



The composition of household waste at the kerbside in 2014-15

Summary of findings

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Date:
November 2017



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Acknowledgements

Zero Waste Scotland would like to express our thanks to the local authorities that took part in the waste composition analysis that underpins this report. Without their contribution, this analysis would not be possible.

This report was prepared by Phil Williams, Research and Evaluation team at Zero Waste Scotland, with valuable input from Zero Waste Scotland colleagues. The detailed analysis of waste composition and waste data flow datasets that underpins the findings in this report was carried out by Tim Reid. The extensive programme of waste composition analysis conducted between 2013 and 2015 was delivered by Polly Griffiths, Tim Reid and Daniel Stunell.

Some of the waste composition data used in national estimates was generated using household sampling frameworks developed using Experian/MOSAIC^{©Experian 2015} socio-demographic data.

If you would like more information on this project please call Zero Waste Scotland on 01786 433 930 and ask to speak to our research and evaluation team, alternatively use the contact form on our website:

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1 Summary of findings



This report provides new estimates for the composition of household waste collected at the kerbside in Scotland in 2014-15, from the physical analysis of waste.

The report covers the contents of the residual waste, which is the bin that should be used to dispose of wastes that cannot be recycled. We use the term residual waste, regardless of whether the contents of that bin could be recycled or not.

The report also covers the contents of mixed recycling containers provided to households, and we use the term “non-recyclable” waste within recycling containers to define wastes not typically recycled anywhere within a local authority service e.g non-recyclable paper and disposable nappies.

Our analysis excludes household waste collected at non-kerbside locations, such as recycling points and household waste recycling centres. It’s worth remembering that significant quantities of household waste material – particularly recycled items – are also collected via these non-kerbside routes, so overall household recycling performance is not identified in this kerbside analysis alone.

The last time a similar study was conducted was in 2009¹, so the findings provide an important update on kerbside waste composition.

Our analysis includes:

- How much is collected at the kerbside in total?
- What is thrown away in the residual waste bin?
- Changes in what we throw away in the residual waste bin since 2009
- How many items that could be recycled at the kerbside, are actually recycled?
- How common is it for the wrong items to end up in mixed recycling collections?

The findings in this report are based on a programme of waste composition analysis carried out between 2013 and 2015, and household waste tonnages reported by local authorities in 2014 or 2015. Findings are representative of the 2014-15 period.

This report focuses on describing what households throw away and recycle, in order to highlight the opportunities for further waste prevention, recycling and diversion from landfill. We do provide summary analysis of the avoided carbon emissions and landfill tax associated with current levels of kerbside recycling, but it was beyond the scope of this study to carry out a more detailed environmental and economic impact analysis².

To accompany this report, Zero Waste Scotland has also produced a more detailed methodology document designed for technical readers, an excel dataset of key findings, and a set of frequently asked questions.

How much is collected at the kerbside in total?

If we add up everything collected from households at the kerbside – i.e. both in the residual waste bin, and in recycling collections – Scottish households put 1.78 million tonnes of material into kerbside collections in 2014-15. Food wastes, paper and cardboard, garden waste, and glass waste made up nearly 1.2 million tonnes, or 68% of the total. Food wastes made up the largest single waste type at just under 410,000 tonnes, or 23% of the total. **Please see Section 3 of this report for further details.**

What is thrown away in the residual waste bin?

If we consider just the waste that went into household residual bins, this adds up to 1.13 million tonnes. The most commonly occurring waste types were food waste, paper and cardboard, healthcare waste and plastic films, and collectively made up just over 710,000 tonnes, or 63% of the total. For a more detailed breakdown of what is thrown away in the residual waste bin, **please see Section 4.1 of this report.**

We estimate that approximately 670,000 tonnes, or just under 60% of the residual waste, is made up of waste types that could typically have been recycled with existing kerbside recycling services. This equates to just over 275 kilogrammes of waste per household per year, or 125 kilogrammes per person per year. **Please see Section 4.2 of this report for further details.**

The residual waste also contains significant quantities of disposable nappies and plastic packaging films, which are potentially recyclable but where establishing sustainable

collection and reprocessing facilities has proved challenging to date. **Please see Section 4.3 of this report for further details.**

Of the 1.13 million tonnes of kerbside residual waste, we estimate that approximately 680,000 tonnes (or 60%) is bio-degradable. Food waste and Paper and Card dominate the bio-degradable portion of residual waste, making up approx. 49% and 25% respectively. **Please see Section 4.4 of this report for further details.**

Changes in what we throw away in the residual waste bin since 2009

Between 2009 and 2014-15, the overall quantity of household residual waste collected at the kerbside reduced by approximately 317,000 tonnes (or 22%), from 1.45 million tonnes in 2009 to 1.13 million tonnes in 2014-15.

In 2014-15 our analysis estimates that just under just under 640,000 tonnes of waste in total was collected for recycling at the kerbside. When compared to sending this waste to landfill, by recycling we avoided over 525,000 tonnes of CO₂e emissions³ and £52 million in landfill disposal costs⁴.

Six of the seven waste types in our summary analysis have all reduced in terms of what we throw away in the residual waste (which likely reflects the increased provision of kerbside recycling services). However, the scale of change since 2009 and opportunities for further recycling are not equal.

Food waste has shown the largest absolute reduction, from approx. 420,000⁵ tonnes in 2009, to 330,000 tonnes in 2014-15 (approx. 90,000 tonnes reduction). However, food waste remains the largest single waste type in the residual waste stream in 2014-15. The current study is by nature a snapshot in time, which took place at a time of significant change in local authority recycling services, including the introduction of additional food waste collections. The most recent local authority data for 2016 suggests there has been a relatively modest increase in the recycling of food waste at the kerbside, but we think our estimates for the quantity thrown away are still broadly representative of the scale of the issue.

Healthcare wastes (which include disposable nappies and other absorbent hygiene products) have shown a small decline (13,000 tonnes or 8% of 2009) between 2009 and 2014-15.

Of the seven most commonly occurring wastes types in the residual waste, plastic films are the only type that has increased in absolute terms between the two periods, from 69,000 tonnes in 2009 to 85,000 tonnes in 2014-15. However, estimates for plastic films should be treated with some caution, owing to the potential for contamination with other waste during composition analysis. The evidence we do have suggests that all of the increase in plastic films between the two periods is due to other plastic films (excluding bin liners and carrier bags), which could reflect both the increased use of this packaging type in household groceries and a lack of recycling services for this waste.

