2022 HOUSEHOLD KERBSIDE MUNICIPAL WASTE CHARACTERISATION

Final Report

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Household Municipal Waste Characterisation 2022

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RPS

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EPA

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- DLRCC and Thorntons Recycling for support during the conduct of the surveys.

GLOSSARY OF TERMS

The terms used in this report have the following meanings:

Authorised waste collector (AWC) means a waste collector who has a valid permit issued by the National Waste Collection Permit Office.

Biodegradable Municipal Waste (BMW) is the fraction of municipal waste that will rot or degrade biologically. The main constituents of the biodegradable proportion of municipal waste are typically parks and garden waste, food waste, timber, paper, card, and textiles. BMW is as defined by EPA, 2011, Protocol for The Evaluation of Biodegradable Municipal Waste Sent to Landfill. Each waste type that was characterised is assigned as being either 100% BMW, 50% BMW or 0% BMW:

- 100% BMW   Organics (Food), Organics (Garden), papers, and cardboard.
- 50% BMW   Textiles (including nappies), and wood, unclassified combustibles, and fines.
- 0% BMW   Other categories such as glass, plastics, and metals.

Brown Bin is a reference to an organic waste collection. Where garden waste is excluded, this bin may be termed an organics (food) collection.

Bring Centres includes Civic Amenity Sites, Recycling Centres, Bring Banks & WEEE recycling points.

Civic Amenity Site are designated centres that accept household and some commercial items such as bulky items, hazardous wastes and WEEE that should not be placed in kerbside bins.

Contamination refers to two main types of contamination – residual contamination and cross-contamination.

- **Residual contamination** typically refers to food (or dirt) that is left over on paper, cardboard, plastic, composites, and metal materials after discarding. This is particularly important where the container may be segregated for recycling as contamination can lower the potential recyclability of the material.
- **Cross-contamination** (including moisture) occurs when materials segregated at source are contaminated by other waste materials present in a particular waste stream (e.g., garden or food waste contaminating mixed dry recyclables) or liquids (e.g., coffee, water, soft drinks, oils, paints). Moisture can also be due to rain getting into bins which, although not directly related to the waste materials present, can increases contamination levels.

Compostable refers to the criteria required to meet the European standard EN 13432. EN 13432 requires the compostable plastics to disintegrate after 12 weeks and to completely biodegrade after six months. Compostable items are identified by markings of the standard or by a certification scheme such as the Cré.

Compostable packaging refers to packaging that bears the Cré Certification Scheme Logo to prove the product is certified by Cré that it is compostable in Ireland or the EN 13432 mark to prove the product is certified industrially compostable according to the European Standard EN 13432.

Deposit Return Scheme (DRS) is a circular economy initiative that aims to promote the return of certain types of containers by offering a refundable deposit at the time of purchase. Initially only beverage PET bottles, aluminium, and steel cans from 150ml to 3,000ml are included in the scheme.

Fines (<20mm) refers to material that would pass through a 20mm sieve.

HHMWC means Household Municipal Waste Characterisation.

HMW means Household Municipal Waste.

Household waste is defined as waste produced within the curtilage of a building/residence or self-contained part of a building/premises used for the purposes of living accommodation. Household waste includes dry recyclables (e.g., glass, plastic, metals, paper, and cardboard); organic waste (food and garden organics); residual (black bin) waste and other wastes generated in the household such as bulky waste, portable batteries, waste electrical and electronic equipment, and household hazardous wastes.

Kerbside collection is a common reference for the practice of collecting household or commercial waste directly from its source, often, though not necessarily, from the pavement or front door.

MDR means Mixed Dry Recyclables. Sometimes referred to as Dry Mixed recyclables (DMR).

Mean is the mathematical average of all the items in a sample.

MRW means Mixed Residual Waste. MRW sometimes contains bulky items.

N/A means not applicable.

National models calculate aggregated national factors for two bin and for three bin collection systems. The factors are applied to nationally aggregated residual, mixed dry recyclable, and mixed organic waste figures from each type of collection system.

Non-recyclable material is material that is not widely recycled. The range of materials that are recycled will change over time as technology improves and market conditions alter.

NWCPO means the National Waste Collection Permit Office, the regulatory agency responsible for managing waste collection permits and registrations. The NWCPO is operated by Offaly County Council.

Organic waste (OW) in this report means biodegradable food and liquids (packaged and not packaged), garden and landscaping waste. This is a stream that is sub-divided in the report into:

- 'Organics (Garden)' which includes biodegradable waste from gardens and parks such as grass and bush cuttings, twigs, soil, flowers, leaves, tree branches, weeds.

- 'Organics (Food)' which includes:

  – Food waste, such as Unused or partially used packaged food that cannot easily be separated from packaging. e.g., Jar of honey, a tub of soft cheese, packet of ham, cheese in packaging; Vegetables, fruit, cheese, or sausages removed from packaging. Fruit & vegetables, block of cheese, sausages, bread; Inedible food wastes. Fruit & vegetables peelings, tea bags, meat carcasses (termed 'food waste' in this report).

  – Liquids contained in drink or milk containers. e.g., milk, soft drinks, juices

  – Vegetable oils such as sunflower or olive oil.

Packaging is defined in Directive 94/62/EC initially as: 'packaging' shall mean all products made of any materials of any nature to be used for the containment, protection, handling, delivery, and presentation of goods, from raw materials to processed goods, from the producer to the user or the consumer. 'Non-returnable' items used for the same purposes shall also be considered to constitute packaging.

Waste Categories: refers to classification of waste materials for the purposes of both reporting and on-site survey work. There are three types of waste categories used:

- **Primary Category** is a high-level waste category e.g., plastics, organics, metals etc.

- **Primary Sub-Category** is a more specific sub-category within a Primary Category, e.g., Polyethylene (PET) packaging bottles, food waste, ferrous metal etc.

- **Secondary Sub-Category** includes specific wastes including Single Use Plastics (SUP), compostable wastes and 'special interest items' that could be targeted for alternative collections, and/or has a potential reuse alternative.

- **WRAP** is a not-for-profit organisation that works to improve resource efficiency and reduce waste and its environmental impact. WRAP collaborates with governments, businesses, and local authorities to promote sustainable waste management practices. The organisation is known for promoting recycling, reducing food waste, and encouraging sustainable production and consumption.

Sample means portion of material selected from a larger quantity of material.

Single Use Plastic (SUP) products are made wholly or partly from plastic and are typically intended to be used just once or for a brief period before they are discarded.

Special interest items are items that EPA has identified for the purposes of this report that could be targeted for alternative collections, and/or has a potential reuse alternative.

A stratum (plural strata) refers to a subset (part) of the population (complete collection of items under consideration) which is being sampled. Stratification thus consists of dividing the population into strata within each of which an independent sample can be chosen. In this project strata were selected that describe the Irish waste management system, including urban/rural divisions and divisions by type of service provided. **Urban strata** include Dublin City (the four LAs), Cork City, Limerick City, Galway City and Waterford City. The rural strata include the areas outside of the urban strata.

Target material is any material that identified as needing to be separated from other types of material. For the

purposes of this study, 'target material' means the materials and designated waste management methods listed on the national guide to managing waste (www.mywaste.ie). (e.g., a metal drink can should be placed in MDR bin). Waste collector guidance has been used if waste management guidance for a specific material is not available on MyWaste.

Non-target material is waste that has been placed in the wrong bin (e.g., recyclable cardboard placed in the MRW bin or compostable beverage cups placed in the MDR bin) or waste that should be brought to bring centres (e.g., bulky waste).

Waste is defined as any substance or object which the holder discards or intends or is required to discard, under the Waste Framework Directive (2008/98/EC).

Waste electrical and electronic equipment (WEEE) refers to electrical and electronic equipment which is waste within the meaning of Article 3(a) of the Waste Directive 2008/98/EC, including all components, subassemblies and consumables which are part of the product at the time of discarding.

Waste management means the collection, transport, recovery, and disposal of waste, including the supervision of such operations and the aftercare of disposal sites, and including actions taken as a dealer or broker.

2bin or 3bin system refers to a source segregated collection system where mixed dry recyclables (MDR) and mixed residual wastes (MRW) are separately collected (2bin system), or where dry recyclables (MDR), organics and mixed residual wastes (MRW) are separately collected (3bin system).

EXECUTIVE SUMMARY

This report presents the composition of the national kerbside collected household waste in Ireland in 2022. The profile was generated from a physical analysis of waste as presented kerbside by householders. The report profiles the following waste streams:

- Mixed residual waste (MRW), which is the waste stream that should be used to dispose of wastes that cannot be recycled or composted. The term MRW is used, regardless of whether the contents of that bin could have been recycled, composted or not.

- Mixed dry recyclable (MDR) stream. The term 'recyclable' is used to define wastes that are appropriate for recycling.

- Organic waste (OW) stream, meaning biodegradable food and liquids (packaged and not packaged), garden and landscaping waste.

The three streams above are combined to create a national profile based on fifty samples surveyed from twelve authorised waste collectors. It should be noted that the national profile presented in this report excludes household waste collected at non kerbside locations, so the analysis presented within this report differs from the national household recycling performance which also includes these non-kerbside collections.

The aim of the project is to provide accurate up-to-date waste data on the nature and composition of Ireland's household kerbside municipal waste to enable accurate waste statistics reporting and to inform national waste and circular economy policy, infrastructure planning and regulatory and enforcement activities.

The results of the study are summarised in **Table ES.1**.

Table ES.1 - Kerbside Household Waste Distribution between streams & Profile Composition

Waste Categories	MRW	MDR	OW	National Profile
	Distribution between streams			
Organics (Food)	64.0%	4.2%	31.8%	16.3%
Plastics	64.5%	30.7%	4.8%	15.6%
Organics (Garden)	16.1%	0.2%	83.7%	13.7%
Papers	48.9%	49.9%	1.1%	10.3%
Contamination	68.0%	32.0%	0.0%	6.8%
Cardboards	18.9%	80.1%	1.0%	6.4%
Nappies	96.4%	3.2%	0.4%	6.4%
Textiles excl. nappies	89.2%	9.5%	1.3%	5.9%
Fines (<20mm)	88.2%	11.0%	0.8%	5.6%
Metals	64.4%	35.0%	0.6%	3.8%
Glass	78.4%	20.9%	0.7%	2.3%
Composites	48.8%	49.8%	1.5%	1.4%
Unclassified Incombustibles	82.2%	17.2%	0.5%	1.4%
Unclassified Combustibles	89.5%	10.2%	0.3%	1.4%
Haz. Municipal Waste (Excl. WEEE)	88.4%	11.4%	0.2%	0.7%
Wood	83.9%	13.9%	2.3%	0.7%
Non-municipal waste	94.4%	5.6%	0.0%	0.7%
WEEE	84.4%	15.2%	0.4%	0.6%
Overall Total	**59.7%**	**22.5%**	**17.8%**	**100%**

The study reveals that a significant percentage (47%) of kerbside household waste is being placed in the incorrect bin. These **non-target materials** are wastes which should be segregated into different bins or brought to bring centres.

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The MRW stream contains the highest proportion (64%) of non-target materials. These non-target materials, such as food waste, some uncontaminated plastics, papers, metals, and cardboards, should have been placed in the MDR or OW streams or brought to designated bring centres. These materials have a high circular potential if collected and segregated for recycling, which is not currently being realised as these materials are being treated through thermal recovery or landfill via the MRW bin. The trend is that non-target materials in the MRW stream are increasing.

The MDR stream contains 36% non-target materials, including unrecyclable cardboard, textiles, organic waste, paper, fines (the <20mm fraction), and glass. These non-target materials potentially contaminate the MDR resource reducing the potential for this material to be recycled.

The OW stream has shown improvement with non-target materials falling from 2018 (8%) to 2022 (5%). Even low levels of non-compostable materials like plastic, batteries, and glass can adversely affect the circularity of this stream by disrupting the operation of biogas and composting facilities and reducing the quality of products.

The report notes the introduction of soft plastics to the recycling list and its potential impact on reducing non-target plastics in MDR streams. However, the findings of this report suggest that awareness and implementation of this change are limited among households.

The **packaging waste** content in the national profile is slightly up from 2018 (33%) to 2022 (34%) (when comparing like-for-like data - contaminated packaging data with contaminated packaging data). The ongoing decreases in cardboard and paper, coupled with the 2021 admission of soft plastics to MDR, may, in future, contribute to reductions in packaging waste in MRW streams. Packaging waste analysis reveals that the MRW comprises 23% packaging waste, while the MDR and OW streams contain 56% and 5% packaging waste, respectively. Plastic packaging, packaging metals, packaging glass, packaging cardboard, and paper packaging are the primary categories found in the MRW.

Food waste is a significant concern, representing a large and growing proportion (16%) of the waste stream. The study found that the OW bin captured less than a third of the food waste in the kerbside stream, with most of the rest being disposed to MRW bins.

Garden waste should be collected in the OW bin but was present in both MRW and MDR streams, with higher levels being observed in city bins.

Textiles, excluding nappies, were a significant component (9%) of the MRW stream, with higher levels in city and apartment bins. This stream frequently occurred in batches, rather than being evenly spread, a factor that may favour attempts to divert this stream.

Nappies and incontinence wear represented a substantial (6%) share of the national waste profile. While nappies were mostly correctly placed in the MRW stream (they comprised 10% of that bin), even low rates of nappies in MDR and OW bins adversely affect the quality of recyclables.

Hazardous waste categories comprise paint and associated products; batteries; WEEE; fluorescent tubes and other mercury containing wastes; medicines and drugs; and detergents. These comprise 0.7% of the national profile, of which 0.6% is from WEEE. This is down from 2018 (1.6%), of which 0.7% was from WEEE.

The study quantified 'secondary subcategories,' including single-use plastics (SUPs), compostable materials and special interest items.

Single Use Plastics (SUPs), such as beverage bottles and food packaging, were quantified at 6% in the national profile and at 9% in MDR. The implementation of the SUP regulations and Deposit Refund Scheme (DRS) in Ireland is expected to reduce the volume of SUPs in the kerbside waste stream. The data from this study will inform the monitoring of the schemes.

Similarly, the data on **compostable materials** was gathered to allow better understanding of the prevalence of these materials. These were measured at 0.4% in the national profile and 1% in the OW. These compostable materials replace the non-compostable alternatives and protect the quality of compost product. They do so by providing alternative products to plastics and other materials that are frequently found in the OW stream and that contaminate compost product.

Data on **special interest items** – including milk bottles, washing up liquid bottles, delivery cardboard, coffee pods etc, – was gathered to allow exploration of potential waste prevention opportunities, e.g., by using reusable delivery crates/packs, or reusable milk delivery systems or refillable bottles. This diverse grouping was present at 1.7% in the national profile, of which 74% was in MDR, with a large fraction of the remainder in MRW.

Overall, the study found the need for improved waste segregation and collection practices. Ireland needs to fundamentally improve its performance in managing kerbside collected household waste through better segregation and capture at source of more materials, particularly food waste, plastics, WEEE and textiles from more households.

In looking at bin collection systems, the study found **differences between the 2bin and 3bin systems**, particularly in garden waste materials. The 3bin system had a higher proportion of organics (garden) waste compared to the 2bin system. This may be due to demographic reasons, such as some 2bin households - terraced houses and apartments for example - being less likely to have gardens. However, the proportions of food waste did not differ significantly between the 2bin and 3bin systems, which was unexpected.

The study highlights **differing waste management performance of apartments compared to houses**. Apartment MRW had a higher proportion of organics (food) waste and of other non-target materials like glass and textiles.

To address the segregation challenge, targeted actions are recommended, such as:

- Awareness and education campaigns focused on improving the capture of food waste and recyclables.
- Infrastructure improvements particularly rolling out brown bins to rural areas with no population exemptions.
- Enforcement measures to lower contamination and non-target rates in the recycling bin.
- Actions to improve waste management performance in apartments.
- Exploring and delivering innovative solutions such as for access to bins, waste storage, waste collection and billing systems.

By implementing these measures, Ireland can increase recycling rates, reduce environmental impacts, enhance resource efficiency, and support the transition to a circular economy. It is crucial that these actions are taken to meet municipal and packaging waste recycling targets and ensure a sustainable future, where resources are managed efficiently, waste is minimised, and the well-being of both current and future generations is prioritised.

1 INTRODUCTION

1.1 Background

This Household Municipal Waste Characterisation (HHMWC) project was undertaken on behalf of the Environmental Protection Agency (EPA).

The EPA produces national statistics on waste generation and management. The statistics allow for analysis of consumption behaviour and patterns which in turn influence national and regional waste policy and planning. The statistics are also used to report to the European Commission in relation to a range of legislation.

Accurate and up to date information on the composition of waste is needed for effective waste management planning, implementation, and monitoring.

Information on the composition of waste can be applied at various levels:

- Locally for assessing the feasibility of various collection, recycling, and treatment options.
- Helping compliance schemes in the determination of producers' fees and recovery operator subsidies.
- Assessing the proportion of biodegradable waste in mixed residual waste (MRW) for monitoring compliance with the Landfill Directive.
- Assessing the proportion of packaging waste for monitoring compliance with the Packaging Directive.
- The calculation of Renewable Energy Feed-in Tariff (REFIT) subsidies for thermal treatment waste facilities.
- National and regional levels for strategic waste management planning.
- On the international level to compare with other European countries.

To provide accurate information on the generation and management of municipal waste for waste data reporting, it is necessary to understand and quantify its profile, nature, and constituents. The profile of waste changes over time in response to changes in economic activities, evolving waste management practices and policy measures and interventions. Production and consumption patterns and behaviours identified[1] as being relevant to waste arisings include:

- Population growth.
- Age or life stage of household.
- Affluence and social class.
- Supermarket usage.
- Behavioural traits.
- Pet ownership.
- Presence and number of children.
- Household size.
- Service characteristics.
- Seasonal variations.

Fluctuations in those drivers mean that regular waste characterisation surveys are essential to aid understanding and allow accurate reporting on the generation and management of waste in Ireland. In addition, new statutory targets and reporting obligations arising from the EU's Circular Economy Package bring further requirements for waste characterisation, including information on single-use plastics, food waste, the re-use of second-hand products (including textiles, furniture, WEEE and construction materials). Therefore, it is important that characterisation data is kept up to date.

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[1] Lifestyle Scenarios & Waste Composition – The Core Report, DEFRA, 2007

The last national household kerbside municipal waste characterisation surveys were carried out by the EPA in 2017-2018, building on previous EPA waste characterisation surveys undertaken in 2008, 2004 and 1996. This 2022 HHMWC survey provides up-to-date municipal waste characterisation data.

1.2   Aim

The aims of this project are:

- To obtain up-to-date information on the nature and composition of Ireland's household municipal waste to enable accurate waste statistics reporting and to inform national waste and circular economy policy, infrastructure planning, regulatory and enforcement activities.

- To ensure the collection of suitable samples to assess: the moisture and contamination levels of waste packaging; the mass of labels on plastic packaging (other than single use plastic (SUP) beverage bottles); and the mass of labels and the presence and mass of caps on SUP beverage bottles, in residual and MDR municipal waste from households (two & three bin collections).

- To incorporate the results of the contamination assessment (carried out under a separate contract) into the results of the HHMWC.

1.3   Project Delivery

The sampling methodology was based on the method developed in 2015[2] ('the 2015 methodology') and updated sampling plans issued to the EPA in January 2022. The sampling methodology also draws learnings from sampling plans developed for other recent, similar waste characterisation projects delivered for the EPA.

The sampling fieldwork was completed between February and November 2022. The fieldwork consisted of a physical waste compositional analysis of the following kerbside streams:

- **Mixed residual waste** (hereafter referred to as MRW) - used to dispose of wastes that cannot be recycled or composted. The term MRW is used, regardless of whether material could have been recycled, composted or not.

- **Mixed dry recyclable** (hereafter referred to as MDR) - used to manage dry wastes that are appropriate for recycling.

- **Organic waste** (hereafter referred to as OW) - used to manage food waste (including edible liquids and vegetable oils), and organics (garden) waste.

1.4   Report Content

This report includes:

- A description of the household waste sampling methodology and sampling strategy.

- A summary of the model which calculates a set of aggregated factors that can be applied to nationally aggregated data.

- A summary of the waste composition sampling programme, results and discussion for each waste category and the national household municipal waste profile.

- Quantification of the level of contamination in packaging materials in household MRW and MDR.

- Recommendations for improvements to the methodology.

The data from the MRW, MDR and OW streams are combined to create a national profile using 2021 kerbside household waste data (the most recent kerbside waste data available at the time of report writing). This household kerbside waste profile, by definition, excludes household waste gathered at non-kerbside locations (e.g., at bring banks, civic amenity sites, pay-to-use outlets etc.).

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[2] RPS, 2015. Review of the methodologies used for the characterisation of household municipal waste.

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The results present data at primary category and primary sub-category and secondary sub-categories.

- **Primary Category** is a high-level waste category e.g., plastics, organics, metals etc.
- **Primary Sub-Category** is a more specific sub-category within a Primary Category, e.g., polyethylene (PET) packaging bottles, food waste, ferrous metal etc.
- **Secondary Sub-Category** includes specific wastes including Single Use Plastics (SUP), compostable wastes and 'special interest items' that could be targeted for alternative collections, and/or has a potential reuse alternative.

The results for the MRW, MDR and OW streams are appended to this document in **Appendices F, G, H**.

A national kerbside household waste composition profile (corrected for contamination, with contamination counted in a separate category) across all three kerbside streams – MRW, MDR and OW - is presented in **Appendix I**.

This national waste characterisation profile has been adjusted to reflect contamination measured on packaging waste. This means that references to packaging waste account for adhering residue: the proportions of packaging waste presented are for clean and dry materials and proportions of contamination are presented separately. This adjustment was not included in the 2008 and 2018 HHMWC reports published. Comparisons with previous HHMWC reports published must therefore take this change in results presentation into account.

2 SAMPLING METHODOLOGY

2.1 Sampling Approach

The methodology employed considered the information set out in the RFT (Request for Tender); the updated 2015 methodology, and the methodologies used in previous studies, including those from 2008, 2018, 2020, and 2021[3]. The approach also considered the UK HMW Composition, WRAP (2020) methodology.

The level of sampling effort was set in the RFT at 50 sampling events.

2.2 Sampling Strategy

Selecting samples requires a systematic means of classifying key factors that influence waste composition. This approach is called 'stratification' and involves dividing the population into strata that reflect the variables that influence waste composition. Strata are mutually exclusive (non-overlapping groups), exhaustive parts of a population identified as different from each other, or for purposes of sampling.

Following review of recent developments in the Irish waste management system, and input from the Steering Group, the stratification used for this 2022 HHMWC was as per 2015 methodology and 2018 HHMWC:

- Type of waste - MRW, MDR, OW.

- Type of collection system (2bin & 3bin)[4].

- Area type: 'urban (cities (and suburbs)' and 'rural and mixed rural/city areas.
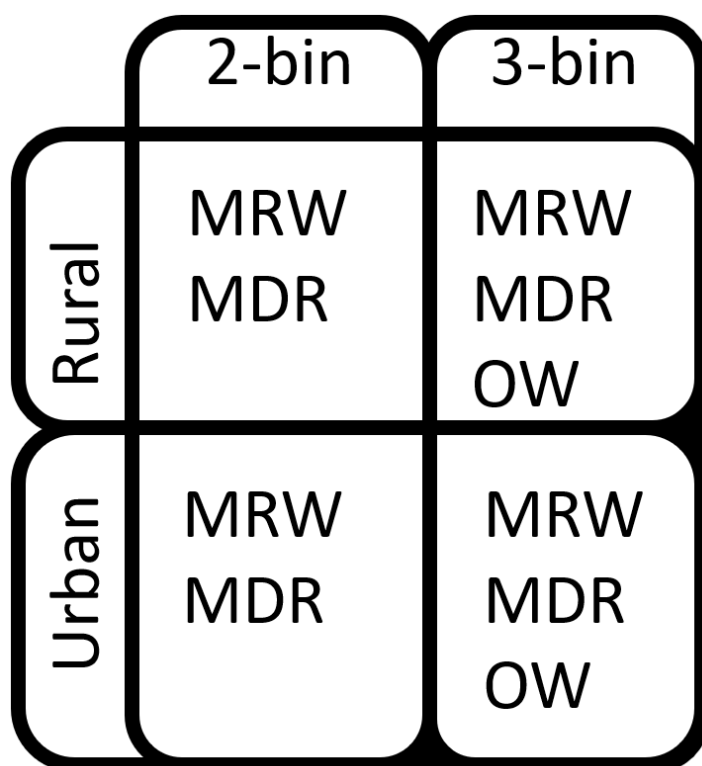
Figure 2-1: Strata sampled

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[3] RPS, 2018. Final methodology for Household Waste Characterisation Campaign. Study on impact of the COVID-19 pandemic on Household Residual Waste Incinerated in Ireland. EPA, 2020. Development of a Method to Characterise Municipal Skip Waste (Household and Non-household), EPA, 2021.

[4] The type (materials collected) and extent (quantities collected) of separate collections changes the composition of residual waste, i.e., food and garden waste content in residual waste is lower for areas provided with kerbside collection of organic waste.

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All samples were from a GIS-mapped representative socioeconomic demographic, per **Figure 2-2**.

Population by Social Class (CSO 2016)			
Social Class	**A** Professional workers, managerial and technical, and 1/3 of all others gainfully occupied and unknown	**B** Non-manual, skilled manual, and 1/3 of all others gainfully occupied and unknown	**C** Semi-skilled, unskilled, and 1/3 of all others gainfully occupied and unknown
National Average	41%	39%	20%

Legend
- County Boundary

Deviation from National Average
- Less than or equal to 5%
- Greater than 5% and less than or equal to 10%
- Greater than 10%

Data Source:
Central Statistics Office (CSO) 2016 data

Figure 2-2: Strata sampled were from areas with a representative demographic

The sampling plan was prepared following background research and using the most up to date waste management data available at project initiation, namely, the 2019 data given in the annual return by the

Authorised Waste Collectors (AWCs) obtained from NWCPO. The data includes the quantities collected, and households serviced per stratum (MRW, MDR, OW), by AWC and local authority. Within these strata, a representative sampling of apartments was included.

Information from the NWCPO was used to update:

- The allocation of sampling effort for each kerbside waste stratum (MRW, MDR and OW).
- The allocation of sampling effort for each area type and collection system stratum (city/rural, 2bin, 3bin).
- The list of AWCs supplying a collection service in each stratum.

During the engagement with AWCs phase, it became clear that samples from certain strata were not available.

2bin house collection systems, particularly city, but also rural, were less available for sampling than expected. This low availability was due to increased rollout of organic (third bin) collections. Further, the characteristics (number of routes, co-collections of 2bin with 3bins, demographic characteristics) of remaining 2bin routes often did not meet sampling requirements. In response, both city 2bin MRW samples were replaced by city 3bin MRW samples; one city 2bin MDR sample was replaced by a rural 2bin MDR sample; one rural 2bin MRW sample was replaced by a rural 3bin MRW sample.

Many city apartments are not serviced with OW kerbside collections – these apartments are serviced with 2bin collections only. This meant that that one apartment city 3bin MRW sample was unavailable. Following discussion, an apartment 3bin MRW sample from a city was replaced by an apartment 3bin MRW sample from a rural area.

Table 2-1 (on the following page) shows the final allocation of sampling effort between strata.

For further detail on the sampling process, see appendices B, C, D, and E to this report.

2.2.1   Changes in categories

The waste characterisation methodology has changed since 2018 in how composites are identified. It does this by placing a numeric value, based on European guidance, on the composition. Composites are now defined as products where two or more materials each make up more than 5% of the product weight. This determination was made onsite via quantitative (measured weights) or subjective assessment.

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Table 2-1: Sampling Allocation

Dwelling type			Houses										Apartments					Total
Urbanisation			City					Rural					City			Rural		
Collection System*			MRW 2bin	MRW 3bin	MDR 2bin	MDR 3bin	OW 3bin	MRW 2bin	MRW 3bin	MDR 2bin	MDR 3bin	OW 3bin	MRW 2bin	MRW 3bin	MDR 3bin	MRW 2bin	MRW 3bin	
EMR	Spring	AWC 1							1		1							2
EMR	Spring	AWC 2		3		1	2					1	1			1	1	10
EMR	Spring	AWC 3					2											2
EMR	Spring	AWC 4						3										3
EMR	Spring	AWC 5							5	1								6
EMR	Spring	AWC 6													1		1	2
CUR	Autumn	AWC 7				1	1		1	1	1	1						6
SR	Autumn	AWC 8									2							2
SR	Autumn	AWC 9		2				3		1								6
SR	Autumn	AWC10		4		1			2									7
CUR	Autumn	AWC11						1	1	1								3
SR	Autumn	AWC12										1						1
Total			0	9	0	3	5	7	10	4	4	3	1	0	1	1	2	50

* Ireland was divided regionally into the Eastern Midlands Region (EMR), Southern Region (SR) and Connaught Ulster Region (CUR)

The fieldwork for the project was completed during the 2022 transitional seasons between winter and summer, and summer and winter, respectively, as were previous studies in 2018 and 2008.

2.3   Modelling

The HHMWC model has been developed and the results have been scaled up using the following inputs:

- The sampling strategy, which was initially based on the 2019 data and then updated accordingly based on 2021 data.

- Waste composition results from the 2022 field surveys.

- Total quantities of household municipal waste collected in Ireland in 2021.

- Calculated contamination factors for selected packaging waste categories.

The model calculates a set of aggregated factors (percentages) that can be applied (scaled up) to national arisings data (tonnages) collated by EPA for national waste data reporting and other reporting requirements.

The model also calculates combined and weighted (by mass per system per year) 2bin and 3bin models for the year in question upon input of the waste arisings for that year.

The model presented includes component models for the 2bin and 3bin systems and can make calculations with and without contamination factors.
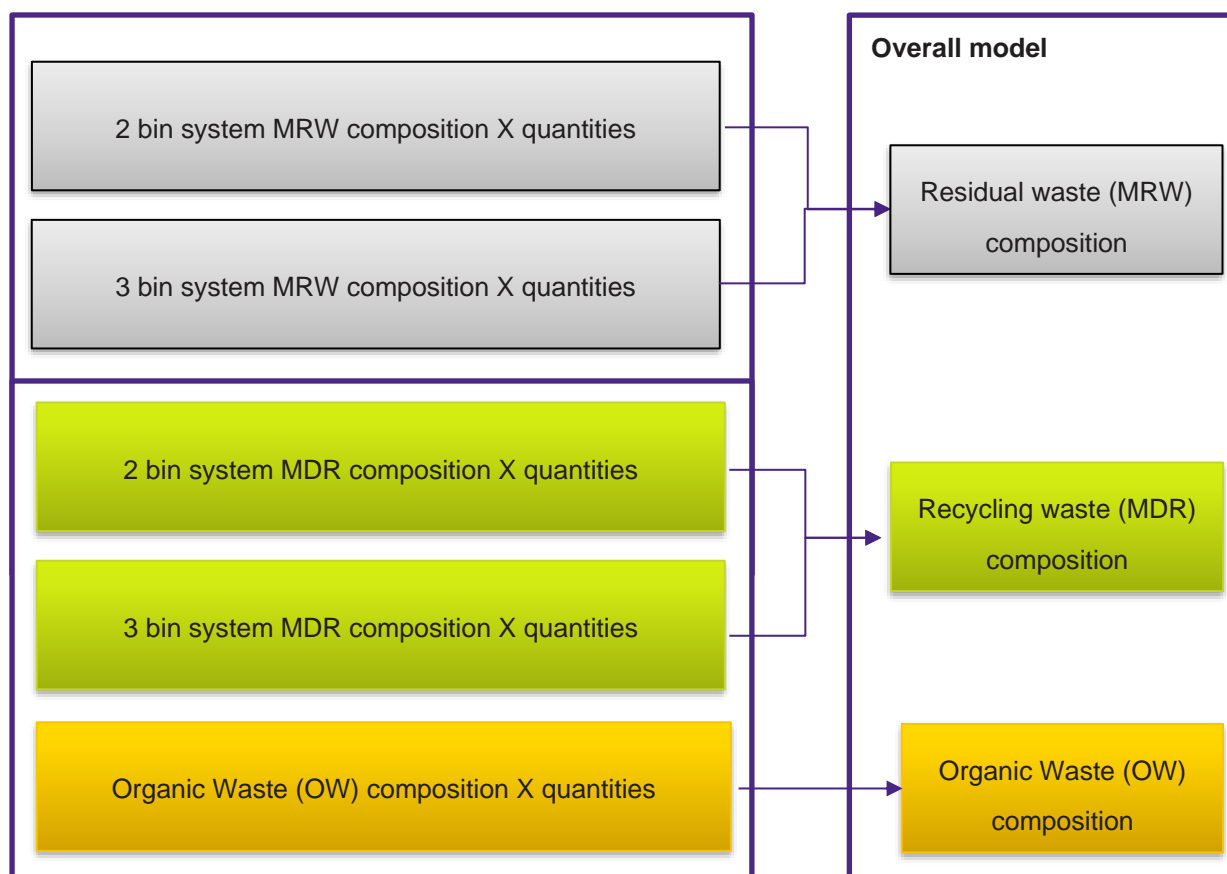
Figure 2-3: Outline of Models Developed

The final model and compositional factors generated have been issued to the EPA.

The model generated allows the annual changes to the kerbside household waste arisings to be scaled up in future based on the 2022 compositional data and on the arisings for the year being scaled up (the model currently uses 2021 arisings data).

2.4   Sampling Programme

In total, fifty samples were surveyed from 12 AWCs during the HHMWC. The number of households serviced by each route varies, depending on route, vehicle, and waste characteristics. Assuming six hundred households per route, with five routes per sample, each sample would represent 3,000 households.

The fifty samples were from three waste strata: MRW, MDR, and OW. The stratum from which each waste sample was collected can be found in **Table 2-2, Table 2-3** and **Table 2-4**.

Table 2-2: Number of Samples - MRW

Stratum Level of Urbanisation	Stratum Collection System	AWC 1	AWC 2	AWC 4	AWC 5	AWC 6	AWC 7	AWC 9	AWC 10	AWC 11	Total
Region		EMR	EMR	EMR	EMR	EMR	CUR	SR	SR	CUR	
Cities (and the suburbs)	2bin		1*								1
	3bin		3					2	4		9
Rural and mixed rural/urban areas	2bin		1*	3				3		1	8
	3bin	1	1*		5	1*	1		2	1	12
Totals		1	6	3	5	1	1	5	6	2	30

* Apartments

Table 2-3: Number of Samples – MDR

Stratum Level of Urbanisation	Stratum Collection System	AWC 1	AWC 2	AWC 5	AWC 6	AWC 7	AWC 8	AWC 9	AWC 10	AWC 11	Total
Region		EMR	EMR	EMR	EMR	CUR	SR	SR	SR	CUR	
Cities (and the suburbs)	2bin										
	3bin		1		1*	1			1		4
Rural and mixed rural/urban areas	2bin			1		1		1		1	4
	3bin	1				1	2				4
Totals		1	1	1j	1*	1	3	2	1	1	12

* Apartments

Table 2-4: Number of Samples – Organic Waste

Stratum Level of Urbanisation	Stratum Collection System	AWC 2	AWC 3	AWC 7	AWC 12	Total
Region		EMR	SR	CUR	SR	
Cities (and the suburbs)	2bin					
	3bin	2	2	1		5
Rural and mixed rural/urban areas	2bin					
	3bin	1		1	1	3
Totals		3	2	2	1	8

Note: No OW samples from apartments

2.4.1 Contamination (including moisture)

Contamination refers to two main types of contamination – residual contamination and cross-contamination. This element of the study calculated contamination factors for the main types of packaging waste collected in the MRW and MDR.

Contamination occurs through residual contamination, and cross-contamination of the waste.

Residual contamination typically refers to food (or dirt) that is left over on paper, cardboard, plastic, composites, and metal materials after discarding. This is particularly important where the container may be segregated for recycling as contamination can lower the potential recyclability of the material.

Cross-contamination (including moisture) occurs when materials segregated at source are contaminated by other waste materials present in a particular waste stream (e.g., garden or food waste contaminating mixed dry recyclables) or liquids (e.g., coffee, water, soft drinks, oils, paints). Moisture can also be due to rain getting into bins which, although not directly related to the waste materials present, can increase contamination levels. Contamination affects the recycling system and data. It lowers the potential recyclability of a waste, as contaminated recyclables may not be 100% recyclable and portions may have to be discarded. This means that contamination can distort recycling data – 1,000kg of recyclables with 10% contamination can only produce 900 kg of recyclables. Therefore, the degree of contamination was examined as part of the study.

To analyse contamination, twenty-two packaging categories were assessed, including plastics, composites, paper and cards, glass, and metals. Plastics were further subdivided to reflect the complexity of plastic polymers and product types. Twenty items per each of the twenty-two packaging categories were targeted for analysis from the strata, 2bin MRW, 2bin MDR, 3bin MRW, 3bin MDR.

The collected samples were weighed, dried, cleaned, and reweighed, following a procedure. The weight of the removed moisture and adhering contamination (together termed 'contamination') was recorded, and the resulting data was presented as a percentage contamination 'factor' per category.

The contamination factors were used to adjust the waste characterisation data by removing contamination data from packaging data (i.e., corrected for contamination) and to account for contamination as a separate line item in the final national model. This allowed production of more accurate estimates of packaging percentages within kerbside waste.

2.5 Commentary on the Sampling Method

In 1996, the EPA published a guidance document '*Municipal Waste Characterisation*'[5] setting out a standard procedure for conducting municipal waste characterisation surveys. The 1996 guidance was aimed at local authorities who were conducting waste characterisation surveys at the time. Surveys conducted using this procedure provided a breakdown of the composition of MRW collected from households or commercial outlets. Waste (such as glass, aluminium, or paper) which had been collected for recycling and recovery was not identified by the surveys using this methodology.

In 2004, the EPA commissioned an update of the 1996 methodology for conducting municipal waste characterisation surveys and the development of a national waste composition profile of municipal solid waste. The findings were published[6] in 2005 and provided a municipal waste composition profile combining household and non-household waste. In total, thirty-seven household waste samples in six local authorities[7] were analysed. The sampling was conducted in two campaigns in October/November 2004 and March/April 2005.

In 2008, the EPA commissioned a new national municipal solid waste campaign (referred as NWD-2007-26). NWD-2007-26 built on and refined the methodologies used in the earlier national waste characterisation studies undertaken in 1996 and 2004. A critical review of the methodology employed in earlier waste characterisation studies was undertaken and it was concluded that due to budget and logistical constraints it was not possible to conduct the level of surveying recommended in 2005 to reach statistical validity. NWD-2007 also introduced a model to calculate a set of factors which could be applied to the aggregated waste data

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[5] Municipal Waste Characterisation Manual (1996).
   www.epa.ie/pubs/reports/waste/wastecharacterisation/EPA_municipal_waste_characterisation.pdf

[6] RPS & CTC. 2005. Municipal Waste Characterisation 2004/05 Surveys - Final Report.
www.epa.ie/pubs/reports/waste/wastecharacterisation/EPA_municipal_waste_characterisation_final_report.pdf

[7] Each survey could include up to three events, one for each waste stratum (MRW, MDR and Organics).

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that is collected nationally for MRW, MDR, and OW, for the National Waste Report. In total, thirty-nine household waste samples were analysed; thirty-six of these were obtained from kerbside collections and three were obtained from civic amenity sites. Of the thirty-six kerbside samples, thirty-four were from collection routes serving individual houses and two were from collection routes serving apartment blocks.

In 2009, the EPA commissioned RPS to develop methodologies to determine the amount of BMW (biodegradable municipal waste) in MSW (municipal solid waste) sent to landfill. The methodologies based on the requirements of the EPA *Guidance on Municipal Solid Waste Pre-treatment & Residuals Management* (2009) were compiled in a 'bespoke' protocol. These methodologies were evaluated at 22 facilities in winter 2009-2010, spring 2010 and autumn 2010. The facilities surveyed managed approximately 85% of the municipal waste that was being mechanically treated in Ireland at the time and therefore supplied good representation of waste residues being produced. Validation included sampling, waste characterisation and collection of samples for laboratory testing. Following the validation and consultation phases, EPA published[8] the 17 BMW factors in 2010, and EPA published guidelines[9] in 2011.

The 2008 EPA Waste Characterisation Methodology was updated in 2015 to provide a solid footing for updating the composition analysis of municipal waste at a national level.

In 2017, the EPA commissioned a national municipal campaign where fifty household waste samples from kerbside collections were analysed. Of these, forty-six samples were from routes serving individual houses and four serving apartment blocks. Samples were collected from eight AWCs managing 47% of households provided with kerbside collection.

The methodologies used in delivery of these previous projects – the national waste characterisation studies in 2018 – have informed the sampling methodology used in the 2022 survey.

