

Cost Benefit Analysis of Standardising the Existing Code of Practice for Household Waste Recycling in Scotland

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Report For

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Executive Summary

Within this project Eunomia has assessed the impact of countrywide adherence to the existing Code of Practice (CoP) for Household Waste Recycling across Scotland. Eunomia's analysis combines detailed baseline mapping of current services, statistical assessment of performance factors, and modelling of costs, benefits and carbon implications of aligning all local authorities with CoP requirements. Future waste flow changes resulting from incoming policy and legislation were not in scope of this project. Therefore, the impacts of the introduction of a Deport Return Scheme (DRS), Extender Producer Responsibility (EPR) and the kerbside collection of flexible plastics were not accounted for. The analysis is also subject to the limitations set out in Section 6.0.

The summary below highlights the key findings from this work:

Finding 1: Current Alignment with the CoP Is Mixed and Highly Variable

In 2023 (the baseline year for Eunomia's analysis):

- Around half of Scottish households received dry recycling services aligned with the CoP requirement for separate paper/cardboard, and plastics/metals/glass.
- When considering food waste collections, 48% of households in urban areas (UR1–3) received a compliant separate food waste service, with rural exemptions covering approximately 20% of households.
- Glass collections show near-universal compliance once the unpublished 2021 CoP update is considered, which permitted glass to be collected within the plastics/metals stream. However, when reviewing compliance against the existing 2015 CoP, compliance was much lower with 29% of properties receiving a separate collection of glass at the kerbside and 45% of properties having access to a community bring bank service.

Finding 2: There are Three Scheme Design Factors Which Have the Greatest Impact Upon Recycling Performance

These are:

- **Restricting Residual Waste Capacity:** Eunomia's analysis demonstrated a statistically significant correlation between lower effective weekly residual container capacity and higher food waste capture and higher overall recycling rates. Within this analysis it was clear that there is a direct inverse correlation between the litres per week of residual waste capacity provided by local authorities and the recycling rates they achieved.
- **Separate Food Waste Collections:** Authorities offering separate weekly food waste services achieve substantially higher food waste yields than those collecting food as part of a mixed organics service.
- **Approach to Glass Collection:** Separate kerbside glass collections achieve the highest yields, followed by glass collected within the plastics/metals/glass stream, with bring sites

having a markedly lower performance. There was a statistically significant difference between the mean yield of glass waste collected for recycling separately at the kerbside compared with bring bank networks.

Eunomia's analysis demonstrated no statistically significant difference in dry recycling capture rates was identified between co-mingled, two-stream, and multi-stream collection systems. However, there is a statistically significant difference in the contamination rate between recycling systems; multi-streams have a significantly lower contamination rate than co-mingled systems indicating an improved quality of the material collected for recycling.

Finding 3: Local Authority Experience of Service Change will be Key to Future Service Design at a Local Level

Capturing the real-life experience of local authorities is key to understanding the practicalities of service implementation. Key learnings and observations from local authorities were:

- There are considerable differences between local authorities across Scotland, with variations in terms of their socio-demographic profile, housing stock, population structure, and their physical geography and connectivity.
- local authorities that implemented both two-stream recycling and reduced residual capacity saw the largest and most sustained improvements in recycling rates. This is supported by Eunomia's analysis.
- Two-stream recycling implemented without accompanying residual restriction yielded little to no measurable improvement in recycling performance. Once again, this consistent with Eunomia's analysis.
- Residual capacity reductions increased participation in food waste services.
- Changes were often enabled by Recycling Improvement Fund (RIF) investment. However, communications funding gaps were a consistent barrier for local authorities.
- Resident satisfaction typically dropped initially due to the inevitable service change issues such as missed bin collections or concerns about coping with the system. However, these typically recovered within six months.

Finding 4: Scotland-Wide Modelling: Costs, Recycling Impact and Carbon Benefits

Future service delivery options were modelled across organic waste, dry recycling and residual waste. The analysis builds on earlier stages and explores national-level implications across all major kerbside collection streams, as well as overall household waste impacts. A structured modelling process was used, incorporating detailed baseline construction, benchmarking, operational modelling and carbon assessment.

The results should be interpreted as an indication of the likely direction and relative magnitude of impacts arising from different service configurations, based on a 2023 baseline. They should not be regarded as predictions of future outcomes, as actual performance and costs will be influenced by subsequent policy changes, market conditions, infrastructure developments and local operational factors.

Food Waste Collections

- Introducing weekly separate food waste collections for urban and the majority of suburban households (defined as urban-rural classification ('UR') 1-3, for which further detail is provided in Section 3.1.1.1.1) was anticipated to increase the quantity of food waste collected for recycling. This change led to the improvement in recycling rates and carbon performance shown in the results.
- Delivering a separate food waste collection service to the remaining less accessible, more remote properties (UR4&5) provides additional gains, though the benefits are more modest relative to the increased cost.
- It was deemed prohibitively expensive to offer separate food waste collections to UR6 zones (those defined as 'remote, rural areas'), so this was not assessed.

Table E- 1: Impact of Separate Food Waste Collections

Measure	UR1-3 Impact	Additional UR1-5 Impact
Increase Households Receiving Service	+1.46m	+200k
Additional Tonnes of Food Waste Collected	+23,000 tonnes	+ 7,600 tonnes
Impact on Kerbside Recycling Rate	+1.8%	+ 0.5%
Impact on National Recycling Rate *	+1.4%	+ 0.3%
Carbon Impact	-11,000 tCO ₂ e	-430 tCO ₂ e
Modelled Additional Annual Operational Costs	£16.3m	£4.9m
Modelled Additional Capital Costs	£20.0m	£5.8m
* National Recycling Rate refers to the national household waste generated and managed.		

Garden Waste Collections

- Universal adoption of free garden waste collections increases participation and material collected, especially in areas without an existing service. This would deliver increased recycling with modest carbon benefits (due to the relatively small difference in CO₂e emissions factors between garden waste in incineration and windrow composting). The reduction in operational costs was associated with the group of local authorities with mixed organics services in the baseline, as separate garden waste has a lower gate fee.
- A chargeable model increases recycling less but reduces system-wide costs and adds substantial income for councils—particularly relevant where councils already operate charged systems.

Table E- 2: Impact of Free and Charged Waste Collections

Measure	Free	Chargeable
Increase Households Receiving Service	1.05m	550k
Additional Tonnes of Garden Waste Collected	+79,000 tonnes	+22,000 tonnes
Impact on Kerbside Recycling Rate	+4.6%	+2.4%
Impact on National Recycling Rate *	+2.9%	+1.7%
Carbon Impact	-1,300 tCO ₂ e	+40 tCO ₂ e
Modelled Additional Income from Charged Collections	N/A	£16,390k
Modelled Additional Annual Operational Costs	-£7.0m	-£12.1m
Modelled Additional Capital Costs	£25.5m	£12.8m

* National Recycling Rate refers to the national household waste generated and managed.

Dry Recycling (Two-Stream (Separate Paper/Cardboard) vs Co-mingled Including Glass)

- Changing dry recycling configurations without adding to the materials collected at the kerbside does not alter recycling rates or material capture at a national scale. This was because yields are similar across service types.
- Two-stream collections (separating paper/cardboard) perform better environmentally and financially, both reducing contamination and lowering long-term operational costs.
- Co-mingled systems simplify operations but increase emissions and material losses through higher rejection rates.

Table E- 3: Impact of Two-Stream (Separate Paper/Cardboard) Compared with Co-mingled Including Glass Recycling Collections

Measure	Two-Stream (Separate Paper/ Cardboard)	Co-mingled with Glass
Local Authorities Changing Scheme	12	17
Households Changing Scheme	1,029,501	1,507,584
Additional Tonnes of Dry Recycling	0 tonnes	0 tonnes
Impact on Kerbside Recycling Rate	0%	0%
Impact on National Recycling Rate *	0%	0%

Measure	Two-Stream (Separate Paper/ Cardboard)	Co-mingled with Glass
Carbon Impact	-12,000 tCO ₂ e	+31,000 tCO ₂ e
Additional Annual Operational Costs	-£5.2m	£6.0m
Additional Capital Costs	£22.3m	£0.8m
* National Recycling Rate refers to the national household waste generated and managed.		

Glass Collection Options

- Collecting glass separately generally delivers strong carbon benefits due to higher quality and increased closed-loop recycling.
- Moving glass into co-mingled streams increases emissions and reduces recycling quality because co-mingled collected glass is sent to MRFs and can generally not be used for closed-loop recycling. This means that changes which result in higher glass capture rates can still see an increase in tonnes of CO₂e emissions.
- Bring systems reduce collection costs but significantly reduce capture compared to kerbside collection.

Table E- 4: Impact of Different Approaches to Collecting Glass

Measure	Non-separate Kerbside to Bring	Non-separate Kerbside to Separate Kerbside	All authorities to Separate Kerbside	Bring to Non- separate Kerbside
Local Authorities Changing Scheme	8	8	20	12
Additional Tonnes of Dry Recycling	-26,000	0	+33,000	+33,000
Impact on Kerbside Recycling Rate	-1.2%	0%	+2.4%	+1.5%
Impact on National Recycling Rate*	-0.4%	0%	+1.14%	+0.5%
Carbon Impact	-11,000 tCO ₂ e	-15,000 tCO ₂ e	-34,000 tCO ₂ e	+12,000 tCO ₂ e

Measure	Non-separate Kerbside to Bring	Non-separate Kerbside to Separate Kerbside	All authorities to Separate Kerbside	Bring to Non- separate Kerbside
Additional Annual Operational Costs	-£0.2m	£1.8m	£1.0m	£1.3m
Additional Capital Costs	£0.0m	£11.7m	£46.8m	£0.0m

* National Recycling Rate refers to the national household waste generated and managed.

Residual Waste Restriction (Three-Weekly and Four-Weekly Collections)

- Reducing residual waste frequency produces the strongest system-wide recycling improvements of any single measure.
- Material is pushed toward recycling and food waste services, leading to higher capture and reduced carbon impact.
- Both three-weekly and four-weekly models generate significant operational savings, with four-weekly producing the greatest change.
- Residual restriction can also be achieved by changing bin sizes, although this will impact the level of operational saving achieved

Table E- 5: Impact of Three and Four-Weekly Residual Waste Collections

Measure	Three Weekly Residual Waste	Four Weekly Residual Waste
Additional Properties Added to the Service	1.2m	2.01m
Change in Dry Recycling Tonnes	+11,000 tonnes	+31,000 tonnes
Change in Food Waste Tonnes	+ 5,900 tonnes	+ 16,000 tonnes
Impact on Kerbside Recycling Rate	+ 2.8%	+ 6.4%
Impact on National Recycling Rate	+ 0.7%	+ 1.6%
Carbon Impact	- 18,000 tCO ₂ e	- 41,000 tCO ₂ e
Operational Costs	-£10.2m	-£18.6m
Capital Costs	-£5.3m	-£6.2m

Measure	Three Weekly Residual Waste	Four Weekly Residual Waste
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* National Recycling Rate refers to the national household waste generated and managed.

Finding 5 Suggestions Based on Modelling

Based on the research undertaken as part of this project using the best available data for Scottish local authorities, the modelling findings suggest;

- **Mandating weekly separate food waste collections for UR1–3 properties** (with a clear timetable for phased expansion to UR4 and 5 where practicable). Based on Eunomia's analysis this change will deliver the greatest carbon benefit alongside a recycling performance uplift. This change does however have significant infrastructure implications. Although it could be argued that a policy change such as this provides predictable feedstock growth signals to the treatment market to facilitate investment in plants, the location of facilities will be essential.
- **Supporting local authorities with a mixed organics service to move to a chargeable garden waste model.** The saving from this service change should be modelled and supported by a full business case, however, based upon Eunomia's modelling this service change could financially support the introduction of weekly separate food waste collections.
- **Supporting the reduction in effective weekly residual capacity, for example by transitioning to three or four-weekly residual collections,** where local service modelling shows net benefits. For the purpose of updating the CoP, making this an essential requirement would need to be discussed in more detail. However, this approach will also give local authorities the opportunity to recognise savings locally to offset additional service costs generated by other changes such as weekly separate food waste collections.
- **Collection of non-separated glass permissible only where it can be demonstrated it is going into closed-loop recycling.** Eunomia recognises that although separate kerbside collections of glass have a much higher capture than bring systems, introducing separate collections require considerable capital investment and on-going operational costs. Non-separate collections can be introduced with lower on-going operational costs and no capital investment as they use the existing infrastructure. However, the environmental impact of these services is marked, and this is largely driven by how the material is recycled.
- **Developing a Scotland-wide organics infrastructure plan,** this would include mapping current vs forecast food and garden waste arisings by local authority, identifying capacity gaps and logistics pinch points. The aim of this would be to support expanded collection services especially in more rural areas, or where existing infrastructure is problematic or does not support service expansion. There will also be an impact on IVC operators that should be factored into considerations. Interviews indicated that infrastructure access

was a key factor in service changes undertaken by local authorities already complying with the existing CoP.

- **Implementing a behaviour change and communication programme** to support service changes, as this is currently a cost borne by local authorities. Feedback from interviews was that high quality and effective communications is essential to scheme success.

Table of Contents

Executive Summary	1
1.0 Project Overview and Approach	12
1.1 Strategic Context	12
1.2 Project Aims	13
1.3 Scope and Definitions	13
2.0 Method	16
2.1 Outline	16
2.2 Stage 1: Current Adherence to the Existing Code of Practice Across Scotland	16
2.2.1 Understanding CoP Essential and Desirable Criteria	16
2.2.2 Baseline Mapping of LA Collection Systems	17
2.2.3 Household-Level Assessment of CoP Alignment	18
2.3 Stage 2: Provisions in the Current CoP and Their Impact	18
2.3.1 Primary Research with Local Authorities	18
2.3.2 Statistical Assessment of Service Design Impacts	19
2.3.3 Identifying High-Performance Characteristics	20
2.4 Stage 3: Cost and Impact of Local Authorities Meeting the CoP Requirements	20
2.4.1 Data Inputs	22
2.4.2 Baseline Construction	23
2.4.3 Benchmarking	24
2.4.4 Waste Flow Modelling	25
2.4.5 Operational Modelling	25
2.4.6 Cost Modelling	25
2.4.7 Carbon Modelling	26
2.4.8 Modelling Simplification	26
3.0 Stage 1: Current Adherence to the Existing Code of Practice Across Scotland	27
3.1 Overview of the Essential and Desirable Criteria Within the CoP	27
3.1.1 Organics	28

3.1.2 Dry Recycling	31
3.1.3 Residual Waste	33
3.1.4 Updates to the Existing CoP	33
3.2 Collection Systems Currently Operated by Scottish Local Authorities	35
3.2.1 Organics	35
3.2.2 Dry Recycling	36
3.2.3 Residual Waste	37
3.3 Degree of Alignment with the Essential and Desirable Criteria within the CoP	38
3.3.1 Food Waste and Mixed Organics	38
3.3.2 Dry Recycling	39
3.3.3 Residual Waste	39
4.0 Stage 2: Provisions in the Current Code of Practice and their Impact	40
4.1.1 How Have Aligned Local Authorities Implemented the CoP?	40
4.1.2 Changes Made	40
4.1.3 Impact of Changes	43
4.2 Impact of Collection Service Design on Waste Reduction	47
4.2.1 Total Household Waste Generated	47
4.2.2 Kerbside Yield	48
4.3 Impact of Collection Service Design on Recycling Capture Rates	49
4.3.1 Recycling Capture Rates	49
4.3.2 Food Waste Yields and Capture Rates	50
4.4 Common Themes Among the Best Performing Local Authorities	52
4.4.1 Overview	52
4.4.2 Social Deprivation	52
4.4.3 Organics	54
4.4.4 Dry Recycling	55
4.4.5 Residual Waste	57
5.0 Stage 3: Cost and Impact of Local Authorities Meeting the Requirements in the Current Code of Practice	61

5.1 Organics	61
5.1.1 Food Waste	61
5.1.2 Garden Waste	66
5.1.3 Summary of Findings.....	71
5.2 Dry Recycling.....	74
5.2.1 Separate Paper/cardboard Collections	74
5.2.2 Co-Mingled Dry Recycling Collections Including Glass	77
5.2.3 Summary of Findings.....	79
5.2.4 Glass	80
5.3 Residual Waste.....	87
5.3.1 Three Weekly Residual Waste Collections	87
5.3.2 Four Weekly Residual Waste Collections	90
5.3.3 Summary of Findings.....	92
6.0 Limitations of the Analysis	92
6.1 Impact of the CoP	93
6.2 2023 Data Year.....	93
6.3 Missing and Incomplete Baseline Data	94
6.4 Modelling Simplification	97
6.5 Other Costs.....	97
7.0 Suggestions Based on Modelling	99
A.1.0 Analysis of Impact of Introducing CoP Aligned Services and Barriers Faced.....	102
A.2.0 Detailed Statistical Analysis Results	137
A.3.0 Benchmarking	146
A.5.0 Cost Assumptions	158
A.6.0 Gate Fee Cost Assumptions	160
A.7.0 Assumptions for Table 5-3.....	165
A.8.0 Carbon Factors	167

1.0 Project Overview and Approach

1.1 Strategic Context

The Charter for Household Recycling in Scotland¹ is a voluntary agreement between Scottish Government and CoSLA. The Charter was originally launched in 2015 with the aim of bringing more consistency to recycling services. As part of the Charter, the Code of Practice (CoP) - Household Recycling in Scotland² was developed to capture best practices to deliver cost-effective and high-performing recycling services. At present, only a third of Scottish local authorities comply fully with the voluntary CoP. However, under the Circular Economy (Scotland) Act 2024, the Scottish Government is required to publish a statutory CoP for Household Waste Recycling. Transitioning the Charter from a voluntary to a statutory model is intended to lay the foundations for bridging the gap between Scotland's current household recycling rate³ and its target. Despite making large improvements between 2004 and 2011, Scotland's household recycling rate has somewhat plateaued in recent years. The Scottish Government's target for household recycling was to reach 60% by 2020. However, in 2020 Scotland's household recycling rate was 42.2%. Whilst this was, in part, due to the impacts of the Covid-19 pandemic, Scotland has not come close to achieving 60%; the highest rate achieved to date is 45.6% in 2017. Scotland is therefore exploring ways to achieve 60% as soon as possible, recognising the considerable impact that Scotland's waste has on carbon emissions.

The Circular Economy & Waste Route Map to 2030⁴ aims to optimise the performance of household recycling services under the strategic aim of modernising recycling in Scotland. It is intended that the increased consistency of services resulting from the new CoP, coupled with modernising services through the actions laid out in the Route Map, will lead to more effective services for households and businesses across Scotland. These services should maximise what can be recycled, significantly reduce waste sent for disposal and provide significant carbon reductions. The goal is also to benefit the Scottish economy by creating new opportunities within the materials handling supply chains, specifically in reprocessing and reuse of materials. Some of the challenges in achieving greater consistency of services include the considerable differences between local authority in terms of geography, housing stock and demographics, alongside constraints relating to infrastructure.

One aspect of optimising the performance of household recycling collection services to increase household recycling rates will be to facilitate the collection of additional materials for recycling. The Scottish Government has committed to introducing kerbside collection of plastic films and flexible packaging by March 2027 for all households.

¹ Scottish Government & COSLA (2015) *Charter for Household Recycling in Scotland*. Available at: <https://cdn.zerowastesotland.org.uk/managed-downloads/mf-s7ua0dvk-1678189917d>

² Scottish Government & COSLA (2016) Code of Practice - Household Recycling in Scotland, Version 2: March 2016. Available at: <https://cdn.zerowastesotland.org.uk/managed-downloads/mf-qsf6btvd-1678189940d>

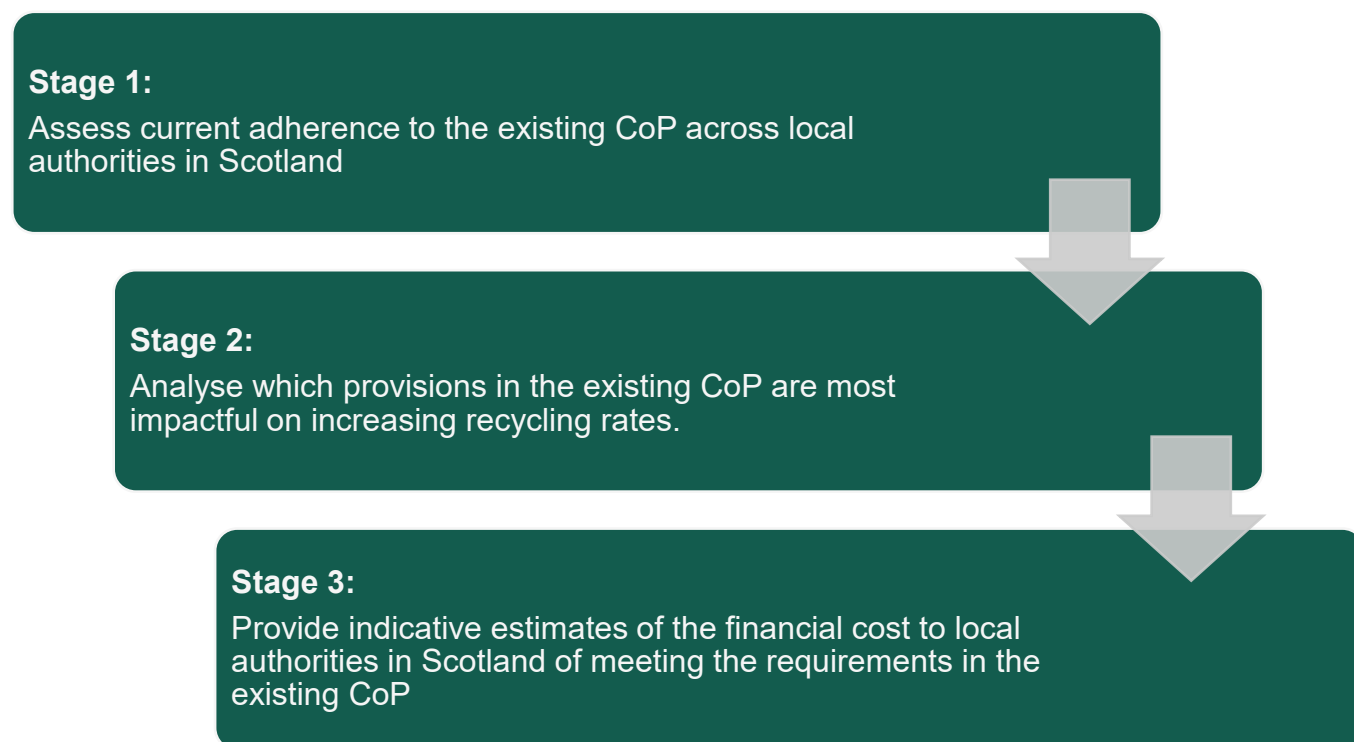
³ SEPA defines the household recycling rate as the 'waste recycled as a percentage of all waste generated.' Available at: <https://data.gov.scot/sepa/waste/household.html>

⁴ Scottish Government (2024) *Scotland's circular economy and waste route map to 2030*. Available at: <https://www.gov.scot/publications/scotlands-circular-economy-waste-route-map-2030/>

1.2 Project Aims

Eunomia Research & Consulting Ltd (Eunomia) was commissioned by the Scottish Government to provide a cost benefit analysis of the service design elements of the existing CoP, providing comparison with other waste collection systems being operated by local authorities in Scotland. This involved understanding the current baseline adherence to the CoP and assessing what the impact would be if all local authorities in Scotland met its key provisions. To deliver this project Eunomia divided our work into three delivery stages, as detailed in Figure 1-1.

Figure 1-1: Project Stages



The analysis and findings from each stage are described in the following sections of this report with supporting information provided in referenced appendices.

- Section 2.0 - Stage 1: Current Adherence to the Existing Code of Practice Across Scotland
- Section 4.0 - Stage 2: Provisions in the Current Code of Practice and their Impact
- Section 4.0 - Stage 3: Cost and Impact of local authorities Meeting the Requirements of the Current Code of Practice

1.3 Scope and Definitions

The scope of this project primarily covers kerbside collections. Kerbside collections refer to household waste collected directly from properties at or near the boundary of the public highway as part of a regular or scheduled local authority collection services. While

acknowledging that there are considerable differences in housing stock between local authorities, two main types of properties/collections are considered within this report:

- Individual/low-rise: individual or low-rise properties that have their own containers (or share with one or two other dwellings in individual households converted to flats). Residents will have specific collections days and present containers for collection at or near the kerbside.
- Communal: mid or high-rise properties (and some HMOs) that share containers. The containers and collections may differ in terms of size, number and frequency of collection, and are not presented for collection.

Other systems from which household waste managed by local authorities originates, includes:

- Bulky waste refers to large household items that are separately collected, such as fridges and sofas.
- Bring sites (sometimes 'bring banks') refer to communal collection points for items that can be recycling or reused. Bring sites are typically sited in public or semi-public locations, such as community centres and car parks. These facilities generally have provision for a narrow range of materials for recycling or reuse.
- A Household Waste Recycling Centre (HWRC) is a facility provided by local authorities where householders can deliver their own household waste for disposal, recycling, or reuse. These facilities generally have provision for a wide range of materials.

Collection system changes at the kerbside can impact on other systems. The project considers these impacts in terms of the movement of waste and recycling between systems and the impact on the recycling rate, and the associated treatment cost. It does not consider the cost impact of other aspects, such as collecting from bring banks or managing HWRCs.

Future waste flow changes resulting from incoming policy and legislation were not in scope of this project. Therefore, the impacts of the introduction of a Deposit Return Scheme (DRS), Extended Producer Responsibility (EPR) and the kerbside collection of flexible plastics were not accounted for.

Further details on limitations can be found in section 6.0 Limitations of the Analysis and further definitions to support understanding/interpretation are included below:

Recycling rate or national recycling rate: Scotland's national household recycling rate (not SEPA's all-source recycling metric), which is the percentage of household waste generated that is recycled or composted within a given calendar year. This is made up of household waste and recycling collected from all systems: kerbside, bring, bulky and HWRCs.

Kerbside recycling rate: This is calculated in the same way but relates only to kerbside collected household waste.

Urban-Rural ('UR') codes refer to Scotland's 6-fold Urban–Rural Classification, which categorises areas into six categories—1. Large Urban Areas, 2. Other Urban Areas, 3. Accessible Small Towns, 4. Remote Small Towns, 5. Accessible Rural and 6. Remote Rural

based on settlement population size and drive-time accessibility to larger towns and cities. The existing CoP define rural properties as those within categories 4 to 6.