Please see Section 4.5 of this report for further details of changes in what we throw away since 2009.

How many items that could be recycled at the kerbside, are recycled?

We define *correct recycling* as the proportion of the overall kerbside tonnage that we estimate is found in the correct recycling service, for a set of waste types typically collected at the kerbside. Our analysis focuses on the eighteen local authorities that took part in waste composition analysis. We exclude any data points where a local authority did not target a given waste type at the kerbside (e.g. where glass was not targeted at the kerbside and households are encouraged to use bring banks). Our analysis is therefore typical *correct recycling when targeted at the kerbside*, as we think this is analytically more useful.

There was a wide range in correct recycling at the kerbside for a given waste type. The average correct recycling for glass was 63%. Correct recycling of garden waste was typically very high (89%), whereas typically only 27% of kerbside food waste is estimated to be found in a food waste recycling service. Even where recycling services are well established (e.g. paper), typically 73% is correctly recycled (with a minimum of 36%).

Our analysis suggests that despite significant investment in kerbside recycling services in recent years, a significant number of households are still not using recycling services to their full potential.

For further details of correct recycling at the kerbside, **please see Section 5.1.**

How common is it for the wrong items to end up in mixed recycling collections?

Contamination of recycling services is where the wrong items end up in the recycling collection. Contamination results in increased waste management costs, through equipment damage, additional sorting, operational costs and waste disposal charges resulting from reduced quality and economic value of materials. Additionally, collection and sorting staff are put at risk from dealing with contaminated recycling.

Waste composition analysis was carried out on thirteen local authority dry mixed recycling services (commonly referred to as "co-mingled recycling"), which enabled us to assess the degree of contamination (i.e. waste types incorrectly placed in the recycling bin). *Non-target materials* (which are items that could be recycled in current services, but which have been placed in the wrong container – e.g. glass in a paper collection) and *non-recyclable wastes* (which are items that cannot be recycled in current kerbside services) typically make up 19% of the overall recycling bin, but ranged from a maximum of 30% contamination in the worst case to a minimum of 9% in the best.

The most commonly occurring *non-target wastes* are glass, food waste, textiles and footwear, whereas the most commonly occurring *non-recyclable wastes* are plastic films, non-packaging dense plastic, disposable nappies and other scrap metal. **Further details are provided in Section 5.2.**

Waste composition analysis was also carried out on five recycling collections where less co-mingling took place⁶.

Target materials typically made up 93% of the recycling container, and ranged from a minimum of 90% to a maximum of 97%. Waste that had been incorrectly placed in the recycling (non-target and non-recyclable contamination combined) typically made up 7%, and ranged from a minimum of 3% to a maximum of 10% of the recycling

container. The relatively low levels of contamination in these services are contrasted with our findings for the co-mingled collections described above, where non-target and non-recyclable wastes typically made up 19% of the overall recycling bin.





2 Introduction

2.1 Study objectives

The objective of this study was to provide new estimates for the composition of household waste collected at the kerbside in Scotland in 2014-15, from the physical analysis of waste. The last time a similar study was conducted was in 2009, so the findings provide an important update on kerbside waste composition.

The information can be used by local and national government to inform their waste management policy and communications, and support technical practitioners working in the fields of resource management and the circular economy.

Our analysis includes:

- How much is collected at the kerbside in total?
- What is thrown away in the residual waste bin?
- Changes in what we throw away in the residual waste bin since 2009
- How many items that could be recycled at the kerbside, are actually recycled?
- How common is it for the wrong items to end up in mixed recycling collections?

We focus on the composition of household waste collected at the kerbside, as this is by far the largest component of household waste managed by local authorities. We do not include household wastes collected via bring banks, household waste recycling centres and other less common collection routes. This means that our findings are not comparable to the household recycling figures published by the Scottish Environment Protection Agency (SEPA).

Individual waste composition studies were designed to be representative of the range of households in a given local authority area, but we did not set out to study the effects of socio-demographic factors on waste composition. Studies typically used two phases of sampling, as an attempt to smooth variation in composition due to any seasonal effects. However, to robustly approach the *effects* of season on waste composition was beyond the scope of this project.

2.2 Summary of methodology

A separate technical methodology document has been written to provide a greater level of detail on how we arrived at national estimates. In summary, our methodology consists of using information from three sources:

- Waste composition analysis of kerbside residual and mixed recycling streams from eighteen Scottish local authorities between 2013 and 2015
- Waste composition analysis of kerbside mixed food and garden waste collections between 2011 and 2014
- Waste tonnages reported as collected at the kerbside by all thirty-two local authorities on waste data flow in 2014 and 2015

Secondary analysis of the datasets is then carried out in order to calculate national estimates.

2.3 Key considerations when reading this report

This report is designed to be a summary of key findings. Our analysis focuses on the most commonly occurring waste types, and those which highlight particular issues (e.g. typical levels of waste and correct recycling).

For a more complete national kerbside waste composition dataset please refer to the excel tables that accompany this report.

As highlighted in Section 2.1, we focus on household waste collected at the kerbside, and do not include household wastes collected via bring banks, civic amenity sites and other less common collection routes. Therefore, our analysis is not a complete analysis of local authority or national recycling performance⁷.

The waste composition analysis that underpins this study took place during 2013-15, which was a time of significant change in local authority waste services. Participating local authorities were understandably keen to sample from households where new recycling services had recently been implemented. In our analysis, we have matched waste composition data to the most appropriate reporting year on waste data flow. In final analysis we used 2014 data for twenty six local authorities and 2015 data for six local authorities. Our analysis is therefore representative of a 2014-15 period

and national tonnages we report will be very close to, but not exactly match those reported on waste data flow for either 2014 or 2015.

Our analysis of what we throw away in the residual waste nationally (**Section 4.2**) identifies waste types that we define as *typically recycled* at the kerbside nationally. Our analysis assumes local authorities collect these waste types at the kerbside and we do not adjust our analysis in the rare cases where this is not the case⁹. We exclude wastes that are not typically targeted for recycling at the kerbside⁹.