Since completion of the studies in 2018, ongoing changes have impacted on waste generation and composition. These changes include:

- The revised EU legislative framework on waste (Directive (EU) 2018/851) includes enhanced requirements and mechanisms for prevention of waste and new targets for municipal wastes.

- The Single Use Plastic (SUP) Directive 2019, transposed into Irish Law 2021.

- Commission Implementing Decision (EU) 2019/665 directed that composite packaging and other packaging composed of more than one material shall be calculated and reported per material contained in the packaging where a given material constitutes an insignificant part of the packaging unit, and in no case more than 5% of the total mass of the packaging unit.

- Service changes include ongoing organic waste collections and soft plastic as an MDR target (2021).

- Ongoing decreased landfill and increased incineration – the Poolbeg facility is at full capacity since 2018.

- Waste generation in Ireland continues to be linked with economic activity - Ireland has not decoupled[10] economic activity from consumption of resources. Ireland's Gross National Product (GNP) has increased 33% since 2018, and waste continues to arise at similar rates.

- Economics - the COVID-19 pandemic slowdown and the subsequent improvement in the economy affect consumption and disposal patterns.

- CSO data[11] shows that Irelands demographics – population (up 5.48% since 2018) and numbers employed (up 13.0% since 2018) – have changed significantly. These demographic factors contribute to the year-on-year increase[10] in municipal waste arisings.

- EPA National Waste Prevention Programmes, which are now well established.

Each of these impacts the quantities of household waste, as is clear from the changing quantities of municipal waste managed nationally. The waste character has also changed.

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[8] EPA. 2011. EPA approved factors to calculate the BMW content of Municipal Waste Streams.
 www.epa.ie/pubs/advice/waste/municipalwaste/Table_of_Approved_EPA_Factors.pdf

[9] EPA. 2011. Protocol for The Evaluation of Biodegradable Municipal Waste Sent to Landfill.
 www.epa.ie/pubs/advice/waste/municipalwaste/EPA_Protocol_For%20BMW%20Final.pdf

[10] www.epa.ie/media/epa-2020/publications/monitoring-amp-assessment/waste/EPA_National_Waste_Stats_Summary_Report_2020.pdf

[11] https://data.cso.ie

3   RESULTS

3.1   Mixed Residual Waste

A total of 30 MRW samples, twenty-six from houses and four from apartments were analysed over the course of two survey campaigns to investigate the waste composition.

It was apparent during the HHWMC survey that MRW management in apartments was different to that for MRW from houses and the results for houses and apartments are considered both separately and together to highlight the differences. A small sample size (four samples) was taken of apartment MRW, aligned to the 10% share of apartments in the Irish housing stock.

Detailed results of MRW (corrected for contamination, with contamination counted in a separate category) are presented in **Appendix F**.

3.1.1   Houses

Table 3-1 and Figure 3-1 show the composition[12] of MRW kerbside collections from houses[13].

Table 3-1: Composition of MRW from Houses

Primary Categories	Mean	Min	Max	Lower Limit	Upper Limit
Plastics	18.0%	11.0%	26.2%	16.6%	19.4%
Organics (Food)	13.8%	6.2%	25.8%	12.2%	15.4%
Nappies	10.8%	3.4%	23.9%	9.0%	12.5%
Textiles excl. nappies	9.2%	2.2%	17.6%	8.0%	10.4%
Fines (<20mm)	9.1%	0.0%	17.8%	7.6%	10.6%
Papers	8.8%	3.3%	14.6%	7.7%	10.0%
Contamination	8.1%	4.0%	12.9%	7.4%	8.7%
Metals	4.3%	1.3%	8.2%	3.8%	4.7%
Organics (Garden)	4.1%	0.0%	28.6%	2.1%	6.2%
Glass	2.2%	0.2%	5.3%	1.8%	2.7%
Unclassified Incombustibles	2.1%	0.2%	6.4%	1.5%	2.6%
Cardboards	1.9%	0.1%	5.6%	1.5%	2.2%
Unclassified Combustibles	1.9%	0.1%	5.2%	1.5%	2.4%
Composites	1.3%	0.3%	2.9%	1.0%	1.5%
Haz. Municipal Waste (Excl. WEEE)	1.2%	0.0%	7.2%	0.8%	1.7%
Wood	1.1%	0.0%	9.0%	0.6%	1.7%
Non-municipal waste	1.1%	0.0%	6.5%	0.5%	1.7%
WEEE	0.9%	0.0%	5.6%	0.5%	1.3%
Total	100.0%	N/A	N/A	N/A	N/A

[12] To compare waste categories, a confidence level of 90% has been used consistently used in this report.

[13] Percentages are generally presented in this report with no decimal places in the text discussions and with one decimal place in tables to simplify data and make it more readable. Some of the percentages presented in the tables do not total exactly to 100% due to this mathematical rounding of numbers. This slight numerical discrepancy does not reflect an error in calculations but is a natural outcome of rounding for simplicity.
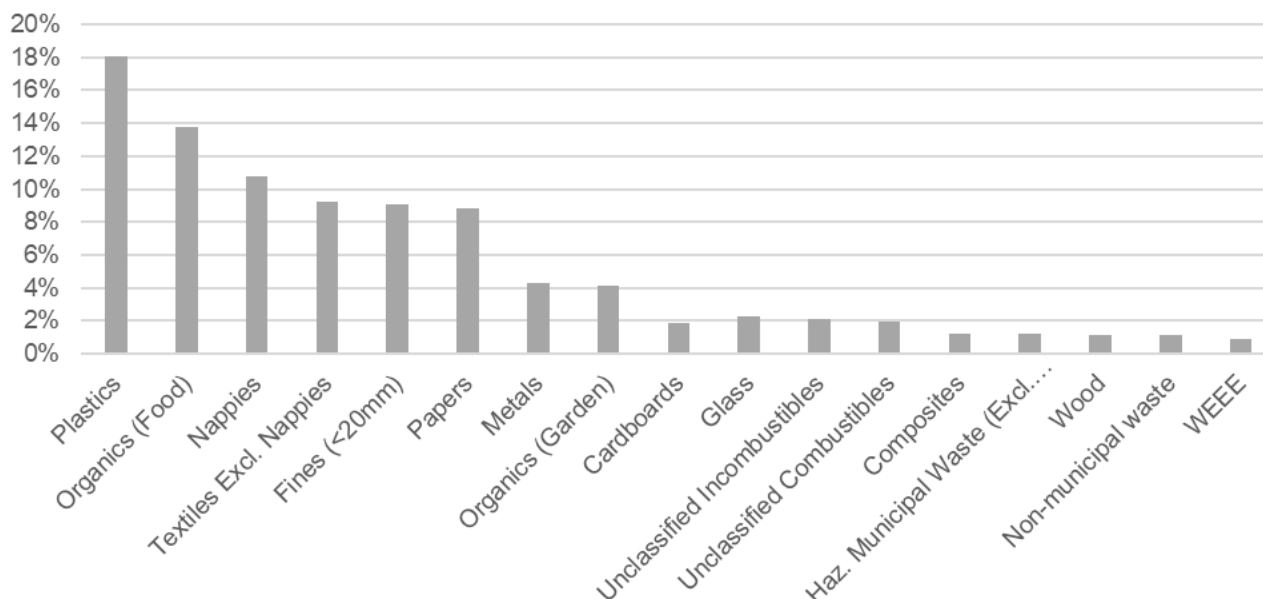
Figure 3-1: Composition of Kerbside house MRW

The three most prominent categories in MRW were plastics, organics (food), and textile waste.

The largest primary category was plastic (18%). Plastics includes the primary sub-categories supermarkets bags and films (packaging) (5%), other plastic (non-packaging and packaging incl. cups and other containers) (5%) and (2%) respectively. PET bottles (1%), PE bottles (1%), and PP bottles (0.1%) were the three types of packaging bottles.

The second largest primary category was organics (food) comprising food waste (14%) and liquid fit for human consumption (0.2%).

Nappies formed 11% of the total MRW composition.

Textile (excl. nappies) waste (9%) included the primary sub-categories: textiles non-packaging (4%), clothes (4%), healthcare textiles (0.3%) and textiles packaging (0.1%).

All other categories each comprised less than 10% and the detailed results (corrected for contamination, with contamination counted in a separate category) are available in **Appendix F**.

3.1.2   Apartments

The three most prominent categories were organics (food), plastics, and glass waste.

The largest primary category was organics (food) (41%), comprised of food waste (39%), with 2% liquid fit for human consumption waste. This high proportion is not surprising given that many apartments do not segregate food waste into an OW stream. Organics (garden) waste formed just 0.7%, a low percentage as expected given that apartments do not typically have garden space.

Plastics (10%) was the second largest primary category. Within the plastics primary category 'other' plastic (non-packaging and packaging incl. cups and other containers) accounted for 2% each. Supermarket bags and films (packaging) comprised 2% of the total plastic waste, while PET bottles (1%), PE bottles (1%), and PP bottles (0.01%) were the three types of packaging bottles.

All other categories each comprised less than 10% and the detailed results (corrected for contamination, with contamination counted in a separate category) are available in **Appendix F**.

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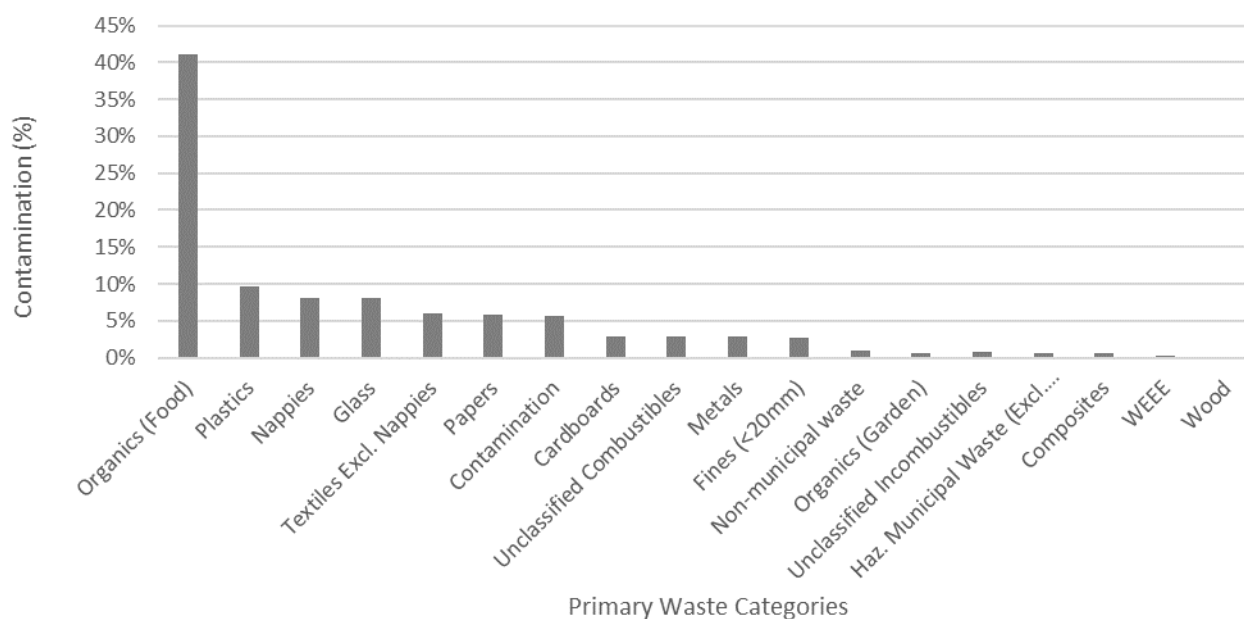
Figure 3-2: Composition of Kerbside Apartment MRW

Table 3-2 and **Figure 3-2** show the composition of MRW kerbside collections from apartments.

Table 3-2: Composition of MRW from Apartments

Waste Categories	Mean	Min	Max	Lower Limit	Upper Limit
Organics (Food)	41.1%	34.2%	51.4%	35.3%	46.9%
Plastics	9.7%	8.0%	12.5%	8.3%	11.1%
Nappies	8.1%	5.2%	10.5%	6.4%	9.8%
Glass	8.1%	6.2%	11.4%	6.4%	9.7%
Textiles excl. nappies	6.1%	4.5%	7.5%	5.2%	6.9%
Papers	5.8%	4.7%	8.5%	4.6%	7.1%
Contamination	5.6%	3.4%	7.0%	4.4%	6.8%
Cardboards	2.9%	1.1%	5.9%	1.5%	4.4%
Unclassified Combustibles	2.9%	0.5%	6.2%	1.2%	4.6%
Metals	2.8%	2.2%	4.5%	2.0%	3.6%
Fines (<20mm)	2.7%	0.0%	6.4%	0.8%	4.6%
Non-municipal waste	1.0%	0.0%	3.5%	-0.2%	2.2%
Organics (Garden)	0.7%	0.0%	1.6%	0.2%	1.2%
Unclassified Incombustibles	0.7%	0.1%	1.9%	0.1%	1.3%
Haz. Municipal Waste (Excl. WEEE)	0.7%	0.0%	1.0%	0.3%	1.0%
Composites	0.6%	0.3%	1.2%	0.3%	0.9%
WEEE	0.3%	0.0%	1.1%	0.0%	0.7%
Wood	0.1%	0.0%	0.4%	0.0%	0.3%
Total	**100%**	**N/A**	**N/A**	**N/A**	**N/A**

3.1.3   Households (houses and apartments combined)

Table 3-3 shows the composition of MRW kerbside collections when houses and apartments are combined.

Table 3-3: Composition of Kerbside Household MRW

Waste Categories	Mean	Min	Max	Lower Limit	Upper Limit
Organics (Food)	17.4%	6.2%	51.4%	14.2%	20.6%
Plastics	16.9%	8.0%	26.2%	15.4%	18.4%
Nappies	10.4%	3.4%	23.9%	8.8%	12.0%
Textiles excl. nappies	8.8%	2.2%	17.6%	7.7%	9.9%
Fines (<20mm)	8.2%	0.0%	17.8%	6.7%	9.7%
Papers	8.4%	3.3%	14.6%	7.4%	9.5%
Contamination	7.7%	3.4%	12.9%	7.1%	8.4%
Metals	4.1%	1.3%	8.2%	3.6%	4.5%
Organics (Garden)	3.7%	0.0%	28.6%	1.9%	5.5%
Glass	3.0%	0.2%	11.4%	2.3%	3.8%
Unclassified Combustibles	2.1%	0.1%	6.2%	1.6%	2.5%
Cardboards	2.0%	0.1%	5.9%	1.6%	2.4%
Unclassified Incombustibles	1.9%	0.1%	6.4%	1.4%	2.4%
Haz. Municipal Waste (Excl. WEEE)	1.2%	0.0%	7.2%	0.7%	1.6%
Composites	1.2%	0.3%	2.9%	1.0%	1.4%
Non-municipal waste	1.1%	0.0%	6.5%	0.6%	1.7%
Wood	1.0%	0.0%	9.0%	0.5%	1.5%
WEEE	0.8%	0.0%	5.6%	0.5%	1.2%
Total	**100.0%**	**N/A**	**N/A**	**N/A**	**N/A**

Figure 3-3 following also shows the percentage of MRW that was on target (i.e., correctly placed in MRW bin) and off target (i.e., should have been segregated and managed in MDR, OW bins or bring centres). Target material is any material identified as needing to be separated from other types of material. For the purposes of this study, 'target material' means the materials and designated routes listed on the national list MyWaste (www.mywaste.ie) for co-mingled mixed dry recyclables bin and the organic materials like organics (food) or organics (garden) typically accepted into the organic waste bin ('brown bin').

Non-target material in the MRW is waste that has been placed in the wrong bin (e.g., recyclable cardboard which should have placed in the MDR bin or compostable beverage cups which should have placed in OW bin) or waste like batteries or WEEE that should be brought to bring centres.

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Organics (Food): 17.4
Plastics: 16.9
Nappies: 10.4
Textiles Excl. Nappies: 8.8
Papers: 8.4
Fines (<20mm): 8.2
Contamination: 7.7
Metals: 4.1
Organics (Garden): 3.7
Glass: 3.0
Unclassified Combustibles: 2.1
Cardboards: 2.0
Unclassified Incombustibles: 1.9
Composites: 1.2
Haz. Mun.: 1.2
Non-Mun.: 1.1
Wood: 1.0
WEEE: 0.8

MRW: 100.0

36.1 % of MRW was on target

63.9% of MRW was off target
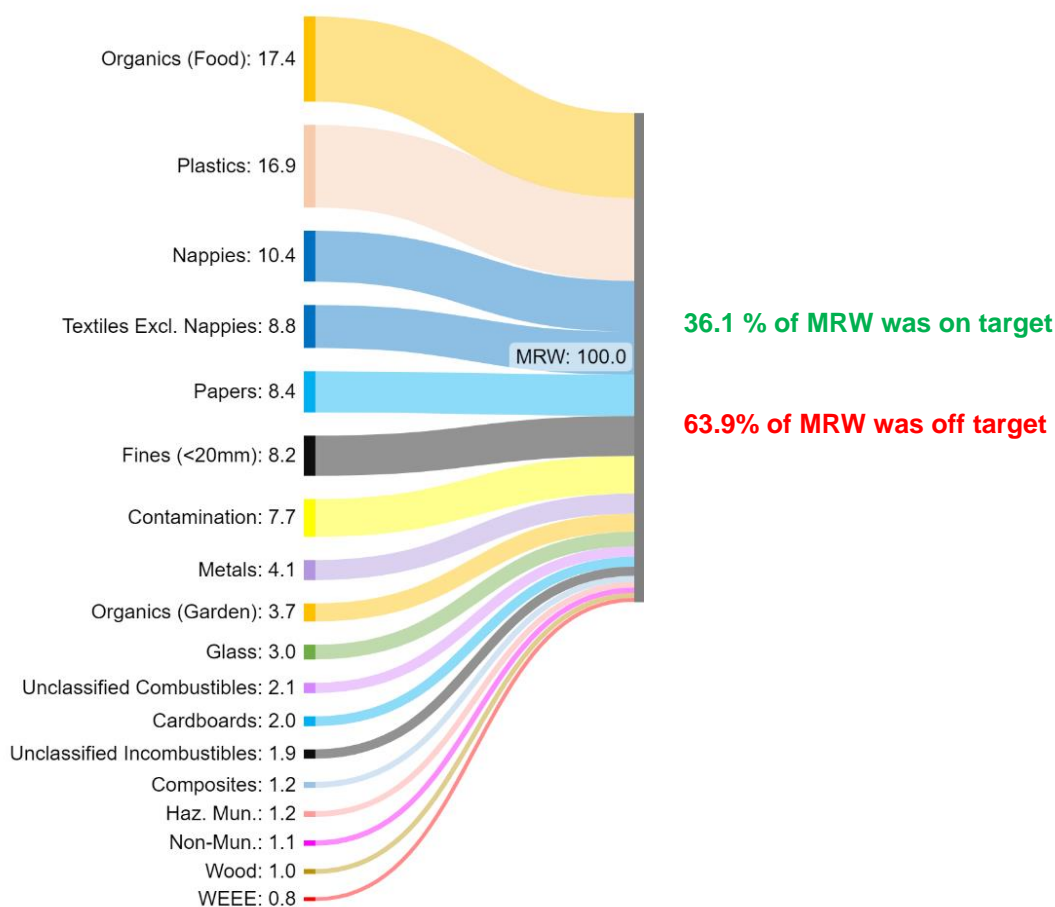
Figure 3-3: MRW Percentage Composition and Percentage on and Off Target

Figure 3-4 following contrasts the apartment/house difference by comparing the composition of MRW kerbside collections for houses, apartments, and households (combination of both).
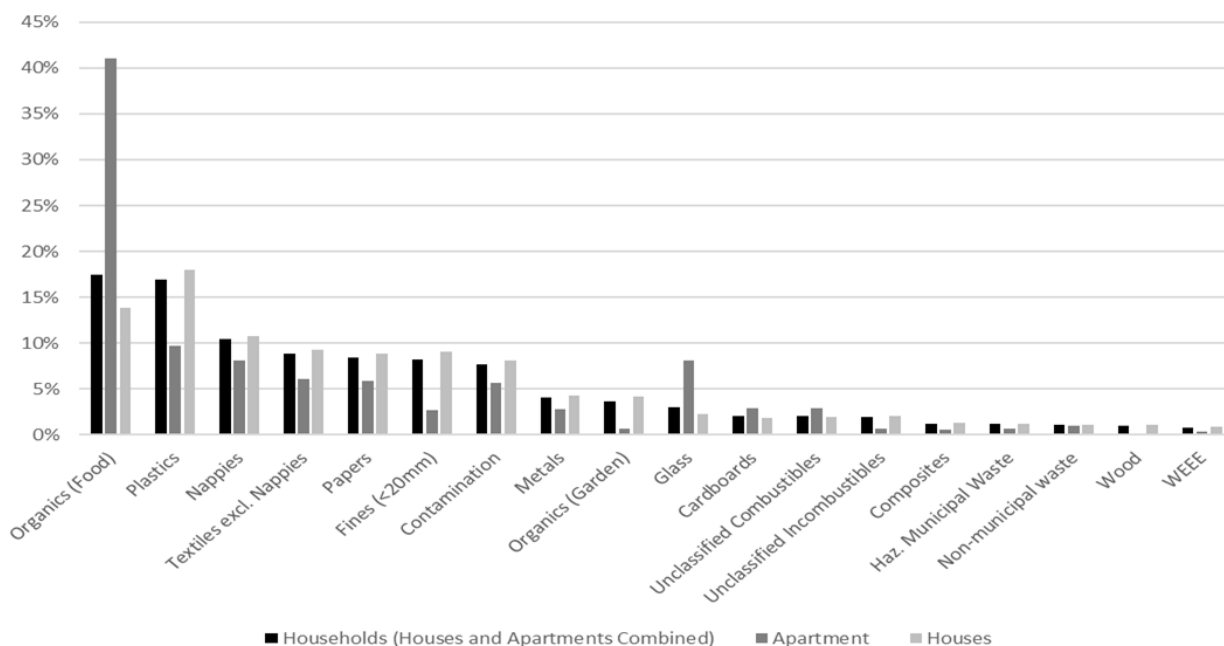
Figure 3-4: Composition of Kerbside Household MRW

Like apartments the three most prominent categories were organics (food), plastics, and nappies waste.

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The largest primary category in the MRW kerbside collection from households was organics (food) (17.5%). This primary sub-categories within this were food waste (17%) and liquid fit for human consumption waste (0.5%).

The second largest primary category was plastic (17%). Within the plastics category were supermarkets bags and films (packaging) (5%), 'other' plastic (non-packaging) (4%) and 'other' packaging incl. cups and other containers) (2%), PET packaging bottles (1%), PE packaging bottles (1%) and PP packaging bottles (0.1%).

Nappies & incontinence wear, the third largest fraction, formed 10% of the combined national MRW profile.

As illustrated in **Figure 3-4,** there were significant differences in the composition of kerbside collections between houses and apartments. Specifically, the presence of food waste was much higher in apartments (42%) than houses (14%). Plastics in MRW from houses (18%) was higher when compared to apartments MRW (10%).

3.2 Mixed Dry Recyclables

A total of 12 MDR samples from nine AWCs were analysed. **Table 3-4** shows the composition of MDR kerbside collections. Detailed results (corrected for contamination, with contamination counted in a separate category) are presented in **Appendix G**.

Table 3-4: Composition of Kerbside Household MDR

Waste Categories	Mean	Min	Max	Lower Limit	Upper Limit
Papers	22.8%	14.2%	33.4%	20.3%	25.3%
Cardboards	22.7%	16.4%	30.7%	20.5%	24.9%
Plastics	21.3%	15.6%	25.2%	20.0%	22.7%
Contamination	9.6%	6.7%	14.1%	8.7%	10.6%
Metals	5.9%	4.2%	7.7%	5.4%	6.3%
Composites	3.2%	1.7%	4.7%	2.8%	3.5%
Organics (Food)	3.0%	0.6%	13.6%	1.4%	4.7%
Fines (<20mm)	2.7%	0.0%	10.5%	1.1%	4.3%
Textiles excl. nappies	2.5%	0.2%	10.4%	1.3%	3.7%
Glass	2.1%	0.2%	15.0%	0.2%	4.0%
Unclassified Incombustibles	1.1%	0.0%	2.3%	0.6%	1.5%
Nappies	0.9%	0.0%	2.7%	0.5%	1.3%
Unclassified Combustibles	0.6%	0.2%	1.2%	0.5%	0.8%
Haz. Municipal Waste	0.4%	0.1%	1.1%	0.3%	0.6%
WEEE	0.4%	0.0%	2.2%	0.1%	0.7%
Wood	0.4%	0.0%	1.2%	0.3%	0.6%
Non-municipal waste	0.2%	0.0%	1.3%	0.0%	0.4%
Organics (Garden)	0.1%	0.0%	0.7%	0.0%	0.2%
Total	**100.0%**	**N/A**	**N/A**	**N/A**	**N/A**

The composition of kerbside household MDR is shown in **Figure 3-5**.
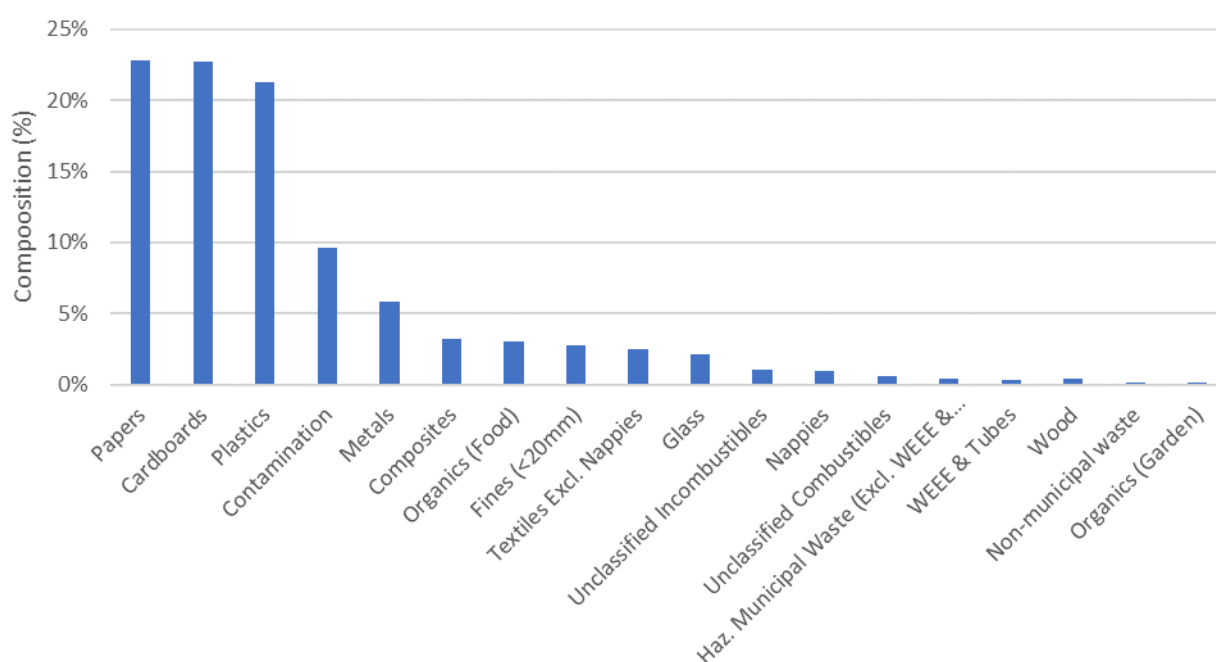
Figure 3-5: Composition of Kerbside Household MDR

The three most prominent waste categories in the MDR stream were papers, cardboards, and plastics. These three categories comprise two thirds of the total MDR stream.

The largest primary category was papers (23%). This category is comprised of newspapers (9%), magazines and glossy papers (5%), other papers (3%), recyclable paper (packaging) (2%), unrecyclable paper (packaging) (1%), office papers (2%) and tissue papers (1%).

The second largest primary category was cardboards (23%). This primary category includes the primary sub-categories of recyclable cardboard (packaging) (16%), unrecyclable flat and corrugated cardboard (packaging) (7%) and other cardboard (non-packaging) (1%).

Plastics constituted the third largest primary category (21%). Within the plastics category were primary sub-categories: supermarkets bags and films (packaging) (4%), other plastic (non-packaging) (2%) and packaging incl. cups and other containers) (2%), PET packaging bottles (5%), PE packaging bottles (3%) and PP packaging bottles (0.1%).

All other categories each comprised less than 10% and the detailed results (corrected for contamination, with contamination counted in a separate category) are available in **Appendix G**.

Figure 3-6 shows the composition of the MDR stream, including the fraction that was on target and off target.
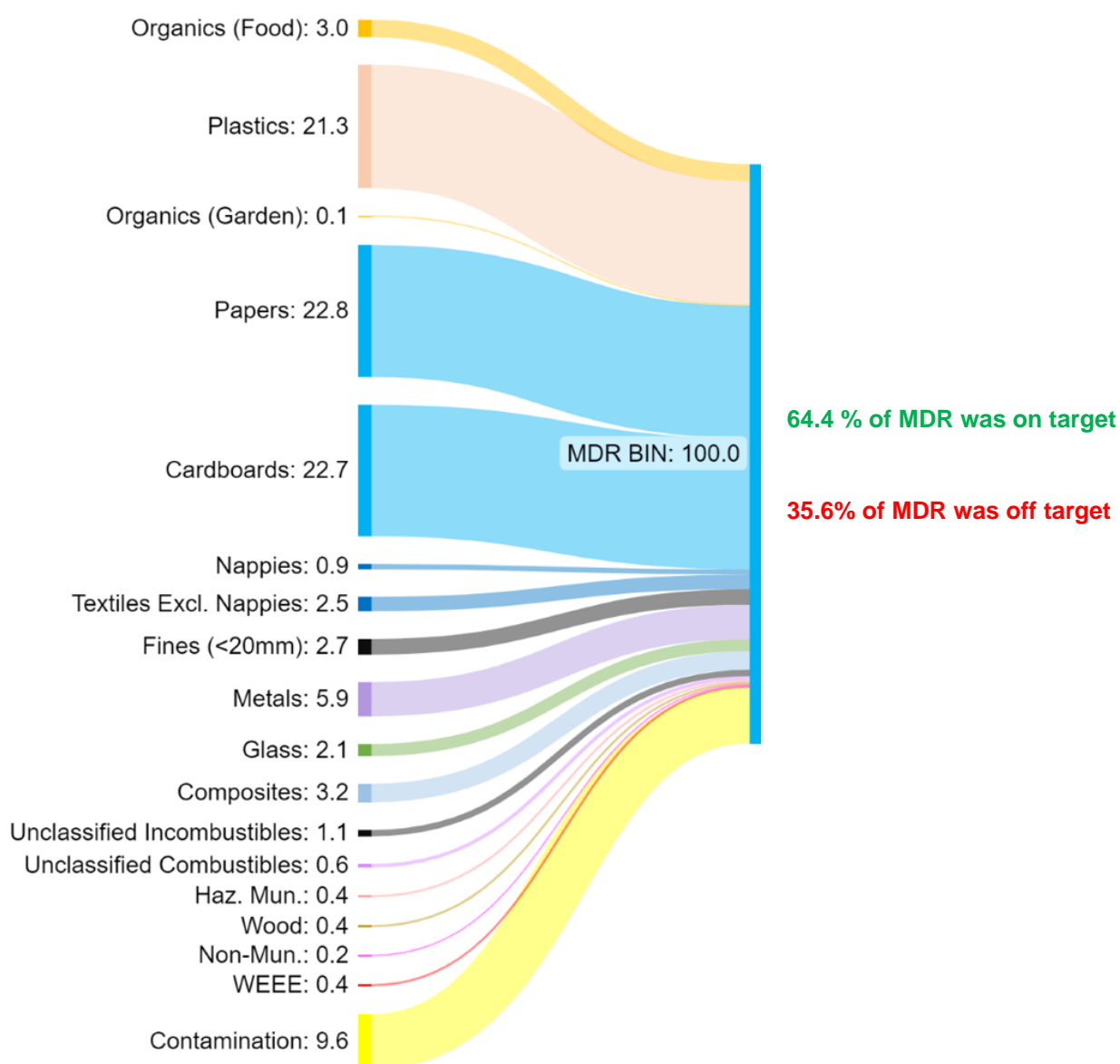
Figure 3-6: MDR Percentage Composition and Percentage on and Off Target

3.3 Organic Waste

A total of eight OW samples from four AWCs were analysed over the course of two survey campaigns to investigate the waste composition. **Table 3-5** presents the data on the composition of OW kerbside collections. Detailed results (corrected for contamination, with contamination counted in a separate category) are presented in **Appendix H.**

Table 3-5: Composition of Kerbside Household Organic Waste

Waste Categories	Mean	Min	Max	Lower Limit	Upper Limit
Organics (Garden)	64.4%	15.6%	88.3%	51.0%	77.8%
Organics (Food)	29.0%	0.0%	83.5%	13.4%	44.7%
Plastics	4.2%	0.0%	15.1%	1.4%	7.1%
Papers	0.6%	0.0%	2.6%	0.0%	1.2%
Cardboards	0.4%	0.0%	2.6%	-0.1%	0.9%
Textiles excl. Nappies	0.4%	0.0%	3.3%	-0.2%	1.1%
Fines (<20mm)	0.3%	0.0%	1.2%	0.0%	0.5%
Composites	0.1%	0.0%	0.6%	0.0%	0.2%
Nappies	0.1%	0.0%	0.7%	0.0%	0.3%
Glass	0.1%	0.0%	0.6%	0.0%	0.2%
Metals	0.1%	0.0%	0.8%	0.0%	0.3%
Wood	0.1%	0.0%	0.5%	0.0%	0.2%
Haz. Municipal Waste (Excl. WEEE)	0.0%	0.0%	0.1%	0.0%	0.0%
WEEE	0.0%	0.0%	0.1%	0.0%	0.0%
Unclassified Combustibles	0.0%	0.0%	0.2%	0.0%	0.1%
Unclassified Incombustibles	0.0%	0.0%	0.3%	0.0%	0.1%
Non-municipal waste	0.0%	0.0%	0.0%		
Total	**100.0%**				

The composition of OW kerbside collections is illustrated in **Figure 3-7**.
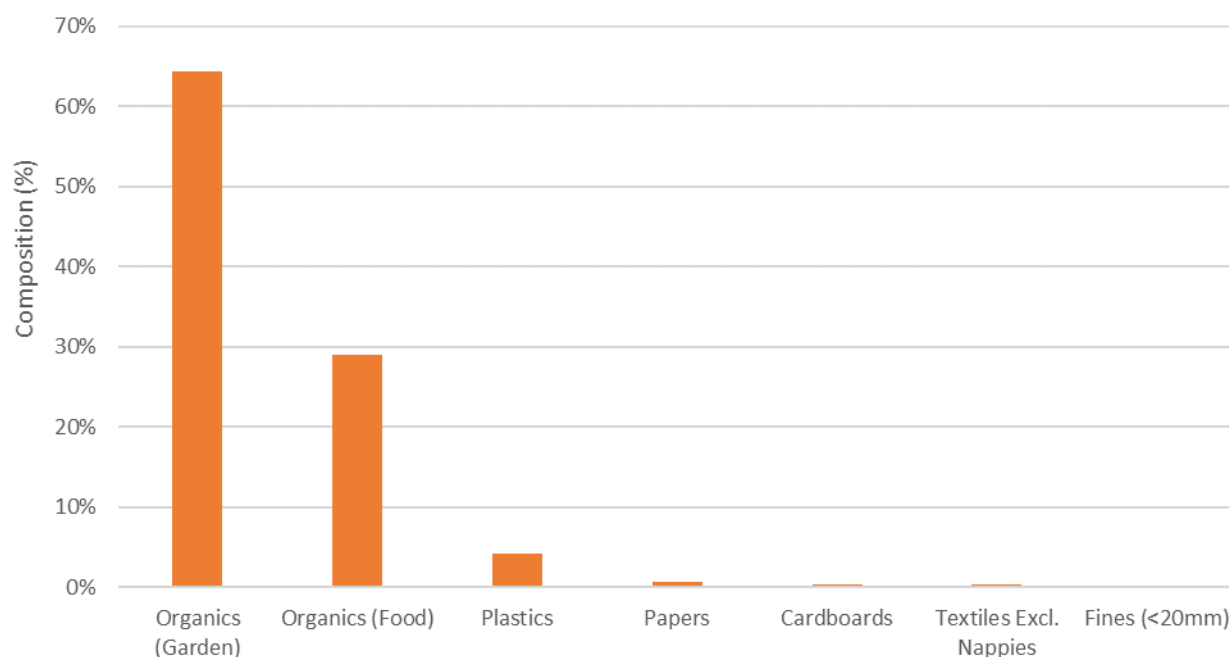
Figure 3-7: Composition of Household Organic Waste (fractions >2%)

Organics (garden) (64%) was the largest category of OW. This category comprises materials such as grass clippings and hedge trimmings.

Organics (food) formed 29% of OW, of which food waste (27%) was a large share, with oils and drink the remainder.

The remaining components were plastics (4%), and papers (0.6%), which was mostly tissue (0.4%) and newspapers (0.2%) and textiles (0.5%). All other wastes accounted for less than 0.1%. **Figure 3-8** shows the composition of the OW stream, including the fraction that was on target and off target. The non-target fraction in OW is lowest of the three bin streams, MRW, MDR, and OW.
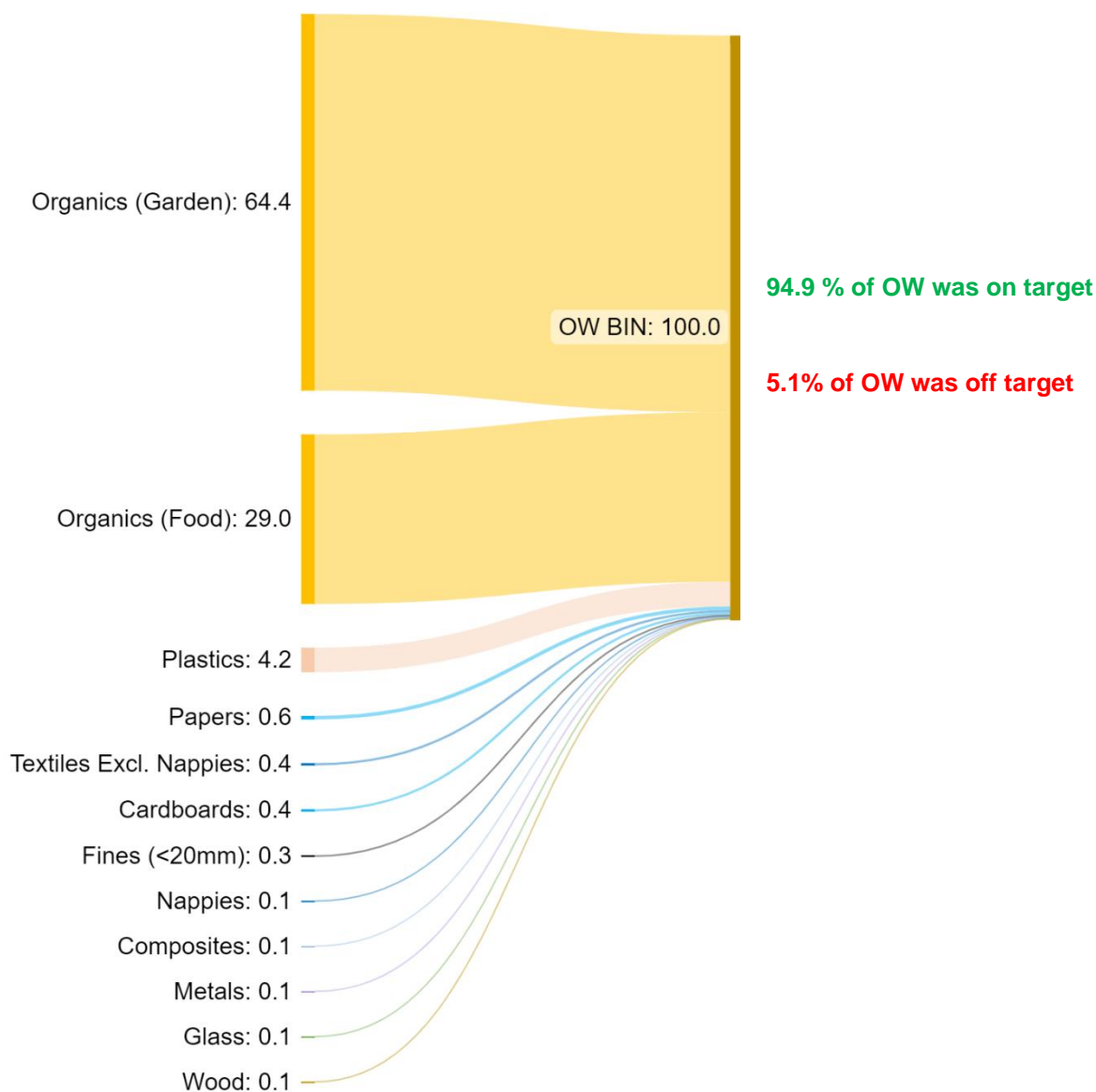
Figure 3-8: OW Percentage Composition and Percentage on and Off Target

3.4   Contamination

Contamination refers to two main types of contamination – residual contamination and cross-contamination. The contamination percentages calculated for the twenty-two different packaging materials assessed from MRW and MDR samples collected are outlined in **Table 3-6**. These results are depicted graphically in **Figure 3-9** and **Figure 3-10**.

