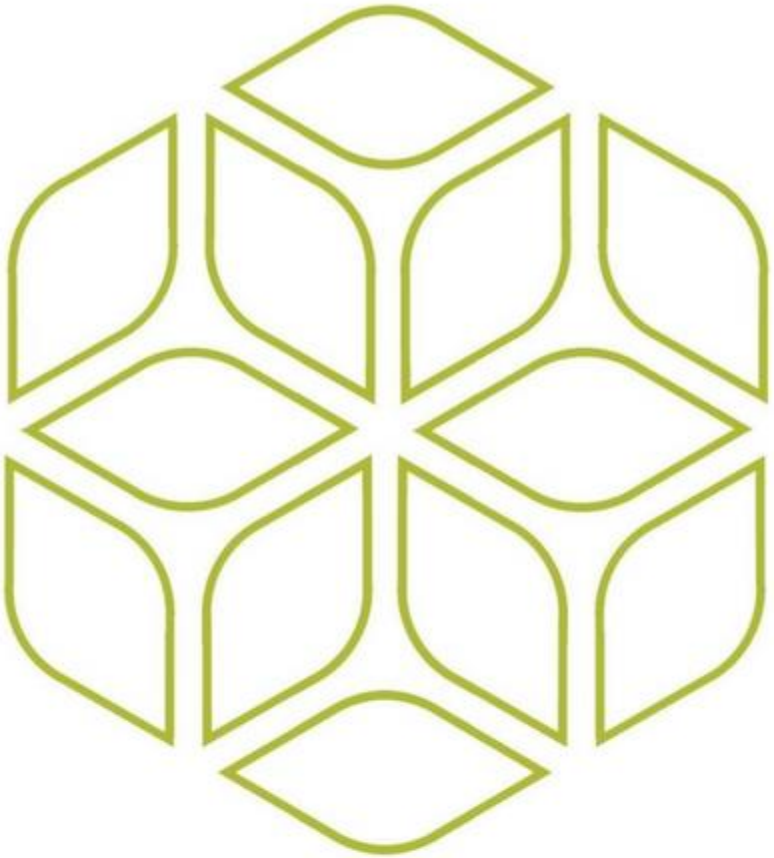

Composition analysis of litter waste in Wales

Welsh Government

June 2019

resourcefutures

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Executive Summary

Aims and objectives

Resource Futures was commissioned by the Welsh Government in January 2019 to conduct compositional analysis of the litter waste in Wales. The aim of the work was to produce a baseline of the litter waste composition across a representative sample of local authorities. The findings will be considered in relation to policy measures which could reduce the negative environmental impact of litter.

The collected data is intended to enable the development of impact assessments for a range of policy initiatives which could be introduced to effectively manage litter waste. These include, but are not limited to, the introduction of a deposit return scheme (DRS) for drinks containers, reforms to extended producer responsibility (EPR) for packaging and possible revisions to local authority recycling targets. The study was to be carried out in such a way as to provide a methodology which can be replicated.

Objectives of the study were to carry out composition analysis fieldwork in four local authorities in Wales, representing rural, urban, coastal and valley communities. This would allow production of an overall, national level litter waste composition. The findings were to provide insight into key recyclable materials including paper, card, plastics, ferrous metal, non-ferrous metal and glass items. Other objectives included sorting drinks containers by their relative sizes and reviewing the current operational practices used by authorities.

Methodology

At the project inception meeting, it was raised that there was a lack of clarity in how each of the local authorities manages litter waste. A number of inconsistencies were also noted in the local authority reported litter tonnages downloaded from the online reporting system, WasteDataFlow (WDF). Consequently, an additional objective was added to the study to conduct an initial desk based review to gather information on how each local authority collects and manages key litter materials, for example the collection of litter with street sweepings and separate collection of road-side bins. Each of the 22 Welsh local authorities were contacted about their common litter management practices. The information collected was then used to select litter samples from appropriate vehicles and was also used at the analysis stage to scale up the waste composition findings to national level.

Four fieldwork study areas were selected with agreement from the Welsh Government. Fieldwork took place in Caerphilly, Ceredigion, Denbighshire and Swansea as each suitably represented the valleys, coastal, rural and urban local authority types respectively.

In each of the four study authorities, the composition analysis fieldwork was carried out over five days in late April and early May. The sampling method intercepted deliveries of waste which had been gathered according to the usual local authority collection of this material. Litter is commonly gathered using flatbed vans fitted with wire cages around their load spaces. Known as ‘caged-tippers’, a representative selection of these vehicles was selected for inclusion within the study. Typically, these vehicles visit a given area or ‘collection round’ each day. In each authority, two vehicles from regular collection rounds were diverted each day to the Resource Futures sort team who hand sorted litter waste to an agreed category list of items and material. For each litter sample, the collective weight of each material or item type was recorded along

with the total number of individual items making up each category. Different types of waste and recycling from different sources are usually referred to as 'streams'. Two main types of litter waste stream were investigated in this study, 'litter bin' waste and the litter picked up from the ground by hand, or the manual 'litter pick' stream.

The sorting method allowed creation of two sets of composition data for the litter streams, firstly a typical composition by percentage weight, which is calculated by dividing the weight of each type of material by the total weight of all material collected, and a second composition calculated using the count of items of each material divided by the total of all items. The second composition is not common to the waste management industry but gives a percentage composition by item count. This item composition allows the study findings to be compared to wider litter studies which are usually based on counts of items rather than the weights of the materials collected as is the norm for the waste industry.

Early in the work it was identified that the majority of local authorities commonly collect more than just litter waste on cage tipper vehicles. Calculating the typical split of all materials 'co-collected' with litter would be essential to estimate an annual figure of litter produced nationally. At present, all local authorities are required to submit waste and recycling figures, in tonnes, for each financial year quarter using WasteDataFlow. Returns are then collated to indicate the amount and type of each waste which has been collected, treated and disposed by the authority each year.

The split or 'profile' of materials making up each load of waste was recorded during the fieldwork. Average 'load profiles' by material streams were then applied to the total tonnes of material collected using caged tippers in each local authority. Using the average load stream profiles, estimated annual tonnages were calculated for litter bin waste and litter picked waste in each of the study local authorities. To calculate an estimated national litter composition, the proportional composition figures by weight of material were applied to the reported annual local authority litter waste tonnages. One of four average study compositions was applied to each of the 22 Welsh local authority's tonnage figures. The composition from the closest matching study local authority was applied to the annual tonnage figures for each of the other Welsh local authorities to produce an estimated national litter baseline by tonnes of material. The baseline is a combination of both litter bin and litter pick waste streams and gives the overall amount of each type of material making up litter across Wales each year in tonnes.

Finally, using the estimated national baseline composition, material and item categories were grouped together to assess the total amount of litter which might be considered within specification of the various policy measures. These 'policy filters' were applied to the data to group together tonnes of the relevant types of item and materials into an overall figure which might be affected. Policy options considered include two variations of a DRS for drink containers, reforms to extended producer responsibility (EPR) to include a wider range of packaging items and charges, levies and bans on the use and sale of certain types of single use plastics.

Results

Local Authority litter management review findings

Key findings from the review of local authority litter management practices were:

- Litter bin waste made up over half of the litter managed by the local authorities.
- Manually picked litter waste was also an important cleansing practice as this was the next most significant proportion of waste from vehicle loads included in the study
- Almost all local authorities have set 'rounds' or 'routes' to manage litter. These rounds are made up of the sets of streets or areas grouped together for operational practically and are collected on a regular or defined frequency.
- In each authority, collection rounds tend to be separated based on zones. Terminology varied by authority, however, 'Zone 1' or 'Central' areas were typically referred to main areas and were areas of an authority where the most litter is likely to accumulate due to the highest intensity of pedestrian and public use. 'Zone 2' areas were those which require less litter management, they may be defined as medium intensity as they have a reduced level of use and activity, typically these include the outskirts of urban areas and into the suburbs.
- Due to the way that rounds are structured, it is not realistically possible to identify and isolate samples from specific areas or venues that litter waste was collected from.
- All local authorities use 'cage tipper' type vans to collect litter bin and manually picked waste, and;
- 17 of the 22 local authorities collected at least one, but more commonly, several additional waste streams such as fly-tipped waste and dog waste bins, at the same time as the litter waste was collected using cage tippers.

During the fieldwork the split of any other waste streams carried on caged tippers was recorded to produce an average. Referred to as 'co-collected' waste, these other types of waste are not separated out when a vehicle deposits its load for disposal. Annually reported tonnage figures on WDF therefore include a mixture of litter and non-litter waste. The average separation of waste carried on cage tippers was applied to the annually reported tonnes to produce an estimate of the total tonnes of litter and other co-collected waste types across Wales each year.

Litter bin waste and litter picked waste made up the two key litter waste streams in all areas, so waste samples of these materials were prioritised for analysis. Local authorities confirmed that litter waste was collected using scheduled collection rounds which were in most cases divided into zones. In line with good litter waste practice, some litter rounds are collected daily or every other day, these were typically Zone 1 areas in town and civic centres where the most litter is generated as a result of high levels of footfall. Litter rounds in Zone 2 areas tend to be more suburban and might only have litter collected from them once or twice a week.

Discussions with local authorities indicated that the majority of litter cleansing activities occurred within Zone 1 areas. On this basis, it was likely that around 50% of the samples analysed would be from this zone, with the remaining samples from Zone 2.

The general litter cleansing patterns discussed with each local authority suggested that cage tipper vehicles operating in zone 1 areas made up the majority of litter management operations in their local authority. For this reason, around 50% of the samples targeted in each local authority would be from zone 1 areas. With the rest made up of a representative mix of zone 2 areas commonly collected in that local authority.

Two cage tipper loads of material were delivered on each day of fieldwork in each authority. Litter waste samples were then separately sorted by hand and the results recorded for analysis.

Composition findings

Headline composition, litter bin waste by percentage weight and item count

Figure Ex 1 and Figure Ex 2 show the average compositions calculated by percentage weight for litter bin and litter picked waste respectively, across all four fieldwork study local authorities.

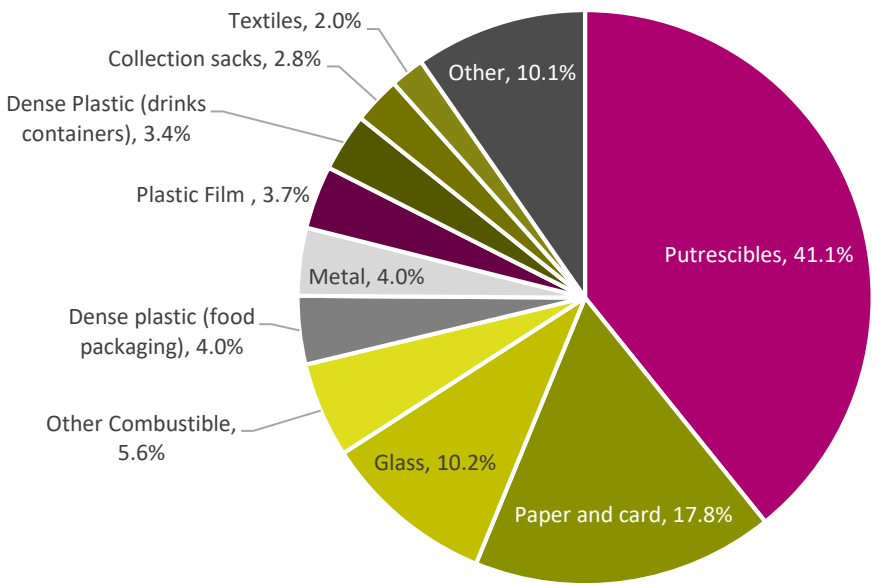

Figure Ex 1: Litter Bins, percentage weight, average waste composition across all four local authorities

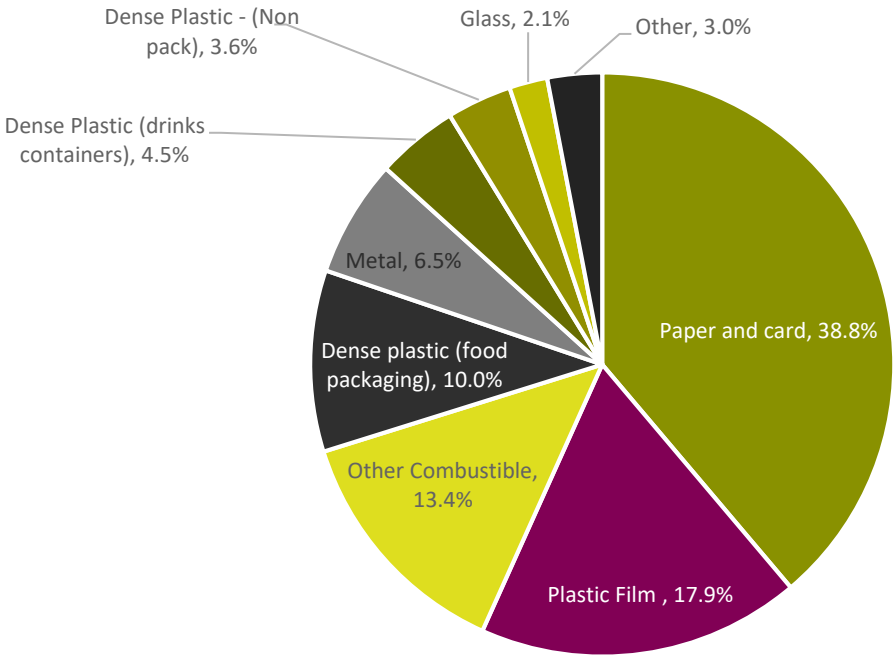

Figure Ex 2: Litter Bins, percentage item count, average waste composition across all four local authorities

Headline composition, litter pick waste by percentage weight and item count

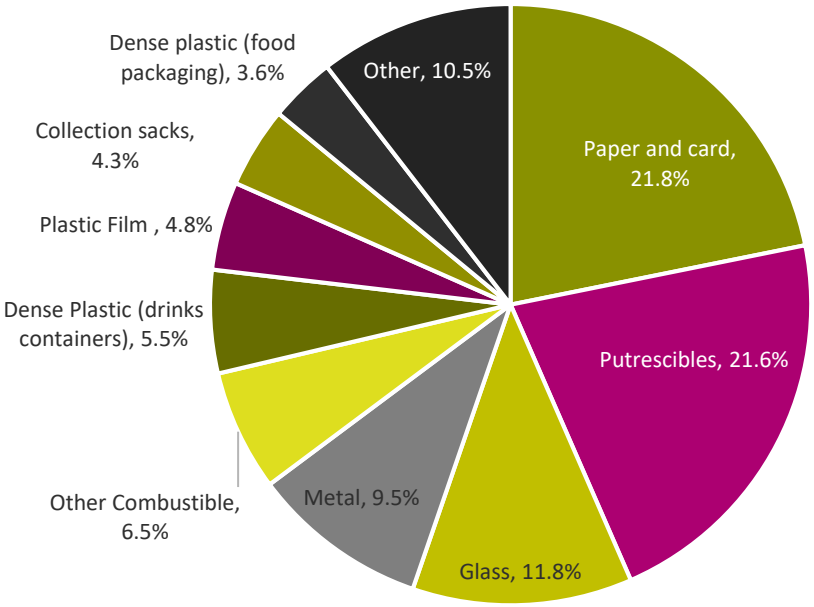

Figure Ex 3: Litter pick waste, average composition across all for study local authorities by percentage weight

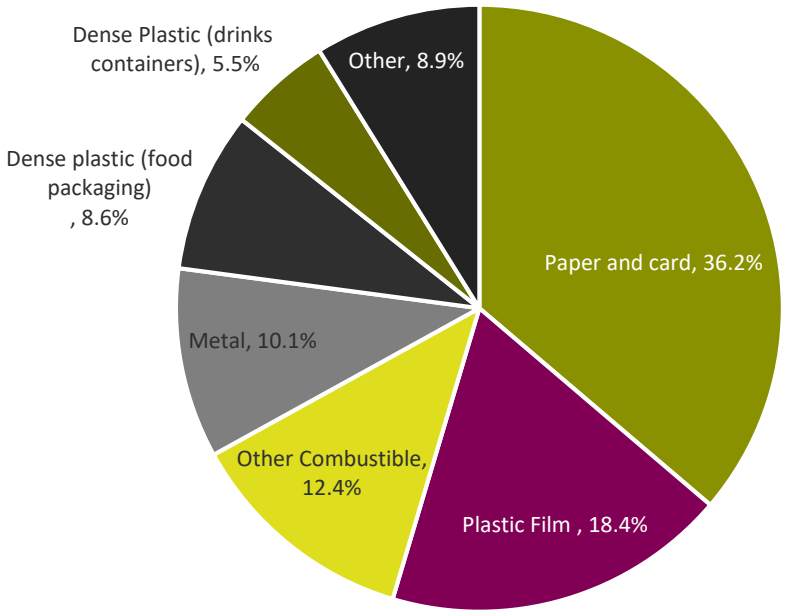

Figure Ex 4: Litter pick, percentage item count, average waste composition across all four local authorities

Putrescible waste including food waste and dog excrement was the most common material found in litter bin waste by weight. Paper and card were the most common materials making up litter pick waste by weight. By total weight, two thirds of the material found in both litter bins and from litter picks was putrescible waste, paper and card and glass.

By item count paper and card items were the most common in litter bin and litter pick waste, followed by plastic film.

A total of 90 samples of litter waste were sorted from 43 cage tipper loads, 53 samples were from litter bins and 37 samples were sorted from picked litter. A total of 4,315kg of material was sorted, comprised of 128,285 items. In total, 65.6% of the material collected on cage tippers was litter bin waste, with litter pick waste making up 13.1% and the remaining material made up by other, non-litter waste streams such as fly-tipped waste and dog waste (Table 9).

The average sample results were similar in each local authority. By weight, putrescible waste made up the most significant proportion of all litter bin waste samples at 41.1% by weight. Paper and card were next most common making up 17.8% and then glass which made up 10.2% (Figure Ex 1).

For litter picked materials, putrescible waste made up 21.6% and was the second most common material after paper and card which made up 21.8% by weight. Glass was the third most significant material at 11.8% followed by metals at 9.5% (Figure Ex 3).

By a count of items, paper and card was the most commonly found material in both litter bin waste (38.8% of all items) and litter picked waste (36.2% of all items) (Figure Ex 2, Figure Ex 4 and Table 14). Plastic film of all types (which included plastic bags and food packaging such as crisp packets and chocolate bar wrappers) was the next common item for both litter bin waste (17.9% of all items) and litter picked waste (18.4%

items). Combustible items including cigarette butts and wet wipes were the third biggest category in both litter bin (13.4% of all items) and litter picked waste (12.4% of all items). Food waste, garden waste and dog excrement were not counted for practical reasons.

Estimated annual arisings in tonnes and composition of all litter waste across Wales

The calculated waste stream load profiles for materials gathered on cage tippers were applied to the total tonnages reported by each local authority to estimate an annual, national tonnage of each type of litter waste. Average composition analysis findings from the fieldwork were then applied to the calculated litter tonnages in each local authority to produce the estimated tonnes per material. The estimated, scaled national composition of the litter bin and litter pick streams is presented in Figure Ex 5 in tonnes.

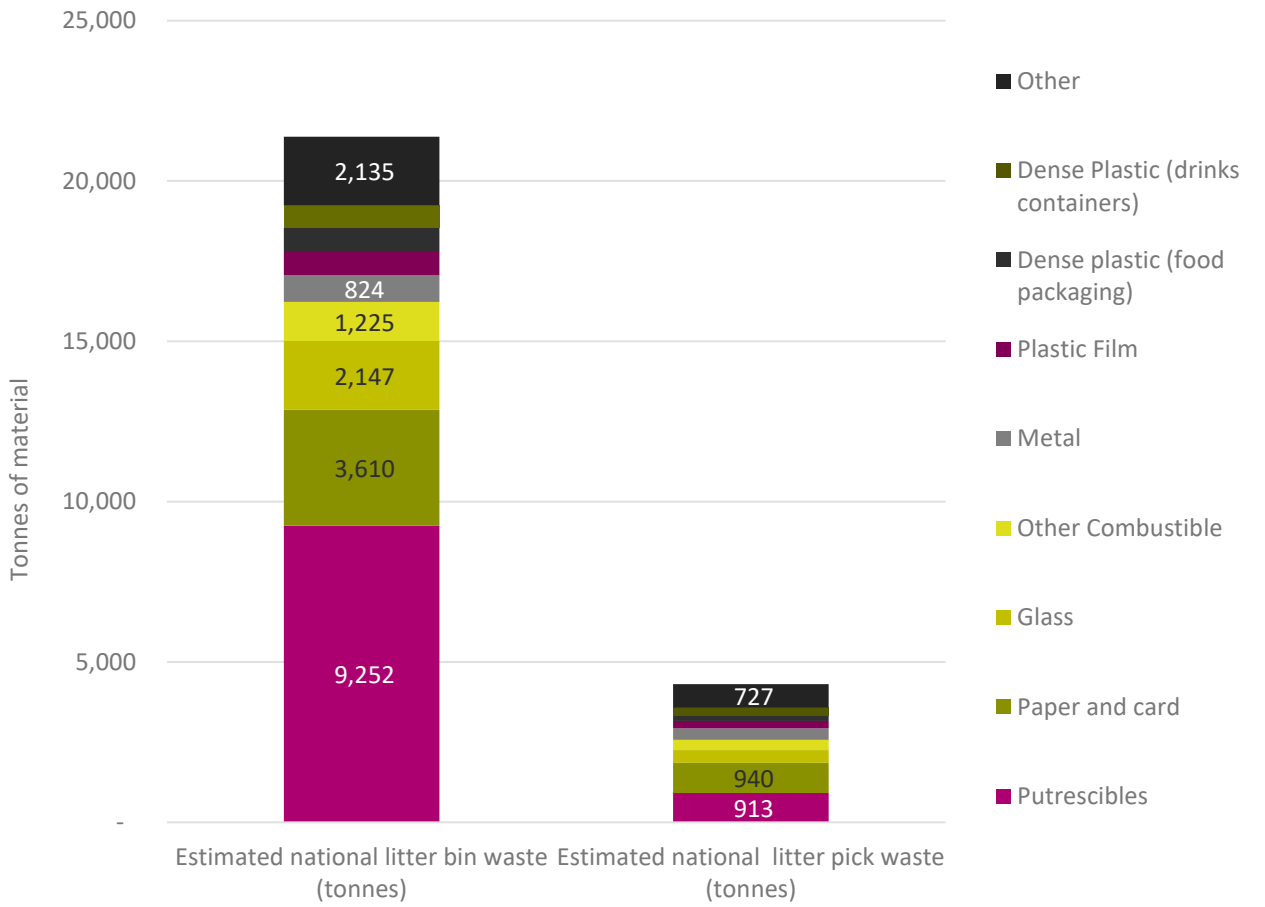

Figure Ex 5: Estimated annual litter waste tonnages from litter bins and litter picked waste in Wales

In total, 21,376 tonnes were estimated as litter from bins and 4,311 tonnes for manually picked waste (Figure Ex 5). 'Other' values include nine further material types, these individually made up less than three percent (around 600 tonnes) of the total estimated composition.

The number of litter items were not scaled up to the national tonnages, however, the total count of items making up the sorted samples of litter bin and litter pick waste are shown below in Figure Ex 6.

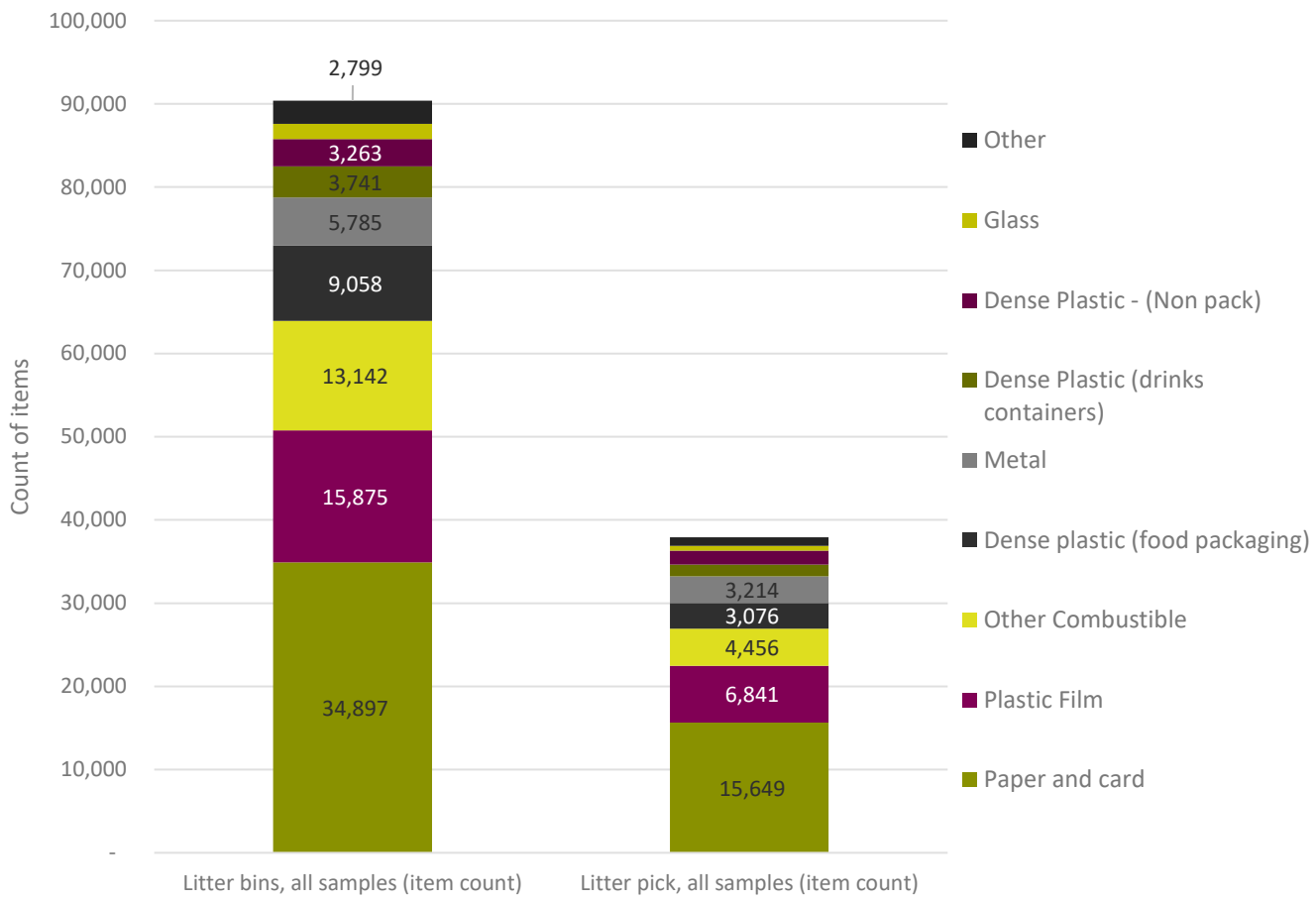

Figure Ex 6: Count of items making up all sorted samples of litter bin and litter pick waste

A total of 128,285 items were counted across all litter bin (90,386 items) and litter pick samples (37,899 items). The 'other' category included in Figure Ex 6 is made up of nine material categories which individually accounted for less than two percent of all items. Putrescible waste including food and animal excrement was not counted for practical reasons and given that both readily degrade in the environment.