Our analysis of recycling at the kerbside (**Section 5.1**) focuses on the eighteen local authorities that took part in waste composition analysis. In our summary analysis we exclude any local authorities that did not target a recyclable waste type at the kerbside, but we do not adjust for any variation in service coverage¹⁰.

All tonnage data in this report will normally have been rounded to two significant figures and therefore may not sum exactly.



3 How much is collected at the kerbside in total?

This section summarises the overall composition of what is thrown away in the residual waste and recycled at the kerbside by households.

Of the 1.78 million tonnes of household waste and recycling collected at the kerbside in our analysis, food wastes, paper and cardboard, garden waste and glass waste make up nearly 1.2 million tonnes, or 68% of the total.



Figure 1 The composition of all household waste collected at the kerbside in 2014-15, with the four largest waste types, and thirteen other waste types combined into "All other" category.

Food wastes make up the largest single waste type at just under 410,000 tonnes, or 23% of the total. We estimate a typical household produces just under 169 kilogrammes of food waste each year at the kerbside, or approx. 76 kilogrammes per capita¹¹. Readers interested in a more complete picture of food wastes produced in the home (including the contribution of disposal by other routes and the relative proportions of avoidable and unavoidable food waste) should refer to the separate food waste study produced by Zero Waste Scotland¹².

Paper and cardboard is the second largest waste type at just over 360,000 tonnes, or 20% of the total kerbside waste. We estimate a typical household produces just under 150 kilogrammes of paper and cardboard each year at the kerbside, or approx. 68 kilogrammes per capita per year. Of the total paper and card, newspapers and magazines, non-recyclable paper and other recyclable paper make up approx. 130,000 tonnes, 56,000 tonnes and 48,000 tonnes respectively. Thin card packaging, board packaging and beverage cartons make up approx. 62,000 tonnes, 42,000 tonnes and 6,800 tonnes respectively.

Garden waste makes up the just over 300,000 tonnes, or 17% of the total. We estimate a typical household produces just under 124 kilogrammes of garden waste each year at the kerbside, or approx. 56 kilogrammes per capita per year. There will also be significant quantities of garden waste taken to household recycling centres and composted at home.

Glass makes up just under 134,000 tonnes, or 8% of the total kerbside waste. There will also be significant quantities of household glass collected at bring banks and household recycling centres. We estimate a typical household produces just over 55 kilogrammes of glass each year at the kerbside, or just under 25 kilogrammes per capita per year. We estimate that clear, green and brown container glass make up 76,000 tonnes, 34,000 tonnes and 20,000 tonnes respectively. Non-packaging glass contributes just over 4,000 tonnes.

"All other" wastes are comprised of thirteen broad waste types and approx. 570,000 tonnes or 32% of the total, and are dominated by healthcare waste (just over 125,000 tonnes or 7%), plastic films (just over 92,000 tonnes or 5%) and dense plastic (75,000 tonnes or 4%). Of the 125,000 tonnes of healthcare wastes, we estimate there is approx. 57,000t of

disposable nappies in the kerbside waste.

Specific recyclable waste types that contribute to the “all other” combined category may be of interest to the reprocessing sector. We estimate there is approx. 54,000 tonnes of plastic bottles in the kerbside waste in total, which includes 28,000 tonnes of polyethylene terephthalate (PET)

drink bottles and 18,000 tonnes of high density polyethylene (HDPE) drink bottles. Metal wastes are estimated to make up 62,000 tonnes or 3.5% of the kerbside waste, of which steel cans and aluminium cans make up 21,000 tonnes and 13,000 tonnes respectively, and steel and aluminium aerosols make up 2,500 tonnes and 3,000 tonnes respectively.



4 What is thrown away in the residual waste bin?

The following section covers the contents of the residual waste, which is the bin that should be used to dispose of wastes that cannot be recycled. We use the term residual waste, regardless of whether the contents of that bin could be recycled or not.

The majority of what we throw away in the residual waste bin is sent to landfill or incineration and will not be recycled.

This section summarises:

- What we throw away in the residual waste bin
- What we throw away that could be recycled
- What we throw away that is currently difficult to recycle
- Changes in what we throw away since 2009
- The biodegradable content of household residual waste

4.1 What we throw away in the residual waste bin

Of the 1.13 million tonnes of household residual waste collected at the kerbside in our analysis, food waste, paper and cardboard, healthcare waste and plastic films make up just over 710,000 tonnes, or 63% of the total.

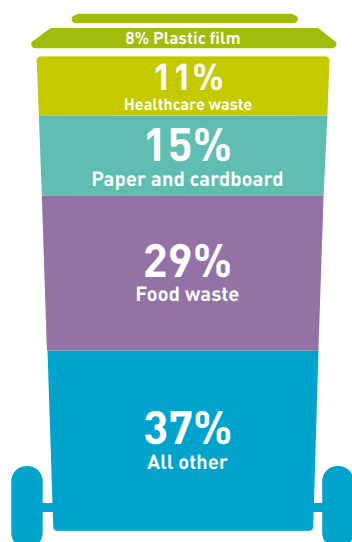


Figure 2 The composition of household residual waste collected at the kerbside in 2014-15, with the four largest waste types, and thirteen other waste types combined into "All other" category.

Food wastes make up the largest single waste type in the kerbside residual waste, at just over 330,000 tonnes, or 29% of the total. We estimate a typical household threw away just over 137 kilogrammes of food waste in 2014-15 in the residual waste bin, or approx. 62 kilogrammes per capita per year.

Paper and Cardboard is the second largest waste type thrown away in the residual waste, at just over 170,000 tonnes, or 15% of the total. We estimate a typical household throws away just over 70 kilogrammes of Paper and Cardboard each year, or 32 kilogrammes per capita per year.

Healthcare wastes make up just over 120,000 tonnes or 11% of the total, and includes approx. 57,000t of disposable nappies and 56,000 tonnes of animal bedding and faeces.

Plastic films make up just over 85,000 tonnes, or 8% of the kerbside residual waste. If we exclude carrier bags and bins liners from this total, all other films (typically comprising food packaging) total just under 57,000 tonnes. We think plastic films are likely to be an overestimate, as this waste type is particularly prone to the effects of contamination by food and other putrescible wastes during waste composition analysis¹³.