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Table 3-6: Contamination Percentages in Packaging Categories of Household MRW and MDR

Packaging primary sub-categories	MRW 2bin		MDR 2bin		MRW 3bin		MDR 3bin	
	No. of items	Contamination (%)	No. of items	Contamination (%)	No. of items	Contamination (%)	No. of items	Contamination (%)
Recyclable paper packaging	3	16.4%	22	19.5%	12	37.8%	40	12.6%
Unrecyclable paper packaging	0	-	16	27%	29	42.4%	12	29.8%
Cardboard (Packaging)	0	-	10	11.5%	20	25.8%	51	13.9%
Unrecyclable flat & corrugated card. (packaging)	6	33.3%	0	-	2	74.8%	34	28.4%
Composite cups for beverages, & same polymer covers & lids (packaging)	4	46.7%	20	15.7%	15	33.8%	27	10.7%
Composite packaging	17	33.9%	15	8.3%	20	37.3%	42	15.4%
PET packaging beverage bottles	19	25.6%	20	9.6%	22	26.0%	48	10.8%
PET packaging containers	17	15.1%	16	15.1%	20	30.6%	38	9.4%
PET cups for beverages & same polymer covers & lids	0	-	0	-	0	-	0	-
PE plastic packaging bottles & same polymer lids	14	22.5%	0	-	32	18.0%	41	8.2%
PP packaging containers (other than bottles & lids) including same polymer covers.	17	27.4%	21	5.7%	18	7.2%	19	15.7%
EPS & Styrofoam packaging food & beverage containers	15	21.7%	20	25.1%	6	34.9%	21	10.4%
EPS & Styrofoam (other than SUP) Packaging non-food	0	-	14	35.8%	15	48.6%	15	9.8%
Other plastic cups for beverages, & same polymer covers & lids	0	-	0	-	0	-	1	-
Other plastic packaging containers	0	-	11	4.2%	8	29.7%	50	16.6%
Other plastic packaging bottles	0	-	0	-	0	-	0	-
Other plastic packaging	34	56.2%	12	9.3%	22	36%	30	17.4%
Supermarket bags, plastic bags & films, wrappers, & compostable bags (packaging)	15	14.9%	11	16.3%	20	39.8%	10	28.5%
Glass (packaging)	11	11.6%	13	8.5%	16	6.1%	9	4.6%
Ferrous metal (packaging)	5	1.7%	15	8.1%	35	9.4%	42	4.9%
Aluminium cans (packaging)	20	37.0%	16	5.9%	16	20.0%	50	3.8%
Other non-ferrous metal (packaging)	5	37.9%	0	-	5	18.1%	17	33.0%

An entry '- 'denotes that no laboratory data was generated for these categories as inadequate samples were available for analysis.
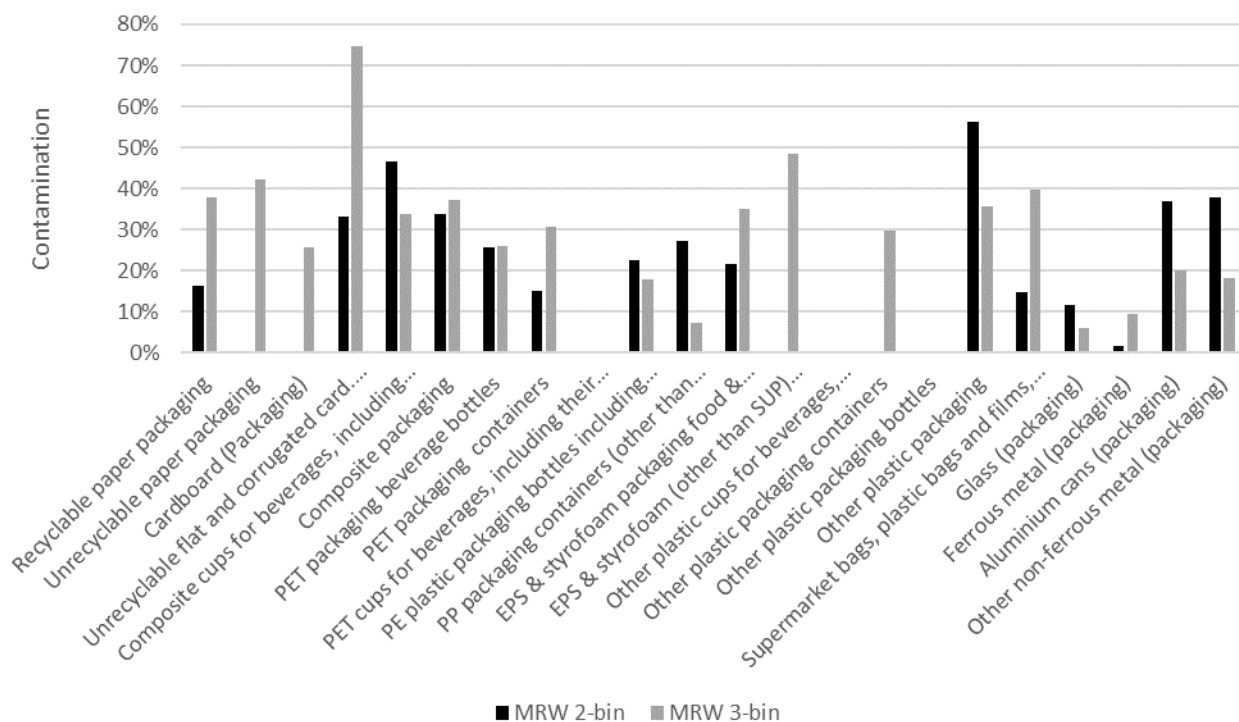
Figure 3-9: Contamination Percentage in Household MRW

The items in kerbside household MRW collections with the highest contamination rates were

- Unrecyclable flat and corrugated cardboard (packaging) (75%) in the 3bin system.
- 'Other' plastic (packaging) (56%) in the 2bin system.
- EPS & Styrofoam (other than SUP) non-food (packaging) (49%) in the 3bin system.

The items in kerbside household MRW collections with the lowest levels of contamination were

- Ferrous metal (packaging) (2%) in 2bin system.
- Glass (packaging) (6%) in 3bin system.
- PP packaging container (7%) in 3bin system.

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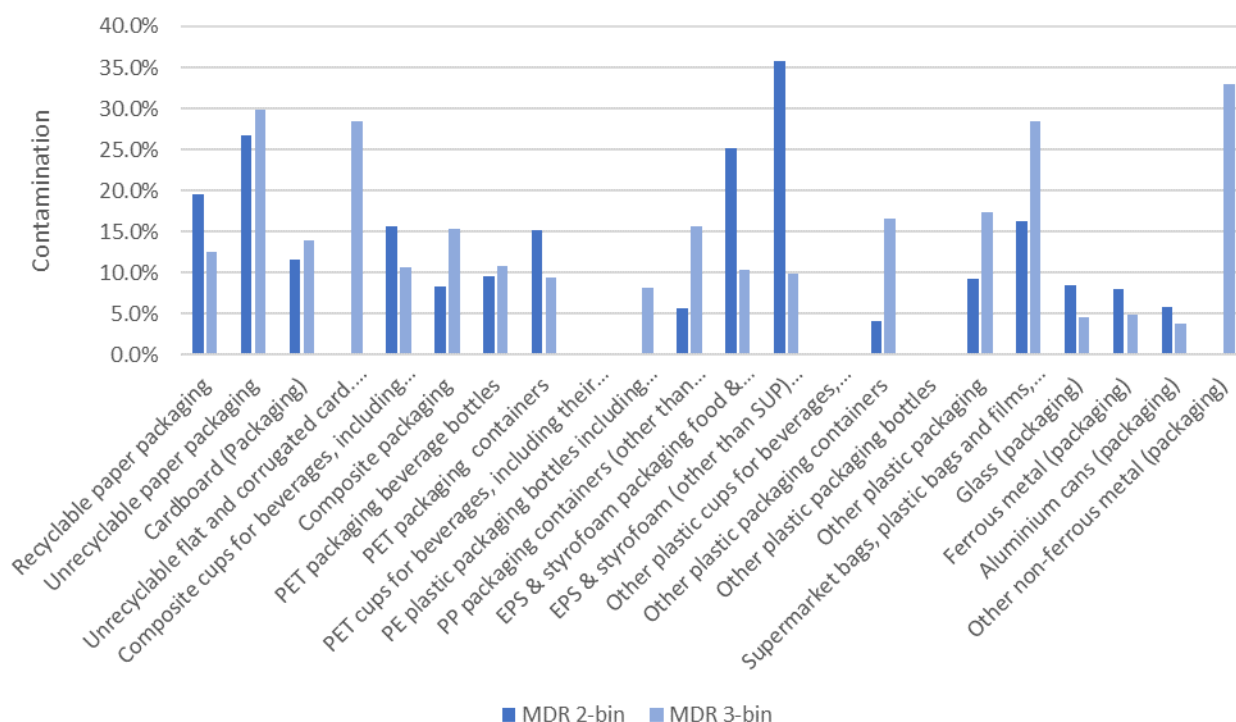
Figure 3-10: Contamination percentage in Household MDR

The three items with the highest contamination rates in kerbside household MDR collections were:

- EPS & Styrofoam (other than SUP) (packaging) non-food (36%) in 2bin systems.

- Other non-ferrous (packaging) (33%) in 3bin systems.

- Unrecyclable paper (packaging) (30%) in 3bin systems.

Items with the lowest contamination rates in kerbside household MDR collections were

- Aluminium cans (packaging) (4%) in 3bin system.

- Other plastic packaging containers (4%) in 2bin systems.

- Glass (packaging) (5%) in 3bin systems.

As in 2018, the results from the 2bin and 3bin systems were combined using weighting based on the prevalence to obtain indicative contamination factors for the overall MRW and MDR streams, see **Table 3-7**.

Table 3-7: Contamination in Household MRW and MDR

Packaging primary sub-categories	MRW	MDR
	Contamination percentage	
Recyclable paper packaging	31.3%	14.9%
Unrecyclable paper packaging	41.5%	28.8%
Cardboard (Packaging)	25.1%	13.1%
Unrecyclable flat and corrugated card. (packaging)	62.3%	24.3%
Composite cups for beverages, & same polymer covers and lids (packaging)	37.7%	12.4%
Composite packaging	36.3%	13.0%
PET packaging beverage bottles	25.9%	10.4%
PET packaging containers	25.9%	11.3%
PET cups for beverages, & same polymer covers and lids	25.9%	11.3%
PE plastic packaging bottles & same polymer lids	15.7%	11.5%
PP packaging containers (other than bottles and lids) including similar covers.	12.2%	12.9%
EPS & Styrofoam packaging food & beverage containers (SUP)	31.0%	15.3%
EPS & Styrofoam (other than SUP) Packaging non-food	52.0%	18.5%

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Packaging primary sub-categories	MRW	MDR
	Contamination percentage	
Other plastic beverage cups & same polymer covers/lids	26.0%	12.5%
Other plastic packaging containers	26.0%	12.5%
Other plastic packaging bottles	25.9%	10.4%
Other plastic packaging	26.0%	14.6%
Supermarket plastic bags and films, wrappers, & compostable bags (packaging)	32.3%	24.4%
Glass (packaging)	7.8%	5.9%
Ferrous metal (packaging)	7.1%	5.9%
Aluminium cans (packaging)	25.1%	4.5%
Other non-ferrous metal (packaging)	24.1%	29.7%

The factors are shown graphically in **Figure 3-11**.
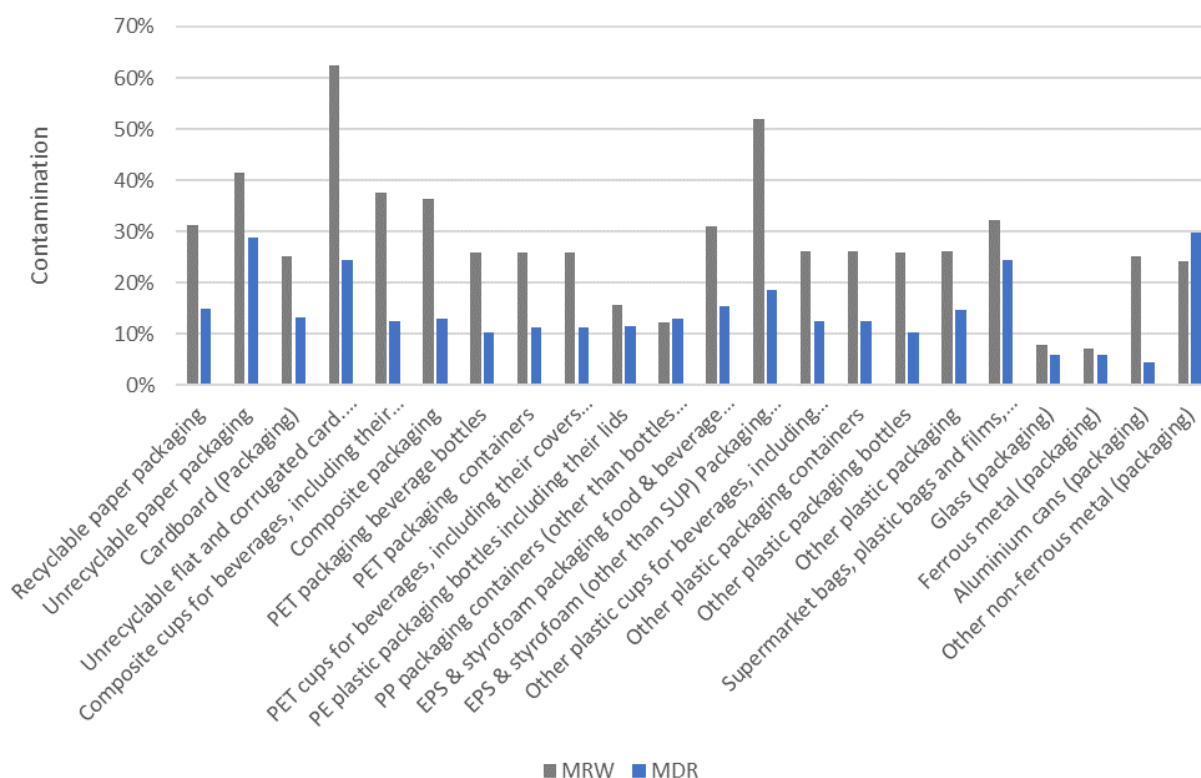
Figure 3-11: Contamination in Household MRW and MDR

For most packaging waste categories, contamination rates are approximately 1-3 times higher in MRW than the MDR. Aluminium cans were 5.6 times more contaminated in MRW, reflecting how clean cans are in MDR.

It was expected that contamination would be lower in the MDR than in MRW, as householders are requested to clean recyclables to remove residual-contamination before placing them in the MDR. Further, packaging waste items in the MRW have higher likelihood of being cross contaminated by MRW such as nappies and food waste.

Certain categories were not targeted by design or certain categories were not encountered. In these instances, comparative assumptions were agreed to find suitable contamination factors to apply to the waste characterisation data. For example, the assumption was made that PET and PP beverage bottles had similar rates of contamination.

3.4.1   Comparison of contamination 2018 to 2022

A comparison between the MRW and MDR results from this current 2022 study and those available from 2018 HHWMC studies is presented in **Figure 3-12** and **Figure 3-13**. The 2018 HHWMC studies analysed a

smaller number of categories, so the comparison only includes categories common to the 2018 and the 2022 HHWMC studies.

Contamination rates on packaging categories in the MRW have changed since 2018 as follows:

- The highest contamination rate was for unrecoverable plastic packaging which increased 15% between 2018 (42%) to 2022 (57%).

- Cardboard plastic packaging contamination increased since 2018 (23%) to 2022 (44%).

- Contamination of composite packaging has increased since 2018 (36%) to 2022 (37%).

- Paper packaging contamination has increased since 2018 (28%) to 2022 (36%).

- Other changes recorded were smaller:

  – The contamination recorded for glass packaging increased from 2018 (4%) to 2022 (8%).

  – PP packaging contamination recorded decreased from 2018 (29%) to 2022 (12%).

  – PE packaging contamination recorded decreased between 2018 (20%) and 2022 (16%).
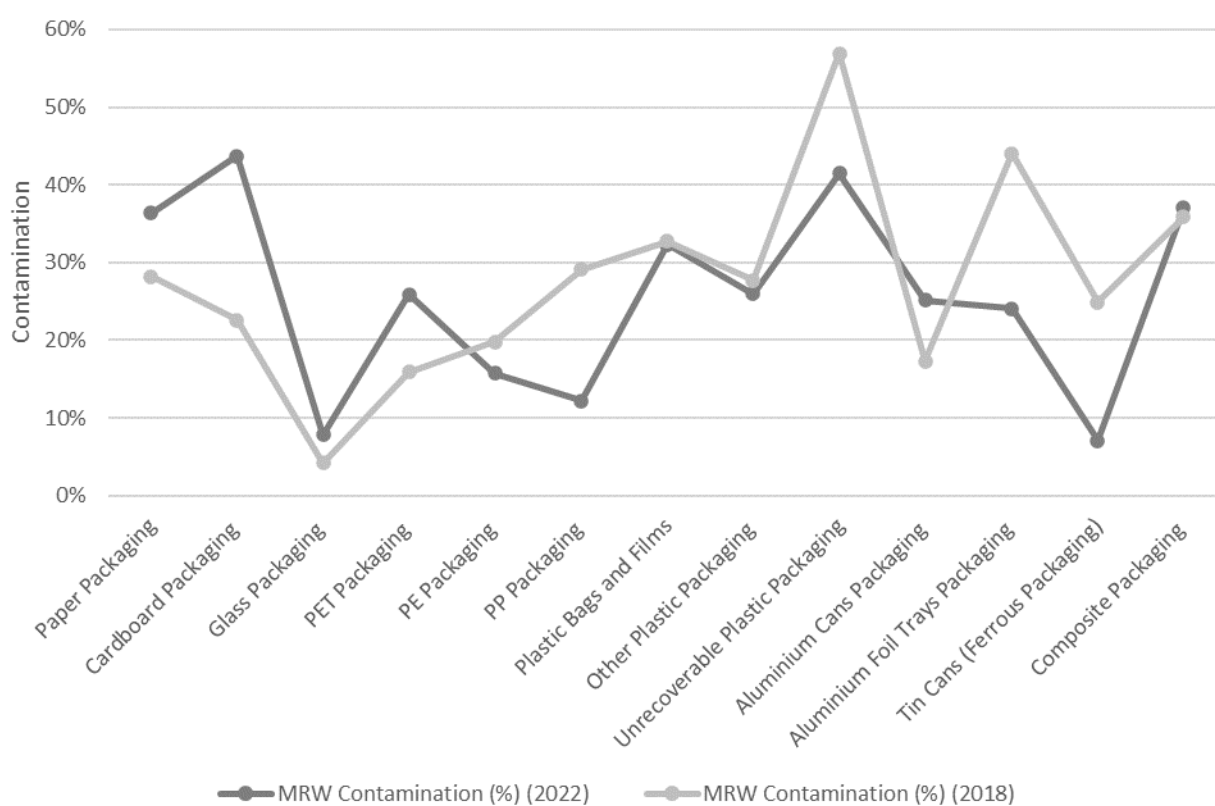
Figure 3-12: Comparison of Contamination Factors for Kerbside MRW (2018, 2022)

Contamination rates for packaging categories in the MDR have changed since 2018 as follows:

- The highest contamination rate was for aluminium foil trays which increased 2018 (27%) to 2022 (30%).

- Plastic bags and films contamination increased since 2018 (5%) to 2022 (24%).

- Other plastic packaging contamination has increased since 2018 (8%) to 2022 (13%).

- Contamination of glass packaging decreased since 2018 (27%) to 2022 (6%).

- Other changes recorded were smaller:

  – The contamination recorded for paper packaging increased from 2018 (18%) to 2022 (22%).

  – Cardboard packaging contamination recorded increased from 2018 (16%) to 2022 (19%).

  – PP packaging contamination recorded increased between 2018 (11%) and 2022 (13%).
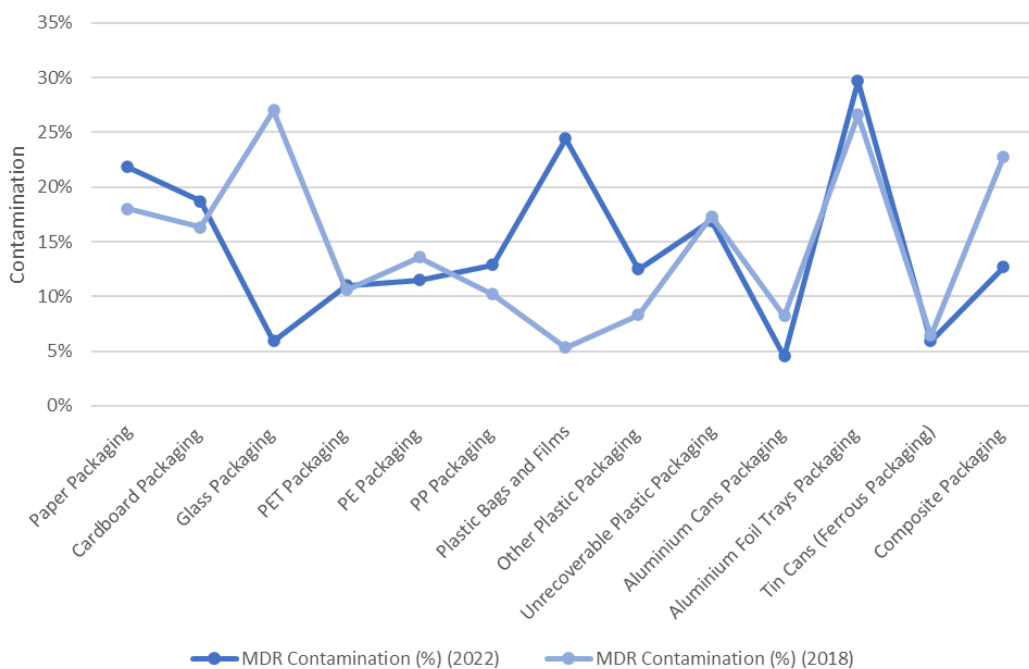
Figure 3-13: Contamination Factors for Kerbside Household MDR (2018 & 2022)

Data was not gathered on the composition of the type of contamination extracted, but it is likely that moisture (especially for paper) and organics (food) formed major fractions. A recommendation to examine composition in future waste characterisation has been made in the recommendations section of this report (**Section 5.1**).

3.5 National Kerbside Household Waste Profile

The national profile of kerbside household waste is a representation of waste generation and management, practices in Ireland.

To generate the national profile, the average (percentage) waste composition for each kerbside waste stream (MRW, MDR and OW) as described in Sections 3.1 to 3.3 were applied to total quantities of kerbside household waste collected in 2021[14].

Detailed results for primary sub-categories in the national profile (corrected for contamination, with contamination counted in a separate category) are presented in **Appendix I. Figure 3-14** shows the national profile for kerbside household waste.
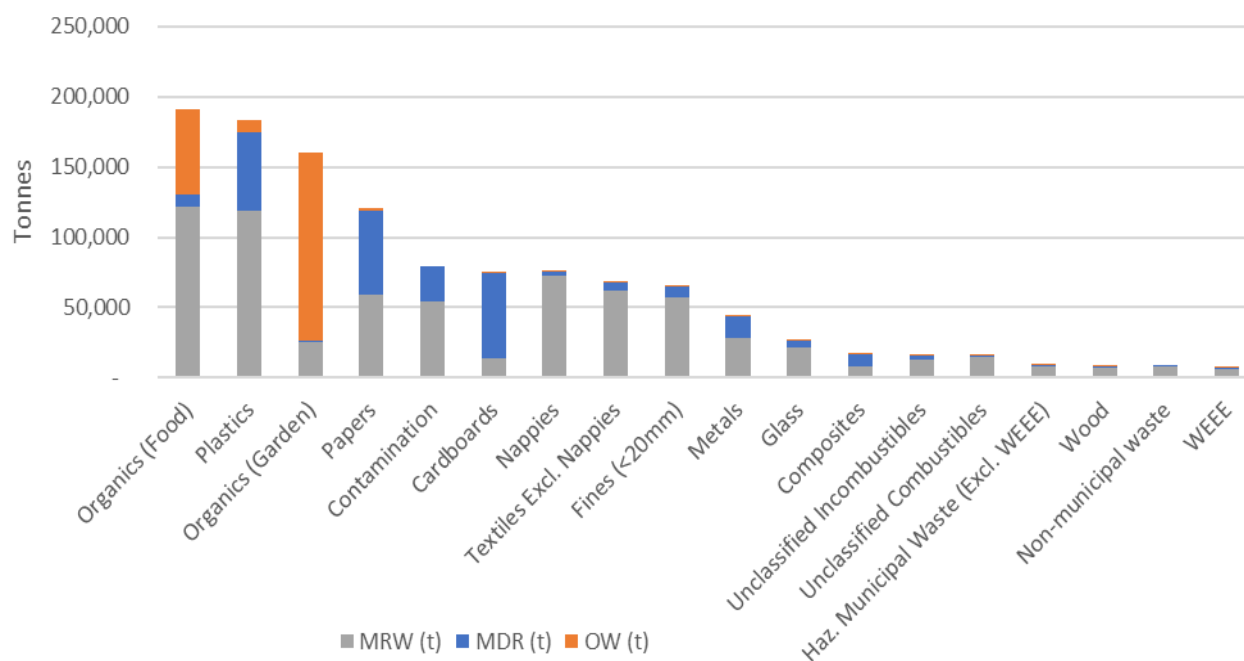
Figure 3-14: National Profile for Kerbside Household Waste 2022

The most prominent category was **food organics** averaging 16% of the total composition. Of this 64% was found in the MRW, with rest split between OW (32%) and MDR (4%).

The second largest primary category was **plastic waste** which formed 16% of the total composition. Of this 65% was captured in MRW and 31% remained in the MDR.

Of the remaining categories, the following are most notable:

- **Garden organics** averaged 14%, with 84% of garden organics remaining in the OW and the 16% collected in the MRW. A small percentage (0.2%) is present as non-target material in the MDR.

- **Paper waste** formed 10% of the total composition. Of this 50% is in the MDR and 49% in the MRW.

- **Cardboard waste** formed 6% of the total composition and were mainly in MDR (80%) and MRW (19%).

- **Nappies** averaged 6% of the total composition and were mainly in MRW (96%) and MDR (3%).

- **Textiles waste (excl. nappies)** averaged 6% and were mainly in MRW (89%) and MDR (10%).

- **Fines (<20mm)** averaged 6% and were mainly in the MRW (88%) and in the MDR (11%).

- **Metal** waste averaged 4% and were mainly in the MRW (64%) with the rest in the MDR (35%).

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[14] Most recent NWCPO data available. Source: EPA on 11/01/2022.

Table 3-8: National Profile Kerbside Household Waste 2022

Waste Categories	MRW	MDR	OW	MRW	MDR	OW	% Of Net weight	National Profile
	(%)			(t)			(%)	(t)
Organics (Food)	64.0%	4.2%	31.8%	122,041	7,954	60,594	16.3%	190,589
Plastics	64.5%	30.7%	4.8%	118,372	56,261	8,845	15.6%	183,478
Organics (Garden)	16.1%	0.2%	83.7%	25,796	315	134,392	13.7%	160,504
Papers	48.9%	49.9%	1.1%	59,016	60,232	1,351	10.3%	120,599
Contamination	68.0%	32.0%	0.0%	54,156	25,431	-	6.8%	79,587
Cardboards	18.9%	80.1%	1.0%	14,173	59,932	750	6.4%	74,855
Nappies	96.4%	3.2%	0.4%	72,909	2,396	312	6.4%	75,618
Textiles excl. nappies	89.2%	9.5%	1.3%	61,684	6,584	903	5.9%	69,172
Fines (<20mm)	88.2%	11.0%	0.8%	57,604	7,176	528	5.6%	65,309
Metals	64.4%	35.0%	0.6%	28,450	15,469	247	3.8%	44,167
Glass	78.4%	20.9%	0.7%	21,109	5,638	181	2.3%	26,929
Composites	48.8%	49.8%	1.5%	8,219	8,384	247	1.4%	16,851
Unclassified Incombustibles	82.2%	17.2%	0.5%	13,266	2,780	86	1.4%	16,132
Unclassified Combustibles	89.5%	10.2%	0.3%	14,529	1,661	50	1.4%	16,239
Haz. Municipal Waste (Excl. WEEE)	88.4%	11.4%	0.2%	7,687	992	14	0.7%	8,693
Wood	83.9%	13.9%	2.3%	6,963	1,152	189	0.7%	8,304
Non-municipal waste	94.4%	5.6%	0.0%	7,807	465	-	0.7%	8,272
WEEE	84.4%	15.2%	0.4%	6,179	1,115	28	0.6%	7,323
Total	59.7%	22.5%	17.8%	699,961	263,939	208,719	100%	1,172,618

4 ANALYSIS AND DISCUSSION

4.1 Non-Target Materials

Waste composition analysis allowed the identification and quantification of 'target' and 'non-target' materials in the household kerbside waste bins. The target list was compiled by the project team following review of waste management guidance from MyWaste (www.mywaste.ie). The non-target list includes items that should be placed in another kerbside bins or brought to bring centres. See **Appendix K** for list of target materials.

The correct separation of waste ensures items can be properly disposed of or recycled in the most efficient and environmentally friendly way. Correctly segregating recyclable materials can help reduce future extraction and consumption of virgin materials and support the circularity of materials. Materials incorrectly placed in the MDR and OW bins can contaminate and reduce the quality of recycled materials and compost, reducing the inherent value.

Figure 4-1 shows the percentage breakdown of materials in the national profile that are on and off target. This shows variable performance with the MRW performing least well, MDR better and OW performing best.
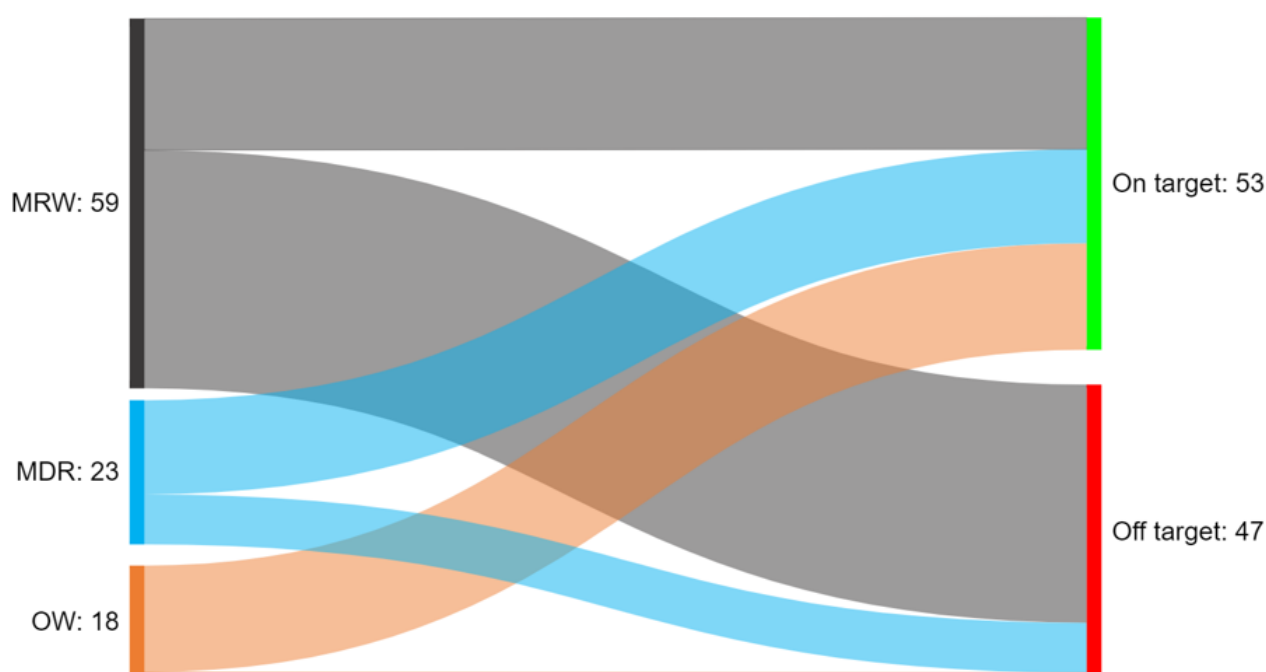
Figure 4-1: Composition (%) Kerbside Household Waste and Target and Non-Target Materials

Overall, a significant percentage (47%) of kerbside household waste could be better segregated into the appropriate bin and more sustainably managed to maximise the circular potential of these resources.

4.1.1   Mixed Residual Waste

The composition of materials incorrectly placed in the MRW is presented in **Figure 4-2**. Non target materials accounted for 64% of the items placed in the MRW bin. These materials could, instead of being placed in the MRW bin, have been directed into MDR[15] (24%) and OW streams[16] (22%) or brought to a bring centre (19%).

The fractions that could have been placed in the organic waste bins include food waste (17%), organics (garden) (4%) and compostable plastics (0.2%).

Plastics (17%), paper (3%), metals (3%) and cardboard (1%) were the main materials that could have been deposited into the MDR bin.

The main primary sub-categories within plastics were supermarket bags and films (5%), 'other' plastic (non-packaging) (4%) and 'other' packaging incl. cups and other containers) (2%), PET packaging bottles (1%) and PP packaging containers (1%).

Recyclable paper packaging (1%) and 'other' papers (1%) are the largest primary subcategories from the paper primary category incorrectly placed in the MRW.

Certain items are unsuitable for disposal in the kerbside system and should instead have been brought to bring centres. These 'non-target' items comprised (19%) of the total composition and included textiles (excluding nappies) (9%) and glass (3%) and WEEE (0.8%).
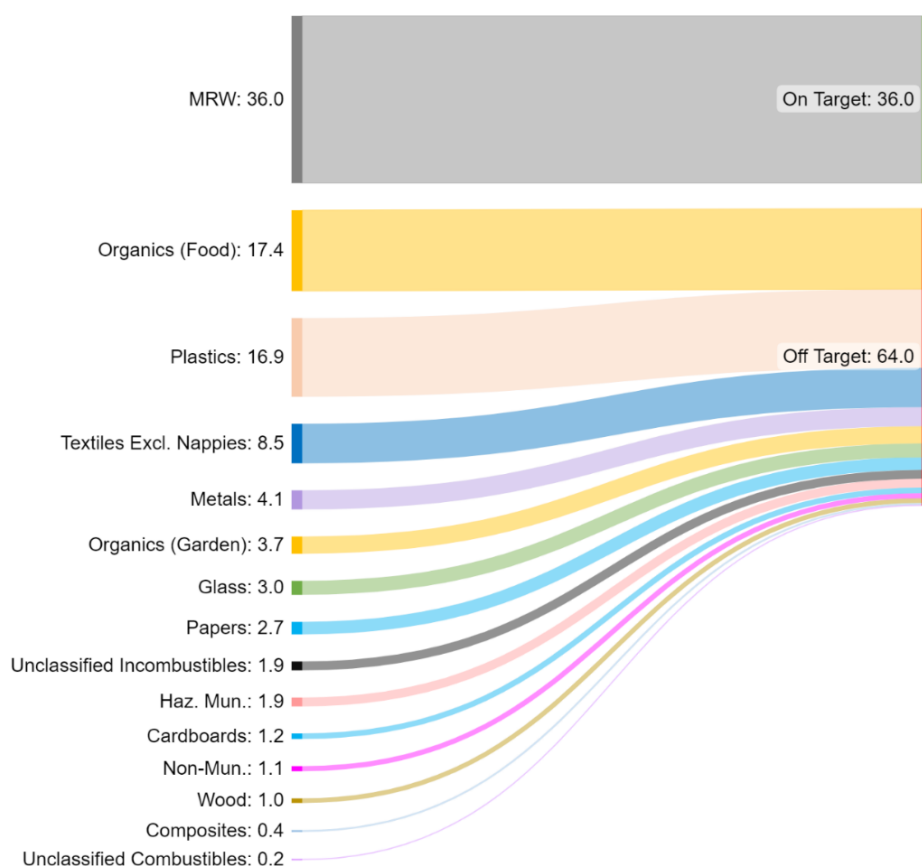
Figure 4-2: Composition (%) of Material Incorrectly Placed in the MRW Stream

Food waste and plastic waste were identified as particularly prevalent in the MRW stream. The prominence of

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[15] Recyclable and Recyclable Paper Packaging, Newspapers, Magazines & glossy paper, Office papers, other papers, Flat Card, and Corrugated Cardboard (Packaging), Other cardboards (Non-packaging), Composite beverage cartons (e.g., Tetra Pak), PET packaging, PE packaging, PP Packaging, Ferrous metal packaging, Aluminium cans.

[16] Food waste, biodegradable waste from garden & park, tissue papers.

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food waste in the MRW bin could be due to:

- A lack of awareness amongst households of the importance of separating food from other waste types such as plastic packaging or about what food types can be placed in the MDR or OW bin, even where there is access to an OW bin service. These houses may then improperly place these wastes into the MRW.

- Households that have an OW bin service may find it more convenient to dispose of all OW in one bin, MRW, rather than segregating.

- Households that have an OW bin service may find that the charging mechanism in place may not adequately reward segregation effort and based on a financial determination use the MRW bin instead.

- Not all households are provided with an OW collection service. Where home composting is not an option, these households have little alternative to using the MRW bin to manage OW.

- Increased provision of appropriately incentivised and enforced OW collection services would capture more organic waste including food waste.

Elevated levels of recyclable plastic waste in household MRW bins may be attributable to factors including:

- Widespread use of plastic and the convenience of plastic packaging. Plastic is frequently used to package food and various other products, tomatoes for instance being commonly packaged using rigid plastic tray and a soft plastic wrapper.

- Plastic bags – shopping or packaging or bin liners – were frequently encountered. These are commonly used for convenience and low cost. These materials are often discarded after a single use or used as bin liners and subsequently discarded.

- Changes in instructions to the public about target materials accepted in kerbside waste collections. Soft plastics had been an MRW target material in 2018 but were added[17] to the MDR target list in 2021. This change might not have been embedded in household behaviour in 2022.

- Households may prefer the convenience of disposing contaminated plastics in MRW bins rather than cleaning, drying, and placing them in the MDR bin regardless of the environmental impacts of the practice.

The application of pay-by-weight charging for waste management already provides financial incentive against use of the MRW bin for non-target materials, but this and other existing incentives, together, may be ineffective in delivering the desired behaviour and diversion.

While the provision of OW and MDR bins can help to reduce food and plastic waste in MRW bins, it is essential to address the underlying issues that contribute to the elevated levels of recyclable waste in the MRW stream. Improving awareness and education on the importance of placing food and plastic waste in the correct bins.

4.1.2   Mixed Dry Recyclables

Non-target materials comprised 36% of the contents analysed in MDR stream. These materials should have been placed in the MRW[18] (14%), OW[19] (5%) and bring centres[20] (8%). **Figure 4-3** shows the composition of the non-target materials in the MDR stream.

Non-target materials placed in the MDR stream included: flat and corrugated cardboard that was unrecyclable

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[17] www.mywaste.ie/news/soft-plastic-recycling

[18] Unrecyclable paper (packaging), Unrecyclable flat ad corrugated cardboard (packaging), Coffee cups, smoothie cups (covers & lids to be put into a plastics category if made from plastic) (packaging), Other composites (packaging), Other composites (packaging) SUP, Other composites (non- packaging), Other composites (non- packaging) SUP, Nappies (& incontinence wear), Healthcare textiles, Polyfilla (& similar containers), Medicines & Drugs, Detergents, Unclassified combustibles (packaging), Coffee plastic pods, Unclassified combustibles (non-packaging), Fines (<20mm).