Anaerobic digestion (AD) is a biological treatment process in which micro-organisms break down biodegradable materials in the absence of oxygen. The process is commonly used to treat food waste and produces biogas and digestate. (May also be referred to as an AD facility).

IVC (In-Vessel Composting) is a controlled, enclosed composting process in which organic waste (typically mixed food and garden waste) is biologically treated inside a sealed vessel—typically a container, tunnel, or silo—allowing temperature, moisture, and airflow to be managed to rapidly break down material into compost while controlling odour and pathogens.

A material recycling facility (MRF) is a facility where mixed recyclable materials are received, separated into individual material streams and prepared for onward recycling. The process depends on the mix of materials but will often use a combination of manual, mechanical and optical processes. Outputs can vary depending on inputs and between facilities.

2.0 Method

2.1 Outline

The methodological approach was structured around the three-stage Project Aims set out in section 1.2. Each stage employed a combination of quantitative analysis, qualitative evidence gathering and operational modelling to determine the costs, benefits and performance implications of local authorities achieving full alignment with the existing CoP.

The approach was designed to:

- Establish a robust and consistent 2023 baseline of household waste and recycling services across Scotland.
- Assess the performance impact of CoP-aligned service design elements using both statistical analysis and lived experience from local authorities.
- Model the cost, performance and carbon implications of implementing CoP requirements nationwide.

The project was organised into three stages:

- Stage 1: Assessing alignment with the existing CoP.
- Stage 2: Assessing the impact of CoP measures.
- Stage 3: Modelling the cost impact of successful measures.

Analytical methods included desk research and structured interviews with local authorities, statistical testing (t-tests and ANOVA), benchmarking, waste flow modelling, operational and cost modelling.

Limitations of the analysis can be found in Section 6.0.

2.2 Stage 1: Current Adherence to the Existing Code of Practice Across Scotland

2.2.1 Understanding CoP Essential and Desirable Criteria

Essential and desirable criteria specified in the existing CoP across organics, dry recycling and residual waste were reviewed. Requirements were interpreted in the context of each property type as set out in the CoP, reflecting the nuanced operational challenges facing local authorities.

This structured review provided the analytical foundation for assessing the degree of alignment of current local authority services with CoP expectations. For organics and glass in particular,

criteria were cross-checked against known exemptions (e.g., rural exemptions for food waste) to ensure an accurate determination of compliance.

2.2.2 Baseline Mapping of LA Collection Systems

Eunomia catalogued the collection scheme types for all local authorities in Scotland in the year 2023. The year 2023 was used as this was also the reference year used for Waste Data Flow (WDF) data (this being the most recent data available at the time of the research being undertaken).

A comprehensive catalogue of 2023 collection services was developed for all 32 Scottish local authorities. Data was obtained from:

- WRAP's 'LA' (local authority) Portal⁵.
- Zero Waste Scotland's 2024 local authority data request.
- Council websites published documentation and news updates.
- Waste Data Flow (WDF) and SEPA 2023 returns.
- Additional evidence from previous Eunomia collection appraisals.

All collection schemes were categorised to allow for variations in collection methodology within the local authority (e.g. where different services are offered in urban and rural areas).

For each service, the following information was recorded:

- Number of households receiving the service.
- Frequency of collection.
- Capacity of the standard suite of containers.
- Materials collected (including Waste Electrical and Electronic Equipment (WEEE), Batteries, Textiles, and Absorbent Hygiene Products (AHPs)).
- Collection scheme type.

Collection scheme types for each level of service were classified as follows:

- Organics:
 - Mixed organics (food and garden waste).
 - Separate food waste.

⁵ WRAP (No Date) *Waste & Recycling Information for local authorities*. Available at: <https://laportal.wrap.ngo.uk/>

- Separate garden waste: free or chargeable.
- Dry recycling:
 - Co-mingled.
 - Two-stream – paper/cardboard and plastics/metals.
 - Two-stream – paper/cardboard and plastics/metals/glass.
 - Three/multi-stream – paper/cardboard, plastics/metals and glass.
- Separate glass collections: Kerbside or bring.
- Residual waste: frequency and container size.

Sections 3.2.1 to 3.2.3 summarise the 2023 scheme types across local authorities in Scotland. These sections provide a summary of the degree of adherence to the essential criteria within the existing CoP at a scheme type level; additional property-level analysis is included in Section 3.3 of this report.

2.2.3 Household-Level Assessment of CoP Alignment

Once the essential and desirable criteria of the CoP had been established and the services offered in each authority mapped, the level of alignment between the service offered and each criterion was assessed. CoP adherence was quantified in two separate ways; the compliance of the primary collection scheme offered for each waste type in each authority, and the coverage in terms of percentage of households of compliant schemes across Scotland. This is important as coverage often varies within authorities, with different collection systems for dry recycling, organic waste and/or residual waste offered to certain groups of households. The CoP recognises the need for such derogations and provides exemptions from the requirements where necessary (for example, for more remote households or for those using communal bins). As it is not always possible to tell from the available data whether the coverage provided by a local authority aligns with the requirements and exemptions precisely, the analysis can only assess whether the main schemes offered are compliant and to what degree compliant schemes cover households in Scotland; there is no attempt made to reconcile coverage levels within authorities with allowed exemptions.

2.3 Stage 2: Provisions in the Current CoP and Their Impact

2.3.1 Primary Research with Local Authorities

To complement quantitative analysis, qualitative evidence was gathered through structured interviews with 11 local authorities (of 26 contacted) representing varied levels of CoP alignment, rurality and deprivation.

Interviews explored:

- Practical experience of implementing (or not implementing) CoP-aligned services.
- Cost, operational and logistical implications.
- Changes in recycling performance and resident satisfaction.
- Infrastructure constraints and enablers.
- Lessons learned and perceived barriers to further change.

Interview transcripts were examined to identify common patterns and insights. Case studies were produced to support the modelling and ensure that real-world experience informed the interpretation of results.

2.3.2 Statistical Assessment of Service Design Impacts

To understand whether greater alignment with the CoP translated into higher recycling performance, Eunomia undertook a statistical assessment of how different collection system characteristics relate to local authority performance.

Quantitative analysis examined the relationship between specific service design features and waste system performance. Using statistical methods, Eunomia could infer whether any correlations between the scale of alignment with the CoP and the performance indicators for each local authority were statistically significant. Using the socio-demographic groups, i.e., the rurality and deprivation level that defines each authority, further correlations with performance were extrapolated from the data.

Statistical tests were carried out:

- A **t-test** is used to determine whether there are significant differences between the means of two groups, typically used when the sample size is small. T-tests were used to evaluate differences between service types (e.g., separate vs mixed organics; separate vs bring glass).
- **ANOVA** refers to a statistical method used to determine if there are significant differences between the means of three or more independent groups. ANOVA was used to test variation in waste generation and recycling capture across socio-demographic groups.

Performance was measured by looking at the following key indicators:

- Total household waste generated.
- Kerbside yield by stream.
- Recycling capture rates.
- Food waste capture rates.

Service characteristics tested included residual waste capacity, frequency of collection, service segregation level, and presence/absence of separate food waste collections.

Socio-demographic factors - rurality, deprivation and communal property share - were included to control for structural variation between local authorities.

Authorities were grouped by collection scheme/type/frequency and plotted against performance indicators such as residual yield, using the aforementioned statistical methods. This determined whether any of the CoP requirements resulted in higher performance, as well as whether these were statistically valid conclusions or just coincidences in the data.

2.3.3 Identifying High-Performance Characteristics

Using kerbside recycling rate as the performance metric, the top-performing local authorities were analysed to identify common features. These included:

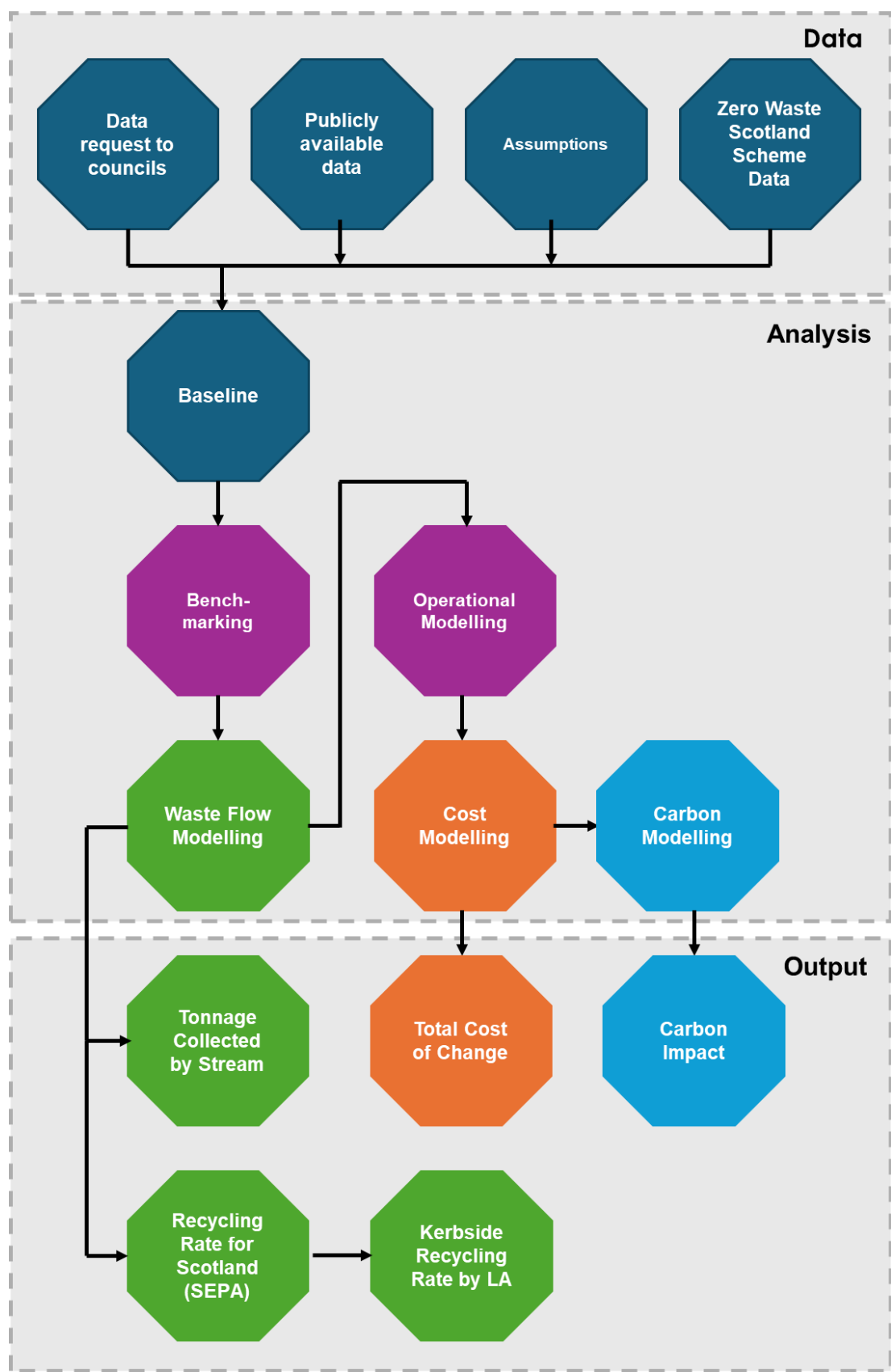
- Reduced effective weekly residual waste capacity
- Weekly separate food waste collections
- Two-stream or multi-stream recycling with low contamination
- Low proportions of communal properties

These characteristics were then used to inform the design of modelling scenarios in Stage 3.

2.4 Stage 3: Cost and Impact of Local Authorities Meeting the CoP Requirements

Stage 3 combined waste flows, operational resource modelling, cost modelling and carbon analysis to assess the impacts of national roll-out of CoP-aligned services. The analytical approach that was adopted to answer the above research question is summarised in Figure 2-1.

Figure 2-1: Diagram of Methodological Approach to Analysis



2.4.1 Data Inputs

The key data inputs are summarised in Table 2-1. Default values for cost assumptions can be found in Appendix A.4.0.

Table 2-1: Data Input Summary

Data Input	Summary
Zero Waste Scotland Data	Zero Waste Scotland shared data provided by local authorities in response to a data request issued in late 2024. This providing information on aspects of kerbside collections.
Publicly available data	Publicly available data from The Scottish Environment Protection Agency (SEPA), Waste Data Flow (WDF), individual local authority websites, WRAP's LA Portal and WRAP Gate Fees Report.
Data Gaps / Assumptions	Data gaps were addressed using available information from similar local authorities with comparable collection schemes, Waste flow assumptions were developed through benchmarking. Data gaps and assumptions used industry knowledge and experience if data was not available via the other sources.

The model was built on detailed data inputs, including:

- 2023 SEPA tonnage data.
- 2023 WDF submissions (validated via ZWS data request where possible).
- Waste composition 2021-2023 waste composition data provided by Zero Waste Scotland, which is the basis of their report [The Composition of Household Waste at the Kerbside in 2021-23](#).
- Local authority provided data on kerbside collections: tonnages, vehicles, staffing levels, container stock, set-out rates, depot/tip locations, and costs.
- WRAP national gate fees and market prices for materials.
- Census data on household types.

2.4.2 Baseline Construction

To understand the performance of different interventions, it was necessary to first set a 'baseline' against which they could be compared. The baseline related to services of local authorities across Scotland as of 2023, as this was the most recent year for which tonnage data was available. The baseline consists of waste flows, resourcing and costs. The aim of this step was to represent collection services in each Scottish local authority as closely as possible. (The outputs of the waste flow modelling provided the tonnage inputs to the baseline operational model. The analysis and outputs were specific to each local authority, determined by its own specific arrangements).

The 2023 baseline served as the reference point to estimate the effect of changes in service design. The list below provides details of the core data inputs for developing the baseline model.

- Tonnage data.
- Waste Composition data.
- The number of households and the different collection types.
- Logistics (depot and tip locations).
- Working arrangements, including weekly contracted hours, working days, shift patterns, time taken for vehicle checks, breaks and collections.
- Number and type of households and collection frequency for the services provided.
- Resourcing details, such as the number and type of vehicles, crewing levels and number of daily tips.
- Numbers and types of containers and set out data.
- Cost data.

Where data was missing from the data inputs, assumptions were used. These were based on similar authorities or published data.

Minimal information was provided for tip time and container set out, which meant that these data points largely relied on assumptions. Other assumptions in the operational model include the numbers of different household types (2022 census data), material density, rurality and certain time assumptions used to determine collection time, such as a wheeled bin lift cycle time.

Other data sources used to fill data gaps and support the development of assumptions, included:

- Scheme data: local authority websites and WRAP's 'LA Portal' provided information on collection systems and service coverage.

- Household data: 2022 census data detailing the numbers by type (e.g. semi-detached, terraced), which was used to develop an assumption for the number of households with gardens.
- Performance: The relative recycling/composting performance between different property types (i.e. individual/low-rise vs communal) was informed by ReLondon's 'Estimates of London household waste composition', 2023 and rurality to determine the proportion of waste, recycling and organics.
- Performance: The food and garden waste split of mixed organics was informed by the most similar local authorities with separate food waste combined with evidence from WRAP 2011 Performance analysis of mixed food, garden waste collection schemes and WRAP 2016 Supporting evidence and analysis.
- Default costs: local authority data requests issued in 2023 contained default cost values for vehicles and containers that were to be used in the absence of actuals.

The operational model is designed to predict resourcing levels. Once all data inputs have been entered, the predicted resources are compared to actuals, and any differences are reconciled by calibrating the model. Calibration commonly involves making incremental adjustments to certain inputs, such as revising the set out rate assumption +/-5% and/or adjusting the finish time assumption by +/-10mins. Once each local authority collection scheme is as closely reflected in the operational model as possible, the system is costed by adding prices for vehicles, staff, containers and the management and treatment of materials.

The analysis and outputs were specific to each local authority, determined by its own specific arrangements.

2.4.3 Benchmarking

Benchmarking was conducted to estimate changes in yields and capture rates under alternative service arrangements. Scottish comparator groups were used wherever possible; UK data (primarily WRAP) filled evidence gaps, particularly in relation to garden waste, food waste capture and co-mingled contamination rates.

Benchmarking aims to determine the impact of service changes on waste flows for each waste stream in each option. This was carried out by examining the relationships between and within Scottish local authorities providing different services to understand how changes would perform. For example, to understand the impact of introducing free garden waste collections where none are currently provided, it was necessary to determine the average household yield through benchmarking informed by similar local authorities already operating free garden waste.

Benchmarking was not used to infer statistical relationships for the Scottish CoP. Where anomalous trends were observed (because of too few comparator authorities within groups), English case studies and WRAP research were used to supplement the evidence base. These broader UK case studies help estimate likely directional changes in capture rates or yields when a service changes. Scottish examples were always used first, with external comparators used only where no Scottish equivalent existed.

Further benchmarking details are provided in Appendix A.3.0 Benchmarking.

2.4.4 Waste Flow Modelling

Waste flow modelling takes the outputs of the benchmarking and works to establish the amount and composition of waste that would arise in each local authority. It generates the changes to waste tonnage by stream, the shifts between kerbside, residual and HWRC sources, and measures the resulting change on kerbside and national recycling rates. This provides the waste flow inputs to the operational model. For example, to understand the impact of introducing free garden waste collections where none are currently provided, the total tonnage was then calculated by multiplying this with the number of households with gardens

The kerbside recycling rate was calculated based on collected waste. The national recycling rate accounts for waste and recycling from other sources (e.g. HWRC and bring) and materials subsequently rejected/recovered. When calculating the impact of system changes on the national recycling rate, changes to waste flows from other sources were accounted for and changes to materials subsequently rejected/recovered estimated.

2.4.5 Operational Modelling

Operational modelling incorporates data on vehicle routing, container set-out rates, drive and tip times, service frequency and coverage, and the volume and density of material collected to assess the impact of system changes on resourcing. Certain inputs, such as working arrangements and staff costs, were straightforward as they will be the same across all collections in each local authority. Other inputs were specific to the local authority and the change being assessed. For example, to understand the impact of introducing free garden waste collections where none are currently provided, inputs such as vehicle sizes drew on those used for recycling or residual waste collections and garden waste specific inputs such as crewing and set out rate were based on the most similar local authority with free garden waste collections in the baseline. The operational model was used to predict resourcing levels based on the inputs for each of the changes assessed. The modelling focusses on frontline vehicle requirements and does not consider spare vehicles or the following other costs:

- Overheads (supervision and management), back-office staff from existing or new collections.
- Transition/implementation costs for service changes, including bin delivery/exchange, route optimisation costs, IT costs, etc.,
- Household communication costs, both in relation to service changes and on-going costs.

2.4.6 Cost Modelling

Cost modelling calculates the capital and operational costs for a local authority to run a service in a steady state. Annual operational costs include vehicle maintenance, fuel, staff, container replacement and material net value (bulking, storage, handling and gate

fees/treatment/revenue).⁶ Capital costs for vehicles and containers are also included, annualised across their respective lifetimes.

Cost of infrastructure changes associated with changing the collection systems have not been accounted for. (For example, the cost of upgrading waste transfer stations to accommodate additional material streams, or depots to accommodate increased vehicle numbers). Spare vehicles, changes to management and supervision, communications and mobilisation and transition costs are also not included in costs.

Limited information was provided for gate fees and material incomes, which meant that these data points largely relied on assumptions. These have been shown in A.4.0.

2.4.7 Carbon Modelling

Carbon modelling quantifies the greenhouse gas emissions impact across the collection and disposal process. The environmental impact was determined by applying carbon factors from WRAP (2025) *Carbon Waste and Resources Metric version 2*. Available at: <https://www.wrap.ngo/sites/default/files/2025-03/WRAP-CarbonWARM2.v0.3.pdf>. These values differentiate between treatment route (such as type of residual or organic treatment), and recycling system (co-mingled or separate) and treatment route (closed or open loop).

The litres of fuel used, tonnages and material treatment route with associated emissions factors for the changes assessed form the main inputs to the carbon model, used to assess the carbon impact. With the move from landfill to EfW, all residual waste that was landfilled in 2023 was assumed to be sent to EfW to avoid counting benefits that will not be seen in future years.

Further information on carbon factors is provided in A.6.0 Carbon Factors.

2.4.8 Modelling Simplification

To maintain Scotland-wide consistency, the modelling excluded:

- Day-to-day operational variability.
- Seasonal fluctuations.
- Spare vehicle requirements.
- Localised infrastructure bottlenecks.

⁶ Cost data was provided by Scottish local authorities and the WRAP gate fees report was used to determine material treatment costs where a new material was introduced or the method of treatment changed. The WRAP gate fee includes bulking, storage, haulage where not tipped directly and the gate fee. The report can be found here: [WRAP Gate Fees Report 2023-24](#). Further detail on gate fees can be found in Appendix A.4.0.

3.0 Stage 1: Current Adherence to the Existing Code of Practice Across Scotland

Understanding how local authority collection provision aligns with the existing CoP is essential for identifying which CoP provisions have the greatest potential to improve recycling rates in a cost-effective way.

To establish the level of adherence to the existing CoP, Eunomia built up a baseline picture of collection services across Scotland, the approach to which can be seen in Section 2.0 Method, seeking to understand in detail:

- The stated essential and desirable criteria of the existing CoP.
- What waste collection systems Scottish local authorities operated in 2023 (the baseline data year for this project) and how these align with the CoP at a collection scheme level.
- The detailed scale of alignment between local authorities' collection schemes and these essential and desirable criteria.

For ease of navigation throughout this project, Eunomia has isolated each of the following collection streams and sub-streams for analysis and reporting.

- Organics: Food waste and garden waste.
- Dry Recycling: Paper, cardboard, metals, plastic and cartons, glass.
- Residual Waste⁷.

By focussing on each stream individually, Eunomia could isolate impacts of different service models while also providing a consistent and robust approach to the detailed modelling undertaken in Stage 3 of the project (Section 5.0 of this report).

3.1 Overview of the Essential and Desirable Criteria Within the CoP

Under the existing voluntary CoP, essential and desirable criteria⁸ are defined in the following way:

- **Essential:** These requirements are vital in the effort to achieve consistency across waste and recycling services in Scotland. The adoption of these requirements is considered to

⁷ Residual waste is defined as waste that is not reused or recycled, including material that is too degraded or contaminated for these purposes. Available at: <https://www.gov.uk/government/statistics/estimates-of-residual-waste-excluding-major-mineral-wastes-and-municipal-residual-waste-in-england/estimates-of-residual-waste-excluding-major-mineral-wastes-and-municipal-residual-waste-in-england#glossary-of-terms>

⁸ Scottish Government & COSLA (2016) Code of Practice - Household Recycling in Scotland, Version 2: March 2016, Page 2. Available at: <https://cdn.zerowastescotland.org.uk/managed-downloads/mf-qsf6btvd-1678189940d>

be the minimum expectation placed on Councils signing up to the Household Recycling Charter.

- **Desirable:** These requirements are important in the effort to achieve consistency across waste and recycling services in Scotland. The adoption of these requirements is something that Councils shall consider after they have met the essential requirements.

Within the CoP, the essential and desirable requirements are tailored to the following property types:

- Households with access to the kerbside (individual / low-rise properties).
- Households without access to the kerbside or with shared containers (communal).
- Rural properties (rural).
- City Centre properties (city centre).
- Island properties (island).
- Difficult to access properties.

Within Eunomia's analysis of the criteria within the existing CoP, different property types have been accounted for. The following sections break down the requirements of the existing CoP by collection type.

3.1.1 Organics

3.1.1.1 Food Waste

A summary of the key essential criteria within the existing CoP regarding food waste are provided in Table 3-1.

Table 3-1: Food Waste Essential and Desirable Criteria

	Individual/ Low-Rise	Communal	Rural	City Centre	Islands	Difficult to Access
Essential						
Collection of food waste from a separate container.	X	X	X*	X**	X**	X**
Where food is collected in the same container as garden waste, the Council shall not be required to separate the materials.	X	X	X*	X**	X**	X**
Minimum equivalent weekly container volume 20 litres.	X		X*	X**	X**	X**

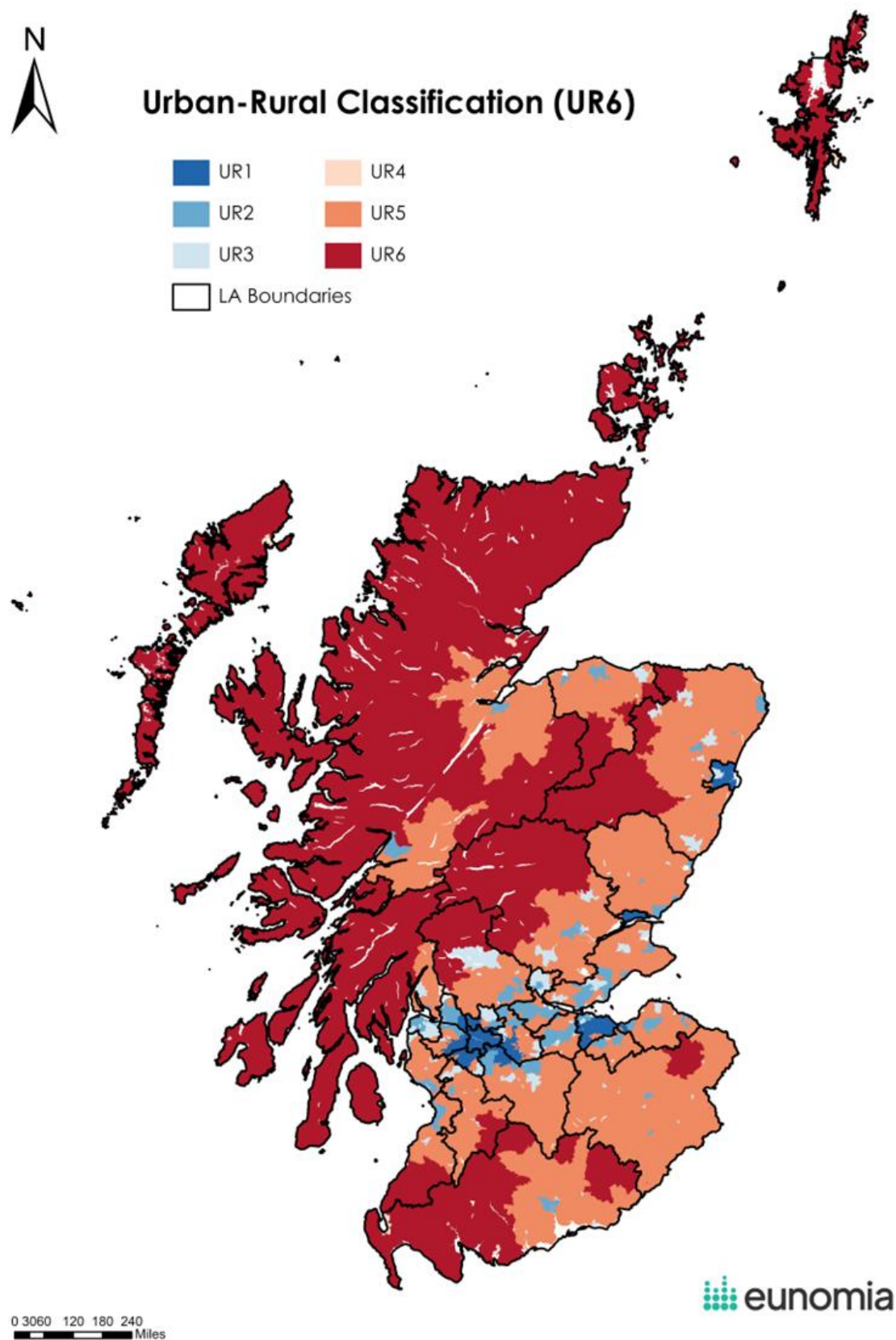
	Individual/ Low-Rise	Communal	Rural	City Centre	Islands	Difficult to Access
Desirable						
Collections of food waste are on a weekly basis.						
Services provided to all properties in all areas where the Waste (Scotland) Regulations 2012 do not require a collection.	X		X			
Notes	*Rural exemptions apply as discussed in Section 3.1.1.1.1. ** Other exemptions apply as discussed in Section 3.1.1.1.2.					