"All other" wastes are comprised of thirteen waste types and approx. 420,000 tonnes or 37% of the total, and are dominated by Glass waste (75,000 tonnes or 7%), Textiles and footwear (65,000 tonnes or 6%), Dense plastics (62,000 tonnes or 6%), and Garden waste (61,000 tonnes or 5%).

4.2 What we throw away in the residual waste bin that could be recycled

This section focuses on those waste types found in the residual waste that are typically targeted¹⁴ for recycling by local authorities using kerbside services. Our analysis is a gross national estimate to highlight the scale of what we currently throw away that could have been recycled. We do not account for any variation in the coverage of kerbside services for individual local authorities. For example, a local authority may not collect glass at the kerbside, or only a percentage of households in a local authority area might be provided with a particular recycling service.

Despite significant increases in the provision of kerbside recycling services in recent years, we estimate that approx. 670,000 tonnes, or 59% of the 1.13 million tonnes of residual

waste is made up of waste types that are typically recycled at the kerbside in Scotland. This equates to just over 275 kilogrammes per household each year, or 125 kilogrammes per person each year.



Figure 3 The proportion of what we throw away in the kerbside residual waste that is typically recycled at the kerbside.

Of the remaining 41% of residual waste in Figure 3, we estimate that 130,000 tonnes could have been recycled at household waste recycling centres, bottle banks and similar (e.g clothing and textiles, construction wastes), and 333,000 tonnes is made up of wastes that have to date proved challenging to establish sustainable recycling services (e.g disposable nappies, dense plastics).

Figure 4 below highlights selected waste types thrown away in the residual waste which are typically recycled at the kerbside. We have focused on those waste types which are likely of interest to local authority waste managers and the reprocessing sector. To aid interpretation only tonnages over 5,000 tonnes are shown. We have also excluded the 330,000 tonnes of food waste typically recycled at the kerbside that is found in the residual waste, so that the other (smaller) tonnages are visible in Figure 4. Please see Table 6.1 in the appendix for the data that underpins Figure 4, including quantities expressed on a per capita and per household basis.

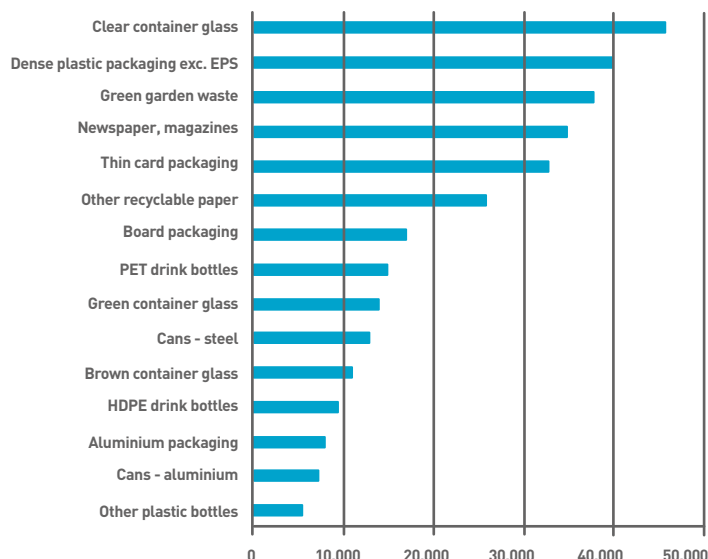


Figure 4 Selected waste types typically recycled at the kerbside which are thrown away in the residual waste. Only tonnages over 5,000 are shown and we have excluded the additional 330,000 tonnes of food waste typically recycled at the kerbside that is found in the residual waste. All tonnages rounded to two significant figures.

The scale of what we throw away represents a challenge to all of us. A large portion of what we throw away currently ends up in landfill, which results in greenhouse gas emissions as it degrades. Recycling more of these materials not only stops this gas being produced in landfill, but will also reduce the carbon emissions associated with manufacturing products from primary raw materials (e.g the oil and other products that are used to produce a plastic bottle), which typically has a larger impact on our global environment.

We also pay a heavy economic price for this waste – directly through local authority costs of disposal, and indirectly through the lost value of this material to Scotland’s economy

4.3 What we throw away in the residual waste bin that is currently difficult to recycle

In addition to the large quantities of waste that we estimate could be recycled using typical kerbside services, residual waste also contains some waste types that have the potential to be recyclable, but where establishing sustainable collection and reprocessing capacity has proved challenging to date.

We estimate there is approx. 57,000t of disposable nappies and 85,000 tonnes of plastic films in the kerbside residual waste in Scotland. As previously highlighted in Section 4.1, we think plastic films generally are particularly prone to over-estimation during waste composition analysis, so figures should be treated as indicative.

4.4 The biodegradable content of the residual waste bin collected at the kerbside

The bio-degradable content of kerbside residual waste collected at the kerbside is of interest to local authority waste managers, and technical and policy practitioners working in the fields of resource management and the circular economy.

Of the 1.13 million tonnes of residual waste collected at the kerbside, we estimate that approximately 680,000 tonnes (or 60%) is biodegradable. It is important to highlight that our estimate is based on the composition of residual waste at the point of collection at the kerbside. It's likely a large proportion of that waste will be landfilled directly, but a portion will be treated¹⁵ to remove both bio-degradable and non-biodegradable wastes, therefore potentially altering the biodegradable content.

Food waste and Paper and Card dominate the bio-degradable portion of residual waste, making up approx. 49% and 25% respectively. In total, just under 500,000 tonnes (or 72%) of the biodegradable waste fraction of residual waste is made up of waste types that are typically recycled at the kerbside. A focus on food waste and paper and card will be important in efforts to reduce the biodegradable content of kerbside residual waste. However, there are also significant quantities of biodegradable waste which to date have proved challenging to recycle cost-effectively (e.g disposable nappies).

There are likely to be a number of related factors¹⁶ that influence the overall biodegradable content of kerbside residual waste, which were beyond the scope of the current study.



Figure 5 The composition of kerbside residual waste (tonnes), according to bio-degradable content. The five largest bio-degradable waste types and combined "all other biodegradable" is shown for clarity. The contribution of non-biodegradable waste is also provided for context.