Figure Ex 7 below compares the overall scaled national composition of materials as a percentage of total tonnes with the right bar providing the percentage composition of all litter samples as a proportion of total items counted.

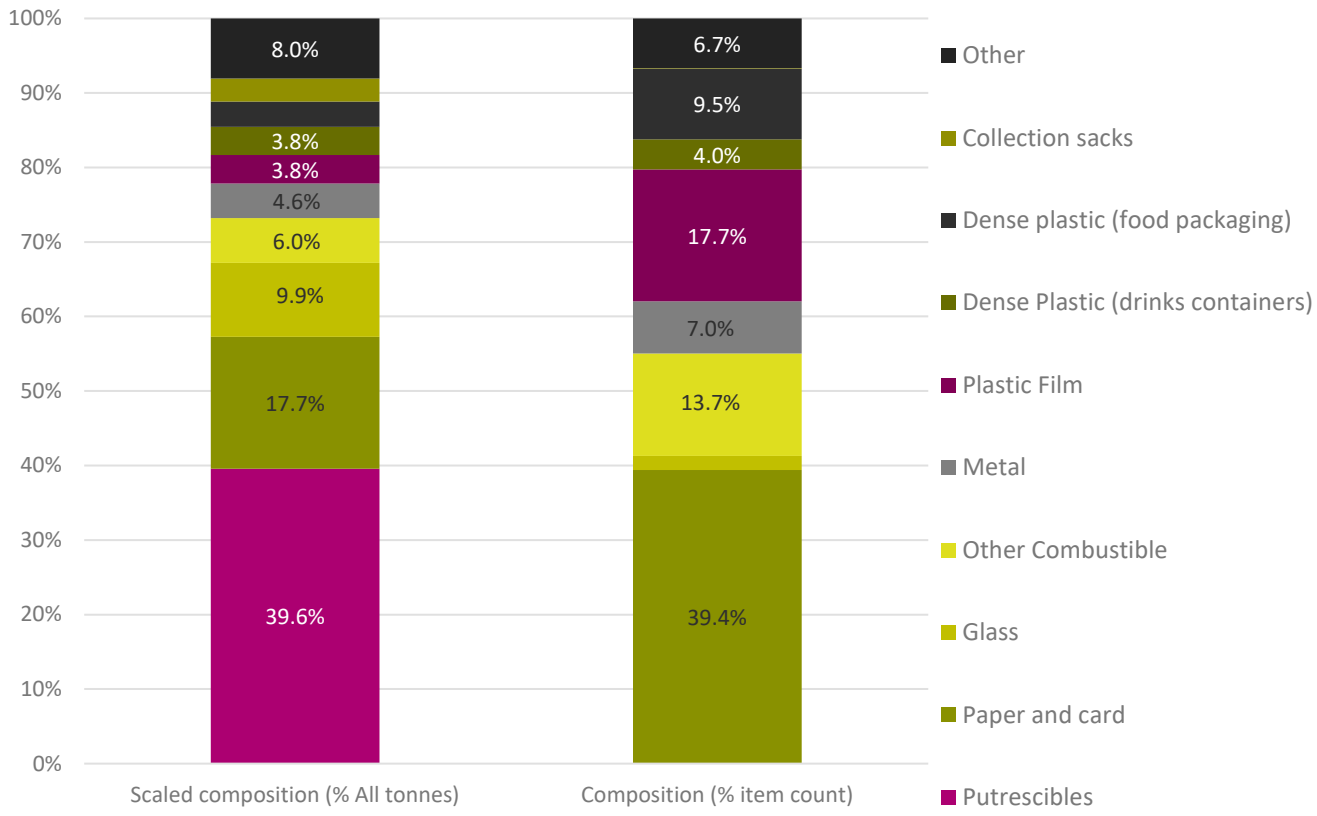

Figure Ex 7: The estimated national composition of all litter waste (litter bins and pick) by percentage tonnes and the composition of all samples by item count

Putrescible waste and paper and card waste were most significant in the respective compositions. The 'other' category in Figure Ex 7 includes eight categories, each makes up less than two percent of the total composition.

By weight, the estimated national figures for putrescible waste from both litter streams makes up 39.6% of all waste followed by paper and card at 17.7% and glass at 9.9% by weight. Food waste was the most significant individual item by percentage weight making up 19.6% followed by dog excrement at 13.7%. (Figure Ex 7). By item count, paper and card made up the largest proportions of waste, 50,546 items made up the 39.4% of all counted items. Plastic film was the next most common material group and 22,716 items made up 17.7% of all items followed by 17,598 combustible items which accounted for 13.7% of all items. Cigarette butts and wet wipes were the most significant items in this category.

Policy option findings for Wales

- Under a proposed 'on-the-go' DRS for drink containers under 750ml, 11.3% of the total litter material would be within specification, making up 2,907 tonnes per year across Wales (Table 27). Across all samples 12,824 items in specification were counted.

- Under an 'all-in' DRS specification, 15.1% of the total material could be within the specifications, equivalent of an estimated 3,873 tonnes per year (Table 28). Across all samples 13,961 items within specification were counted.

- In total, 1.9% of the total litter by weight was coffee cups and lids of all materials. These would be within specification of levies or bans on single use cups; equivalent of 476 tonnes per year (Table 30). A total of 7,338 items were counted within the waste samples.

- Plastics, including film, food packaging and drinks containers are amongst other items which have been identified by the European Commission as commonly littered single use plastics. These items made up 11.6% of all materials by weight and accounted for 40.4% of all items by count and would make up 2,974 tonnes per year (Table 31). In total these made up 51,831 items across all samples,

- Under extended producer responsibility (EPR) reforms, packaging items likely to fall within specification make up 34.8% of all litter waste and an estimated 8,949 tonnes per year. By item count this would include an estimated 59.0% of items, across all samples 75,725 items were counted. (Table 32). The above figures do include all drink containers which would be covered under a DRS.

- In combination, the total proportion of items which could be included within EPR specification and as part of bans on single use plastics would make up 35.7% of all material by weight, this would be 70.1% of all items by count and an estimated 9,162 tonnes of material for the year (Table 33). Within the samples of waste sorted this would include 89,941 items.

- Commonly targeted recyclable materials which could be recycled using existing systems either at home or within bring banks or at recycling centres made up around 61.1% of all litter waste by weight; by item count 42.4% of items could be recycled this way. This would make up 15,683 tonnes per year and would have applied to 50,232 items sorted in the litter samples (Table 35).

Conclusion

The analysis of the fieldwork data gathered from across a representative sample of local authorities was used to produce a national litter baseline. A key conclusion was that litter bin waste was most significant and estimated at around 80% of the total litter weight of litter bin and litter picked waste. Putrescible waste, paper and card materials were the most prominent by weight. Paper and card and plastic film were the most common items.

The review exercise allowed the study to also conclude that virtually all authorities are following the good practice guidance for managing litter waste[1]. Analysis of the litter collected from the selected local authorities indicates that the general consumption of food and drink whilst "on the move" is responsible for the majority of litter waste, particularly single use plastic items. However, as the study did not focus on behavioural practice around litter waste generation, comment is not provided on the impact of potential

[1] Welsh Government, Code of Practice on Litter and Refuse (CoPLAR)

interventions in relation to consumer behaviour, for example the likely use of a deposit return scheme once in place.

For each of the individual policy measures which were applied to the composition findings, the proportion of material which might be impacted upon under the likely specifications varied from between 1.9% single use cups and up to 34.8% of all litter waste under reformed EPR.

Over 50% of the litter material by weight could be recycled at home. A total of 61.1% of all litter waste materials by weight were identified as accepted within current recycling systems and can be readily and widely recycled either at home, bring banks and recycling centres. This accounted for an estimated 15,683 tonnes of litter material over the year. As a large amount of material is recyclable in existing systems, renewed campaigns to reduce littering behaviour and to promote the current services could play an important role in reducing the amount of litter waste produced and should not be overlooked in preference of new policy measures which are likely to have a lower combined impact.

Contents

Tables

Figures

1 Introduction

The Welsh Government commissioned Resource Futures in January 2019 to conduct research into the composition of litter waste collected in Wales. The findings of the work will be used to inform the development of impact assessments in relation to possible policy options which could be implemented to reduce and effectively manage litter waste.

Over the past two years marine and terrestrial litter waste issues have become more prominent, which might be as a result of the wide-reaching impact of the BBC's Blue Planet 2 nature documentary series which aired in 2017. In particular the series highlighted some of the adverse environmental impacts from discarded single use plastic litter entering the marine environment. Due to their proliferation, the uses of plastics have recently come under unprecedented consumer scrutiny, particularly single use packaging applications. UK businesses and the government have responded by calling for improved evidence into how these materials are consumed and how they can be effectively managed once they become waste. In some cases, the future use of certain plastics products is likely to be restricted and controlled through formal bans.

The governments of the four UK nations have investigated ways to disincentivise the production of hard to recycle materials and to stimulate higher levels of recycling for common and easily recycled products. Two proposed policy mechanisms include a Deposit Return Scheme (DRS) for drinks containers and reforming the existing Extended Producer Responsibility (EPR) scheme for packaging wastes. This latter initiative would potentially see producers sharing up to 100% of the costs for handling, treatment and disposing of packaging wastes. At the time of writing, industry wide consultations are taking place for both introducing DRS and reforming EPR.

The following analysis is focused on understanding the relative weight, size and numbers of items making up litter waste across Wales. Drinks containers and other prominent single use plastic packaging are therefore a key focus of this analysis.

1.1 Background to local authority litter management

Under section 89 of the Environmental Protection Act 1990[2], Local Authorities, occupiers and other duty bodies are bound to keep areas they are responsible for free from litter and refuse. The Act does not provide a comprehensive definition of what constitutes litter, but cleansing contracts commonly assume the inclusion of materials connected to eating, drinking and smoking. A broad definition of litter and management guidance is provided in the Welsh Government's, Code of Practice on Litter and Refuse (CoPLAR)[3];

> *"Litter is most commonly assumed to include materials, often associated with smoking, eating and drinking, that are improperly discarded and left by members of the public; or are spilt during business operations as well as waste management operations."*

[2] Environmental Protection Act 1990, https://www.legislation.gov.uk/ukpga/1990/43/section/89
[3] Welsh Government, Code of Practice on Litter and Refuse (CoPLAR) 2007
https://www.gov.uk/government/publications/code-of-practice-on-litter-and-refuse

To support legal powers, the Clean Neighbourhoods and Environment Act 2005[4] extended the offence of littering to specifically include the dropping of discarded ends of cigarettes, cigars, chewing-gum and other similar products.

The CoPLAR guidance summarises the expectations on organisations who have a responsibility to manage litter, as well as outlining the required standards and practical approaches to management. The guide recognises that a range of factors contribute to the accumulation of litter. Generally, the levels of pedestrian and vehicular use are key contributing factors, and those areas or with the greatest intensity of use will require most frequent and greatest intensities of management to ensure that areas are clean and free from litter. The guidance defines four graded standards for cleanliness, from 'Grade A', '*no litter or refuse*' to 'Grade D', *'Heavily affected by litter and/or refuse with significant accumulations'*.

The practical application aspect of the guidance recommends that to effectively manage litter to maintain 'Grade A' levels of cleanliness, local authorities should divide the areas they are responsible for by type and the intensity of usage. These 'zones' are then managed as necessary based on the regular intensity of use and likely accumulation of litter as a result. Where a zone has a high intensity of use, more regular cleaning and resources are usually required to maintain Grade A cleanliness. High intensity use areas such as town centres, urban areas, stations and other busy public areas classed as 'Zone 1'. 'Zone 2' areas have *medium intensity of use* and include areas of occupied housing and suburbs. Zone 3 areas have low intensity use. The majority of local authority litter waste is generated in what would be defined as Zone 1, high-intensity areas. Virtually all authorities employ a litter management approach in line with the CoPLAR guidance and will either refer to these areas as 'Zone 1' or 'central' rounds.

The typical local authority approach to managing the litter waste streams is to both provide bin receptacles on streets for public use and to employ a means of picking up items which have been discarded onto the ground. Most commonly, local authorities employ teams of people to empty litter bins and to 'manually pick' litter waste from the ground. For operational convenience, it is common practice that the same personnel who empty litter bins will also carry out a manual litter pick of the surrounding areas at the same time. On street litter bins are typically between 90 and 120 litres in volume but the containers offered vary by local authority.

Most local authorities also use mechanical road sweepers, although these do pick up some discarded litter, the majority of material handled by the sweepers is considered as 'detritus'. Defined in the CoPLAR guidance as *'small broken down particles made up of a mixture of synthetic or natural materials connected with human and natural actions*.' Detritus is typically made up of dust, mud, soil, grit, gravel, stones, rotted leaf and vegetable residues, fragments of twigs, glass, plastic and other finely divided materials.[5]

1.2 Aims and objectives

The aim of the research was to produce a baseline composition analysis of litter from a selection of Welsh local authorities. This will allow the Welsh Government to evaluate the impact of any new policy initiatives on littering. The work is also intended to help inform impact assessments which will be carried out as policies are developed.

[4] The Clean Neighbourhoods and Environment Act 2005, https://www.legislation.gov.uk/ukpga/2005/16/part/3/crossheading/general

[5] Welsh Government, Code of Practice on Litter and Refuse (CoPLAR) 2007 https://www.gov.uk/government/publications/code-of-practice-on-litter-and-refuse

To develop a robust and representative baseline composition, the work was to include a mixture of waste samples taken from the broad of the local authority types across Wales. This included carrying out analysis of litter samples from rural, urban, coastal and valley communities. The study was also designed so as to allow it to be replicated in future.

The specific objectives of the work were to:

- Provide information on the current litter management practices of all Welsh local authorities. This objective was added after the inception meeting and was not part of the original scope. In discussion with Welsh Government, it was agreed that this review would add value to the study by clearly collating current practice which is necessary to inform the sample design. This step also supports a future repetition of the work as service changes can easily be tracked.
- Carry out composition analysis to provide information on the proportions of commonly occurring items within the litter waste stream.
- Provide insight into the key materials making up litter waste, including paper, card, plastics, ferrous metal, non-ferrous metal and glass.
- Count and record the number and weight of all drink containers, of all material types and by the most common sizes.
- Provide information on single use plastic items, by separately recording, weighing and counting prominent single use and single portion plastic and plastic film items, such as crisp packets and chocolate bar wrappers.

Collecting information on the composition of litter waste from highways was part of the original scope of the work. However, highway cleansing operations are sporadic and none of the identified fieldwork authorities had cleansing work scheduled. Independent collections of this material were not logistically possible as road closures would be a necessary safety measure. After all fieldwork was planned, an additional local authority confirmed that highway waste cleansing would be taking place at the same time as the scheduled fieldwork. The Welsh Government were keen to incorporate analysis of this material and additional resources were made available to gather and analyse waste samples of this material.

1.2.1 Background to possible policy options

The Welsh Government has identified a number of future policy initiatives which could have an impact on the generation and composition of litter waste in Wales. As such, the findings of this work will help provide robust data from which to inform policy development and to provide baseline evidence required to assess their impact.

Some of the possible policy options being considered by the Welsh Government include;

- a DRS for ‘all in’ drinks containers of all sizes (plastic, glass and metal),
- a DRS for ‘on-the-go’ drinks containers (plastic, glass and metal),
- a charge, levy or tax on single-use drinks cups, filled at the point of sale,
- a UK Treasury Plastics Tax, following a Call for Evidence in 2018,

- a ban or restriction on the sale of ten commonly littered single use plastics found in the marine environment as defined by the European Commission's Strategy for Plastics in a Circular Economy[6]
- implementation of EU Directive measures to reduce the inappropriate disposal of certain single-use plastics,
- revised recycling targets for Local Authorities municipal collections in Wales,
- revised UK packaging waste recycling targets, and;
- potential new EPR legislation to replace the Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended).

The results section of this report provides detailed summaries of the proportions of items and materials likely to be included within the scope of the above policy options.

2 Methodology

The following section summarises the methodologies used for the main tasks within this study, these include:

- High level review of national litter data tonnages reported on WasteDataFlow (WDF)
- Review of individual local authority litter management practices and tonnage figures
- Sample design and stratification by local authority
- Composition analysis fieldwork methodology
- Data analysis approach, composition by key litter waste, estimated national baseline and assessment of policy impacts.

2.1 High level review of National litter data reported on WasteDataFlow

Ahead of the project inception meeting, Resource Futures carried out an initial investigation into nationally reported litter waste data from all 22 Welsh local authorities. All local authorities are required to report to the Welsh Government with information on the amounts and types of waste they collect, handle and send for treatment.

WasteDataFlow (WDF) is the centralised online data collection system used by all UK local authorities to report their waste data each quarter as part of the national data set. Data is typically provided in the form of tonnes of material, this is allocated by the local authority under a pre-set heading for the type of waste. Sets of different types of waste are reported under a number of 'questions', which help to filter the information into specific waste types and their origins, such as '*collected residual household waste*' or '*non-household collected recycling'*. The data is collated by financial year quarters and is used to assess nationwide performance towards targets, to produce national statistics on waste and to serve as an evidence base to guide government policy.

[6] European Commission (EC), European Strategy for Plastics in a Circular Economy, https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1516265440535&uri=COM:2018:28:FIN

Question 23 is used by authorities to specify amounts of other collected waste under the following heading*; 'Please provide details of other waste collected for disposal'.* This question is used to report other collected residual waste and disposal and should include local authority collected litter waste. The question is divided into eight sections for household waste and non-household waste.

The total waste reported for 2017-18 under this question was investigated to check for consistency in reporting and any data gaps, this was a necessary first step to inform the development of a suitable sample and analysis approach as the reported tonnage information would be used to scale -up the composition findings to national level.

2.2 Review of Local Authority litter management practices

2.2.1 Overview of approach

A review of local authority litter management practices was conducted with all 22 Welsh local authorities via telephone to:

- gather information on common local authority litter management practices, and;
- verify the tonnages which each local authority reported on WDF.

The first aspect of the review was to understand local authority litter collections and containment systems, such as the scheduling and frequency of litter bin collections, manual litter picking and the use of mechanical sweepers. The calls also investigated any variation in how local authority litter services are delivered across different geographical areas of the local authority, for example, if the local authority uses a form of zoned separation of areas based on the intensity levels of public use and traffic as defined in the CoPLAR guidance[7].

Each local authority was also asked additional questions about their approach to the management of litter on beaches and highway areas and the involvement of any local volunteer litter picking groups.

The second focus of the litter management review was to understand how each local authority recorded its annual litter waste tonnages in WDF. This step was important as it would be necessary to understand under which section of WasteDataFlow litter waste was recorded and if any other waste types were included under the same figure. Once clarified these figures were then used to appropriately scale up the composition analysis results to a national estimate of the total litter material managed. Each local authority was asked if they could provide any further separation of the reported litter waste which they collected from different areas using different methods.

To gather and manage the information in a structured way, Resource Futures created a data gathering proforma. This also helped to steer conversations and draw out key litter management practices. The Proforma was divided into six broad areas:

A. Street cleansing and litter services (operational practices)
B. Areas and Venues
C. Beaches
D. Highways
E. Volunteers, partners and community cleansing activities

[7] Welsh Government, Code of Practice on Litter and Refuse (CoPLAR) 2007
https://www.gov.uk/government/publications/code-of-practice-on-litter-and-refuse

F. WDF data, reporting and specific questions

Detailed questions were asked under each heading to draw out any predominant approaches and themes. A full version of the proforma is included in Appendix A.

Ahead of the calls, a request for information letter was circulated by the Welsh Government to the Waste Services team leader in each local authority as a way of gaining support at an early stage. The letter, which asked for cooperation and support of the work, outlined the scope of the litter waste study and indicated the data and information which would be required.

The review calls were first directed to the Heads of Waste Services as they would already be aware of the work and would be able to direct queries to the most relevant colleagues. When contacting each local authority, it was often necessary to speak to several people across different teams to gather the required operational information.

The information collected by this process was used to inform the sample design.

2.3 Sample design

The review of litter management practices identified a number of common factors to all local authorities in how they manage their litter waste, the findings were used to inform the sample design for the composition analysis. A detailed discussion of the findings can be found in Section 3.2.

Local authorities commonly record litter waste from cage tippers under the 'Collected household waste: street cleansing' category under question 23 in WDF. To establish estimated annual litter tonnages across Wales, it would be important to investigate the typical proportions of the different waste streams which made up cage tipper loads of materials.

2.3.1 Sample stratification to target litter waste representatively

The original brief asked for waste samples to be gathered from specific 'venues' such as parks, shopping centres and retail parks. Findings from the review indicated that local authorities had no way of separating out reported litter tonnage data according to the proposed areas and venues, as operational rounds tend to be grouped geographically with multiple areas and venues visited in each collection making it impossible to determine the proportions and significance of waste from different venues.

The most common litter waste streams from on street bins and litter manually picked up from the ground made up the largest proportion of litter waste managed across the country. To provide a robust national representation of these types of waste they were handled and sorted and analysed separately so far as possible.

Each of the study local authorities provided an indication of the most commonly collected litter rounds. Litter waste from zone 1 and zone 2 areas were most prominent, and this was very likely the case for all other local authorities. The sampling approach adopted in each local authority was to collect at least half of samples from zone 1 areas with the rest of the samples made up from a mixture of zone two areas and other commonly collected rounds.

2.3.2 Selection of fieldwork local authorities and representative samples

It was important for the local authorities selected for study were made up of a combination of area types as identified in the brief, namely: valleys, coastal, rural and urban to ensure that the eventual scaling up of figures would allow a reasonable level of representation for all local authorities.

The local authorities listed in Table 1 were agreed as suitable with the Welsh Government. Each local authority confirmed that they were able to participate in the fieldwork and they had been generally communicative during the review calls. Arrangements were made with each local authority's waste management and street cleansing officers to ensure appropriate samples were collected and delivered to the agreed site where sorting would take place.

Each study local authority was asked to provide detailed information on their litter collection rounds. Town centres, or Zone 1 areas, which are generally cleansed daily, were selected as key target samples due to the large contribution they make to the overall litter produced. In Caerphilly, Ceredigion and Denbighshire half of waste samples targeted would be from town centre areas.

Table 1: Local authorities selected as sample sites, their authority type and targeted samples

Selected study Local Authority	Authority type	Target sample split
Caerphilly	Valleys	50% zone 1 central areas, 50% zone 2 suburban areas
Ceredigion	Coastal	50% zone 1 central areas, 50% zone 1 & 2 coastal areas
Denbighshire	Rural	50% zone 1 central areas, 50% zone 1 & 2 and rural areas
Swansea	Urban	75% zone 1 central areas, 25% zone 1 & zone 2 suburban areas

The targeted litter waste for the remaining samples varied according to the local authority type, typically these were a mixture of zone 1 and zone 2 areas. For the coastal and rural local authorities, 50% of the samples targeted were from either coastal or rural areas. Caerphilly represented the valley local authorities and was comprised of town centre and suburban litter waste as these are the areas where the main sources of litter waste is generated.

Swansea represented the urban local authority type and the majority of litter to be sorted was targeted from daily collections in the city centre area. A portion was from less busy, outer city centre areas where litter bin collections and picks occur several times a week.

2.3.3 Item categorisation and measurement of litter materials

The categorisation list was devised based on the initial requirements set out in the brief. A full waste sort category list is included in Appendix B.

A particular focus was on the quantity, size and count of drinks containers of all material types (paper and card cartons, PET and HDPE plastic bottles, plastic pouches, glass bottles, ferrous and non-ferrous metal cans) to provide data useful for assessing the possible impact from the introduction of a DRS for drinks containers in Wales. The analysis team also separately recorded weights and counts of specific plastic items, particularly those which are single use and single portion packaging. Items of interest included; straws, balloons and balloon sticks, single use cups and plastic film wrappers (sweets and chocolates, crisps and biscuits) amongst others.

It was agreed that it would be beneficial to count items across almost all of the waste sort categories. Single use plastic packaging items in particular have a low combined weight, yet their size and abundance produce a high visual impact if littered. Due to their nature and often durability, these items can also be most damaging if they enter water courses and the marine environment. Due to the visual impact of litter,

common methodologies for recording litter waste often collect data on the quantity of individual items rather than their combined weight. In addition, data gathered as part of the increasing volunteer litter picking movement is predominantly based on items or bag counts rather than grouped item weights. Separating and weighing the total items by type at a litter pick event is not usually practical whereas recording a basic count is. Incorporating a count of items as part of this study alongside weights provided the opportunity to make the data comparable to other past and future litter studies.

Almost all items of litter waste were counted. Many common items such as drinks containers are discrete in size, weight and dimensions. Other packaging items like plastic film, paper and cardboard are much more variable, but were still counted as they are some of the most common items and pose problems where littered. Items of food waste were not counted. These items were likely to be highly variable in sizes and shape, but also usually break down readily in the environment, counting them was therefore not deemed as a priority or as useful compared to other non-degradable materials; weight data was still recorded for all categories. Dog excrement was also not counted for the same reason as food waste items. Waste electronic and electrical equipment (WEEE) and hazardous items were also not counted as they were likely to be more variable in size and less common.

The fieldwork team also separately recorded counts of alcoholic and soft drinks containers of all sizes to allow for a more detailed analysis to support development of policies which consider any different consumption and littering behaviour for the different containers.