3.1.1.1.1 Rural Exemption

In line with the categories used in the 2009-10 '6-fold Urban/Rural Classification', Figure 3-1 highlights the UR1-6 zones in Scotland; Local Authorities are not required (although they are encouraged) to offer food waste collections to properties located within areas designated as:

- UR4 - remote small towns.
- UR5 - accessible rural areas.
- UR6 - remote rural areas.

Figure 3-1: 6-fold Urban-Rural Local Authorities Classification of 2009-10 (based on 2011 Census Data)



3.1.1.1.2 Exemption Based on Operational Complexity

For properties in city centres, on islands or that are difficult to access, the existing CoP offers additional exemptions, recognising the challenges of introducing and operating collection services for these households. In all cases, the CoP states that the local authority should consider the provision of services and provide evidence of any assessment made which concludes it is not possible to provide a food waste collection service. For some islands and difficult to access properties, the rural exemption discussed in 3.1.1.1.1 also applies.

3.1.1.2 Garden Waste

The existing CoP states that “Councils may make their own plans for the collection of garden waste.” There are no essential or desirable criteria.

3.1.2 Dry Recycling

The essential and desirable criteria within the existing CoP regarding dry recycling are provided in Table 3-2. There are a number of exceptions to these criteria which are described below Table 3-2.

Table 3-2: Dry Recycling Essential and Desirable Criteria

	Individual/ Low-Rise	Communal	Rural	City Centre	Islands	Difficult to Access
Essential						
Separate containers shall be provided to separate properties/groups of properties for the following: Paper/cardboard; Metals, plastics and cartons.	X	X	X	X	X	X
Glass Separate containers for glass shall be provided to each property or alternatively within the community for communal use.	X	X	X	X	X	X
Glass Where the Council is not providing a glass collection from each property, the service should achieve the same quality and quantity of glass that would be collected from kerbside collection.	X	X	X	X	X	X

	Individual/ Low-Rise	Communal	Rural	City Centre	Islands	Difficult to Access
Glass Where glass containers are not provided to each property the Council should provide a minimum capacity outlined of 10 litres per week for each property within the community.	X	X	X	X	X	X
Glass Colour separation of glass is not required at the kerbside and can occur at a sorting facility, providing the same quantity of glass can be put into high end processes.	X	X	X	X	X	X
Paper/Cardboard: Minimum equivalent weekly container volume 40 litres.	X	X	X	X	X	X
Metals/Plastics/Cartons: Minimum equivalent weekly container volume 70 litres.	X	X	X	X	X	X
Glass Minimum equivalent weekly container volume 20 litres.	X	X	X	X	X	X
Desirable						
Weekly collection of each recycling material stream.	X	X				
The Council shall consider means to collect small Waste Electrical and Electronic Equipment (WEEE), Textiles, Batteries and Absorbent Hygiene Products (AHPs, also referred to as nappies).	X					

Exceptions to the above criteria are as follows:

- All property types: Where services cannot be provided as stipulated in the essential criteria for individual/low-rise properties, local authorities can provide evidence to this effect.
- Communal properties: Less frequent collections can be delivered where a larger container capacity is provided.
- Rural properties: Where glass recycling containers are not provided to each property and the alternative service provision via recycling points is being used, settlements of less than 100 properties need not be provided with a recycling point.
- The proximity of glass recycling points can be variable, but efforts should be made to have these as close to each property as is practicable (in urban areas the stated distance is 1km from any property).
- Island properties: Where local glass reprocessing is available, the local authority can consider the use of such facilities where the environmental benefits are proven.

3.1.3 Residual Waste

The existing CoP has no essential requirements regarding residual waste. The desirable criteria are that the maximum capacity that should be provided is the equivalent of 80 litres per week for individual/low-rise properties and 70 litres per week for communal properties.

3.1.4 Updates to the Existing CoP

In 2021, Scottish Government developed a number of possible updates to the existing voluntary CoP that were not ultimately published or brought into effect. The updates were drafted on the assumption that the Code would remain voluntary. These are summarised in

Table 3-3.

Table 3-3: Changes Between 2015 CoP and Unpublished 2021 CoP

Collection Stream	2015 Criteria	2015 Essential/ Desirable	2021 Requirement Update
Organics	No Updates		
Dry Recycling	Glass Provision of separate containers	Essential	Glass can be collected within the plastics/metals stream, where councils already operate this service

Collection Stream	2015 Criteria	2015 Essential/ Desirable	2021 Requirement Update
	Glass Colour separation can occur at sorting facilities	Essential	Removed
	Minimum weekly capacity for dry recycling materials	Essential	Paper/Cardboard raised from 40 litres per week to 55 litres per week Metals/Plastics/Cartons decreased from 70L litres per week to 60 litres per week Updated list of accepted and non-accepted materials for each stream.
	Weekly collection of each recyclable stream	Desirable	Removed
	Consistent container colours	Desirable	Provide the required container colours
	Consider collecting additional items (textiles, small WEEE, batteries, AHPs)	Desirable	Removed
	N/A	Desirable	New provision for 'additional capacity' that outlines the application and approval process for households with special circumstances that result in higher waste generation.
Residual Waste	Provide weekly equivalent capacity for non-recyclable waste	Desirable	Criteria removed for communal properties.

Although there was no change to the CoP, the proposed updates indicate a potential direction of travel for the CoP. Where updates were proposed to essential requirements, these were considered within the statistical analysis undertaken by Eunomia as described in Section 4.0 of this report.

3.2 Collection Systems Currently Operated by Scottish Local Authorities

3.2.1 Organics

3.2.1.1 Food Waste and Mixed Organics

As summarised in Table 3-1, the essential criteria for the collection of food waste from individual/low-rise properties is households have a minimum of 20 litres of capacity per week for food waste, weekly collections are however desirable and not essential. However, where food is collected in the same container as garden waste, the local authority is not required to separate the materials. Table 3-4 provides a summary of primary scheme types catalogued across Scotland in 2023.

Table 3-4: Food Waste and Mixed Organics Collection Scheme Types (2023)

Primary Scheme Type	Number of Authorities	CoP <u>Essential</u> Criteria Aligned Primary Scheme?	CoP <u>Desirable</u> Criteria Aligned Primary Scheme?
Weekly Separate Food Waste Collections	16	Yes	Yes
Weekly Mixed Organics	1	Yes	Yes
Fortnightly Separate Food	1	No	No
Fortnightly Mixed Organics	11	No	No
Three-Weekly Mixed Organics	1	No	No
None	2	No	No

Where the primary scheme type is assessed as not aligned with the essential criteria of the existing CoP, exemptions based upon rurality and/or property type may apply. A more detailed breakdown of the total number of households across Scotland receiving a CoP-compliant collection service can be found in Section 3.3.

3.2.1.2 Garden Waste

Although not a part of the existing CoP and therefore not subject to an assessment of compliance, Eunomia also gathered data regarding garden waste collection schemes in

operation across Scotland. This data informed the CBA modelling undertaken in Stage 3 of this project and is summarised in Table 3-5.

Table 3-5 : Garden Waste Collection Scheme Types (2023)

Primary Scheme Type	Number of Authorities	CoP Aligned Primary Scheme?
Fortnightly Free	7	N/A
Three Weekly Free	2	
Four Weekly Free	1	
Weekly Charged	1	
Fortnightly Charged	11	
Three Weekly Charged	2	
Four Weekly Charged	2	
None	6	

3.2.2 Dry Recycling

As summarised in Table 3-2, there are essential and desirable criteria focussing on dry recycling and specifically for glass. Dry recycling collection scheme information is provided in Table 3-6 with specific details of glass collection schemes provided in Table 3-7. At a collection scheme level, it is not possible to fully isolate whether the scheme is aligned with the existing CoP due to the complexity of the requirements surrounding glass. However, a breakdown at a household level is provided in Section 3.3.

Table 3-6: Dry Recycling Collection Scheme Types (2023)

Primary Scheme Type	Number of Authorities	CoP Compliant Primary Scheme?
Co-mingled (incl. glass)	2	No
Co-mingled (excl. glass)	6	No
Two-Stream - Paper/Cardboard, Plastics/Metals/Glass	6	No
Two-Stream - Paper/Cardboard, Plastics/Metals	7	Yes*
Two-Stream - Co-mingled, separate glass	4	No
Three-Stream	7	Yes*

*Providing scheme aligns with the other essential elements of the CoP.

Table 3-7: Glass Collection Scheme Types (2023)

Primary Scheme Type	Number of Authorities	CoP Compliant Primary Scheme?
Co-collected with Plastics/Metals/Glass/Other Materials	8	No
Collected as Separate Stream	11	Yes*
Bring / Community Collection Points	13	Yes*

*Providing scheme has been established in adherence with the CoP.

3.2.3 Residual Waste

The existing CoP has no essential requirements regarding residual waste. The desirable criteria are that the maximum capacity that should be provided is the equivalent of 80 litres per week for individual/low-rise properties and 70 litres per week for communal properties. However, extensive UK-wide research by WRAP in 2015 found that effective weekly residual waste capacity was one of the major factors affecting household recycling performance:

“An increase in effective weekly residual containment capacity from 120 to 240 litres is associated with decreases in recycling rate by 7.2±2.9 percentage points.”⁹

While no similarly extensive study has been carried out more recently, benchmarking work carried out by Eunomia has found that the pattern of recycling increasing as effective residual waste capacity decreases continues at lower levels of residual waste capacity. Because of the relevance of effective residual waste capacity to recycling performance, data on this aspect of local authority services was gathered to inform Stage 3 modelling and is presented in Table 3-8.

Table 3-8: Residual Waste Scheme Types (2023) Compliance with Desirable Criteria

Primary Scheme Type	Effective Weekly Capacity	Number of Authorities	CoP Aligned Primary Scheme?
Fortnightly – 140 litres	70	6	Yes
Fortnightly – 180 litres	90	2	No
Fortnightly – 240 litres	120	9	No
Three Weekly – 240 litres	80	12	Yes

⁹ WRAP (2015) *Analysis of recycling performance and waste arisings in the UK 2012/13*, Page 5: Available at: <https://www.wrap.ngo/sites/default/files/2020-09/WRAP-anaylsis-recycling-performance-2012-13.pdf>

Primary Scheme Type	Effective Weekly Capacity	Number of Authorities	CoP Aligned Primary Scheme?
Three Weekly – 360 litres	120	1	No
Four Weekly – 240 litres	60	2	Yes

3.3 Degree of Alignment with the Essential and Desirable Criteria within the CoP

Section 3.2 presents the number of local authorities whose primary collection scheme is aligned with the essential and desirable criteria within the CoP. However, this analysis is high level; although it is indicative of whether authorities are compliant with the CoP, it does not consider whether any exemptions may apply or take account of the number of households within each authority. In this section, we take the analysis further by considering these factors, so as to provide a clearer view of alignment.

Sections 3.3.1 to 3.3.3 break down compliance at household level, applying the previously determined categories of Organics, Dry Recycling and Residual Waste.

3.3.1 Food Waste and Mixed Organics

Table 3-9 details the percentage of households across all local authorities receiving food waste and mixed organics collection services aligned with the existing CoP.

Table 3-9: National Scale Alignment with Essential Food Waste and Mixed Organics Code of Practice Criteria

Collection Type	% Households
Weekly Separate Food Waste Collections	39% (total households) 48% (UR1-3 households*)
Weekly Mixed Organics**	1.4% (total households) 1.7% (UR1-3 households*)

*When considering food waste collections, it is worth noting that local authorities are not currently required to offer food waste collections to properties located in areas designated UR4 to UR6. This therefore means that ~20% of all households are exempt from food waste collections.

**The low percentage of households receiving a weekly mixed organics collection is due to this service model being employed only by East Renfrewshire Council.

When developing Eunomia's assessment of alignment in Table 3-9 it was complex to assess compliance of mixed organics services. Therefore, Eunomia agreed a position with Scottish Government whereby mixed organics collections were considered compliant where the service pre-dated the existing CoP. However, as it is essential for food waste to have separate containers, mixed organics services introduced after the CoP were considered non-compliant.

As garden waste is not a part of the existing CoP requirements, no analysis of the percentage of households with access to these services has been undertaken.

3.3.2 Dry Recycling

Table 3-10 details the percentage of households across all local authorities receiving Dry Recycling services which are aligned with the CoP requirements.

Table 3-10: National Scale Alignment with Essential Dry Recycling Code of Practice Criteria

Collection Type	% Households
Separate Paper/Cardboard and Plastics/Metals/Glass	58%
Separate Kerbside Glass	29%
Separate Bring Glass	45%
Non-separate Kerbside Glass	26%

The findings in Table 3-10 are striking, in that just over 50% of households across all local authorities receive separate collections of paper/cardboard and plastics/metals/glass. Meanwhile, 100% of households receive a glass service that is aligned to the 2021 update to the CoP (see section 3.1.4 where it is explained that glass can be collected within the plastics/metals stream where local authorities already operate this service).

3.3.3 Residual Waste

As previously explained, the existing CoP has no essential requirements regarding residual waste. The desirable criteria are that the maximum capacity that should be provided is the equivalent of 80 litres per week for individual/low-rise properties and 70 litres per week for communal properties. In total, approximately 1.37 million individual/low-rise properties in Scotland currently receive a residual collection service, where the effective weekly residual capacity is 80 litres or less. This represents around 60% of individual/low-rise properties.

Calculating communal households with sufficient residual capacity is more difficult; it requires details on the number of households within a communal housing unit, the number of bins per communal housing unit, their capacity and the frequency of collection. Available data does not provide the required granularity to estimate if individual communal households have less than 70 litres per week.

4.0 Stage 2: Provisions in the Current Code of Practice and their Impact

Eunomia analysed the impact of the existing CoP to understand which provisions are most impactful and cost effective to increase recycling rates. Most particularly, we sought to understand in detail:

- How have aligned local authorities implemented the CoP?
- The influence of the different collection schemes on waste reduction at a household level.
- The influence of the different collection schemes on the use of recycling services at a household level.
- The common themes among the best-performance authorities, whether adhering to the CoP or not.

4.1.1 How Have Aligned Local Authorities Implemented the CoP?

Alignment with the new statutory CoP will require widespread service changes for many local authorities. Understanding what historical service changes have practically and operationally meant for local authorities, both in terms of cost and service performance, was key to Stages 2 and 3 of the project.

To develop a clearer understanding of what CoP alignment meant from a local authority perspective, structured interviews were held with local authorities to understand the following:

- How have aligned local authorities implemented the CoP?
- What was the cost of service change and what was the impact on service budgets?
- What was the recycling rate impact of the change being made?

The methodology employed for this primary research is explained in Appendix A.1.0.

4.1.2 Changes Made

The team contacted 26 local authorities, 11 of which were subsequently interviewed. Of these, nine implemented changes to better align with the 2015 CoP, while two did not. It was considered important to include the latter group to better understand their barriers to implementation, and their views are incorporated in Appendix A.1.5.

Authorities that had implemented changes reported a range of approaches to better align with the CoP, depending on their previous service provision, the funding they received via the Recycling Improvement Fund (RIF), and the specific barriers they faced to full alignment. For some authorities, the required change was minimal, as many of the core components of the

CoP were already in place prior to its publication in 2015. For others, more substantive service changes were required.

Changes among the authorities included:

- 6 authorities switched from a co-mingled to a two-stream service (excluding glass)
- 6 authorities introduced or expanded separate food waste collections. Where food waste collection coverage was expanded, this typically occurred in high-rurality areas and communal settings.
- 3 authorities expanded the range of dry materials collected. Of the authorities that expanded dry materials collected, glass was a focus. One centrally located local authority introduced additional glass recycling points in town centres following the removal of kerbside glass collection in 2019 due to high costs. Another centrally located authority introduced soft plastic film collection after purchasing an optical sorter using RIF funding.
- 4 authorities restricted residual waste capacity. Restrictions on residual waste capacity were implemented either through reducing bin size or decreasing collection frequency. One large rural authority reduced residual bin capacity from 240 litres to 140 litres, while a Central Belt authority moved from a three-weekly to a four-weekly residual waste collection cycle.
- 2 authorities made no changes to their service.

Appendix A.1.0 provides a detailed summary of how the local authorities that were interviewed said they had implemented the CoP.

Key findings on how local authorities implemented the CoP were:

Rollout Approach

- Implementation timelines varied widely depending on complexity, household numbers, and geography. For example, one small Central Belt authority implemented a switch from co-mingled collection to two-stream recycling alongside a move from three-weekly to four-weekly residual waste collection in a single phase. In contrast, a large rural authority phased an equally complex service change over an 18-month period across seven operational areas.
- Large rural authorities typically used phased rollouts over long periods (e.g., 18 months).
- Urban authorities, especially with communal properties and tenements, planned for and delivered multiyear phased implementation to allow for the complexity of service provision.

Resources Required

- Most RIF funding was used for bin provision to support:

- Two-stream recycling transitions;
 - Food waste service expansions; and/or
 - Reductions in residual waste capacity.
- Councils often repurposed existing bins to reduce costs. In one authority where residual bin capacity was reduced from 240 litres to 140 litres, the 240 litre residual bin was repurposed for the plastic/cans/cartons stream, the former co-mingled bin was reassigned for paper/cardboard, and a new 140-litre bin was issued for residual waste.
 - Food waste expansions required significant new vehicle purchases, typically funded through RIF support, with vehicle needs scaling to the number of households added. For example, one authority that extended food waste collections to an additional 30,000 households purchased six additional vehicles (with associated additional staffing needs), while another authority that expanded coverage to 4,000 households purchased two additional vehicles.

Logistics & Infrastructure

- Some authorities required major infrastructure upgrades. This included expanding or procuring new transfer stations and acquiring additional MRF capacity. These changes were typically funded through a combination of RIF support and council funding. In some cases, this required investing millions of pounds in new infrastructure, including one authority that invested £17 million in the construction of multiple new transfer stations.
- Other authorities needed minimal infrastructure change, often due to outsourcing sorting functions or using neighbouring infrastructure. For example, one authority transfers its waste to a neighbouring authority that already has arrangements in place to handle source-separated materials. Another authority used the service change as an opportunity to identify efficiency gains, reducing the number of transfer stations from two to one.

Communications & Engagement

- Councils used multi-phase communication strategies. One authority characterised its strategy as attempting to “take residents on a journey” through the service change process. Communications typically began four to six weeks prior to implementation, with teaser letters providing advance notice of the upcoming changes and explaining why they were being introduced.
- Multi-channel engagement was common. Methods employed included direct mailing, social media, updates to council websites, newspapers, posters in communal areas, and in-person events.
- Councils made specific efforts to reach non-digital residents, including increasing staff capacity to handle queries.
- Communications were not eligible for RIF funding, which councils perceived as a gap.

- Support from Zero Waste Scotland communications consultants was viewed by interviewees as highly valuable.
- No councils maintained ongoing communication after rollout, though many highlighted its importance in addressing issues like contamination.

4.1.3 Impact of Changes

4.1.3.1 Cost Savings

Cost savings opportunities for authorities typically arose from reductions in disposal costs following service changes. Under previous arrangements, some authorities paid for the disposal of co-mingled materials, whereas under the new services they now have the opportunity to generate income from recyclable materials. Reported annual cost savings from switching from a co-mingled service to twin-stream or multi-stream ranged from £0.5 million to £2 million. One authority noted that, as a result of this income, the service was considered self-financing and had effectively broken even.

However, another authority cautioned that these levels of cost savings may not be sustained in the future, as income is dependent on recycling markets, which are inherently volatile.

4.1.3.2 Additional Costs

Most interviewed authorities incurred additional costs associated with implementing service changes, including expenditure on communications, increased staffing capacity, and infrastructure improvements. In some cases, infrastructure costs alone amounted to several million pounds. While RIF funding supported improvements to recycling services, it was not intended to replace Local authority waste service budgets, and authorities were therefore required to meet some costs through their own budgets. One authority said that they were committed to delivering the service change regardless of the additional costs involved and therefore identified ways to cover these through existing revenue budgets.

4.1.3.3 Funding

Most of the interviewed authorities received funding from the RIF to implement changes. This five-year programme, funded by the Scottish Government and delivered by Zero Waste Scotland (ZWS), provides capital grants to local authorities to improve recycling infrastructure and services.¹⁰ While not a focus of the interviews, the RIF's role in enabling service changes is noted as important context.

Overall, the interviewed authorities reported being satisfied with the level of RIF funding received and expressed appreciation for the support provided by ZWS. However, several authorities thought that the funding should have covered communications, as this is a vital part

¹⁰ Zero Waste Scotland (2023) *Recycling Improvement Fund (RIF)*. Available at: <https://www.zerowastescotland.org.uk/resources/recycling-improvement-fund>

of a service change. One authority also highlighted the difficulty of accurately assessing service change requirements at the funding application stage.

4.1.3.4 Recycling Rate Impact

Only three interviewed local authorities, which implemented a combination of recycling scheme changes and reductions in residual waste capacity, had introduced these changes sufficiently long ago to allow an assessment of impacts on recycling performance. According to SEPA data, each recorded increases in kerbside recycling rates of approximately 1–5% in the years following the service change, largely driven by reductions in residual kerbside yield.

To increase the volume of data, the performance of non-interviewed local authorities, which had made changes to align with the CoP and had available data, was also assessed. A pattern emerged whereby authorities that implemented reduced residual waste capacity alongside a switch to two-stream recycling saw larger and more sustained improvements in recycling rates than those that introduced two-stream recycling alone.

This difference is illustrated in the two charts below. Figure 4-1 shows the performance of an interviewed authority that introduced two-stream recycling and reduced residual capacity in 2023. Figure 4-2 shows the performance of an authority that in 2022 switched to two-stream recycling without making a residual waste change. Authority 1 saw a 5.2 percentage point increase in kerbside recycling rate in the year following the service change, which was driven by a small increase in food waste yields (+12%), and a reduction in the residual waste generated per household (-8%). Authority 2 saw its kerbside recycling rate decrease by around one percentage point over the following years; there was a reduction in yields across all waste streams since 2022. This highlights the importance of reduced residual capacity to drive recycling-rate performance improvements.