4.5 Changes in what we throw away in the residual waste bin since 2009

In 2009 Zero Waste Scotland published the first study of the composition of municipal waste in Scotland¹⁷, which included the composition of household residual waste collected at the kerbside. While the scope of the 2009 study was broader, the key aspects of methodology are sufficiently similar to enable comparisons with the current findings.

From Figure 6 below the overall quantity of household residual waste collected at the kerbside between the two

periods has reduced by 317,000 tonnes, from 1.45 million tonnes in 2009 to 1.13 million tonnes¹⁸ in 2014-15.

In 2014-15 Scottish households recycled just under 640,000 tonnes of common waste types at the kerbside. When compared to sending this waste to landfill, by recycling we avoided over 525,000 tonnes of CO₂e emissions¹⁹ and 52 million in landfill disposal costs²⁰.

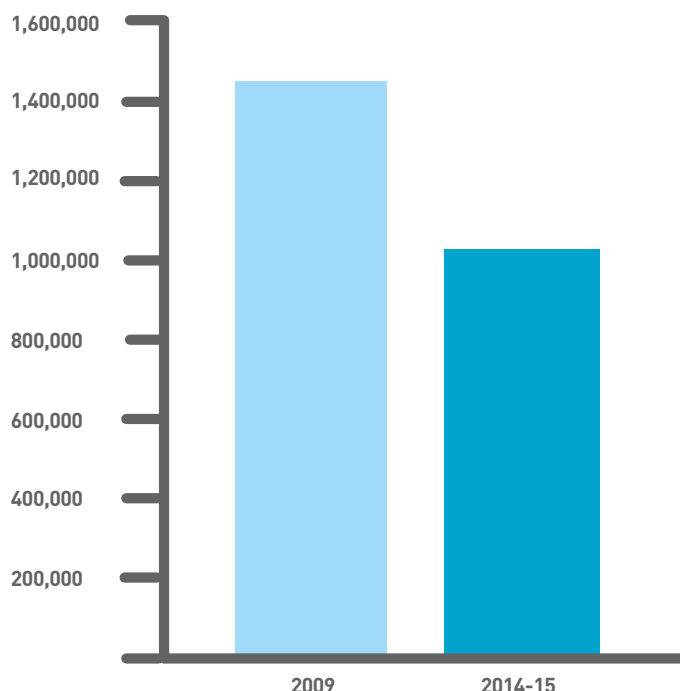


Figure 6 The overall quantity of household residual waste collected at the kerbside, from the previous waste composition study in 2009 and the current study.

On the following page Figure 7 summarises the change in tonnage of the seven most commonly occurring materials in the residual waste between 2009 and 2014-15. Six of the seven waste types have all reduced in tonnage, but the scale of reduction and opportunities for further recycling is not equal.

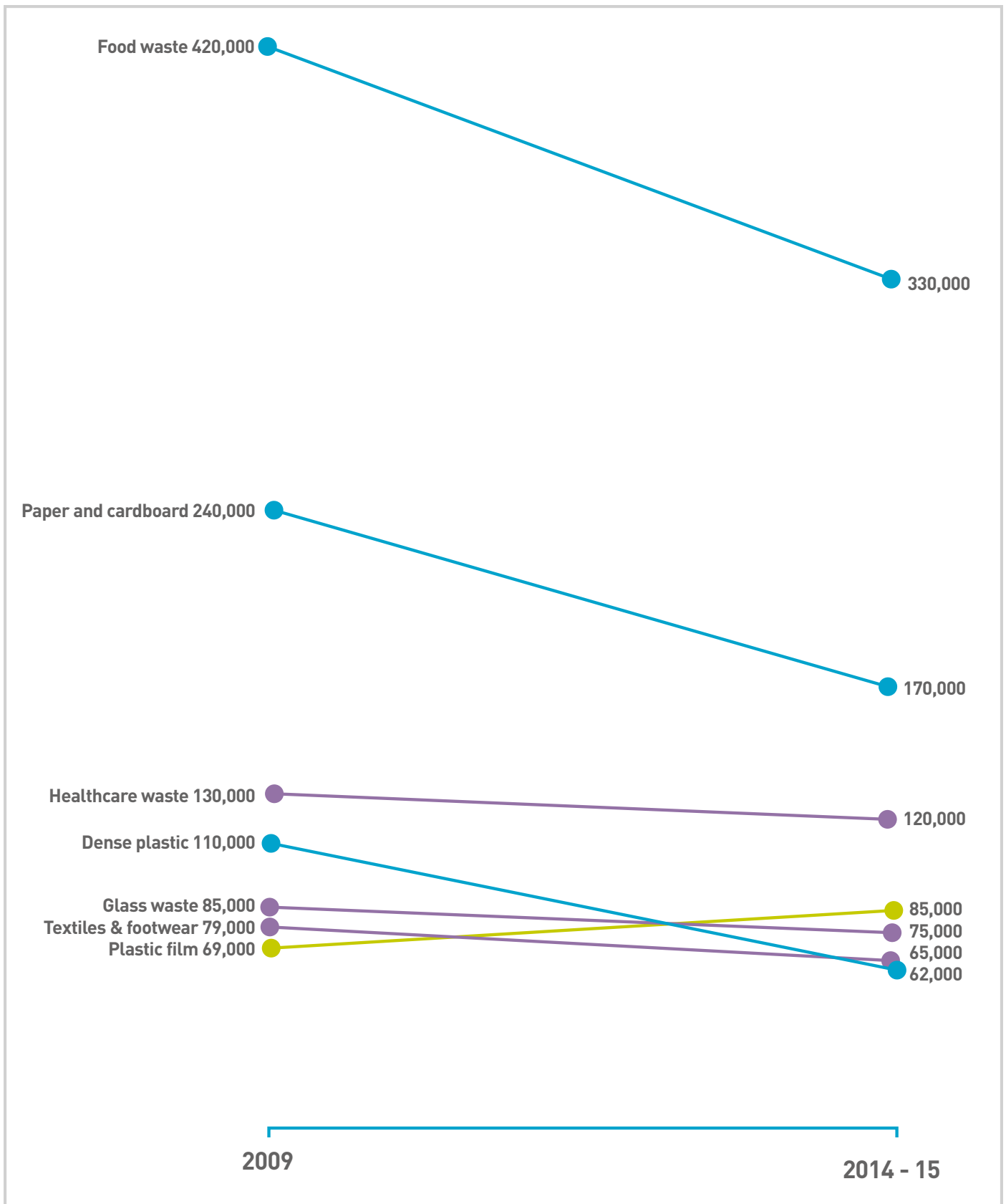


Figure 7 The seven largest waste types (tonnes) in household residual waste collected at the kerbside in 2014-15, compared to previous composition analysis published in 2009. All data rounded to two significant figures.