2.3.4 Highways litter analysis

An additional element of the fieldwork included a compositional analysis of litter from highways verges and laybys. Conversations with local authorities confirmed that highways cleansing schedules tend to be sporadic. These are usually planned well in advance due to the necessity to close off sections of roads. None of the four study local authorities included were carrying out highways cleansing operations during the agreed fieldwork period. However, Monmouthshire Council were carrying out two days of cleansing along stretches of its highways. The Resource Futures fieldwork team made two separate collections of this waste and samples of litter from highway verges and laybys were included for analysis.

The highway waste samples were sorted to produce composition by percentage waste and all items were counted to produce composition by item type, however, as the sample was small and as the national proportions of reported tonnage data relating to highways waste was unclear, this composition was not scaled up to national level.

2.4 Fieldwork methodology

The composition analysis fieldwork was scheduled to take place over two weeks, with five days spent in each local authority. Two teams worked simultaneously, the first carrying out work in Denbighshire, then Ceredigion and the second team working in Caerphilly, then Swansea. Each day two cage tipper loads of waste were delivered to the Resource Futures team for sorting in the sample area provided by each local authority. Advance planning with each local authority indicated that most loads would contain a mixture of at least litter bin waste and manually picked, dropped litter. Each of these waste streams would be treated as two separate samples, which would be sorted separately to produce separate composition results. Each day four samples were targeted in each local authority.

2.4.1 Recording co-collected waste streams making up waste deliveries

At the point each cage tipper load tipped off waste, the Resource Futures site manager spoke to the vehicle driver and gathered any information on where the waste had been collected from and recorded it on prepopulated record sheets.

The team then identified and separated the types and quantities of any co-collected waste streams which made up the full cage tipper load.

Bags of waste were first opened and grouped based on whether they appeared to be from litter bins, from manual litter pick or whether they appeared to be household waste. In some cases, the local authority used different coloured bags as part of its usual operating practice. However, where this was not the case the sort team used a number of waste type and condition indicators to identify if waste was from litter bins or appeared to have come from manual picks. Similar identifiers where used to distinguish between recycling and residual waste and litter picks. A list of the identifiers used is provided in Table 2.

Larger items such as broken furniture, car parts and mattresses were treated as fly tipped waste. Where identified, litter bin and manually picked litter waste was sorted as separate samples. The total weight of other waste streams was recorded but this waste was not sorted.

Table 2: Waste item indicators used by the sample team to identify waste streams co-collected with litter

Stream	Identifiers
Litter bins (residual)	Waste is relatively clean, generally intact and NOT flattened, cans, paper cups and bottles are not crushed or smashed. Checking gum in balls, blobs stuck to inside of bags. More food waste present and intact and partially contained in packaging, relatively intact fruit cores and peel. Stubbed but not completely squashed and flattened cigarette butts. Intact glass bottles. More chance of original drink liquids still in their bottles
Manual pick (residual)	Waste is dirty and flattened, Cans, cups and bottles are flattened, squashed and broken. Little or no chewing gum. Sweepings from dustpans – fragments of broken glass. Entirely squashed cigarette butts, depending on weather conditions items might be wet or muddy
Recycling bins (recycling)	As with residual bins, but less contaminants – may not be possible to differentiate
Manual pick (recycling)	Less contamination, recyclable items only – no food waste present
Dog waste (bins)	Dog waste gathered in designated bins contained in council bags, possibly marked 'dog waste'. Contents consist of multiple bags of dog waste. Unlikely to be many other items of waste present.
Fly tipped waste	Larger, often individual items including electrical and furniture, may also include car parts and broken children's toys. Rubble and construction type wastes too.
Household residual waste (black bags)	For waste contained in black bags - Items that identify household waste include: Vegetable and food preparation waste, food packing for food that would need cooking at home, microwave and oven ready meals, bathroom waste, toothbrushes, floss, sanitary and toilet roll tubes.
Voluntary litter pick waste	Unless bags are separately marked, these materials may be indistinguishable from other manually picked wastes.
Other waste streams	Trade and commercial waste might be identifiable by their contents, for example, branded items linked to a shop, store or chain.

The separate weights of each of the identified waste streams making up all of the material on each cage tipper was recorded by the site manager

2.4.2 Sort protocol

All samples were hand sorted by a team of experienced Resource Futures waste composition technicians. Bags of waste were opened on a bespoke waste composition sort table fitted with a 10mm mesh screen to separate 'fines' material as is standard composition analysis practice. All materials were separated into the agreed waste sort categories and placed into separate containers around the table. Once the sample had been sorted into the material categories, all individual items were counted, and a collective weight of the items was returned using calibrated digital weighing scales. The item counts and quality of the sorted materials were checked by the site manager who then recorded the information onto paper data recording sheets.

2.5 Data analysis methodology

2.5.1 Data quality checking

All data was recorded using paper datasheets which were pre-populated to record the categorisation by both weight and item count. Particular care was taken by the site operatives to ensure the sizes and materials of drinks containers were accurately recorded. The site manager was responsible for checking the quality of the sort process and was solely responsible for recording the weights of sorted items.

Once returned to the office, the data sheets were entered into electronic spreadsheets and quality checked for complete accuracy. The project manager then carried out additional validation and verification checks on the data for any outlying or unusual values or items.

2.5.2 Estimated waste stream 'load profiles' of co-collected litter and other wastes

The proportions of different waste types making up each cage tipper load was used to produce an average 'load profile' in each authority. This load profile is based on the average percentage by weight that different waste types accounted for as part of the total weight of the load. Load profiles were calculated for each of the four study authorities, with a fifth, average load profile also calculated from all loads of waste delivered over the local authorities where fieldwork was carried out. An appropriate load profile was applied to each local authority's annually reported WDF tonnage to calculate an estimated separate tonnage for all litter bin and litter picked waste in the local authority. The most appropriate load profile to use was selected and applied based on known similar operational and collection practices, for example, whether or not dog excrement bins and fly tipping were collected by the litter cage tippers in that local authority. This differs from the approach taken to applying the most appropriate waste composition results which were applied based on the closest neighbouring study authority or best demographic match. If the authority was not able to confirm which types of waste were collected with litter waste, then the average litter stream profile from across all four studies was used.

In summary, the purpose of the load profiles calculated from the collected samples was to help estimate the typical proportions of litter bin and litter picked waste on the average cage tipper load. When applied to the total authority reported waste tonnages on WDF, it was possible to estimate the national baseline of total annual litter tonnages produced each year. The load profile of samples was applied to local authorities with similar operational and collection litter cleansing practices to those of the local authority from where samples were collected.

The split of each category of litter items making up each sample was calculated according to the total percentage by weight of all items, this is standard practice in the waste industry and produces a waste '*composition by percentage weight*'. However, a second percentage composition was also calculated for the total count of all items within each sort category. At local authority level, the total weight of all samples and sorted material was used to produce an average composition by percentage weight. The same approach was then used for the composition by item count. Two compositions, *by percentage weight* and *by percentage count of items*, were calculated for each local authority and for both the litter bin waste and for the manually picked litter waste.

2.5.3 Calculating estimated national litter tonnages and waste composition baseline

The local authority review exercises confirmed the total street cleansing waste tonnages reported for the year. The calculated cage tipper waste stream load profile was calculated as explained in section 2.5.2 and the percentage split was used to estimate tonnages by waste stream.

An average local authority waste composition was returned from each of the four fieldwork study areas. This was then applied to the estimated litter tonnages from each local authority to produce a baseline of the national litter waste composition across Wales. Table 3 shows which of the four fieldwork study waste composition findings was applied to the annual litter tonnages reported by each local authority.

Table 3: Welsh local authorities and the most appropriate fieldwork study authority to use to scale composition analysis findings to national level.

Welsh Local Authority	Authority type				Closest waste composition study results to apply to local authority scale up
	Rural	Urban	Valley	Coastal	
Blaenau Gwent CBC			■		Caerphilly CBC
Bridgend CBC	■	■	■	■	Caerphilly CBC
Caerphilly CBC **(study LA)**	■		■		**Caerphilly CBC**
Cardiff CC		■		■	Swansea City
Carmarthenshire CC	■			■	Denbighshire CC
Ceredigion CC **(study LA)**	■			■	**Ceredigion CC**
Conwy CBC	■			■	Denbighshire CC
Denbighshire CC **(study LA)**	■				**Denbighshire CC**
Flintshire CC	■	■		■	Denbighshire CC
Gwynedd Council	■			■	Ceredigion CC
Isle of Anglesey CC	■			■	Ceredigion CC
Merthyr Tydfil CBC	■		■		Caerphilly CBC
Monmouthshire CC	■				Denbighshire CC
Neath Port Talbot CBC			■		Caerphilly CBC
Newport City Council		■		■	Swansea City
Pembrokeshire CC	■			■	Ceredigion CC
Powys County Council	■				Denbighshire CC
Rhondda Cynon Taff CBC	■		■		Caerphilly CBC
Swansea **(study LA)**		■		■	**Swansea City**
Torfaen CBC	■		■		Caerphilly CBC
Vale of Glamorgan C	■			■	Ceredigion CC
Wrexham CBC	■	■			Swansea City

The most common litter items were summarised at both material type and item level categorisation as this provides additional insight into whether a wide or narrow range of specific product and packaging items make up each of the materials groups.

2.5.4 Assessment of litter waste and future policy initiatives

The proportions of litter waste making up the current baseline litter composition were assessed against a number of possible policy options under consideration by the Welsh Government. The findings were used to calculate the proportions and estimated tonnages of litter waste which might be within the specifications of each policy initiative listed in Table 4. A full category level list of items included under different policy options is provided in Appendix C.

Table 4: Policy initiatives, materials and items included within likely specifications

Policy initiative	Items and materials within specification
Deposit return scheme (DRS) for drinks containers	'on-the-go' drinks containers of all materials up to 750ml in size. OR, 'all-in' specification including drinks containers of all sizes
Charges and levies or tax on single-use drinks cups, filled at the point of sale	All plastic and card drinks cups and their plastic lids
A UK Treasury Plastics Tax, following a Call for Evidence in 2018	Common single and single use plastic packaging materials including; plastic film food packaging, carrier bags, plastic bottles, plastic stirrers and cutlery, balloons, balloon sticks and expanded polystyrene packaging
A potential ban or restriction on the sale of commonly littered single use plastic items	
Proposed new EU rules to target certain types of Single-Use Plastic items	
Revised recycling targets for Local Authorities municipal collections in Wales,	Items which are commonly accepted within most local authority household kerbside recycling collections. Including food waste, plastic bottles, metal food and drinks cans glass food and drink packaging, plastic pots tubs and trays and paper and card packaging. Also, recyclable materials widely accepted at recycling centres and bring banks including plastic carrier bags, WEEE items, and scrap metal
Revised UK packaging waste recycling targets, and;	
Reforms to EPR legislation to replace the Producer Responsibility Obligations (Packaging Waste) Regulations 1997 (as amended).	All items of packing waste including paper, card, plastic film and all food and drink packaging containers.

2.6 Limitations and assumptions

The following section summarises some of the limitations which came to light during the study and some of the assumptions which were made as part of the analysis.

2.6.1 Data review and local authority information limitations

- It wasn't always possible to confirm all service and operational details with each of the local authorities. Several local authorities were extremely busy due to the end of the financial year and were not able to give their time to provide detailed answers.

- Operational knowledge and expertise were very often split across more than one team within each local authority and for larger local authorities it was sometimes necessary to speak with up to five different people to gather the required information.
- Where operational data has been confirmed by speaking with someone at the local authority, we have assumed this data to be correct and a fair representation of actual practices, and;
- Collection round information and separate tonnage data was requested from each local authority although very few were able to provide detailed versions of this information and the responses were sometimes limited to verbal clarification only. Again, where questions were asked on the number of collection rounds and crews in place, we have assumed that the information given is correct.

2.6.2 Analysis Assumptions and limitations

- The original scope of work detailed specific separate 'areas' and 'venues' for which analyses would be desirable. Telephone discussions with local authorities confirmed that the most significant proportions of litter were being generated from the central and populated areas of each local authority. Although these would likely include areas and venues of interest, it would prove logistically and operationally very difficult to obtain enough separate samples to produce nationally representative findings.
- It was not always possible for crews to conclusively distinguish between litter bin and litter picked waste materials and bags were not often separately marked or labelled, and;
- Highways waste management practices vary more between local authorities than approaches to litter bin and litter picking waste. Some local authorities will clear litter by hand from sections of roads once every few months while others will only carry this out twice a year on similar roads. Review call findings suggested that mechanical sweepers are used to sweep more rural roads once or twice per year. For most local authorities, main roads and trunk roads are swept often but more rural roads might be mechanically swept only once a year. It was difficult to speak to the most relevant local authority contact about both litter waste issues and highways cleansing as this was typically managed across different council departments. It therefore proved challenging to incorporate this aspect of litter waste management within the study.

3 Results

3.1 High level review of National litter data reported on WasteDataFlow

Table 5 shows the annual summary of waste tonnage data reported in WDF under eight waste categories in question 23 from 2017-18 data. This question is used by authorities to specify amounts of other collected waste which would include local authority collected litter waste. The question is divided into sections for household waste and non-household waste for the eight types of waste; a total of 89,231 tonnes were recorded.

Table 5: Welsh local authority reported WDF tonnages under question 23 from 2017-18

Row Labels	Beach cleansing	Collected gully emptyings	Collected household waste: Other	Collected household waste: Street Cleaning	Collected non-household waste: Grounds Waste	Collected non-household waste: Highways waste	Collected non-household waste: Other	Other collected waste	Total
Blaenau Gwent CBC	-	1,572	-	1,016	-	-	-	-	2,588
Bridgend CBC	-	-	-	2,755	-	-	-	-	2,755
Caerphilly CBC	-	-	-	2,293	-	-	-	-	2,293
Cardiff County Council	-	-	-	8,350	-	-	-	-	8,350
Carmarthenshire County Council	-	593	-	1,647	-	-	-	-	2,240
Ceredigion County Council	-	-	214	6,632	-	-	-	-	6,847
City and County of Swansea	203	2,738	-	2,562	-	-	-	-	5,502
Conwy CBC	-	-	-	3,639	-	-	3,137	103	6,880
Denbighshire County Council	-	-	735	883	309	-	-	-	1,927
Flintshire County Council	-	215	-	3,121	209	425	-	-	3,971
Gwynedd Council	-	1,042	-	4,579	-	-	305	-	5,926
Isle of Anglesey CC	-	-	109	2,986	-	-	-	-	3,095
Merthyr Tydfil CBC	-	551	354	-	-	-	-	-	905
Monmouthshire CC	-	533	-	1,487	577	119	-	-	2,715
Neath Port Talbot CBC	-	-	-	2,567	-	-	-	-	2,567
Newport City Council	-	-	195	2,167	511	105	619	141	3,737
Pembrokeshire County Council	484	6,260	558	1,705	200	565	-	-	9,773
Powys County Council	-	1,539	-	1,099	-	208	-	-	2,845
Rhondda Cynon Taff CBC	-	2,864	-	1,282	-	-	140	-	4,286
Torfaen CBC	-	-	-	-	252	-	2,055	-	2,307
Vale of Glamorgan Council	-	1,337	-	2,094	-	-	-	-	3,431
Wrexham CBC	-	-	1,052	2,771	-	-	469	-	4,292
Total	**687**	**19,244**	**3,218**	**55,633**	**2,059**	**1,421**	**6,725**	**244**	**89,231**

The greatest proportion of waste reported under question 23 was '*Collected household waste: street cleansing'* which made up 55,633 tonnes, shown by the pale yellow column in Table 5. This is the correct category under which litter waste should be reported. Most local authorities reported a relatively similar figure under this heading, with 14 local authorities recording figures between 1,000-3,000 tonnes. However, Merthyr and Torfaen councils did not report any data here.

Only two figures were reported under 'beach cleansing', yet eleven local authorities have stretches of coastline. Both Conwy and Torfaen also reported significant tonnages under 'Collected non-household waste: Other'.

The variable spread of data across different columns suggested that different reporting practices might be used by local authorities and that the same figures are being recorded but under different headings, or possibly a combination of both. This uncertainty was considered to have implications for the study as a whole, both in terms of sample design and analysis, and the potential to aggregate collected data to national level. So, it was agreed with the Welsh Government to conduct a more detailed review of litter management practices and how waste data was used across individual Welsh local authorities.

3.2 Review of individual local authority operational practices and WasteDataFlow (WDF) tonnage clarifications

Each of the 22 local authorities were contacted to review their main operational practices for managing litter waste. Initial contact was by phone call with follow up questions answered by email. The information was gathered using the agreed proforma and full responses are presented in the accompanying excel spreadsheet. The following section provides a summary of key findings in relation to the analysis approach.

It proved challenging to identify the most appropriate person to discuss litter management practices as responsibilities and knowledge were often split across staff in different teams in each local authority. In most local authorities, the initial contact was usually with a senior member of the waste and environmental services team. In some local authorities this contact was able to provide partial answers to some of the broader questions. In most cases however, the most relevant contact might be separated by several levels of management or might work in a different team, such as the 'waste and environment team' or 'Street scene' team.

Table 6 gives an example of the range of roles or job titles of the contacts who were spoken to throughout the review calls and provides an indication of the sorts of information which was held at different levels.

Table 6: Examples of different local authority contacts spoken to during review calls

Roles/job title	Information and area covered
Head of Waste and environmental services/ Head of waste strategy	Operations overview – top level WDF query responses
Head of Street Scene	Operations overview/detailed operational summary
Environmental Cleansing & Enforcement Manager	Operational overview/detailed operational summary
Waste Services Assistant/Team Leader	Detailed WDF query responses
Northern area Waste services manager	Area specific operational clarifications
Street Scene Coordinator/ WasteDataFlow officer	Detailed operational summary/ clarification

Despite challenges in contacting the relevant person within each local authority, it was possible to confirm the key approaches to litter management for almost all local authorities.

3.2.1 Summary of local authority litter operational practices review

Following the review calls with the local authorities, it was clear that none could provide separate tonnages for different types of litter waste from different areas. Common operational practices meant that litter waste might also be collected and reported with several other waste streams such as fly tipping.

Litter waste management is most necessary in the areas which experience the greatest intensity of public use, as such, local authorities focus their cleansing operations on town and population centres. In most cases it was found that the local authorities have structured litter waste collection rounds, similar to domestic household waste collections, but due to the nature of litter generation, these rounds tend to have a more flexible and ad hoc nature. Litter cleansing teams will clear up additional waste as it is found and crews are often redirected to areas where more litter has been generated, for example, due to good weather or specific local events.

Around two thirds of local authorities confirmed that litter collections take place according to a planned schedule where either zone 1 or central areas are prioritised. The remaining authorities either managed litter more reactively or did not confirm their arrangements. Local authorities that did have scheduled collections broadly followed the zones outlined in the CoPLAR guidance, for example; Zone 1 areas typically require most attention and will be made up of litter rounds which are carried out daily. Zone 2 areas might be patrolled only once or twice a week and beyond Zone 2 areas, rural villages and suburban areas might be attended once a week or less to collect litter.

In addition to the common zonal structuring of services, several other key management practices were also employed by all of the local authorities.

Litter bin waste

A key finding from the initial calls was that one of the most significant aspects of litter waste management for all local authorities is the emptying of fixed litter waste bins in public spaces. In total 16 local authorities provided an indication of how many litter bins were placed on streets in their authority, on average this was around 1,300 litter bins per authority. Cardiff had most at around 3,000 litter bins and Merthyr Tydfil had fewest at around 108 bins.

Anecdotally most authorities indicated that more of their litter bins were placed in central and built up areas and are part of collection rounds which would be defined as zone 1 and so are serviced daily or sometimes twice a day. However, only three authorities were able to provide a more detailed split including Carmarthenshire (50% rural and 50% urban split), Conwy (83% urban and 17% rural), and Pembrokeshire (85% urban and 15% rural split).

Most local authorities were not able to provide a clear summary of their collection round structures, but all confirmed that the most frequently managed zone 1/central areas made up the great majority of areas where resources were deployed, and of the total waste collected.

Manually picked or 'leakage' litter

Along with litter bin waste, the manual pick of dropped litter was the next most significant aspect of litter waste management identified by the local authorities. Dropped litter is waste which has been lost from the waste and resources management systems. As this waste has not been captured in litter bins or disposed of at home or the place of purchase, it is referred to as 'leakage' from the waste system, this uncaptured

material can move freely from the terrestrial to marine environments posing risks to a range of wildlife as well as causing a visual nuisance. Collecting this 'leakage' waste is a priority for local authorities to maintain clean public spaces.

In total around 14 of the 22 local authorities confirmed that their collection rounds will service a number of fixed litter bins in zone 1 and 2 areas and at the same time, the crew will also carry out a litter pick to remove any dropped waste in the vicinity. Both bin waste and manually picked litter waste are then most commonly collected on the same vehicle to take the waste for disposal.

In more built up areas like town and district centres and shopping precincts, a separate operative using a hand cart or 'barrow' might carry out a litter pick of any dropped litter, but usually the collected sacks of waste would be picked up by a nearby litter bin servicing round.

Use of cage tipper collection vehicles

Every Welsh local authority spoken to uses cage or 'caged' tipper type vehicles to collect their litter waste. This included both litter waste from bins and 'manually picked' waste. Most commonly these are 3.5 tonne class vans but larger 5.2 tonne vans and small 7.5 tonne lorries are also used. The cage tipper is essentially a transit type van with a three seater cab and a flatbed load space. Rather than a boxed shell around the load space, a metal framed wire cage surrounds the load platform and allows waste to quickly and easily be loaded by hand through a loading hatch. The tall height of the wire cage means that a large volume of light material, such as litter, can easily be loaded and transported. The contents are then emptied by opening the rear of the cage and tipping the entire flatbed up. These vehicles offer a good manoeuvrability and a great deal of flexibility in use as they can access narrow and hard to reach areas and take up relatively little space compared to larger refuse collection vehicles (RCVs). The variable nature of litter waste generation and the flexibility offered by cage tippers are possibly reasons why most local authorities collect multiple types of waste on these vehicles in addition to their primary role in collecting litter.

Co-collection of materials

A total of 17 local authorities confirmed that they use their litter waste caged tippers to collect at least one other waste stream in addition to litter; most collected several additional streams. Local authorities commonly use litter cage tippers to co-collect smaller fly tip incidents (typically just a few items), dog waste collected separately in dog waste bins and small amounts of household waste. The household waste was usually made up of a few households' worth of refuse bin waste which might have been missed as part of regular residential collection rounds. Alternatively, if the householder had left black bags next to their bin as it was full but this waste was not then collected by the regular crew. It is often local authority policy to not accept these bags of 'side waste' from next to domestic waste bins.

Though the review calls, the following co-collected waste streams were identified:

- Litter bins (residual)
- Manual pick (residual)
- Recycling bins (recycling)
- Manual pick (recycling)
- Dog waste (bins)
- Fly-tipped waste

- Black bag household type waste (left side waste/ missed collections)
- Voluntary litter pick, community groups, and;
- Other waste types including trade waste

Most local authorities were not able to provide a separate split of the amounts of litter bin waste collected compared to manually picked litter waste. A few were able to identify a tonnage of both combined litter sources which the local authority collected, however, even in these cases discussions with operational staff indicated that it was still common for them to collect other waste streams alongside this litter, meaning the accuracy of these figures would be questionable.

It was necessary therefore to develop a sampling approach which would allow the inclusion of representative samples of litter, whilst at the same time excluding the additional materials from other non-litter waste streams, so as not to skew the composition of the litter waste when scaled up to national level.

A summary of these practices is as follows:

- Litter bin waste made up the largest proportion of the litter waste managed and collected
- Manually picking up litter waste is an important cleansing operation for all local authorities
- Litter bin waste is already bagged whilst manually picked litter must be picked off the ground and gathered into bags
- In almost all cases, emptying litter waste bins and manually picking up litter are carried out according to planned operational 'rounds' or 'routes'
- All local authorities use cage tippers to gather and transport both litter bin and manually picked litter
- 17 local authorities collect several different waste streams on the same cage tipper vehicles alongside their litter waste.

3.2.2 Local authority litter data reported on WasteDataFlow and tonnage clarification review

All of the local authorities confirmed that the key aspects of the litter waste they managed were litter bin waste and manually picked litter waste which had been dropped on the ground. In addition, all confirmed that they predominantly use caged tipper vehicles to collect these litter waste streams. A total of 17 of the 22 local authorities confirmed that litter waste was 'co-collected' with other waste streams, such as household residual side waste, fly tipping and dog waste bins. Operational findings by local authority are summarised in Table 7 along with confirmed WDF figures.

Table 7: Key operations summary and clarification on total WDF reported litter tonnages

	Operational litter management- 'co-collected' streams					WDF queries		
Local Authority	**Litter bin**	**Litter pick**	**Fly tipping**	**Dog bins**	**Household waste**	**Reported WDF figures for 2017/18 ('street cleansing')**	**Local Authority clarified cage tipper litter tonnage figures**	**Tonnage exclusively litter streams (i.e. Excluding mech sweepings)**
Blaenau Gwent CBC	Yes	Yes	Yes	Yes	Yes	1,016	1,016	Yes
Bridgend CBC	Yes	Yes	Yes	Yes	Yes	2,755	933	Yes
Caerphilly CBC	Yes	Yes	Yes	Yes	Yes	2,293	2,668	Yes
Cardiff CC	Yes	Yes	No	No	No	8,350	441	Yes
Carmarthenshire CC	Yes	Yes	Yes	Yes	Yes	1,647	1,647	Unsure (assumed no)
Ceredigion CC	Yes	Yes	Yes	No/ very few	Yes	6,632	314	Yes
Conwy CBC	Yes	Yes	Yes	Yes	Yes	3,639	3,137	No
Denbighshire CC	Yes	Yes	Yes	No	Yes	883	735	Yes
Flintshire CC	Yes	Yes	No	Yes	No	3,121	3,121	Unsure (assumed yes)
Gwynedd Council	Yes	Yes	No	Yes	No	4,579	4,579	No
Isle of Anglesey CC	Yes	Yes	Yes	Yes	No	2,986	2,986	Yes
Merthyr Tydfil CBC	Yes	Yes	No	Yes	No	-	230	Yes
Monmouthshire CC	Yes	Yes	Yes	Yes	Yes	1,487	1,487	Yes
Neath Port Talbot CBC	Yes	Yes	Yes	Yes	Yes	2,567	- [8]	n/a
Newport City Council	Yes	Yes	No	No	No	1,767	474	Yes
Pembrokeshire CC	Yes	Yes	No	No	No	1,705	1,705	Yes
Powys County Council	Yes	Yes	Yes	Yes	Yes	1,099	1,099	Yes
Rhondda Cynon Taff CBC	Yes	Yes	Yes	Yes	No	1,282	1,282	Yes
Swansea	Yes	Yes	Yes	No	Yes	2,562	2,161	Yes
Torfaen CBC	Yes	Yes	Yes	Yes	Yes	-	514	Yes
Vale of Glamorgan C	Yes	Yes	Yes	Yes	Yes	1,694	1,694	Yes
Wrexham CBC	Yes	Yes	Yes	Yes	Yes	2,771	517	Yes
					Total	**54,833**	**32,738**	

[8] No figure reported, an average figure has been calculated and applied within the analysis section.