Figure 4-1: Recycling Performance of Interviewed Authority Following Introduction of Two-Stream Recycling and Reduced Residual Frequency in 2023

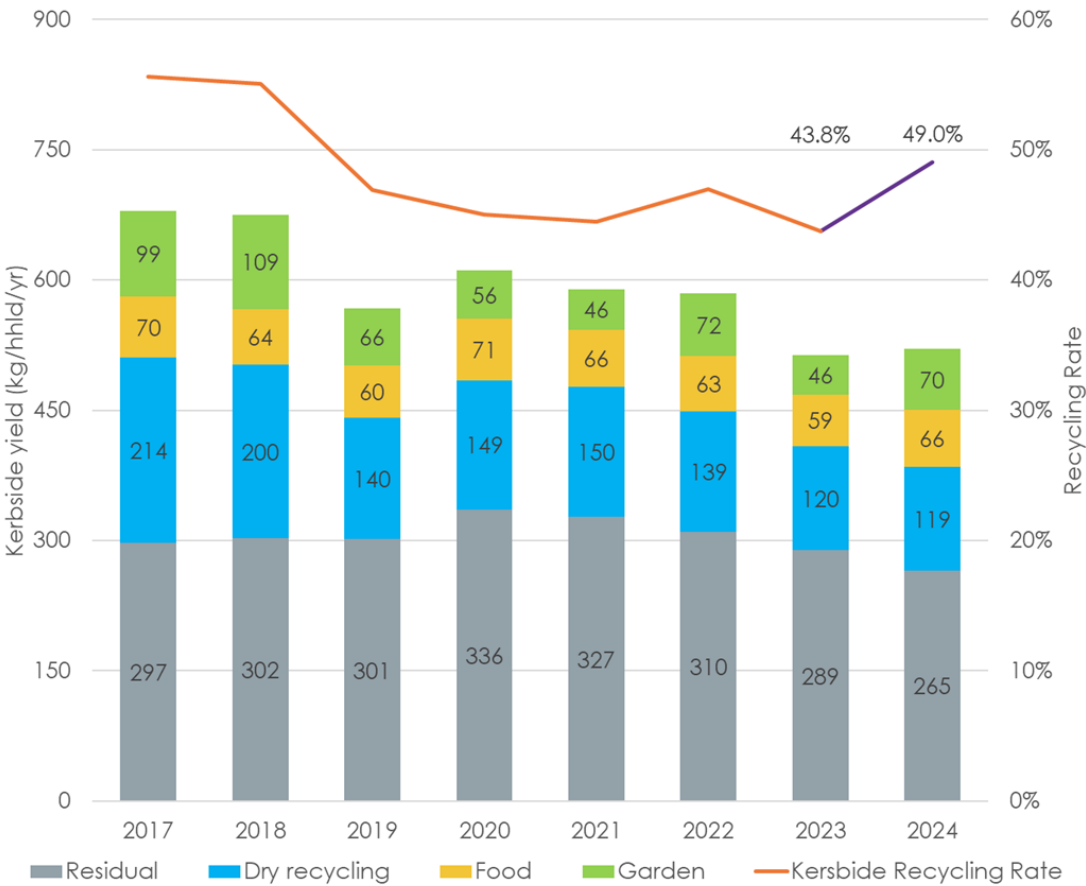
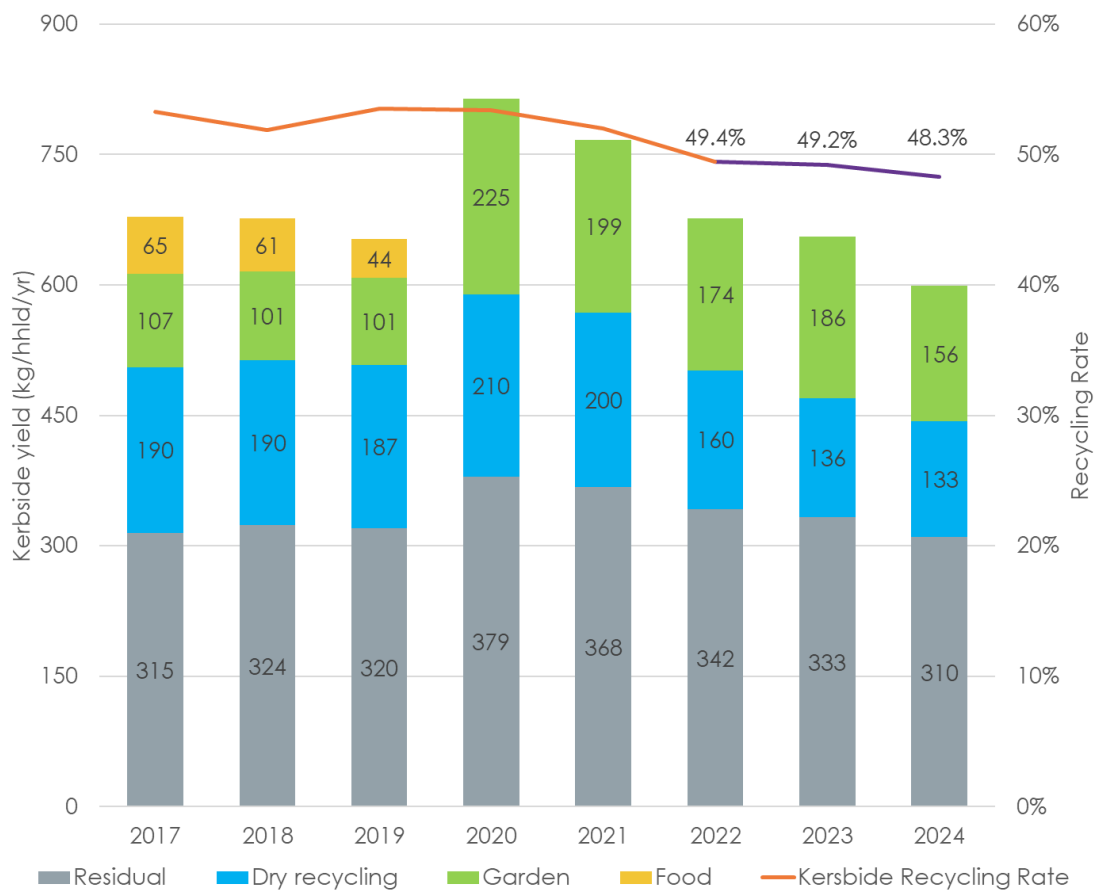


Figure 4-2: Recycling Performance of Non-Interviewed Authorities Following Introduction of Two-Stream Recycling in 2022



4.1.3.5 Contamination

At least four of the interviewed authorities that switched to two-stream collections reported an increase in contamination rates within their plastics/metals/glass recycling bins. One authority observed that residents appeared to understand the target materials for the paper/cardboard bin much better than those for the plastics/metals/glass bin, indicating that further resident education may be required to address this issue. This observation was supported by data shared by another authority, which showed that contamination levels in its previous co-mingled bin were 11–12%, falling to 3% in the paper/cardboard bin following the service change, but rising to 18% in the plastics/metals/glass bin.

4.1.3.6 Resident Satisfaction

There was a general consensus among the interviewed authorities that, while there were some “minor teething issues” during the rollout of service changes, most residents adapted over time. One authority, which undertakes monthly monitoring of resident satisfaction through a third-party provider, found that satisfaction levels declined following each service change but subsequently recovered to pre-change levels.

Other authorities have not undertaken comparable monitoring or surveys but reported observing similar trends anecdotally. The most common complaints related to issues with initial bin provision and missed collections. There was also some pushback against the need to accommodate an additional bin. However, this concern typically diminished as residents adjusted and found ways to manage the additional storage requirements.

Key reflections and lessons learned from the interviews can be found in Appendix A.1.5.

4.2 Impact of Collection Service Design on Waste Reduction

4.2.1 Total Household Waste Generated

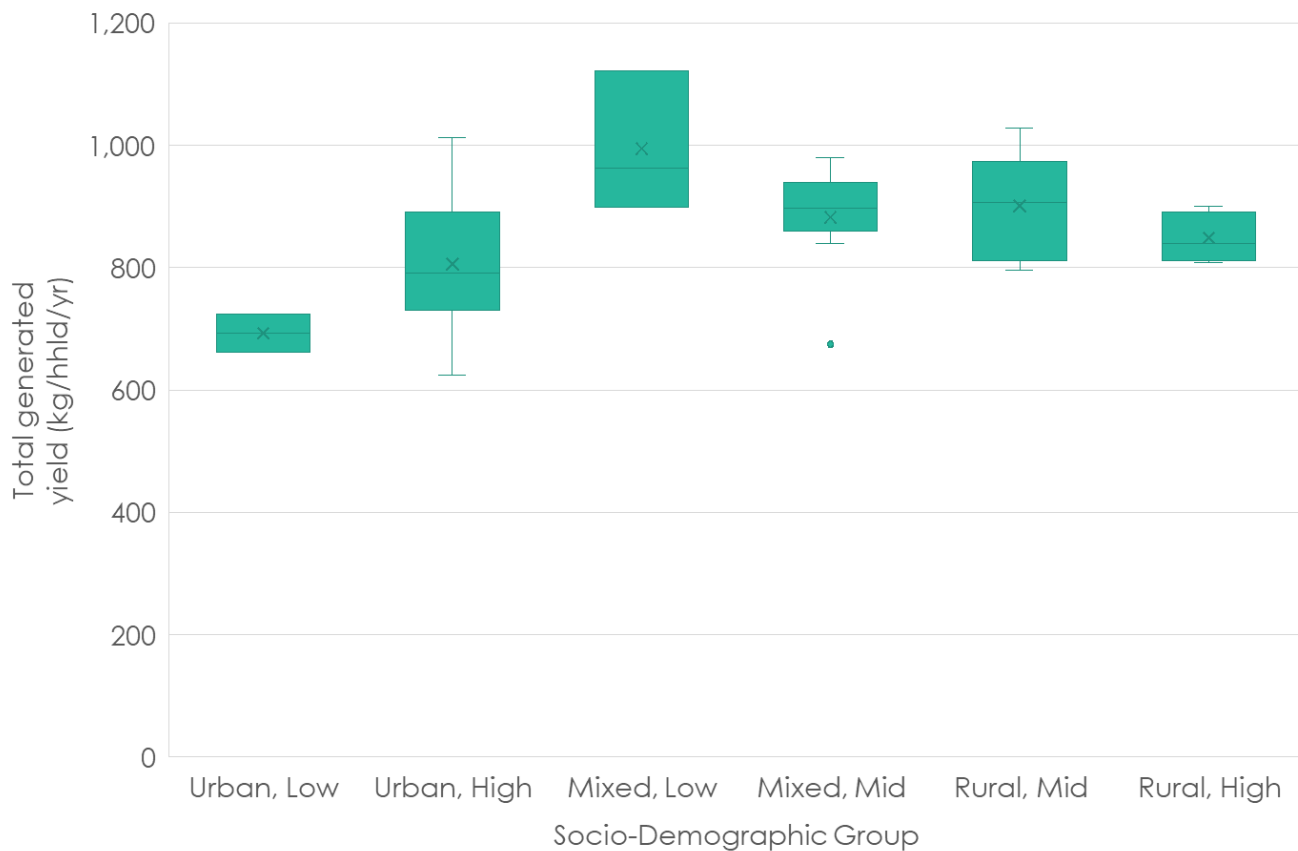
The first indicator against which Eunomia measured performance was waste generated, evaluating whether alignment with the CoP led to a reduction in waste generated per household. The analysis was undertaken using the generated tonnes of waste per household extracted from Scottish Environment Protection Agency (SEPA)¹¹ data – this is inclusive of all waste streams (kerbside collected, waste from Household Waste and Recovery Centres (HWRCs) and bring banks).

The statistical analysis showed that, the only factor which significantly influenced waste generation when considering total local authority household waste was socio-demographic groups.

When grouping local authorities by socio-demographic group, i.e., by deprivation and rurality, an ANOVA (Analysis of Variation) test resulted in a p-value of 0.02. This highlights that there is a *statistically significant* difference in the means of each social demographic group. As per Figure 4-3, the analysis shows that those authorities with a mixed rurality and low deprivation generate the highest tonnes per household, with an average of 994 kilograms per household per year. Urban authorities with low deprivation form the group with the lowest waste generated, with a mean of 693 tonnes generated per household. However, there is no clear pattern that emerges across all the groups; in mixed rurality and rural groups, the higher the level of deprivation, the lower the generated yield. However, this pattern is not consistent within urban local authorities.

¹¹ Scottish Environment Protection Agency (SEPA): [Tonnes of household waste generated by local authority](#).

Figure 4-3: Box and Whisker plot of SEPA Tonnes Generated by Socio-Demographic Group



The statistical analysis indicated that none of the other tested factors had a significant influence on waste generation when looking at total local authority household waste generated. The other factors tested were social deprivation, CoP compliance and effective weekly residual capacity. The data suggests that there are statistical patterns, however none of them are statistically significant; the co-efficient of determination (r-squared), which indicates the proportion of variance in the dependent variable explained by independent variables, was very low and suggested no statistically significant relationship. For example, the total generated yield is inversely correlated with the proportion of households that are communal properties i.e. the greater the proportion of communal properties in a local authority, the lower the yield of waste generated per household. The same pattern is present when analysing the relationship between the total generated yield and fraction of population in social groups D and E. Given that there is no statistically significant relationship between individual indicators of social deprivation and waste generated reported by SEPA, it can be concluded that multiple factors govern waste generation; a single indicator cannot be isolated.

Detailed results of the statistical analysis for these factors are available in Appendix A.2.1.1.

4.2.2 Kerbside Yield

The same groups were tested against the kerbside yield (excluding bring banks and Household Waste Recycling Centre (HWRC) waste). Again, the statistical analysis showed that the only factor which significantly influenced kerbside waste generation was socio-demographic groups;

the ANOVA test returned a p-value of 0.04, indicating that there is a statistically significant difference between the means of each social demographic group. In general, within the rurality groups, the more socially deprived a local authority the lower the yield of kerbside waste generated. The statistical analysis indicated that none of the other tested factors, when considered in isolation, had a significant influence on waste generation when looking at kerbside yields. The other factors tested were proportion of households that are communal properties, the proportion of populations in social groups D & E, CoP compliance and effective weekly residual capacity.

Despite no statistically significant relationships between indicators of social deprivation and the yields of kerbside waste generated, similar patterns to the relationships between SEPA reported generated yields and indicators of social deprivation (outlined in Section 4.2.1) are also present. Again, the higher the proportion of communal properties within a local authority or the higher the proportion of the population in social groups D & E, the lower the kerbside waste generated.

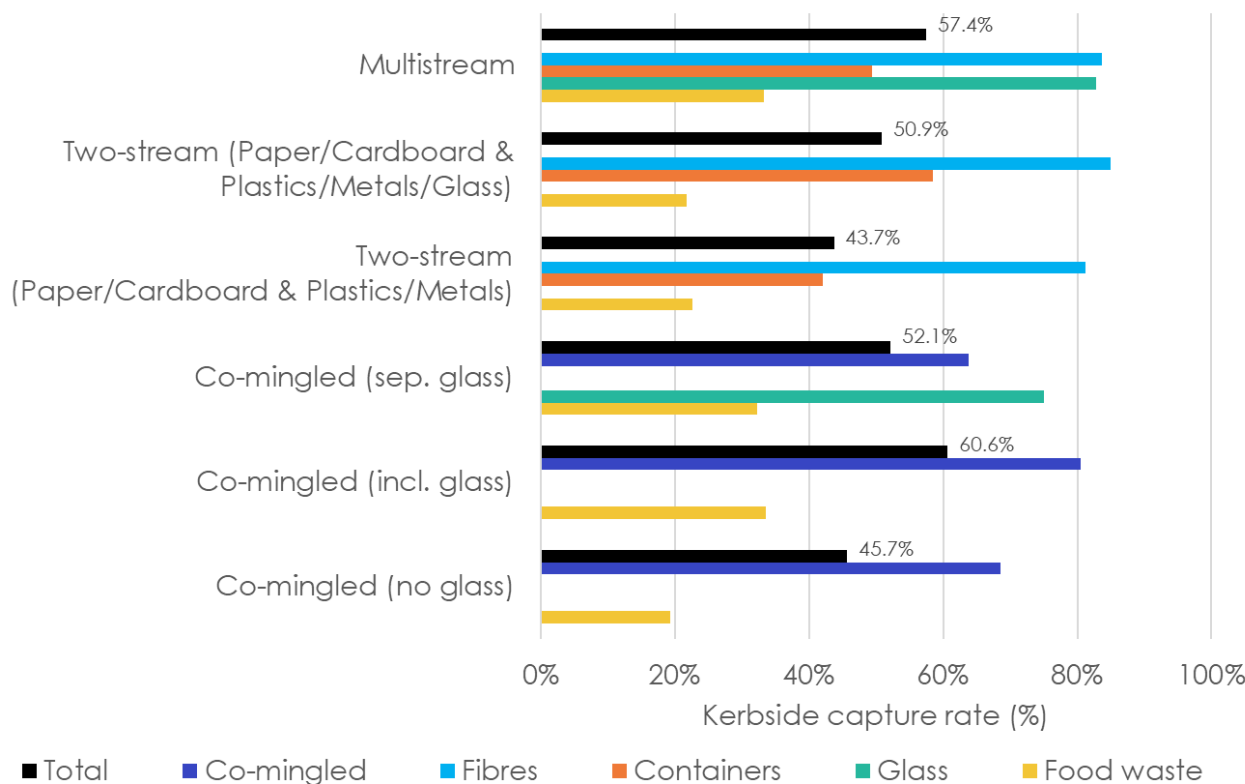
Detailed results of the statistical analysis for these factors are available in Appendix A.2.1.2.

4.3 Impact of Collection Service Design on Recycling Capture Rates

4.3.1 Recycling Capture Rates

Performance was measured by analysing the impacts of each factor on the capture rates of each recycling stream. This analysis was used to understand how well recycling services are used at a household level. The capture rates in Figure 4-4 show that co-mingled (including glass) collections have the highest total capture rates at 60.2%, closely followed by multi-stream collections which have a 57.6% capture rate. However, the lowest capture rate is 44.5% - for a co-mingled collection without glass. Overall, no pattern or trend was apparent in dry recycling capture rates when grouped by recycling system.

Figure 4-4: Kerbside Recycling Capture Rates for each Type of Recycling Stream



4.3.2 Food Waste Yields and Capture Rates

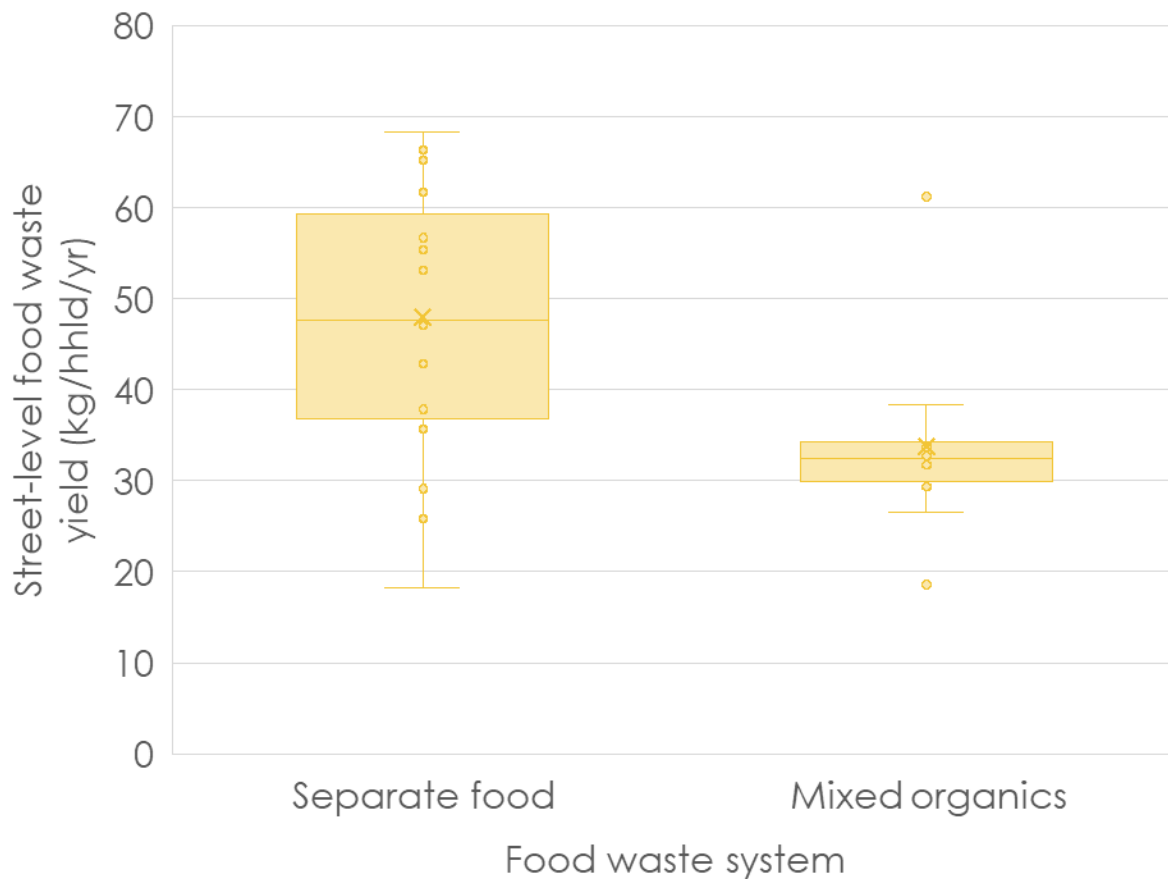
Authorities that provided separate food collections had higher yields (and higher capture) than those which provided mixed organics collections¹². This aligns with the findings reported in WRAP (2025)¹³.

A t-test, a statistical test to determine if differences between two group means were statistically significant, highlighted a significant difference (p-value of 0.01) between local authorities grouped by the food waste collection system (Figure 4-5). The difference between the food waste capture rate for local authorities offering separate food waste collections was not statistically significantly higher.

¹² Food waste in mixed organic waste was determined using waste composition analysis provided by Zero Waste Scotland.

¹³ WRAP (2025): [Household Food Waste Collections Guide](#)

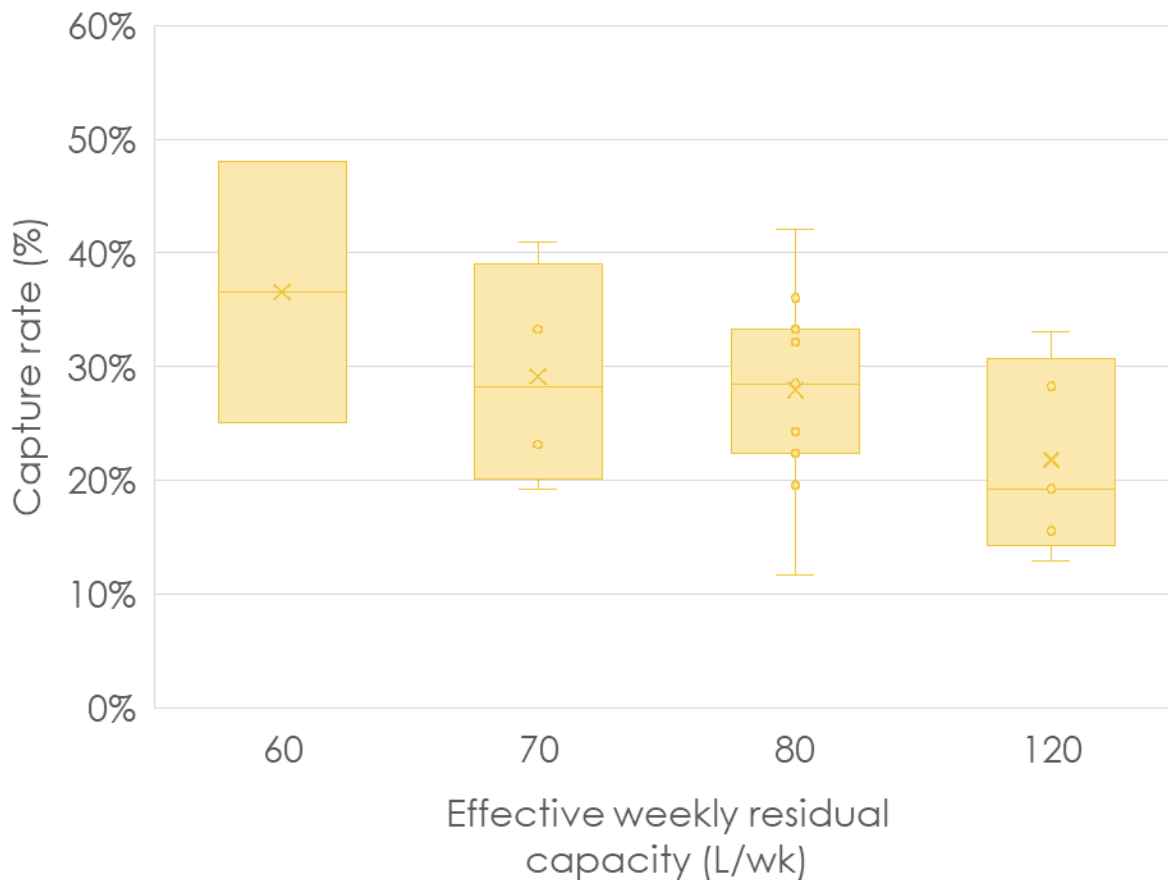
Figure 4-5: Box and Whisker Plot of Individual bin/Low-Rise Properties Food Waste Yield (kg/hhld/yr) of Authorities Grouped by Food Waste Collection System



When grouped by residual collection frequency, the mean capture rate was proportional to frequency, i.e., 4-weekly authorities had a higher capture rate for food waste. However, there are only two local authorities in Scotland with a four-weekly residual frequency (Falkirk and Stirling) it is not possible to test the statistical differences between these groups.

When grouped by effectively weekly residual capacity, the statistical analysis indicated that, as per Figure 4-6, food waste capture rates are inversely correlated with effective weekly residual capacity i.e., the higher the effective weekly residual capacity, the lower the food waste capture rate is.

Figure 4-6: Box and Whisker plot of Food Waste Capture Rates of Authorities Grouped by Effective Weekly Residual Capacity



4.4 Common Themes Among the Best Performing Local Authorities

4.4.1 Overview

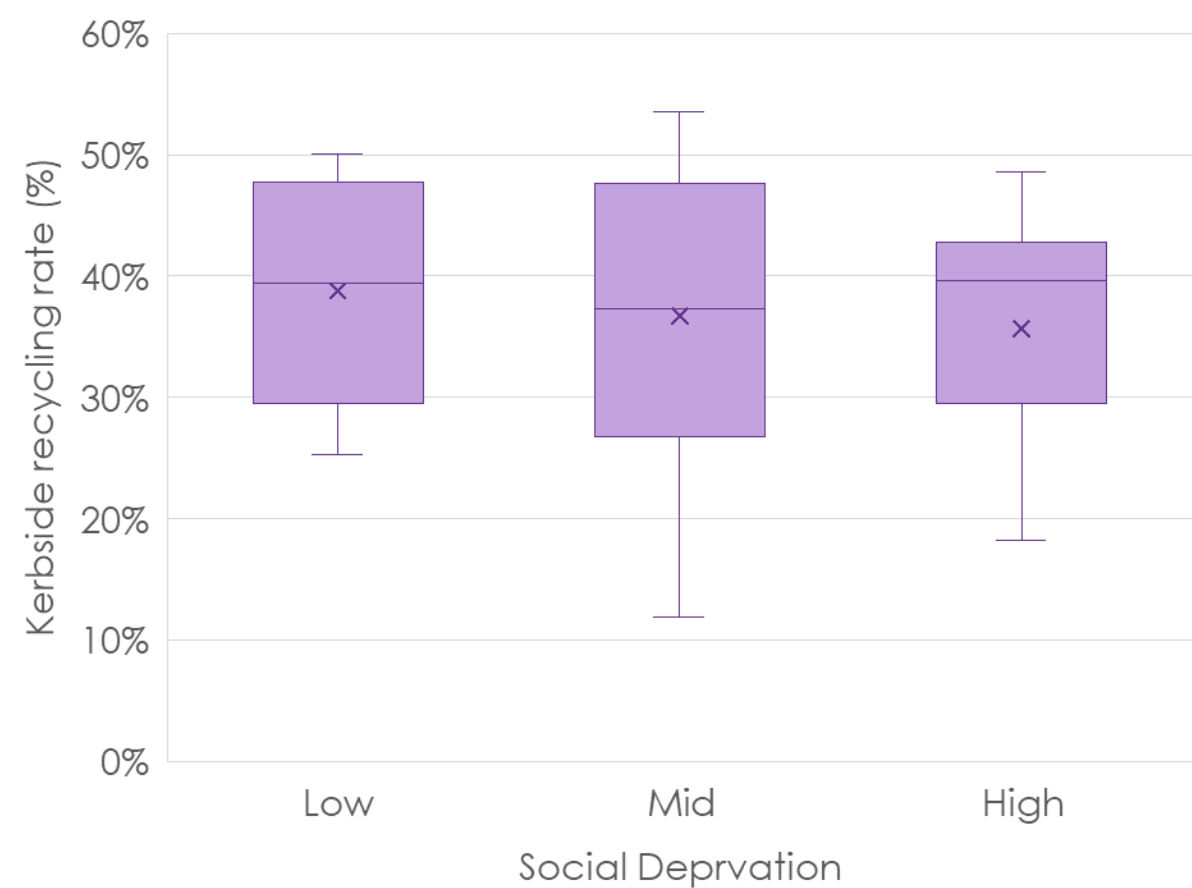
The following section presents analysis of themes between the top five performing local authorities of Stirling, East Renfrewshire, Falkirk, North Ayrshire, and Angus. As per the specification, all analysis has been presented according to the ranked performance of kerbside recycling rate, as opposed to the recycling rates reported to SEPA. This kerbside recycling rate excludes waste collected from bring banks, HWRCs or civic amenity sites as the focus of this analysis is kerbside recycling services. It also excludes recycling that is recovered from kerbside collected residual waste.