[19] Food waste, biodegradable waste from garden & park, Compostable Composites, Compostable Plastics,

[20] Textiles, Styrofoam & EPS (non-packaging), Styrofoam & EPS (non-packaging) SUP, Styrofoam, & EPS (packaging), Styrofoam & EPS (packaging) SUP, Glass (packaging), Glass (non-packaging), Wood Packaging, Untreated wood (non-packaging), Treated/composite wood (non-packaging), Water based paints, other paint & products, Batteries & Accumulators, WEEE, Fluorescent tubes & mercury containing wastes, Garden chemicals, Healthcare risk waste, Haz. domestic waste, Coffee aluminium pods, Unclassified incombustibles (packaging), Unclassified incombustibles (non-packaging), non-municipal waste.

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due to contamination (packaging) (7%), textiles and nappies (3%), organic waste (food and garden) (3%), paper (unrecyclable paper packaging and tissue papers) (3%), Fines (<20mm) (3%) and glass (2%).

Reasons for the presence of non-target materials in the MDR bin may include:

- Confusion about what can and cannot be recycled. Some households may believe that any paper or cardboard can be recycled, regardless of condition or quality. Others may be unsure about certain types of paper or cardboard, such as tissue paper.

- Changes in instructions to the public about target materials accepted in certain bins explain some differences between 2018 and 2022 surveys. Soft plastics were added[17] to the MDR target list during 2021. Compliance may have been developing slowly during the 2022 surveys. This is significant as film plastics packaging accounts significant portions of MDR (4%) and MRW (4.5%) in 2022.

- Households may dispose unrecyclable materials in the MDR bin out of convenience or lack of awareness on alternative, non-kerbside, disposal options.

- Inadequately incentivised waste management charging, especially with communal bins like in apartments.

- Inadequate enforcement of the rules on permissible bin contents.

Even at low levels certain non-target materials can have significant effects: nappies (0.9%), for example, present a disproportionately large potential for contamination. Glass (2%) similarly has been shown to have a negative effect on recycling potential of the paper content of MDR.
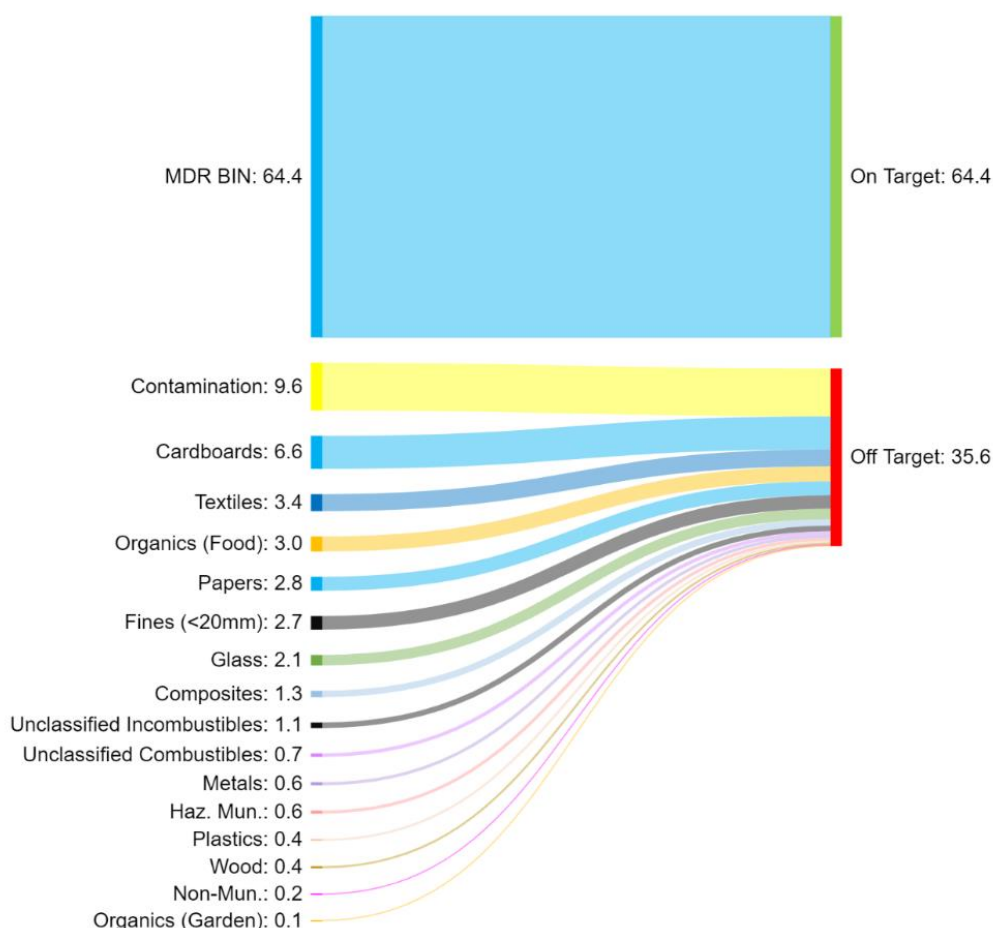
Figure 4-3: Composition (%) of Non-target Materials in the MDR Stream

4.1.3 Organic Waste

Non target materials comprised 5% of the materials in the OW. In OW bins, the main non-target materials in OW bins included supermarket bags, plastic bags, and films (2%), other plastic bottles (0.9%), and glass (0.1%). Non-packaging non-target materials included textiles (0.4%), untreated wood (0.1%), and nappies (0.1%). The composition of materials incorrectly placed in the MDR is presented in **Figure 4-4**.
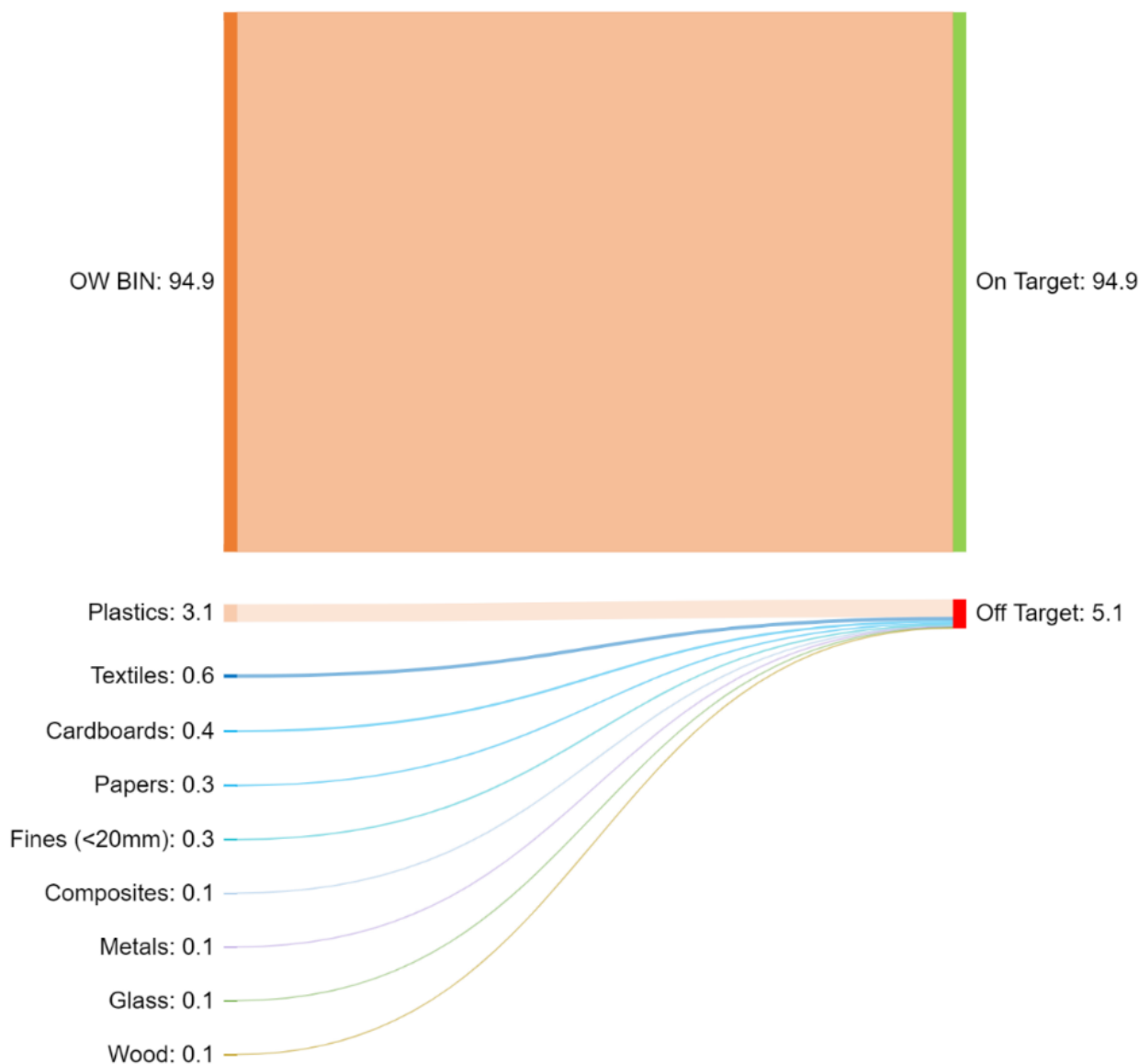
Figure 4-4: Composition (%) of Non-target Materials in the OW Stream

It is important to avoid placing non-target materials in the OW. Even low levels, non-compostable plastic and glass can have adverse effects on composting facilities, obstructing machinery, and contaminating compost product and reduce its quality.

The trend of non-target materials in the OW stream is improving since 2008 (13%), to 2018 (8%) to 2022 (5%).

4.2   Packaging Waste

4.2.1   Mixed Residual Waste

Packaging materials[21] comprised 23% of items in the MRW stream, as shown in **Table 4-1**. The main packaging primary sub-categories identified in MRW were plastic packaging (12%), packaging metals (3%), packaging glass (3%) packaging cardboard (2%), and paper packaging (2%).

In Ireland, clean dry and loose soft plastics can now be placed in the recycling bin alongside rigid plastics. The high proportion of 'supermarket bags, plastic bags, films, and wrappers' in the MRW stream indicates that many households are either unaware that soft plastic can be placed in MDR bins or are simply failing to implement this option. As awareness of the change grows, the volume of soft plastics in the MRW stream may decrease.

Packaging glass was present in every MRW (and MDR bin) despite nationwide provision of glass collection at bring centre networks and associated messaging. Packaging metals were present in every MRW bin, despite every household having an MDR collection service. Ongoing messaging about how best to manage packaging glass and metals is required.

4.2.2   Mixed Dry Recyclables

Packaging materials identified in the MDR stream accounted for 56%, as shown in **Table 4-1**.

The three most prominent packaging waste primary sub-categories in MDR were flat card and corrugated cardboard (packaging) (16%), unrecyclable flat card and corrugated cardboard (packaging) (7%) and PET packaging bottles (5%). These three primary sub-categories comprised over half of the packaging waste in MDR bins.

This survey quantified secondary subcategories which had not previously been investigated. Among these were the packaging waste subcategories, cardboard packaging used for delivery (post or other) (2%), milk bottles (2%), milk cartons (1%) and washing up bottles (0.1%).

Certain packaging items can pose a challenge for the waste management system. For instance, cardboard packaging used for delivery (post or other) are present at large and increasing volumes. Those placing this cardboard on the market need to contribute accordingly to compliance schemes for the costs of recycling. The category is also often contaminated with tape, or other substances that can hinder the recycling process.

4.2.3   Organic Waste

The packaging materials identified in the OW stream accounted for 5%, as shown in **Table 4-1**.

Packaging materials included supermarket bags and films (the biggest fraction) (3%), other plastics (1%), recyclable flat card and corrugated cardboards (0.3%), and PET (0.1%). Almost a quarter (24%) of packaging waste items in the OW stream was compostable. The volume of compostable packaging items may increase in the coming years as more businesses and consumers seek sustainable alternatives. The current HHMWC is the first to investigate the content of compostable packaging in kerbside household collected waste. Future HHMWC that focus on compostable packaging will help to identify patterns and determine whether these materials are being placed in the correct bin.

The packaging waste content of OW is effectively unchanged from 2018 (5%) to 2022 (5%).

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[21] Paper Packaging, Flat Card, and Corrugated Cardboard (Packaging), Composite beverage cartons (e.g., Tetra Pak), Textiles Packaging, PET packaging, PE packaging, PP Packaging, EPS Styrofoam Packaging, Supermarkets bags and films (packaging), Other plastic (packaging), Glass packaging, Ferrous metal packaging, Aluminium cans, Aluminium foil, other metal packaging, Wood packaging, Aerosols, Unclassified combustibles packaging, Unclassified incombustibles packaging,

4.2.4 National Profile

The previous sections discussed the proportions of packaging waste in each of the MRW (23%), MDR (56%) and OW (5%) streams as determined in the 2022 surveys. **Table 4-1** presents this data together.

When this data is weighted to reflect the differing contributions of the three streams, they can be combined to present a weighted national profile. To calculate this, the fractions identified in the surveys are applied to the total waste collected in each bin and this fraction is then applied to the total national kerbside collection to generate a national profile of packaging waste in the kerbside stream. This is presented in **Table 4-2** below**.**

Table 4-1: Proportion of Packaging Waste in each Kerbside Stream

Primary Subcategory Waste	MRW	MDR	OW
Recyclable and Recoverable Paper	0.8%	2.1%	0.0%
Unrecyclable paper	0.9%	1.4%	0.0%
Recyclable Flat Card and Corrugated Cardboard	1.1%	15.5%	0.3%
Unrecyclable Flat and Corrugated Cardboard	0.8%	6.6%	0.1%
Coffee cups, smoothie cups (packaging)	0.2%	0.4%	0.0%
Beverage cartons (packaging)	0.4%	1.9%	0.0%
Other composites (packaging)	0.3%	0.8%	0.1%
Textiles (packaging)	0.1%	0.2%	0.0%
PET (packaging)	2.3%	7.4%	0.1%
PE (packaging)	1.5%	3.7%	0.03%
PP (packaging)	1.4%	1.8%	0.01%
Supermarket bags and films	4.5%	3.7%	2.8%
Shrink wrap and pallet wrap packaging	0.1%	0.2%	0.0%
EPS Styrofoam packaging	0.1%	0.2%	0.1%
Other plastic packaging	2.4%	1.8%	0.9%
Glass (packaging)	2.7%	2.1%	0.1%
Ferrous metal packaging	1.2%	2.7%	0.0%
Aluminium cans	0.6%	2.3%	0.0%
Aluminium foil (packaging)	0.9%	0.2%	0.0%
Other metal (packaging)	0.0%	0.0%	0.0%
Wood (packaging)	0.1%	0.1%	0.0%
Aerosols	0.3%	0.2%	0.0%
Unclassified Combustibles (packaging)	0.1%	0.0%	0.0%
Unclassified Incombustibles (packaging)	0.1%	0.1%	0.0%
Total of stream that was packaging waste	**22.8%**	**55.5%**	**4.6%**

Household Municipal Waste Characterisation 2022

Table 4-2: Distribution of Packaging Items in the National Profile

Primary Subcategory Waste	MRW	MDR	OW	National profile
Recyclable and Recoverable Paper	0.5%	0.5%	0.0%	0.9%
Unrecyclable paper	0.5%	0.3%	0.0%	0.8%
Recyclable Flat Card and Corrugated Cardboard	0.6%	3.5%	0.1%	4.2%
Unrecyclable Flat Card and Corrugated Cardboard	0.5%	1.5%	0.0%	2.0%
Coffee cups, smoothie cups (packaging)	0.1%	0.1%	0.0%	0.2%
Beverage cartons (packaging)	0.2%	0.4%	0.0%	0.6%
Other composites (packaging)	0.2%	0.2%	0.0%	0.4%
Compostable other composites (packaging)	0.5%	0.7%	0.0%	1.2%
Textiles Excl. Nappies	0.1%	0.0%	0.0%	0.1%
PET packaging bottles, cups containers	1.4%	1.7%	0.0%	3.1%
PE packaging bottles, cups containers	0.9%	0.8%	0.0%	1.7%
PP packaging bottles, cups containers	0.8%	0.4%	0.0%	1.2%
Supermarket bags and films	2.7%	0.9%	0.5%	4.0%
Shrink wrap and pallet wrap	0.1%	0.0%	0.0%	0.1%
EPS Styrofoam	0.1%	0.0%	0.0%	0.1%
Other plastic	1.4%	0.4%	0.2%	2.0%
Glass (packaging)	1.6%	0.5%	0.0%	2.1%
Ferrous metal	0.7%	0.6%	0.0%	1.3%
Aluminium cans	0.4%	0.5%	0.0%	0.9%
Aluminium foil	0.5%	0.1%	0.0%	0.6%
Other metal	0.0%	0.0%	0.0%	0.0%
Wood (packaging)	0.1%	0.0%	0.0%	0.1%
Aerosols	0.2%	0.0%	0.0%	0.2%
Unclassified Combustibles	0.0%	0.0%	0.0%	0.0%
Unclassified Incombustibles	0.0%	0.0%	0.0%	0.1%
Total	**13.6%**	**12.5%**	**0.8%**	**27.0%**

Table 4-2 indicates that packaging waste accounted for 27% of the total household kerbside waste surveyed.

Presenting **Table 4-2** graphically in **Figure 4-5** highlights where the various packaging waste streams are being found providing insights as to where attention may be required to improve capture.

This shows, for example, that a considerable proportion of recyclable cardboard packaging is correctly placed in the MDR stream, with much of the rest in MRW.

By contrast, a sizeable portion of plastic packaging items was found in MRW. Much of these were potentially recyclable and could have been managed into MDR. This highlights the need for householders to better divert recyclable packaging items to the correct bins[22].

Much aluminium foil and tray packaging (e.g., meat trays) could also be diverted from MRW into MDR.

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[22] ESRI research is underway to investigate the underlying factors leading to the misplacement of recyclable plastic packaging items in MRW bins. The outcome of this research will help to better understand these findings.
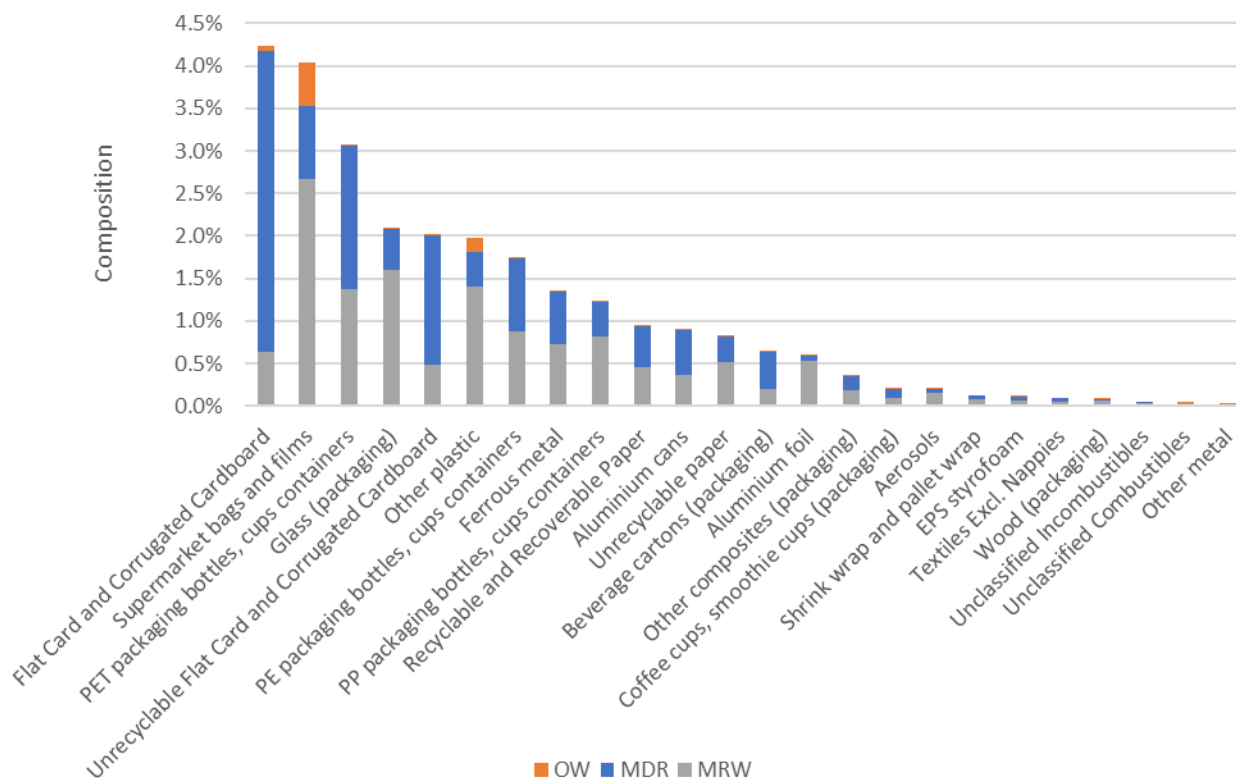
Figure 4-5: National Profile for Kerbside Household Packaging Waste

4.3 Biodegradable Municipal Waste

Biodegradable Municipal Waste (BMW) is the fraction of municipal waste that will rot or degrade biologically. To comply with the Landfill Directive, EU member states should reduce the amount of biodegradable municipal waste (BMW) consigned to landfill. The Directive sets targets for the reduction of BMW sent to landfills, and Member States report progress towards these targets to the European Commission. Monitoring and measuring the amount of BMW sent to landfills is an essential part of implementing the Landfill Directive and assessing its effectiveness in reducing greenhouse gas emissions from waste management.

Each waste category characterised was assigned, using published EPA guidance[23] as being either 100% BMW, 50% BMW or 0% BMW. This allows estimation of the BMW content. Contamination on packaging waste accounts for 7% of the national profile. Future surveys should determine the biodegradable content of this category and include this in the BMW calculation.

The analysis shows that the MRW comprised 46% BMW. The BMW content compromised: organics (food) 17%; nappies (5%); Textiles excl. nappies (4%); papers (8%); fines (<20mm) (4%); organics (garden) (4%); cardboards (2%); composites (0.6%); wood (0.5%). Within these categories, compostable plastic and compostable composite materials accounted for 0.2% of the MRW.

Figure 4-6 shows the composition of BMW material in the MRW stream.

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[23] As per 'Protocol for the evaluation of biodegradable municipal waste sent to landfill', EPA, 2011. The percentages agreed are food organics (100%); plastics (0%); papers (100%); fines (<20mm) (50%); nappies (50%); Textiles excl. nappies (50%); organics (garden) (100%); metals (0%); cardboards (100%); glass (0%); unclassified combustibles (0%); unclassified incombustibles (0%); wood (50%); composites (50%).
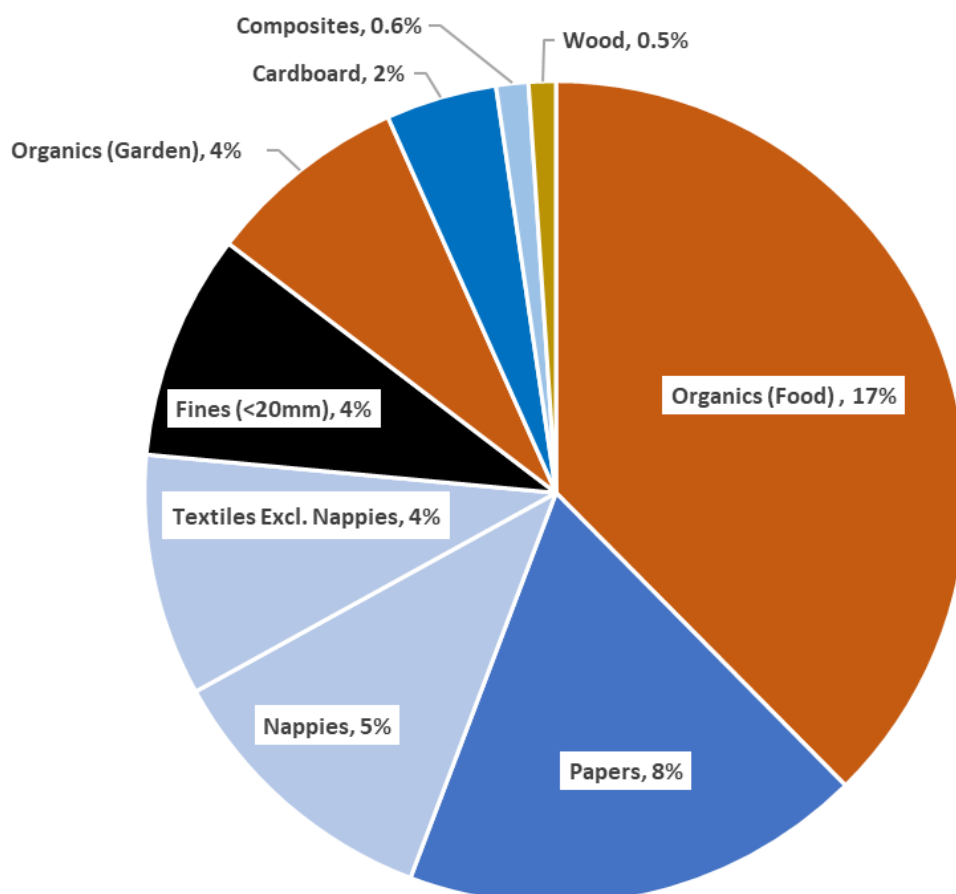
Figure 4-6: Composition of the 46% of BMW Materials in the MRW Stream

The OW stream comprised 95% BMW. Organics (garden) made up the largest fraction (64%) with organics (food) (29%) also contributing significantly to the BMW composition. These two fractions add to 93% with the remaining materials – papers, Textiles excl. nappies, cardboards, fines, nappies, composites, wood – together making up the remainder (2% BMW).

The analysis shows that BMW comprised 57% of the overall national profile in 2022.

4.4   Fines

The material from kerbside household waste samples that passes through the 20mm network of round holes on the sorting table was classified as 'fines (< 20mm)'. This category comprises a mixture of materials. The identification of the quality and quantities of fines provides for a better understanding of waste composition.

A laboratory organic content analysis was conducted on MRW and MDR fines (<20mm) samples to estimate the percentage of organics (food and garden) in MRW and MDR in 2bin and 3bin streams. The 2bin and 3bin streams were selected to examine the impact of a separate organic waste collection on the composition of fines, and to determine whether there is more food waste in the 2bin stream. **Table 4-3** presents the results of this analysis.

Table 4-3: Organic Composition of Fines 2022

Waste Categories	MRW 2-bin	MRW 3-bin	MRW	MDR 2-bin	MDR 3-bin	MDR	National Profile
Fines content (how much of the stream was fines)	8.5%	8.1%	8.2%	2.4%	2.9%	2.7%	5.6%
Organics content of the fines (how much of the fines were organic)	17.7%	23.6%	18.1%	2.1%	3.7%	3.3%	12.8%

Waste Categories	MRW 2-bin	MRW 3-bin	MRW	MDR 2-bin	MDR 3-bin	MDR	National Profile
Organics content (from fines) how much of the stream was organics)	1.5%	1.9%	1.5%	0.0%	0.1%	0.1%	0.7%

There were significantly more fines overall in MRW than in MDR. This is to be expected, as MRW contains more ash, soil, dust, and food particles than MDR.

The composition of fines differed between 2bin and 3bin streams. There was a slightly higher organics content in 3bin MRW fines (1.9%) than 2bin MRW fines (1.5%). Although this difference was small, it was unexpected as the OW collection service diverts organic waste from the 3bin MRW stream.

MDR fines organics content was lower overall than for MRW fines. Organic content was higher in 3bin MDR fines (0.1%) than 2bin MDR fines (0.0%), although still at low percentages overall.

Organics content was highest in MRW fines (23.6% in 3bin and 17.7% in 2bin). Organics content was low in MDR fines – 0.1% in 3bin and 0.0% in 2bin.

For this 2022 study, fines formed 6% of the overall national profile for household kerbside waste. This compares to 2008 (10%). The decrease may be due to increased efforts to stop the waste self-heating during project delivery. Waste that is not self-heating retains moisture and generates fewer fines. Reduced incidence of fines could also be attributable partially to other factors such as samples selected containing less solid fuel ash. This ash was noted as being visible in samples from County Galway in 2018 but this occurrence was not observed in the same manner during 2022.

4.5   Food Waste

Food waste is a priority area for the EPA. It is a global problem that has environmental, social, and economic consequences. More than one quarter of the food produced globally is wasted. It is a significant contributor to climate change, as food loss and waste contribute to 8-10% of greenhouse gas emissions.

The EPA's household food waste prevention programme was implemented by the Agency's Circular Economy Programme. It aims to raise awareness of food waste and target behavioural change through the Stop Food Waste campaign.

Food waste is the largest primary category in MRW and the second largest in the OW stream and the main findings are presented in **Table 4-4**. Overall, organics (food), comprising food waste, liquids, and vegetable oil, formed 16% of the national MRW profile in 2022.

Table 4-4: Food Waste Findings

Waste Categories	MRW	MDR	OW	National Profile
% of the category that is food waste, liquids, veg oil	17.4%	3.0%	29.0%	16.3%
Capture of food waste between bins	64.0%	4.2%	31.8%	100.0%

These results show that less than a third of food waste is placed in the OW bin, while twice that is being disposed of in MRW.

The fines (<20mm) fraction also contains organic waste, some of which is food waste. The organic content of the fines has been analysed in a laboratory for the first time, but this did not explicitly determine a proportion of food waste. This fines category is discussed in the preceding **Section 4.4** of this report.

These proportions of food waste are a concern, and the levels in apartments are particularly concerning. Organics (food) content was significantly more prominent in the four apartment MRW samples (41% and which were two 2bin and two 3bin samples) than house MRW (14% and which were 7 2bin and 19 3bin samples). Food waste was also significantly more prevalent in the one apartment MDR sample (13%) than in houses (4%). The high prevalence of organics (food) in apartment MRW and apartment MDR could be due to one or all the following:

- Poor provision of apartments with OW collection/management services, as identified in the methodology. Residents without OW collection or home composting services must place food waste in MRW bins.

- Apartments tend to have limited space available (in individual apartments and communally) for waste segregation. This can make it difficult for residents to segregate food waste.

- Many apartment complexes have communal bins. If bin location is inconvenient, it may be more convenient for residents to dispose of food waste in one bin rather than taking the time and effort to properly segregate waste.

- When residents are charged a flat rate for waste disposal, it can lead to a decrease in financial motivation to sort waste properly. This can result in residents being less inclined to take the time and effort to manage waste effectively. Consequently, residents may be more inclined to dispose of food waste in the MRW bin.

- Even where an organic waste collection service is supplied, residents who do not understand that meat and dairy products can be managed in OW, may place this food waste into MRW bins.

Targeted action in terms of enforcement and behavioural messaging is required to improve awareness and support better segregation throughout but particularly at apartments.

4.5.1   Organics (garden)

Organics (garden) was present (4%) in the kerbside MRW. Organics (garden) was present at high percentages (84%) in the OW stream, and at much lower percentages (0.2%) in the MDR stream characterised.

Equal levels of organics (garden) waste were found in the city (3%) and the rural MRW (4%), whereas lower levels were found in the 2bin (1%) than the 3bin MRW (5%).

Higher levels of organics (garden) waste were found in the city OW (74%) than the rural OW (48%). This may reflect less access to home composting due to restricted space in cities.

Organics (garden) waste represented (14%) of the national profile.

City households and apartments performed worse at segregating organics (garden) waste in terms of placement in non-target bins, albeit the material appeared at low levels in non-target bins.

4.6   Textiles

4.6.1   Textiles (excluding nappies)

The production of textiles involves a complex global chain with significant and rising environmental impacts. Diverting textiles to recycling systems can help reduce this impact.

Textiles (excluding nappies) remain a significant component of the MRW stream (9%), of which houses (9%) and apartments (6%). Distribution between 2bin (8%) and 3bin (9%) MRW streams are evenly split. Textiles waste was found to be higher in cities (11%) compared to in rural areas (8%).

Textiles were detected at low levels within the MDR (3%) streams. Textiles were significantly overrepresented in apartment MDR (10%) compared to house MDR bins (2%).

Increased awareness regarding the correct materials for MRW, OW and MDR bins may contribute to the lower levels of textile waste in some streams.

Overall, textiles (excluding nappies) represented 6% of the national profile.

The presence of textiles in kerbside household waste was weighted towards cities, and apartments. Targeted action both in terms of enforcement and behavioural messaging could deliver results in these areas of highest prevalence.

A feature of the presentation of textiles is that it is sporadic - appearing infrequently but in larger volumes when it does appear, e.g., appearing in only one bag within a sample, or none in some samples and in a larger fraction in other samples. This pattern suggests that a sub-fraction of households may be disproportionately responsible for these arisings and/or that these textiles are discarded infrequently and in batches.

Clothes formed a large fraction of the textiles category and frequently appeared in batches which appeared to have reuse potential and could have been managed at BCs. Due to the convenience and relative low cost of fast fashion individuals may perceive low value to worn or old clothes. Lack of transport, storage space or awareness may also be considerations leading to disposal at kerbside rather than at BCs. Bed linen (textiles non-packaging - duvets, blankets, and pillows) were also a feature. Bed linen did not appear frequently, but

given its weight, did represent a share of the category.

4.6.2   Nappies and Incontinence Wear

Nappies & incontinence wear are a primary sub-category within the textile primary category. These are addressed separately here as these materials represent a large share (6%) of the national profile. Most nappies (96%) were correctly placed in the MRW stream, with the remainder incorrectly placed in MDR (3%) and OW (0.4%). Nappies remain a feature of the MRW stream with recorded levels at 10%.

Nappies represent 10% of the household MRW fraction, with slightly more (11%) in house MRW compared to apartment MRW (8%). The prevalence of nappies was low in the MDR (0.9%) and in OW (0.1%) streams.

The low (although still highly contaminating) levels of nappies found in MDR and OW bins compared to MRW suggest that households understand the proper waste segregation practices for nappies. However even nappies at low rates present a disproportionately large potential for contamination, leading to a reduction in the quality of recyclable and compostable material. This suggests that additional awareness on correct waste segregation practices may be required to prevent a further rise of nappies in the MDR and OW.

4.7   Secondary Subcategories

Certain items were selected as those that could potentially be targeted for alternative collections, and/or having a potential reuse alternative. The project refers to these as secondary subcategories and comprise:

- **Special interest items** that could be targeted for alternative collections, and/or have a potential reuse alternative.

- **Single Use Plastic (SUP)** products made wholly or partly from plastic and are typically intended to be used just once or for a brief period before being discarded.

- **Compostable materials** under the criteria required to meet the European standard EN 13432. EN 13432 requires the compostable plastics to disintegrate after 12 weeks and to completely biodegrade after six months. Compostable items are identified by markings of the standard or by a certification scheme such as Cré.

Waste characterisation data on these items may be used, for example, to highlight the potential impact of using reusable and refillable alternatives rather than single use packaging.

4.7.1   Single Use Plastics

The SUP category includes items such as shopping bags, drinks bottles, coffee cups, straws, cutlery, and food packaging. These items are designed to be used once or for a brief period before being discarded.

Single-use plastics (SUP) have become increasingly prevalent in Ireland. With the implementation[24] of the SUP Regulations in 2021, and the implement a deposit refund scheme from 2024, data will be required. Accordingly, this is the first national kerbside waste characterisation study that has quantified Irish SUPs. **Table 4-5** shows the SUP content in kerbside household waste.

SUPs are primarily being placed in the MRW and MDR bins.

The 2022 HHMWC is the first to investigate SUPs, which, despite constituting a small percentage of kerbside household municipal waste (6%), still accounted for a significant waste volume of 66,283 tonnes. Supermarket bags, plastic bags and films, wrappers and PET packaging bottles including same polymer lids were the two largest SUP materials, comprising over 58,043 tonnes of the national household waste profile and accounted for 88% of SUPs.

These findings highlight the need to minimise dependence on SUPs and to promote more environmentally friendly alternatives. Future HHMWC that focus on SUPs will help to identify patterns and determine whether the usage of these products is increasing or decreasing based on the 2022 baseline.

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[24] www.irishstatutebook.ie/eli/2021/si/516/made/en/print

Table 4-5: Single-use Plastics Content in the National Profile

Single-use Plastics	MRW	MDR	OW	% Net weight
Supermarket bags, plastic bags and films, wrappers (packaging)	4.5%	3.6%	1.7%	3.8%
PET packaging bottles including same polymer lids	0.5%	3.8%	0.0%	1.2%
PET - Take-away trays/containers	0.3%	0.3%	0.0%	0.2%
Beverages cups & same polymer covers & lids	0.2%	0.4%	0.0%	0.2%
Beverage cartons (packaging)	0.1%	0.2%	0.0%	0.1%
Other plastic including packaging containers, other than packaging bottles	0.1%	0.0%	0.0%	0.1%
Food trays and coffee cups	0.0%	0.1%	0.0%	0.0%
PE - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%
PP - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%
PE packaging bottles & same polymer lids	0.0%	0.0%	0.0%	0.0%
PP packaging bottles & same polymer lids	0.0%	0.0%	0.0%	0.0%
Other plastic including non-packaging cup and other containers (non-packaging) cutlery, stirrers, plates, straws balloon sticks, cotton buds.	0.0%	0.0%	0.0%	0.0%
Other composites (packaging)	0.0%	0.0%	0.0%	0.0%
PET - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%
Styrofoam, EPA, and PS Cups	0.0%	0.0%	0.0%	0.0%
PP - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%
PE - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%
Other composites (non- packaging)	0.0%	0.0%	0.0%	0.0%
Total	5.7%	8.5%	1.9%	5.7%

Of note within the SUP category, were small but increasing volumes of 'other' plastics (RIC 7). **Figure 4-7** presents two examples of 'other' plastics identified during sampling events.

Figure 4-7: 'Other' Plastic Packaging (L, RIC 7), Polymer Wine Bottle 'Cork' (R, no RIC)

Replacement products for SUPs - wooden and cardboard cutlery - were identified as shown in **Figure 4-8** .

Figure 4-8: Alternatives to SUP Cutlery - Cardboard and Wooden Cutlery

Wooden and cardboard cutlery had been identified in 2018 but prevalence increased in 2022.

4.7.2   Compostables

There has been an increase in the use of compostable plastic and composite products which offer an alternative to conventional materials. Compostables are designed to decompose under specified conditions, such as elevated temperatures and moisture levels. In Ireland compostable packaging products are certified to standards such as EN 13432 and products are certified by bodies, such as Cré, that supply certification markings. These certification marks are used to help identify compostable materials during the study. **Table 4-6** shows the compostable content in kerbside household waste.

Table 4-6: Compostable Content in the Kerbside Collection Household Waste

Primary sub-categories	MRW	MDR	OW	National Profile
Compostable plastic bags, supermarket bags, films, and wrappers	0.0%	0.1%	1.1%	0.3%
Compostable 'other plastic' including non-packaging cups and other containers	0.2%	0.0%	0.0%	0.1%
Compostable cups for beverages, including covers and lid	0.0%	0.0%	0.0%	0.0%
Compostable beverage cartons	0.0%	0.0%	0.0%	0.0%
Compostable other composites (packaging)	0.0%	0.0%	0.0%	0.0%
Compostable plastic bottles including same polymer lids	0.0%	0.0%	0.0%	0.0%
Compostable other composites (non-packaging)	0.0%	0.0%	0.0%	0.0%

Primary sub-categories	MRW	MDR	OW	National Profile
Compostable shrinks wrap and pallet wrap	0.0%	0.0%	0.0%	0.0%
Compostable 'other plastic' including packaging containers	0.0%	0.0%	0.0%	0.0%
Total	0.2%	0.2%	1.1%	0.4%

Overall compostable materials comprised a small portion of kerbside collection household waste (0.4%). The most prominent primary sub-category was compostable plastic bags, films, and wrappers. Just over half of compostable material is placed in the OW stream. Almost half of the compostable items (47%) were placed in the wrong (MRW and MDR) bin. Further education is required to ensure that compostable items are directed towards the correct bin.

Analysis of the other streams indicated that there was no notable variance in compostables between the 2bin and 3bin systems, city and rural areas, or houses and apartments.

4.7.3   Special Interest Items

Special interest items are items that the EPA has identified for the purposes of this report that may be targeted for alternative collections, and/or have a potential reuse alternative. The distribution of these special interest items is presented in **Table 4 7**.

The three categories of special interest items that made up the largest fractions were:

- Cardboard packaging used for delivery (post or other).
- Plastic milk bottles.
- Composite ('Tetra Pak type') milk cartons.

The significant volume of cardboard packaging used for delivery (post or other) may reflect a societal change away from retail to online shopping, reinforced by COVID-19 effects. Plastic packaging used for delivery was a related material, not measured separately, also formed a visible fraction.