All local authorities except two confirmed that they have set collection rounds to empty fixed litter waste bins. Of the exceptions, litter bins in Newport are emptied as needed by one of the designated litter picking teams and Ilse of Anglesey did not respond to confirm their operational practices.

Table 7 shows the range of waste streams each local authority confirmed as co-collected with litter waste using the caged tipper vehicles. None of the local authorities were able to provide separate tonnages for the co-collected waste streams or give an indication of the typical proportional splits of co-collected materials.

Litter reporting varied, by local authority and under the different categories within WDF, possibly as a result of how waste is disposed of at different facilities or due to how different individuals use the system. In 2017/18 a total of 54,833 tonnes of material was reported under 'street cleansing' using WDF.

During the review discussions, local authorities were asked to clarify the WDF reported tonnage figures under 'street cleansing'. Several local authorities included other separately collected waste streams such as 'mechanical sweepings' or separately collected fly tipping as part of their main 'street cleansing' tonnage figures. Cardiff, Ceredigion, Newport, Torfaen and Wrexham confirmed the actual tonnages which would relate to litter waste collected on caged tippers. Merthyr and Torfaen had not reported tonnage figures under the WDF category 'street cleansing' but were able to provide a tonnage figure for waste from tippers. Neath Port Talbot confirmed that the tonnage reported under street cleansing did not relate to litter waste but were not able to confirm an actual litter tonnage figure. The litter tonnage for Neath Port Talbot was estimated in the analysis in Section 3.5. Several authorities confirmed that street sweepings tonnages were also included within this reported figure and several additional authorities confirmed lower tonnage figures than those reported on WasteDataFlow. Once the additional non-litter waste streams were separated, so far as possible, the total material collected by cage tippers was calculated as 32,738 tonnes.

The first part of the review calls exercise showed that the main litter sources were typically collected as part of set rounds which were serviced using caged tippers as the predominant collection method in all local authorities. The calls also indicated that most litter rounds are comprised of a mixture of public areas, shopping precincts and the surrounding streets and that targeting litter collected from discrete venues or areas would be both highly logistically challenging.

The second aspect of the review calls investigated the WDF reported figures. This helped to establish a more precise national total for co-collected litter waste. However, it would still be necessary to use a calculation to separate waste types collected on average by cage tippers. This would include estimated tonnage figures for the amount of co-collected litter bin and manually collected litter waste.

3.3 Field work and waste sample stratification by local authority

3.3.1 Waste material loads and samples obtained

The fieldwork took place over five days in each selected local authority, regular, scheduled litter collections took place as usual and were carried out by the regular collection crews. Specific cage tipper loads of waste were targeted each day and diverted to a designated sort area. Table 8 gives the number of cage tipper loads which were delivered and the number and weight of samples sorted.

Table 8: Number of vehicles loads analysed

Local Authority	Cage tipper vehicle loads	Samples	Weight of material sorted (kg)
Caerphilly	12	20	758
Ceredigion	13	26	1,199
Denbighshire	9	20	1,401
Swansea	9	25	958
Monmouthshire (highways)	2	5	168
Total	**45**	**96**	**4,483**

A total of 45 cage tipper loads of waste were included in the analysis. Local authority litter waste from regular collections made up 91 of the samples sorted accounting for 4,315kg. The total sorted waste and other unsorted waste streams from these loads made up 13,271 kg. Two loads of highways litter waste from Monmouthshire were also sorted by the team working in Swansea; five samples of 168kg of material were sorted from the total vehicle loads which made up 371kg.

3.3.2 Average waste stream profiles by cage tipper loads

Each of the cage tipper loads delivered were from normal local authority collection operations. Almost all were made up of a number of different 'co-collected' types of waste or 'streams' (Table 9 and Figure 1).

Table 9: Average waste stream load profile from tipper vehicles by local authority and by all loads

Waste stream (% weight)	Caerphilly	Ceredigion	Denbighshire	Swansea	Average
Litter bins (residual)	45.1%	64.4%	79.8%	28.1%	54.6%
Manual pick (residual)	8.9%	18.7%	5.2%	13.3%	12.0%
Recycling bins (recycling)	0.4%	6.9%	0.0%	42.1%	11.0%
Manual pick (recycling)	0.0%	0.0%	0.0%	5.2%	1.1%
Dog waste (bins)	10.7%	0.0%	0.0%	0.0%	3.0%
Fly tipping	16.4%	2.0%	7.2%	3.8%	7.5%
Black bag household waste	9.2%	3.0%	6.9%	1.6%	5.3%
Voluntary litter picks	8.3%	2.6%	0.0%	0.0%	3.1%
Loose waste - unclassifiable	0.0%	2.3%	1.0%	2.1%	1.3%
Other: Inc commercial, trade, unknown, roadkill	0.9%	0.1%	0.0%	3.7%	1.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**
All litter & recycling bins	**45.4%**	**71.3%**	**79.8%**	**70.2%**	**65.6%**
Litter and recycling pick	**8.9%**	**18.7%**	**5.2%**	**18.6%**	**13.1%**

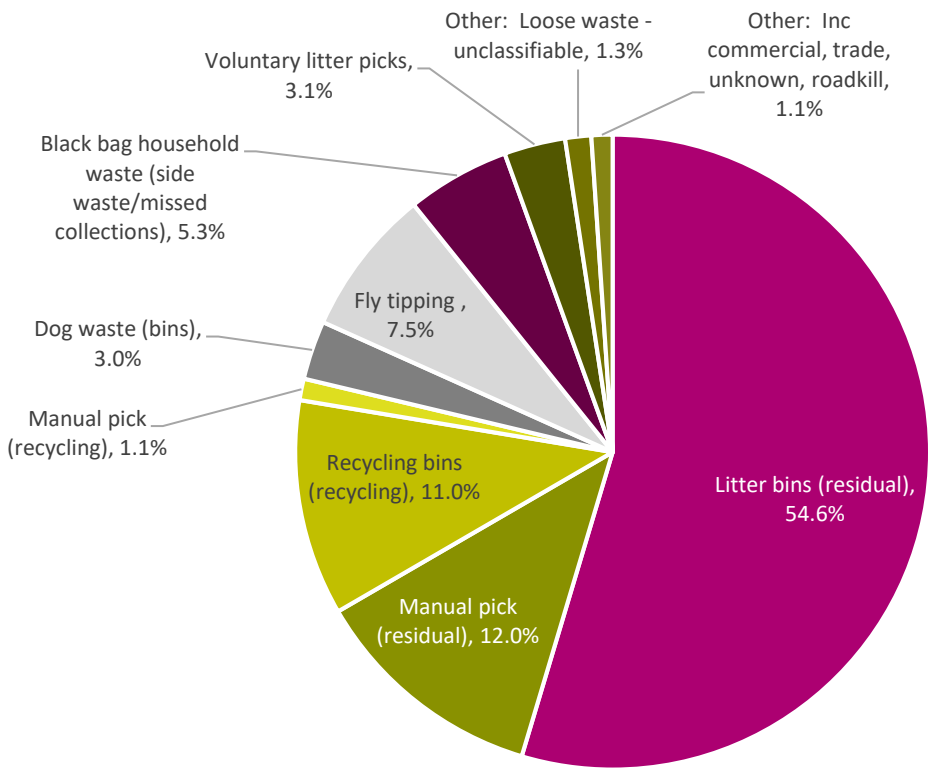

Figure 1: Average Waste stream profile by load

Different waste streams were identified according to the methodology outlined in Table 2 in section. 2.4.1. On average, residual litter bin waste accounted for the largest proportion of the co-collected wastes making up 54.6% of the total waste types making up each load. Manually picked residual waste was 12.0% and waste from recycling bins then accounted for 11.0% of the material, followed by 7.5% fly tipped waste and 5.3% black bag household waste.

Litter bin residual waste from the tipper loads was the most significant waste type making up the average tipper load in each local authority except Swansea where waste from recycling bins accounted for 42.1% of the average tipper load. The average proportion of residual waste from litter bins was highest in Denbighshire at 79.8%. The proportion of litter bin waste making up the average load was lowest in Swansea at 28.1% which might be connected to a Swansea having a more extensive number of recycling on-the-go litter bins in place than the other study local authorities.

From discussions with local authorities which provide recycling-on-the-go bins, it was suggested that contamination of recyclable materials with residual waste was a significant problem and that both bins are essentially used in the same way by the public. The lower shaded sections of Table 9 indicates the combined proportions of both residual and recycling litter bins, this was equivalent of 65.6% of the material making up caged tippers.

Caerphilly was the only local authority in which dog waste bins were provided and also collected by the litter waste caged tippers. This made up 10.7% of material on the caged tippers. Fly tip waste accounted for 7.5% of the total material weight making up the average caged tipper loads. This was highest in Caerphilly at 16.4% and lowest in Ceredigion at 2.0%.

3.3.3 Litter samples obtained by local authority

A total of 91 waste samples were sorted from cage tipper loads carrying out regular collections of material in each local authority area. Table 10 shows the predominant type of areas where litter samples were gathered in each local authority. Highest priority was given to gathering samples from town centres and urban areas as the greatest proportion of litter waste is generated in these areas. Samples from urban areas were then targeted as these are areas where waste is next most frequently collected. Information on the collection round and area the sample had come from was either provided by the local authorities or sets of streets or locations were provided and the obtained samples were then categorised accordingly. Table 10 and Table 11 show the range of samples gathered from different area types and by waste stream types in each local authority.

Table 10: Samples obtained by predominant collection round type and per local authority

Predominant collection round type	Caerphilly	Ceredigion	Denbighshire	Monmouthshire (highways)	Swansea	Total	% all samples
Beach			2			2	**2.1%**
Coastal		10				10	**10.4**
Coastal/rural		4				4	**4.2%**
Highways waste				5		5	**5.2%**
Rural			6			6	**6.3%**
Rural, suburban			2			2	**2.1%**
Suburban	3					3	**3.1%**
Town centre	9	12	8		21	50	**52.1%**
Town centre/suburban	7		2			9	**9.4%**
Urban outskirts					4	4	**4.2%**
Voluntary - suburban	1					1	**1.0%**
Total	**20**	**26**	**20**	**5**	**25**	**96**	**100%**

Table 11: Samples obtained by waste stream sample and per local authority

Waste stream	Caerphilly	Ceredigion	Denbighshire	Monmouthshire (highways)	Swansea	Total	% all samples
Household recycling					1	1	**1.0%**
Layby (Monmouthshire)				3		3	**3.1%**
Recycling litter pick					5	5	**5.2%**
Recycling bins	1	3			7	11	**11.5%**
Residual litter bins	10	14	14		4	42	**43.8%**
Residual litter pick	8	7	6		8	29	**30.2%**
Verges (Monmouthshire)				2		2	**2.1%**
Voluntary beach litter pick		1				1	**1.0%**
Voluntary litter pick	1	1				2	**2.1%**
Total	**20**	**26**	**20**	**5**	**25**	**96**	**100%**

Just over half (52.1%) of the samples analysed came from town centre locations. Ceredigion included a mix of samples from coastal areas and Denbighshire included a mixture of samples from more rural areas.

Residual litter bins made up 43.8% of the total samples; residual litter picked waste made up 30.2% of the samples.

3.3.4 Composition analysis results

The following section provides the average composition of the waste samples obtained across the four study local authorities. Figures are presented by the upper level material categories, by percentage weight of all material and by percentage count of total items making up the samples.

3.3.5 Litter bin waste composition

In total, 53 samples of litter bin waste were sorted; this was made up of 3,389 kg of material and 90,386 items; the following section shows the average composition of this litter.

Table 12: Average composition of all litter bin samples by percentage weight, percentage item count and total item counts

Material category	All average bin samples composition (% weight)[9]	All average bin sample composition (% count)	Count of all sample items
Putrescibles	41.1%	0.0%	n/a
Paper and card	17.8%	38.8%	34,897
Glass	10.2%	2.1%	1,826
Other combustible wastes	5.6%	13.4%	13,142
Dense plastic (food packaging)	4.0%	10.0%	9,058
Metal	4.0%	6.5%	5,785
Plastic Film	3.7%	17.9%	15,875
Dense Plastic (drinks containers)	3.4%	4.5%	3,741
Collection sacks	2.8%	0.0%	109
Textiles	2.0%	0.5%	478
Fines (sub 10mm)	1.3%	0.0%	-
Non-Combustible	1.1%	0.2%	149
Dense Plastic - (Non pack)	1.1%	3.6%	3,263
Other plastic bottles (milk and non-drink)	0.7%	0.6%	496
Dense plastic (pack - non-food)	0.5%	1.7%	1,560
Hazardous Waste Items	0.4%	0.0%	-
WEEE	0.3%	0.0%	-
Total	**100.0%**	**100.0%**	**90,386**

[9] For clarity, those items below 2% composition by percentage weight and percentage count have been grouped under the 'other' category in Figure 2 and Figure 3

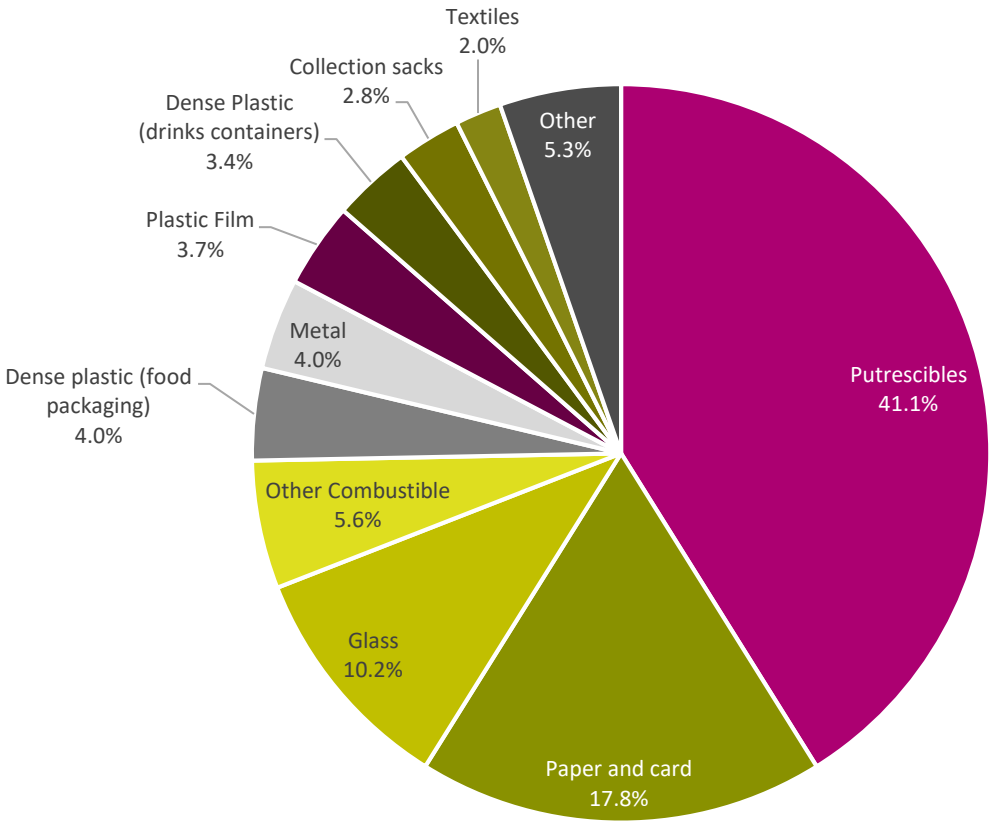

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Figure 2: Average composition of all litter bin samples by percentage weight

By weight, putrescible items made up the majority, 41.1% of litter bin waste items. Food waste removed from its packaging made up 21.7% of the overall composition and dog excrement found within the litter bin samples made up 13.1%, liquid food waste (drinks emptied from bottles) made up 4.9%.

Paper and card items were the next most prominent materials, making up 17.8% of the litter bin waste. The most significant items in this category by weight were non-packaging recyclable paper at 3.7%, tissues and napkins at 2.9%, thin card packaging at 2.3% and waxed card at 1.8% of the materials by weight.

Glass made up 10.2% by weight, bottles under 499ml made up 3.2%, bottles over 750 ml and up to 999ml made up 2.5% and bottles between 500ml and 749ml made up 2.6%. All glass containers include broken glass made up 1,826 items.

All 'other combustible' waste made up 5.6%, within this category absorbent hygiene products (AHPs) including nappies and sanitary waste made up 2.9% by weight and wet wipes made up 0.5%. In total, other miscellaneous combustible items made up a further 2.0% and included packaging foam, foam from cushions, latex gloves and plastic based cleaning cloths and sponges.

Dense plastic food packaging made up 4.0% of the waste by weight, 2.8% of the composition were food containing pots, tubs and trays.

Metal accounted for 4.0% of the litter bin waste by weight, aluminium cans in different sizes made up 2.4% of all waste, aluminium cans under 330ml were most common by weight at 1.4% by weight. Ferrous drink cans made up less than 0.05% of the composition by weight.

Plastic film made up 3.7% of the composition by weight, non-food packaging wrap made up 1.0% whilst food packaging wrap made up 0.7%. Food packaging wrap including crisps, sweets and biscuit wrappers made up a total of 1.2%.

Plastic drink bottles made up 3.4% of all litter bin materials by percentage weight. The 'other' category including fines, non-combustibles, dense plastics (non-packaging and non-food packaging, other plastic bottles, hazardous waste items and WEEE makes up 5.3% of the all litter bin materials by percentage weight.

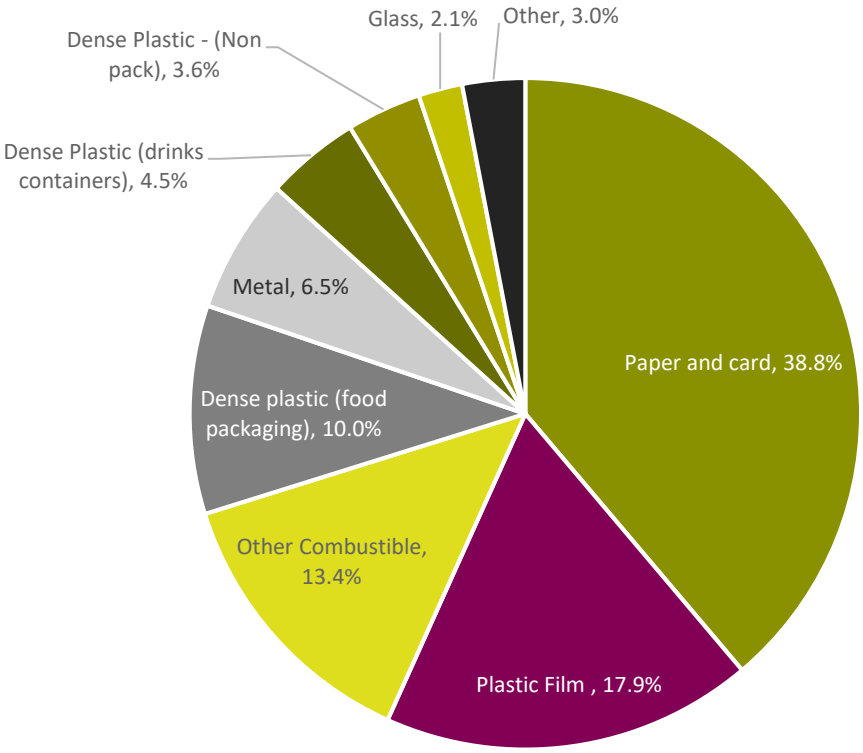

Figure 3: Average litter bin composition of all samples by percentage item count

In total, 90,386 items of litter bin waste were counted. Paper and card items made up the largest proportion of the composition at 38.8%, equivalent of 34,897 items. Napkins and tissues made up 10.4%, a total of 8,328 items, recyclable non-packaging paper items made up 7.9% (7,635 items), thin packaging card made up 4.5% and waxed card made up 3.4%, waxed or laminated paper made up 3.3% and card coffee cups made up 2.5%.

All plastic film made up 17.9%, a total of 15,875 items. Collectively, food packaging film made up 11.9% of all items counted, a total of 10,817 items. Sweet and chocolate bar wrappers made up 4.5% of all items, while other food wrappers made up 4.2%, non-food packaging film made up 3.2% and crisp packets made up 2.4% of all items. All plastic bags and carrier bags made up 2.7% of items.

Combustible waste made up 13.4% of the items counted, a total of 13,142 items. Most notably within this category, cigarette butts made up 6.1% (6,777 items) of all counted items and wet wipes made up 2.7%, a total of 2,344 items.

Dense plastic food packaging made up 10% of the composition, a total of 9,955 items. Of the total items 3.3% were plastic pots tubs and trays for food and 2.7% was plastic lids for plastic and card coffee cups. Expanded polystyrene trays made up 0.3%.

Dense plastic drink containers made up 4.5% of the total items in total there were 3,741 of these items. The eight categories of PET drink bottles made up 2.7% of all items with 500ml to 749ml size bottles being most common at 1.5% of all items. PET water bottles made up 1.6%. Separation at the lowest sorted level showed that PET water and drink bottles made up 4.3% of all items while dense plastic non-packaging items made up 3.6% of the total items, of these, plastic cutlery was most common and made up 1.3%.

Dense non-food plastic packaging, other milk and non-drink plastic bottles, textiles, non-combustibles, collection sacks, putrescibles, fines, hazardous waste items and WEEE constitute the 'other' category and make up 3% of all litter bin items by percentage count.

The following table and chart show the general compositional trends across each of the sample local authorities.

Table 13: Average composition of litter bin samples by percentage weight per local authority

Material category	Denbighshire	Caerphilly	Ceredigion	Swansea	All Samples
Putrescibles	53.3%	35.0%	41.8%	30.6%	41.1%
Paper and card	11.3%	20.8%	18.9%	21.3%	17.8%
Glass	8.6%	12.1%	10.4%	9.9%	10.2%
Other Combustible	4.8%	3.8%	8.1%	4.7%	5.6%
Dense plastic (food packaging)	2.1%	3.2%	2.8%	9.2%	4.0%
Metal	3.4%	6.5%	2.7%	4.2%	4.0%
Plastic Film	3.2%	3.8%	3.3%	4.9%	3.7%
Dense Plastic (drinks containers)	2.8%	6.1%	2.3%	3.2%	3.4%
Collection sacks	2.3%	2.4%	3.0%	3.5%	2.8%
Textiles	1.4%	1.6%	1.4%	4.2%	2.0%
Fines (sub 10mm)	2.1%	0.8%	1.3%	0.8%	1.3%
Non-Combustible	1.5%	1.0%	0.8%	1.0%	1.1%
Dense Plastic - (Non pack)	1.0%	0.8%	1.4%	0.7%	1.1%
Other plastic bottles (milk and non-drink)	0.6%	1.1%	0.6%	0.7%	0.7%
Dense plastic (pack - non-food)	0.3%	0.6%	0.4%	0.8%	0.5%
Hazardous Waste Items	0.6%	0.2%	0.4%	0.3%	0.4%
WEEE	0.5%	0.3%	0.4%	0.1%	0.3%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

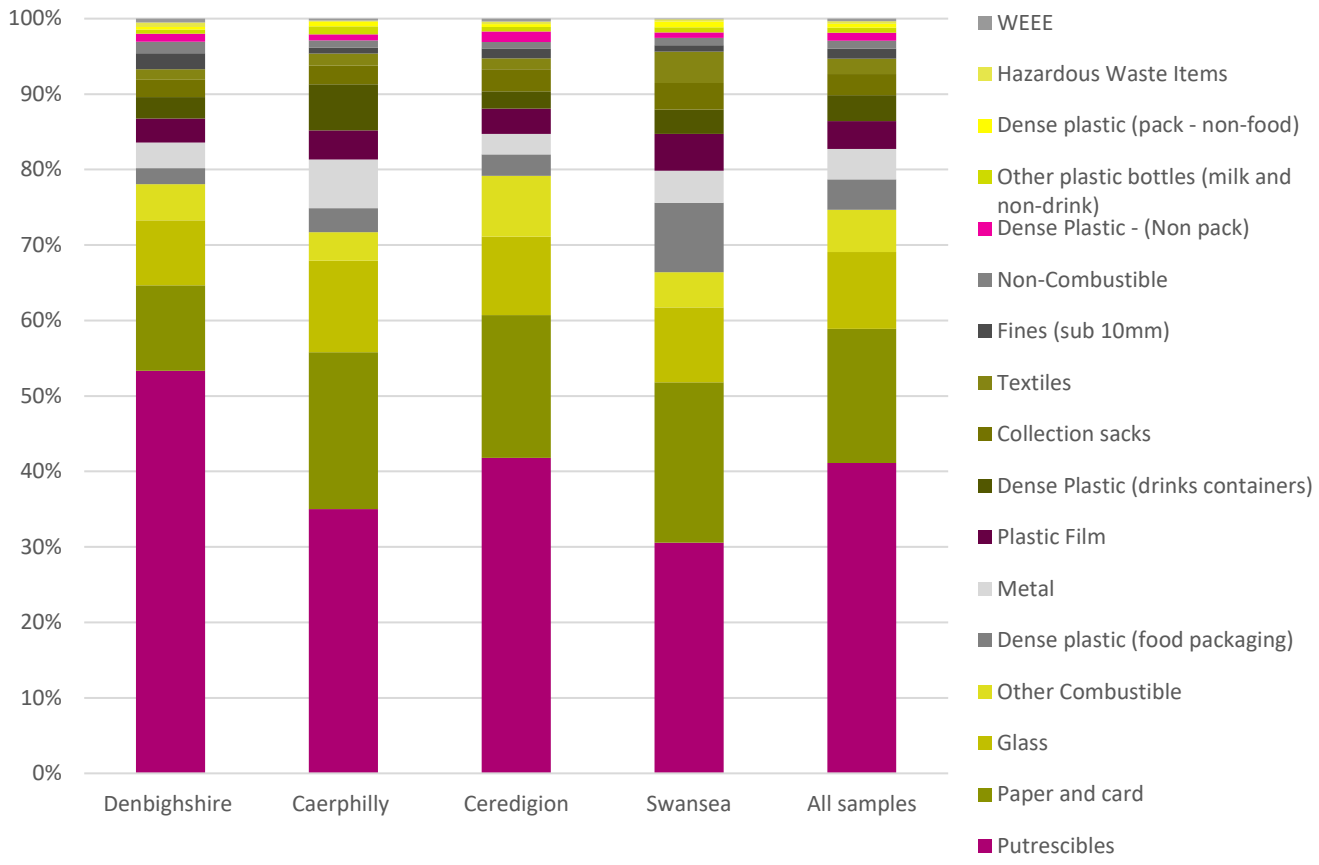

Figure 4: Average litter bin sample composition by percentage weight per local authority

Across all four study local authorities the average composition of litter bin samples was broadly similar. Putrescible waste items were most common by percentage weight making up between 30.6% in Swansea and 53.3% in Denbighshire. A higher proportion of dog excrement in Denbighshire accounted for the higher putrescible figure which accounted for 28.3% of all material by weight. Food made up between around 24% and 29% in each local authority.