4.4.2 Social Deprivation

When analysing the effect of social deprivation level on kerbside recycling, the 2023 data suggests that the recycling rate slightly decreases as deprivation level increases. This finding is aligned with WRAP (2015), which also suggests that higher levels of deprivation levels are associated with lower recycling rates. Despite this relationship, there is not a statistically

significant difference between the mean recycling rate of each social deprivation group. Figure 4-7 highlights the average kerbside recycling rate for each local authority group by social deprivation group.

Figure 4-7: Kerbside Recycling Rate (2023) for each Local Authority Grouped by Social-Deprivation Group.



The relationship between kerbside recycling rate and other indicators of social deprivation (proportion of households that are communal properties, and proportion of population that are in social deprivation groups D-E) were also examined. In both instances there is an inverse correlation between social deprivation indicator (independent variable) and kerbside recycling rate (dependent variable), reinforcing the finding that kerbside recycling rate decreases as deprivation level increases. However, the co-efficient of determination (r-squared) was very low and suggested no statistically significant relationship.

Table 4-1 highlights the top performing local authorities, when ranked by kerbside recycling rate. As shown, each of highest performing authorities have a low proportion of communal properties; only Falkirk has more than 10% of its properties classified as communal properties. By contrast, around 61% of households in Glasgow are communal properties, and the kerbside recycling rate in 2023 is 18.3%.

Table 4-1: Local Authorities Ranked by Kerbside Recycling Rate in Study Baseline Year 2023 – Socio-Demographics

	Local Authority	Kerbside recycling rate (%)	Social Deprivation Group	Proportion of properties, communal properties (%)
1	Stirling	53.5%	Mixed rurality, mid deprivation	1.3%
2	East Renfrewshire	50.0%	Mixed rurality, low deprivation	0.9%
3	Falkirk	49.3%	Mixed rurality, mid deprivation	14.7%
4	North Ayrshire	48.6%	Mixed rurality, mid deprivation	4.2%
5	Angus	48.3%	Mixed rurality, mid deprivation	0.9%

4.4.2.1 Socio-Demographic group

The analysis did not show any significant statistical difference in kerbside recycling performance when grouping authorities by socio-demographic groups.

4.4.3 Organics

This section provides an overview of key trends of the top five local authorities for organics collections.

4.4.3.1 Food Waste

Although not in the top performing authorities in Scotland, East Dunbartonshire ranked first for kerbside food waste yield, as shown in Table 4-2. East Dunbartonshire operates separate weekly food collections, the authority's food waste yields were of 68.3 kg/hhld/yr. Second was East Renfrewshire and third place was Falkirk (both top performers in terms of recycling rate). Their Food Waste yield was of 66.6 and 66.4 kg/hhld/yr respectively. East Renfrewshire operates a mixed organics weekly collection.

Statistical analysis indicated that a separate food waste collection achieves a higher average yield, than a mixed organics system. The t-test recorded a p-value of 0.01, making the difference in these mean yields, statistically significant, this trend agrees with the findings reported in WRAP (2025).

The local authorities operating weekly food waste collections also achieved collected yields of almost double compared to fortnightly collection systems. This is expected given the unit of measurement for the kerbside collections (kg/hhld/yr).

Table 4-2: Local Authorities Ranked by Kerbside Recycling Rate (RR%) – Food Waste Collections. (CB = Communal Properties, kg/hhld/yr = kilograms per household per year).

Local Authority	KS RR (%)	Food Waste Yield Rank	Food Waste System	Food Waste Frequency	Kerbside (excl. CB) yield (kg/hhld/yr)
1 Stirling	53.5%	20	Mixed	Fortnightly	32.7
2 East Renfrewshire	50.0%	5	Mixed	Weekly	61.2
3 Falkirk	49.3%	2	Separate	Weekly	66.4
4 North Ayrshire	48.6%	22	Mixed	Fortnightly	32.2
5 Angus	48.3%	8	Separate	Weekly	55.4
East Dunbartonshire	45.5%	1	Separate	Weekly	68.3

4.4.3.2 Garden Waste

East Renfrewshire ranked first for garden waste kerbside yield, at 235.4 kg/hhld/yr offering a charged weekly service. However, there is no significant statistical difference between the means of garden waste yields of authorities grouped by free and charged systems. However, the mean garden waste yield for a free garden waste service (153 kg/hhld/yr) is greater than a yield achieved by charged services (138 kg/hhld/yr). This agrees with WRAP (2015) which also highlights evidence of an association between lower recycling rates and charged, subscription garden waste services.

4.4.4 Dry Recycling

This section overviews key trends of the top five local authorities for dry recycling collections.

4.4.4.1 Recycling Collection System

Each of the five best performing local authorities have implemented either two-stream or multi-stream collections. However, the statistical analysis did not show a clear trend or correlation between the type of recycling collection system and the kerbside recycling yield. WRAP (2015) also suggested that very little certainty can be applied in establishing a difference in recycling performance between dry recycling scheme types.

4.4.4.2 Glass

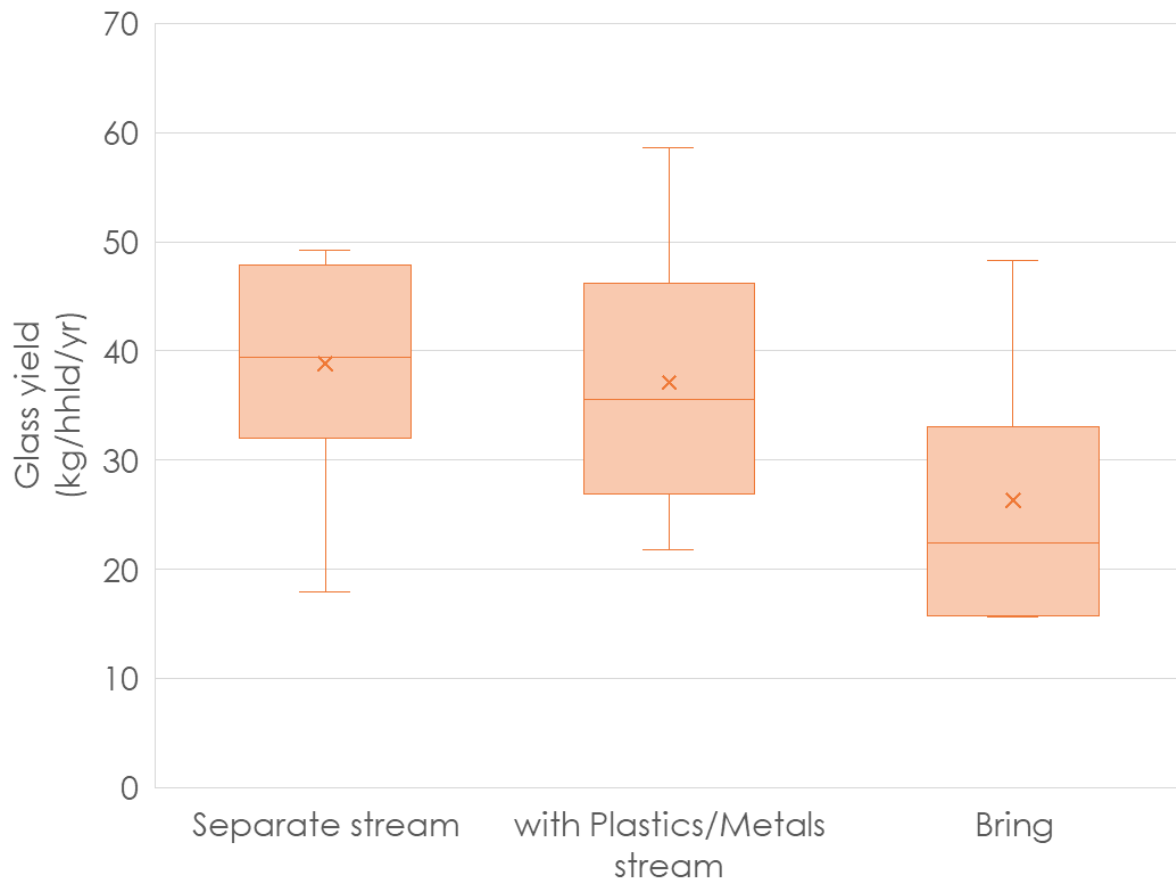
As shown in Table 4-3, the local authority with the highest kerbside glass yield is Renfrewshire with 58.6 kg/hhld/yr. This local authority collects glass with their plastics/metals stream at a 4-weekly frequency compared to three-weekly and fortnightly for other local authorities. Fife has no rank as its glass collection relies on bring banks, whereas Stirling maintains second rank for glass collections.

Table 4-3: Local Authorities Ranked by Kerbside Recycling Rate – Glass Collections

	Local Authority	KS RR (%)	Glass Yield Rank	Glass System	Collection Frequency	Kerbside yield (kg/hhld/yr)	Bring yield (kg/hhld/yr)
1	Stirling	53.5%	2	Separate	Four-weekly	47.3	8.4
2	East Renfrewshire	50.0%	9	Plastics/ Metals/ Glass	Three-weekly	44.3	-
3	Falkirk	49.3%	12	Separate	Fortnightly	41.0	-
4	North Ayrshire	48.6%	21	Plastics/ Metals/ Glass	Three-weekly	27.6	-
5	Angus	48.3%	20	Plastics/ Metals/ Glass	Fortnightly	28.5	-
	Renfrewshire	39.7%	1	Plastics/ Metals/ Glass	Four-weekly	58.6	-

The glass yields presented in Table 4-3 reflect the tonnage across the total number of households in a local authority. From the graph, Figure 4-8, a separate glass stream achieves a higher average yield, collecting glass with the plastics/metals stream is second highest, and bring banks for glass present the lowest yield. The two-tailed t-test carried out to test the statistical value of these differences between groups presented a p-value of 0.047, which lower than 0.05. This means that there is statistically significant difference in the means and therefore, collecting glass through a separate stream does result in a higher yield.

Figure 4-8: Box and Whisker Plot of Glass Yield of Authorities Grouped by Glass Collection Method



4.4.5 Residual Waste

From Table 4-4, each of the highest performing local authorities, in terms of lowest residual yield, have implemented a residual restriction, either by:

- Reducing the frequency of collection to 3- or 4-weekly, or
- Reducing the capacity of the residual bin

When recording kerbside residual yield for these, excluding yield from communal properties, Fife and Falkirk generate the lowest residual arisings.

Table 4-4: Local Authorities Ranked by Kerbside Recycling Rate – Residual Collections

	Local Authority	KS RR (%)	Residual Yield Rank	Residual Frequency	Residual Container	Effective Weekly Capacity (L/wk)	Kerbside (excl. CB) yield (kg/hhld/yr)
1	Stirling	53.5%	4	Four-weekly	240	60	280.0
2	East Renfrewshire	50.0%	20	Three-weekly	240	80	388.8
3	Falkirk	49.3%	2	Four-Weekly	240	60	245.9
4	North Ayrshire	48.6%	11	Three-Weekly	240	80	328.3
5	Angus	48.3%	5	Fortnightly	140	70	282.8

The impact of effective weekly residual capacity on the kerbside residual yield and recycling rate is shown in Figure 4-9 and Figure 4-10. Groups with higher residual waste capacity were proportional to higher residual yields, but, inversely proportional to recycling rate. WRAP (2015)¹⁴ also suggested that an increase in effective weekly residual container capacity from 120 to 240 litres is associated with decreases in recycling rate. In part, this is due to increases in residual waste yields.

¹⁴ WRAP (2015): [Analysis of recycling performance and waste arisings in the UK 2012/13](#)

Figure 4-9: Box and Whisker plot of Kerbside Residual Yield of Authorities Grouped by Effective Weekly Residual Capacity

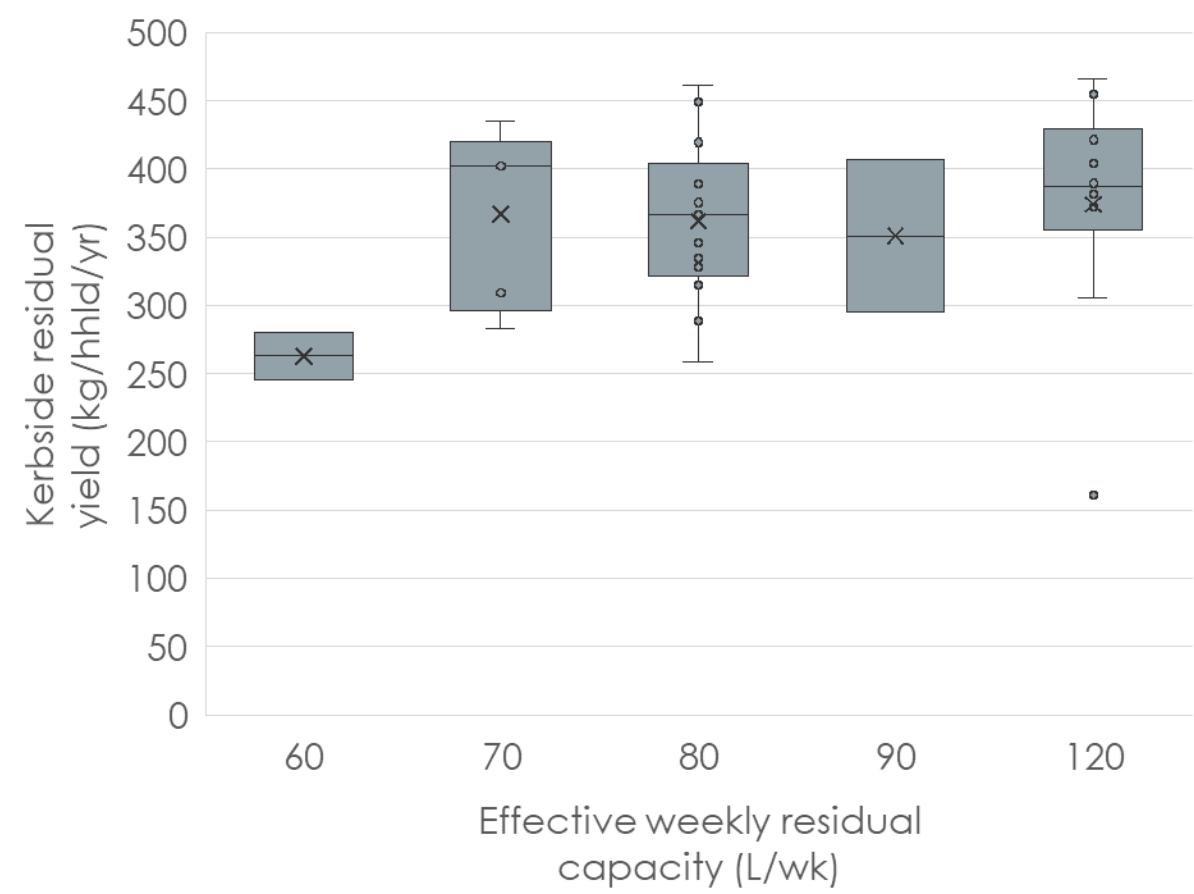
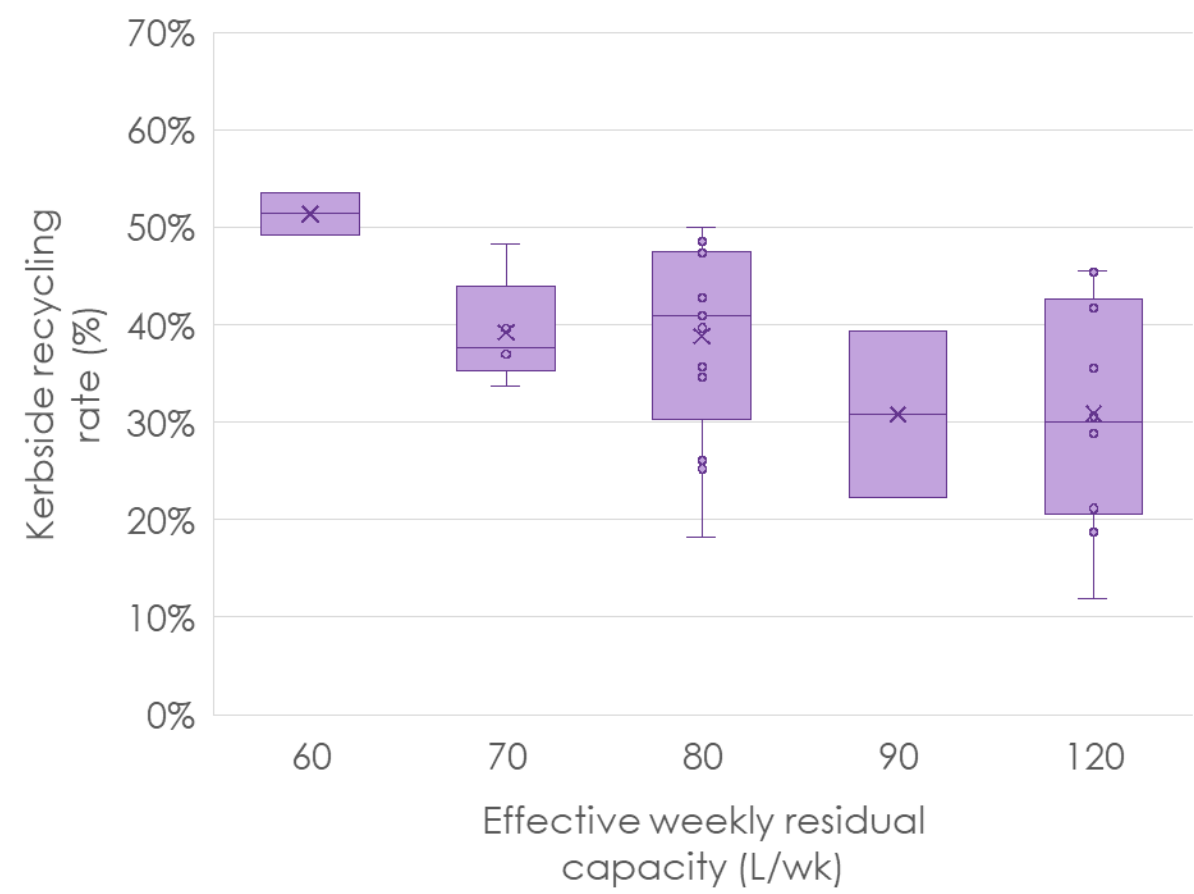


Figure 4-10: Box and Whisker plot of Kerbside Recycling Rate of Authorities Grouped by Effective Weekly Residual Capacity



5.0 Stage 3: Cost and Impact of Local Authorities Meeting the Requirements in the Current Code of Practice

Within Stage 3 of the project, Eunomia brought together our findings from Stage 1 and Stage 2 to analyse the cost and impact of Scottish local authorities meeting the requirements in the existing CoP. Within this stage, we looked to answer the following research questions

- What is the cost of a Scotland-wide roll-out of those successful measures?
- What is the impact of a Scotland-wide roll-out on national household recycling % rates and tonnage collected?
- What more needs to happen to meet Scotland's recycling targets, and what will it cost?

As with previous sections of this report, the services will be reported by collection stream and, where appropriate, sub-stream. Whilst we recognise these services are interlinked and influence one another, as demonstrated in Stage 1, the complexity of the baseline position across Scotland means this approach was necessary to provide clarity regarding the impact at a national level. The following sections provide a detailed breakdown of the results of our analysis.

Within each collection stream and sub-stream, Eunomia has developed a number of 'stream features' to explore individual changes.

Future waste flow changes resulting from incoming policy and legislation were not in scope of this project. Therefore, the impacts of the introduction of a Deport Return Scheme (DRS), Extender Producer Responsibility (EPR) and the kerbside collection of flexible plastics were not accounted for. The analysis is also subject to the limitations set out in Section 6.0.

The results should be interpreted as an indication of the likely direction and relative magnitude of impacts arising from different service configurations, based on a 2023 baseline. They should not be regarded as predictions of future outcomes, as actual performance and costs will be influenced by subsequent policy changes, market conditions, infrastructure developments and local operational factors.

5.1 Organics

5.1.1 Food Waste

Based on Eunomia's findings reported in Section 4.0 of this report, the focus of our assessment when considering food waste was the introduction of weekly separate food waste collections. This is because there is a statistically higher yield of food waste collected as part of separate collections than is achieved when food is collected as part of mixed organics collections.

Our analysis examined the impact of two key policy changes:

- Weekly separate collections of food waste to all UR1-3 properties across Scotland. This equates to approximately 1.46 million additional properties receiving collections.
- Weekly separate collections of food waste to all UR1-5 properties across Scotland. This equates to approximately 200,000 additional properties receiving collections.

5.1.1.1 Weekly Separate Collections of Food Waste to All UR1-3 Properties

Table 5-1 provides a breakdown of the recycling performance and carbon impact of extending weekly separate food waste collections to all UR1-3 properties. This change has been modelled to include the following:

- Introducing collections to households where these were not previously offered.
- Households that currently receive mixed organics collections switching to separate food waste collections.

Table 5-1: Recycling Performance and Carbon Impact of Extending Weekly Separate Collections of Food Waste to All UR1-3 Properties

Measure	Impact
Additional Households Receiving Service	1.46m
Additional Tonnes of Food Waste Collected	+23,000 tonnes
Impact on Kerbside Recycling Rate	+1.8%
Impact on National Recycling Rate*	+1.4%
Carbon Impact	-11,000 tCO ₂ e

* National Recycling Rate refers to the national household waste generated and managed.

Carbon benefits were seen due to the increased capture of food waste treated by anaerobic digestion (AD) and a diversion of food waste from in-vessel composting, known as IVC (mainly for authorities operating mixed organics collections). For the carbon factors used in this analysis, IVC does not generate as large a carbon saving as AD, or windrow composting for garden waste.

The modelled costs of extending weekly separate food waste collections to all UR1-3 properties are provided in Table 5-2.

Table 5-2: Modelled Annual Operational Cost Impact of Extending Weekly Separate Collections of Food Waste to All UR1-3 Properties Across Scotland

Item	Baseline	Food Waste UR1 -3	Difference
Container Replacement	£320k	£910k	£590k
Residual Waste Treatment	£143,330k	£140,040k	-£3,290k
Food Waste Treatment	£1,820k	£4,600k	£2,790k
Staff	£8,180k	£22,000k	£13,830k
Fuel	£640k	£1,800k	£1,160k
Vehicles	£710k	£1,880k	£1,170k
Total Operational Costs	£155.0m	£171.2m	£16.3m

Key points of difference between the modelled baseline position and food waste collections being rolled out to all UR1-3 properties are:

- Increased food collection coverage meant that food caddies needed purchasing. This increased container replacement costs compared with the modelled baseline.
- Residual waste treatment costs were reduced from the modelled baseline position due to the increased diversion of food waste from residual waste.
- Increased food tonnage (as shown in Table 5-1), led to higher food waste treatment costs. This was due to more properties receiving the service coverage and the separate collection of material previously collected in mixed organics services.
- Staff, fuel and vehicle costs all increased compared to the modelled baseline as more resources were required to collect food waste due to the coverage of this service increasing.

The modelled capital costs of introducing these services have been separated and included in Table 5-3. (More detail can be found in the Appendix

Table 5-3: Modelled Total Capital Cost Impact of Extending Weekly Separate Collections of Food Waste to All UR1-3 Properties

Item	Baseline	Food Waste UR1 -3	Difference
Vehicle Capital	£7.1m	£20.5m	£13.4m
Container Capital	£138.4m	£145.0m	£6.6m
Total	£145.5m	£165.5m	£20.0m

Vehicle and container capital increased from the modelled baseline position as more resources were required to collect food waste due to the increased service coverage. Within the vehicle capital, it was assumed that additional food waste collections vehicles were purchased by the relevant authority.

5.1.1.2 Weekly Separate Collections of Food Waste to All UR1-5 Properties

Eunomia recognises that expanding food waste collections to UR1 to UR5 properties could be operationally challenging. However, building upon the environmental and carbon impact of the extension of the service to all UR1-3 properties, it provides a useful point of comparison. (Note that within this modelling, we have rounded 95% food coverage in a particular local authority, to 100%). Table 5-4 provides a summary of the impact of this stream feature.

Table 5-4: Recycling Performance and Carbon Impact of Extending Weekly Separate Collections of Food Waste to All UR1-5 Properties

Measure	Impact
Additional Households Receiving Service	200k
Additional Tonnes of Garden Waste Collected	+ 7,600 tonnes
Impact on kerbside Recycling Rate	+ 0.5%
Impact on National Recycling Rate *	+ 0.3%
Carbon Impact	-430 tCO2e
* National Recycling Rate refers to the national household waste generated and managed.	

Carbon impacts here are not significant compared to UR1-3 expansion. This is because food waste is no longer diverted from mixed organics but from EfW, which already delivers a small carbon saving. The biogenic carbon in food waste is not counted towards EfW's carbon impact, while the electricity from the EfW plant avoids the need for some fossil fuel-based electricity generation.

Table 5-5 provides the additional modelled costs of extending food waste collections to cover UR1 to U5, over and above those included in Table 5-2.

Table 5-5: Modelled Annual Operational Cost Impact of Extending Weekly Separate Collections of Food Waste to All UR1-5 Properties Across Scotland

Item	Food Waste UR1-3	Food Waste UR1-5	Additional Costs of UR1-5 compared to UR1-3
Diversion	£20k	£20k	£0k
Container Replacement	£910k	£1,030k	£120k
Residual Waste Treatment	£140,210k	£139,020k	-£1,190k
Food Waste Treatment	£4,600k	£5,000k	£400k
Staff	£22,000k	£26,840k	£4,840k
Fuel	£1,800k	£2,150k	£360k
Vehicles	£1,880k	£2,260k	£380k
Total Operational Costs	£171.4m	£176.3m	£4.9m

The rationale for the increase in costs between a UR1-3 service and a UR1-5 service is the same as for the increase between the modelled baseline and a UR1-3 service, which is explained in Section 5.1.1.1 of this report.