Food waste has shown the largest absolute reduction, from approx. 420,000²¹ tonnes in 2009, to 330,000 tonnes in 2014-15 (approx. 90,000 tonnes reduction). This likely reflects both the introduction of food waste collection services, and waste prevention by householders. However, there are clearly still very large quantities of food waste remaining in the residual waste bin in 2014-15 that could be recycled.

The current study is by nature a snapshot in time which took place at a time of significant change in local authority recycling services, including the introduction of additional food waste collections. Of the eighteen local authorities that took part in waste composition analysis, fifteen collected food waste separately or mixed with garden waste. Local authorities reported separately collected food waste of 38,301 tonnes, 55,244 tonnes and 62,203 tonnes in 2014, 2015 and 2016 respectively. They also reported 102,330 tonnes, 104,968 tonnes and 135,296 tonnes of mixed food and garden waste in 2014, 2015 and 2016 respectively. The most recent local authority data for 2016 suggests there has been a relatively modest increase in the recycling of food waste at the kerbside, but we think our estimates for the quantity thrown away are still broadly representative of the scale of the issue.

Dense plastic showed the largest proportional reduction, from 110,000 to 62,000 tonnes, or a 44% reduction on 2009. This reduction could reflect increased acceptance and capture in recycling services, but could also be at least partly influenced by changes in packaging design (e.g. "light weighting").

Healthcare wastes (which include disposable nappies and other absorbent hygiene products) have shown a small decline between 2009 and 2014-15, from approx. 130,000 tonnes to 120,000 tonnes. As highlighted in Section 4.3, it has proved challenging to establish sustainable recycling services targeting this waste type.

Of the seven most commonly occurring wastes types in the residual waste, plastic films are the only type that has increased in absolute terms between the two periods, from 69,000 tonnes in 2009 to 85,000 tonnes in 2014-15.



However, as highlighted in Section 4.1, estimates for plastic films should be treated with some caution, owing to the potential for contamination with other putrescible wastes during composition analysis. The waste type "plastic films" used in our analysis includes *other plastic films* (typically flexible food packaging), *waste bin liners* and *carrier bags*. Our evidence suggests that all of the increase in plastic films between the two periods is due to other plastic films, which could reflect both the increased use of this packaging type in household groceries and a lack of recycling services for this waste.

5 Recycling at the kerbside

This section provides a summary of the typical proportions of correct recycling at the kerbside and typical levels of contamination found in dry mixed recycling collections. We focus on using data from the eighteen local authorities that took part in waste composition analysis. Unlike the national estimates in sections 3 and 4, we do not extrapolate to local authorities that did not take part in waste composition analysis.

In Section 5.2 we use the term “non-recyclable” waste within recycling containers to define wastes not typically recycled anywhere within a local authority service e.g non-recyclable paper and disposable nappies.

5.1 How many items that could be recycled, are actually recycled?

This section combines data on the composition of kerbside residual waste, with mixed and segregated recycling, in order to estimate the proportion of *correct recycling* at the kerbside. We define correct recycling as the proportion of the overall kerbside tonnage that we estimate is found in the correct kerbside recycling service. We provide average, maximum and minimum % correct recycling for eight waste types typically recycled at the kerbside. Our analysis focuses

on the eighteen local authorities that took part in waste composition analysis. We exclude any data points where a local authority did not target a given waste type at the kerbside²². Our analysis is therefore *correct recycling when targeted at the kerbside*, as we think this is analytically more useful.

Our analysis is a whole local authority assessment of what is collected for recycling at the kerbside, as a proportion of the total occurring at the kerbside (from compositional analysis of what is thrown away in the residual waste). We do not make any adjustment for kerbside service coverage, where a recycling service was provided to only a percentage of the households in a local authority area.

From Figure 8, there is a wide range in correct recycling at the kerbside.

The average correct recycling for glass was 63%, with a maximum of 84% and a minimum of 12%. The minimum value for glass may reflect more widespread use of alternative glass recycling (bring banks etc.), which was beyond the scope of this study.

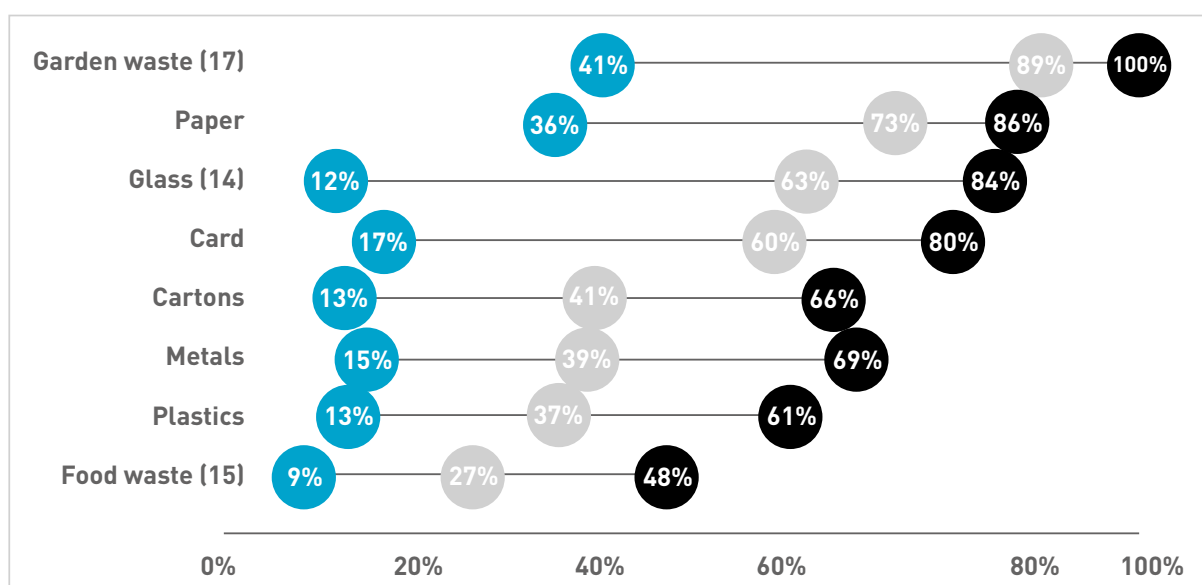


Figure 8 The proportions (%) of eight typically recycled waste types that we estimate are correctly recycled at the kerbside. The minimum (blue), average (grey) and maximum (black) are provided for each waste type. Number of local authorities that observations are based on is 18 (unless highlighted in brackets).