Paper and card, glass and other combustible items were all prominent in each local authority by percentage weight.

3.3.6 Litter pick composition

A total of 885kg of material was sorted from 37 samples of litter bin waste and 37,899 items.

Table 14: Average composition of all litter pick samples by percentage weight, percentage count and with item counts

Material category	Average all litter Pick samples (% weight)	Average all litter pick samples (% count)	Count of all sample items
Paper and card	21.8%	36.2%	15,649
Putrescibles	21.6%	0.0%	10
Glass	11.8%	1.7%	592
Metal	9.5%	10.1%	3,214
Other Combustible	6.5%	12.4%	4,456
Dense Plastic (drinks containers)	5.5%	5.5%	1,414
Plastic Film	4.8%	18.4%	6,841
Collection sacks	4.3%	0.0%	-
Dense plastic (food packaging)	3.6%	8.6%	3,076
Dense Plastic – (Non pack)	2.5%	4.5%	1,653
Textiles	2.3%	0.5%	200
Fines (sub 10mm)	2.0%	0.0%	-
Non-Combustible	1.5%	0.1%	48
Dense plastic (pack – non-food)	0.7%	1.5%	594
Hazardous Waste Items	0.6%	0.0%	-
Other plastic bottles (milk and non-drink)	0.6%	0.5%	152
WEEE	0.4%	0.0%	-
Total	**100.0%**	**100.0%**	**37,899**

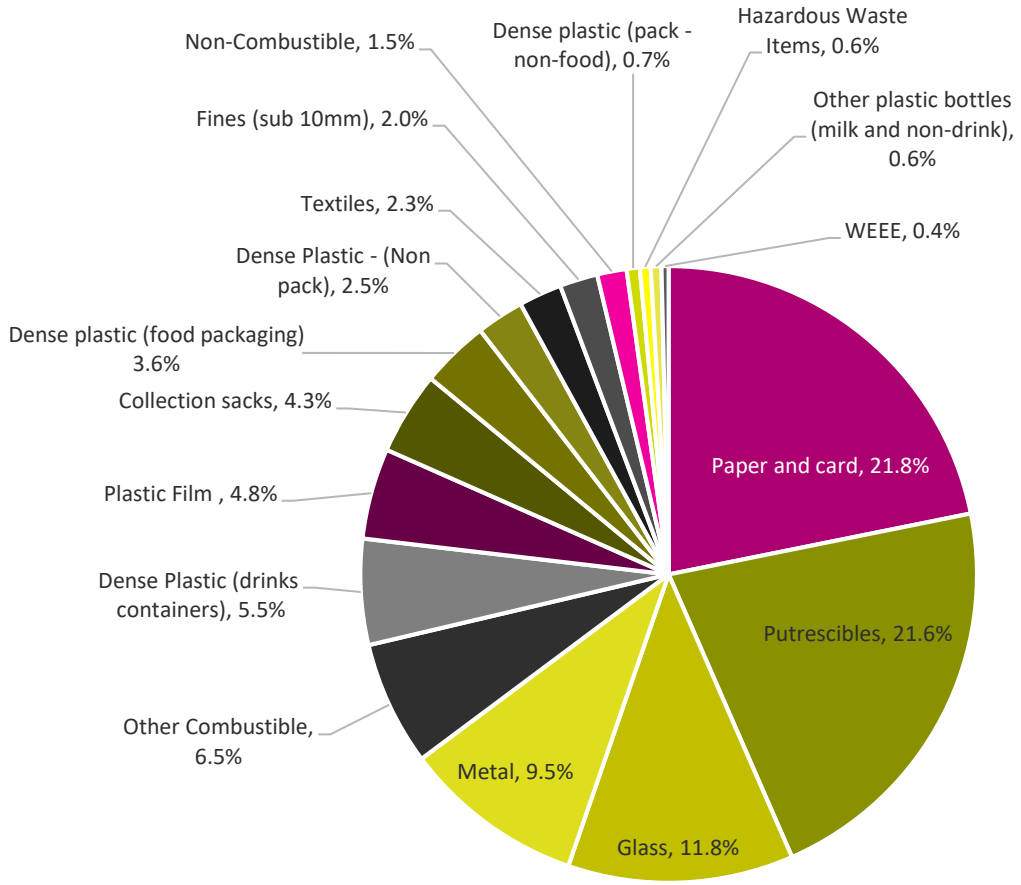

Figure 5: Average litter pick composition of all samples by percentage weight

By percentage weight of all litter picked waste across all samples, paper and card was the most significant material at 21.8% of all material. Thin card packaging made up 4.6%, recyclable non-packaging paper and card made up 3.6%, corrugated card made up 3.1%, waxed and laminated card made up 2.6% and tissues and napkins made up 2.5%.

Putrescible waste made up 21.6% by percentage weight; all food waste made up 10.2%, liquid food waste made up 4.7% and dog excrement made up 4.2%.

Glass made up 11.8% of littered items with bottles under 499ml most common at 3.2% of all items by weight.

Metals made up 9.5% of all litter picked waste by total weight, aluminium drink cans made up 4.9%, those under 330ml were most common at 2.1% by weight. Steel drink cans made up less than 0.5% by weight of the total materials.

Combustible items made up 6.5%, other combustible items such as mixed material products made up 3.9% followed by absorbent hygiene products at 1.5% of material by weight.

Dense plastic drink containers made up 5.5%, PET plastic drink bottles were most common at 4.2% of all items by weight, 500ml to 749ml bottles were most common at 2.2%. Plastic film made up 4.8% of all material by weight. Food wrapping collectively made up 1.8% of litter picked waste, non-food packaging made up 1.6% by weight.

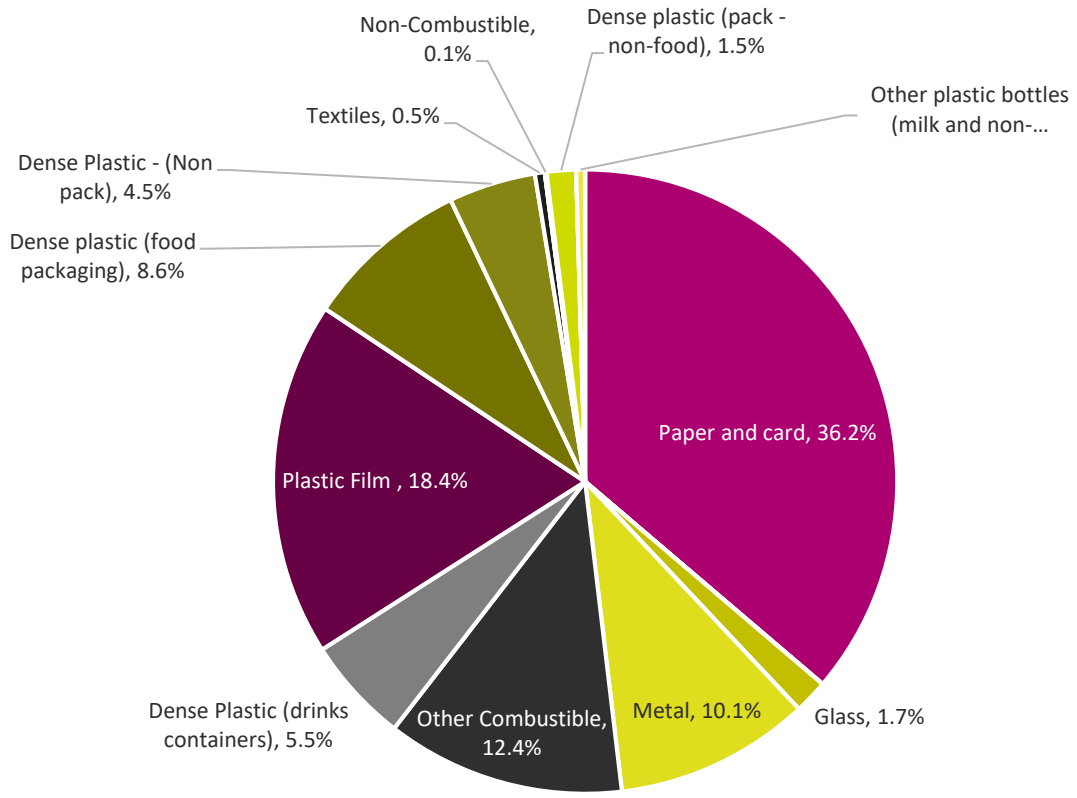

Figure 6: Average litter pick composition of all samples by percentage count

In total 37,899 items were counted across all samples of manually picked litter waste. Paper and card made up the most common items found in these samples at 36.2% of all items, a total count of 15,649 items. Recyclable paper including newspaper, leaflets and magazines was most common in this category at 8.3% of all items, tissues and napkins made up 6.7% and thin card packaging made up 5.9%.

Plastic film items made up 18.4% (6,841 items) sweet and chocolate wrappers were most common at 5.5% of all items, plastic non-food packaging wrap then made up 5.0% and other plastic food wrap made up 3.4%. Collectively all plastic food wrapping made up 11.7%.

Other combustible items were next most common making up 12.4% by item count (4,456 items), cigarette butts were the most common item here at 5.1% of all items. Wet wipes made up 2.5% of all items from samples of litter picked waste.

Metal items made up 10.1% of all littered items equivalent of 3,214 items, with aluminium cans drink cans making up 7.9%, cans of 330ml size or less made up 3.8% of all items.

Dense plastic food packaging made up 8.6% (3,207 items) of all items picked up from dropped litter, pots, tubs and trays for containing food made up 2.5% and lids for cups made up 1.7%. Other non-packaging dense plastic made up 4.5%.

Table 15: Average composition of litter pick samples by percentage weight per local authority

Material category	Denbighshire	Caerphilly	Ceredigion	Swansea	All samples
Paper and card	25.5%	20.1%	18.5%	23.6%	21.8%
Putrescibles	21.2%	26.1%	18.7%	20.8%	21.6%
Glass	4.1%	9.7%	10.4%	17.9%	11.8%
Metal	6.8%	8.7%	8.5%	12.0%	9.5%
Other Combustible	9.4%	7.2%	6.7%	4.6%	6.5%
Dense Plastic (drinks containers)	9.3%	6.0%	3.6%	4.8%	5.5%
Plastic Film	6.3%	4.9%	4.8%	3.9%	4.8%
Collection sacks	5.1%	2.5%	7.4%	3.2%	4.3%
Dense plastic (food packaging)	1.9%	2.5%	6.5%	3.0%	3.6%
Dense Plastic – (Non pack)	2.0%	4.1%	3.3%	1.0%	2.5%
Textiles	2.3%	3.0%	2.1%	1.8%	2.3%
Fines (sub 10mm)	3.7%	2.9%	1.8%	0.7%	2.0%
Non-Combustible	1.2%	0.4%	4.4%	0.5%	1.5%
Dense plastic (pack – non-food)	0.2%	0.7%	0.8%	0.8%	0.7%
Hazardous Waste Items	0.1%	0.4%	1.1%	0.5%	0.6%
Other plastic bottles (milk & non-drink)	0.7%	0.4%	1.0%	0.3%	0.6%
WEEE	0.1%	0.4%	0.3%	0.5%	0.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**

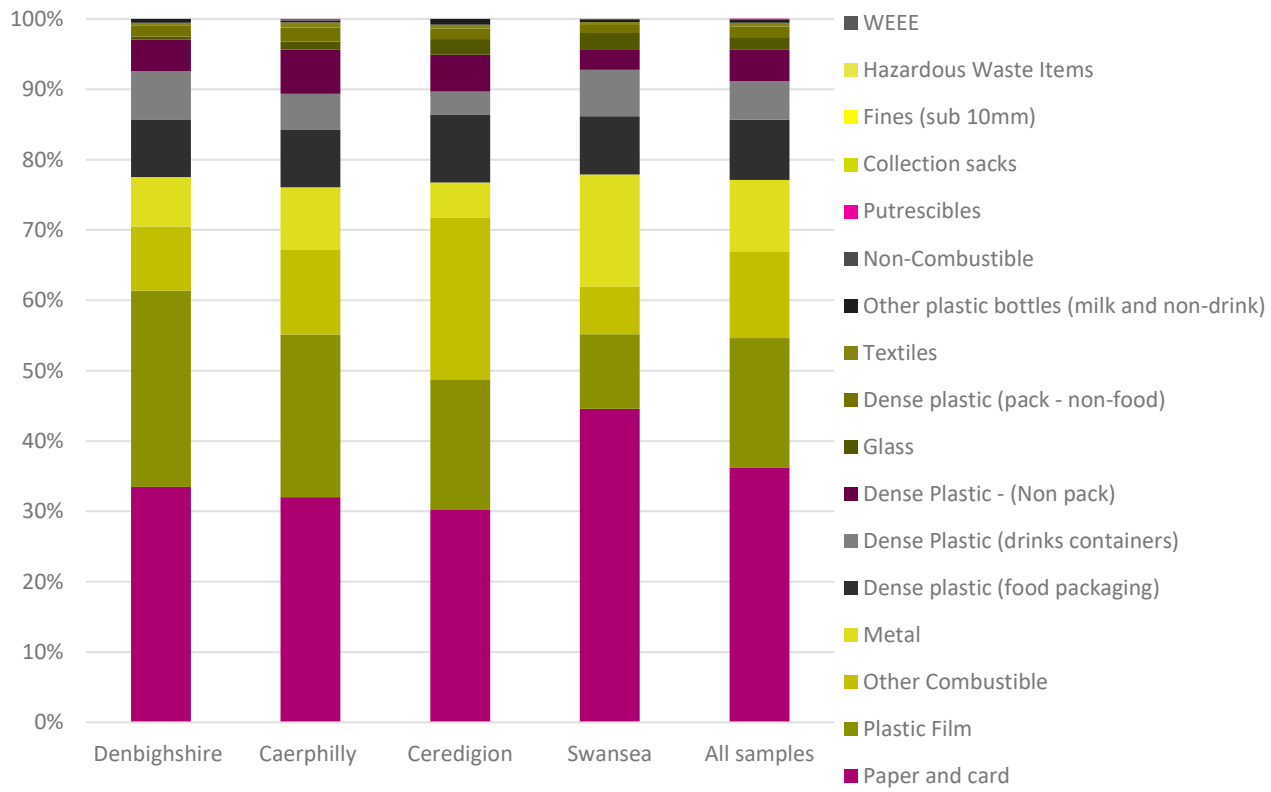

Figure 7: Average composition of litter pick samples by percentage item count per local authority

Like the litter bin waste composition, the average composition of litter pick samples is similar in each local authority. Paper and card and putrescibles were the most significant proportions of the litter picked waste, each accounting for around 20% of the composition by weight. The proportion of glass varied from 4.1% in Denbighshire to 17.9% by weight in Swansea.

The average waste compositions from all litter bin waste and manual picked litter are used in the following analyses, the most appropriate average composition from each of the four fieldwork local authorities has been applied to each local authority litter tonnage as set out in the analysis methodology in section 2.6.3. Analysis findings for the estimated nation level composition are presented in section 3.4.

3.3.7 Highways waste composition

Two caged tipper loads of local authority collected highway's waste were also analysed in addition to the work in each of the four study areas. Waste came from two four kilometre long sections of the A40, between Raglan and Abergavenny in Monmouthshire. The local authority separately collected litter picked waste from laybys and roadside verges; waste was gathered in different coloured bags to identify which source it was from. In total 168kg of material was sorted. The highways layby waste samples were made up of 108Kg of material and the highway verges samples were made up of 60kg of material.

Table 16: Highways waste composition by percentage weight

Material category	Laybys	Highway verges	All highways waste
Putrescibles	21.5%	18.4%	20.3%
Paper and card	18.7%	16.8%	17.9%
Metal	12.5%	15.5%	13.7%
Glass	10.0%	4.7%	7.9%
Other Combustible	7.1%	6.3%	6.8%
Dense Plastic (drinks containers)	5.9%	12.1%	8.4%
Textiles	5.5%	4.2%	5.0%
Dense Plastic - (Non pack)	4.7%	9.0%	6.4%
Plastic Film	4.3%	2.6%	3.6%
Dense plastic (food packaging)	2.9%	2.6%	2.8%
WEEE	2.2%	1.7%	2.0%
Collection sacks	1.9%	2.1%	2.0%
Fines (sub 10mm)	1.2%	1.4%	1.3%
Dense plastic (pack - non-food)	0.9%	0.8%	0.9%
Other plastic bottles (milk and non-drink)	0.5%	0.8%	0.6%
Non-Combustible	0.3%	0.7%	0.5%
Hazardous Waste Items	0.0%	0.1%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**

Table 17: Highways waste composition by percentage item count.

Material category	Laybys		Highway verges		All samples	
	%	Items	%	Items	%	Items
Paper and card	31.2%	1,225	23.5%	548	28.6%	1,773
Plastic Film	15.6%	604	17.3%	382	15.9%	986
Other Combustible	14.5%	584	6.2%	148	11.8%	732
Metal	13.5%	523	18.4%	428	15.3%	951
Dense plastic (food packaging)	10.9%	418	11.9%	273	11.1%	691
Dense Plastic (drinks containers)	5.8%	228	11.6%	269	8.0%	497
Dense Plastic - (Non pack)	3.4%	137	7.1%	158	4.8%	295
Glass	1.9%	71	0.5%	12	1.3%	83
Dense plastic (pack - non-food)	1.1%	42	1.6%	35	1.2%	77
Textiles	1.0%	42	0.8%	19	1.0%	61
Other plastic bottles (milk & non-drink)	0.4%	18	0.7%	17	0.6%	35
Putrescibles	0.3%	12	0.1%	2	0.2%	14
Non-Combustible	0.2%	5	0.4%	8	0.2%	13
Collection sacks	0.0%	-	0.0%	-	0.0%	-
Fines (sub 10mm)	0.0%	-	0.0%	-	0.0%	-
Hazardous Waste Items	0.0%	-	0.0%	-	0.0%	-
WEEE	0.0%	-	0.0%	-	0.0%	-
Total	**100%**	**3,909**	**100%**	**2,299**	**100%**	**6,208**

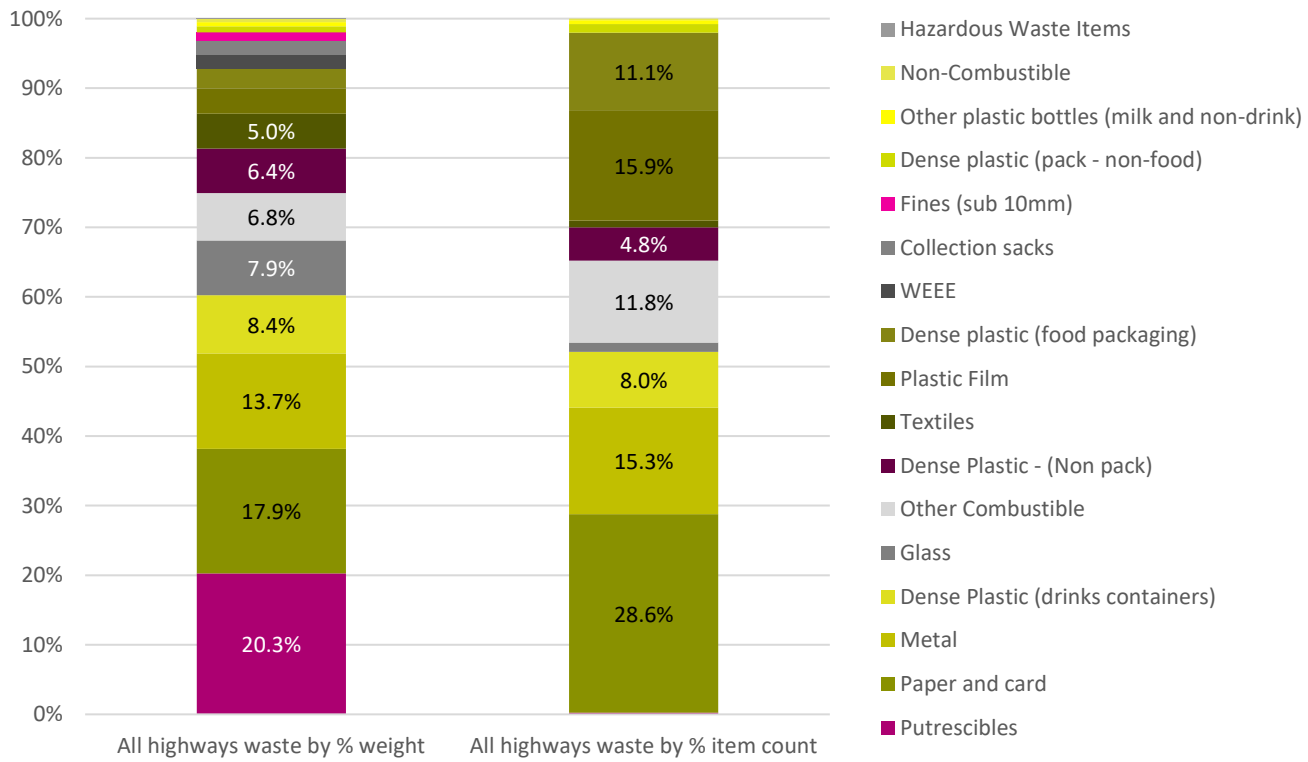

Figure 8: Highways waste composition, combined layby and verges samples, by percentage weight and by percentage item count

Table 16 shows that the composition by percentage weight of highways litter samples was relatively similar for laybys and verges, putrescible waste made up around 20% in both cases and paper and card made up between around 17% and 19%.

Metal items from the verges made up 15.5% by weight and dense plastic drinks containers made up 12.1%. and accounted for greater proportions of this sample than for the laybys sample where glass items were more prominent making up 10.0% of all material.

Table 17 provides a summary by item count, paper and card items were most prominent in laybys waste making up 31.2% by count while plastic film made up 15.6% and other combustible items made up 14.5% followed by metal at 13.5%.

The most numerous items in the verges waste were also paper and card, making up 23.5% of all items. Metal items where then next most common at 18.4% followed by plastic film at 17.3% of all items. Dense plastic food packaging containers were then both important items each accounting for around 12.0% of all items.

3.4 Estimated waste stream load profile of cage tippers and tonnages by local authority

Based on the methodology detailed in Section 2.5.2, load profiles calculated from collected samples were used to estimate litter bin and litter picked waste tonnages for each local authority. Section 3.3.2 gives the calculated average waste stream load profiles from cage tipper vehicle in each of the four study local authorities. Fieldwork data from each sample was used to create the average proportions as a percentage of weight which each waste type accounted for in each of the sample local authorities.

An estimated annual tonnage for both litter bin waste and manually picked litter has been calculated for all local authorities using the average waste stream profiles from the sample Local Authorities. Table 18 shows the selected local authority waste stream profile which was applied to each local authority tonnage and the rationale for applying the profile.

Table 18: Average waste stream load profile of waste proportions applied to local authorities

Local Authority	Approach to tonnage apportioning by waste stream and average load profile applied
Blaenau Gwent CBC	Uses average load profile split from all local authority samples
Bridgend CBC	Uses Caerphilly proportions
Caerphilly CBC	Uses Caerphilly proportions
Cardiff CC	Uses Swansea proportions. Fly tip, dog waste and household added to grouped 'other'
Carmarthenshire CC	Uses average load profile split, all local authority samples – limited info on services
Ceredigion CC	Uses Ceredigion proportions
Conwy CBC	Uses average load profile split, all local authority samples – limited info on services
Denbighshire CC	Uses Denbighshire sample proportions
Flintshire CC	Use average – limited info on services. Fly tip and black bag added to other
Gwynedd Council	Use average – limited info on services. Fly tip and black bag added to other
Isle of Anglesey CC	Use average – limited info on services, black bag added to grouped other
Merthyr Tydfil CBC	Use average – limited info on services. Fly tip and black bag added to other
Monmouthshire CC	Use average – limited info on services
Neath Port Talbot CBC	No total tonnage available, average of Valley local authorities, uses Caerphilly proportions
Newport City Council	Uses Ceredigion - tonnage is litter bins, pick and volunteer only, fly tipping, dog waste and household added to grouped 'other'
Pembrokeshire CC	Use average - limited info on services. Fly tip and black bag added to other
Powys County Council	Uses average – Includes all streams like Caerphilly but less urban
Rhondda Cynon Taff CBC	Uses average load profile split, all local authority samples - limited info on services
Swansea	Swansea sample proportions
Torfaen CBC	Uses Caerphilly proportions – all streams collected
Vale of Glamorgan C	Uses average load profile split, all local authority samples - limited info on services
Wrexham CBC	Use Caerphilly - all services in place

Information from the review calls was used to match all Welsh local authorities to the most similar study authority based on both key operational practices and the mixture of waste streams the local authority collects with litter waste using caged tipper vehicles.

Where a local authority was unable to clearly confirm their operational practices for each of the waste streams commonly collected with litter caged tippers, the average load stream profile was applied. Table 19 provides the estimated split of tonnages per waste stream by local authority.