Coffee pods (both plastic and aluminium) were noted in 2018 as being new products that have a high prevalence, and these have been quantified in 2022 at approximately 2,485 tonnes of the national household waste profile. Plastic and aluminium coffee pods were each identified in approximately equal volumes. These categories were not characterised in 2018, so comparisons cannot be made in many circumstances.

Table 4-7: Special Interest Item in the National Profile

Special Interest Items	MRW	MDR	OW	National Profile
Cardboard packaging used for delivery (post or other)	2.3%	97.7%	0.0%	0.5%
Milk bottles	18.8%	81.1%	0.1%	0.5%
Milk cartons	22.3%	77.7%	0.0%	0.3%
Coffee aluminium pods	91.5%	8.5%	0.0%	0.1%
Coffee plastic pods	83.9%	16.1%	0.0%	0.1%
Washing up liquid bottles	60.4%	39.6%	0.0%	0.1%
PET cups for beverages in this subcategory	30.9%	69.1%	0.0%	0.0%
PP cups for beverages in this subcategory	100.0%	0.0%	0.0%	0.0%
PE cups for beverages in this subcategory	0.0%	100.0%	0.0%	0.0%
Cardboard used to package milk in bags in a box (milk dispensers)	0.0%	100.0%	0.0%	0.0%
Other plastic cups for beverages in this subcategory	41.9%	50.9%	7.3%	0.0%
Polyfilla (and similar containers)	66.8%	33.2%	0.0%	0.0%
Water based paints	100.0%	0.0%	0.0%	0.0%
Total	26.1%	73.8%	0.1%	1.7%

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Ireland will introduce a Deposit Return Scheme[25] from February 2024. Purchasers of drinks in a plastic bottle, aluminium or steel can that feature the Re-turn logo, will pay a small deposit in addition to the price of the drink. When returning the empty, undamaged container to a retail outlet, the depositor will get the deposit back in full.

PET beverage bottle and aluminium cans are the major components of Deposit Return Scheme materials. The characterisation national profile shows that significant volumes of these materials are not being placed in the correct (MDR) bin as shown in **Table 4-8**.

Table 4-8: Capture Rates of Deposit Return Scheme Materials

Capture rates	MRW	MDR	OW	National profile
PET packaging bottles & same polymer lids	25.8%	73.6%	0.6%	100.0%
Aluminium cans (packaging)	40.9%	58.3%	0.9%	100.0%

The materials targeted under the DRS scheme, and volumes in kerbside household waste are likely to decrease when the scheme is implemented as householders seek to recover the value of deposit.

Reuse alternatives for these materials can have a significant impact on waste prevention initiatives.

In the case of cardboard packaging used for delivery, implementing reuse options such as returnable and refillable packaging systems can reduce the amount of cardboard waste generated during delivery processes. Similarly, for milk bottles and milk cartons, promoting bottle deposit systems or milk refill stations can encourage consumers to reuse these containers multiple times, minimising waste.

Refillable or reusable coffee pod systems can significantly decrease the environmental impact associated with single-use aluminium and plastic pods. Encouraging customers to use refillable washing up liquid bottles can also contribute to waste reduction efforts in household cleaning products.

For PET, PP, and PE beverage cups, a refillable cup system or promoting the use of reusable cups can decrease the number of single-use cups disposed of daily.

In the case of other plastic cups for beverages, implementing a deposit system or encouraging the use of reusable cups can significantly reduce plastic waste generation. Similarly, promoting reuse of containers for milk and similar products can contribute to waste prevention by reducing the need for single-use packaging.

Lastly, for water-based paints, encouraging consumers to donate or exchange leftover paint and providing refill stations can minimize the amount of unused paint that ends up as waste.

Identifying these target areas for reuse alternatives in waste prevention initiatives allows for strategic planning to minimise the environmental impact associated with these materials and foster a more sustainable approach to consumption and packaging.

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[25] https://re-turn.ie

4.8   Novel Wastes

Novel categories of note are evident in the waste since 2018. These include healthcare risk waste associated with the COVID-19 pandemic – antigen tests and masks - epinephrine autoinjectors and electronic cigarettes (nicotine vapes). **Figure 4-9** shows examples of these waste streams collected in the survey.

Figure 4-9: New Categories: COVID-19 Antigen Tests, Masks, Autoinjectors, Nicotine Vapes

Nicotine vapes are a concern for waste management as these materials contain a battery that may ignite under certain circumstances. In addition, the e-liquid contained in nicotine vapes is highly flammable and can ignite if it encounters a heat source. This can cause a fire if placed with combustible materials in the waste. Therefore, it is important to dispose of nicotine vapes and e-liquid in a safe and responsible manner at bring centres – not within the kerbside waste management system. Given the increasing prevalence of these products, an information campaign about appropriate management may be needed.

Healthcare risk waste associated with COVID-19 – antigen tests and masks – should be directed into the MRW stream[26]. The prevalence of these may fall as the pandemic recedes.

Used and unused epinephrine autoinjectors should be placed in the HRW stream, as at pharmacies or at bring centres.

4.9   WEEE and Batteries

WEEE accounted for 0.6% in the national profile. Two thirds of this WEEE content were in the MRW stream, and most of the remainder in the MDR stream. Arisings of WEEE are affected by increasing volumes of WEEE on the market[27].

The battery content in the national profile is 0.05%. This content was split relatively evenly between the MRW and MDR streams.

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[26] www.mywaste.ie/what-to-do-with/rapid-antigen-test

[27] www.epa.ie/our-services/monitoring--assessment/waste/national-waste-statistics/weee

4.10 Bin Collection Systems

4.10.1 2bin and 3bin Systems

There were differences in the performance of the 2bin and 3bin systems, most pronounced in the organics (garden) waste materials.

Organics (garden) waste was higher in the 3bin MRW (5%) than in the 2bin MRW (1%). This was not expected as 3bin households have access to an OW service. Demographic reasons may have a role: 2bin households, being more rural on average, may have more access to gardens for management of this material.

It is of note that in the combined national profile organics (garden) waste is significantly higher in city kerbside waste (21%) overall than in rural kerbside waste (7%). Again, demographic reasons may have a role: rural households may have more access to gardens for management of this material.

The prevalence of food waste did not differ very significantly between 2bin (19%) and 3bin (17%) MRW streams. Again, this is unexpected as 3bin households were expected to have significantly extracted the food waste content. Apartments contribute to this given the previously noted poor performance and the increasing share of the household sector.

4.10.2 Apartments

Five of the fifty samples analysed were apartments (four MRW, one MDR), representing 10% of samples. The results showed some differences of note despite the relatively low numbers of samples.

A recurring finding of this study is ongoing poor waste management performance of apartments compared to houses. The most significant difference between MRW from houses and apartments is the proportion of organics (food) in household MRW (14%) compared to apartment MRW (41%).

Apartment MDR samples had significantly higher organics (food) (14%), compared to house MDR at (2%). This issue of food waste in apartments is discussed in **Section 4.5** of this report.

Other notable differences in apartment waste were higher proportions of glass waste in apartment MRW (8%) compared to house MRW (2%), and higher textile waste in apartment MDR (10%) compared to house MDR (2%). Non target materials were also higher in apartment MRW bins compared to house MRW bins.

To address these issues, it is recommended to focus attention on the most significant materials, food waste, glass, and textiles. The provision of, and enforcement of separate collection of these materials from apartments may lead to less contamination, and improved segregation and collection rates. Additionally, improved management of materials such as glass and textiles. WEEE and batteries in apartments, such as centralised storage and/or collection, may also deliver benefits.

Apartments have characteristics that differ from houses including demographic (higher turnover, younger residents, fewer people / household, regional differences) and technical (mixed with commercial collections, shared costs, low storage space). Therefore, tailored messaging is required.

4.11 Wastes that are challenging to identify

As with previous surveys, distinguishing 'recyclable' and 'unrecyclable' materials is challenging. The decision depends on whether the material was contaminated before or after it was extracted for the survey. This is especially true for materials like cardboard and paper, which easily absorb liquids and become contaminated. An estimated 25% (a subjective assessment) of materials that were classified as 'unrecyclable' were categorised via subjective judgement.

The plastics resin identification code (RIC) is often illegible due to poor printing or contamination. Identification using other characteristics (flexibility, colour change when flexed) can also be affected by contamination.

Non-expanded polystyrenes look like non-expanded polypropylene. Further, expanded polypropylenes look like expanded polystyrene – e.g., **Figure 4-10.** RICs are needed to distinguish, but as noted may not be visible.
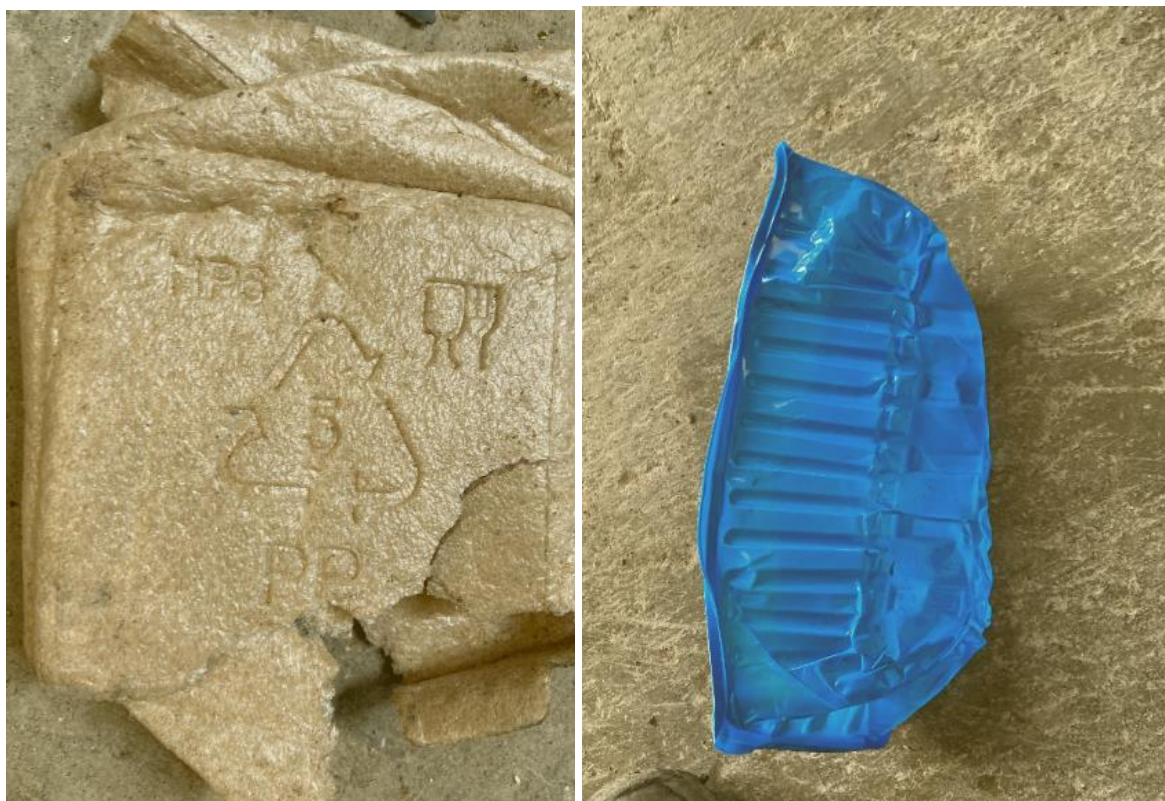
Figure 4-10: Expanded Polypropylene (left) and Non-expanded Polystyrene (right)

It can be difficult to distinguish food waste and organics (garden) waste in the organic waste. The degree of difficulty depends on the characteristics of each sample such as age, self-heating, degree of mixing, grass, and moisture content of the sample. See figure following illustrating this difficulty in distinguishing this homogenous material. Also note the low levels of visible contaminants and the 'sticky' nature of the material, which, generates few fines.

Figure 4-11: Food Waste and Organics (garden) waste are difficult to distinguish in OW

It is important to keep these considerations, which are unchanged from previous surveys, in mind when considering data about how much of a category is 'unrecyclable' or 'target/non-target.'

4.12   Waste Composition Trend Analysis 2008-2022

In this section, comparisons are made with the 2008 and 2018 surveys to determine trends and highlight areas for action.

The 2022 MRW and MDR data presented to this point in this report has been 'corrected for contamination' adhering to certain packaging categories. This contamination fraction is accounted for in a separate standalone category, whose calculation is discussed in Section 3.4 of this report.

Correction for contamination was not done in the previously published 2008 and 2018 reports, although it is noted that EPA adjusted the 2018 HHMWC results for contamination when using the results for waste statistical reporting purposes.

To allow like-for-like comparisons to be made with the 2008 and 2018 data, the comparisons in this section are made with 2022 data that has not been corrected by removal of contamination into a separate category.

It is important to recognise that year-on-year changes are not isolated events; for instance, the decline observed in papers and fines in 2022, results in a proportional, relative increase in other materials.

4.12.1 Mixed Residual Waste

A comparison of the MRW composition for years 2008, 2018 and 2022 is shown in **Figure 4-12**.

The plastics category was the largest primary category in MRW in 2022. The composition of plastics has increased since 2008 (14%) to 2018 (19%) to 2022 (21%).

The organics (food) category was the second largest primary category in MRW in 2022. The composition of organics (food) had decreased between 2008 (24%) to 2018 (14%) but has subsequently increased in 2022 (17%).
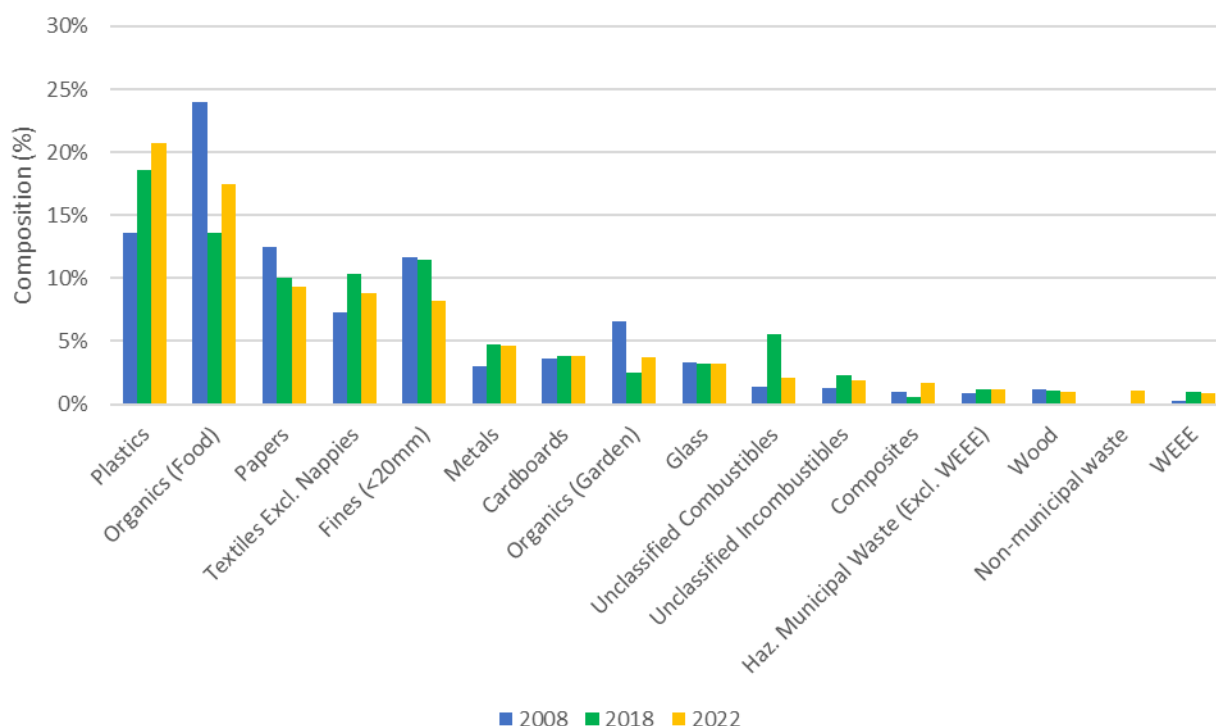
Figure 4-12: Kerbside Household MRW Composition (2008, 2018, 2022)

The proportion of nappies in MRW bins has continued to increase, from 2008 (8%), 2018 (10%) to 2022 (10%).

Other MRW categories of note included:

- **Paper waste** has continued to fall from 2008 (13%) to 2018 (10%) and to 2022 (9%).
- **Fines (<20mm)** proportion changed from 2008 (12%) to 2018 (12%) and 2022 (8%).
- **Metals** have increased from 2008 (3%) to 2018 (5%) and 2022 (5%).

- **Materials incorrectly placed in the MRW** bin increased from 2018 (55%) to 2022 (69%). These include items that could have been presented in the MDR [28](29%) OW[29] (21%) and bring centres (19%).

The introduction of soft plastics to the recycling list in Ireland during 2021 is intended to reduce the volume of non-target soft plastics material in the MRW stream. Irish households can now recycle the 'supermarket bags, plastic bags, films, and wrappers' category along with rigid plastic in the kerbside MDR bins. The 2022 survey identified that most 'supermarket bags, plastic bags, films, and wrappers' were in the MRW stream (70%) compared to the MDR (21%) and OW (9%), suggesting that many households were not yet implementing the then relatively new change during 2022. As awareness and implementation grows, the volume of soft plastics in the MRW stream is likely to decrease.

A comparison of the non-target material in MRW bins for years 2008, 2018 and 2022 is shown in **Figure 4-13**.

The increase in non-target content of the MRW bin reflects an increase in the proportions of food waste in the MRW. The high and increasing proportion of food waste in MRW bins could be attributed to a lack of awareness of waste segregation practices and convenience. This issue is particularly acute in apartments where food waste storage space may be limited, or where separate bins may not be available, as discussed in **Section 4.5**.
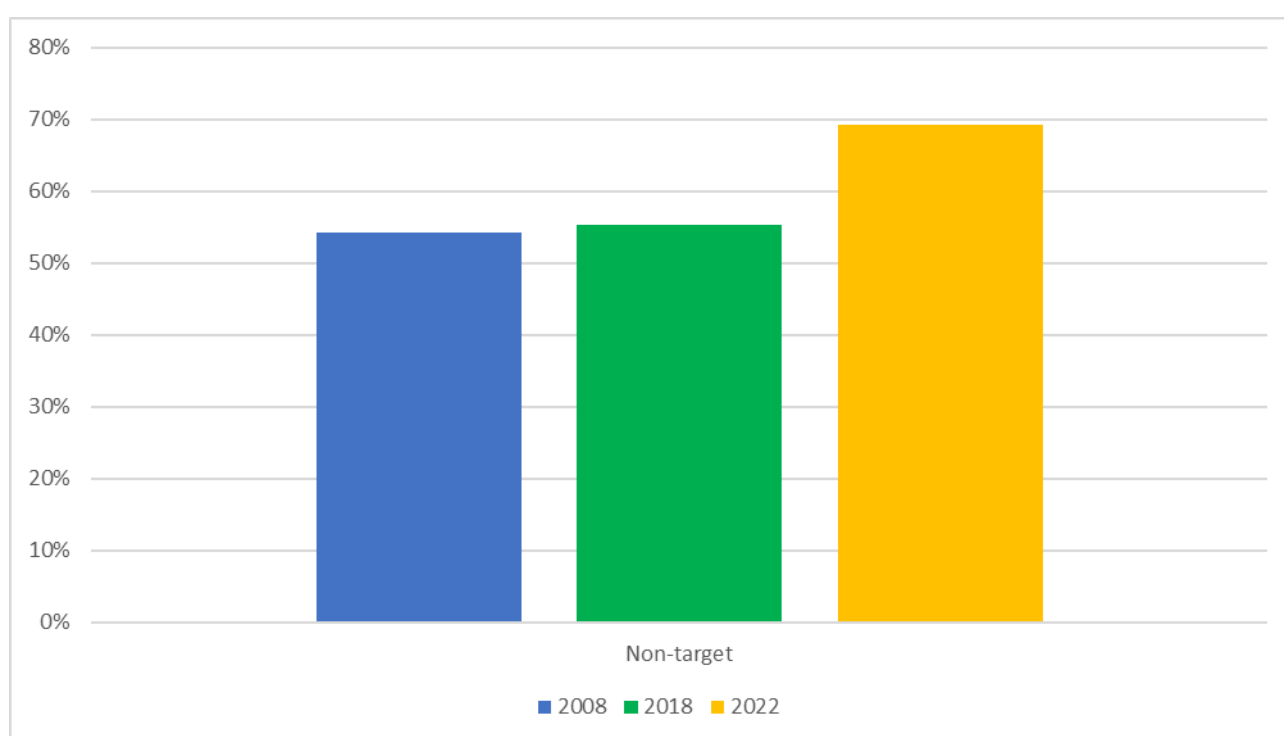
Figure 4-13: Non-Target Material in Kerbside Household MRW Trends (2008, 2018, 2022)

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[28] Recyclable and Recyclable Paper Packaging, Newspapers, Magazines & glossy paper, Office papers, other papers, Flat Card, and Corrugated Cardboard (Packaging), Other cardboards (Non-packaging), Composite beverage cartons (e.g., Tetra Pak), PET packaging, PE packaging, PP Packaging, Ferrous metal packaging, Aluminium cans.

[29] Food waste, biodegradable waste from garden & park, tissue papers.

The share of BMW proportion within MRW fell from 2008 (62%) to 2008 (49%) and then plateaued in 2022 (49%). **Figure 4-14** shows the change in proportion of BMW in MRW across the three survey years.
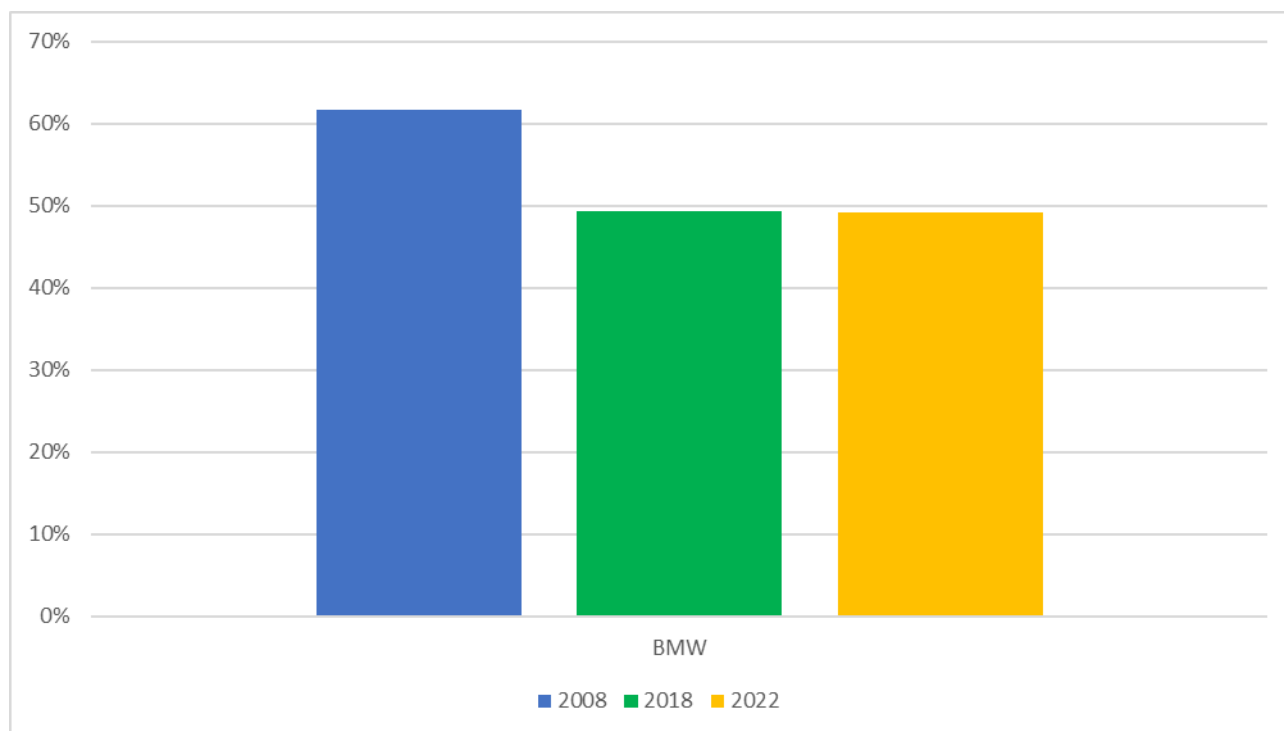
Figure 4-14: Proportions of BMW in Kerbside Household MRW (2008, 2018 and 2022)

Packaging waste in MRW has continued to increase since 2008. A notable increase of 7% between 2008 (22%) and 2018 (30%), followed by a further increase in 2022 (31%). The main changes within this fraction were as follows:

- Plastic packaging changed from 11% in 2008 to 16% in 2018 and 16% in 2022.
- Cardboard packaging has remained relatively unchanged since 2008, 3% in 2008, 3% in 2018 to 4% in 2022.
- Metal packaging proportions varied between 2008 (2%) and 2018 (3%) and 2022 (3%).
- Paper packaging content stayed relatively steady between 2008 (2%), 2018 (2%) and 2022 (2%)

The admission of soft plastics to the recycling list in 2021, coupled with the ongoing decrease in cardboard, paper, and composite packaging waste, may result in a further reductions of packaging waste in the MRW stream.

Figure 4-15 shows the trend in packaging waste in kerbside household MRW collections.

Household Municipal Waste Characterisation 2022
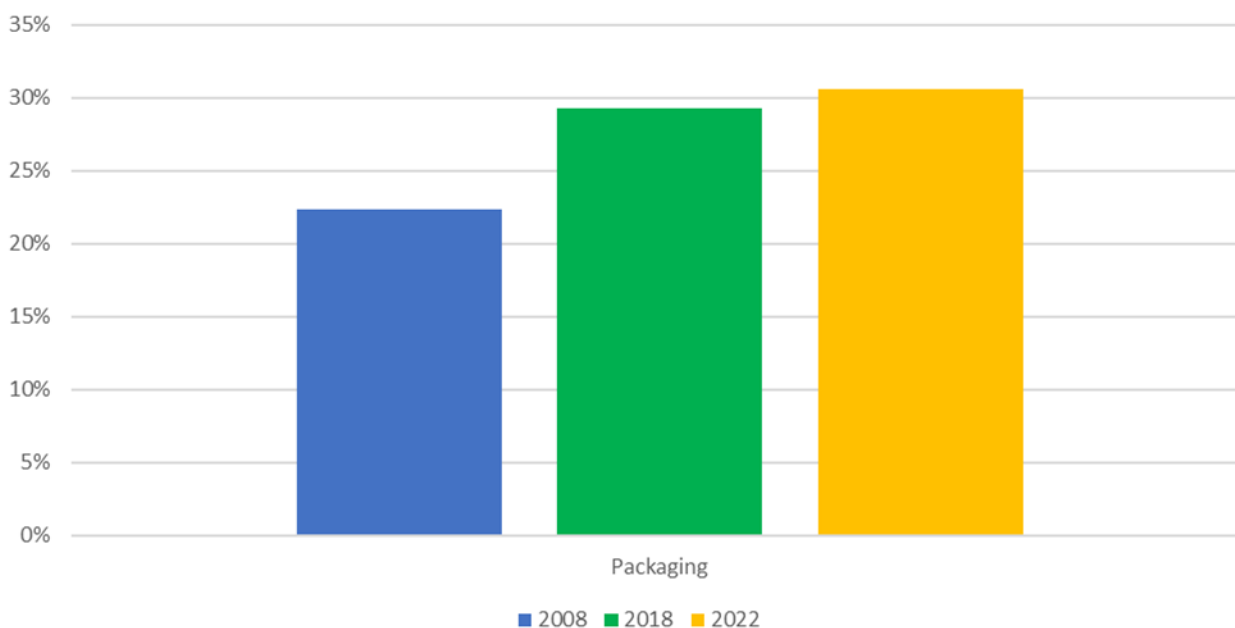
Figure 4-15: Proportions of Packaging in Kerbside Household MRW (2008, 2018 and 2022)

4.12.2 Mixed Dry Recyclables

A comparison of the MDR composition for years 2008, 2018 and 2022 is shown **Figure 4-16**.

The main changes within the MDR primary categories are:

- **Cardboard waste** is the largest primary category in the MDR stream, and its proportion continues to increase in MDR from 2008 (15%) to 2018 (24%) to 2022 (27%). An increase in cardboard packaging used for delivery (quantified in 2022 for the first time at 3% in the MDR stream) had been expected due to the increasing prevalence[30] of online orders and home deliveries. Film plastic delivery wrapping may have a larger role than anticipated. Cardboard and plastic packaging used for delivery should be monitored in future MWC surveys as it is a potentially large source of waste arisings on the Irish market.

- Plastic is the second largest primary category in MDR. The proportion of plastic waste in the MDR stream continues to grow, aided by the 2021 addition of soft plastics to the recycling list.

- Paper waste in the third largest category, having been the largest category in 2018. The decrease in paper can be attributed to a significant ongoing decrease in newspapers and magazines (& glossy paper) from 2008 to 2022. Newspapers have declined from 2008 (31%), to 2018 (13%) to 2022 (9%), while magazines have also decreased from 2008 (14%), 2018 (7%) to 2022 (5%). This decline may be due to the content of these newspapers and magazines moving online.

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[30] www.cso.ie/en/releasesandpublications/ep/p-isshdcb/householddigitalconsumerbehaviour2022/internetpurchasesandsubscriptions

Household Municipal Waste Characterisation 2022
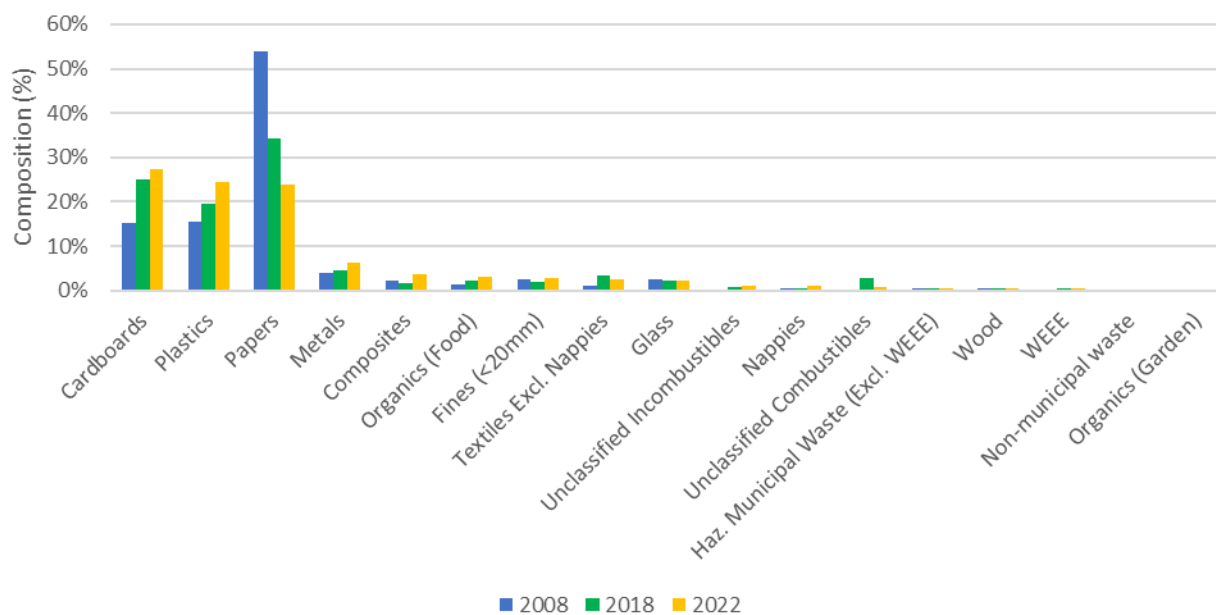
Figure 4-16: Kerbside Household MDR Composition Trends (2008-2018)

The proportions of non-target materials in MDR bins have continued to increase, from 2008 (17%), 2018 (27%) to 2022 (29%) as shown in **Figure 4-17**. This increase has happened despite the addition of soft plastics to the target list. Non-target material includes unrecyclable cardboard (9%), food waste (3%) and glass (packaging) (2%).

The increasing volume of food waste in MDR bins in 2022 (3%), up since 2018 (2%) is a concern, as discussed in **Section 4.5**. Also of note is the organic waste content within MDR fines (measured in 2022 for the first time) and in MDR contamination (food content is not measured as a fraction of contamination, but likely to be significant). These streams should be quantified again in future surveys to better quantify food waste.
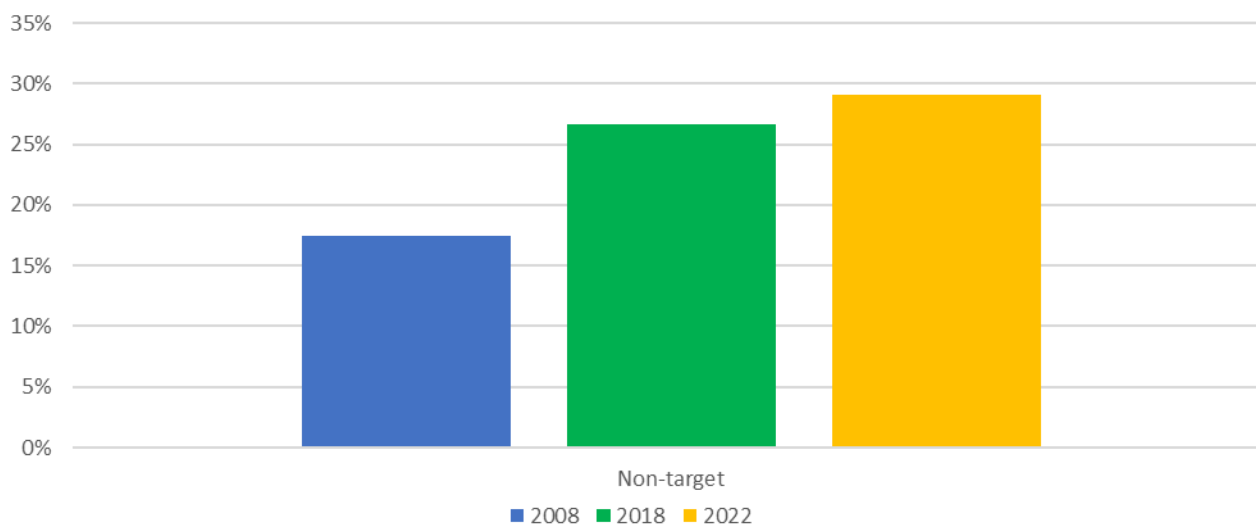
Figure 4-17: Non-Target Material in Kerbside Household MDR Trends (2008, 2018 and 2022)

BMW proportions in MDR bins have decreased further, from 2008 (73%), to 2018 (66%) to 2022 (59%). This decrease can be partially attributed to a significant drop in paper waste (11%) between 2018 and 2022. **Figure 4-18** shows the change in proportion of BMW in MDR across the three surveys.
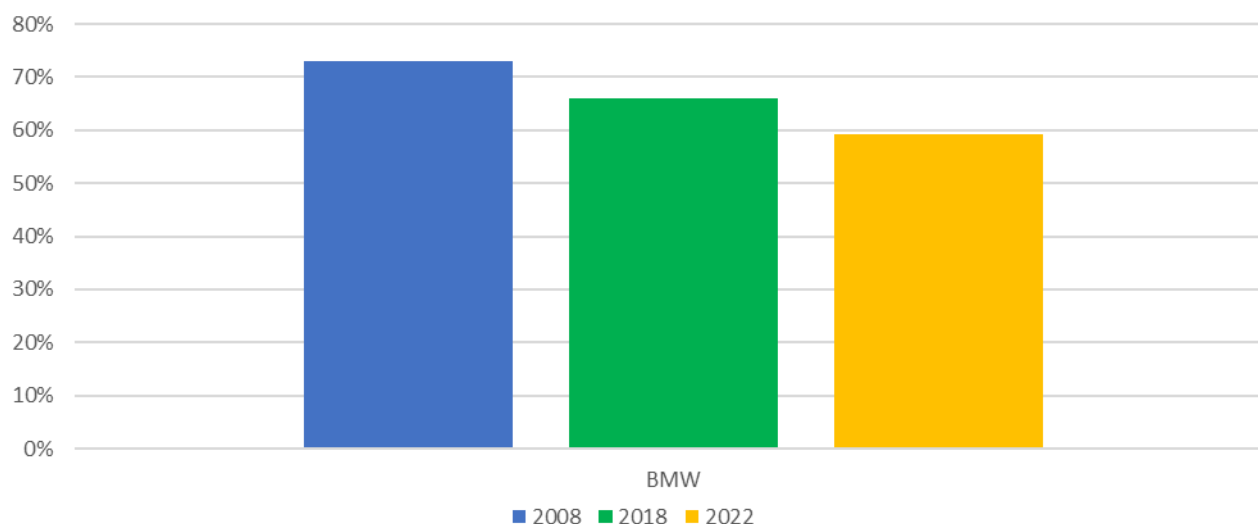
Figure 4-18: Proportions of BMW in Kerbside Household MDR (2008, 2018 and 2022)

There was a 10% increase in the composition of packaging waste in the MDR from 2018 (55%) to 2022 (65%). Analysis of packaging categories shows that:

- The volume of cardboard packaging increased between 2018 (24%) and 2022 (27%).

- Plastic packaging has continued to increase from 14% in 2008, 18% in 2018 to 22% in 2022. Given ongoing increase in plastic waste and the recent admission of soft plastics to the recycling ('target') list plastics may become the largest packaging category in the MDR stream.

- Overall packaging has increased (24%) since 2008.

Figure 4-19 shows the trend in packaging waste in kerbside household MDR collections.
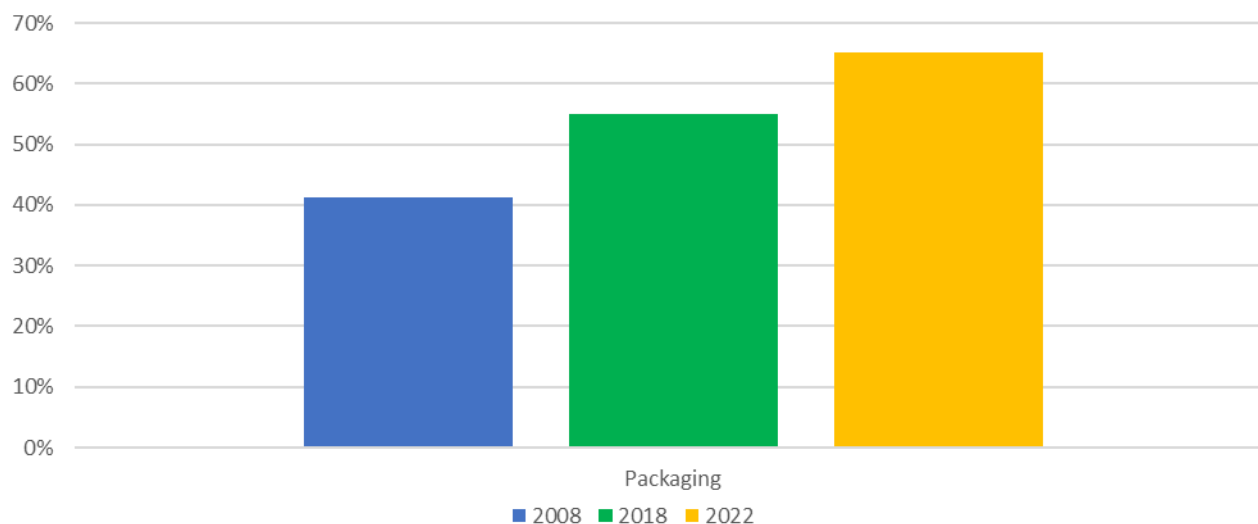
Figure 4-19: Proportions of Packaging in Kerbside Household MDR Waste (2008, 2018, 2022)

4.12.3 Organic Waste

A comparison of the OW composition for years 2008, 2018 and 2022 is shown in **Figure 4-20**.
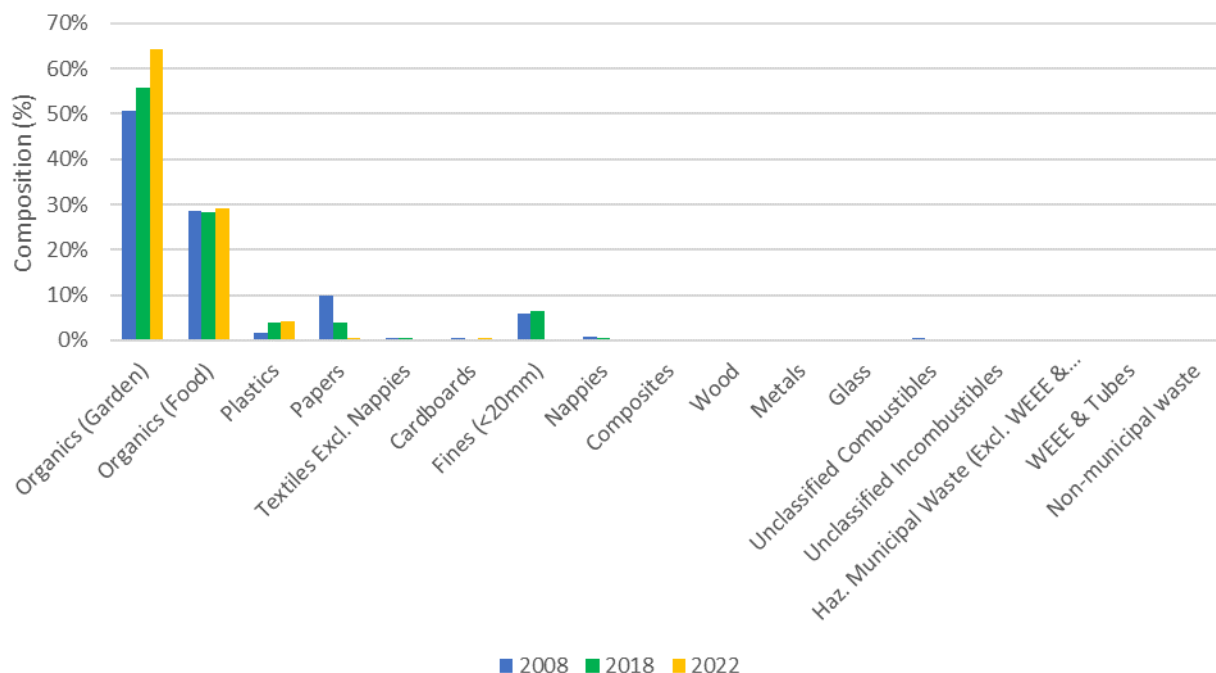
Figure 4-20: Kerbside Household OW Composition (2008, 2018, 2022)

- The main primary sub-categories are:
- **Organics (garden) waste** is still the largest primary sub-category in the OW stream. This category has increased from 2018 (56%) to 2022 (64%).
- **Organics (food) waste** is the second largest category in the OW stream. Food waste content in the OW stream has remained relatively stable from 2008 (29%) 2018 (28%) and 2022 (29%).
- Primary categories which have changed include:
- **Fines (<20mm)** have reduced in the OW between 2018 (6%) and 2022 (0.3%). This may be explained by the effort made to prevent samples self-heating which keeps samples moist, which, in turn, reduces fines content.
- **Papers** decreased from 2018 (4%) to 2022 (0.6%). This can be attributed to a 2% reduction in tissue papers and a 0.8% drop in recyclable paper (packaging). However, cardboards have increased from 0.4% (2018) to 2022 (0.4%).