The total additional annual operational costs of moving from the modelled baseline to a UR1-5 service can be calculated by adding the figures in

Table 5-2 to those in Table 5-5. This change resulted in a total modelled additional annual cost of £21.2m. This (and additional capital costs) are the only instances where summing the results of different service feature calculations yields accurate result.

The modelled capital costs of introducing these services have been separated and included in Table 5-6.

Table 5-6: Modelled Total Capital Cost Impact of Extending Weekly Separate Collections of Food Waste to All UR1-5 Properties

Item	Baseline	Food Waste UR1 - 5	Difference
Vehicle Capital	£19.2m	£23.7m	£4.5m
Container Capital	£139.7m	£141.0m	£1.3m

Item	Baseline	Food Waste UR1 - 5	Difference
Total	£158.9m	£164.6m	£5.8m

5.1.2 Garden Waste

Within Section 5.1.1, the analysis focused on the separate collection of food waste. However, the introduction of this service would mean the ‘unmingling’ of food and garden waste collections for 15 authorities (based on 2023 data included in Table 3-4). Therefore, it is also necessary to understand the consequent changes that would be required to garden waste collections, and their performance impact and cost, to provide a complete picture of the impact of changes to organics collections.

Two changes were examined in relation to garden waste: free collections and chargeable collections across Scotland.

Within the modelling, existing service frequency for each local authority was retained in both options, apart from local authorities currently with weekly mixed food and garden waste collection schemes, which were assumed to move to fortnightly. Where a local authority did not offer a garden waste collection service, the frequency was aligned to other services, to deliver a level of operational consistency.

5.1.2.1 Free Garden Waste

Although some local authorities have already made the political decision to deliver chargeable garden waste services, a free garden waste collection service across Scotland could have greater recycling performance and carbon benefits. This option was therefore modelled alongside a chargeable service. Table 5-7 shows the recycling performance and carbon impacts of extending free garden waste services across Scotland.

Table 5-7: Recycling Performance and Carbon Impact of Extending Free Garden Waste Collections Across Scotland

Measure	Impact
Increased Households Receiving Service (switched and new)	1.05m
Additional Tonnes of Garden Waste Collected	+79,000 tonnes
Impact on Kerbside Recycling Rate	+4.6%
Impact on National Recycling Rate *	+2.9%
Carbon Impact	-1,300 tCO ₂ e
* National Recycling Rate refers to the national household waste generated and managed.	

The carbon impact of this change was small due to the assumption that residual waste is largely dealt with via EfW. The carbon factors used for this analysis show garden waste delivers a carbon saving when treated via EfW.¹⁵ Therefore, when garden waste is transferred from EfW to open windrow, the carbon benefit per tonne is small.

Table 5-5 provides the annual modelled costs of introducing free garden waste collections across Scotland.

Table 5-8: Modelled Annual Operational Cost Impact of Free Garden Waste Collections Across Scotland

Item	2023 Baseline	Free Garden Waste	Change in Cost
Garden Charge Income	£13,860k	£0k	£13,860k
Diversion	£0k	£570k	£570k
Container Replacement	£820k	£1,040k	£220k
Residual Waste Treatment	£143,330k	£138,800k	£4,520k
Garden Waste Treatment	£17,520k	£10,630k	£6,890k
Staff	£17,060k	£20,730k	£3,670k
Fuel	£3,200k	£3,790k	£590k
Vehicles	£2,510k	£3,130k	£620k
Total Operational Costs	£170.6m	£177.6m	£7.0m

Key points of difference between the modelled baseline position and free garden waste services being rolled out across Scotland are:

- No income was generated when charged garden waste services were replaced with a free service.
- Container replacement costs increase from the modelled baseline as more households were provided with the service.
- Residual waste treatment costs reduce compared to the modelled baseline, as a proportion of the garden waste captured in the free garden service is diverted from the kerbside residual waste stream.
- The garden waste treatment savings are nuanced and would be different for each authority depending on their baseline position.

¹⁵ WRAP (2025) *Carbon Waste and Resources Metric version 2*. Available at: <https://www.wrap.ngo/sites/default/files/2025-03/WRAP-CarbonWARM2.v0.3.pdf>

- The cost of garden waste treatment was modelled to increase for local authorities with charged garden collection services or without garden waste collection services in the baseline.
- The cost of garden waste treatment was modelled to remain the same for those local authorities with free garden waste collection services in the baseline.
- The cost of garden waste treatment decreased for those with mixed organics services in the baseline. This was because we assumed these authorities would change to windrow composting for garden waste, which was associated with a lower gate fee than IVC. However, this saving does not account for the treatment costs for the newly separated food waste, which is included in Section 5.1.1 of this report.
- For authorities with a chargeable garden waste service or no service, some garden waste was assumed to transfer from the HWRC to the kerbside. No additional cost to treat waste displaced from HWRCs was modelled.
- Staff, fuel and vehicle costs all increased compared to the modelled baseline as more resources are required to collect garden waste due to the wider coverage offered.

Table 5-9 shows the capital costs of the introduction of free garden waste collections across Scotland.

Table 5-9: Modelled Total Capital Cost Impact of Free Garden Waste Collections Across Scotland

Item	2023 Baseline	Free Garden Waste	Cost
Vehicle Capital	£25.4m	£33.0m	£7.5m
Container Capital	£141.4m	£159.4m	£18.0m
Total	£166.8m	£192.4m	£25.5m

Vehicle and container capital has increased from the modelled baseline position as more resources are required to collect garden waste due to the wider coverage of the service.

5.1.2.2 Chargeable Garden Waste

Some local authorities currently offer a chargeable garden waste service. This enables services to be focused on the households that have the greatest desire for a garden waste service, while also providing an income stream to offset some of the costs of service provision. The annual operating costs of moving to separate weekly collections of food waste across Scotland is substantial at just over £17m. If this were to be adopted, local authorities that currently offer free garden waste services (whether separate garden or mixed food and garden) might wish to begin charging for garden waste collections in order to offset some of these costs.

Table 5-10 shows the recycling performance and carbon impacts of introducing chargeable garden waste services across Scotland.

Table 5-10: Recycling Performance and Carbon Impact of Extending Chargeable Garden Waste Collections Across Scotland

Measure	Impact
Increased Households Receiving Service (switched and new)	550k
Additional Tonnes of Food Waste Collected	+22,000 tonnes
Impact on Kerbside Recycling Rate	+2.4%
Impact on National Recycling Rate *	+1.7%
Carbon Impact	+40 tCO ₂ e
* National Recycling Rate refers to the national household waste generated and managed.	

As with the free garden waste collections modelling, the carbon impact of this change was a small increase due to the assumption residual waste is largely dealt with via Energy from Waste (EfW). The carbon factors used for this analysis showed that garden waste treated via EfW would lead to a carbon saving.¹⁶ Therefore, when garden waste is transferred from EfW to open windrow, the carbon benefit per tonne is small.

Table 5-11 shows the annual modelled costs of introducing chargeable garden waste collections across Scotland.

Table 5-11: Modelled Annual Operational Cost Impact of Chargeable Garden Waste Collections Across Scotland

Item	2023 Baseline	Chargeable Garden Waste	Change in Cost
Diversion	£0k	-£180k	-£180k
Container Replacement	£820k	£540k	-£280k
Residual Waste Treatment	£143,330k	£140,020k	-£3,310k
Garden Waste Treatment	£17,520k	£8,490k	-£9,030k
Staff	£17,060k	£17,550k	£500k
Fuel	£3,200k	£3,310k	£110k

¹⁶ WRAP (2025) *Carbon Waste and Resources Metric version 2*. Available at: <https://www.wrap.ngo/sites/default/files/2025-03/WRAP-CarbonWARM2.v0.3.pdf>

Item	2023 Baseline	Chargeable Garden Waste	Change in Cost
Vehicles	£2,510k	£2,640k	£120k
Total Operational Costs	£184.4m	£172.4m	-£12.1m

Key points of difference between the modelled baseline position and a chargeable garden waste service being rolled out across Scotland are:

- There is a diversion saving, due to the movement of garden waste from other non-kerbside sources (HWRCs). However, this saving was lower than was modelled for free garden waste collections across Scotland because charged garden services have a lower participation rate than free services, meaning that households continue to use the HWRC.
- Overall, container replacement costs reduce compared to the baseline. This is because fewer households require bins as coverage is reduced due to some households that currently receive a free service opting out of a chargeable one. However, the financial implications will differ between local authorities: costs will increase for those that currently provide no garden waste collections, whereas costs will reduce for those that currently provide free garden collections. For local authorities that already offer chargeable garden waste collections, modelled container replacement costs were kept the same as in the baseline.
- Residual waste treatment costs are reduced compared to the modelled baseline, although not as much as for a free garden waste scheme. The reason for this is nuanced depending upon the baseline scheme operated by the local authority.
 - For local authorities with a free garden waste service in the baseline, it was assumed that changing to a charged service would lead to a small amount of garden waste being disposed of in the kerbside residual waste service and a larger increase in garden waste taken to HWRCs.
 - There is no change in residual waste treatment costs for local authorities with chargeable garden waste collection services in the baseline.
 - Where a local authority does not currently offer garden waste collections, there is a saving in residual waste disposal costs as a proportion of the garden waste collected by the new service is diverted from the residual waste bin.
- As with residual waste treatment savings, garden waste treatment savings are also nuanced and differ between authorities depending on their baseline position.
 - The cost of garden waste treatment increases for authorities without garden waste collection services in the baseline.
 - The cost of garden waste treatment decreases for those local authorities with free garden waste collection services in the baseline.

- The cost of garden waste treatment decreases for those with mixed organics services in the baseline. This is because we have assumed such authorities will change to using cheaper windrow composting for garden waste, instead of the higher cost In Vessel Composting (IVC) treatment needed for mixed food and garden. However, this saving does not account for the treatment costs for the newly separated food waste, which is included in Section 5.1.1 of this report.
- Staff, fuel and vehicle costs all increase compared to the modelled baseline as more resources are required to collect garden waste due to the wider coverage offered.

A key balancing factor when considering the viability of chargeable garden waste services is the income generated. Modelled income from chargeable garden waste collections across Scotland is provided in Table 5-12.

Table 5-12: Modelled Income from Chargeable Garden Waste Collections Across Scotland

Item	2023 Baseline	Chargeable Garden Waste	Change
Garden Waste Income	£13,860k	£30,250k	£16,390k

Table 5-12 shows the capital costs of the introduction of free garden waste collections across Scotland.

Table 5-13: Modelled Total Capital Cost Impact of Chargeable Garden Waste Collections Across Scotland

Item	2023 Baseline	Chargeable Garden Waste	Change in Cost
Vehicle Capital	£25.4m	£28.7m	£3.3m
Container Capital	£149.8m	£159.4m	£9.6m
Total	£175.2m	£188.1m	£12.8m

Within Table 5-13, container capital increases, but by a smaller amount compared to a free garden waste service. This is because fewer households require bins due to the subscription nature of the service leading to some households opting out. Container capital is potentially recoverable if local authorities charge for the cost of the bin when a household first subscribes to the service.

5.1.3 Summary of Findings

This section of the report summarises Eunomia's analysis of food waste and garden waste collection changes. A more detailed breakdown of results and explanation of these can be found in Sections 5.1.1 and 5.1.2 respectively.

5.1.3.1 Food Waste Summary

A summary of the impact of these changes can be found in Table 5-14, with detailed analysis included in Section 5.1.1 of this report

Table 5-14: Summary of Food Waste Stream Feature Results

Measure	UR1-3 Impact	Additional UR1-5 Impact
Increase Households Receiving Service	+1.46m	+200k
Additional Tonnes of Food Waste Collected	+23,000 tonnes	+ 7,600 tonnes
Impact on Kerbside Recycling Rate	+1.8%	+ 0.5%
Impact on National Recycling Rate *	+1.4%	+ 0.3%
Carbon Impact	-11,000 tCO ₂ e	-430 tCO ₂ e
Modelled Additional Annual Operational Costs	£16.3m	£4.9m
Modelled Additional Capital Costs	£20.0m	£5.8m

* National Recycling Rate refers to the national household waste generated and managed.

Expanding weekly separate food waste collections across Scotland, particularly for UR1–3 properties, delivers clear environmental benefits, including a notable increase in food waste captured, a 1–2% rise in recycling rates, and substantial carbon savings. These gains, however, come with higher operational and capital costs due to increased collection coverage and resource requirements. Extending collections to UR1–5 properties offers – as would be expected – smaller additional benefits at proportionally higher cost, reflecting the operational difficulties of servicing more rural housing types.

5.1.3.2 Garden Waste Summary

A summary of the impact of these changes can be found in Table 5-15, with detailed analysis included in Section 5.1.2 of this report

Table 5-15: Summary of Garden Waste Stream Feature Results

Measure	Free	Chargeable
Increase Households Receiving Service	1.05m	550k
Additional Tonnes of Garden Waste Collected	+79,000 tonnes	+22,000 tonnes

Measure	Free	Chargeable
Impact on Kerbside Recycling Rate	+4.6%	+2.4%
Impact on National Recycling Rate *	+2.9%	+1.7%
Carbon Impact	-1,300 tCO ₂ e	+40 tCO ₂ e
Modelled Additional Income from Charged Collections	N/A	£16,390k
Modelled Additional Annual Operational Costs	-£7.0m	-£12.1m
Modelled Additional Capital Costs	£25.5m	£12.8m
* National Recycling Rate refers to the national household waste generated and managed.		

A free garden waste service across Scotland offers greater recycling and carbon benefits than a chargeable service. However, the operational savings associated with a chargeable garden waste service are substantially higher at a Scotland wide level. Additionally, as chargeable services are already operated by 16 local authorities, there is no modelled cost of change for these councils, who would incur additional costs if required to move to a free garden waste service. In addition to the operational cost savings, the modelling implies that local authorities would receive an additional £16.39m of income from these services across Scotland, which would be payable by local households.

5.2 Dry Recycling

Eunomia's statistical analysis within Section 4.0 of the report did not show a clear correlation between the type of dry recycling collection scheme operated (multi-stream, two-stream and co-mingled) and the kerbside recycling yield. This is supported by research undertaken by WRAP and published in its report 'Analysis of Recycling Performance and Waste Arisings' in the UK 2012/13 (2015), which although somewhat dated, is still the largest published study of its kind on this topic.

When considering glass, Eunomia's analysis did, however, demonstrate that although there is no substantial difference in yield between the different approaches to collecting glass at the kerbside, the mean yield of glass was statistically higher when collected at the kerbside compared to bring banks. This understanding led Eunomia to carefully consider the stream features modelled for the dry recycling collection service.

- The existing CoP is clear that the default level of material separation at the kerbside is two-stream, with paper/cardboard collected separated from metals, plastics and cartons. Therefore, this has been assumed to be the maximum level of segregation required. This also supports Eunomia's analysis that dry recycling contamination is reduced where there is greater segregation of material. Eunomia therefore focussed on two-stream and co-mingled recycling services as a point of comparison to ensure cost and performance differences between these approaches were analysed at a Scotland level.
- Glass is clearly dealt with separately within the existing CoP (and the unpublished 2021 draft) and yields for separate collections are proven to be higher than for bring services. However, recognising the potential costs differential between these approaches, both separate and bring glass approaches were analysed. Additionally, Eunomia also considered an alternative two-stream model where the glass was collected within the plastics/metals mix due to the prevalence of this service across Scotland currently.

Dry Recycling stream features are discussed in Sections 5.2.1 and 5.2.2, and glass in Sections 5.2.4.

5.2.1 Separate Paper/cardboard Collections

Table 5-16 provides the recycling performance and carbon impacts of introducing two-stream dry recycling services across Scotland. This analysis focuses on the impact of separating collections for paper and cardboard. Collections for other materials were not changed; authorities which currently collect glass co-mingled with plastics and metals continue to do so, those with separate glass collections retain them, and those with bring-only glass collections continue to not have kerbside glass collections. This means that the impacts shown in this section focus on the separation of paper and cardboard, isolating the impact of this change, and are not driven by changes in collection for glass, which is assessed in 5.2.4.

Table 5-16: Recycling Performance and Carbon Impact of Two-Stream Dry Recycling Collections Across Scotland

Measure	Impact
Local Authorities Changing Scheme	12*
Additional Tonnes of Dry Recycling	0 tonnes
Impact on Kerbside Recycling Rate	0%
Impact on National Recycling Rate *	0%
Carbon Impact	-13,000 tCO ₂ e
* National Recycling Rate refers to the national household waste generated and managed.	

*South Ayrshire and North Lanarkshire predominantly provide a two-stream service with separate papers and cardboard, so these have been modelled as not switching services (recognising that services differ in places such as Arran). Western Isles has been included as a two-stream co-mingled and glass service as per the service provided to the majority of the population on Lewis & Harris, as only Uist & Barra have two-stream paper/cardboard and plastics/metals collections.

The performance of the dry recycling service is not modelled to change when two-stream collections are introduced across Scotland. Based on the analysis carried out by Eunomia in Section 4.0 of this report, there is no statistically significant difference between material yields within the services. However, there is a carbon benefit to this approach as it is assumed that due to the increased segregation and quality of material, more recycling can be reprocessed in closed-loop markets.

Table 5-17 provides the modelled annual cost impact of implementing two-stream recycling collections across Scotland.

Table 5-17: Modelled Annual Operational Cost Impact of Two-Stream Dry Recycling Collections Across Scotland

Item	2023 Baseline	Two-Stream Dry Recycling	Change in Cost
Diversion	£20k	£20k	£0k
Container Replacement	£1,590k	£1,860k	£270k
Residual Treatment	£140,210k	£140,890k	£690k
Plastics/ Metals/ Glass Treatment	£10,660k	£4,370k	-£6,290k

Item	2023 Baseline	Two-Stream Dry Recycling	Change in Cost
Paper/Cardboard Treatment	-£1,180k	-£1,680k	-£500k
Staff	£45,600k	£46,050k	£450k
Fuel	£6,210k	£6,390k	£180k
Vehicles	£6,550k	£6,590k	£40k
Total Operational Costs	£209.7m	£204.5m	-£5.2m

Key points of difference between the modelled baseline position and a two-stream dry recycling service being rolled out across Scotland are:

- There is no change in the amount of waste modelled to be diverted to other outlets (including HWRC's) as there is no change in the waste flows underpinning the modelling assumptions.
- Container replacement costs increase where local authorities previously offering single stream services have been moved to two-stream collections and additional containers are required.
- The residual waste treatments costs are modelled to increase as a proportion of the contamination from previously co-mingled collections moves to the residual bins.
- Treatment costs reduce as less recycling is sent to MRFs, and MRF gate fees for the plastic and metal (and glass for some local authorities) stream are lower than for fully co-mingled materials. Net income for paper and cardboard also improves as, despite a lower per tonne income being assumed for mixed paper and cardboard stream compared with MRF-sorted fractions, the material is not sent to a MRF and so does not require a gate fee to be paid.
- Staff, fuel and vehicle costs increase as more resources are required to deliver these services.

Table 5-34 provides the capital costs of impact of the introduction of two-stream dry recycling collections across Scotland.

Table 5-18: Modelled Total Capital Cost Impact of Two-Stream Dry Recycling Collections Across Scotland

Item	Increase in Cost of Capital
Vehicle Capital	£1.0m
Container Capital	£21.24m

Item	Increase in Cost of Capital
Total	£22.3m

As discussed above the increased cost of container capital reflects the additional containers required to operate two-stream service. The vehicle capital is a net Scotland wide position accounting for some authorities needing more vehicles and some needing less.

5.2.2 Co-Mingled Dry Recycling Collections Including Glass

Table 5-35 provides the recycling performance and carbon impacts of introducing co-mingled dry recycling (including glass) across Scotland.

Table 5-19: Recycling Performance and Carbon Impact of Co-Mingled Dry Recycling (Including Glass) Collections Across Scotland

Measure	Impact
Local Authorities Changing Scheme	17
Additional Tonnes of Dry Recycling	0 tonnes
Impact on Kerbside Recycling Rate	0%
Impact on National Recycling Rate *	0%
Carbon Impact	+31,000 tCO ₂ e including non-target material

* National Recycling Rate refers to the national household waste generated and managed.

As with the two-stream analysis, the performance of the dry recycling service is not modelled to change when co-mingled collections are introduced across Scotland. However, unlike the two-stream collections, co-mingled collections are modelled to incur an additional 31,000 tCO₂e when compared to the baseline. The increase in the carbon emissions is associated with a reduction in the proportion of collected recycling that is ultimately recycled, when collected co-mingled. Fewer tonnes are ultimately recycled as more material is rejected from the recycling process at MRFs, either because of non-target materials or contaminated target materials.

Table 5-36 provides the modelled annual cost impact of implementing co-mingled collections including glass across Scotland.

Table 5-20: Modelled Annual Operational Cost Impact of Co-mingled Dry Recycling including Glass Collections Across Scotland

Item	2023 Baseline	Co-mingled, including Glass	Change in Cost
Diversion	£40k	£40k	£0k
Container Replacement	£1,860k	£1,170k	-£690k
Residual Treatment	£139,180k	£135,870k	-£3,310k
Plastics/Metals/ Glass Treatment	£7,140k	£25,520k	£18,380k
Paper/Cardboard Treatment	-£1,680k	-£10k	£1,670k
Staff	£46,180k	£38,300k	-£7,880k
Fuel	£6,440k	£5,350k	-£1,080k
Vehicles	£6,610k	£5,540k	-£1,080k
Total Operational Costs	£205.8m	£211.8m	£6.0m

Key points of difference between the modelled baseline position and co-mingled collections including glass being rolled out across Scotland are:

- There is no change in the amount of waste modelled to be diverted to other outlets (including HWRC's) as there is no change in the waste flows underpinning the modelling assumptions.
- Container replacement costs reduce as two and three-stream authorities collect material together.
- Residual waste treatments costs reduce, because of the diversion of material from the residual waste stream.
- The cost of co-mingled plastics and metals (plus glass) treatment increases as previously separately collected material is now co-mingled and being reprocessed at a higher gate fee. Costs to treat non-target material and contamination in this stream also increases.
- Income from paper/cardboard is lost as paper/cardboard are no longer separately collected.
- Staff, fuel and vehicle costs reduce as less resources are required to deliver these services.

Table 5-37 provides the capital costs of the introduction of co-mingled dry recycling collections across Scotland. This system resulted in fewer vehicles almost universally with an exception whereby one local authority's existing fleet profile meant changes to operate co-mingled collections. This cost would not be required if the service was implemented alongside scheduled fleet renewal (or potentially by adjusting service design).

Table 5-21: Modelled Total Capital Cost Impact of Co-Mingled Dry Recycling Collections Across Scotland

Item	Increase in Cost of Capital
Vehicle Capital	£0.0m (£0.8m)
Container Capital	£0.0m
Total	£0.0m (£0.8m)

The capital costs increase in Table 5-21 as within the modelling Eunomia has only accounted for increases in capital. We have not reduced capital where fewer vehicles are operated as this is not necessarily a saving which could be recognised by local authorities.

5.2.3 Summary of Findings

Table 5-22 provides a summary of the impact of Scotland wide implementation of two-stream dry recycling and co-mingled collections with glass.

Table 5-22: Summary of Impact of Scotland Wide Implementation of Two-Stream Dry Recycling and Co-Mingled Collections with Glass Stream Features

Measure	Two-Stream	Co-mingled with Glass
Local Authorities Changing Scheme	12*	17*
Households Changing Scheme	1,029,501	1,507,584
Additional Tonnes of Dry Recycling	0 tonnes	0 tonnes
Impact on Kerbside Recycling Rate	0%	0%
Impact on National Recycling Rate *	0%	0%
Carbon Impact	-12,000 tCO ₂ e	+31,000 tCO ₂ e
Additional Annual Operational Costs	-£5.2m	£6.0m
Additional Capital Costs	£22.3m	£0.8m

* National Recycling Rate refers to the national household waste generated and managed.

The assessment demonstrates that moving to either two-stream dry recycling or co-mingled collections with glass across Scotland would not increase recycling tonnages or improve kerbside or national recycling rates. However, the two options differ significantly in cost and carbon performance. Two-stream collections deliver annual operational savings, however, require much higher capital investment than the co-mingled with glass stream feature. The carbon impact of this change is however beneficial, unlike the co-mingled (with glass) stream feature which has a detrimental carbon impact compared to the baseline position. Both options would require a substantial number of local authorities to change their current collection systems, and this is a significant practical consideration for Scottish Government.

5.2.4 Glass

As discussed at the beginning of Section 5.2, glass and how it is collected is discussed in detail within the existing CoP and the 2021 un-published update. Therefore, Eunomia has examined various options for the collection of glass to understand not only how to maximise capture of this material but also the cost of these stream features. Stream features examined are:

- local authorities with non-separate kerbside glass collections within their baseline switching to bring glass collections.
- local authorities with non-separate kerbside glass collections within their baseline switching to separate glass collections.
- All local authorities switching to separate glass collections.
- All local authorities switching to non-separate glass collections for most households.

It should be noted that these stream features are not directly comparable due to the complexity of the baseline position.

5.2.4.1 Non-Separate Kerbside Glass Local Authorities Switching to Bring Glass

This stream feature focuses on a sub-set of local authorities who have non-separate kerbside glass collection service as part of their in the baseline. Table 5-23 provides the recycling performance and carbon impacts of this stream feature change to bring glass collections. The below results focus on the impact for these local authorities only.

Table 5-23: Recycling Performance and Carbon Impact of Non-Separate Kerbside Glass Collections Switching to Bring Glass

Measure	Impact
Local Authorities Changing Scheme	8x Local authorities kerbside non-separate
Changes in Tonnage Collected	- 26,000 tonnes
Impact on Kerbside Recycling Rate	- 1.2%

Measure	Impact
Impact on National Recycling Rate *	- 0.4%
Carbon Impact	-11,000 tCO2e

* National Recycling Rate refers to the national household waste generated and managed.

Table 5-23 shows a reduction in tonnage of glass collected in this option as supported by Eunomia's analysis in Section 4.0 of this report. Within this stream feature the carbon impact is largely driven by glass being diverted into closed-loop recycling.

Table 5-24 provides a comparison of the costs of these services for the 8 local authorities who would change scheme.

Table 5-24: Comparison of Baseline of Non-Separate Kerbside Glass Collection Baseline with Bring Glass Services.