Table 19: Estimated waste stream tonnage spilt for all Welsh local authorities calculated using applied load steam profiles

			Estimated split of cleansing waste streams (tonnes)							
Local Authority	**Confirmed annual litter waste (tonnes)**	**Annual litter waste with final assumptions (tonnes)**	**Litter bins**	**Manual Pick**	**Fly tipping**	**Dog bins**	**Missed household waste collections**	**Voluntary**	**Other and unknown**	**Total**
Blaenau Gwent CBC	1,016	1,016	666	133	76	30	53	32	24	1,016
Bridgend CBC	933	933	424	83	153	100	86	78	9	933
Caerphilly CBC	2,668	2,668	1,212	237	439	286	247	222	25	2,668
Cardiff CC	441	441	309	82	No	No	No	-	50	441
Carmarthenshire CC	1,647	1,647	1,080	216	124	49	87	51	40	1,647
Ceredigion CC	314	314	224	59	6	-	9	8	7	314
Conwy CBC	3,137	3,137	2,058	411	235	94	165	98	75	3,137
Denbighshire CC	735	735	586	38	53	-	51	-	7	735
Flintshire CC	3,121	3,121	2,048	409	No	93	No	97	473	3,121
Gwynedd Council	4,579	4,579	3,005	600	No	137	No	143	694	4,579
Isle of Anglesey CC	2,986	2,986	1,960	391	224	89	No	93	229	2,986
Merthyr Tydfil CBC	230	230	151	30	No	7	No	7	35	230
Monmouthshire CC	1,487	1,487	975	195	112	45	78	46	36	1,487
Neath Port Talbot CBC[10]	***N/a***	*1,152*	*588*	*116*	*170*	*86*	*100*	*70*	*21*	*1,152*
Newport City Council	474	474	311	62	No	-	No	15	86	474
Pembrokeshire CC	1,705	1,705	1,119	223	No	51	No	53	259	1,705
Powys County Council	1,099	1,099	721	144	82	33	58	34	26	1,099
Rhondda Cynon Taff	1,282	1,282	841	168	96	38	67	40	31	1,282
Swansea	2,161	2,161	1,517	401	82	-	35	-	126	2,161
Torfaen CBC	514	514	234	46	85	55	47	43	5	514
Vale of Glamorgan C	1,694	1,694	1,111	222	127	51	89	53	41	1,694
Wrexham CBC	517	517	235	46	85	56	48	43	5	517
All	**32,738**	**33,891**	**21,37**	**4,311**	**2,149**	**1,302**	**1,221**	**1,228**	**2,303**	**33,891**

[10] Neath Port did not report any tonnages. An average of valley councils was used to estimate these tonnages.

Neath Port Talbot were not able to confirm an annual tonnage of material which was collected using caged tipper vehicles; an average annual tonnage from all other valley local authorities was therefore applied. This gave a revised total figure across Wales of 33,891 tonnes of litter and other waste streams collected using cage tippers for the year 2017/18, shown in the second column of Table 19.

The two yellow columns in Table 19 show the estimated annual tonnes of just litter waste collected on caged tippers across Wales. This was calculated as 21,376 tonnes of litter bin waste and 4,311 tonnes of manually picked litter waste. An estimated additional 8,203 tonnes of other non-litter waste streams made up the remainder of around 34,000 tonnes of total waste collected using cage tippers across Wales.

3.5 Estimated national litter tonnages and composition baseline

The calculated average waste stream profiles from section 3.3.2 were used to calculate the estimated annual tonnes of both litter streams for each of the Welsh local authorities. The average litter bin and litter pick compositions from the fieldwork were then applied to each of the calculated annual local authority tonnages to produce an overall estimated national composition of litter waste, shown in the highlighted columns of Table 19. Table 20, Figure 9 and Figure 10 present the estimated national composition of the combined litter bin waste and litter picked waste across Wales.

Table 20: Estimated annual tonnes and composition of litter bin and manual pick waste across Wales

Material category	Estimated national tonnes of litter bin and pick waste	Composition (% tonnes) from samples	Composition (% item count) from samples	Count of all item in samples	Estimated items per average tonne
Putrescibles	10,165	39.6%	0.0%	-	-
Paper and card	4,550	17.7%	39.4%	50,546	12,117
Glass	2,545	9.9%	1.9%	2,418	550
Other Combustible	1,543	6.0%	13.7%	17,598	4,490
Metal	1,189	4.6%	7.0%	8,999	2,071
Plastic Film	981	3.8%	17.7%	22,716	5,671
Dense Plastic (drinks containers)	973	3.8%	4.0%	5,155	1,400
Dense plastic (food packaging)	878	3.4%	9.5%	12,134	2,431
Collection sacks	796	3.1%	0.1%	109	29
Textiles	475	1.8%	0.5%	678	145
Fines (sub 10mm)	416	1.6%	0.0%	-	
Dense Plastic – (Non pack)	351	1.4%	3.8%	4,916	1,129
Non-Combustible	329	1.3%	0.2%	197	55
Other plastic bottles (milk & non-drink)	175	0.7%	0.5%	648	167
Dense plastic (pack – non-food)	119	0.5%	1.7%	2,154	444
Hazardous Waste Items	109	0.4%	0.0%	-	
WEEE	92	0.4%	0.0%	-	
Total	**25,687**	**100.0%**	**100.0%**	**128,285**	**30,703**

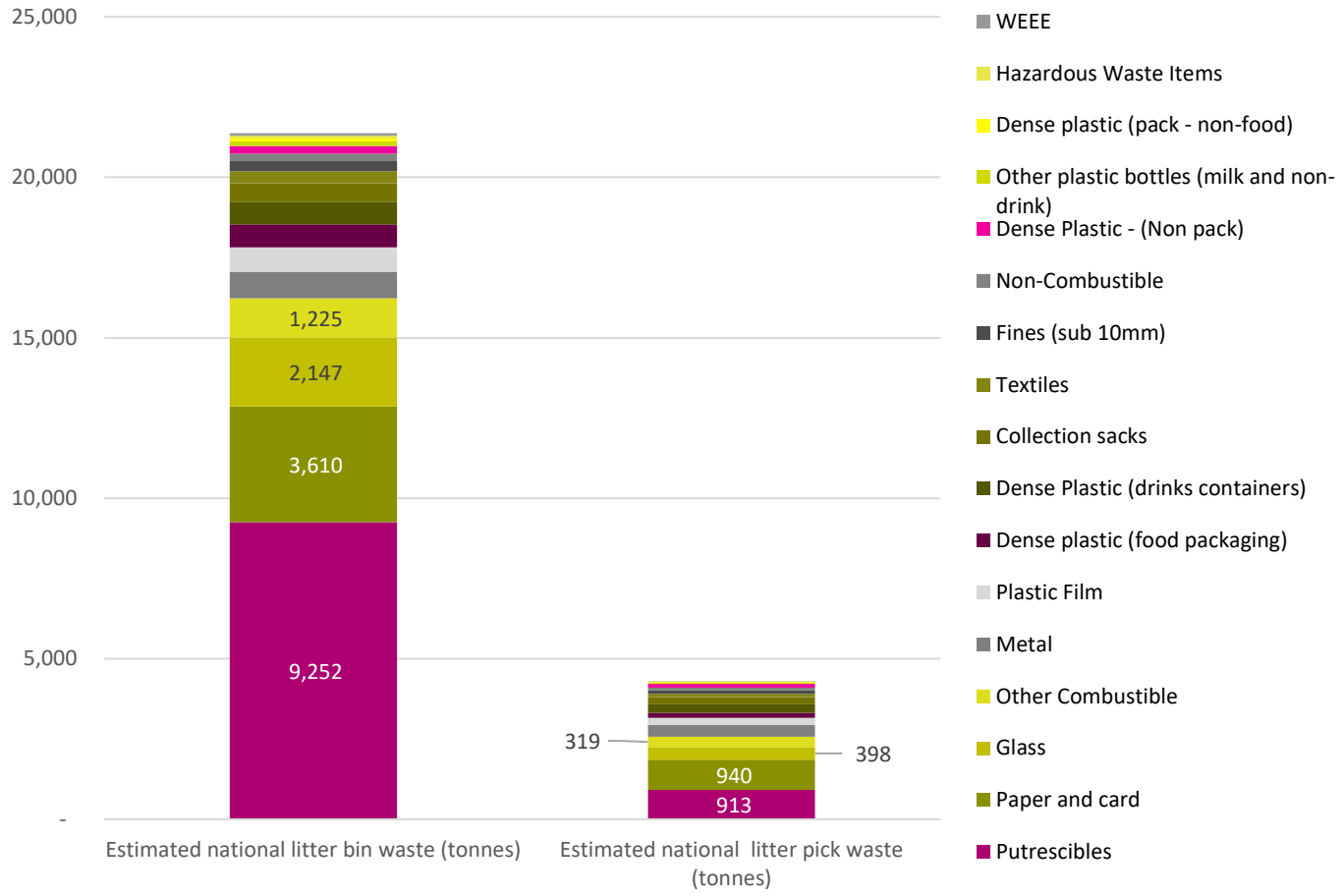

Figure 9: Estimated annual tonnage of litter bin waste and manual pick waste

Litter bin waste was estimated to make up the greater proportion of litter waste at over 20,000 tonnes per year compared to around 5,000 tonnes of manually picked litter. Putrescible waste across the combined composition up 39.6%, with food waste accounting for a total of 19.6% and dog excrement making up 13.7% of all litter.

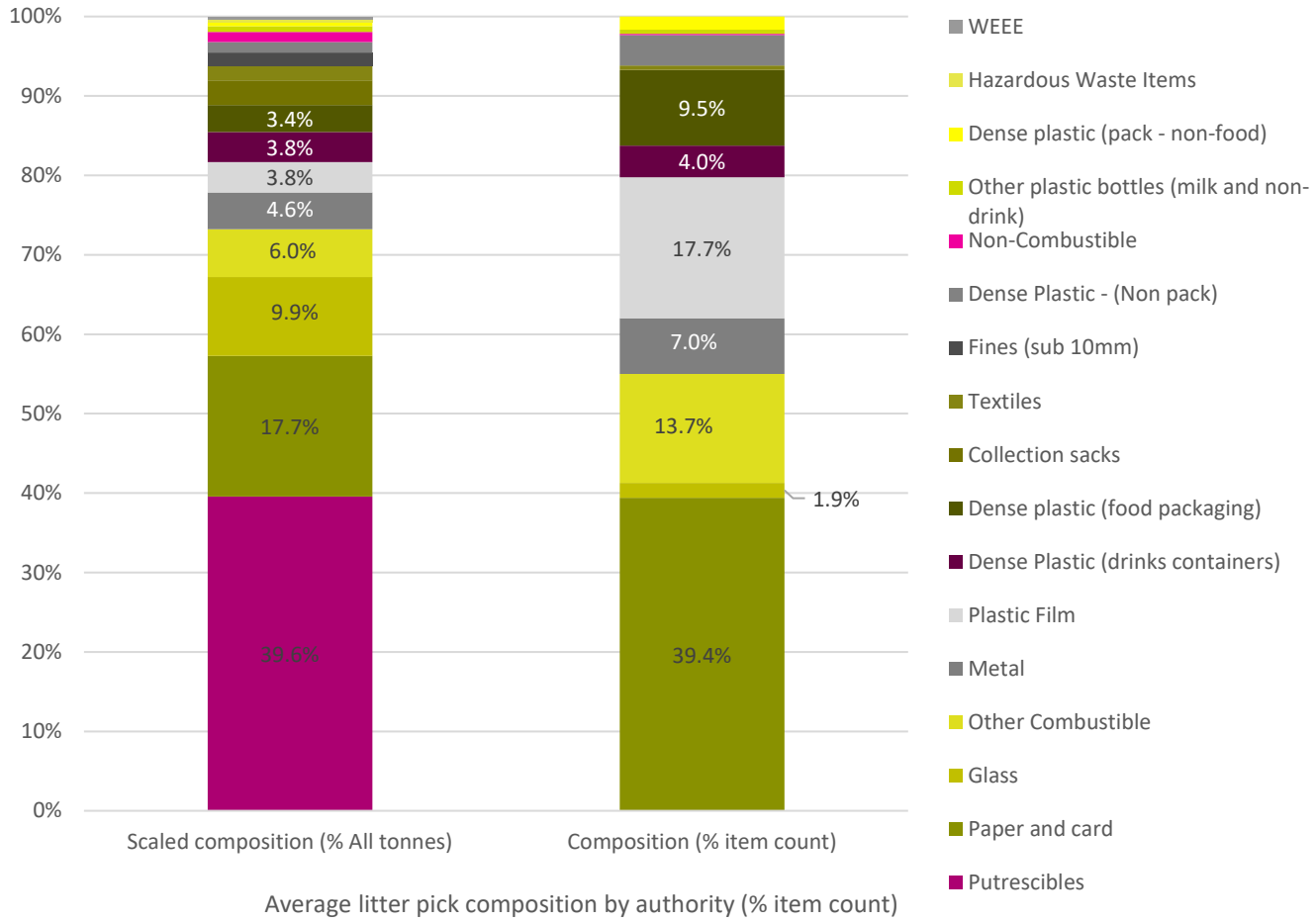

Figure 10: Composition of all litter bin and manually picked waste by percentage weight and percentage item count

The difference in the estimated composition by weight and by item count is shown in Figure 10.

By percentage weight, putrescible waste is most significant by weight at 39.6% of the total material. Paper and card are then next most common at 17.7% by weight. Putrescibles, paper, card, glass and combustibles are the most significant materials by weight making up 73.2% of all materials by weight.

Item counts are those recorded directly from the samples sorted in the fieldwork unlike the percentage weight composition by item count, these are not scaled up to the known national tonnage figures. By count of items, paper and card are the most common materials (39.4%), followed by plastic film (17.7%), combustibles (13.7%), and dense plastic food packaging (9.5%); collectively these materials make up 80.3% of all items counted during the fieldwork.

3.5.1 Common litter items at secondary category level

The following tables present a summary of the items and materials calculated as most significant by percentage weight and most common by item counts. In the following table drink containers are only separated by material type, so glass bottles and PET drink bottles of all sizes are grouped together at secondary category level. The most common items are presented by material and individual container size level in the following section (3.5.2).

Table 21: The ten most significant materials across litter bin and manually picked litter by percentage weight

Material category (level 2)	Estimated national tonnage Litter bin and manual pick waste	Scaled composition based on % tonnage
Food waste	6,217	24.2%
Other organic	3,948	15.4%
Glass Bottles	2,167	8.4%
Recyclable paper	1,226	4.8%
Collection sacks	796	3.1%
AHPs	736	2.9%
PET Drink Bottles	702	2.7%
Tissues and napkins (paper)	700	2.7%
Non-ferrous (Alu) drink cans	668	2.6%
Thin card	641	2.5%
Total	**17,802**	**69.3%**

Across both litter bin waste and manually picked litter food waste was estimated as making up 24.2% of all material. Other organic wasting including dog excrement made up 15.4%, glass bottles made up 8.4%, recyclable paper made up 4.8%, collection sacks made up 3.1% and AHPs made up 2.9% by weight. The 10 most significant materials at level 2 categorisation made up 69.3 % of all litter and an estimated 17,802 tonnes per year.

Table 22: The ten most common materials across litter bin and picked litter by percentage item count

Material category	Average sample composition (% item count)	Count of items across all samples
Plastic Film (food packaging)	11.8%	15,163
Recyclable paper	10.7%	13,702
Tissues and napkins (paper)	8.8%	11,288
Cigarette butts	6.9%	8,833
Nonferrous (Alu) drink	5.4%	6,979
Thin card	5.1%	6,582
Paper and card non packaging	3.8%	4,874
Plastic Film (packaging)	3.5%	4,524
Pots tubs and trays – Food	3.0%	3,854
Waxed/laminate/wet strength paper	3.0%	3,846
Total	**62.1%**	**79,645**

By item count, at material level the ten most common groups of items made up 62.1% of all items, accounting for 79,645 items. Combined food packaging film accounted for 11.8% of the total recorded items, recyclable paper made up 10.7% and tissues and napkins made up 8.8%. Although they have a very small item weight, cigarette butts made up 6.9% of all litter items counted. Aluminium drinks cans made up 5.4% of all counted items with a total of 6,979 cans recorded across all samples.

3.5.2 Most common litter items from all litter waste at detailed subcategory level

The following section presents the composition by weight of the most common and significant items at the subcategory level, these findings use the calculated, scaled-up national tonnage arisings estimates. This is the most detailed level to which items were sorted. Items such as drinks containers are separated by material container size and they had contained alcoholic or soft drinks.

Table 23: The ten most significant item categories from all litter bin and manual pick waste by percentage weight of calculated national arisings

Detailed material item category	Estimated national tonnage Litter bin and pick waste (tonnes per year)	Scaled composition based on % tonnage
All food waste (removed from packaging)	5,043	19.6%
Dog excrement	3,529	13.7%
Liquid food waste	1,174	4.6%
Recyclable paper – Non packaging	872	3.4%
Collection sacks	796	3.1%
AHPs	736	2.9%
Tissues & napkins (paper)	700	2.7%
499ml & under Alcohol (glass)	670	2.6%
Thin card – Packaging	641	2.5%
750ml – 999ml Alcohol (glass)	594	2.3%
Total	**14,757**	**57.4%**

Food waste and dog excrement made up the two most significant detailed category groups for the combined litter waste streams; food waste made up 19.6% and dog excrement made up 13.7% of the composition by percentage weight. Liquid food waste then made up 4.6% and recyclable non-packaging paper made up 3.4% of the composition by weight. Two categories of glass container were significant by weight, containers less than 500ml in size for alcoholic drinks made up 2.6% and between 750ml and 999ml for alcoholic drinks made up 2.3% by weight, collectively making up 4.9%.

At detailed category level the item count data is split across more individual categories than for the items making up the greatest proportions by weight.

Table 24: The ten most common item categories for litter bin and litter pick waste by percentage item count

Detailed material item category	Composition (% item count)	Count of items in all fieldwork samples
Tissues & napkins (paper)	8.8%	11,288
Recyclable paper – Non packaging	8.7%	11,164
Cigarette butts	6.9%	8,833
Thin card – Packaging	5.1%	6,582
Sweet /chocolate wrappers	4.8%	6,136
Plastic wrap (Food)	3.8%	4,923
Paper and card non packaging	3.8%	4,874
Plastic wrap (non-food)	3.5%	4,524
Pots tubs and trays – Food	3.0%	3,854
Waxed/laminate/wet strength paper	3.0%	3,846
Total	**51.5%**	**66,024**

The ten most common items from all litter waste samples accounted for 66,024 items and 51.5% of all items counted. Tissues and napkins were the most common items across all samples accounting for 8.8% of those counted. Non packaging, recyclable paper accounted for 8.7%, cigarette butts 6.9% and thin card packaging made up 5.1% of all counted items. The categories of sweet and chocolate wrappers, plastic food wrap, and non-food plastic wrap each included over 3.5% of the total counted items with over 4,000 items counted in each group.

3.5.3 Most commonly dropped litter items from litter picked waste at detailed subcategory level

Dropped items of litter are lost from the waste system up to the point of being picked up. The ten most significant categories of litter calculated using the scaled up tonnage estimates are shown in Table 25.

Table 25: The ten most significant item categories for dropped, litter pick waste by percentage weight

Detailed material item category	Count of items in all samples	Composition (% item count)
All food waste (removed from packaging)	409	9.5%
Collection sacks	221	5.1%
Dog excrement	220	5.1%
Other combustible	178	4.1%
Thin card - Packaging	177	4.1%
Liquid food waste	172	4.0%
Waxed/laminate/wet strength card	164	3.8%
Recyclable paper - Non packaging	136	3.2%
Thin card- Packaging	119	2.8%
499ml & under Alcohol (glass)	116	2.7%
Total	**1,911**	**44.3%**

Food waste was the most significant item by weight at 9.5% of the estimated annual tonnage. Collection sacks made up 5.1% and dog excrement also made up 5.1%. Other combustible items and thin card packaging each accounted for 4.1% by weight. By weight, the ten most commonly dropped items of litter accounted for 44.3% of all dropped litter items.

All items within the gathered samples of litter pick waste were counted. The ten most common items of litter pick waste are shown in Table 26.

Table 26: The ten most common item categories for litter pick waste by percentage item count

Detailed material item category	Composition (% item count)	Count of items in all samples
Recyclable paper - Non packaging	8.3%	3,529
Tissues & napkins (paper)	6.7%	2,960
Thin card - Packaging	5.9%	2,323
Sweet /chocolate wrappers	5.5%	2,103
Cigarette butts	5.1%	2,056
Plastic wrap (non-food)	5.0%	1,871
330ml and under Soft (Alu)	3.6%	1,115
Waxed/laminate/wet strength card	3.5%	860
Paper and card non packaging	3.4%	2,750
Plastic wrap (Food)	3.4%	1,120
Total	**50.4%**	**20,687**

The ten most common items accounted for 50.4% of all litter picked items, a total of 20,687 items. Recyclable, non-packaging paper was the most common item making up 8.3% (3,529 items). Tissues and napkins made up 6.7% of all litter pick items (2,960 items), 2,323 items of thin card packaging made up 5.9%. In total, 2,103 plastic based sweet and chocolate wrappers made up 5.5% of all litter pick items. Cigarette butts were the fifth most common item, 2,056 made up 5.1% of all litter pick items. Non-food plastic wrap then made up 5.0% and a total of 1,871 items, plastic food wrap was the tenth most common littered item with 1,120 items making up 3.4% of all items.

3.6 Future policy initiatives and litter waste

The following section considers the current estimated baseline composition of litter waste across Wales with respect to potential policy initiates which could in future impact the amount and type of litter waste generated. A list of category level items included under different policy options is provided in Appendix C.

Assessments were carried out for the following policy initiatives:

- Proposed 'on-the-go' and 'all-in' deposit return schemes for drink containers
- Charges for single use drink cups issued at the point of sale
- European Commission (EC) measures targeting the most commonly littered single use plastic items through either bans, restrictions or producer charges
- Reforms to extended producer responsibility for packaging wastes
- Revisions to local authority and packaging waste targets

3.6.1 Drinks containers and proposed deposit return schemes (DRS)

Drinks containers were separated and counted by material types, size and whether the contents were alcoholic or not. Composition of these items was calculated based on percentage weight and percentage of total items counted.

The following section shows in detail the proportions of drinks containers of different sizes and materials making up the current estimated national litter waste stream tonnages. Item counts are not scaled up estimates but show the number of items counted as part of all sorted waste samples. The two broad options for a drink container deposit return scheme are likely to be an 'on-the-go' format (Table 27), so those up to 750ml in size and an 'all-in' format scheme which could include drink containers of all sizes (Table 28). The following tables show the calculated tonnages of material which could be impacted by implemented by either policy.

Table 27: Composition and count of drink containers by material and size from litter bin and litter pick waste likely to be included within 'on-the-go' specifications for a deposit return scheme (DRS)

Drink container type	Size	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Plastic drink containers					
Pouches	500ml – 749 ml	0.0%	-	-	0.0%
	499ml & under (pouch)	0.0%	9	161	0.1%
HDPE Bottles (non-milk)	500ml – 749 ml (hdpe)	0.0%	3	11	0.0%
	499ml & under (hdpe)	0.1%	30	173	0.1%
PET Drink Bottles	500ml – 749 ml	1.4%	360	2,057	1.6%
	499ml & under	0.7%	182	899	0.7%
PET Water bottles	500ml – 749 ml	0.4%	105	916	0.7%
	499ml & under	0.3%	69	161	0.1%
All plastic drink containers		**2.9%**	**758**	**4,378**	**3.4%**
Glass drink containers					
Bottles	500ml – 749 ml (glass)	2.5%	630	352	0.3%
	499ml & under (glass)	3.1%	807	704	0.5%
All glass drink containers		**5.6%**	**1,437**	**1,056**	**0.8%**
Metal drink containers					
Steel drink cans	Over 500 ml	0.0%	6	62	0.0%
	331ml – 499ml	0.0%	4	28	0.0%
	330ml and under	0.0%	7	51	0.0%
Aluminium drink cans	Over 500 ml	0.6%	158	1,422	1.1%
	331ml – 499ml	0.6%	149	1,465	1.1%
	330ml and under	1.4%	362	4,092	3.2%
All metal drink containers		**2.7%**	**685**	**7,120**	**5.6%**
Paper and card drink containers					
Cartons	500ml – 749 ml (carton)	0.0%	2	10	0.0%
	499ml & under (carton)	0.1%	25	260	0.2%
All paper and card drink containers		**0.1%**	**26**	**270**	**0.2%**
Total all drink containers		**11.3%**	**2,907**	**12,824**	**10.0%**

Drink containers under 750ml and made of metal, glass, plastic and card currently make up 11.3% of litter materials by percentage weight of the estimated national composition. By item count, drink containers made up 10.0% of the composition. By weight, glass bottles make up the largest proportion of materials at 5.6%, followed by all plastic drink and water bottles at 2.9% of the composition. By item count, metal drinks cans are the most common container which would be in-scope making up 5.6% of all items.

Table 28: Drink container composition by material and size from all litter waste likely to be included under an 'all-in' specification for a deposit return scheme (DRS)

Drink container type	Size	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Plastic drink containers					
Drink pouches	749ml and below	0.0%	9	161	0.1%
	Over 750 ml	0.0%	-	-	0.0%
	Total	0.0%	9	161	0.1%
HDPE bottles (non-milk)	749ml and below	0.1%	33	184	0.1%
	Over 750 ml	0.0%	2	4	0.0%
	Total	0.1%	34	188	0.1%
PET drink bottles	749ml and below	2.1%	542	2,956	2.3%
	Over 750 ml	0.6%	160	519	0.4%
	Total	2.7%	702	3,475	2.7%
PET water bottles	749ml and below	0.7%	174	1,077	0.8%
	Over 750 ml	0.2%	54	254	0.2%
	Total	0.9%	228	1,331	1.0%
All plastic drink containers		**3.8%**	**973**	**5,155**	**4.0%**
Glass drink containers					
Glass Bottles	749ml and below	5.6%	1,437	1,056	0.8%
	Over 750 ml	2.8%	730	294	0.2%
All glass drink containers		**8.4%**	**2,167**	**1,350**	**1.1%**
Metal drink containers					
Steel drink cans	Up to 499 ml	0.0%	11	79	0.1%
	Over 500 ml	0.0%	6	62	0.0%
	Total	0.1%	17	141	0.1%
Aluminium drink cans	Up to 499 ml	2.0%	511	5,557	4.3%
	Over 500 ml	0.6%	158	1,422	1.1%
	Total	2.6%	668	6,979	5.4%
All metal drink containers		**2.7%**	**685**	**7,120**	**5.6%**
Paper and card drink containers					
Cartons	1 litre & over (carton)	0.1%	21	66	0.1%
	749ml and under	0.1%	26	270	0.2%
All paper and card drink containers		**0.2%**	**47**	**336**	**0.3%**
Total all drink containers		**15.1%**	**3,873**	**13,961**	**10.9%**
Total additional for All-in DRS		**3.8%**	**966**	**1,137**	**0.9%**

Under the 'all-in' specifications for a drink container deposit return scheme, an additional 3.8% of materials making up litter could be impacted. A total of 15.1% of the total composition by weight was made up of drink containers would be considered as within-specification.