Household Municipal Waste Characterisation 2022

Overall, **non-target materials** in the OW have continued to decrease from 2008 (13%), 2018 (8%) to 2022 (5%) as shown in **Figure 4-21**. This suggests that there is a greater awareness of the correct waste segregation practices for this stream.
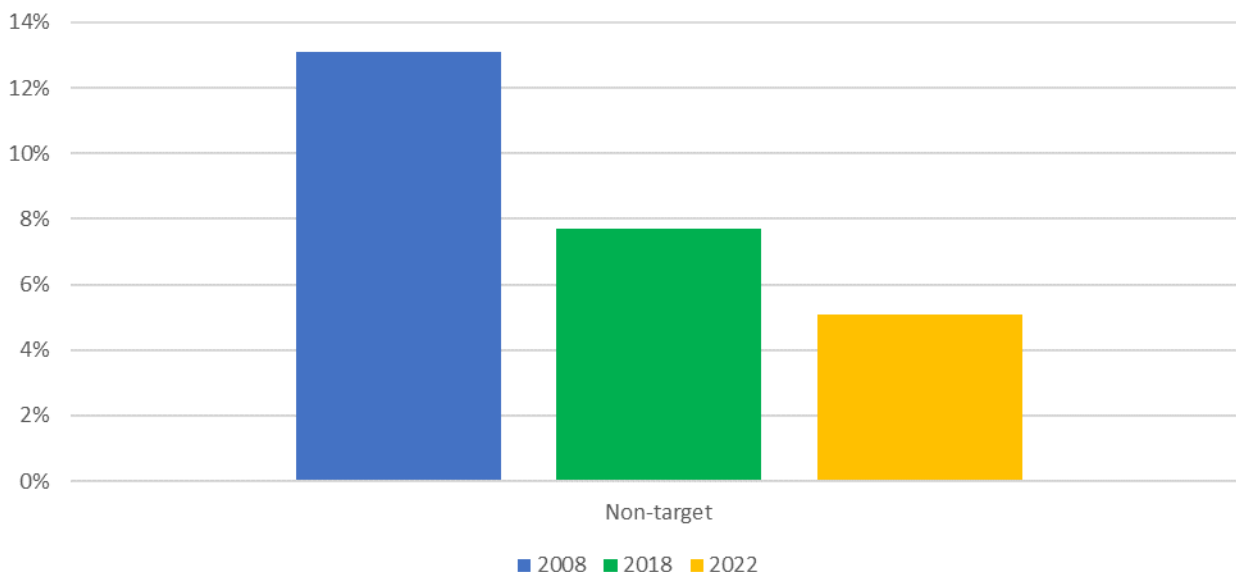
Figure 4-21: Non-Target Material in Kerbside Household OW Trends (2008, 2018 and 2022)

The proportions of BMW in the OW stream have fluctuated slightly from 2008 (94%) to 2018 (92%) and then to 2022 (95%) as shown in **Figure 4-22**.
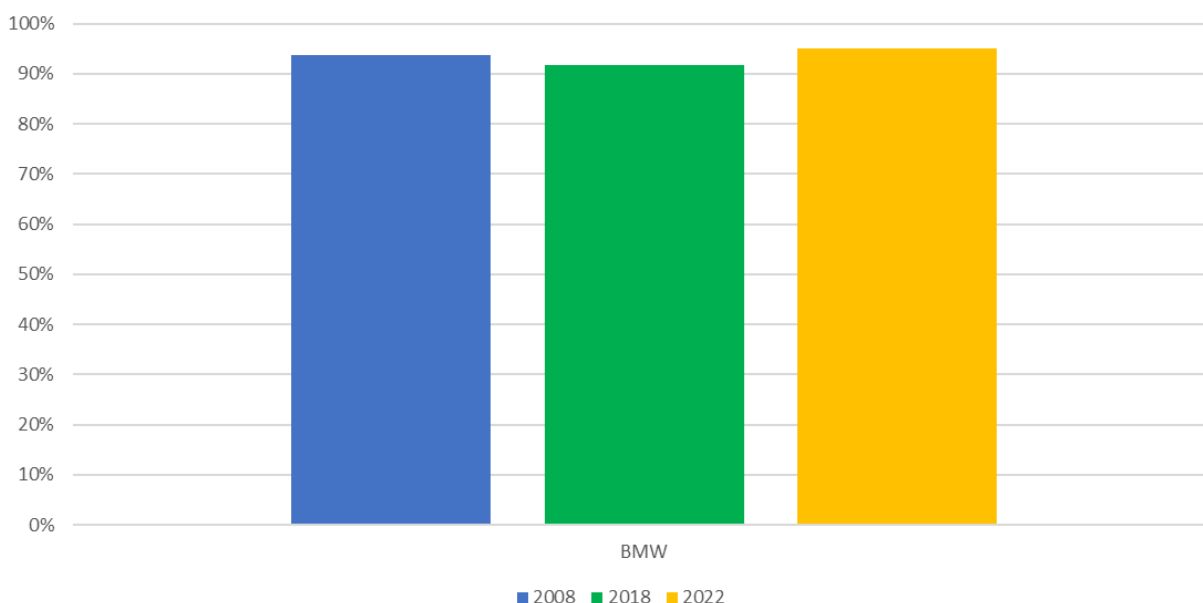
Figure 4-22: Trend in share of BMW in Kerbside Household OW (2008, 2018 and 2022)

The proportions of packaging waste increased slightly between 2008 (3%) and 2018 (5%). However, the packaging proportions within the OW remained the same between 2018 and 2022 (5%). The low proportion of packaging waste is expected as most packaging items should be placed in the MDR and MRW or brought to a bring centre. However, given the increased interest in compostable packaging items from consumers and businesses it is likely that packaging waste within the OW will increase. Continued analysis of compostable packaging in future survey will help to identify patterns and determine whether the usage of these products is increasing or decreasing from the 2022 baseline. **Figure 4-23** shows the trend in packaging waste in kerbside household OW collections.

Household Municipal Waste Characterisation 2022
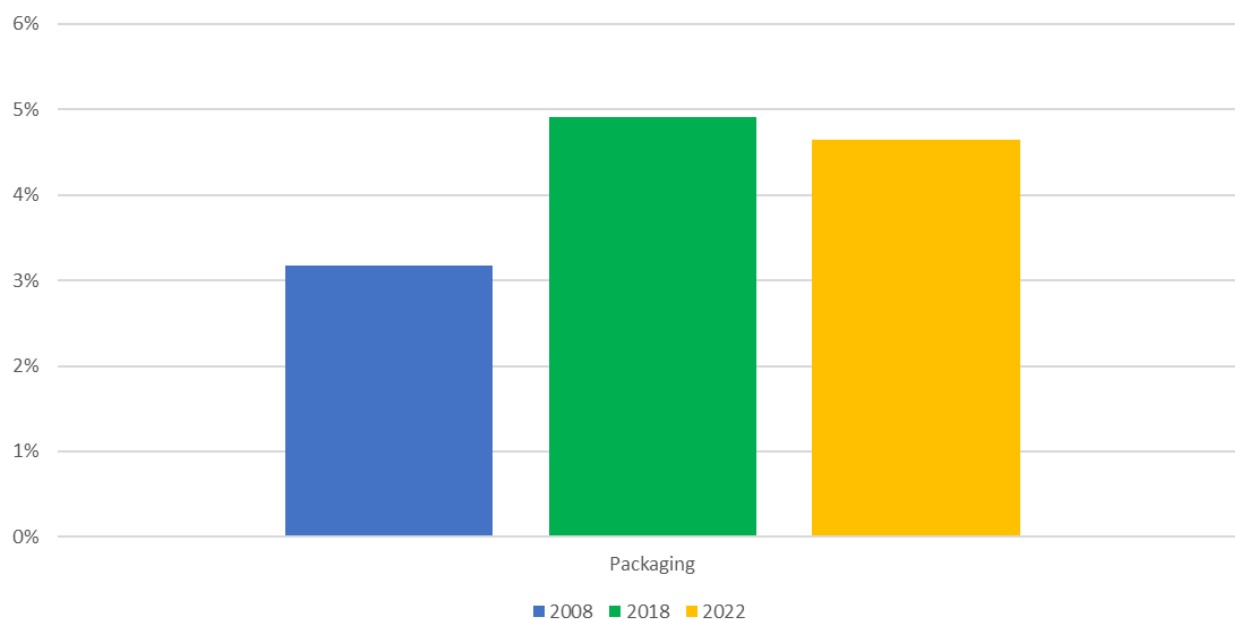
Figure 4-23: Proportions of Packaging in Kerbside Household OW (2008, 2018 and 2022)

Figure 4-24 illustrates typical contents of the OW bin. Frequently, the material was a congealed wet mix of materials difficult to separate, although delicate materials like flowers, did appear. Compostable composite materials appeared, in low numbers, though film plastic was more visible.

Figure 4-24: Organic Waste Input Materials as Received

The wet nature of the materials may have been due to better sample management that avoids self-heating which dries and heats the material and generates fines.

4.12.4 National Profile

A comparison of National Profile composition for years 2008, 2018 and 2022 is shown in **Figure 4-25**.
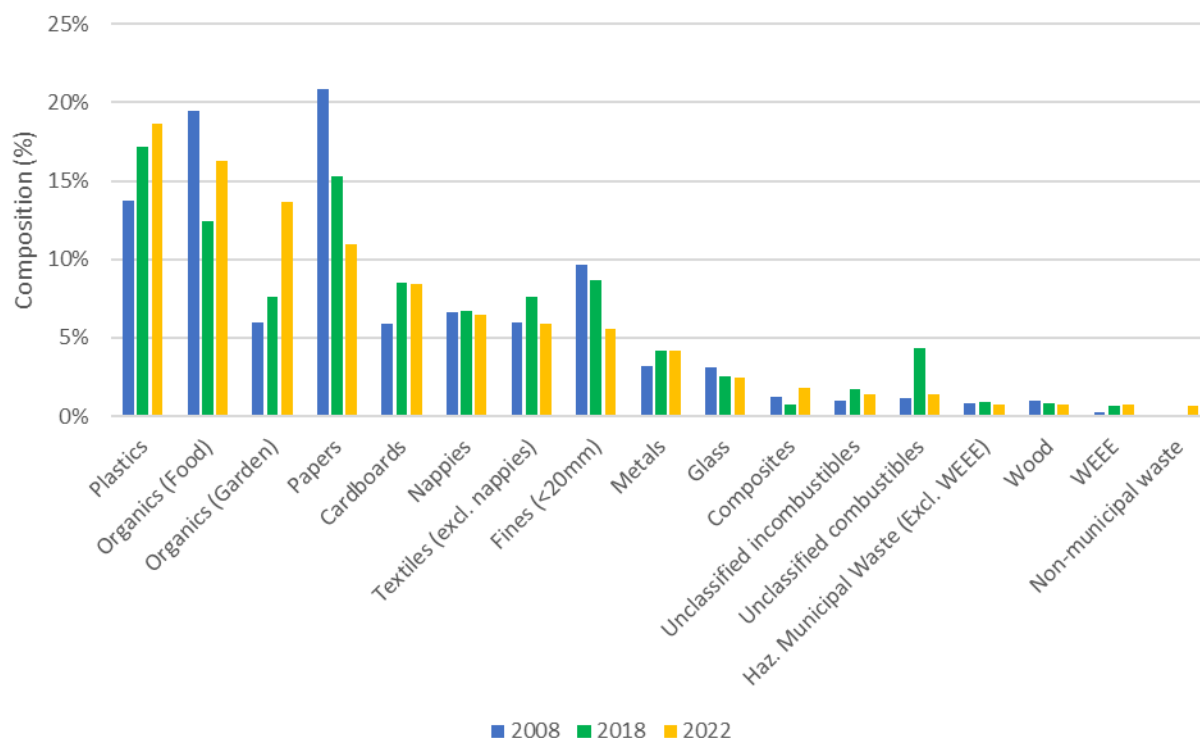
Figure 4-25: National Profile for Kerbside Household Waste (2008-2018-2022)

The most prominent category in the national profile in 2022 was plastics, comprising 19%. This category has increased from 2008 (14%) to 2018 (17%)

The second largest primary category in 2022 was organics (food) (16%), up since 2018 (12%), but still not as high as 2008 (19%). Addressing the issue of food waste is complex and will require implementation of behavioural changes such as meal planning, making shopping lists and using correct food storage techniques, all of which can assist in reducing household food waste arisings.

Organics (garden) have continued to increase in the national profile from 2008 (6%), to 2018 (8%), to 2022 (14%).

Papers have steadily decreased from 2008 (21%), in 2018 (15%) to in 2022 (11%).

Cardboards increased from 2008 (6%) to 2018 (9%) and fell slightly to 2022 (8%).

5 CONCLUSION

The core objective of this project is to obtain up-to-date information on the nature and composition of Ireland's kerbside household municipal waste. This will enable accurate waste statistics reporting and to inform national waste and circular economy policy, infrastructure planning, regulatory and enforcement activities.

The findings of this project are presented in three deliverables – this report, the associated messaging booklet, and the underlying model that contains and analyses the data that is reproduced in the report and booklet.

The key findings include:

- **Target / non-target:** Overall, a significant percentage (47%) of kerbside household waste could be segregated better and managed elsewhere than in the bin which it was placed. A significant, and increasing, proportion of items are 'off target' – these materials are being placed in the incorrect bin. These are materials that should either go in a different kerbside bin or that should be managed at bring banks or civic amenity sites.

- **Food waste:** Food waste is one of the largest fractions in household waste (16%) and has a dedicated collection stream – the OW bin. Yet, the food waste capture rate in the OW bin is low - twice as much food waste is placed in MRW bins (119,000 tonnes) as in the OW bins (60,000 tonnes). Furthermore, the food waste content of MRW and MDR bins is up since 2018. Proportions of food waste recorded in apartments MRW are significantly higher than in houses.

- **Plastic waste:** Plastic waste is a prominent category. Analysis shows that less than a third (31%) of recyclable plastic is correctly placed in the MDR bin with most of this material (65%) placed in MRW.

- **Contamination on packaging waste:** Contamination (food, dirt, or moisture) on packaging waste comprises 7% of the entire household kerbside waste stream. This suggests that messaging about keeping recyclables 'Clean, Dry and Loose' is not being adhered to sufficiently and further awareness and education campaigns are needed.

- **Apartments:** Apartments demonstrated poor waste management performance relative to other housing, based on a small sample size. Non-target materials are present in higher proportions, including streams that are already well served by separate collection systems – food waste, textiles (clothes) and glass. This finding is consistent with known demographic and technical characteristics of apartments which are not optimal for good waste management.

- **Novel wastes, including nicotine vapes** new categories of waste identified include epinephrine autoinjectors and nicotine vapes (electronic cigarettes). Nicotine vapes are a concern due to the potential fire hazard at waste management facilities.

Overall, these findings emphasise the need for improved waste segregation practices. Ireland needs to fundamentally improve its performance in managing kerbside collected household by capturing and segregating at source more materials, in better condition, from more households.

To address these challenges and move towards a circular economy, targeted actions are recommended, see Section 5.1, such as awareness campaigns, infrastructure improvements, enforcement measures, and innovative technologies. By implementing these measures, Ireland can increase recycling rates, reduce environmental impact, enhance resource efficiency, and support the transition to a circular economy. It is crucial that these actions are taken to meet municipal and packaging waste recycling targets and ensure a sustainable future, where resources are managed efficiently, waste is minimised, and the well-being of both current and future generations is prioritised.

5.1   Recommendations

The following key actions are generated to assist in achieving the aim of segregating more materials at source, from more households, in better condition. Importantly, the actions are essential if Ireland is to meet its municipal and packaging waste recycling targets.

Priority waste streams

Food waste is a priority due to the high proportion of food waste in household MRW bins. Key actions recommended include:

1. Implement actions to reduce household food waste generation by 50% by 2030 in accordance with UN Sustainable Development Goal 12.3.
2. Rollout the OW segregated collection service (brown bins) to all households, including apartments, in accordance with the new EU legislation for mandatory separate biowaste collection by the end of 2023.
3. Targeted and co-ordinated awareness and education campaigns focused on improving food waste segregation.
4. Provide all households with an OW segregated collection service that is appropriately incentivised to reward food waste reduction and segregation.
5. Enforce appropriate use of the OW collection service provided including penalties for improper waste management practices, to ensure compliance and accountability.

Other waste streams of concern and that require targeted action.

6.   Further action is essential to reduce recyclable plastic waste content in MRW bins. Targeted and co-ordinated awareness and education campaigns on improving the separate capture of plastic packaging materials from households, incentivising the collection of plastic packaging, the incoming Deposit Return Scheme and industry level actions from EPR schemes could all help to minimise plastic waste. These actions will require broad and coordinated stakeholder collaboration.
7. The improving trends in WEEE, packaging BMW and textiles demonstrate that previous targeted actions are having impact and may provide lessons for other streams. The presence of these materials is still not at desired levels, especially considering the growing baseline of overall arisings, and there is still work to do on these streams to increase both prevention and recycling. Pending changes include the DRS for bottles and cans and a requirement for separate collection of textiles will further enhance collection and segregation of these material streams.
8. Nicotine vapes and other battery-operated devices are increasingly prevalent and pose potential to cause fires at waste management facilities. There is need for an information campaign to educate the public about the appropriate management and disposal methods for battery operated devices.

Apartments

Apartments form an increasing share of Irelands housing stock yet, based on survey observations and findings, appear to have inadequate waste management performance. This performance may be driven by behavioural and infrastructural issues. Key actions recommended include:

9. Targeted education and awareness of waste management in apartments. Campaigns on education and enforcement should reflect the demographic and technical differences of apartment waste management from other household types. As apartments are demonstrated to have worse rates of waste segregation in target bins than houses, it is important that educational efforts - such as educational workshops for residents - are ongoing and expanded.
10. Food waste was recorded at high levels in apartment MRW. There is an immediate need to implement the rollout of segregated food waste collections for residents. The actions identified in number 9 are also relevant.
11. Glass and textiles were recorded at high levels in apartment MRW. Opportunities to provide dedicated glass and clothes banks at apartments should be considered especially at medium to large scale multi-storey complexes.
12. Infrastructure provision in apartments must support provision of collection systems. Consideration should be given to requiring, by law, infrastructure supporting segregated collection for materials in apartment complexes. Enhancements are required in waste collection systems, storage facilities, and shared bins to support effective waste management in apartment complexes.
13. Implement targeted enforcement campaigns to lower off-target rates in bins from apartments.

Collection systems and encouraging effective participation

Kerbside waste collection systems have a significant role in driving household waste management performance. Key actions recommended include:

14. Encourage waste collectors to configure charging mechanisms for all household waste collection services to encourage, incentivise, and reward prevention and appropriate segregation. Increase effective participation in these household waste collection services through clear and accessible, nationally aligned, educational campaigns that provide information on waste management requirements.
15. Increase enforcement of existing waste regulations to encourage appropriate household waste management. Enforcement also requires application of penalties for improper waste management practices.
16. Promote research and innovation in technologies including digital platforms to improve use of shared bins, to facilitate monitoring, reporting, and billing.
17. Encourage use of bring centres, e.g., for glass, textiles/clothes, WEEE and batteries. Targeted education campaigns, incentives, expanded bring centre services, improved access for non-private transport, and dedicated kerbside collections, would encourage proper management of these materials and to protect the quality of the kerbside collected streams. The presence of textiles and glass despite decades old bring centre networks highlights the need for on-going efforts.
18. Deliver on the legislative requirements for separate collection systems for textiles and household hazardous waste to remove these streams from the existing bin systems to segregate these streams and prevent contamination of other streams.

Other areas for action

Other areas identified as potentially problematic and requiring attention are addressed here. Key actions recommended include:

19. Households need ongoing awareness and education campaigns to present MDR materials 'clean, dry and loose' to reduce the contamination levels found on packaging and other wastes. This would address the significant contamination (7%) adhering to packaging and other materials.
20. This report has noted challenges encountered in delivery of the surveys and made recommendations on how to address these challenges and smooth delivery of future surveys. These recommendations are presented in **Appendix J**.

Appendix A

Municipal Waste Categories

(Changes since 2018 Household Municipal Waste Characterisation in red)

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
Organics	20 01 08	All food: packaged and non-packaged	Unused or partially used packaged food that cannot easily be separated from packaging. e.g., Jar of honey, a tub of soft cheese, packet of ham, cheese in packaging. Vegetables, fruit, cheese, or sausages removed from packaging. e.g., Fruit & vegetables, block of cheese, sausages, bread Inedible food wastes. e.g., fruit & vegetables peelings, tea bags, meat carcasses		Targeted by OW
Organics	20 01 08	Liquid fit for human consumption	Liquid contained in drink or milk containers. e.g., Milk, soft drinks, juices. (NB: weigh without the packaging)		Targeted by OW
Organics	20 02 01	Biodegradable waste from garden & park	Grass and bush cuttings, twigs, soil, flowers, leaves, tree branches, weeds		Targeted by OW
Organics	20 01 25	Vegetable oil	Sunflower, Olive Oil (NB: weigh without the packaging)		Targeted by OW
Papers	15 01 01	Recyclable paper packaging	Brown or white paper bags, egg cartons, bread wrappers	Packaging	Targeted by MDR
Papers	15 01 01	Unrecyclable paper packaging	Soiled/contaminated bags, cartons, and wrappers	Packaging	
Papers	20 01 01	Newspapers	Newspapers, newsprint-type advertising publications, other newsprint		Targeted by MDR
Papers	20 01 01	Magazines & glossy paper	Magazines and advertisements on glossy paper, shop catalogues & supermarket flyers		Targeted by MDR
Papers	20 01 01	Office papers	Office type envelopes, letters, reports, print outs		Targeted by MDR
Papers	21 01 01	Tissue Papers	Tissue paper, kitchen roll, disposable tissues, hand drying tissue sheets and blue paper roll		Targeted by OW (only when placed in OW bin)[1]

[1] Changes since 2018 in red font.

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
Papers	20 01 01	Other papers	Till receipts, books, telephone directories, non-glossy junk mail, loose leaf paper, non-glossy brochures and catalogues, notebooks, envelopes		Targeted by MDR
Cardboards	15 01 06	Cardboard (packaging)	Cereal boxes, toy boxes, washing powder containers, corrugated packaging cardboard used for household items packaging (tv, computer hardware, furniture etc.).	Packaging	Targeted by MDR
Cardboards	15 01 06	Unrecyclable flat and corrugated card. (packaging)	Unrecyclable flat and corrugated card packaging e.g., ready packed meats, contaminated pizza box.	Packaging	
Cardboards	20 01 01	Other cardboards (non-packaging)	Greeting cards, postcards, files and folders, tickets		
Composites		Cups for beverages, including similar covers and lids (packaging)	Coffee cups, smoothie cups NB: Covers and lids to be put into a plastics category if they are made from plastic.	Packaging	
Composites		Beverage cartons (packaging)	Beverage/juice cartons (tetra Pak), soup	Packaging	Targeted by MDR
Composites		Other composites (packaging)	Packaging containers, wrappers, trays, pringles tubes, tablet packaging	Packaging	
Composites		Other composites (non-packaging)	Composite cups (including covers and lids) and containers (including covers) bought in multipack for home use (e.g., children parties) (non-packaging).		
Textiles	15 01 09	Textiles Packaging	Shoe bag, handbag cover, potato sacks	Packaging	
Textiles	20 01 11	Textiles Non-Packaging	Rags, household soft furnishings (cushions) and upholstery, blankets, towels, carpets, curtains, rucksacks,		
Textiles	20 01 10	Clothes	Clothing, shoes (non-plastic)		
Textiles		Nappies (& incontinence wear)			
Textiles	20 01 99	Healthcare textiles	Dressings, plasters, linen, disposable clothing, bandages. Covid-19 PPE (PERSONAL PROTECTIVE		

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
			EQUIPMENT) - masks, booties		
Plastics	15 01 02	PET packaging bottles including similar lids	PET bottles e.g., soft drink, water bottles NB: Lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	PE plastic packaging bottles including similar lids	High- and low-density PE bottles NB: Lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	PP plastic packaging bottles including similar lids	PP bottles NB: Lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	Other plastic packaging bottles including similar lids	Other Plastic bottles NB: Lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	PET packaging containers (other than bottles and lids) including similar covers.	PET cups, packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	PE packaging containers (other than bottles and lids) including similar covers.	PE cups packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	15 01 02	PP packaging containers (other than bottles and lids) including similar covers.	PP cups packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging	Targeted by MDR
Plastics	20 01 39	PET cups and other containers non-packaging, including similar covers and lids	PET cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g., children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.		Targeted by MDR

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
Plastics	20 01 39	PE cups and other containers non-packaging, including similar covers and lids	PET cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g., children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.		Targeted by MDR
Plastics	20 01 39	PP cups and other containers non-packaging, including similar covers and lids	PET cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g., children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.		Targeted by MDR
Plastics	20 01 39	Styrofoam and EPS (non-packaging)			
Plastics	15 01 02	Styrofoam and EPS (packaging)	Electronic goods packaging, food containers	Packaging	
Plastics	15 01 02	Supermarket bags, plastic bags and films, wrappers, including compostable bags (packaging)	Lightweight supermarket shopping bags, sandwich bags from other than home use, compost/peat-moss bags, cling film from other than home use, biscuit wrappers	Packaging	Targeted by MDR
Plastics	15 01 02	Shrink wrap and pallet wrap, including compostable.		Packaging	Targeted by MDR
Plastics	15 01 02	Other plastic, including packaging containers (other than bottles, including compostable (packaging)	Containers, trays, wrappers, crisp packets and similar, toothpaste tubes, reusable plastics bags and similar, cups	Packaging	Some sub-categories targeted by MDR and OW
Plastics	20 01 39	Other plastic, including non-packaging cups and other containers, including compostable (non-packaging)	Cutlery, stirrers, plates, straws, balloon sticks, cotton buds Bin liners, toys, CDs, buckets, clothes hangers, lighters, rulers, babies' bottles, shoes, reusable plastics bags (no supermarket logo) and similar, wet wipes, beakers, reusable bottles.		Some sub-categories targeted by MDR and OW
Glass	15 01 07	Glass (packaging)	Wine bottles, beer bottles, water bottles, jam jars and medicine bottles.	Packaging	
Glass	20 01 02	Glass (non-packaging)	Mirrors, plate glass, flat glass, cookware (Pyrex),		

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
			mixed broken glass, drinking glasses.		
Metals	15 01 04	Ferrous metal (packaging)	Canned food, biscuit tins, tins of polish, beer bottle tops, glass jar lids.	Packaging	Targeted by MDR
Metals	20 01 40	Ferrous metal (non-packaging)			
Metals	15 01 04	Aluminium cans (packaging)	Beverage cans - soft drinks, beer	Packaging	Targeted by MDR
Metals	15 01 04	Aluminium trays and foil (packaging)	Foil trays, some toothpaste/cosmetic products tubes.	Packaging	Targeted by MDR
Metals	15 01 04	Other non-ferrous metal (packaging)		Packaging	
Metals	20 01 40	Other non-ferrous metal (non-packaging)			
Wood	15 01 03	Wood Packaging	Bottle corks, cork packaging, pallets, ice-cream sticks, wooden boxes for wine/cheese/garden products/ slates, wooden separators between products e.g., slats used to separate windows in transport, wooden spools for cables)	Packaging	
Wood	20 01 37	Untreated wood (non-packaging)	Wood fencing (unpainted/unvarnished), some wood from DIY		
Wood	20 01 38	Treated/composite wood (non-packaging)	Kitchen units, particle wood, toilet seats, skirting (chipboard, plywood, MDF), baskets.		
Haz. Municipal	20 01 28	Water based paints	Water based paint.		
Haz. Municipal	20 01 27* / 20 01 28	Other paint and associated products	Paint other than water-based paint, heavily soiled paint brushes.		
Haz. Municipal	20 01 33* / 34	Batteries & Accumulators	Lead acid, nickel cadmium, other car and household batteries and accumulators (including rechargeable batteries).		
Haz. Municipal	15 01 04	Aerosols (packaging)	Deodorant, perfume, hairspray.	Packaging	Targeted by MDR
Haz. Municipal	21 01 35* / 36	Electronic equipment	Household appliances (toasters etc.), electronic toys, remote controls, phone chargers.		

Primary Category	LOW CODE	Secondary Category description	Examples*	Packaging	Target bin
Haz. Municipal	21 01 35* / 36	Fluorescent tubes and other mercury containing wastes.	Fluorescent tubes and other mercury containing wastes.		
Haz. Municipal	20 01 31* / 32	Medicines and Drugs	Out of date antibiotics, steroids, tablets, etc. Separated from packaging, inhaler.		
Haz. Municipal	20 01 29* / 30	Detergents	Laundry detergents separated from packaging i.e. The liquid or powder only		
Haz. Municipal	20 02 03	Garden chemicals	Sprays, feeds		
Haz. Municipal	20 03 99	Healthcare risk waste	Sharps, vials		
Haz. Municipal	20 03 99	Other hazardous domestic waste	Any other items e.g., hair dye, waste oil, oil filters, ink cartridges and toner. NB: Description to be provided during survey		
Unclassified combustibles	15 series	Unclassified combustibles (packaging)	Assorted items	Packaging	
Unclassified combustibles	20 03 99	Unclassified combustibles (non-packaging)	Animal hair, linoleum (lino), non-PPE household rubber gloves, candles, full tube body lotion, paint brush. Tobacco without filters.		
Unclassified incombustibles	15 series	Unclassified incombustibles (packaging)		Packaging	
Unclassified incombustibles	20 03 99	Unclassified incombustibles (non-packaging)	Inert waste e.g., Ceramics, crockery, stone/ceramic floor and wall tiles, vases.		
Fines		Fines (<20mm)	Material that falls through the tabletop holes 20mm mesh		
Non-municipal waste		Non-municipal waste	e.g., C&D waste		

Appendix B

Site Sampling Plan

MUNICIPAL WASTE CHARACTERISATION 2022 - APPENDICES

Sampling Plan completed by: RPS	**On behalf of:** Environmental Protection Agency
Client: Environmental Protection Agency	**Facility being sampled:** Xxxxxx
Client Contact: Name:	Site Contact: Name: [**Insert text**] Ph: [**Insert text**]
Sampling to be conducted by: RPS	**Sampler:** Name: [**Insert text**] Ph: [**Insert text**]

SAMPLING OBJECTIVE: To undertake characterisation of unsorted household HMW xxxxxxxxxx.

SAMPLING APPROACH:
[**Insert text**] of RPS conducted a site visit to *** facility on [**Insert text**]. The following information was obtained to develop the sampling approach:

-

MATERIAL

Type of material: Unsorted household municipal waste | **Location:** *** facility at ***

Source and origin of the material (E.g., form and nature of arising):
Household Kerbside HMW that has not been processed by sorting/screening, either:
- delivered direct from kerbside collection to the xxx Facility or
- stored at an intermediate facility prior to delivery to WTE.

Process/activity producing the material:
Households – city and rural.

Identify access problems that may affect sampling programme, for example:
- Time constraints due to sampling large quantities of waste in a short timeframe.
- Commercial waste being co-collected with household or consigned as household. Confirmation was sought to ensure that there is no commercial waste incorporated.
- household HMW not from target areas being presented E.g., city presented as rural.
- Materials being mislabelled when stored in skips

SAMPLING METHODOLOGY

Specify detailed sampling location: WTE facility reception hall

Define sub-population or consignment to be sampled:

The number of grab samples to be collected are as follows

insert table here when sources are agreed

Define place and point of sampling: [**Insert text**].

Specify date and time(s) of sampling: [**Insert text**].

Specify persons to be present:
Task Supervisor: [**Insert text**].
Other Staff Members: [**Insert text**].

Identify sampling technique:
Each survey a minimum of 100kg was sampled, with ideally an added 20kg stored as a buffer in case of loss or other issue with the sample.
Each sample was sorted into buckets according to those categories listed, weighed, and recorded. Single use plastics can be aggregated into categories (E.g., bottles, food containers; [**Insert text**]) for a later secondary sort to help speedy segregation.
At the end of the sampling period, the data was aggregated and scaled up to generate an average percentage composition of each category in the HMW waste.

Equipment required for each survey CHECKLIST

Data Recording materials and other	- Dust Masks x 20

paperwork
- RPS EPA Surveys Manual
- Agency Staff Time Sheets
- Staff Contact Details
- Sorting Record Forms
- Clipboards x 2
- Calculator
- Identification guide to plastics
- Detailed listing describing the waste types
- Toolbox talk outline.
- Labels and markers for buckets
- Masking Tape
- Labels already printed with numbered labels for buckets (with numbers and photos)
- Pens and Markers
- Large white stickers to label items & samples

To Build the table
- Cordless Drill
- Spanners - Nuts & Bolts
- Table number 1

PPE and safety
- Safety Boots
- Hard hats
- Bump hats
- Cut resistant Gloves
- High Viz Vests

- Paper Suits x 10
- First Aid Box
- Ear Plugs x 20
- Safety Glasses x 10
- Hand Sanitiser
- Poking sticks
- Boxes to store / keep PPE clean
- PPE paperwork
- Risk Assessment Forms
- SSW Forms
- SSW Check List
- Scales and Batteries 1
- Scales and Batteries 2 (backup)
- Mobile phone Camera (or phone) need to photo lots of buckets
- Cable Ties
- Stanley Knife
- Yellow Buckets x 60
- Buckets with Handles x 60
- Shovel x2
- Yard Brush x2
- Large Rake x2
- Duct Tape
- Ropes
- Black Sacks
- Wire chicken mesh shaker
- 2 * broom or shovel handles

Number of samples to be collected:
TBC

Detail requirements for on-site determinations: n/a

Identify safety precautions:
Staff working on the project was protected by the normal procedures and by additional procedures to protect against COVID-19:
- Each sampler was provided with a Health and Safety briefing prior to sampling and will have completed the RPS Safe Systems of Work (SSW).
- Supplied with and required to wear PPE E.g., coveralls, face masks and gloves.
- RPS staff vaccinated against Hepatitis A and Hepatitis B and tetanus
- Have had manual handling training
- COVID-19: Assigned a cover certifying that their attendance is required as an essential service
- COVID-19: Required to complete a risk assessment
- COVID-19: Required to complete a self-declaration
- COVID-19: Working area was laid out in a manner that facilitates social distancing as much as possible.

WASTE CHARACTERISATION

Sorting categories: See Appendix A of the methodology report

Sample size to sort: 100kg

Contact: [**Insert text**]   **Sorting date:** [**Insert text**]

Appendix C

Sampling Plan

EPA CHARACTERISATION HHMW

Sampling Plan

rpsgroup.com

Contents

Tables

1 INTRODUCTION

The sampling plan for the characterisation of household municipal solid waste is a deliverable of Task 1 of the EPA Request for Tender 2 CCCEP-2021-06 Municipal waste characterisation.

This sampling plan takes into consideration the updated methodology published in 2015[1], the RFT (Request for Tender) and the methodology used in previous study from 2018[2].

The sampling plan has been prepared following background research and using the most up to date waste management data available at project initiation, namely, the 2019 data submitted in the annual return by the Authorised Waste Collectors (AWCs) obtained from NWCPO. The data is made of the quantities collected and households serviced per waste stream (residual waste, recyclables, organic waste), AWC and local authority.

Using the methodology developed in 2015, the background information from the NWCPO was used to update:

- The allocation of sampling effort per for each waste stream (Mixed Residual, Mixed Dry Recyclables and Organics Collections).
- The allocation of sampling effort per for each stratum[3].
- The list of Authorised Waste Collectors provided a collection service in each stratum.

Table D.3 shows the allocation of sampling effort between Stratum.

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[1] RPS, 2015. Review of the methodologies used for the characterisation of household municipal waste.

[2] RPS, 2018. Final methodology for Household Waste Characterisation Campaign.

[3] **Stratum/strata** are mutually exclusive and exhaustive parts of a population. They are identified either because they are believed to be different from each other or for the purposes of sampling.

2 SAMPLING APPROACH

The aim of this project is to complete 50 waste characterisations on household waste (HMW) in Ireland.

This methodology considers the information set out in the RFT; the updated methodology published in 2015[4] and the methodologies used and agreed in previous studies, including:

- Those from 2004 and 2008 and 2018 and
- The characterisation of household residual waste consigned to WTE during COVID-19 in 2021.

For other relevant/comparable EU states, consideration was given to the methodology used in the UK National Household Waste Composition, WRAP (Waste and Resources Action Programme) (2020).

The background information from the NWCPO was used to update:

- The allocation of sampling effort per for each waste stream (Mixed Residual, Mixed Dry Recyclables and Organics Collections).
- The allocation of sampling effort per for each stratum5.
- The list of Authorised Waste Collectors provided a collection service in each stratum.

2.1 Stratification

Selecting samples requires a systematic means of classify them in terms of key factors that influence waste composition. This approach is called stratification and involves dividing the population into different strata (non-overlapping groups) that reflects the main variables that influence kerbside waste composition. Strata are mutually exclusive and exhaustive parts of a population.

In the 2018 study, the strata chosen were:

- Type of waste stream - Mixed Dry Recyclables, Mixed Residual, Organics
- Type of collection system (E.g., 1, 2 & 3-bin)[6] and
- area type ("Urban (Cities (and their suburbs))" and "rural and mixed rural/city areas").

Following review or recent developments in the Irish waste management system and input from the Steering Group, the same stratification system will be used as per 2015 methodology and 2018 campaign.

2.1.1 Stratum 1: Type of waste stream

The EPA requires the following three strata for evaluation:

- Mixed Residual Waste (MRW)
- Mixed Dry Recyclables (MDR)
- Organic waste (OW)

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[4] RPS, 2015. Review of the methodologies used for the characterisation of household municipal waste

[5] Stratum/strata are mutually exclusive and exhaustive parts of a population. They are identified either because they are believed to be different from each other or for the purposes of sampling.

[6] The type (materials collected) and extent (quantities collected) of separate collections changes the composition of residual waste, i.e., the proportion of food and garden waste in residual waste is lower for those areas which are provided with separate kerbside collection of household food and garden waste, thus reducing the organic waste content of mixed residual waste.