Item	Non-Separate Kerbside Glass Collections	Bring Glass Collections	Change in Cost
Diversion	£0k	£0k	£0k
Container Replacement	£1,860k	£1,860k	£0k
Residual Treatment	£140,890k	£142,850k	£1,960k
Plastics/Metals/ Glass Treatment	£6,010k	£4,180k	-£1,830k
Paper/Cardboard Treatment	-£1,680k	-£1,680k	£0k
Glass Treatment	-£1,640k	-£1,720k	-£80k
Staff	£46,050k	£45,910k	-£140k
Fuel	£6,390k	£6,320k	-£70k
Vehicles	£6,590k	£6,570k	-£20k
Total Operational Costs	£204.5m	£204.3m	-£0.2m

Table 5-24 demonstrates that is marginally more expensive for these local authorities to have non-separate kerbside glass than moving to a bring system for glass.

5.2.4.2 Non-Separate Kerbside Glass Local Authorities Switching to Separate Kerbside Glass Collections

As with the service analysed in Section 5.2.4.1, this stream feature focuses on the same subset of local authorities who have non-separate kerbside glass collection service as part of their service in the baseline. Table 5-25 provides the recycling performance and carbon impacts this change to separate glass collections. The below results focus on the impact for these local authorities only.

Table 5-25: Recycling Performance and Carbon Impact of Non-Separate Kerbside Glass Collections Switching to Separate Kerbside Glass Collections

Measure	Impact
Local Authorities Changing Scheme	8x Local authorities kerbside non-separate
Changes in Tonnage Collected	0
Impact on Kerbside Recycling Rate	0%
Impact on National Recycling Rate *	0%
Carbon Impact	-15,000 tCO ₂ e
* National Recycling Rate refers to the national household waste generated and managed.	

Within this stream feature there is no modelled reduction in tonnage, and the full benefit of closed-loop recycling is modelled as part of the assessment of the carbon impact of this change.

Table 5-26 provides a comparison of the costs of these services for the 8 local authorities who would change scheme.

Table 5-26: Comparison of Baseline of Non-Separate Kerbside Glass Collection Baseline with Separate Kerbside Glass Collections

Item	Non-Separate Kerbside Glass Collections	Separate Glass Collections	Change in Cost
Diversion	£0k	£0k	£0k
Container Replacement	£1,860k	£1,940k	£80k
Residual Treatment	£140,890k	£140,890k	£0k

Item	Non-Separate Kerbside Glass Collections	Separate Glass Collections	Change in Cost
Plastics/Metals/ Glass Treatment	£6,010k	£4,450k	-£1,560k
Paper/Cardboard Treatment	-£1,680k	-£1,680k	£0k
Glass Treatment	-£1,640k	-£1,720k	-£80k
Staff	£46,050k	£48,670k	£2,620k
Fuel	£6,390k	£6,740k	£360k
Vehicles	£6,590k	£6,970k	£380k
Total Operational Costs	£204.5m	£206.3m	£1.8m

Table 5-26 demonstrates that it is more expensive for these local authorities to have a separate glass collection than retain their current non-separate kerbside glass collections. However, unlike in Section 5.2.4.1 there is a capital impact associated with this change. This is detailed in Table 5-27. Once again, these costs apply to a sub-set of authorities only.

Table 5-27: Capital Impact of Non-Separate Kerbside Glass Collections Switching to Separate Kerbside Glass Collections

Item	Increase in Cost of Capital
Vehicle Capital	£2.6m
Container Capital	£9.0m
Total	£11.7m

5.2.4.3 All Local Authorities Switching to Separate Kerbside Glass Collections

This stream feature models the impact of all local authorities introducing a separate glass collection pass at a 4-weekly frequency. Authorities who already have a separate glass collection have not been modelled to change their service.

Table 5-28: Recycling Performance and Carbon Impact of All Local Authorities Switching to Separate Glass Collections

Measure	Impact
Local Authorities Changing Scheme	12x Local authorities bring* 8x Local authorities kerbside non-separate
Changes in Tonnage Collected	+33,000 tonnes
Impact on Kerbside Recycling Rate	+2.4%
Impact on National Recycling Rate **	+1.4%
Carbon Impact	-34,000 tCO2e
* 3x Local authorities have a mix of separate kerbside and bring glass.	
** National Recycling Rate refers to the national household waste generated and managed.	

Table 5-29 provides a comparison of the costs of these services.

Table 5-29: Additional Cost of All Local Authorities Switching to Separate Glass Collections

Item	Non-separate glass collections	Separate glass collections	Change in Cost
Diversion	£0k	£20k	£20k
Container Replacement	£1,590k	£1,630k	£40k
Residual Treatment	£143,360k	£139,180k	-£4,180k
Glass Treatment	-£1,700k	-£2,650k	-£950k
Staff	£45,600k	£49,920k	£4,320k
Fuel	£6,210k	£6,940k	£720k
Vehicles	£6,550k	£7,550k	£990k
Total Operational Costs	£201.6m	£202.6m	£1.0m

Key points of difference between the modelled baseline position and all local authorities implementing kerbside collections of glass are:

- The cost of diversion increased as material is diverted out of the bring system.

- Container replacement costs increase as more households receive glass containers as collection coverage is increased.
- Residual treatment costs reduce as glass is diverted from kerbside residual waste collections.
- More glass collected, and all glass is collected separately resulting in more income.
- Staff, fuel and vehicle costs increase as additional resource are required to deliver this service.

Table 5-35 provides the additional capital costs of all local authorities switching to separate glass collections. These additional costs are reflective of the additional vehicles and containers needed to support service delivery.

Table 5-30: Capital Impact of All Local Authorities Switching to Separate Glass Collections

Item	Increase in Cost of Capital
Vehicle Capital	£18.9m
Container Capital	£27.8m
Total	£46.8m

5.2.4.4 Bring Glass Local Authorities Switching to Non-Separate Kerbside Glass Collections

This option moves local authorities from bring collections for glass to non-separate kerbside collections, testing both the impact and cost of widespread non-separation of glass. Within this option all local authorities are modelled to retain or introduce kerbside glass within the plastics/metals stream of a two-stream recycling service. Where a local authority separately collects glass in the baseline, this service is retained.

Table 5-31: Recycling Performance and Carbon Impact of Bring Glass Local Authorities Switching to Non-Separate Glass Collections

Measure	Impact
Local Authorities Changing Scheme	12x Local authorities bring*
Changes in Tonnage Collected	+33,000 tonnes
Impact on Kerbside Recycling Rate	+1.5%
Impact on National Recycling Rate **	+0.5%
Carbon Impact	+12,000 tCO ₂ e

Measure	Impact
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* 3x Local authorities have a mix of separate kerbside and bring glass.

** National Recycling Rate refers to the national household waste generated and managed.

When comparing the results of a bring glass collection to non-separate glass collection there is a substantial impact on carbon emissions. With non-separation of glass having a positive (higher emissions) carbon impact. This is because clean separate glass from bring banks is diverted to glass mixed with plastics/metals, which receives a much lower carbon credit for the glass that is eventually recycled.

Table 5-37 provides a comparison of the costs of these services.

Table 5-32: Additional Cost of Bring Glass Local Authorities Switching to Non-Separate Glass Collections

Item	Baseline Glass Collections	Bring Glass to Non-Separate Glass Collections	Change in Cost
Diversion	£0k	£20k	£20k
Container Replacement	£1,860k	£1,860k	£0k
Residual Treatment	£140,890k	£139,180k	-£1,710k
Plastics/Metals/ Glass Treatment	£6,010k	£8,790k	£2,780k
Paper/Cardboard Treatment	-£1,680k	-£1,680k	£0k
Glass Treatment	-£1,640k	-£1,650k	-£10k
Staff	£46,050k	£46,180k	£130k
Fuel	£6,390k	£6,440k	£50k
Vehicles	£6,590k	£6,610k	£30k
Total Operational Costs	£204.5m	£205.8m	£1.3m

Key points of difference between the modelled baseline position and local authorities implementing non-separate glass collections for most households are:

- Diversion is the cost associated with glass from bring banks moving to the kerbside. Added to the glass treatment there is a net £20k cost associated with this change as glass prices are generally lower when glass is not collected separately.

- More glass was captured from residual waste and moved into the recycling stream, reducing residual treatment costs and increasing treatment costs for the plastics/metals/glass stream.
- There was no resource impact as glass was modelled as being added to an existing container and set out was not modelled as changing.

There were no associated capital costs.

5.3 Residual Waste

Based upon Eunomia's findings reported in Section 4.0 of this report, we understand there to be a statistically significant correlation between the restriction of effective weekly residual waste capacity and increased recycling performance and materials capture rates. This is also true for food waste collections, where there is a statistically significant increase in the mean capture rate of food waste.

Residual waste can be constrained either by frequency or container size, however based upon standard container sizes for residual waste bins (240 litre, 180 litre and 140 litre) the most effective way to effectively constrain the equivalent weekly capacity is to reduce collection frequency. This approach has already been taken by numerous local authorities across Scotland with 13 operating three-weekly services and 2 operating four-weekly collection services in 2023.

Therefore, the stream features modelled for residual waste were three-weekly and four-weekly collections.

5.3.1 Three Weekly Residual Waste Collections

Table 5-32 details the recycling performance and carbon impacts of introducing three-weekly residual waste collections across Scotland. Where authorities already operate three or four-weekly collections these have not been altered from the baseline position. Where an authority provided data on properties receiving collections at a greater frequency than their standard kerbside service (e.g. communal, sacks etc.) these properties were not modelled to move to three-weekly collections.

Table 5-33 Recycling Performance and Carbon Impact of Three Weekly Residual Waste Collections Across Scotland

Measure	Impact
Additional Properties Added to the Service	1.20m
Change in Dry Recycling Tonnes	+11,000 tonnes
Change in Food Waste Tonnes	+ 5,900 tonnes
Impact on Kerbside Recycling Rate	+ 2.7%

Measure	Impact
Impact on National Recycling Rate *	+ 1.5% (0.6%**)
Carbon Impact	- 18,000 tCO ₂ e

* National Recycling Rate refers to the national household waste generated and managed.

** If this change did not lead to a net reduction in total arisings (average of 2% reduction modelled), the recycling rate increase would be less.

Table 5-34 provides a breakdown of the operational cost impact of introducing three-weekly residual waste collections across Scotland.

Table 5-34: Modelled Annual Operational Cost Impact of Three Weekly Residual Waste Collections Across Scotland

Item	2023 Baseline	Three Weekly Residual Waste	Change in Cost
Container Replacement	£4,290k	£4,290k	£0k
Diversion Treatment	£0k	£7,410k	£7,410k
Garden Waste/Mixed Organics Treatment	£17,520k	£17,620k	£100k
Food Treatment	£1,820k	£2,110k	£290k
Glass Treatment/Income	-£1,700k	-£1,780k	-£80k
Recycling Treatment/Income	£11,190k	£11,810k	£620k
Residual Treatment	£143,560k	£131,030k	-£12,520k
Garden Waste / Mixed Organics Collection	£8,910k	£9,120k	£210k
Food Collection	£9,520k	£9,870k	£350k
Glass Collection	£5,600k	£5,640k	£40k
Recycling Collection	£52,760k	£53,140k	£390k
Residual Collection	£49,950k	£42,970k	-£6,970k
Total Operational Costs	£303.4m	£293.2m	-£10.2m

Key points of difference between the modelled baseline position and three-weekly residual waste collections being delivered across Scotland are:

- There are no additional container replacement costs, as no additional containers are required by this service.
- There are additional costs associated with diversion treatment. This accounts for the additional treatment cost for material displaced from the kerbside into other disposal routes such as HWRCs. When considering residual waste treatment, it is essential this is captured (both in terms of performance and cost) so as not to overstate any savings from this change.
- Food waste and mixed organic treatment costs increase as additional food waste is modelled to be captured when residual waste capacity is restricted.
- Income from glass treatment increases due to the increased capture of this material when residual waste capacity is restricted.
- Recycling treatment is a net cost in the baseline. With increased capture, this increases when three-weekly residual waste income is introduced.
- Residual waste treatment costs reduce as a greater tonnage of this material is diverted to the dry recycling and food waste collection services.
- The collection costs for all services, apart from residual waste, increased when three-weekly residual waste collections were introduced. This was associated with the modelled assumption that set out and participation would increase for these services. While set out for residual waste was also assumed to increase, the reduction in collection frequency was associated with collection cost savings.

Table 5-35 provides the capital costs of impact of the introduction of three-weekly residual waste collections across Scotland.

Table 5-35: Modelled Total Capital Cost Impact of Three Weekly Residual Waste Collections Across Scotland

Item	2023 Baseline	Three Weekly Residual Waste	Change in Cost
Vehicle Capital	£163.7m	£158.4m	-£5.3m
Container Capital	£191.5m	£191.5m	£0.0m
Total	£355.2m	£349.8m	-£5.3m

When considering additional capital requirements associated with the introduction of three-weekly residual waste, there is a saving on the capital required to operate services due to the reduction in residual waste frequency.

5.3.2 Four Weekly Residual Waste Collections

Table 5-36 details the recycling performance and carbon impacts of introducing four-weekly residual waste collections across Scotland. As with three-weekly collections modelling, where authorities already operate four-weekly collections these have not been altered from the baseline position. Also, where an authority provided data on properties receiving collections at a greater frequency than their standard kerbside service (e.g. communal, sacks etc.) these properties were not modelled to move to four-weekly collections.

Table 5-36: Recycling Performance and Carbon Impact of Four Weekly Residual Waste Collections Across Scotland

Measure	Impact From Baseline
Additional Properties Added to the Service	2.01m
Change in Dry Recycling Tonnes	+31,000 tonnes
Change in Food Waste Tonnes	+ 16,000 tonnes
Impact on Kerbside Recycling Rate	+ 6.3%
Impact on National Recycling Rate *	+ 3.4% (1.4%**))
Carbon Impact	- 41,000 tCO ₂ e

* National Recycling Rate refers to the national household waste generated and managed.

** If this change did not lead to a net reduction in total arisings (average of 2% reduction modelled), the recycling rate increase would be less.

Table 5-37 provides a breakdown of the operational cost impact of introducing four-weekly residual waste collections across Scotland.

Table 5-37 Modelled Annual Operational Cost Impact of Four Weekly Residual Waste Collections Across Scotland

Item	2023 Baseline	Four Weekly Residual Waste	Change in Cost
Container Replacement	£4,290k	£4,330k	£40k
Diversion Treatment	£0k	£14,820k	£14,820k
GW/MO Treatment	£17,520k	£18,110k	£590k
Food Treatment	£1,820k	£2,670k	£850k
Glass Treatment/Income	-£1,700k	-£1,880k	-£180k

Item	2023 Baseline	Four Weekly Residual Waste	Change in Cost
Recycling Treatment/Income	£11,190k	£12,660k	£1,480k
Residual Treatment	£143,560k	£116,680k	-£26,880k
GW/MO Collection	£8,910k	£9,370k	£450k
Food Collection	£9,520k	£11,340k	£1,810k
Glass Collection	£5,600k	£5,700k	£100k
Recycling Collection	£52,760k	£54,620k	£1,860k
Residual Collection	£49,950k	£36,410k	-£13,540k
Total Operational Costs	£303.4m	£284.8m	-£18.6m

The rationale for the change in modelled annual operational costs associated with a four-weekly residual waste collection service is aligned with the impact of introducing three-weekly collections (albeit the costs and savings are greater due to the increased diversion of material from kerbside residual waste). However, there are some additional container replacement costs modelled where authorities who have 140 litre bins in the baseline, have been modelled to change these for 180 litre bins.

Table 7-1 provides the capital costs of impact of the introduction of four-weekly residual waste collections across Scotland.

Table 5-38: Modelled Total Capital Cost Impact of Three Weekly Residual Waste Collections Across Scotland

Item	2023 Baseline	Three Weekly Residual Waste	Change in Cost
Vehicle Capital	£163.7m	£156.0m	-£7.7m
Container Capital	£187.9m	£189.5m	£1.6m
Total	£351.6m	£345.4m	-£6.2m

As with the three-weekly collections modelling, when considering additional vehicle capital requirements there is a saving on the capital required to operate services due to the reduction in residual waste frequency. Container capital has been included within the modelling to account for the additional containers needing to be purchased by authorities who are modelled to need to swap 140 litre bins for 180 litre bins.

5.3.3 Summary of Findings

Table 5-39 provides a comparison of the modelling undertaken by Eunomia when considering the impact of restricting residual waste capacity.

Table 5-39: Restricting Residual Waste Stream Feature Results

Measure	Three Weekly Residual Waste	Four Weekly Residual Waste
Additional Properties Added to the Service	1.2m	2.01m
Change in Dry Recycling Tonnes	+11,000 tonnes	+31,000 tonnes
Change in Food Waste Tonnes	+ 5,900 tonnes	+ 16,000 tonnes
Impact on Kerbside Recycling Rate	+ 2.8%	+ 6.4%
Impact on National Recycling Rate *	+ 0.7%	+ 1.6%
Carbon Impact	- 18,000 tCO ₂ e	- 41,000 tCO ₂ e
Operational Costs	-£10.2m	-£18.6m
Capital Costs	-£5.3m	-£6.2m
*National Recycling Rate refers to the national household waste generated and managed.		

Moving to three-weekly or four-weekly residual waste collections is modelled to significantly increase recycling performance and reduce carbon emissions compared to the baseline position in 2023. Financially, both options generate a saving when considering a Scotland wide rollout, however this saving is limited to local authorities who have not already made this change. There are a number of practical considerations when reducing residual waste frequency, however within Scotland 15 authorities have already made this change, demonstrating the operational viability of this model. Although the operational challenges of service changes should not be underestimated.

6.0 Limitations of the Analysis

Based on the evidence reviewed and the modelling undertaken in this project, Eunomia has identified the following key limitations that should be considered when interpreting the results. These do not undermine the direction or validity of the findings but do highlight where there are sensitivities that could change the cost outcome and where further, authority-specific analysis would be required for more detailed understanding of operational and cost implications of service changes.

6.1 Impact of the CoP

Statistical Analysis limited by a small sample size. The statistical analysis was limited by covering data points from only 32 local authorities. This was a limiting factor when conducting the analysis as further sub-divisions by system and/or demography meant the number of authorities within each group was smaller still, reducing the statistical power of identifying significant relationships.

While elements of the CoP can be seen in authorities outside of Scotland and including them would have increased the sample size, scheme data was not available in a downloadable format for use to do allow the analysis to be undertaken. Recycling rates are also not directly comparable between nations as certain material are accounted for differently and authorities in other nations operate under different waste regulations and policies.

Recognising the small sample size, the statistical relationships highlighted within WRAP's study of all local authorities in the UK has been used to supplement the relationships (statistically significant or otherwise) within Scotland's data.

6.2 2023 Data Year

All analysis and the baseline relied on 2023 data, which was the latest complete dataset available at when the work commenced. Subsequent **service changes made by local authorities after 2023 were not accounted for in the results**. Service changes Eunomia is aware of, included:

- Angus: RIF funded service change from June 2024, completing March 2025. Changed from co-mingled, including glass, to two-stream with glass removed from kerbside to bring sites. Expansion of food waste service.
- Clackmannanshire: Change in October 2023 from co-mingled without glass to two-stream and residual collection frequency reduced from three to four-weekly.
- East Ayrshire: RIF funded improvement to recycling and food waste infrastructure at communal properties in February/March 2024 changing from co-mingled without glass to two-stream.
- Highland: RIF funded service change from April 2024. Recycling changed from co-mingled without glass to two-stream and food waste collection coverage was expanded to a further 30,000 households. Residual waste bins were changed from 240-litres to 180 where residents do not have a food waste collection and 140-litres where they do.
- Perth and Kinross: Recycling changed from co-mingled without glass to two-stream between November 2023 and January 2024.
- West Dunbartonshire: From November 2025, residual waste reduced to three-weekly collections and recycling increased from fortnightly to twice every three weeks.

The CoP alignment is therefore underestimated for certain elements. We do not hold the details but estimate that up to an additional 273,500 households (10.1%) have switched to two-stream collections (with separate paper/cardboard). This is based on ~57,000 households with recycling in Angus, ~25,500 in Clackmannanshire, ~120,000 in Highland and ~71,000 in Perth and Kinross.

Cost assumptions were also based on 2023 figures. Staff, vehicle and container costs will have likely increased, gate fees will probably also have increased, and material values will have changed, as they are highly variable.

Staff costs and material revenue will probably have the biggest cost impact. Staff costs make up a large proportion of operating costs while material values can be highly variable.

- **Staff costs:** While salary increases have generally been below CPI in recent years, the Real Living Wage has risen considerably, affecting the lowest-paid roles, which will likely include waste collection operatives. Operational costs are therefore likely to have increased beyond those presented due to pay rises since 2023 and will continue to increase. Yet while higher staff costs will magnify a cost increase or reduction presented, the direction of impact will not change.
- **Material revenue** (source data was LetsRecycle mid-point material prices): Material prices increased following the pandemic, peaking for many materials in 2022. 2023 saw a downturn in value and is broadly representative of values in recent years. For example, using an example local authority with 50,000 properties and assuming a split of 45% paper and 55% cardboard and a yield of 70kg/hhld/yr, the change in values between 2023 and more recent years has had minimal cost impact (Table 6-1). However, material values can be volatile, and small changes can have a large financial impact. As an example, if the 2023 value was £10 different either way, the income would increase or decrease by £35,000 for just one local authority. Yet, while absolute costs may vary, these changes are not expected to alter the comparative direction of results, as regardless of the level of income, separately collecting paper/cardboard will result in lower treatment costs and usually generate an income compared with co-mingled collections.

Table 6-1: Example Paper/Cardboard (45%/55%) Income (50k hhlds, 70kg/hhld/yr)

Paper/cardboard	2023	2024	2025
Income per tonne (£)	66.65	68.99	66.06
Tonnes	3,500	3,500	3,500
Income (£)	233,290	241,478	231,204

6.3 Missing and Incomplete Baseline Data

Tonnage data uses 2023 SEPA and WDF returns. WDF was used as it allows local authorities to provide tonnage information separately for each system (e.g. kerbside collected, bring banks, bulky, HWRCs, streets, etc.). It also provides a detailed breakdown of MRF outputs, including

contamination, and greater detail relating to material treatment routes. However, while WDF has the facility to provide tonnage information with a greater level of detail, only 12 local authorities did so. This left uncertainty as to whether tonnage reported under WDF (Question 10, “Tonnes of material collected through kerbside schemes from household sources by local authority or its contractors”) was correctly completed. A data request issued to local authorities by ZeroWasteScotland in Autumn/Winter of 2024 in which they were asked to confirm WDF tonnage information or correct data for kerbside collected tonnage, bring bank tonnage and the composition of co-mingled streams. Table 6-2 lists local authorities with completed WDF returns and local authorities that completed the data request (either by confirming WDF was correct or providing new data).

Table 6-2: Tonnage Data: Completed WDF and Data Requests

Number	Completed WDF Return	Completed Data Request for Tonnages
1	Aberdeen City	Aberdeenshire
2	Argyll & Bute	Angus
3	Clackmannanshire	Edinburgh, City of
4	Dumfries & Galloway	Falkirk
5	Dundee City	Glasgow City
6	Highland	Midlothian
7	Inverclyde	North Ayrshire
8	Moray	Perth & Kinross
9	North Lanarkshire	Renfrewshire
10	South Lanarkshire	South Ayrshire
11	Stirling	West Lothian
12	West Dunbartonshire	

For a small number of the nine local authorities not included in the table, data held from conducting collection appraisals was used. For the majority, kerbside collected tonnage data from WDF was used for the 2023 baseline. It was possible to identify and correct certain issues: for example, glass reported as separately collected at the kerbside was assumed to instead originate from bring banks/HWRCs when the local authority did not operate separate glass collections. However, without a local authority response, it cannot be guaranteed that all publicly reported WDF data is entirely accurate for kerbside collected data. Any tonnage data inaccuracies will have influenced the baseline and particularly baseline capture rates and tonnages, which were used in the statistical analysis and in some cases, in benchmarking.

Round data (working arrangements, households, container details, set out, vehicle details and crew configuration) relied on local authorities completing the data request issued to local authorities by ZeroWasteScotland in Autumn/Winter of 2024. For a small number of local authorities, for which a collection appraisal had recently been conducted, this information was pre-populated for confirmation.

Table 6-3 lists local authorities that fully (or close to fully) or part-completed information about rounds. Partly completed responses tended to provide comprehensive round data for most households but insufficient information about narrow or rural access rounds. Although some partially completed data returns provided round information for most but not all services, with the number of food and garden rounds being the most commonly missing data point. Responses were considered incomplete where the number of collections rounds was missing for all services.

As missing data required making assumptions, the baseline will not be a wholly accurate reflection of resourcing. As the approach to modelling focuses on the impact of the change, the direction of impact where resourcing levels and costs increase or decrease, the absolute scale of change will be different.

Table 6-3: Round Data: Data Request Completion

Number	Completed	Number	Completed	Number	Part-Completed
1	Aberdeen City	12	Inverclyde	1	Angus
2	Aberdeenshire	13	Midlothian	2	Clackmannanshire
3	Argyll and Bute	14	North Ayrshire	3	Dumfries and Galloway
4	Edinburgh	15	North Lanarkshire	4	Dundee City
5	East Ayrshire	16	Perth and Kinross	5	East Dunbartonshire
6	East Lothian	17	Scottish Borders	6	Renfrewshire
7	East Renfrewshire	18	South Ayrshire		
8	East Renfrewshire	19	Shetland Islands		
9	Falkirk	20	West Dunbartonshire		
10	Fife	21	West Lothian		
11	Highland	22	Western Isles		

Similarly, details relating to logistics and costs were not provided by all local authorities, requiring data gaps to be addressed through research or assumptions.

6.4 Modelling Simplification

Any modelling is a **simplification of reality** and decisions are made about what to include to ensure objectives are met, and what to exclude to prevent over-complication and/or time spent incorporating components that have little to no impact on the order of results. To provide a consistent Scotland-wide assessment, the modelling adopts a level of simplification that differs from a detailed, authority-specific options appraisal. While Eunomia's operational model applies authority-specific assumptions, it was not feasible to incorporate every operational detail and nuance within the scope of this study, which would require more granular analysis. Examples include:

- excluding narrow/rural access rounds that made up less than 5% of households and for which no round data was supplied.
- reflecting the average operational year, rather than day-to-day variability. For example, it does not capture seasonal fluctuations, short-term operational pressures, missed collection rounds, temporary resourcing constraints, among other variabilities. (The outputs should therefore be interpreted as representing typical conditions rather than real-time operations).

Assumptions. Determining the number of resources for a future service design is a modelling exercise that uses approximations and estimations. Using assumptions where needed ensures more local authority collections were modelled, which was intended to support the decision-making process. However, using assumptions also introduce uncertainty. It is not a simple exercise to present the impact of assumptions due to many factors; one of the most notable being commodity value, which a global market and subject to many drivers. See the Appendix for the main assumptions that could be shared.