Glass containers are most significant by weight making up 8.4% of the composition by weight, followed by all plastic drink containers at 3.8% by weight. By item count, metal cans were the most common items at 5.6% of the total items counted across all samples and plastic drink containers made up 4.0%.

The split between alcoholic and soft drinks was also recorded for all types of drink container as this may have a bearing on policy considerations and ways of targeting littering behaviour.

Table 29: The proportion of all alcoholic and soft drink containers by material

Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Alcoholic drink containers				
Plastic drink containers	0.1%	23	123	0.1%
Glass bottles	7.4%	1,911	1,199	0.9%
Metal cans	0.9%	234	2,476	1.9%
All Alcoholic drink containers	**8.4%**	**2,168**	**3,798**	**3.0%**
Soft drink containers				
Plastic drink containers	3.7%	951	5,032	3.9%
Glass bottles	1.0%	256	151	0.1%
Metal cans	1.8%	451	4,644	3.6%
Cardboard cartons	0.2%	47	336	0.3%
All soft drink containers	**6.6%**	**1,705**	**10,163**	**7.9%**
Total drinks containers	**15.1%**	**3,873**	**13,961**	**10.9%**

Alcoholic drink containers were more significant by weight than soft drink containers at 8.4% of the composition compared to 6.6% for soft drinks. Glass bottles accounted for most of the greatest weight of alcoholic drink containers at 7.4% of the composition by weight. At 7.9% of the total item count soft drink containers were more numerous than alcoholic containers at 3.0% of all items.

3.6.2 Single use cups issued at the point of sale for drinks

Single use drink cups filled at the point of sale could in future become subject to government introduced charges, levies or taxes. All plastic, and card drinks cups and lids were weighed and counted to estimate the proportion of material which may be impacted under any such polices. Table 30 shows the proportions of these items within the overall composition.

Table 30: Composition of single use cups and lids by material within bin and litter pick waste

Material	Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Plastic	Expanded polystyrene cups	0.1%	14	368	0.3%
	Plastic lids for cups	0.3%	68	3,072	2.4%
	Other Plastic cups	0.2%	58	1,003	0.8%
All plastic cups and plastic lids		**0.5%**	**140**	**4,443**	**3.5%**
Paper and card	Cardboard coffee cups	1.3%	336	2,895	2.3%
Total single use cups and lids		**1.9%**	**476**	**7,338**	**5.7%**

By percentage weight, single use cups made up 1.9% of the estimated national litter composition. Cardboard cups were most significant making up 1.3% of the combined litter streams. By total item count, all cups made up 5.7% of all items. Plastic lids were most common making up 2.4% of all items.

3.6.3 Commonly littered single use plastic items identified by the European Commission (EC)

The Welsh Government intends to meet its commitments under Directive (EU) 2019/904 which aims to reduce the environmental impact of certain plastic products on the environment[11]. Table 31 shows items which may be included under a range of measures such bans, restrictions and charges in line with the European Directive.

[11] European Commission: Directive (EU) 2019/904 of the European Parliament and of the Council of 5 June 2019 on the reduction of the impact of certain plastic products on the environment, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2019.155.01.0001.01.ENG&toc=OJ:L:2019:155:FULL

Table 31: Proportion of all litter items identified by the EC as the most commonly littered plastic items

Item type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Plastic drink containers	**3.8%**	**964**	**4,994**	**3.9%**
HDPE Bottles (non-milk)	0.1%	34	188	0.1%
PET Drink Bottles	2.7%	702	3,475	2.7%
PET Water bottles	0.9%	228	1,331	1.0%
Plastic film	**3.8%**	**981**	**22,716**	**17.7%**
Plastic bags	1.4%	362	3,029	2.4%
Plastic Film (food packaging)	1.3%	346	15,163	11.8%
Plastic Film (packaging)	1.1%	274	4,524	3.5%
Plastic food packaging	**3.4%**	**873**	**12,047**	**9.4%**
Expanded polystyrene cups	0.1%	14	368	0.3%
Expanded Polystyrene Trays	0.4%	92	1,620	1.3%
Lids for plastic cups	0.3%	68	3,072	2.4%
Other Plastic cups	0.2%	58	1,003	0.8%
Plastic drink bottle lids	0.3%	68	1,126	0.9%
Pots tubs and trays – Food	2.1%	537	3,854	3.0%
Sachets and pots	0.1%	36	1,004	0.8%
Other plastic bottles (milk,	**0.4%**	**99**	**360**	**0.3%**
Other plastic bottles	0.4%	99	360	0.3%
Dense plastic non packaging	**0.1%**	**33**	**2,881**	**2.2%**
Balloon sticks	0.0%	0	24	0.0%
Balloons	0.0%	3	489	0.4%
Cotton buds	0.0%	0	16	0.0%
Cutlery	0.1%	23	1,548	1.2%
Plates	0.0%	1	9	0.0%
Stirrers	0.0%	0	2	0.0%
Straws	0.0%	6	793	0.6%
Other combustible plastic	**0.1%**	**24**	**8,833**	**6.9%**
Cigarette butts	0.1%	24	8,833	6.9%
All commonly littered items	**11.6%**	**2,974**	**51,831**	**40.4%**

By percentage weight, 11.6% of all materials were made up of commonly littered single use plastic items as identified by the European commission. By item count this was equivalent of 40.4% of items making up all of the sorted waste samples. By item type, plastic film and plastic drink containers were the most significant by weight, each making up 3.8% by weight of the estimated composition. Dense plastic food packaging then made up 3.4% by percentage weight.

3.6.4 Reforms to extended producer responsibility for packaging wastes

Extended producer responsibility may be adopted by new legislation as a means of disincentivising the use of hard to recycle packaging materials and to potentially recover the costs of treatment and disposal for packaging items. The government is currently consulting on reforms to the existing producer responsibility obligations legislation for packaging wastes. Table 32 gives a summary of materials making up the current litter waste composition which might be included within the scope of these reforms.

Table 32: The proportion of items by material making up packaging waste items which could be included under extended producer responsibility reforms for packaging wastes

Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Paper and card packaging	10.6%	2,718	21,632	16.9%
Glass bottles	8.4%	2,167	1,350	1.1%
Plastic film packaging	3.8%	981	22,716	17.7%
Dense Plastic (drinks containers)	3.8%	973	5,155	4.0%
Metal packaging (cans)	3.6%	921	8,666	6.8%
Dense plastic (food packaging)	3.4%	878	12,134	9.5%
Other plastic bottles (milk and non-drink)	0.7%	175	648	0.5%
Dense plastic (pack – non-food)	0.5%	119	2,154	1.7%
Other Combustible (plastic food pouches)	0.0%	11	477	0.4%
Dense Plastic – (Non pack) (straws)	0.0%	6	793	0.6%
Total	**34.8%**	**8,949**	**75,725**	**59.0%**

Across all material categories 34.8% of the estimated national composition by weight was made up of packaging items which may be within the scope of proposed EPR reforms. By weight, paper and card packaging items were most significant making up 10.6% of all material in the overall composition, followed by packaging glass at 8.4%. Plastic film packaging plastic drink containers both made up 3.8% by weight.

By item count, 59.0% of the litter items counted may be included in the scope of EPR reforms for packaging wastes. Plastic film packaging items were most common, making up 17.7% of all items counted, paper and card packaging items were next most common making up 16.9% of all items, followed by dense plastic food packaging at 9.5% and metal cans at 6.8%.

3.6.5 Combined EPR items and common single use plastic items which may face bans

Table 33 combines the proportions of commonly littered single use plastics covered in 3.6.3 and packaging waste or all material types that were covered in the previous section. The table indicates the total proportion of materials making up the current estimated litter waste in Wales which could be impacted under both bans and restrictions on single use plastics and EPR reforms for packaging wastes.

Table 33: Proportion of materials making up litter bin and picked litter waste which could be impacted by EPR reform and bans on common single use plastics

Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Paper and card	10.6%	2,718	21,632	16.9%
Glass	8.4%	2,167	1,350	1.1%
Plastic Film	3.8%	981	22,716	17.7%
Dense Plastic (drinks containers)	3.8%	973	5,155	4.0%
Metal	3.6%	921	8,666	6.8%
Dense plastic (food packaging)	3.4%	878	12,134	9.5%
Combustible items (inc cigarette butts)	0.8%	196	12,605	9.8%
Other plastic bottles (milk and non-drink)	0.7%	175	648	0.5%
Dense plastic (packaging – non-food)	0.5%	119	2,154	1.7%
Dense Plastic – (Non packaging)	0.1%	33	2,881	2.2%
Total	**35.7%**	**9,162**	**89,941**	**70.1%**

As a proportion of the total estimated national litter composition, 35.7% of all materials by weight might be impacted by bans, sales restrictions and EPR reforms. By item count, this might include 70.1% of the total items counted across all waste samples.

3.6.6 Commonly targeted recyclable materials within litter waste streams

The litter waste stream contains a number of items which could be readily recycled through either existing recycling-on-the-go bins, bring banks or regular household kerbside recycling collections. In future, targets may be increased as a driver to divert more material for recycling. Table 34 shows the proportion of the current overall litter waste which is targeted for recycling.

Table 34: Readily recyclable materials making up the litter bin and picked waste

Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Putrescibles (food waste)	25.7%	6,610	n/a	0.0%
Paper and card	10.0%	2,579	27,119	21.1%
Glass	8.4%	2,167	1,350	1.1%
Dense Plastic (drinks containers)	3.8%	964	4,994	3.9%
Metals	3.6%	921	8,666	6.8%
Dense plastic (food packaging)	2.4%	605	4,980	3.9%
Textiles	1.8%	475	678	0.5%
Dense plastic (packaging – non-food)	0.5%	119	2,154	1.7%
Other plastic bottles (milk and non-drink)	0.3%	76	288	0.2%
Total	**56.5%**	**14,515**	**50,232**	**39.2%**

Food waste was the most significant targeted recyclable waste type making up the litter waste streams at 25.7% of all material by weight. Paper and card made up 10.0%, followed by glass at 8.4% of targeted recyclables by weight. Recyclable dense plastic drink containers made up 3.8% and metals made up 3.6%. By item count paper and card were the most common items which could be readily recycled, making up 21.1% of all items.

Additional materials, described as 'widely recycled' include items such as other scrap metals, WEEE, and plastic carrier bags. These are generally not accepted at the kerbside or as part of on-the-go collections materials but are often accepted at a mix of bring banks, local household recycling centres and return points at supermarkets and shops. Table 35 shows the total readily recyclable material as shown in Table 34 with the addition of 'widely' recyclable items and materials.

Table 35: Widely accepted for recycling materials in litter bin and litter pick waste

Type	Estimated national composition (% weight)	Estimated national arising (tonnes)	Total item count – All samples	Average sample composition (% count)
Putrescibles	25.7%	6,610	3	0.0%
Paper and card	10.0%	2,579	27,119	21.1%
Glass	9.9%	2,545	2,418	1.9%
Metal	4.6%	1,189	8,999	7.0%
Dense Plastic (drinks containers)	3.8%	964	4,994	3.9%
Dense plastic (food packaging)	2.4%	605	4,980	3.9%
Textiles	1.8%	475	678	0.5%
Plastic Film	1.3%	331	2,399	1.9%
Other plastic bottles (milk and non-drink)	0.7%	175	648	0.5%
Dense plastic (packaging – non-food)	0.5%	119	2,154	1.7%
WEEE	0.4%	92	-	0.0%
Total	**61.1%**	**15,683**	**54,392**	**42.4%**

All readily recyclable and widely recyclable items make up 61.1% of the current litter waste streams by percentage weight. The estimated tonnage arisings indicate this could be in the region of 15,500 tonnes of material per year.

4 Conclusions

4.1 Key findings

Operational practices and WasteDataFlow reported tonnes

- The management and reporting of litter waste are often split across multiple local authority teams and officers, which made it difficult to readily understand how services are managed.
- WDF reported tonnages were more likely to be managed by the 'waste' teams rather than street cleansing teams. As this information is also likely to be passed through a variety of channels, details like the breakdown of other waste types collected with litter waste, if recorded, are likely to get lost in the recording process.
- All of the local authorities confirmed that litter bin collections and manual litter picking operations were the key aspects of managing litter waste in their local authority and that cage tipper vehicles are the predominant means of managing this waste.
- Some local authorities confirmed that other waste types such as mechanical street sweepings were included within waste reported under 'street cleansing' within WDF. This added additional challenges in trying to ascertain what proportion of material might be attributable to just the litter waste streams.
- This study identified that in 2017/18 the total litter material collected by cage tippers was closer to the region of 33,000 tonnes per year rather than 55,600 tonnes per year as reported under 'street cleansing' on WDF (Table 7). This study found that this was in part due to other waste streams such as fly tipping and missed household collections being co-collected with litter and being reported under the 'street cleansing' category. Street sweepings from mechanical sweepers were also sometimes recorded under street cleansing, which is permitted in the WDF guidance, but this varied by authority depending on their treatment methods.
- Along with litter waste, 17 of the 22 local authorities co-collected at least one other waste stream such as fly tipping using cage tippers. The variable nature of litter waste generation may in part be a reason that other waste streams are commonly collected using these vehicles.
- All but two of the Welsh local authorities confirmed that they use set, structured rounds to empty fixed litter bins. One of the two authorities who did not have set litter bin rounds, instead has set litter picking rounds, while the other authority employed largely ad hoc and reactive collections.

Samples obtained and cage tipper waste stream profiles

- Across all four local authorities litter bin waste made up an average of 65.6% of the total weight of material collected using cage tippers. Litter picked waste made up 13.1% of all waste across all four local authorities (Table 9).
- Caerphilly was the only local authority in the fieldwork in which dog waste bins were also collected by the litter waste cage tippers. Dog waste made up 10.7% of the loads collected in Caerphilly.
- On average, fly tipped waste collected with cage tippers made up 7.5% of the co-collected waste material across all local authorities.

- Cage tipper loads were targeted in each local authority to prioritise those collecting waste from town centre and urban areas as greater proportions of litter waste are generated in these areas. 52.1% (Table 10) of the litter samples sorted came from town centre areas and residual bin samples made up 43.8% of those sorted (Table 11).

Average litter bin composition findings

- **By percentage weight**, putrescible waste made up 41.1% of the litter bin waste samples; food waste was 21.7% and dog excrement was 13.1% of the total composition (Table 12).
- Paper and card then made up 17.8% of the composition. At detailed item level, recyclable non-packaging paper made up 3.7%, tissues and napkins made up 2.9% and thin card packaging made up 2.3%. (section 3.3.5)
- Glass made up 10.2% of the total litter bin waste by weight. There was a fairly even split of bottle sizes by weight, but those under 499ml were most significant making up 3.2% by weight.
- **By item count,** 90,386 items were counted from litter bin samples; paper and card items made up 34,897 items, 38.8% of all items counted. Napkins and tissues were most common at 10.4% of counted items (Table 12).
- 15,875 plastic film items made up 17.9% of the counted items, collectively, food packaging film was most common, making up 11.9% of all items. Chocolate bar and sweet wrappers were the most numerous film items making up 4.5% of all items.
- Combustible items made up 13.4% of the counted items, including cigarette butts (6.1%) and wet wipes (2.7%).
- 9,058 dense plastic food packaging items made up 10.0% of all items in litter bin samples, with plastic pots, tubs and trays most common making up 3.3% of items and coffee cup lids made up 2.7% of all items. (Table 12, section 3.3.5).

Average litter pick composition findings

- **By percentage weight**, Paper and card were the most significant materials 21.8% of material by weight followed by putrescibles at 21.6% and glass at 11.8%. (Table 14).
- **By items counted**, 37,899 items were counted; this made up close to a third of all items counted (Table 14). This is disproportionate figure compared to the total items and weight making up bin waste items may indicate that litter picked items tended to be smaller and but more numerous.
- Paper and card items were the most common materials counted with 15,649 items making up 36.2% of all items counted, recyclable non-packaging paper made up 8.3%, tissues and napkins made up 6.7% and thin card packaging made up 5.9% of items.
- 6,841 items were plastic film accounting for 18.4% of all items, sweet and chocolate wrappers were most common at 5.5% of all items and non-food packaging wrap then made up 5.0%.
- Combustible items made up 12.4% (including cigarette butts at 5.1% and wet wipes at 2.5% of all items counted.

Highways waste sample findings

- Putrescible waste made up around 20% of all the **highway samples by percentage weight**. Paper and card material made up between 17% and 18% by weight (Table 16)
- Of the **highway verges samples, by weight**, Metal items made up 15.5% of and were more prominent here than in laybys.
- Dense plastic drink containers were more common from verges waste and made up 12.1%; more than double that in laybys. Glass was less common at 4.7% from verges by weight.
- **By count of items within highway verges waste,** paper and card were the most prominent items, with 548 items counted from verges waste making up 23.5% of items (Table 17). Metal items were more common from the highway verges waste with 428 items making up 18.4%, 382 Plastic film items then made up 17.3% of the highway verges litter items. 273 dense plastic food packaging containers made up 11.9% of highway
- For the **highway layby samples, by weight**, metals were less prominent than in the verges samples, making up 12.5% of materials by weight. Aluminium drinks cans were the main items. Glass was more common in laybys at 10.0% by weight (Table 17).
- Dense plastic drink containers were less common from laybys, making up 5.9% by weight
- **By count of items within highway layby waste,** paper and card were the most prominent materials counted with 1,225 items making up 31.2% of all items in laybys, plastic film items were the next most common item, with 604 items making up 15.6%. 418 dense plastic food packaging containers made up 10.9% of all items.

Estimated national litter waste arisings and composition

- The average splits of waste types on cage tipper loads (was stream profiles) was scaled up to national tonnages and it was estimated that 21,376 tonnes of material are litter bin waste and 4,311 tonnes is manually picked waste (Table 19).
- **By percentage weight of the estimated, scaled national tonnages,** putrescible waste from both litter streams made up 39.6% with food accounting for 19.6% and dog excrement making up 13.7% (Table 20).

  Putrescible waste, paper, card, glass and other combustible waste were most significant and made up 73.2% of all waste material by weight. Paper and card items made up 17.7% by weight. Plastic film made up 3.8% by weight of the scaled tonnage estimated.
- **By count of items making up waste samples**, paper and card, plastic film, combustible and dense plastic food packaging were the most common materials, with 102,994 items making up 80.3% of all items counted.
- Paper and card were the most common materials making up 50,546 items and 39.4% of all items counted within the waste samples. Plastic film made up 17.7%, a total of 22,716 items.

- Combustible items including cigarette butts and wet wipes made up 13.7% of all items (17,598 items). Cigarette butts were prominent here making up 8,833 items and wet wipes made up 3,295 items.

Estimated national composition – findings in relation to policy initiatives

Common items

- Food waste (including liquid food waste) was the most significant material by weight and made up 24.2% of all waste by weight with other organic waste at 15.4% of all materials by weight. Glass bottles made up 8.4% of all litter waste and recyclable paper made up 4.8%. The ten most significant materials at secondary category level made up 69.3% of all litter and an estimated 17,802 tonnes per year (Table 21).
- Across both litter streams, plastic food packaging film was the most common item making up 11.8%, 15,163 counted items. Recyclable paper then made up 10.7% of items (13,702 items), tissues and napkins made up 8.8% (11,288 items) and cigarette butts made up 6.9% (8.833 items), followed by aluminium drinks cans at 5.4%. The ten most common materials and items at secondary category level made up 62.1% of all items counted (Table 22).
- At the most detailed item, or subcategory level, the ten most common items made up 79,645 items and 57.4% of all items by weight.
- All food waste was the most significant item type by weight at 19.6% and dog excrement then made up 13.7%. Liquid food waste then made up 4.6%, followed by recyclable non-packaging paper at 3.4%, waste collection sacks then made up 3.1% of items by weight. Absorbent hygiene products including nappes and sanitary waste made up 2.9% followed by tissues and napkins at 2.7%. Collectively, alcoholic drink glass containers, less than 500ml in size and between 750ml and 999ml made up 4.9% of all items by weight (Table 23).
- At detailed category level, the ten most common items made up 51.5% of all those counted. Tissues and napkins were the most common individual items making up 8.8% of all items, recyclable non packaging paper made up 8.7% and cigarette butts made up 6.9%. Thin card made up 5.1%. Sweet and chocolate wrappers were the fifth most numerous of all items making up 4.8% followed by plastic food wrap at 3.8% of all items (Table 23).
- Common plastic packaging accounted for four of the 10 most common items; collectively, plastic film chocolate and sweet wrappers, plastic food wrapping film, plastic non-food wrapping film and plastic pots tubs and trays made up 15.2% of all counted items.

Drinks containers under a proposed deposit return scheme (DRS)

- **Under an 'all-in' DRS specification, by weight** Drinks containers in-specification would make up 15.1% of all items. Glass would be the predominant material by weight making up 8.4% of the total weight.
- By alcoholic and non-alcoholic drinks, all alcoholic drink containers accounted for 8.4% of the composition by percentage weight compared to 6.6% for soft drinks across all material types. Glass bottles accounted for the large proportion of alcoholic drink containers making up 7.4% by weight (Table 29).
- **By count** and 10.9% of all counted items would be in-specification. Metal drink cans are the most common item in scope at 5.6% of all items, these are mainly aluminium.
- **Under the likely 'on-the-go' DRS specifications, by weight** 3.8% less material would be considered in-scope, than the 'all-in' option, equivalent of an additional 966 tonnes of material per year.
- By weight, 'on-the-go' containers under 750ml and made of all material types made up 11.3% of all litter by weight; by item count this was 10.0%. It was estimated that this accounted for 2,907 tonnes of litter per year (Table 27).
- By weight, glass bottles were the most significant material type at 5.6%. Plastic drink and water bottles were next significant by weight, making up 2.9% of all the total composition.
- **By item count** metal drink cans were the most common container in-scope for 'on-the-go' items making up 5.6% of all items.

By weight, alcoholic drink containers were more prominent than soft drinks containers at 8.4% by weight, by item count, soft drink containers were more prominent, with 10,961 containers out of a total of 13,961 containers. This 7.9% of all items counted.

Single use drink cups

- Single use cups made of plastic and card and lids accounted for 1.9% of all items by weight and 5.7% of items by count; making up an estimated 476 tonnes per year (Table 30).
- Cardboard cups were most significant accounting for 1.3% by item weight and 2.3% by item count, plastic lids for card and plastic cups made up 2.4% of items counted.

Commonly littered plastic items

- By percentage weight, single use plastic items which have been identified by the European commission as commonly littered, made up 11.6% of the total materials by weight. By item count this was equivalent of 40.4% of all items and an estimated 2,974 tonnes of litter waste generated in Wales per year (Table 31).
- Plastic films and drink containers were the most significant materials by weight each making up 3.8% of the estimated composition by weight. Dense plastic food packaging then made up 3.4%.
- By item count plastic films made up 17.7% and plastic food packaging made up 9.4%, cigarette butts then made up 6.9% of items.

Reforms to producer responsibility under extended producer responsibility (EPR)

- Material which might fall within the specifications of an extended producer responsibility initiative could make up 34.8% of all litter waste items by weight, equivalent of an estimated 8,949 tonnes of material per year. By item count this would include 59.0% of items (Table 32).
- By weight, paper and card packaging items are most significant making up 10.6% of all materials, followed by glass at 8.4%, plastic film packaging at 3.8% and dense plastic containers also at 3.8% by weight.
- Plastic film packaging items made up 17.7% of all counted items and under EPR could be the most significantly impacted items by count.

Common single use plastic and items for inclusion under EPR

- In combination, the total proportion of items which could be included within the scope of EPR and plastic bans and restrictions would be 35.7% of all materials by weight. This was calculated as 9,162 tonnes of material each year and 70.1% of all items by count (Table 33).

Commonly targeted recyclable materials within litter waste

- Of the materials which are recyclable, either within existing kerbside household recycling collections or at common bring bank facilities, it was estimated that 56.5% of all litter waste could be readily recycled. This was equivalent of 14,515 tonnes of material per year (Table 34).
- By item count, readily recyclable items made up 39.2% of all materials.
- These findings include food waste as a targeted recyclable material which accounted for 25.7% of all materials by weight. Paper, card and glass made up the next most significant recyclable materials.
- Materials which would be considered as 'widely recyclable' and are commonly accepted within bring banks and at recycling centres accounted for 61.1% of all litter material by weight and estimated 15,683 tonnes of litter per year; by item count this was 42.4% of all litter items (Table 35).

4.2 Discussion

The operational practices for managing litter waste employed by each of the 22 Welsh local authorities are similar and each generally follows the code of practice on litter and refuse (CoPLAR [12]) guidance from Defra. All local authorities collected litter waste using cage tipper vehicles which in most cases also collect materials from at least one other waste stream. The predominant waste making up cage tipper loads is litter bin waste which accounted for 65.6% of these loads on average. Manually picked litter waste made up 13.1% of materials making up the average caged tipper load.

Across Wales the annually reported litter waste tonnage for 2017/18 was estimated as being made up of 21,376 tonnes of waste from litter bins and 4,311 tonnes of waste from litter picking. The applied

[12] Defra, Code of practice on Litter and Refuse (CoPLAR), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/221087/pb11577b-cop-litter.pdf

composition analysis proportions indicated that degradable waste still makes up the greater proportion of the litter waste stream by weight with putrescible waste at 39.6% by weight, food waste accounted for 19.6% and dog excrement made up 13.7% by weight. Paper and card litter waste was significant, making up 17.7% by weight. The item count figures, however, provide a different insight into the most common items of litter; in total 128,285 items were counted. The most common items by were paper and card materials which made up 39.4% of all items, plastic film was next most common making up 17.7% of all items compared to just 3.8% by weight. Sweet and chocolate wrappers were the most common plastic film at 4.8% of all items.