2.1.2 Stratum 2: Type of collection system

- **Type of collection system**: The type (materials collected) and extent (quantities collected) of separate collections changes the composition of the residual waste, i.e., the proportion of food and garden waste in residual waste is lower for those areas which are provided with separate kerbside collection of household food and garden waste, thus reducing the organic waste content of mixed residual waste. Similarly, the type of materials accepted in mixed dry recyclables collection influences the composition of the mixed dry recyclables and the composition of the remaining mixed residual waste collection. It is important to distinguish between the collection systems used to understand the composition of waste arisings. In the context of this programme the following kerbside collection systems have been identified[7]:

    o **1-bin** which includes MRW only.

    o **2-bin** which includes MRW and MDR (Mixed Dry Recyclables) collection.

    o **3-bin** which includes MRW and MDR and organic waste collection.

    o **2& 3-bin with Glass** which includes segregated glass collection combined with MRW and MDR and sometimes organic waste collection.

Table C-1: Number of households with kerbside services in 2019 (Source NWCPO)

Stream	Number of households	% Of collections	Notes
MRW	1,300,895	100%	All served with 1,2,3,4-bin service (1% of households have only a 1-bin service)
Organic	818,204	63%	Have at least a 3-bin service[8]
MDR	1,291,045	37%	c.37% (100%-63%) of households have a 2-bin service
Glass	115,258	9%	Have a glass-bin service with MDR and/or Organic service

2.1.3 Stratum 3: Area type City rural

In Ireland household kerbside waste arisings can be divided between "Urban (Cities (and their suburbs))"[9] and "rural and mixed rural/urban areas."

The city: rural strata is readily identifiable through knowing the source facility and the locality from which the source facility collects its household waste. Sources which straddle city and rural areas can be excluded to increase confidence in identification.

Distribution of waste between the urban/city stratum is applied based on the arisings during 2019. The splits are set out in the table following.

Table C-2: % of Households with kerbside waste service, by area type 2019 (Source: NWCPO)

Year	Cities (& their suburbs)	Rural and mixed rural/urban areas	
2019	46%	54%	100% of households

2.1.4 Strata considered and excluded

The following additional strata were considered. Each was included or excluded, for the reasons given:

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[7] No additional separate collection was highlighted by the Steering Group.

[8] The rollout of the brown bin has continued since 2015 (when 38% had 3-bin service), and the population being provided with a 3-bin service has increased further from the 43% calculated in 2017 to 63% in 2019.

[9] This stratum includes Dublin City (the four LAs), Cork City, Limerick City, Galway City and Waterford City.

- Because of the small quantities collected in the strata 1-bin, the 1-bin collection system was grouped with the 2-bin collection system.
- The sub-stratum with glass-bin services were excluded as being too small and too heterogenous to consider for evaluation itself.

3 ALLOCATION OF SAMPLING EFFORT

This characterisation campaign requires 50 household waste characterisation events. The number of waste characterisation events has been allocated, generally, proportionately based on the quantities collected in the strata in 2019, as shown in in the section following[10].

3.1 Allocation of samples required

The total number of samples to be analysed for each waste stream is shown in **Table C-3**.[11]

Table C-3: Allocation of samples by tonnes, (Source: NWCPO)

Waste Stream	Mixed Dry Recyclables	Mixed Residual	Organic Waste	Total
Tonnes managed (2019)	278,611	609,913	159,389	1,047,913
Percentage of samples	23%	61%	15%	100%
Number of samples	12	30	8	50

The total number of samples to be analysed for each waste stream shown must now be allocated to each stratum. An explanation of the methodology used to generate the percentages is provided in Appendix C of 2015 Methodology.

3.1.1 Allocation of sampling effort for Mixed Residual

The allocation of sampling effort per stratum is shown in **Table C-4**. The derived percentages presented are applied to the target total of 30 No. samples.

Table C-4: Proportion of MRW per Stratum and Allocation of Sampling Effort [12]

Stratum - MRW	2-bin	3-bin	Totals
Cities (and their suburbs)	44,059	178,142	222,201
Rural and mixed rural/urban areas	197,538	190,175	387,712
Total tonnes			**609,913**
Cities (and their suburbs)	7%	29%	36%
Rural and mixed rural/urban areas	32%	31%	64%
Total %			**100%**
Cities (and their suburbs)	2	8	10
Rural and mixed rural/urban areas	10	10	20
Total Samples	**12**	**18**	**30**

For the stratum Cities (and their suburbs):

- o Circa 80% of the samples must come from the four Dublin local authorities
- o The recruitment must include at least two AWCs from the Dublin Region and one AWC from another location (Galway, Cork, Limerick, or Waterford City).

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[10] See Section 4.6 of 2015 Methodology.

[11] To reflect the 2021 rule change directing soft plastics into the MDR, and following discussion with the AWC representative, it was agreed to use the assumption that 50% of this soft plastic is captured in the MDR bin for 2022, based on the information available to that AWC on 1/12/2021. In 2017/2018 the proportion of the soft plastics fraction in the MRW was 10.4%. The volumes of these two streams change as a result, but do not alter numbers of MDR and MRW samples.

[12] This table is based on households serviced from the 2019 NWCPO datasets.

   o   Circa 20-25% of the samples will need to come from apartments

For the stratum Rural and mixed rural/urban areas:

   o   Circa 40% of the samples must come from EMWR, 40% from SWR and 20% from CUWR.
   o   At least two AWCs must be recruited from each region.
   o   Circa 5% of the samples will need to come from apartments.

3.1.2   Allocation of Sampling Effort for Mixed Dry Recyclables

The allocation of sampling effort per stratum is shown in **Table C-5**. The derived percentages presented are applied to the target total of 12 No. samples.

Table C-5: Proportion of MDR per Stratum[13]

Stratum - MDR	2-bin	3-bin	Total
Cities (and their suburbs)	21,850	88,345	110,195
Rural and mixed rural/urban areas	85,807	82,609	168,416
Total tonnes	**0**	**0**	**278,611**
Cities (and their suburbs)	8%	32%	40%
Rural and mixed rural/urban areas	31%	30%	60%
Total %	**0**	**0**	**100%**
Cities (and their suburbs)	1	4	5
Rural and mixed rural/urban areas	4	3	7
Total Samples	**5**	**7**	**12**

For the stratum Cities (and their suburbs):

   o   Circa 80% of the samples must come from the four Dublin local authorities
   o   The recruitment must include at least two AWCs from the Dublin Region and one AWC from another location (Galway, Cork, Limerick, or Waterford City).
   o   Circa 20-25% of the samples will need to come from apartments.

For the stratum Rural and mixed rural/urban areas:

   o   Circa 40% of the samples must come from EMWR, 40% from SWR and 20% from CUWR.
   o   At least two AWCs must be recruited from each region.

3.1.3   Allocation of Sampling Effort for Organics

The allocation of sampling effort per stratum is shown in **Table C-6**. The derived percentages presented are applied to the target total of 8 No. samples. Organic bins are all considered to be 3-bin service.

Table C-6: Proportion of Organics per Stratum[14]

Stratum – Organic Waste	2-bin	3-bin	Total
Cities (and their suburbs)		96,596	96,596
Rural and mixed rural/urban areas		62,792	62,792
Total tonnes		**0**	**159,389**
Cities (and their suburbs)		61%	61%

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[13] This table is based on households serviced from the 2019 NWCPO datasets.

[14] This table is based on households serviced from the 2019 NWCPO datasets.

Rural and mixed rural/urban areas	39%	39%
Total %	**0**	**100%**
Cities (and their suburbs)	5	5
Rural and mixed rural/urban areas	3	3
Total Samples	**8**	**8**

4 FREQUENCY AND TIMING OF SAMPLING

To account for seasonal variation, two survey campaigns per year should be undertaken. The first campaign should take place in the spring, between the months of March and April where possible, and the second campaign should take place in the autumn, between the months of September and October where possible[15].

The total number of samples to be analysed for each waste stream in Tables 4.2, 4.3 and 4.4 should be divided between these seasons i.e., 25 samples per campaign. The second campaign should ideally be a mirror image of the first campaign, assuming the AWCs agree to and are able to partake in both, so that the overall scaled up results can capture the seasonal variation.

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[15] For further information on seasonal variation see final report *A Programme for Municipal Waste Characterisation Surveys* published by the EPA in 2005

Appendix D

Sampling Procedure

EPA WASTE CHARACTERISATION

Sampling Procedure

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Tables

1 LOGISTICS PLANNING

AWCs were recruited from the list of AWCs provided by NWCPO. To improve the cost effectiveness of the programme, larger AWCs were targeted for recruitment in priority.

RPS engaged with the selected AWCs to plan the surveys. This included preparing for and resolving the practical issues involved, such as:

- Communication with the selected AWCs on an individual basis, to brief them on their role in the allocated survey(s) and profiling the AWC to understand the AWCs waste population for guiding sample selection.

- Reconciling waste collection routes with sets of socioeconomic factors at electoral division levels: RPS identified on a map the geographic coverage of the waste collection routes and cross references the information with the socioeconomic factors (type of accommodations, and social class). The purpose of this exercise is to target collection routes that can provide a social class composition that broadly matches the national breakdown presented in **Table E.1**.

- Briefing AWC personnel involved in each survey. This typically involves an initial meeting at the facility in question.

- Checking availability at the treatment facility of a covered area and a machine and driver (bobcat or similar vehicle) for mixing and reducing the sampled waste.

- Sourcing equipment to carry out the physical sorting of the waste including sorting table with a network of holes that are 20mm diameter in size, buckets, weighing scales, shovels, sample bags if laboratory testing is taking place.

- The measures required for meeting the H&S requirements specific to the site in question - issues such as vaccinations, gloves, masks, protective clothing, and disinfectant wipes etc.

- Briefing and training of sorting staff in advance of each sorting event.

1.1 Selection of a Representative Route / Stream

The starting point is to only consider routes that:

- Fit within the required strata.

- Are primarily within the correct social class mix

Samples will be collected from routes / streams which fit the following requirements:

- The routes must exclude commercial waste. Streams that are or appear to be commercial in origin – - based on descriptors provided or source sites or appearance on receipt – will be excluded from consideration and sampling

- The routes must include a mix of social classes to reflect the national average social class breakdown from the CSO. [1]

In all cases, the household waste streams sampled are to be household and unsorted after collection. These considerations will be applied to the stream selection:

- Waste will be sampled before any processing – by screening, bag splitting, magnet picking etc. – is applied to it by the facility.

- Some facilities accept bulk waste deliveries from other facilities. It is not possible to clearly know the routes/sources of these streams and whether any processing has been applied to it. Therefore, only waste streams directly delivered from kerbside collection will be sampled, as these are clearly not sorted.

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[1] It is possible to obtain social class information at electoral division levels and compare these with the waste collection routes.

1.1.1 Social class

Within the routes that fit the selected strata needed, routes sampled must fit within a national average of social classes. **Table D-1** shows the national distribution of the population by social class.

Table D-1: Population % allocation to Social Class in Ireland 2016 (CSO)[2]

	A - Professional workers, Managerial & technical & 33% of others gainfully occupied and unknown	B - Non-manual, Skilled manual & 33% of others gainfully occupied and unknown	C - Semi-skilled, Unskilled and 33% of others gainfully occupied and unknown	Total
%	42%	37%	21%	100%

Information on social class at electoral division level was compiled in a national map shown in **Figure E.1**. The map shows the deviation from national average of each electoral division in the country based on three bands. These three bands are less than or equal to 5%; greater than 5% and less than or equal to 10%; greater than 10%. Waste collection routes were selected from areas in green (in priority) and yellow (if no green available).

Composite samples will be prepared by selecting in increments (grab samples) from selected loads. The increments will be stored in an area where they cannot be compromised or contaminated (using a skip for example). Five increments collected from the loads accepted over a day (where possible). The recommended sample collection parameters are provided in **Table D.2**.

Table D-2: Recommended Sample Collection Parameters for MRW, MDR & OW

Number of Increments (n)	Min. Size of Increment (kg)	Min. Composite Sample Size (kg)	Sample Reduction Coning & Quartering	Sample Size (after Coning & Quartering) (kg)
5	400	2,000	Yes	100
5	400	2,000	Yes	100
5	400	2,000	Yes	100

The composite sample is then reduced to obtain a more manageable size for sorting. The size reduction was be obtained by the **Coning and Quartering technique.**

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[2] CSO (2016) Socio-economic group and social class. Available at: https://www.cso.ie/en/media/csoie/newsevents/documents/census2016summaryresultspart2/Chapter_6_Socio-economic_group_and_social_class.pdf. (Accessed: 12th November 2021).

Population by Social Class (CSO 2016)			
Social Class	A	B	C
	Professional workers, managerial and technical, and 1/3 of all others gainfully occupied and unknown	Non-manual, skilled manual, and 1/3 of all others gainfully occupied and unknown	Semi-skilled, unskilled, and 1/3 of all others gainfully occupied and unknown
National Average	41%	39%	20%
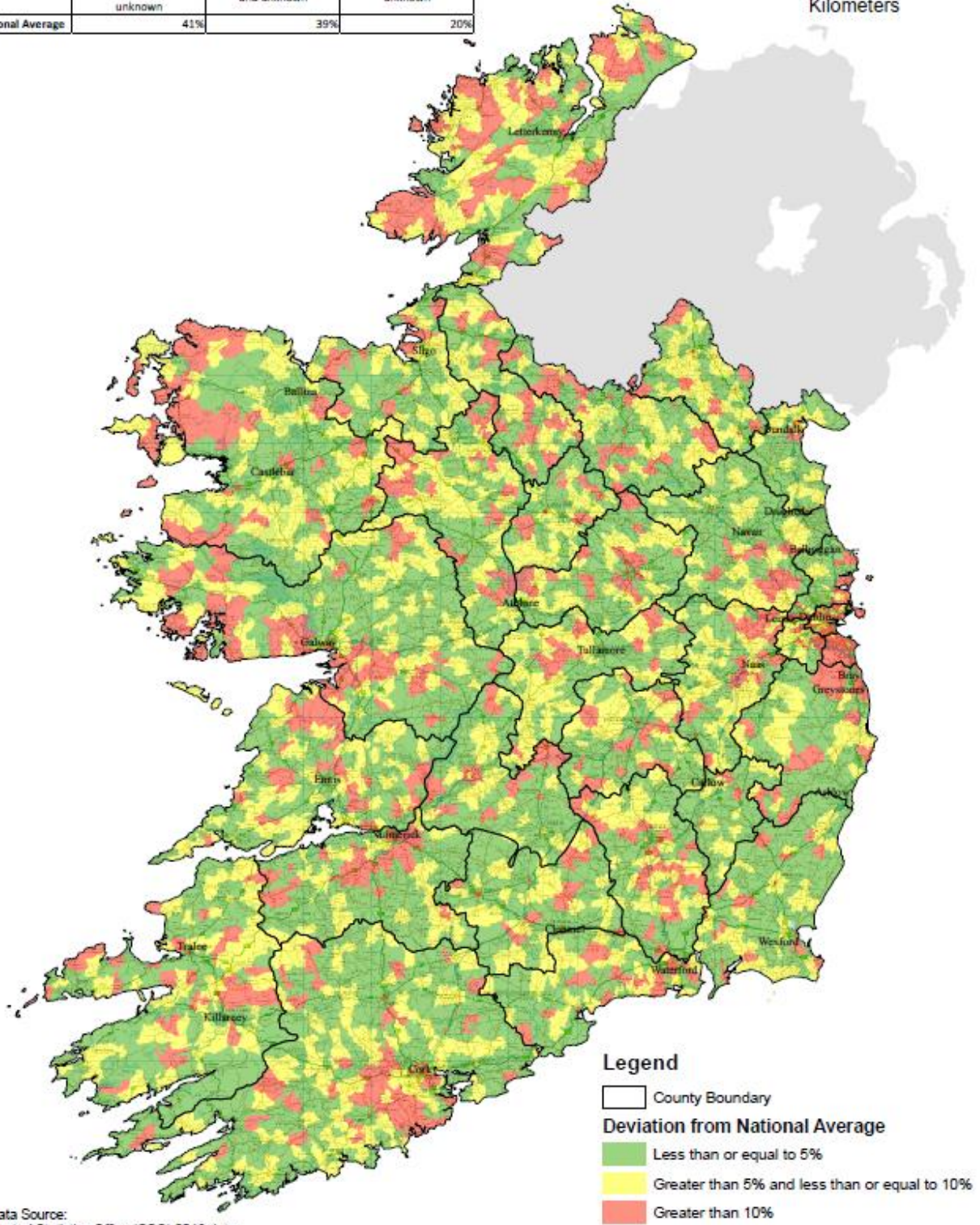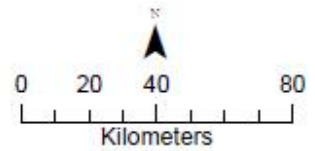
Figure E.1 - National Deviation of Population by Social Class (CSO 2016)

Image C.1 – MRW Samples being Coned and Quartered

1.1.2 Sample Sorting

Once a reduced or workable sample had been obtained, the sub-sample was manually sorted into the categories shown in **Appendix A**.

The sorting team comprised of a supervisor and the sorting staff (at least four sorters are advised).

Prior to carrying out the waste characterisation, the sorting staff were trained by the supervisor to recognise the different waste categories.

The supervisor ensured the quality control of the sorted material by checking the material placed in each container.

Any remaining material that passed through the 20 mm network of holes on the sorting table was classified as 'Fines < 20 mm'.

The weights of each category were recorded on an appropriate Waste Composition Form.

Figure C.2 – Sorting Table and Containers

Appendix E

Samples Collected

EPA CHARACTERISATION

Samples Collected

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Tables

1 SAMPLES COLLECTED PER STRATUM

Table E.1 presents the number of samples collected per stratum. Number in brackets indicates the number required by the sampling plan.

Table E-1: Samples Surveyed per Stratum

	C2B	C3B	R2B	R3B	Total
Mixed Residual Waste	1 (2)	9 (8)	8 (10)	12 (10)	30
Mixed Dry Recyclable	0 (1)	4	4	4 (3)	12
Organic Waste	0	5	0	3	8
Total No. Samples	1 (3)	18 (17)	12 (14)	19 (16)	50
Total %	2%	36%	24%	38%	100%

1.1 Additional Sampling Requirements

Table E.2 presents the number of samples collected compared with geographical distribution requirements and minimum numbers of apartment samples.

Table E-2: Specific Requirements for the Allocation of Sampling Effort

	MRW		MDR		OW	
Area	City	Rural	City	Rural	City	Rural
EMR		58% (50%)		29% (50%)		
Dublin	45% (80%)		40% (80%)			
CUR		11% (20%)		14% (20%)	N/A	
SR		16% (30%)		43% (30%)		
Apartments	27% (20-25%)	11% (5%)	20% (20-25%)			

The requirement for the minimum number of AWCs per stratum was achieved.

1.2 Frequency and Timing of Surveys

Table E.3 presents an overview of the timing of the surveys.

Table E-3: Overview of Survey Timings

Period	MRW	MDR	OW
March - April	7	2	5
September - October	6	6	2
Other	3 May, 6 June, 8 November	2 June, 2 November	1 November
Total	30	12	8

Appendix F

Results Mixed Residual Waste

MUNICIPAL WASTE CHARACTERISATION 2022 - APPENDICES

Survey Data - MRW

Appendix G

Results Mixed Dry Recyclables

MUNICIPAL WASTE CHARACTERISATION 2022 - APPENDICES

Survey Data - MDR

Sample number	8	9	23	24	29	30	31	32	38	39	46	50
Authorised Waste Collector	AWC2	AWC1	AWC5	AWC6	AWC7	AWC8	AWC9	AWC8	AWC8	AWC8	AWC6	AWC11
Region	EMR	EMR	EMR	EMR	CUR	CUR	CUR	SR	SR	SR	SR	CUR
Type of Waste	MDR	MDR	MDR	MDR	MDR	MDR	MDR	MDR	MDR	MDR	MDR	MDR
Stratum c3b. C2b R2b r3b A3b a2b etc	C3Bhr	R3Bhr	R2Bhr	C3Bar	C3Bhr	R3Bhr	R2Bhr	R3Bhr	R2Bhr	R3Bhr	C3Bhr	R2Bhr
House or Apartment	Household	Household	Household	Apartment	Household	Household	Household	Household	Household	Household	Household	Household
Frequency of collection (all are fortnightly)	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly
Date of Sorting	16/03/2022	24/03/2022	10/06/2022	10/06/2022	04/10/2022	04/10/2022	05/10/2022	24/10/2022	27/10/2022	27/10/2022	03/11/2022	18/11/2022

#	Primary Waste Categories	Packaging	Single Use Plastics (SUP)	Secondary Categories	Primary Subcategory Waste	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	Average - both
1	Organics	No	No		Food waste.	1.0%	4.3%	2.2%	12.8%	1.3%	1.0%	2.4%	0.6%	1.5%	0.6%	1.6%	3.5%	2.7%
4	Organics	No	No		Liquid fit for human consumption	0.5%	0.0%	0.0%	0.7%	0.0%	0.1%	0.0%	0.0%	0.6%	0.0%	0.0%	0.1%	0.2%
5	Organics	No	No		Biodegradable waste from garden & park	0.0%	0.0%	0.7%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
5.1	Organics	No	No		Grass cuttings	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	Organics	No	No		Vegetable oil	0.0%	1.3%	0.1%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%
7	Papers	Packaging	No		Recyclable paper packaging	0.7%	0.0%	0.3%	4.2%	3.3%	3.6%	3.8%	2.0%	3.4%	1.2%	1.8%	1.0%	2.1%
8	Papers	Packaging	No		Unrecyclable paper packaging	3.2%	1.4%	1.2%	0.5%	0.4%	0.4%	0.9%	2.4%	1.2%	2.5%	1.8%	0.3%	1.4%
9	Papers	No	No		Newspapers	5.3%	6.2%	10.1%	5.7%	10.1%	8.1%	5.7%	10.8%	3.4%	13.9%	9.3%	13.2%	8.5%
10	Papers	No	No		Magazines & glossy paper	3.9%	2.2%	1.8%	1.4%	5.6%	5.9%	3.3%	12.2%	4.3%	4.2%	4.0%	7.8%	4.7%
11	Papers	No	No		Office papers	0.9%	0.7%	0.1%	2.9%	1.5%	2.8%	0.4%	1.6%	3.1%	2.0%	1.1%	1.7%	1.6%
12	Papers	No	No		Tissue Papers	1.2%	0.5%	1.3%	1.4%	1.4%	1.6%	2.0%	2.9%	1.3%	0.6%	1.9%	0.7%	1.4%
13	Papers	No	No		Other papers	4.4%	3.2%	3.5%	1.9%	3.7%	5.9%	4.1%	1.5%	2.5%	3.0%	3.2%	1.2%	3.2%
14	Cardboards	Packaging	No		Cardboard (packaging)	17.3%	11.1%	6.0%	12.7%	9.1%	15.4%	16.5%	9.3%	22.0%	14.0%	7.5%	17.9%	13.2%
14.1.1	Cardboards	Packaging	No	Secondary Categories	Cardboard packaging used for delivery (post or o	0.0%	0.6%	0.0%	4.2%	5.9%	0.8%	0.8%	0.3%	3.8%	1.6%	2.9%	6.3%	2.3%
14.1.2	Cardboards	Packaging	No	Secondary Categories	Cardboard used to package milk in bags in a box	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.1%
15	Cardboards	Packaging	No		Unrecyclable flat and corrugated card (packaging)	12.8%	3.1%	21.7%	1.4%	1.8%	3.6%	2.0%	11.1%	2.3%	8.9%	10.1%	0.6%	6.6%
16	Cardboards	No	No		Other cardboards (non-packaging)	0.6%	1.6%	1.1%	0.1%	0.6%	0.0%	0.6%	0.0%	0.3%	0.4%	1.1%	0.6%	0.5%
17	Composites	Packaging	No	Secondary Categories	Coffee cups, smoothie cups (covers and lids to	0.2%	0.4%	0.5%	0.1%	0.5%	0.2%	0.8%	0.3%	0.5%	0.4%	0.5%	0.2%	0.4%
17-19.3	Composites	Packaging	No	Secondary Categories	Compostable cups for beverages, including the	0.0%	0.2%	0.0%	0.0%	0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%
18	Composites	Packaging	No		Beverage cartons (packaging)	0.7%	0.5%	0.5%	0.6%	0.7%	0.5%	0.6%	1.1%	0.6%	0.5%	0.3%	0.7%	0.6%
18.1	Composites	Packaging	No	Secondary Categories	Milk cartons	1.1%	0.9%	1.8%	0.5%	1.5%	1.6%	1.7%	0.2%	0.6%	1.0%	0.6%	1.1%	1.1%
18.2	Composites	Packaging	SUP	Secondary Categories	Beverage cartons (packaging)	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.2%	0.4%	0.6%	0.3%	0.5%	0.4%	0.2%
18.3	Composites	Packaging	No	Secondary Categories	Compostable beverage cartons	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
19	Composites	Packaging	No		Other composites (packaging)	0.9%	0.7%	0.9%	0.2%	1.1%	0.9%	1.1%	0.6%	0.8%	0.8%	0.5%	0.4%	0.8%
19.2	Composites	Packaging	SUP	Secondary Categories	Other composites (packaging)	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
19.3	Composites	Packaging	No	Secondary Categories	Compostable other composites (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20	Composites	No	No		Other composites (non- packaging)	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%	0.3%	0.0%	0.1%
20.2	Composites	No	SUP	Secondary Categories	Other composites (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20.3	Composites	No	No	Secondary Categories	Compostable other composites (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
21	Textiles	Packaging	No		Textiles Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.0%	0.4%	1.0%	0.2%	0.2%
22	Textiles	No	No		Textiles non-packaging	0.0%	0.2%	0.6%	5.0%	0.5%	0.4%	0.2%	0.0%	0.4%	0.2%	1.5%	0.9%	0.8%
23	Textiles	No	No		Clothes	0.1%	0.9%	1.6%	5.3%	0.7%	1.2%	1.9%	0.7%	1.4%	1.9%	0.7%	0.4%	1.4%
24	Textiles	No	No		Nappies (& incontinence wear)	0.6%	2.7%	1.5%	0.0%	0.6%	0.3%	2.0%	0.4%	0.0%	0.5%	0.3%	2.0%	0.9%
25	Textiles	No	No		Healthcare textiles	0.0%	0.0%	0.1%	0.1%	0.2%	0.0%	0.0%	0.0%	0.3%	0.1%	0.2%	0.1%	0.1%
26	Plastics	Packaging	No		PET packaging bottles including their lids	0.3%	3.3%	0.7%	0.8%	0.4%	1.0%	0.6%	1.2%	0.5%	1.0%	1.0%	1.3%	1.0%
26.1.1-27.1.1-28.1.1	Plastics	Packaging	No	Secondary Categories	Milk bottles	0.9%	1.2%	1.5%	0.9%	2.5%	2.5%	1.1%	1.7%	2.8%	1.6%	1.7%	1.7%	1.7%
26.1.2-27.1.2-28.1.2	Plastics	Packaging	No	Secondary Categories	Washing up liquid bottles	0.0%	0.1%	0.1%	0.1%	0.0%	0.3%	0.3%	0.1%	0.3%	0.0%	0.0%	0.1%	0.1%
26.2	Plastics	Packaging	SUP	Secondary Categories	PET packaging bottles including their lids	4.3%	3.3%	3.3%	1.7%	2.5%	3.5%	5.0%	4.5%	5.6%	2.9%	4.8%	4.1%	3.8%
27	Plastics	Packaging	No		PE plastic packaging bottles including their lids	1.4%	1.1%	0.5%	0.9%	1.8%	2.2%	1.9%	1.0%	0.9%	0.6%	1.2%	2.0%	1.3%
27.2	Plastics	Packaging	SUP	Secondary Categories	PE packaging bottles including their lids	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28	Plastics	Packaging	No		PP plastic packaging bottles including their lids	0.1%	0.1%	0.0%	0.1%	0.0%	0.2%	0.4%	0.2%	0.0%	0.1%	0.2%	0.1%	0.1%
28.2	Plastics	Packaging	SUP	Secondary Categories	PP packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%
29	Plastics	Packaging	No		Other plastic packaging bottles including their lids	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%
29.3	Plastics	Packaging	No	Secondary Categories	Compostable plastic bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30	Plastics	Packaging	No		PET packaging containers (other than bottles and lids) including their covers.	1.7%	1.4%	2.5%	2.7%	0.9%	3.3%	4.5%	3.2%	1.4%	1.2%	1.9%	0.5%	2.1%
30.1	Plastics	Packaging	No	Secondary Categories	PET cups for beverages in this subcategory	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%
30.2-36.2	Plastics	Packaging	SUP	Secondary Categories	PET - Take-away trays/containers	0.0%	0.0%	0.0%	0.2%	0.2%	0.2%	0.1%	0.0%	0.5%	0.8%	0.3%	0.7%	0.3%
31	Plastics	Packaging	No		PE packaging containers (other than bottles and lids) including their covers.	1.6%	0.7%	0.4%	0.2%	2.3%	0.2%	0.2%	0.7%	0.9%	0.7%	0.0%	0.1%	0.7%
31.1	Plastics	Packaging	No	Secondary Categories	PE cups for beverages in this subcategory	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.8%	0.0%	0.1%
31.2	Plastics	Packaging	SUP	Secondary Categories	PE - Take-away trays/containers	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32	Plastics	Packaging	No		PP packaging containers (other than bottles and lids) including their covers.	1.0%	0.8%	0.8%	1.3%	2.1%	1.5%	1.7%	1.7%	3.0%	3.0%	1.9%	0.7%	1.6%
32.1	Plastics	Packaging	No	Secondary Categories	PP cups for beverages in this subcategory	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32.2	Plastics	Packaging	SUP	Secondary Categories	PP - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
33	Plastics	No	No		PET cups and other containers non-packaging, including their covers and lids	1.1%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
33.2	Plastics	No	SUP	Secondary Categories	PET - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34	Plastics	No	No		PE cups and other containers non-packaging, including their covers and lids	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	0.0%	0.0%	0.0%
34.2	Plastics	No	SUP	Secondary Categories	PE - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
35	Plastics	No	No		PP cups and other containers non-packaging, including their covers and lids	0.2%	0.0%	0.1%	0.0%	0.1%	0.2%	0.0%	0.0%	0.0%	0.1%	0.2%	0.1%	0.1%
35.2	Plastics	No	SUP	Secondary Categories	PP - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
36	Plastics	No	No		Styrofoam and EPS (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.0%	0.1%	0.0%	0.0%	0.1%
36.2	Plastics	No	SUP	Secondary Categories	Styrofoam, EPA and PS Cups	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
37	Plastics	Packaging	No		Styrofoam and EPS (packaging)	0.2%	0.1%	0.5%	4.4%	0.0%	0.0%	0.2%	0.1%	0.2%	0.3%	0.0%	0.0%	0.5%
37.2	Plastics	Packaging	SUP	Secondary Categories	Food trays and coffee cups	0.1%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	0.0%	0.2%	0.1%	0.1%
38	Plastics	Packaging	SUP	Secondary Categories	Supermarket bags, plastic bags and films, wrap	4.7%	3.8%	2.9%	1.4%	2.1%	6.8%	3.4%	3.9%	4.8%	3.8%	1.9%	4.2%	3.6%
38-40.3	Plastics	Packaging	No	Secondary Categories	Compostable supermarket bags, plastic bags, fi	0.0%	0.1%	0.0%	0.0%	0.7%	0.2%	0.1%	0.0%	0.0%	0.0%	0.1%	0.1%	0.1%
39	Plastics	Packaging	No		Shrink wrap and pallet wrap	0.2%	0.1%	0.1%	0.3%	0.4%	0.0%	0.2%	0.0%	0.0%	0.1%	0.1%	0.9%	0.2%
39.3	Plastics	Packaging	No	Secondary Categories	Compostable shrink wrap and pallet wrap	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40	Plastics	Packaging	No		Other plastic, including packaging containers (other than bottles, including compostable (packaging)	1.9%	0.7%	2.8%	1.1%	1.3%	0.9%	2.1%	0.4%	2.5%	1.7%	3.8%	1.2%	1.7%
40.1.1	Plastics	Packaging	No	Secondary Categories	40.1.1. Other plastic cups for beverages in this sub	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40.1.2	Plastics	Packaging	No	Secondary Categories	40.1.2 Polyfilla (and similar plastic)	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40.2	Plastics	Packaging	SUP	Secondary Categories	Food containers including lids. (as per SUP Annex	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.1%	0.0%	0.0%
40.3	Plastics	Packaging	No	Secondary Categories	Compostable 'other plastic' including packaging containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
41	Plastics	No	No		Other plastic, including non-packaging cups and other containers (non-packaging)	1.8%	1.5%	1.9%	2.9%	1.6%	1.4%	1.2%	4.5%	1.1%	2.3%	1.1%	4.3%	2.1%
41.2	Plastics	No	No	Secondary Categories	Identify cutlery, stirrers, plates, straws balloon sti	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
41.3	Plastics	No	No	Secondary Categories	Compostable 'other plastic' including non- packaging cups and other containers	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
42	Glass	Packaging	No		Glass (packaging)	0.6%	14.9%	1.5%	3.7%	0.7%	0.2%	1.0%	0.5%	0.2%	0.3%	0.4%	1.2%	2.1%
43	Glass	No	No		Glass (non-packaging)	0.0%	0.1%	0.1%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
44	Metals	Packaging	No		Ferrous metal (packaging)	3.7%	2.9%	2.5%	1.7%	3.5%	2.3%	3.6%	2.2%	2.4%	2.5%	1.8%	3.7%	2.7%
45	Metals	No	No		Ferrous metal (non-packaging)	0.0%	0.2%	0.9%	1.8%	0.0%	0.0%	0.3%	0.5%	0.0%	0.1%	0.5%	0.1%	0.4%
46	Metals	Packaging	No		Aluminium cans (packaging)	2.5%	2.3%	1.8%	3.9%	2.2%	2.0%	1.6%	1.7%	3.7%	1.0%	3.9%	1.3%	2.3%
47	Metals	Packaging	No		Aluminium trays and foil (packaging)	0.2%	0.1%	0.2%	0.0%	0.4%	0.3%	0.3%	0.3%	0.5%	0.2%	0.2%	0.2%	0.2%
49	Metals	Packaging	No		Other non-ferrous metal (packaging)	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
50	Metals	No	No		Other non-ferrous metal (non-packaging)	0.0%	0.1%	0.1%	0.2%	0.5%	0.0%	0.3%	0.2%	0.1%	0.4%	0.5%	0.0%	0.2%
51	Wood	Packaging	No		Wood Packaging	0.5%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%
52	Wood	No	No		Untreated wood (non-packaging)	0.0%	0.2%	0.9%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.1%
53	Wood	No	No		Treated/composite wood (non-packaging)	0.0%	0.6%	0.0%	1.2%	0.4%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.2%
54	Haz. / Non-Haz. Municipal Waste	No	No	Secondary Categories	Water based paints	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
55	Haz. / Non-Haz. Municipal Waste	No	No		Other paint and associated products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
56	Haz. / Non-Haz. Municipal Waste	No	No		Batteries & Accumulators	0.0%	0.2%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%
57	Non-Haz. Municipal Waste	No	No		Aerosols (packaging)	0.2%	0.2%	0.1%	0.1%	0.0%	0.3%	0.1%	0.2%	0.3%	0.1%	0.2%	0.2%	0.2%
58	Haz. / Non-Haz. Municipal Waste	No	No		Electronic equipment	0.0%	0.1%	2.2%	0.4%	0.0%	0.8%	0.2%	0.1%	0.3%	0.1%	0.0%	0.0%	0.4%
59	Haz. / Non-Haz. Municipal Waste	No	No		Fluorescent tubes and other mercury containing wastes.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
60	Haz. / Non-Haz. Municipal Waste	No	No		Medicines and Drugs	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.1%	0.1%	0.3%	0.0%	0.0%
61	Haz. / Non-Haz. Municipal Waste	No	No		Detergents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
62	Non-Haz. Municipal Waste	No	No		Garden chemicals	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
63	Non-Haz. Municipal Waste	No	No		Healthcare risk waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
64	Non-Haz. Municipal Waste	No	No		Other Haz. domestic waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.2%	0.0%	0.0%
65	Unclassified Combustibles	Packaging	No		Unclassified combustibles (packaging)	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
65.1.1	Unclassified Combustibles	No	No	Secondary Categories	Nespresso aluminium pods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%	0.0%
65.1.2	Unclassified Combustibles	No	No	Secondary Categories	Nespresso plastic pods	0.0%	0.0%	0.1%	0.0%	0.2%	0.2%	0.0%	0.1%	0.0%	0.1%	0.2%	0.0%	0.1%
66	Unclassified Incombustibles	No	No		Unclassified incombustibles (non-packaging)	0.1%	0.2%	1.0%	0.7%	0.4%	0.0%	0.4%	0.5%	0.4%	1.1%	0.0%	0.3%	0.4%
67	Unclassified Incombustibles	Packaging	No		Unclassified incombustibles (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
68	Unclassified Incombustibles	No	No		Unclassified incombustibles (non-packaging)	0.1%	0.1%	1.8%	0.0%	2.2%	2.3%	1.8%	0.2%	0.3%	0.5%	0.4%	2.2%	1.0%
69	Fines (<20mm)	No	No		Fines (<20mm)	0.0%	7.9%	2.8%	0.2%	10.5%	0.4%	5.5%	0.0%	1.2%	0.7%	3.3%	0.0%	2.7%
70	Non-municipal waste	No	No		Non-municipal waste	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	1.3%	0.0%	0.2%
					Contamination	14.1%	8.4%	8.6%	6.7%	8.2%	10.5%	8.2%	11.5%	9.7%	11.6%	10.8%	7.2%	9.6%
					Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	

Appendix H

Results Organic Waste

Survey Data - OW

						Sample number	5	6	7	10	11	26	27	48	
						Authorised Waste Collector (name)	AWC2	AWC2	AWC2	AWC3	AWC3	AWC7	AWC7	AWC12	
						Region	EMR	EMR	EMR	EMR	EMR	CUR	CUR	SR	
						Type of Waste	OW	OW	OW	OW	OW	OW	OW	OW	
						Stratum c3b. C2b R2b A3b a2b etc	R3Bho	C3Bho	C3Bho	C3Bho	C3Bho	C3Bho	R3Bho	R3Bho	
						House or Apartment	Household	Household	Household	Household	Household	Household	Household	Household	
						Frequency of collection (all are fortnightly)	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	Fortnightly	
						Date of Sorting	11/03/2022	16/03/2022	16/03/2022	24/03/2022	24/03/2022	03/10/2022	03/10/2022	18/11/2022	