The maximum estimate for garden waste (99.6%, rounded to 100% in Figure 8) seems unrealistically high, but there is a high average (89%) across the seventeen local authorities which targeted garden waste at the kerbside.

Typically 27% of kerbside food waste is correctly recycled at the kerbside, with a maximum of 48%. As highlighted previously, waste composition analysis took place during the roll out of additional food waste recycling services, which we have tried to account for by using either 2014 or 2015 waste data flow data (residual and recycling)²³.

Even where recycling services are well established (e.g paper), 73% is typically recycled, with a minimum of 36% correct recycling.

5.2 How common is it for the wrong items to end up in mixed recycling collections?

A large number of local authorities in Scotland provide a kerbside dry mixed recycling (DMR, or co-mingled) service, typically targeting paper, card, metals and plastic wastes produced by households.

Contamination of recycling services is where the wrong items end up in the recycling collection. Contamination results in increased costs, through equipment damage, additional sorting, operational costs and waste disposal charges resulting from reduced quality and economic value of materials. Additionally, collection and sorting staff are put at

risk from dealing with contaminated recycling (e.g cuts from hand sorting).

Waste composition analysis was conducted on thirteen local authority dry mixed recycling services between 2013 and 2015 and wastes were classified into three groups:

- **Target** - wastes targeted for collection by the local authority e.g recyclable paper and card
- **Non-target** – wastes not targeted, but were targeted elsewhere by the local authority service e.g recyclable glass might be targeted using a separate kerbside glass collection, or via bring banks
- **Non-recyclable** – wastes not typically recycled anywhere within a local authority service e.g non-recyclable paper and disposable nappies

We use the term “non-recyclable” waste within recycling containers to define wastes not typically recycled anywhere within a local authority service e.g non-recyclable paper and disposable nappies.

Figure 9 summarises the minimum (light blue), average (grey) and maximum (dark grey) observations (expressed as % of overall composition) from thirteen samples of dry mixed recycling, for target, non-target and non-recyclable waste.

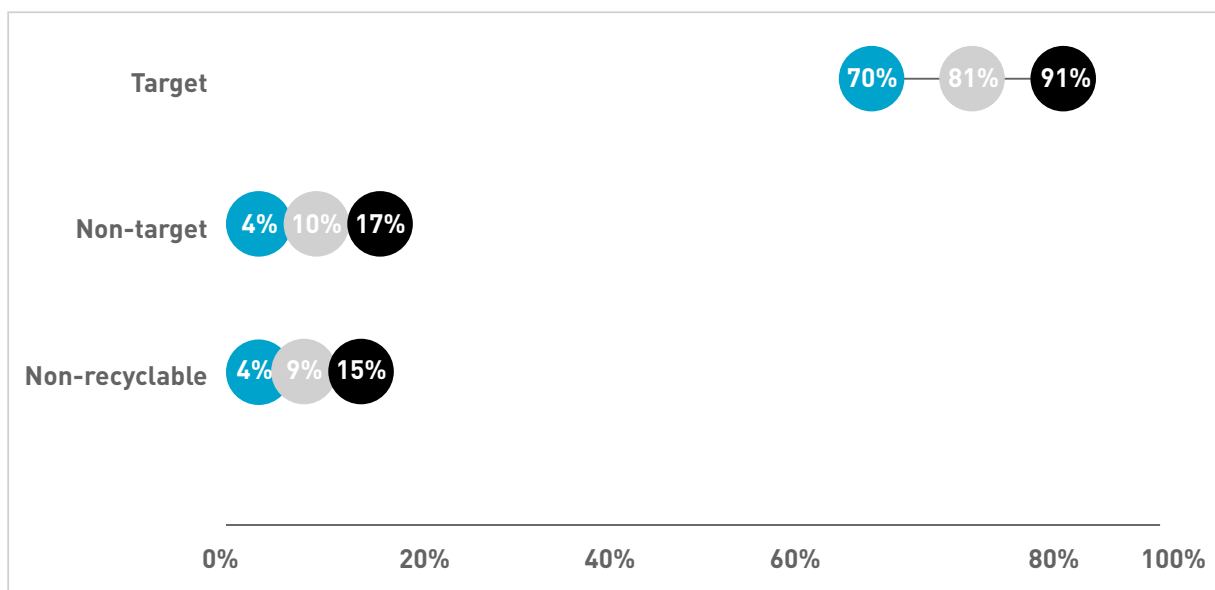


Figure 9 The proportions (%) of target, non-target and non-recyclable waste types in thirteen local authority dry mixed recycling services. The minimum (blue), average (grey) and maximum (black) are provided for each waste type.

Target materials typically made up 81% of the dry mixed recycling services we sampled from, and ranged from a minimum of 70% to a maximum of 91%.

Waste that has been incorrectly placed in the dry mixed recycling (non-target and non-recyclable contamination combined) typically makes up 19%, and can range from a minimum of 9% to a maximum of 30%.

Contamination by non-target wastes typically make up 10% of the dry mixed recycling. The most commonly occurring non-target waste types are Glass waste (2.8%, for nine dry mixed recycling services not targeting glass), Food waste (2.5%, all thirteen services) and Textiles and footwear (2.2%, all thirteen services).

Non-recyclable wastes typically make up 9% of the thirteen samples of dry mixed recycling, and are typically comprised of Plastic films (2.3%), non-packaging dense plastic (1.0%), disposable nappies (0.5%) and other scrap metal (0.4%).