From the count information it was possible to determine the most common individual items rather than just materials types which made up the average litter waste stream. Ten items were found to account for 51.5% of all items counted, with tissues and napkins being the most predominant (8.8%), followed by recyclable non-packaging paper (8.7%) and cigarette butts (6.9%). However, collectively, plastic packaging items were prominent amongst those making up litter waste; plastic film chocolate and sweet wrappers, plastic food wrapping film, plastic non-food wrapping film and plastic pots tubs and trays collectively made up 15.2% of all counted items. All of the 10 most common items except recyclable non-packaging paper were connected to the consumption of food, drink and cigarettes whilst on the move.

The results from this study suggest the range of policy initiatives being considered by the Welsh Government could, in time, have an impact on the amount of litter waste produced in Wales. However, human behaviour is inherently connected to litter waste generation and the adoption of such policies is, therefore, not a guarantee of total compliance. As this study looked at the current composition of litter data, rather than detailed disposal behaviours and patterns, it is not therefore possible to confirm the level of impact such policies may have when accounting for behaviour. However, the following figures are an indication of the total proportions of material in the waste stream which could be affected.

Between 11.3%, under an ‘on the go’ DRS, and 15.1%, under an ‘all-in’ DRS, of material making up litter could be within the specifications of a deposit return scheme for drink containers. This is equivalent of an estimated between 2,907 and 3,873 tonnes of material per year. The introduction of such a scheme could have a more immediate impact than other policy initiatives but even at its most comprehensive form the finding suggest this would apply to only a relatively small proportion of the 21,376 tonnes from litter bins and 4,311 tonnes from manual picking that make up the estimated overall litter waste in Wales.

Levies or bans on single use cups are likely to have less impact on the total litter waste than a deposit return scheme for drinks containers, all cups and lids made up a small proportion of the total litter at 1.9% by weight, and 5.7% by item count, equivalent of 7,338 items.

Commonly littered single use plastic items identified by the European Commission made up 11.6% of all materials by weight and the composition analysis findings confirmed that a number of these items, particularly plastic packaging and plastic films were common items making up the study samples.

Reforms to extended producer responsibility (EPR) obligations could mean that over a third of items (34.8%) and materials making up litter waste would be within specification of an EPR scheme which could bring about changes in the litter composition through legislative controls. Depending on the agreed mechanisms implemented, producers could be responsible for covering or offsetting more or all of the costs of recovering, recycling or cleaning up littered items which they have produced that fall within this specification.

Of the current litter stream 35.7% (9,162 tonnes) of material could be subject to the combined impact of bans on common single use plastic items and the introduction of an extended producer responsibility scheme.

Items which could be readily recycled at home made up 56.5 % of all litter by weight, and those that are currently 'widely' recycled at bring banks and recycling centres made up 61.1% of all of the litter material by weight. This included food waste and was estimated to make up 15,683 tonnes of litter per year. As this final finding suggests, a high proportion of litter waste could be easily recycled within existing systems. This figure does not account for behaviour but is substantial when compared to the possible policy options, therefore, renewed campaigns to stop littering behaviours and to champion the existing recycling schemes at home, on the street and in shops could play an important role in reducing the amount of litter waste produced and should not be overlooked in light of the likely lower combined impact of new policy options.

Appendix A Review calls proforma

Welsh litter composition - proforma questions for operational data matrix

Top level proforma sections

A. Street cleansing and litter services

Note: - Consider any local authority distinction between 'litter' and 'street cleansing'

- Deployment, where materials go and how they are collected for transport is of importance

Bins	1. Do you have set rounds and beats to empty litter bins? [Deployment]
	2. If yes, how many rounds and how often are litter bins emptied? (If frequency varies by different areas, then please summarise in section B.) [Deployment]
	3. How are bins emptied and how is waste collected - using what vehicles? (RCVs, Caged tipper or other)
	4. Where does this litter bin waste go? (Facility, depot or transfer station - name if possible)
	5. Is litter bin waste co-collected with other waste streams? What streams and is this always managed in the same way?
	5a. If co-collecting, what is the % split between the 2 streams?
	6. Do you have Recycling on the go bins? What materials are collected? How are these emptied and using what vehicles? Co- collected with other waste streams?
	7. Are the contents actually recycled, if so where are they sent?
	8. Do you have details on the precise number of bins? Can you comment on the split of bins in Urban/suburban/more rural areas?
Manual picking	9. Do you operate street cleansing teams with hand carts/barrows for manual litter picking?
	10. Do you have set rounds and beats? At what frequency? Or are these more adhoc? (please add comments to section B if variable by area)
Mechanical sweeping	11. Do you have mechanical street sweepers? (vehicles such as scarabs). Do you have set schedules and rounds for these? How often and in what areas? If ad hoc, please provide an estimate of frequency.
Seasonal	12. Do you do anything differently due to summer tourism?
Contract	13. In house/contractor services for litter waste?

B. Areas and Venues

Note: During calls, we may need to elaborate and describe what we mean for each area type. **For each area below ask:**

- How do you manage litter waste in each of the following Areas/Venues? (If these do not apply use n/a)
- At what frequency is **bin waste** collected or **dropped litter** picked? Is this as part of a **regular round or adhoc**? Please elaborate:
- How is the waste then collected?

First ask:	What are the main places litter is collected from? What is the approximate split between these?
	1. Town centres
	2. Urban areas
	3. Suburban
	4. Parks, rec and green spaces
	5. Retail parks
	6. Parades and shopping precincts

	7. Hand carts - Beats
	8. Post recycling and bin collection clean ups?
	9. Zonally - Zones 1, Zones 2. etc. (see existing matrix for LAs this applies to)
	10. COPLAR (see existing matrix for LAs this applies to)
	11. Other specific area where you manage litter waste in addition to those mentioned already.
C. Beaches Note: Important to differentiate between large, one-off events and regular, planned or scheduled beach cleans (and if these are managed by the LA or other partners)	
	1. How do you manage litter waste from beaches? I.e. litter picks, beach cleans and beach carparks. (see notes on WDF reporting)
	2. Is this waste separately collected by a designated vehicle for disposal OR is it collected with other waste streams? i.e. With household waste in an RCV or in a cage tipper with other bagged waste like fly tipping
	3. If a separate partner, voluntary or community group does beach cleans and litter picks, how often do these take place?
	4. How is this waste disposed of? Who arranges this?
	5. If a voluntary org does collect this waste, is the tonnage reported anywhere?
D. Highways Note: May be cross over with Voluntary organisations	
	1. Do you manage any roadside, highway and verges litter picking?
	2. If so, how often and where from?
	3. Is this part of a normal round or beat?
	3. Do you have any hot spots?
	4. Where is this waste taken? Is it co-collected with any other waste?
	5. Do other bodies or groups carry out litter picks? (for example, the trunk roads agencies and voluntary groups?)
	6. Is the tonnage reported anywhere?
E. Volunteers, partners and community cleansing activities Note: - See point in WDF section relating to tonnage - Stress that we are not interested in volunteer groups who work with bulky waste and do furniture upcycling etc. Just those engaged in litter picks	
	1. What range of activities take place? Across beaches, parks, green spaces, nature reserves, (i.e. friends of ….), national parks?
	2. How often do activities take place?
	3. How many groups are active?
	4. Where is this waste taken? Is it co-collected with any other waste?
	5. Do these groups formally report weight or total material/items collected?
	6. Does this feed into Waste data flow reported figures?
F. Waste Data Flow data, reporting and specific questions Note: - Refer to LA waste data flow table. - May need to see if there is another colleague who manages WDF which this needs to be discussed with	
	a. Beach cleansing - is this co-collected with other LA wastes or not collected, or not reported?

	b. How does the LA define gully emptying's? Are any mechanical street sweepings recorded here or with street cleansing?
	c. What streams make up these 'other collected' hh tonnages?
	d. Why are no street cleansing figures reported? for (**Merthyr & Torfaen)** What is recorded here? Mechanical street sweepings? Manual litter picks with barrows? Street litter bins and if so from which areas?
	e. How do these LAs define grounds waste? Where do other LAs report this sort of waste? Or do they not have this waste?
	f. Highways waste. Who collects this and what is reported here? Is this co-collected in other LAs and so not reported? Does a community partner collect any of this?
	g. What streams make up these 'other collected' **non-hh tonnages**?
	h. What makes up these **'other' collected** waste tonnages?
G. Other areas Note:	
	Most problematic aspect of any of these waste types?
	most common wastes?

Appendix B Waste sort category list

Level 1	Level 2	Level 3 (size)	Count items (Y/N)	Examples
1. Paper and card	Recyclable paper	Non packaging	Y	News and mags, junk mail, flyers, posters, household/office paper, envelopes, books, catalogues, directories
	Recyclable paper	Packaging	Y	Shoe box and stuffing paper
	Paper carrier/shopping bags	Paper carrier/shopping bags	Y	Incl brown paper type and more robust designer type.
	Tissues and napkins (paper)	Tissues & napkins (paper)	Y	Tissues and wipes but not the polyester variety
	Waxed/laminate/wet strength paper	Waxed/laminate/wet strength paper	Y	Doughnut bags, lined paper, rotisserie chicken bags
	Thin card	Packaging	Y	Cigarette packets, cereal boxes, tea boxes, biscuit boxes (not laminated)
	Corrugated card	Packaging	Y	pizza boxes, chip shop boxes, large boxes
	Waxed/laminate/wet strength CARD	Waxed/laminate/wet strength P&C	Y	sandwich boxes - Takeaway trays lids, noodle boxes and pots (**not inc cups**), pringle tins
	Drink Cartons (not milk)	1 litre & over	Y	Fruit juices, Ribena etc & milk based drinks but not Milk, cold coffees
		750ml - 999ml	Y	
		500ml - 749 ml	Y	
		499ml & under	Y	
	Milk cartons and Plant milks	Milk cartons and Plant based drinks	Y	Milk cartons, soya, hemp, almond milk etc (no need to record size) not drink cartons
	Coffee cups	Coffee cups	Y	Single use Coffee and hot drink cups
	Paper and card non packaging	Paper and card non packaging	Y	Corrugated and thin - non pack
	Other non-recyclable paper and card	Other non rec-paper & card	Y	Jiffy bags, heavy contamination, wallpaper, photo paper
2. Plastic Film	Plastic bags	Single use carrier bags	Y	Single use 5p paid-for carrier bags
		Bag for life' carrier bags	Y	Thicker bag for life type plastic carrier bags
		Very lightweight plastic bags	Y	Used for fruit and vegetables & pastries
		Other plastic bags	Y	Black bin bags (not LA collection sacks), NOT carrier bags
	Plastic Film (food packaging)	Plastic wrap (Food)	Y	Bread bags, other film food wrap
		Crisp packets	Y	Crisps and nuts
		Sweet /chocolate wrappers	Y	confectionary, chocolate bars, Haribo, multipack sweets, ice cream/lolly wrappers
		Biscuit and cake wrappers	Y	multipack & individual cake/cake bar, flapjack, muffins
	Plastic Film (packaging)	Plastic wrap (non-food)	Y	Tobacco pouches, bubble wrap non-food packaging film
3. Dense Plastic (drinks containers)	PET Drink Bottles	1 litre & over	Y (A/S)	fizzy drinks, juices, squash, smoothies (NOT Water) flavoured water
		750ml - 999ml	Y (A/S)	as above
		500ml - 749 ml	Y (A/S)	Drinks OTG
		499ml & under	Y (A/S)	Drinks OTG
	PET Water bottles	1 litre & over	Y	Water only inc fizzy (NOT flavoured)
		750ml - 999ml	Y	as above
		500ml - 749 ml	Y	Drinks OTG
		499ml & under	Y	Drinks OTG
	HDPE Bottles (non-milk)	1 litre & over	Y	Juices, squash, milk based drinks but NOT Milk
		750ml - 999ml	Y	as above
		500ml - 749 ml	Y	Drinks OTG
		499ml & under	Y	Drinks OTG
	Drink pouches	1 litre & over	Y (A/S)	Wine bags, Capri sun, Vimto, Ella's kitchen baby food
		750ml - 999ml	Y (A/S)	As above
		500ml - 749 ml	Y (A/S)	As above
		499ml & under	Y (A/S)	As above
3. Other plastic	HDPE Milk bottles	n/a	Y	HDPE milk bottles all sizes

Level 1	Level 2	Level 3 (size)	Count items (Y/N)	Examples
bottles (milk and non-drink)	Other plastic bottles	n/a	Y	non drinks plastic bottles, engine oil window cleaner
4. Dense plastic (food packaging)	Pots tubs and trays - Food	n/a	Y	Plastic pots tubs and trays
	Sachets and pots	n/a	Y	All single portion condiment sachets and pots, mini coffee creamer/UHT milk
	Expanded polystyrene cups	n/a	Y	Expanded PS coffee cups
	Other Plastic cups	n/a	Y	Single use cups, coffee, shakes, smoothies, Inc, PS-6, PET-1, PP- 5 or 7)
	Lids for plastic cups	n/a	Y	coffee, milkshake and smoothies' lids
	Compostable plastic F&D packaging	n/a	Y	Vegware and other brands - plastic like - (not paper and card)
	Expanded Polystyrene Trays	n/a	Y	Polystyrene Trays burgers, kebabs, with or without lids (also separate count of pieces between 1 - 50mm)
4a. Dense plastic (pack - non-food)	Dense - Non-food pack	n/a	Y	**List:** headphone and tool packs, Including Expanded polystyrene from electrical goods - (count of pieces between 0-50mm & 1mm and over)
5 Dense Plastic - (Non pack)	Plates	n/a	Y	
	Cutlery	n/a	Y	
	Stirrers	n/a	Y	
	Straws	n/a	Y	
	cotton buds	n/a	Y	
	Balloons		Y	
	Balloon sticks	n/a	Y	
	Other dense plastic (non-packaging)	n/a	Y	Consumer items, List: toys, pipes, hangers, plastic furniture, pens, razors, toothbrushes
6. Textiles	Textiles	n/a	Y	Clothes, shoes, accessories, handbags, rags, towels, pillows, sleeping bags, duvets (list large item separately)
7. Other Combustible	AHPs	n/a	Y	Nappies, pads, feminine absorption products
	Pouches (non - drinks)	n/a	Y	Cat food and solid food (not drinks, yoghurt, energy gels or baby food)
	Wet wipes	n/a	Y	
	Cigarette butts	n/a	Y	cigarette butts, dog ends, filters
	Wooden cutlery	n/a	Y	Forks, spoons, knives chip forks, wooden stirrers, ice cream sticks, wooden chopsticks
	Other combustible	n/a	Y	Soft furniture, NOT plastic or metal, wood and cork, sponges, candles
8. Non-Combustible	inert -Stones etc	n/a	N	inert materials, stones, ceramics, rubble, brick, plasterboard
9. Glass	Glass Bottles	1 litre & over	Y (A/S)	Magnum size bottles
		750ml - 999ml	Y (A/S)	Wine, spirits and beer
		500ml - 749 ml	Y (A/S)	Beer, spirits and coke
		499ml & under	Y (A/S)	Beer, spirits and coke
	All other glass	n/a	Y	Jars - mirrors, light bulbs
10. Putrescibles	Food waste	All food waste (remove from packaging)	n/a	All food - cooked and prepared meals and takeaway food, sandwiches, whole fruit, veg, fruit&veg flesh, crisps, cakes, bread slices, confectionary, condiments, meat & fish cooked and raw, bones, gristle, nut shells, fruit stones; banana peel, avocado, fruit cores, fruit stalks, cheese wax,
	Food waste	Liquid food waste	n/a	All liquid drinks, inc water, pop, tea, coffee
	Other organic	Garden waste & soil	n/a	
	Other organic	Dog excrement	n/a	
11. Metal	Ferrous drink cans	Over 500 ml	Y (A/S)	
	Ferrous drink cans	331ml - 499ml	Y (A/S)	
	Ferrous drink cans	330ml and under	Y (A/S)	
	Ferrous Metal FOOD	Food cans (steel)	Y	
	Ferrous Metal	Other ferrous	n/a	inc aerosols, pans, tools, cutlery, pipes, metal furniture
	(Alu) drink cans	Over 500 ml	Y (A/S)	

Level 1	Level 2	Level 3 (size)	Count items (Y/N)	Examples
	(Alu) drink cans	331ml - 499ml	Y (A/S)	
	(Alu) drink cans	330ml and under	Y (A/S)	
	(Alu) drink cans	Food cans (alu)	Y	
	(Alu) drink cans	Foil (alu)	Y	inc foil trays
	(Alu) drink cans	Other non-ferrous	n/a	inc aerosols, pans, tools, cutlery, pipes, metal furniture
12. Waste Electrical and Electronic Equipment	WEEE items		n/a	Toasters, kettles, hair and beauty, chargers, toys, cables, lamps, vacuum cleaners, power tools, keyboards, laptops, games, phones and mobile phones
13. Potentially Hazardous Waste Items	Hazardous		n/a	Paint, medicine, chemicals, batteries
14. Fines	Fines sub 10mm		n/a	
15. Collection sacks	Collection sacks		n/a	

Appendix C Items and categories included by policy initiative

Material category	Policy initiatives filter Detailed sort category (level 3)	On-the-go DRS (below 750 ml)	All-in DRS (all drinks containers)	Single use cups (card and plastic inc lids)	EPR reform, UK packaging	EC Most Commonly littered single use plastic items	EPR and single use plastics	Common recyclable' items	Widely recyclable' items
Paper and card	Recyclable paper - Non packaging	0	0	0	0	0	0	1	1
	Recyclable paper - Packaging	0	0	0	1	0	1	1	1
	Paper carrier/shopping bags	0	0	0	1	0	1	1	1
	Tissues & napkins (paper)	0	0	0	0	0	0	0	0
	Waxed/laminate/wet strength paper	0	0	0	1	0	1	0	0
	Thin card - Packaging	0	0	0	1	0	1	1	1
	Thin card- Packaging	0	0	0	1	0	1	1	1
	Waxed/laminate/wet strength card	0	0	0	1	0	1	0	0
	1 litre & over (carton)	0	1	0	1	0	1	1	1
	750ml - 999ml (carton)	0	1	0	1	0	1	1	1
	500ml - 749 ml (carton)	1	1	0	1	0	1	1	1
	499ml & under (carton)	1	1	0	1	0	1	1	1
	Milk cartons and Plant based drinks	0	0	0	1	0	1	1	1
	Coffee cups	0	0	1	1	0	1	0	0
	Paper and card non packaging	0	0	0	0	0	0	1	1
	Other non rec-paper & card	0	0	0	0	0	0	0	0
Plastic Film	Single use carrier bags	0	0	0	1	1	1	0	1
	Bag for life' carrier bags	0	0	0	1	1	1	0	1
	Very lightweight plastic bags	0	0	0	1	1	1	0	0
	Other plastic bags	0	0	0	1	1	1	0	1
	Plastic wrap (Food)	0	0	0	1	1	1	0	0
	Crisp packets	0	0	0	1	1	1	0	0
	Sweet /chocolate wrappers	0	0	0	1	1	1	0	0
	Biscuit and cake wrappers	0	0	0	1	1	1	0	0
	Plastic wrap (non-food)	0	0	0	1	1	1	0	0
	1 litre & over Alcohol (PET)	0	1	0	1	1	1	1	1
	1 litre & over Soft (PET)	0	1	0	1	1	1	1	1
	750ml - 999ml Alcohol (PET)	0	1	0	1	1	1	1	1

Material category	Policy initiatives filter Detailed sort category (level 3)	On-the-go DRS (below 750 ml)	All-in DRS (all drinks containers)	Single use cups (card and plastic inc lids)	EPR reform, UK packaging	EC Most Commonly littered single use plastic items	EPR and single use plastics	Common recyclable' items	Widely recyclable' items
Dense Plastic (drinks containers)	750ml - 999ml Soft (PET)	0	1	0	1	1	1	1	1
	500ml - 749 ml Alcohol (PET)	1	1	0	1	1	1	1	1
	500ml - 749 ml Soft (PET)	1	1	0	1	1	1	1	1
	499ml & under Alcohol (PET)	1	1	0	1	1	1	1	1
	499ml & under Soft (PET)	1	1	0	1	1	1	1	1
	1 litre & over (water)	0	1	0	1	1	1	1	1
	750ml - 999ml (water)	0	1	0	1	1	1	1	1
	500ml - 749 ml (water)	1	1	0	1	1	1	1	1
	499ml & under (water)	1	1	0	1	1	1	1	1
	1 litre & over (hdpe)	0	1	0	1	1	1	1	1
	750ml - 999ml (hdpe)	0	1	0	1	1	1	1	1
	500ml - 749 ml (hdpe)	1	1	0	1	1	1	1	1
	499ml & under (hdpe)	1	1	0	1	1	1	1	1
	1 litre & over **Alcohol** (pouch)	0	1	0	1	0	1	0	0
	1 litre & over **Soft** (pouch)	0	1	0	1	0	1	0	0
	750ml - 999ml **Alcohol** (pouch)	0	1	0	1	0	1	0	0
	750ml - 999ml **Soft** (pouch)	0	1	0	1	0	1	0	0
	500ml - 749 ml **Alcohol** (pouch)	1	1	0	1	0	1	0	0
	500ml - 749 ml **Soft** (pouch)	1	1	0	1	0	1	0	0
	499ml & under **Alcohol** (pouch)	1	1	0	1	0	1	0	0
	499ml & under **Soft** (pouch)	1	1	0	1	0	1	0	0
Dense plastic	Plastic drink bottle lids	0	0	0	1	1	1	1	1
Other plastic bottles (milk	HDPE Milk bottles	0	0	0	1	0	1	1	1
	Other plastic bottles	0	0	0	1	1	1	0	1
Dense plastic (food packaging)	Pots tubs and trays - Food	0	0	0	1	1	1	1	1
	Sachets and pots	0	0	0	1	1	1	0	0
	Expanded polystyrene cups	0	0	**1**	1	1	1	0	0
	Other Plastic cups	0	0	**1**	1	1	1	0	0
	Lids for plastic cups	0	0	1	1	1	1	0	0
	Compostable plastic F&D packaging	0	0	0	1	0	1	0	0

Material category	Policy initiatives filter Detailed sort category (level 3)	On-the-go DRS (below 750 ml)	All-in DRS (all drinks containers)	Single use cups (card and plastic inc lids)	EPR reform, UK packaging	EC Most Commonly littered single use plastic items	EPR and single use plastics	Common recyclable' items	Widely recyclable' items
	Expanded Polystyrene Trays	0	0	0	1	1	1	0	0
Dense plastic pack – (non-food)	Dense - Non-food pack	0	0	0	1	0	1	1	1
Dense Plastic - (Non pack)	Plates	0	0	0	0	0	1	0	0
	Cutlery	0	0	0	0	1	1	0	0
	Stirrers	0	0	0	0	1	1	0	0
	Straws	0	0	0	1	1	1	0	0
	Cotton buds	0	0	0	0	1	1	0	0
	Balloons	0	0	0	0	1	1	0	0
	Balloon sticks	0	0	0	0	1	1	0	0
	Other dense plastic (non-packaging)	0	0	0	0	0	0	0	0
Textiles	Textiles	0	0	0	0	0	0	1	1
Other Combustible	AHPs	0	0	0	0	0	0	0	0
	Pouches (non - drinks)	0	0	0	1	0	1	0	0
	Wet wipes	0	0	0	0	0	1	0	0
	Cigarette butts	0	0	0	0	1	1	0	0
	Wooden cutlery	0	0	0	0	0	0	0	0
	Other combustible	0	0	0	0	0	0	0	0
Non-	Inert-Stones etc	0	0	0	0	0	0	0	0
Glass	1 litre & over Alcohol (glass)	0	1	0	1	0	1	1	1
	1 litre & over Soft (glass)	0	1	0	1	0	1	1	1
	750ml - 999ml Alcohol (glass)	0	1	0	1	0	1	1	1
	750ml - 999ml Soft (glass)	0	1	0	1	0	1	1	1
	500ml - 749 ml Alcohol (glass)	1	1	0	1	0	1	1	1
	500ml - 749 ml Soft (glass)	1	1	0	1	0	1	1	1
	499ml & under Alcohol (glass)	1	1	0	1	0	1	1	1
	499ml & under Soft (glass)	1	1	0	1	0	1	1	1
	All other glass	0	0	0	0	0	0	0	1
	All food waste (remove from packaging)	0	0	0	0	0	0	1	1

Material category	Policy initiatives filter Detailed sort category (level 3)	On-the-go DRS (below 750 ml)	All-in DRS (all drinks containers)	Single use cups (card and plastic inc lids)	EPR reform, UK packaging	EC Most Commonly littered single use plastic items	EPR and single use plastics	Common recyclable' items	Widely recyclable' items
Putrescibles	Liquid food waste	0	0	0	0	0	0	1	1
	Garden waste & soil	0	0	0	0	0	0	1	1
	Dog excrement	0	0	0	0	0	0	0	0
	Urine	0	0	0	0	0	0	0	0
Metal	Over 500 ml **Alcohol** (steel)	1	1	0	1	0	1	1	1
	Over 500 ml **Soft** (steel)	1	1	0	1	0	1	1	1
	331ml - 499ml **Alcohol** (steel)	1	1	0	1	0	1	1	1
	331ml - 499ml **Soft** (steel)	1	1	0	1	0	1	1	1
	330ml and under **Alcohol** (steel)	1	1	0	1	0	1	1	1
	330ml and under **Soft** (steel)	1	1	0	1	0	1	1	1
	Food cans (steel)	0	0	0	1	0	1	1	1
	Other ferrous	0	0	0	0	0	0	0	1
	Over 500 ml **Alcohol** (Alu)	1	1	0	1	0	1	1	1
	Over 500 ml **Soft** (Alu)	1	1	0	1	0	1	1	1
	331ml - 499ml **Alcohol** (Alu)	1	1	0	1	0	1	1	1
	331ml - 499ml **Soft** (Alu)	1	1	0	1	0	1	1	1
	330ml and under **Alcohol** (Alu)	1	1	0	1	0	1	1	1
	330ml and under **Soft** (Alu)	1	1	0	1	0	1	1	1
	Food cans (alu)	0	0	0	1	0	1	1	1
	Foil (alu)	0	0	0	1	0	1	1	1
	Other non-ferrous	0	0	0	0	0	0	0	1
WEEE	WEEE items	0	0	0	0	0	0	0	1
Hazardous	Hazardous	0	0	0	0	0	0	0	0
Fines (sub	Fines sub 10mm	0	0	0	0	0	0	0	0
Collection sacks	Collection sacks	0	0	0	0	0	0	0	0