#	Primary Waste Categories	Packaging	Single Use Plastics (SUP)	Secondary Categories	Primary Subcategory Waste	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	% Net weight	Average
1	Organics	No	No		Food waste.	54.9%	21.6%	0.0%	21.2%	39.3%	6.8%	4.9%	66.7%	26.9%
4	Organics	No	No		Liquid fit for human consumption	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	16.8%	2.1%
5	Organics	No	No		Biodegradable waste from garden & park	44.6%	63.3%	88.3%	78.8%	58.9%	80.3%	85.2%	15.6%	64.4%
5.1	Organics	No	No		Grass cuttings	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
6	Organics	No	No		Vegetable oil	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
7	Papers	Packaging	No		Recyclable paper packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
8	Papers	Packaging	No		Unrecyclable paper packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
9	Papers	No	No		Newspapers	0.0%	0.0%	0.0%	0.0%	0.0%	1.4%	0.3%	0.0%	0.2%
10	Papers	No	No		Magazines & glossy paper	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
11	Papers	No	No		Office papers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
12	Papers	No	No		Tissue Papers	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	1.6%	0.3%	0.4%
13	Papers	No	No		Other papers	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
14	Cardboards	Packaging	No		Cardboard (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	0.0%	0.3%
14.1.1	Cardboards	Packaging	No	Secondary Categories	Cardboard packaging used for delivery (post or c	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
14.1.2	Cardboards	Packaging	No	Secondary Categories	Cardboard used to package milk in bags in a box	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
15	Cardboards	Packaging	No		Unrecyclable flat and corrugated card. (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.3%	0.0%	0.1%
16	Cardboards	No	No		Other cardboards (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
17	Composites	Packaging	No	Secondary Categories	Coffee cups, smoothie cups (covers and lids to b	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%
17-19.3	Composites	Packaging	No	Secondary Categories	Compostable cups for beverages, including thei	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
18	Composites	Packaging	No		Beverage cartons (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
18.1	Composites	Packaging	No	Secondary Categories	Milk cartons	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
18.2	Composites	Packaging	SUP	Secondary Categories	Beverage cartons (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
18.3	Composites	Packaging	No	Secondary Categories	Compostable beverage cartons	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
19	Composites	Packaging	No		Other composites (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.2%	0.0%	0.1%
19.2	Composites	Packaging	SUP	Secondary Categories	Other composites (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
19.3	Composites	Packaging	No	Secondary Categories	Compostable other composites (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20	Composites	No	No		Other composites (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
20.2	Composites	No	SUP	Secondary Categories	Other composites (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
20.3	Composites	No	No	Secondary Categories	Compostable other composites (non-packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
21	Textiles	Packaging	No		Textiles Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
22	Textiles	No	No		Textiles non-packaging	0.0%	0.0%	3.3%	0.0%	0.1%	0.0%	0.0%	0.0%	0.4%
23	Textiles	No	No		Clothes	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
24	Textiles	No	No		Nappies (& incontinence wear)	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.1%
25	Textiles	No	No		Healthcare textiles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
26	Plastics	Packaging	No		PET packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
26.1.1-27.1.1-28.1.1	Plastics	Packaging	No	Secondary Categories	Milk bottles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
26.1.2-27.1.2-28.1.2	Plastics	Packaging	No	Secondary Categories	Washing up liquid bottles	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
26.2	Plastics	Packaging	SUP	Secondary Categories	PET packaging bottles including their lids	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%
27	Plastics	Packaging	No		PE plastic packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
27.2	Plastics	Packaging	SUP	Secondary Categories	PE packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28	Plastics	Packaging	No		PP plastic packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
28.2	Plastics	Packaging	SUP	Secondary Categories	PP packaging bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
29	Plastics	Packaging	No		Other plastic packaging bottles including their lids	0.0%	6.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.9%
29.3	Plastics	Packaging	No	Secondary Categories	Compostable plastic bottles including their lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30	Plastics	Packaging	No		PET packaging containers (other than bottles and lids) including their covers.	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.1%	0.0%	0.0%
30.1	Plastics	Packaging	No	Secondary Categories	PET cups for beverages in this subcategory	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
30.2-36.2	Plastics	Packaging	SUP	Secondary Categories	PET - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31	Plastics	Packaging	No		PE packaging containers (other than bottles and lids) including their covers.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
31.1	Plastics	Packaging	No	Secondary Categories	PE cups for beverages in this subcategory	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
31.2	Plastics	Packaging	SUP	Secondary Categories	PE - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32	Plastics	Packaging	No		PP packaging containers (other than bottles and lids) including their covers.	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
32.1	Plastics	Packaging	No	Secondary Categories	PP cups for beverages in this subcategory	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32.2	Plastics	Packaging	SUP	Secondary Categories	PP - Take-away trays/containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
33	Plastics	No	No		PET cups and other containers non-packaging, including their covers and lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
33.2	Plastics	No	SUP	Secondary Categories	PET - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34	Plastics	No	No		PE cups and other containers non-packaging, including their covers and lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
34.2	Plastics	No	SUP	Secondary Categories	PE - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
35	Plastics	No	No		PP cups and other containers non-packaging, including their covers and lids	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.0%	0.1%
35.2	Plastics	No	SUP	Secondary Categories	PP - Disposable cups (non- packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
36	Plastics	No	No		Styrofoam and EPS (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
36.2	Plastics	No	SUP	Secondary Categories	Styrofoam, EPA and PS Cups	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
37	Plastics	Packaging	No		Styrofoam and EPS (packaging)	0.0%	0.0%	0.1%	0.0%	0.0%	0.4%	0.0%	0.0%	0.0%
37.2	Plastics	Packaging	SUP	Secondary Categories	Food trays and coffee cups	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
38	Plastics	Packaging	SUP	Secondary Categories	Supermarket bags, plastic bags and films, wrap	0.0%	5.7%	4.3%	0.0%	0.0%	2.3%	1.4%	0.0%	1.7%
38-40.3	Plastics	Packaging	No	Secondary Categories	Compostable supermarket bags, plastic bags, fi	0.0%	1.3%	3.8%	0.0%	1.7%	0.1%	2.0%	0.0%	1.1%
39	Plastics	Packaging	No		Shrink wrap and pallet wrap	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
39.3	Plastics	Packaging	No	Secondary Categories	Compostable shrink wrap and pallet wrap	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40	Plastics	Packaging	No		Other plastic, including packaging containers (other than bottles, including compostable (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
40.1.1	Plastics	Packaging	No	Secondary Categories	40.1.1. Other plastic cups for beverages in this sub	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40.1.2	Plastics	Packaging	No	Secondary Categories	40.1.2 Polyfilla (and similar containers)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
40.2	Plastics	Packaging	SUP	Secondary Categories	Food containers including lids. (as per SUP Annex	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
40.3	Plastics	Packaging	No	Secondary Categories	Compostable 'other plastic' including packaging containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
41	Plastics	No	No		Other plastic, including non-packaging cups and other containers (non-packaging)	0.0%	1.3%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.2%
41.2	Plastics	No	No	Secondary Categories	Identify cutlery, stirrers, plates, straws balloon sti	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%
41.3	Plastics	No	No	Secondary Categories	Compostable 'other plastic' including non-packaging cups and other containers	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
42	Glass	Packaging	No		Glass (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%	0.0%	0.0%	0.1%
43	Glass	No	No		Glass (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%
44	Metals	Packaging	No		Ferrous metal (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.1%	0.0%	0.0%
45	Metals	No	No		Ferrous metal (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
46	Metals	Packaging	No		Aluminium cans (packaging)	0.0%	0.0%	0.1%	0.0%	0.0%	0.2%	0.0%	0.0%	0.0%
47	Metals	Packaging	No		Aluminium trays and foil (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%
49	Metals	Packaging	No		Other non-ferrous metal (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
50	Metals	No	No		Other non-ferrous metal (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
51	Wood	Packaging	No		Wood Packaging	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
52	Wood	No	No		Untreated wood (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.5%	0.0%	0.1%
53	Wood	No	No		Treated/composite wood (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
54	Non-Haz. Municipal Waste	No	No	Secondary Categories	Water based paints	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
55	Haz. / Non-Haz. Municipal Waste	No	No		Other paint and associated products	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
56	Haz. / Non-Haz. Municipal Waste	No	No		Batteries & Accumulators	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
57	Non-Haz. Municipal Waste	Packaging	No		Aerosols (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
58	Haz. / Non-Haz. Municipal Waste	No	No		Electronic equipment	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%
59	Haz. / Non-Haz. Municipal Waste	No	No		Fluorescent tubes and other mercury containing wastes.	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
60	Haz. / Non-Haz. Municipal Waste	No	No		Medicines and Drugs	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
61	Haz. / Non-Haz. Municipal Waste	No	No		Detergents	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
62	Non-Haz. Municipal Waste	No	No		Garden chemicals	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
63	Non-Haz. Municipal Waste	No	No		Healthcare risk waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
64	Non-Haz. Municipal Waste	No	No		Other Haz. domestic waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
65	Unclassified Combustibles	Packaging	No		Unclassified combustibles (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.0%
65.1.1	Unclassified Combustibles	No	No	Secondary Categories	Nespresso aluminium pods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
65.1.2	Unclassified Combustibles	No	No	Secondary Categories	Nespresso plastic pods	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
66	Unclassified Combustibles	No	No		Unclassified combustibles (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
67	Unclassified Incombustibles	Packaging	No		Unclassified incombustibles (packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
68	Unclassified Incombustibles	No	No		Unclassified incombustibles (non-packaging)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	0.0%	0.0%
69	Fines (<20mm)	No	No		Fines (<20mm)	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.8%	0.0%	0.3%
70	Non-municipal waste	No	No		Non-municipal waste	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
					Total	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	

Appendix I

National Profile

National Factor for kerbside household waste
Household Kerbside Waste Collected

	MRW	MRW (t)	MDR	MDR (t)	OW	OW (t)	Total
2021 EPA data (tonnes) supplied data	59.7%	699,961	22.5%	263,939	17.8%	208,719	1,172,618
Contamination Factor (tonnes)	54.5%	645,805	20.5%	274,952	18.1%	208,719	1,129,476

Source: 2021 data, EPA 11/01/2023

National Composition Profile for Household Waste Kerbside Collection

#	Primary Waste Categories	Primary Subcategory Waste Categories	MRW	MRW (t)	MDR	MDR (t)	OW	OW (t)	National Profile	% Net weight
1	Organics	Food waste.	17.0%	118,819	2.7%	7,193	26.9%	56212	182,225	15.5%
4	Organics	Liquid fit for human consumption	0.5%	3,222	0.2%	435	2.1%	4382	8,039	0.7%
5	Organics	Biodegradable waste from garden & park	3.4%	23,550	0.1%	315	64.4%	134392	158,258	13.5%
5.1	Organics	Grass cuttings	0.3%	2,246	0.0%	-	0.0%	0	2,246	0.2%
6	Organics	Vegetable oil	0.0%	-	0.1%	326	0.0%	0	326	0.0%
7	Papers	Recyclable paper packaging	0.8%	5,473	2.1%	5,563	0.0%	29	11,065	0.9%
8	Papers	Unrecyclable paper packaging	0.9%	6,072	1.4%	3,578	0.0%	85	9,735	0.8%
9	Papers	Newspapers	0.3%	2,079	8.5%	22,380	0.2%	439	24,898	2.1%
10	Papers	Magazines & glossy paper	0.4%	2,714	4.7%	12,506	0.0%	0	15,220	1.3%
11	Papers	Office papers	0.4%	2,951	1.6%	4,107	0.0%	0	7,057	0.6%
12	Papers	Tissue Papers	4.9%	34,048	1.4%	3,715	0.4%	769	38,532	3.3%
13	Papers	Other papers	0.8%	5,678	3.2%	8,385	0.0%	29	14,092	1.2%
14	Cardboards	Cardboard (packaging)	1.1%	7,424	13.2%	34,919	0.3%	641	42,984	3.7%
14.1.1	Cardboards	Cardboard packaging used for delivery (post or other)	0.0%	143	2.3%	5,955	0.0%	0	6,098	0.5%
14.1.2	Cardboards	Cardboard used to package milk in bags in a box (milk dispensers)	0.0%	-	0.1%	138	0.0%	0	138	0.0%
15	Cardboards	Unrecyclable flat and corrugated card. (packaging)	0.8%	5,833	6.6%	17,486	0.1%	109	23,428	2.0%
16	Cardboards	Other cardboards (non-packaging)	0.1%	773	0.5%	1,433	0.0%	0	2,206	0.2%
17	Composites	Cups for beverages, including their covers and lids (packaging)	0.2%	1,069	0.4%	1,014	0.0%	81	2,165	0.2%
17-19.3	Composites	Compostable cups for beverages, including their covers and lid	0.0%	102	0.0%	107	0.0%	0	209	0.0%
18	Composites	Beverage cartons (packaging)	0.1%	975	0.6%	1,598	0.0%	5	2,578	0.2%
18.1	Composites	Milk cartons	0.1%	813	1.1%	2,828	0.0%	0	3,641	0.3%
18.2	Composites	Beverage cartons (packaging)	0.1%	640	0.2%	552	0.0%	0	1,192	0.1%
18.3	Composites	Compostable beverage cartons	0.0%	38	0.0%	-	0.0%	0	38	0.0%
19	Composites	Other composites (packaging)	0.3%	2,080	0.8%	1,985	0.1%	109	4,174	0.4%
19.2	Composites	Other composites (packaging)	0.0%	38	0.0%	70	0.0%	0	108	0.0%
19.3	Composites	Compostable other composites (packaging)	0.0%	9	0.0%	-	0.0%	0	9	0.0%
20	Composites	Other composites (non- packaging)	0.4%	2,455	0.1%	230	0.0%	52	2,737	0.2%
20.2	Composites	Other composites (non- packaging)	0.0%	-	0.0%	-	0.0%	0	-	0.0%
20.3	Composites	Compostable other composites (non-packaging)	0.0%	-	0.0%	-	0.0%	0	-	0.0%
21	Textiles	Textiles Packaging	0.1%	640	0.2%	496	0.0%	0	1,136	0.1%
22	Textiles	Textiles non-packaging	4.1%	28,588	0.8%	2,208	0.4%	899	31,695	2.7%
23	Textiles	Clothes	4.3%	30,271	1.4%	3,678	0.0%	0	33,949	2.9%
24	Textiles	Nappies (& incontinence wear)	10.4%	72,909	0.9%	2,396	0.1%	312	75,618	6.4%
25	Textiles	Healthcare textiles	0.3%	2,185	0.1%	202	0.0%	5	2,392	0.2%
26	Plastics	PET packaging bottles including their lids	0.5%	3,598	1.0%	2,669	0.0%	38	6,305	0.5%
26.1.1	Plastics	Milk bottles	0.0%	-	0.0%	-	0.0%	0	0	0.0%
26.1.2	Plastics	Washing up liquid bottles	0.1%	503	0.1%	330	0.0%	0	833	0.1%
26.2	Plastics	PET packaging bottles including their lids	0.5%	3,492	3.8%	9,964	0.0%	81	13,536	1.2%
27	Plastics	PE plastic packaging bottles including their lids	0.5%	3,427	1.3%	3,410	0.0%	0	6,837	0.6%
27.1.1	Plastics	Milk bottles	0.1%	1,031	1.7%	4,439	0.0%	5	5,475	0.5%
27.1.2	Plastics	Washing up liquid bottles	0.0%	-	0.0%	-	0.0%	0	0	0.0%
27.2	Plastics	PE packaging bottles including their lids	0.0%	142	0.0%	28	0.0%	0	170	0.0%
28	Plastics	PP plastic packaging bottles including their lids	0.1%	742	0.1%	317	0.0%	0	1,058	0.1%
28.1.1	Plastics	Milk bottles	0.0%	-	0.0%	-	0.0%	0	0	0.0%
28.1.2	Plastics	Washing up liquid bottles	0.0%	-	0.0%	-	0.0%	0	0	0.0%
28.2	Plastics	PP packaging bottles including their lids	0.0%	18	0.0%	127	0.0%	0	144	0.0%
29	Plastics	Other plastic packaging bottles including their lids	0.0%	284	0.0%	96	0.9%	1786	2,166	0.2%
29.3	Plastics	Compostable plastic bottles including their lids	0.0%	4	0.0%	-	0.0%	0	4	0.0%
30	Plastics	PET packaging containers (other than bottles and lids) including their covers.	1.0%	6,656	2.1%	5,548	0.0%	95	12,299	1.0%
30.1	Plastics	PET cups for beverages in this subcategory	0.0%	85	0.1%	189	0.0%	0	274	0.0%
30.2	Plastics	PET - Take-away trays/containers	0.3%	2,029	0.3%	710	0.0%	0	2,739	0.2%
31	Plastics	PE packaging containers (other than bottles and lids) including their covers.	0.8%	5,627	0.7%	1,808	0.0%	57	7,491	0.6%
31.1	Plastics	PE cups for beverages in this subcategory	0.0%	-	0.1%	178	0.0%	0	178	0.0%
31.2	Plastics	PE - Take-away trays/containers	0.0%	221	0.0%	18	0.0%	0	239	0.0%
32	Plastics	PP packaging containers (other than bottles and lids) including their covers.	1.2%	8,571	1.6%	4,273	0.0%	19	12,863	1.1%
32.1	Plastics	PP cups for beverages in this subcategory	0.0%	257	0.0%	-	0.0%	0	257	0.0%
32.2	Plastics	PP - Take-away trays/containers	0.0%	170	0.0%	-	0.0%	0	170	0.0%
33	Plastics	PET cups and other containers non-packaging, including their covers and lids	0.0%	259	0.1%	286	0.0%	0	545	0.0%
33.2	Plastics	PET - Disposable cups (non- packaging)	0.0%	6	0.0%	66	0.0%	0	71	0.0%
34	Plastics	PE cups and other containers non-packaging, including their covers and lids	0.0%	268	0.0%	70	0.0%	0	338	0.0%
34.2	Plastics	PE - Disposable cups (non- packaging)	0.0%	22	0.0%	-	0.0%	0	22	0.0%
35	Plastics	PP cups and other containers non-packaging, including their covers and lids	0.1%	751	0.1%	238	0.1%	135	1,124	0.1%
35.2	Plastics	PP - Disposable cups (non- packaging)	0.0%	6	0.0%	-	0.0%	28	34	0.0%
36	Plastics	Styrofoam and EPS (non-packaging)	0.1%	693	0.1%	201	0.0%	0	894	0.1%
36.2	Plastics	Styrofoam, EPA and PS Cups	0.0%	37	0.0%	-	0.0%	0	37	0.0%
37	Plastics	Styrofoam and EPS (packaging)	0.1%	588	0.1%	349	0.1%	119	1,056	0.1%
37.2	Plastics	Food trays and coffee cups	0.0%	221	0.1%	157	0.0%	29	407	0.0%
38	Plastics	Supermarket bags, plastic bags and films, wrappers (packaging)	4.5%	31,351	3.6%	9,593	1.7%	3563	44,507	3.8%
38.3	Plastics	Compostable supermarket bags, plastic bags, films and wrappers	0.0%	296	0.1%	303	1.1%	2336	2,935	0.3%
39	Plastics	Shrink wrap and pallet wrap	0.1%	989	0.2%	564	0.0%	0	1,552	0.1%
39.3	Plastics	Compostable shrink wrap and pallet wrap	0.0%	-	0.0%	-	0.0%	0	-	0.0%
40	Plastics	Other plastic, including packaging containers (other than bottles, including compostable (packaging)	2.2%	15,685	1.7%	4,503	0.0%	14	20,202	1.7%
40.1.1	Plastics	40.1.1. Other plastic cups for beverages in this subcategory	0.0%	41	0.0%	49	0.0%	7	97	0.0%
40.1.2	Plastics	40.1.2 Polyfilla (and similar containers)	0.0%	53	0.0%	26	0.0%	0	80	0.0%
40.2	Plastics	Food containers including lids. (as per SUP Annex Part A)	0.1%	532	0.0%	72	0.0%	28	632	0.1%
40.3	Plastics	Identify compostable plastic across all the 'other plastic' and films and similar subcats. One	0.0%	-	0.0%	-	0.0%	0	-	0.0%
41	Plastics	Other plastic, including non-packaging cups and other containers (non-packaging)	4.1%	28,524	2.1%	5,653	0.2%	413	34,590	2.9%
41.2	Plastics	Identify cutlery, stirrers, plates, straws balloon sticks, cotton buds as one class.	0.0%	6	0.0%	11	0.0%	91	108	0.0%
41.3	Plastics	41.3 Identify all items that bear the Cré and/or EN13432 logo, in this subcategory	0.2%	1,191	0.0%	16	0.0%	0	1,207	0.1%
42	Glass	Glass (packaging)	2.7%	18,958	2.1%	5,553	0.1%	153	24,664	2.1%
43	Glass	Glass (non-packaging)	0.3%	2,151	0.0%	86	0.0%	28	2,265	0.2%
44	Metals	Ferrous metal (packaging)	1.2%	8,556	2.7%	7,207	0.0%	62	15,825	1.3%
45	Metals	Ferrous metal (non-packaging)	0.5%	3,326	0.4%	969	0.0%	0	4,295	0.4%
46	Metals	Aluminium cans (packaging)	0.6%	4,305	2.3%	6,141	0.0%	90	10,536	0.9%
47	Metals	Aluminium trays and foil (packaging)	0.9%	6,308	0.2%	613	0.0%	86	7,008	0.6%
49	Metals	Other non-ferrous metal (packaging)	0.0%	236	0.0%	47	0.0%	10	293	0.0%
50	Metals	Other non-ferrous metal (non-packaging)	0.8%	5,719	0.2%	491	0.0%	0	6,210	0.5%
51	Wood	Wood Packaging	0.1%	737	0.1%	215	0.0%	10	962	0.1%
52	Wood	Untreated wood (non-packaging)	0.3%	2,259	0.2%	402	0.1%	180	2,841	0.2%
53	Wood	Treated/composite wood (non-packaging)	0.6%	3,967	0.2%	534	0.0%	0	4,501	0.4%
54	Non-Haz. Municipal Waste	Water based paints	0.0%	13	0.0%	-	0.0%	0	13	0.0%
55	Haz. / Non-Haz. Municipal Waste	Other paint and associated products	0.2%	1,188	0.0%	30	0.0%	0	1,219	0.1%
56	Haz. / Non-Haz. Municipal Waste	Batteries & Accumulators	0.1%	457	0.1%	159	0.0%	14	630	0.1%
57	Non-Haz. Municipal Waste	Aerosols (packaging)	0.3%	1,857	0.2%	490	0.0%	7	2,354	0.2%
58	Haz. / Non-Haz. Municipal Waste	Electronic equipment	0.8%	5,721	0.4%	957	0.0%	14	6,692	0.6%
59	Haz. / Non-Haz. Municipal Waste	Fluorescent tubes and other mercury containing wastes.	0.0%	-	0.0%	-	0.0%	0	-	0.0%
60	Haz. / Non-Haz. Municipal Waste	Medicines and Drugs	0.1%	751	0.1%	200	0.0%	0	951	0.1%
61	Haz. / Non-Haz. Municipal Waste	Detergents	0.0%	34	0.0%	-	0.0%	0	34	0.0%
62	Non-Haz. Municipal Waste	Garden chemicals	0.0%	144	0.0%	54	0.0%	0	198	0.0%
63	Non-Haz. Municipal Waste	Healthcare risk waste	0.5%	3,484	0.1%	209	0.0%	0	3,693	0.3%
64	Non-Haz. Municipal Waste	Other Haz. domestic waste	0.0%	215	0.0%	10	0.0%	7	232	0.0%
65	Unclassified Combustibles	Unclassified combustibles (packaging)	0.1%	371	0.0%	86	0.0%	42	500	0.0%
65.1.1	Unclassified Combustibles	Coffee aluminium pods	0.2%	1,199	0.0%	111	0.0%	0	1,310	0.1%
65.1.2	Unclassified Combustibles	Coffee plastic pods	0.1%	986	0.1%	189	0.0%	0	1,175	0.1%
66	Unclassified Combustibles	Unclassified combustibles (non-packaging)	1.7%	11,973	0.5%	1,275	0.0%	7	13,254	1.1%
67	Unclassified Incombustibles	Unclassified incombustibles (packaging)	0.1%	506	0.1%	169	0.0%	0	676	0.1%
68	Unclassified Incombustibles	Unclassified incombustibles (non-packaging)	1.8%	12,759	1.0%	2,611	0.0%	86	15,456	1.3%
69	Fines (<20mm)	Fines (<20mm)	8.2%	57,604	2.7%	7,176	0.3%	528	65,309	5.6%
70	Non-municipal waste	Non-municipal waste	1.1%	7,807	0.2%	465	0.0%	0	8,272	0.7%
		Contamination	7.7%	54,156	9.6%	25,431	0.0%	0	79,587	6.8%
		Total	100.0%	699,961	100.0%	263,939	100.0%	208,719	1,336,966	100.0%

Appendix J

Recommendations on the Methodology

Waste characterisation surveys improve continuously by building upon the learnings of previous surveys. This improves survey delivery, improves sample acquisition, and ensures always improving data accuracy and precision. Some of the challenges, and associated suggestions for improvements on the survey delivery are presented below.

Sampling Plan

Changes that could help streamline sample sourcing and analysis include:

1. Aligning the EPA project with other waste characterisation projects would ease cost and effort burden on AWCs and ease difficulty of sample sourcing.
2. Discuss the findings of the analysis of EPA/NWCPO data with AWCs prior to finalising the sampling plan to assess sample availability early, if possible. This will allow adjustment of the sampling plan early in the process.
3. Requiring full participation in these national waste characterisation studies as a prerequisite for holding a waste collection permit. This would require legislative change.
4. Consider whether and how to re-assign limited availability streams in future surveys when drafting the sampling plan. This would address the issue where availability of some samples had changed between sampling plan drafting and on-the-ground sampling.
5. Apartments were sampled at a rate equivalent to their share of the housing stock. Given their increasing share of housing stock, and the attention required to improve their performance, EPA should consider sampling apartments more intensively in the next waste characterisation campaigns.
6. Exclusively apartment AWC-collected samples were not available under standard AWC collection structures. Manual collections were instead used to sample apartments. These collections were resource intensive and ergonomically challenging. Consider alternative approaches to manual apartment collections in future surveys.
7. Legislative definitions change regularly – e.g., for composites in 2022. Standardised approaches agreed before surveys commence ensure that training - toolbox talks, printed guidance help - will maximise precision and accuracy in categorising difficult/subjective to categorise materials.
8. Given the importance of food waste quantification, future surveys would benefit from repeating the analysis of organic content of the 'fines' stream. Further, determining food waste composition of the fines fraction would provide still further detail.
9. Given the importance of food waste quantification, future surveys would benefit from analysis of contamination on packaging waste to determine its composition including of food.

Survey delivery

10. The number of sub-categories should be reduced to minimise complexity of survey delivery and to minimise effort made in generating less important data, by eliminating and/or merging categories that had zero or very low occurrences or that are not significant.
11. It can be difficult to differentiate food waste (edible packaged, edible non-packaged and inedible food waste) categories used during the 2018 survey. EPA merged these three categories, removing the difficulties of the differentiation. Maintain this change in future surveys.
12. Handle samples to avoid self-heating and to preserves samples close to their original quality. Doing so retains moisture and reduces fines content compared to where samples are allowed to self-heat, a change that must be understood when querying data.

Understanding the data and actions on data

13. This 2022 survey is the first to publish data with contamination on packaging waste extracted into its own category. However, comparisons with 2018 or 2008 data are made without extracting this data, meaning that comparisons are 'like-for-like'. It is important to understand the difference between the two types of data presented, corrected ('clean' with contamination accounted for separately) and uncorrected ('dirty' with contamination not accounted for separately and used in this report only for comparisons with 2018 or 2008 data).
14. Poor markings and heavy contamination make some plastics identification difficult and make it difficult to differentiate "recyclable" from "unrecyclable" plastic and card. In some cases, it can be

Understanding the data and actions on data

difficult to differentiate food waste from organics (garden) waste. Subjective evaluation is required. This needs to be considered when evaluating results. This factor is unchanged since 2018 and 2008 surveys.

15. Route structures follow geographic rather than socioeconomic features. Routes selected were of a social class composition that broadly match the national breakdown, not always precisely. This demographic factor needs to be considered when evaluating results. This factor is unchanged since 2018 and 2008.

16. The 2022 survey identified materials that are novel and may require attention to better manage their presence in kerbside household waste. These include nicotine vapes that contain batteries, and healthcare risk wastes including autoinjectors and COVID-19 associated materials such as masks and antigen tests. Previous surveys had identified new products like coffee pods. Focus to search for new items can help identify trends early such as the risk posed by vape batteries to waste management facilities.

17. This waste characterisation campaign quantified several waste categories for the first time, including SUPs and coffee cups. This forms a baseline to track arisings over time and to assess the effectiveness of policies and initiatives. SUPs are subject to legislation that requires monitoring for effectiveness, and they should be re-examined in future surveys.

Appendix K

Target and Non-Target designations

Waste Categories - 2021

Primary subcategory Number	Primary Category	LOW CODE	Primary subcategory description	Examples**	Packaging	Secondary subcategories: Special Interest Item	Secondary subcategories: Single Use Plastic	Secondary subcategories: Compostable
1	Organics	20 01 08	Food Waste	Edible Food: Packaged Unused or partially used packaged food that cannot easily be separated from packaging. e.g. Jar of honey, a tub of soft cheese, packet of ham, cheese in packaging. Edible Food: Non-packaged Vegetables, fruit, cheese, or sausages removed from packaging. e.g. Fruit & vegetables, block of cheese, sausages, bread Inedible food wastes. e.g. fruit & vegetables peelings, tea bags, meat carcasses				
4	Organics	20 01 08	Liquid fit for human consumption	Liquid contained in drink or milk containers. e.g. Milk, soft drinks, juices (NB: weigh without the packaging)				
5	Organics	20 02 01	Biodegradable waste from garden & park	Grass and bush cuttings, twigs, soil, flowers, leaves, tree branches, weeds				
6	Organics	20 01 25	Vegetable oil	Sunflower, Olive Oil (NB: weigh without the packaging)				
7	Papers	15 01 01	Recyclable paper packaging	Brown or white paper bags, egg cartons, bread wrappers	Packaging			
8	Papers	15 01 01	Unrecyclable paper packaging	Soiled/contaminated bags, cartons and wrappers	Packaging			
9	Papers	20 01 01	Newspapers	Newspapers, newsprint-type advertising publications, other newsprint				
10	Papers	20 01 01	Magazines & glossy paper	Magazines and advertisements on glossy paper, shop catalogues & supermarket flyers				
11	Papers	20 01 01	Office papers	Office type envelopes, letters, reports, print outs				
12	Papers	21 01 01	Tissue Papers	Tissue paper, kitchen roll, disposable tissues, hand drying tissue sheets and blue paper roll				
13	Papers	20 01 01	Other papers	Till receipts, books, telephone directories, non-glossy junk mail, loose leaf paper, non-glossy brochures and catalogues, notebooks, envelopes				
14	Cardboards	15 01 06	Cardboard (packaging)	Cereal boxes, toy boxes, washing powder containers, corrugated packaging cardboard used for household items packaging (tv, computer hardware, furniture etc.).	Packaging	**14.1** Identify cardboard packaging used for delivery (post or other). **14.2** Identify cardboard used to package milk in bags in a box (e.g. used in milk dispensers in commercial canteens)		
15	Cardboards	15 01 06	Unrecyclable flat and corrugated card. (packaging)	Unrecyclable flat and corrugated card packaging e.g. ready packed meats, contaminated pizza box.	Packaging			
16	Cardboards	20 01 01	Other cardboards (non-packaging)	Greeting cards, postcards, files and folders, tickets				
17	Composites		Cups for beverages, including their covers and lids (packaging)	Coffee cups, smoothie cups NB: Covers and lids to be put into a plastics category if they are made from plastic.	Packaging		**17.1** This whole subcategory is a SUP and does not need to be sorted but tagged as SUP.	**17-19.3** Across these four primary subcategory composites, identify all items that bear the Cré and/or EN13432 logo. One overall subcategory for all of these three composites is sufficient.
18	Composites		Beverage cartons (packaging)	Beverage/juice cartons (tetra Pak), soup	Packaging	**18.1** Identify milk cartons in the primary subcategories (beverage cartons).	**18-20.2** Across these three primary subcategory composites, identify all SUP listed in SUP Directive Annex Part A other than cups for beverages that qualify as packaging. One overall class for all of these three composite categories is sufficient.	
19	Composites		Other composites (packaging)	Packaging containers, wrappers, trays, pringles tubes, tablet packaging	Packaging			
20	Composites		Other composites (non- packaging)	Composite cups (including covers and lids) and containers (including covers) bought in multipack for home use (e.g. children parties) (non-packaging).				**20.3** Identify all items that bear the Cré and/or EN13432 logo, in this subcategory
21	Textiles	15 01 09	Textiles Packaging	Shoe bag, handbag cover, potato sacks	Packaging			
22	Textiles	20 01 11	Textiles Non-Packaging	Rags, household soft furnishings (cushions) and upholstery, blankets, towels, carpets, curtains, rucksacks, including cloth PPE masks				
23	Textiles	20 01 10	Textiles	Clothing, shoes (non-plastic)				
24	Textiles	20 01 99	Nappies (& incontinence wear)					
25	Textiles	20 01 99	Healthcare textiles	Dressings, plasters, linen, disposable clothing, bandages. Covid-19 PPE - masks, booties				
26	Plastics	15 01 02	PET packaging bottles including their lids	PET bottles e.g., soft drink, water bottles NB: Lids to be put into another plastics category if they are made from a different polymer.	Packaging	**26-28.1** Identify milk bottles across these three primary plastic bottle subcategories. **26-28.2** Identify washing up liquid bottles across these three primary plastic bottle subcategories.	**26-28.3** Identify SUP listed in SUP Directive Annex Part F in these 4 subcategories (bottles less than 3 litres). One overall class is sufficient.	
27	Plastics	15 01 02	PE plastic packaging bottles including their lids	High and low density PE bottles NB: Lids to be put into another plastics category if they are made from a different polymer.***	Packaging			
28	Plastics	15 01 02	PP plastic packaging bottles including their lids	PP bottles NB: Lids to be put into another plastics category if they are made from a different polymer.***	Packaging			
29	Plastics	15 01 02	Other plastic packaging bottles including their lids	Other Plastic bottles NB: Lids to be put into another plastics category if they are made from a different polymer.***	Packaging			**29.1 & 38-40.1** Identify compostable plastic across all the 'other plastic' and films and similar subcats. One secondary subcategory overall with other compostable items in subcategories (38-40) below.
30	Plastics	15 01 02	PET packaging containers (other than bottles and lids) including their covers.	PET cups, packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging	**30-32.1 & 40.1** Identify cups for beverages across these three subcategories and also the 'other plastic' pack subcategory (40) below.	**30-36.1** Identify SUP listed in SUP Directive Annex Part A across these 7 primary subcategories. One overall class is sufficient.	
31	Plastics	15 01 02	PE packaging containers (other than bottles and lids) including their covers.	PE cups packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging			
32	Plastics	15 01 02	PP packaging containers (other than bottles and lids) including their covers.	PP cups packaging trays and containers. NB: Covers and lids to be put into another plastics category if they are made from a different polymer.	Packaging			
33	Plastics	20 01 39	PET cups and other containers non-packaging, including their covers and lids	PET cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g. children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.				
34	Plastics	20 01 39	PE cups and other containers non-packaging, including their covers and lids	PE cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g. children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.				
35	Plastics	20 01 39	PP cups and other containers non-packaging, including their covers and lids	PP cups, bottles (non-packaging), trays and containers bought in multipack for home use (e.g. children parties). NB: Covers, lids to be put into another plastics category if they are made from a different polymer.				
36	Plastics	20 01 39	Styrofoam and EPS (non-packaging)					
37	Plastics	15 01 02	Styrofoam, polystyrene (PS) and expanded polystyrene (EPS) (packaging)	Electronic goods packaging, food containers, certain yoghurt tubs	Packaging		**37.1** Identify SUP listed in SUP Directive Annex Part A in this primary subcategory. (This category links with contamination category for styrofoam food containers)	
38	Plastics	15 01 02	Supermarket bags, plastic bags and films, including compostable bags (packaging)	Lightweight supermarket shopping bags, sandwich bags from other than home use, compost/peat-moss bags, cling film from other than home use, reusable supermarket bags (with logo).	Packaging		**38.1** This whole category is a SUP and does not need to be sorted but only tagged as SUP.	
39	Plastics	15 01 02	Shrink wrap and pallet wrap, including compostable.		Packaging	**39.1** Identify strink wrap & pallet wrap. Does not need a secondary sort as whole categorey is reuse alternative		**29.1 & 38-40.1** Identify compostable plastic across all 'other plastic' subcategories and wrap and film subcategories. Secondary subcategory combined also with subcategory 29.1 above.
40	Plastics	15 01 02	Other plastic, including packaging containers (other than bottles, including compostable (packaging)	Containers, trays, wrappers, crisp packets and similar, toothpaste tubes, reusable plastics bags and similar, cups,	Packaging	**40.1.1** Identify cups for beverages in this subcategory and combine with subcategories 30-32 above. **40.1.2** Polyfilla (and similar containers)	**40-41.1** Identify cutlery, stirrers, plates, straws balloon sticks, cotton buds as one class and food containers including lids and cups for beverages in these two subcategories. (as per SUP Annex Part A)	
41	Plastics	20 01 39	Other plastic, including non-packaging cups and other containers, including compostable (non-packaging)	Cutlery, stirrers, plates, straws, balloons, balloon sticks, cotton buds Bin liners, toys, CDs, buckets, clothes hangers, lighters, rulers, babies' bottles, shoes, reusable shopping plastics bags (no supermarket logo) and similar, wet wipes, beakers, reusable bottles.				**41.2** Identify all items that bear the Cré and/or EN13432 logo, in this subcategory

Primary subcategory Number	Primary Category	LOW CODE	Primary subcategory description	Examples**	Packaging	Secondary subcategories: Special Interest Item	Secondary subcategories: Single Use Plastic	Secondary subcategories: Compostable
42	Glass	15 01 07	Glass (packaging)	Wine bottles, beer bottles, water bottles, jam jars and medicine bottles.	Packaging			
43	Glass	20 01 02	Glass (non-packaging)	Mirrors, plate glass, flat glass, cookware (Pyrex), mixed broken glass, drinking glasses.				
44	Metals	15 01 04	Ferrous metal (packaging)	Canned food, biscuit tins, tins of polish, beer bottle tops, glass jar lids.	Packaging			
45	Metals	20 01 40	Ferrous metal (non-packaging)					
46	Metals	15 01 04	Aluminium cans (packaging)	Beverage cans - soft drinks, beer	Packaging			
47	Metals	15 01 04	Aluminium trays and foil (packaging)	Foil trays, some toothpaste/cosmetic products tubes.	Packaging			
48	Metals	15 01 04	Other non-ferrous metal (packaging)		Packaging			
49	Metals	20 01 40	Other non-ferrous metal (non-packaging)	Includes foil sheets from home use				
50	Wood	15 01 03	Wood Packaging	Bottle corks, cork packaging, pallets, ice-cream sticks, wooden boxes for wine/cheese/garden products/ slates, wooden separators between products e.g. slats used to separate windows in transport, wooden spools for cables)	Packaging			
51	Wood	20 01 37	Untreated wood (non-packaging)	Wood fencing (unpainted/unvarnished), some wood from DIY				
52	Wood	20 01 38	Treated/composite wood (non-packaging)	Kitchen units, particle wood, toilet seats, skirting (chipboard, plywood, MDF), baskets.				
53	Non-Hazardous Municipal Waste	20 01 28	Water based paints	Water based paint.		54.1 This whole primary subcategory is an special interest item and does not need a second sort.		
54	Hazardous / Non-Hazardous Municipal Waste	20 01 27* / 20 01 28	Other paint and associated products	Paint other than water based paint, heavily soiled paint brushes.				
55	Hazardous / Non-Hazardous Municipal Waste	20 01 33* / 34	Batteries & Accumulators	Lead acid, nickel cadmium, other car and household batteries and accumulators (including rechargeable batteries).				
56	Non-Hazardous Municipal Waste	15 01 04	Aerosols (packaging)	Deodorant, perfume, hairspray.	Packaging			
57	Hazardous / Non-Hazardous Municipal Waste	21 01 35* / 36	Electronic equipment	Household appliances (toasters etc.), electronic toys, remote controls, phone chargers.				
58	Hazardous / Non-Hazardous Municipal Waste	21 01 35* / 36	Fluorescent tubes and other mercury containing wastes.	Fluorescent tubes and other mercury containing wastes.				
59	Hazardous / Non-Hazardous Municipal Waste	20 01 31* / 32	Medicines and Drugs	Out of date antibiotics, steroids, tablets, etc. Separated from packaging, inhaler.				
60	Hazardous / Non-Hazardous Municipal Waste	20 01 29* / 30	Detergents	Laundry detergents separated from packaging i.e. The liquid or powder only				
61	Non-Hazardous Municipal Waste	20 02 03	Garden chemicals	Sprays, feeds				
62	Non-Hazardous Municipal Waste	20 03 99	Healthcare risk waste	Sharps, vials				
63	Non-Hazardous Municipal Waste	20 03 99	Other hazardous domestic waste	Any other items e.g., hair dye, waste oil, oil filters, ink cartridges and toner. NB: Description to be provided during survey				
64	Unclassified combustibles	15 XX XX	Unclassified combustibles (packaging)	Various items	Packaging	65.1.1 Coffee pods metal or plastic 65.1.2 Coffee pods metal or alumimium		
65	Unclassified combustibles	20 03 99	Unclassified combustibles (non-packaging)	Animal hair, linoleum (lino), non-PPE household rubber gloves, candles, full tube body lotion, paint brush. Tobacco without filters.				
66	Unclassified incombustibles	15 XX XX	Unclassified incombustibles (packaging)		Packaging			
67	Unclassified incombustibles	20 03 99	Unclassified incombustibles (non-packaging)	Inert waste e.g., Ceramics, crockery, stone/ceramic floor and wall tiles, vases.				
68	Fines		Fines (<20mm)	Material that falls through the tabletop holes 20mm mesh				
69	Non-municipal waste		Non-municipal waste	e.g. C&D waste				

Table Notes:
*denotes Hazardous Waste
**examples of wastes in each primary subcategories are given as a guide but should not be considered an exhaustive list
***If bottle lids of different polymers are not removed & put into relevant plastics category during sampling, the tonnage will be adjusted for lids @ the end using the results of the 'lid & label' assessment.
SUP = single use plastics