Waste composition analysis was also carried out on five recycling collections where less co-mingling took place²⁴. Target materials typically made up 93% of the recycling container, and ranged from a minimum of 90% to a maximum of 97%. Waste that had been incorrectly placed in the recycling (non-target and non-recyclable contamination combined) typically made up 7%, and ranged from a minimum of 3% to a maximum of 10% of the recycling container. In a previous study of kerbside recycling²⁵, similarly low levels of contamination were found in recycling services targeting a small number of materials. The relatively low levels of contamination in these services are contrasted with our findings for the co-mingled collections described above, where non-target and non-recyclable wastes typically made up 19% of the overall recycling bin.



6 Appendix: Selected waste types in kerbside residual waste

Table 6.1 below summarises the occurrence of selected waste types in kerbside residual waste, which are typically recycled at the kerbside. The quantities are expressed as a

national estimate, kilogrammes per household per year and kilogrammes per capita per year. **Please also see Section 4.2 for further details.**

Waste type	Typically recycled at the kerbside in the residual waste (Tonnes)	Typically recycled at the kerbside in the residual waste (kg/household/year)	Typically recycled at the kerbside in the residual waste (kg/capita/year)
Food waste	330,000	136.9	61.9
Clear container glass	46,000	19.0	8.6
Dense plastic packaging ²⁶	40,000	16.7	7.5
Green garden waste	38,000	15.6	7.1
Newspaper and magazines	35,000	14.3	6.5
Thin Card Packaging	33,000	13.6	6.1
Other Recyclable Paper	26,000	10.6	4.8
Board Packaging	17,000	6.9	3.1
PET drink bottles	15,000	6.2	2.8
Green container glass	14,000	6.0	2.7
Cans - steel	13,000	5.3	2.4
Brown container glass	11,000	4.6	2.1
HDPE drink bottles	9,500	3.9	1.8
Aluminium packaging	8,000	3.3	1.5
Cans - Aluminium	7,200	3.0	1.3
Other plastic bottles	5,400	2.2	1.0

Table 6.1 The occurrence of selected waste types in kerbside residual waste, which are typically recycled at the kerbside. Quantities expressed as overall national estimate, kilogrammes per household per year, and kilogrammes per capita per year.



7 Reference list

- ¹ <http://www.zerowastescotland.org.uk/content/composition-municipal-waste-scotland>
- ² For a more detailed analysis of the carbon impacts of Scotland's waste, including household waste, please see <http://www.zerowastescotland.org.uk/research-evidence/2014-15-carbon-metric-summary-report>.
- ³ Based on the emissions solely associated with landfilling waste. For a more detailed analysis of the carbon impacts of Scotland's waste, including household waste, please see <http://www.zerowastescotland.org.uk/research-evidence/2014-15-carbon-metric-summary-report>.
- ⁴ Based on 2014-15 landfill tax rate of £80 per tonne.
- ⁵ The food waste tonnage for 2009 is taken from updated food waste estimates produced by ZWS in 2014.
- ⁶ Services that targeted a small number of material types e.g cans and plastic.
- ⁷ Readers interested in this information should go to the household recycling dataset, <https://www.sepa.org.uk/environment/waste/waste-data/waste-data-reporting/household-waste-data/>
- ⁸ In relatively rare cases a waste type that we define as typically recycled at the kerbside nationally (e.g glass bottles) may not be targeted at the kerbside by a given local authority (i.e households are expected to use other non-kerbside recycling facilities).
- ⁹ For example, clothing and textiles are commonly collected at bring banks, but not typically targeted at the kerbside.
- ¹⁰ For example, only a percentage of households in a local authority area are provided with a given recycling service.
- ¹¹ Per person.
- ¹² For the separate food waste study see <http://www.zerowastescotland.org.uk/sites/default/files/Household%20Food%20and%20Drink%20Waste%20Estimates%202014%20Final.pdf> . This gives a more detailed breakdown of food waste arisings (including some non-kerbside routes). Estimates for food waste collected at the kerbside in the current study and the earlier study differ slightly due to slightly different scaling assumptions being used; these differences are highlighted in the respective methodology sections. We recommend the dedicated food waste study is preferred for discussion of food waste amounts, and the current study is preferred for discussion of kerbside collected waste and recycling in the round.
- ¹³ During compositional analysis effort is made to separate wastes contained within carriers bags, bin bags and plastic film packaging, but we think it's unlikely that 100% can be removed in practice.
- ¹⁴ Readers interested in the individual waste types defined as typically recycled at the kerbside should refer to the appendix of the separate methodology document.
- ¹⁵ Typically via incineration and mechanical and biological treatment.
- ¹⁶ e.g variation in householder utilisation of services, collection frequencies of all services, whether garden waste and glass waste are targeted at the kerbside.
- ¹⁷ <http://www.zerowastescotland.org.uk/content/composition-municipal-waste-scotland>
- ¹⁸ As highlighted in Section 2.3 our analysis is representative of a 2014-15 period. The national residual waste tonnage used in our analysis is very similar to, but will not exactly match those reported on waste data flow for either 2014 or 2015 reporting year.
- ¹⁹ Based on the emissions solely associated with landfilling waste. For a more detailed analysis of the carbon impacts of Scotland's waste, including household waste, please see <http://www.zerowastescotland.org.uk/research-evidence/2014-15-carbon-metric-summary-report>.
- ²⁰ Based on 2014-15 landfill tax rate of £80 per tonne.
- ²¹ The food waste tonnage for 2009 is taken from updated food waste estimates produced in 2014.
- ²² At the time of waste composition studies in 2013-2015, four of the eighteen local authorities did not target glass for recycling at the kerbside, three did not collect food waste at the kerbside, and a single local authority did not target garden waste at the kerbside.
- ²³ In this case, if residual waste composition data represented households covered by a food waste service, but the local authority had only rolled out the service in part during 2014, we would normally have used 2015 waste data flow data in our analysis.
- ²⁴ Services that targeted a small number of material types e.g cans and plastic.
- ²⁵ <http://www.zerowastescotland.org.uk/sites/default/files/Contamination%20in%20source-separated%20municipal%20and%20business%20recyclate%20in%20the%20UK%20report.pdf>
- ²⁶ Excluding expanded polystyrene.



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