td>5%</td>
<td>5%</td>
<td>0%</td>
<td></td>
<td></td>
<td></td>
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</table>