Confidence intervals and sensitivity testing. Results were presented without formal confidence ranges or full sensitivity testing. The number of variables with inherent uncertainty (e.g., participation, yield shifts, material cost changes, contract terms) means that applying confidence intervals across all inputs would significantly increase complexity and risk obscuring the overall direction of findings. The results should therefore be interpreted as indicative estimates that highlight relative differences rather than precise actual costs.

6.5 Other Costs

The results presented showed the cost of system changes that were assessed through waste flow and resource modelling. The modelled costs included:

- Vehicle purchase (capital is annualised) and running costs (maintenance, insurance, fuel, VED).
- Staff costs, including on costs, including holiday and sickness cover.

- Container purchase (capital is annualised) and annual replacement costs.
- Material bulking, storing, hauling, gate fees/treatment and revenue.

Cost impacts not modelled, include:

- Changes to spare vehicle provision and changes to supervision and management.
- PPE, training and other staff costs. (Salary and on-costs, were included).
- One-off costs for mobilising and implementing service changes. Mobilisation cost will depend on the scale of change but may include costs for: planning and managing the change, legal, HR, permitting, vehicle routing, IT and other digital services/functions, development or adaption of operational documentation (e.g. Safe Operating Procedures/Safe Work Procedures), procurement of products and/or services, organising contract variations where necessary, and other specialist support (e.g. delivering new containers) and sundries. Transition costs may include temporary additional resource to support the bedding in of the new service/s and resolve issues.
- One-off and costs associated with communicating service changes, and any one-off or on-going educational programmes to reinforce behaviour change.
- Depot and/or transfer station infrastructure costs. The cost impact of service changes in terms of expanding, modifying or developing depots and/or transfer stations was not assessed. The space and permitting constraints of depots and transfer stations was not known but it is probable that changes involving increases in fleet size and/or material streams would require some degree of site development. The cost of changes to facilities could be substantial or even not possible. Given changes were both system and site-specific, it was not feasible to estimate the cost impact.
- The cost impact of changes to bulking, storage and haulage were not accounted for. The assessment is based on there being no change in logistics even when the method of collection or treatment was changed. For example, where the impact of a local authority switching from co-mingled recycling to two-stream with separate paper/cardboard was assessed, the change was assumed to have the same infrastructure. This is a modelling simplification. It was practically necessary as there is not comprehensive spatial data of transfer stations and treatment facilities. It was also theoretically necessary as the existing infrastructure should not be a constraint against change. An example of this is the existing AD infrastructure where facilities are largely located in the central belt; while impractical and cost prohibitive for some local authorities to use these sites, this barrier can be addressed through policy change.

7.0 Suggestions Based on Modelling

Based on the research undertaken as part of this project, using the best available data for Scottish local authorities, the modelling findings suggest;

- **Mandating weekly separate food waste collections for UR1–3 properties** (with a clear timetable for phased expansion to UR4–5 where practicable). Based on Eunomia's analysis this change will deliver the greatest carbon benefit alongside a recycling performance uplift. This change does however have significant infrastructure implications. Although it could be argued that a policy change such as this provides predictable feedstock growth signals to the treatment market to facilitate investment in plants, the location of facilities will be essential.
- **Support local authorities with a mixed organics service to move to a chargeable garden waste model.** The saving from this service change should be modelled and supported by a full business case, however, based upon Eunomia's modelling this service change could financially support the introduction of weekly separate food waste collections.
- **Supporting the reduction in effective weekly residual capacity, for example by transitioning to 3- or 4-weekly residual collections,** where local service modelling shows net benefits. For the purpose of updating the CoP, making this an essential requirement would need to be discussed in more detail. However, this approach will also give local authorities the opportunity to recognise savings locally to offset additional service costs generated by other changes such as weekly separate food waste collections.
- **Collection of non-separated glass permissible only where it can be demonstrated it is going into closed-loop recycling.** Eunomia recognises that although separate kerbside collections of glass have a much higher capture than bring systems, introducing separate collections require considerable capital investment and on-going operational costs. Non-separate collections can be introduced with lower on-going operational costs and no capital investment as they use the existing infrastructure. However, the environmental impact of these services is marked, and this is largely driven by how the material is recycled.
- **Developing a Scotland-wide organics infrastructure plan,** this would include mapping current vs forecast food and garden waste arisings by local authority, identifying capacity gaps and logistics pinch points. The aim of this would be to support expanded collection services especially in more rural areas, or where existing infrastructure is problematic or does not support service expansion. There will also be an impact on IVC operators that should be factored into considerations. Interviews indicated that infrastructure access was a key factor in service changes undertaken by local authorities already complying with the existing CoP.
- **Implementing a behaviour change and communication programme** to support service changes, as this is currently a cost borne by local authorities. Feedback from

interviews was that high quality and effective communications is essential to scheme success.

Appendix

A.1.0 Analysis of Impact of Introducing CoP Aligned Services and Barriers Faced

A.1.1 Approach to Primary Research

Eunomia interviewed with 11 local authorities (26 were invited to take part) to discuss CoP alignment, service change costs, and recycling impacts and recycling impacts.

Authorities were divided into sub-groups based on alignment with the existing CoP. These groups were: aligned, broadly aligned and not aligned. Table 7-1 provides a summary of how many authorities were interviewed from each group.

Table 7-1: Number of Authorities Interviewed by Sub Group Alignment

Alignment with CoP	Number of authorities interviewed
Aligned	8
Broadly aligned	2
Not aligned	1

The sample of authorities were selected to represent a range of rurality and deprivation. This can be seen in Table 7-2.

Table 7-2: Interviews completed by rurality and deprivation

		Rurality (Population density, capita per km ²)			
Deprivation (Based on percentage of social grade D&E)		Urban 0-11%	Mixed 11-20%	Rural 20-40%	Inaccessible 40+%
	Low	1	1	1	
	Mid		2		2
	High	2	2		

A.1.2 Interviews

All interviews followed a topic guide with questions previously agreed with Scottish Government. Questions covered the details of service changes to align with the existing CoP, changes to logistics and infrastructure, approach to communications, impact on performance, the cost of service changes and particular challenges or barriers to service change. The full

topic guide can be found in Appendix A.1.6. Questions were used to as a broad guide to conversation, but Authorities were allowed the freedom to openly discuss any feedback, suggestions or particular challenges they had.

Based on interview transcripts thematic analysis was undertaken which involved the identification of themes broadly related to the set of research questions. Transcript data was then organised and coded according to these themes to allow responses to be compared across authorities.

Section 4.1.1 summarises the key findings from these interviews, including those relating to implementation, performance, and lessons learned. Case studies for each interviewed local authority were also produced and are provided in Appendix A.1.4.

A.1.2.1 Interview Data Caveat

As part of the interview process, local authorities were asked to share any available performance data, as well as cost data relating to the service change, including implementation costs, impacts on revenue budgets, and annual service costs, to enable further analysis. Providing performance data proved challenging for many of the authorities interviewed. In several cases, service changes had been implemented recently (within the past year or less), meaning that only preliminary performance data were available or that no formal evaluation had yet been conducted. Others highlighted the difficulty of measuring impacts where service changes were rolled out on a phased basis.

With regard to cost data, while some authorities were able to provide indicative or ballpark figures, such as costs associated with bin provision, additional staffing, or infrastructure changes, many were unable to supply a detailed breakdown of expenditure. Information on the impact of service changes on revenue budgets or overall annual service costs was particularly difficult to obtain. This was either because the data were not yet available due to the recency of implementation or because interviewees did not have access to the relevant figures at the time of the interview. The project team attempted to follow up with local authorities to obtain additional cost information. However, these efforts were largely unsuccessful.

A.1.3 Interview Quantitative Analysis

Following the interviews, the team undertook additional analysis examining the impact of those service changes on kerbside recycling rates. This analysis focused on a sample of local authorities that had applied for Recycling Improvement Fund (RIF)¹⁷ funding and for which pre- and post-implementation SEPA recycling data were available, including both interviewed and non-interviewed authorities. The decision to focus on kerbside collection rates was made as there was a concern that other changes at HWRCs might cloud the SEPA reported local authority-wide recycling rate.

Information on the service changes was obtained through the interviews and publicly available case studies. The findings from this analysis can be found in Section 4.1.3.4.

¹⁷ Zero Waste Scotland (2023) [Recycling Improvement Fund \(RIF\)](#)

A.1.4 Interview Topic Guide

Question	Sub-question / prompt
Service change <i>The following questions relate to the waste collection service changes made in your local authority in order to better align to the essential and desirable requirements listed in the code of practice.</i>	
Please give an overview of any changes made to better align with the requirements in the code of practice	
When were these changes made?	What were the timescales, year and months are important. Where these changes made as a 'big bang' or in tranches/one service at a time
Were there any changes to the containers used for collection?	Change in types or size of containers / bin hubs. This could include swapping of containers between services
What changes to materials collected have been made?	Types of materials collected in DMR, food waste, WEEE, textiles etc.
Have you made any changes to the collection frequency of different waste streams?	e.g., reduced frequency of residual waste
Have you increased coverage of any parts of the service?	e.g. extended to communal properties, rural areas
Logistics and infrastructure	
Have the changes required any new infrastructure arrangements?	e.g. new treatment capacity or contracts, changes to location or infrastructure at depots, new transfer stations
What was the impact of the change on: - Recycling rate	

- Contamination - Waste arisings - Resident satisfaction	
Communications	
How did you communicate service changes to the public?	Leaflets, websites, email, Was it informative or designed to gather feedback? Did you use any innovative forms of communications? Is there anything you wish you had done or done more of?
What feedback did you receive on the changes being made and did this influence the changes you made?	
Costs	
What were the costs associated with the service change?	
What was the impact on revenue budgets/annual service costs?	
Was the funding received sufficient to deliver the change effectively? Or did you have to make compromises?	
Evaluation/Reflection	
Did you come across any barriers or challenges in delivering the changes?	
Would you make any changes to how you delivered the project if you were to do it again?	

Is there any support you could have received that would have made the change easier, more cost effective or increased its impact?

Guidance, funding, skills, expertise or training?

Table 7-3 Implementation of CoP

Category	Theme	Details	Examples / Notes
Rollout Approach	Timeframes vary by complexity, households and geography	Single phase feasible for small authorities; phased rollouts common in large rural areas and urban communal settings (often multi-year).	Small Central Belt authority delivered a complex change in one phase. Large rural authority phased over 18 months across seven areas. Two dense urban authorities expect multi-year updates for communal properties/tenements.
Resources Required	Bin provision was the main use of RIF funding	Repurposed co-mingled bins; new bin for paper/cardboard; reductions in residual capacity where needed.	In one case, residual capacity cut from 240L to 140L: residual bin repurposed for plastics/metals/glass; former co-mingled bin for paper/cardboard; new 140L bin issued for residual.
	Food waste expansion required extra vehicles	Vehicle needs scale with households added to service.	+30,000 households → 6 vehicles; +4,000 households → 2 vehicles.
Logistics & Infrastructure	Significant upgrades for some (4 authorities)	Adapt/expand transfer stations; build new stations (investments upwards of £17m); plan new MRFs to increase	One authority planning a new MRF; others investing in multiple transfer stations. Funding blends RIF support and council capital.

Category	Theme	Details	Examples / Notes
		in-house processing and reduce reliance on contractors.	
	Minimal changes for others (5 authorities)	Outsource sorting or use neighbouring infrastructure; some identified efficiency gains.	One authority reduced transfer stations from two to one. Another transferred waste to a neighbour handling source-separated material.
Communications	Multi-phase communications timeline	4–6 weeks: teaser letters with rationale; 1–3 weeks: detailed instructions, calendars and bin guidance; final info delivered with new bins.	One council aimed to ‘take residents on a journey’.
	Multi-channel engagement, including non-digital	Social media, email, websites, local press, posters in communal areas, in-person events; additional staff capacity to handle queries.	Noted significant effort to reach residents who are not digitally enabled.
	Funding and expert support	Comms not eligible for RIF; councils viewed this as a gap; ZWS-provided consultants were rated extremely valuable.	At least two authorities received external comms support via ZWS.

Category	Theme	Details	Examples / Notes
	Post-rollout engagement	No ongoing communications maintained, but several see value in continued education, e.g., to reduce contamination.	One authority is considering a future contamination-focused campaign.

A.1.4.1 Lessons learned

As part of the interviews, local authorities shared the lessons they wish they had known at the start of their service change. These lessons fall into four key themes: planning and funding, service change rollout, customer satisfaction, and communications and ongoing engagement, which are explored in more detail below.

Planning & funding:

- Start funding discussions early and strengthen applications by learning from other councils' experiences.
- Coordinate thoroughly with internal departments at the design stage to avoid delays, stoppages, and complaints later on.
- Consider using a 1-2-3 collection scheme instead of a four-weekly recycling and three-weekly residual service, as it is operationally simpler and easier for residents to understand.

Service change rollout:

- Consider using external contractors for bin deliveries where staffing or recruitment is challenging.
- Be realistic about the number of households that can be included in each rollout phase.
- Build flexibility into the rollout plan so phases can be reordered if delays arise, helping to avoid overall project delays.
- Where possible, allow time between rollout phases to assess the service and implement any learnings.

Customer satisfaction:

- To avoid capacity constraints becoming a source of dissatisfaction, ensure sufficient additional bins are ordered to meet demand from households eligible for extra residual capacity, and do not limit households to a single recycling bin. One council found that almost 2% of households requested additional bins during rollout.
- To minimise dissatisfaction during a transition to reduced residual waste collections, offer interim collections for residents most affected, such as those waiting up to five weeks for their next collection.

Communications & ongoing engagement:

- Invest in sustained communications before, during, and after the service change, particularly to educate residents on the correct materials for each bin. This could be supported by adaptable materials shared by central government that each authority can personalise.
- Put resources in place to monitor material quality on a daily or weekly basis, using this information to target high-contamination areas and re-engage residents.

A.1.5 Case Studies

A.1.5.1.1 Aberdeen City

Local Authority	Aberdeen City
Current Service	Co-mingled dry recycling (including glass), mixed food and garden waste
Alignment with CoP	No

Council Background

The Council implemented a fully co-mingled dry recycling service in 2017. A key part of this service change was the construction of a purpose-built MRF designed to accommodate glass, alongside a move away from the previous box-and-bag collection system. The Council perceives this system as equitable, as households in both urban and suburban areas receive access to what is effectively a full recycling service. By 2019, they believe the full impact of these changes was evident, with Aberdeen City achieving a 51% recycling rate, which was above the Scottish average at that time.

Code of Practice Alignment Perspective

The Council's view is that a fully co-mingled collection system, supported by a modern, purpose-built MRF, can deliver the best outcomes in an urban area with a high proportion of communal bins. Unfortunately, the Council's MRF was destroyed by fire in 2022, which has impacted recycling rate performance. As a result, data from 2022 onwards do not fully reflect the performance of a fully co-mingled service or provide a complete picture when assessing alignment with the Code of Practice.

Barriers to Aligning with CoP:

- **Space:** In communal areas, there is insufficient space for the additional bins required for two-stream recycling.
- **Exemptions:** If communal properties are exempt from alignment, messaging to residents becomes more complex, as the Council would be operating two different services (co-mingled collections in urban areas and two-stream collections in suburban areas). This would also require managing different material streams through the MRF.
- **Reliance:** As the service becomes more complex, operational resilience decreases, increasing the risk of service disruption.
- **Costs:** Achieving alignment would require significant financial support, as Aberdeen City would likely need a new vehicle fleet, additional bins, a comprehensive communications plan, and a dedicated project team to support planning and implementation.

A.1.5.1.2 Aberdeenshire

Local Authority	Aberdeenshire
Service change to align with CoP	Two-stream recycling with 3-weekly residual waste collection.
Previous Service	Fortnightly co-mingled and residual collection
Date of Change	April 2023 – April 2024
Funding	£3.5M in RIF funding provision of new bins, pilots with bin distribution company
Financial Savings	£2m annual savings in waste disposal cost

Details on service change:

Aberdeenshire moved from a co-mingled service to a two-stream service for paper/cardboard and plastics/metals, not including glass. A new 180L orange lidded bin was introduced for plastics/metals, while the previous recycling bin was used for paper/cardboard. The frequency of residual waste collections was reduced from fortnightly to 3-weekly, reducing the weekly capacity from 120L to 80L. Glass continues to be collected at dedicated collection points in supermarkets and car parks. There were no changes to food or garden waste collection.

Communications:

The communications strategy covered phases from pre-rollout, during rollout and post-rollout for six areas (one for each depot). The outputs covered direct-to-household messaging, direct-to-trade messaging, social media and websites.

Pre-rollout information went to the household 6 weeks prior to the service change and included a teaser postcard giving advance notice with what to expect and why the change is taking place. Two to three weeks prior to the change, a letter, information booklet and calendar giving detailed information on the service change including how to use the new bins and community events where questions could be posed. During the rollout, bin stickers and tags were also provided, giving information on what materials should go into which bins.

Logistics and infrastructure changes:

Aberdeenshire made a number of changes to 5 out of 6 transfer stations to increase its capacity to be able to take the split of dry mixed recycling to paper/cardboard and plastics/metals. The council built additional storage bays at Stonehaven using Lev-co blocks made from recycled materials from their street sweepings. A 360x excavator grab was also moved to this site, as this was needed to maintain access to the sheds when the vehicles were unloading due to the additional bays. A cardboard baler at the Ellon transfer station was also removed to accommodate additional bays, which meant that the council stopped baling their own cardboard. One transfer station had construction works to extend the building at Kirkhill to accommodate the additional bays.

Impacts of change:

Residual & Recycling Tonnages:

The service change resulted in a reduction in residual waste collected and disposed of 1,031 tonnes from 2022 to 2023 and a further reduction of 1,861 tonnes from 2023 to 2024. This amounts to a reduction of 4.3% in residual tonnages from 2022 to 2024. The recycling rate increased by 2.8% from 2022 to 2023, reaching 43%. Further increases in the recycling rate are expected but these figures will not be published until later in 2025. It was noted that recycling tonnages also decreased slightly, while food waste showed a slight increase. Reductions in residual waste tonnages and increase in tonnage for some recycling streams has led to a carbon saving of 1,685 tCO₂e from 2022 to 2024, which is attributed to this service change.

Contamination Rate:

Contamination in the bins reduced overall from splitting out the recycling into two separate streams by 4.5%.

Resident Satisfaction:

Aberdeenshire monitors their resident satisfaction monthly through a third party. They found that resident satisfaction dropped initially each time they rolled out the service change to a new area, before recovering again to pre-roll out levels. This was attributed to minor teething problems with the service, such as missed collections or not being delivered the bin, as this drop in satisfaction was not sustained. Most depots experienced an increase in missed bin rates, and for some depots this took longer than others to come back down to normal, in some cases two or three collection cycles.

Cost Savings:

As a result of splitting recycling collections into two separate streams and reducing the residual waste collection, there have been annual savings of approximately £2m from the waste disposal budget. This exceeded the expectations of any anticipated savings. However, this is partly due to increased recycle quality and is subject to the volatility of the recycling markets.

Reflections:

Sufficient Funding:

The council received £3,540,415 from the Recycling Improvement Fund for new bins and pilots with the bin distribution company. The council also invested £1,175,000 of its own capital for infrastructure improvements and additional loading equipment. The council's revenue funding also covered the cost of staffing, communications and printing which was £542,000.

Barriers to delivering changes:

There are approximately 200 households in Aberdeenshire that do not have access to a food waste collection due to accessibility issues. The council raised concerns at the possibility of a blanket mandated food waste collection, as this would require them to purchase an additional vehicle that would be able to access the 200 households.

Aberdeenshire also raised concerns at the possibility of being required to collect garden waste as part of their service. As some of the transfer stations would not be able to accommodate the additional bays needed to transfer and sort the waste.

Lessons learned:

- The council had to add an extra collection vehicle than was originally planned to deal with the additional capacity with the new collection routes. The routes were revised to make them more efficient and to take the additional weight from moving to 3-weekly residual collections into account. However, the routes as calculated by the computer ended up being too large and overestimated the number of bins that crews could collect before reaching the vehicles maximum load. This led to the council adding an extra vehicle to cope with the capacity from newly build houses and reduced residual collection frequency.
- The council ordered additional bins with 240L and 140L capacity to cater for households that wanted extra capacity (for larger families) or smaller bins (for manoeuvrability) than the 180L bins that were delivered as standard. They also did not limit households to one recycling bin if they requested additional bins. 3000 additional bin requests in total were made at the rollout which equates to just under 2% of households.
- Due to delays in construction work at one of the transfer stations, the council had to delay the rollout for the area covered by the site. The council was able to adapt to this by changing the order of the rollout, as it was not the final phase. This led to no delays in the overall project rollout.

A.1.5.1.3 Angus

Local Authority	Angus
Service change to align with CoP	Two-stream collection (alternate fortnights, 240L bins), increased glass collection points, expanded food collection
Previous Service	Fully co-mingled (including glass, 240L bin), some food collection
Date of Change	June 2024 – March 2025 (nine-month implementation period)
Funding	£2.8M in RIF funding (provision of new bins, 2 food waste vehicles, additional glass collection points) + other council funding (communications)
Financial Savings	£0.5M in disposal costs to date

Details on service change:

Angus moved from a co-mingled service including glass to a **two-stream system**, with glass collected at dedicated collection points. A **new 240L bin** was introduced for paper/cardboard, while the existing 240L bin was used for plastics/metals. Food waste collections were also extended to 4,000 additional households, mainly those removed from the service in 2016 due to inefficiencies, enabled by lower disposal costs and the purchase of **two new food waste vehicles**.

Communications:

A two-pronged message was used to promote the service change, highlighting environmental benefits and cost savings. Communications were designed to take residents on a journey, starting with reminders that announcement letters would soon arrive on their doorsteps. The team also engaged directly with residents who were not digitally enabled and ensured additional staff were available to answer questions.

ZWS supported the service change by producing a range of communications materials, including posters displayed in public spaces such as supermarkets, social media posts, and features in local news outlets.

Logistics and infrastructure changes:

The council introduced the service change as part of the re-procurement of the new waste collection contract. The service change also provided an opportunity to undergo route optimisation, which identified further efficiency gains, including a transition from two transfer stations to one.

Impacts of change:

Residual & Recycling Tonnages:

As the service was rolled out recently, complete data is not yet available. Early indications suggest that the move to two-stream recycling has not led to a significant change in recycling volumes compared to the previous co-mingled service, despite the removal of glass. Residual waste tonnages have decreased, although this is difficult to attribute directly to the service change and may reflect wider national trends.

Contamination Rate:

Contamination rates are higher than under the co-mingled service. Paper/cardboard streams show lower contamination than plastics/metals, suggesting residents have a better understanding of this element. The Council has expressed an intention to improve resident education regarding the two-stream service, but no specific initiatives are currently in place.

Resident Satisfaction:

A pre-change survey showed that the removal of kerbside glass collection was less acceptable to residents than the introduction of an additional bin. However, Angus residents are generally engaged and rule-compliant, and most adapted to the new service with minimal complaints.

Cost Savings:

The council has achieved disposal cost savings of over £0.5 million to date. As this coincided with the start of a new contract, it is unclear whether savings will continue at the same level, although further savings are expected.

Reflections:

Sufficient Funding:

Funding from RIF was largely sufficient, although it was difficult to accurately assess requirements at the application stage. ZWS was flexible in allowing funds to be reallocated as needed. However, RIF funding does not cover communications, which is an oversight given that it's a vital part of any service change.

Barriers to delivering changes:

Installing glass recycling points was more challenging than anticipated, as residents and businesses were often opposed to having glass bins located nearby.

Lessons learned:

- It is important to make funding applications as robust as possible by starting conversations early and learning from other councils' experiences.
- Consider using an external contractor for bin deliveries, as it can be challenging to ensure there is sufficient staff in place for each delivery, especially if recruitment is difficult.
- Be realistic about the number of households that can be served in each phase of the rollout.
- Ensure adequate staffing resources are in place to manage the introduction of new glass recycling points, recognising the potential for opposition from residents and businesses unwilling to have recycling points located nearby.

A.1.5.1.4 Clackmannanshire

Local Authority	Clackmannanshire
Service change to align with CoP	Two-stream collection (alternate fortnights, 240L bins), 4-weekly residual (240L bin)
Previous Service	Co-mingled (excluding glass), 3-weekly residual (240L bin), separate weekly food collection
Date of Change	October 2023
Funding	£0.5M in RIF funding (provision of new bins)
Financial Savings	Broke even

Details on service change:

Clacks moved from a co-mingled service to a **two-stream system**. A new **240L bin** was introduced for paper/cardboard, while the existing 240L bin was used for plastics/metals. Residual waste collection moved from 3-weekly to **4-weekly**. Coverage remained the same post service change and no additional vehicles were required. Separate weekly food waste service also remained unchanged as it has been available to all but the most rural residents for the past 12 years.

Kerbside glass collection ended in 2019 due to the high cost of the service and low recycling income. The Council added communal recycling facilities in town centres in 2024 after an inquiry from SEPA about how the Council was planning to increase coverage of glass collection.

Communications:

They used standard communication channels, including three advance mail drops ahead of the change, followed by an information leaflet immediately prior to implementation. This was supported by email communications and social media activity.

In the future, they plan to run a targeted campaign to address contamination issues once the root cause has been identified. They may also do another campaign. A further campaign focused on food waste is also being considered, using participation in the service as a lever for households that need to request an additional bin (i.e. larger households or those with a medical condition), as eligibility requires engagement with the food waste service.

Logistics and infrastructure changes:

The Council retained its existing depot and transfer stations, transferring waste via Stirling Council, which already had arrangements in place to accept separated materials. This helped to mitigate costs. The Council also implemented two new contracts for separated paper/cardboard, and plastics/metals, respectively. Previously, Clacks sent all dry recycling to Northern Ireland.

Impacts of change:

Recycling Rate:

The recycling rate increased by 5.3 percentage points between 2023 and 2024, driven by a reduction in residual waste (−8.1%) and increases in food waste (+12.2%) and garden waste (+53.4%) tonnages. The Council also hypothesises that the increase in the recycling rate may be partly attributable to a shift from landfill to incineration for residual waste.

Recycling Tonnages:

Following the service change, there was an initial increase in requests for food waste caddies and a corresponding rise in food waste tonnages; however, both have since stabilised. The Council believes this initial increase may have been driven by residents' concerns about coping with a four-weekly residual waste collection cycle.

Glass tonnages collected at communal recycling bins have increased more recently, which may indicate that residents are increasingly using this recycling service to reduce the volume of their residual waste.

Contamination Rate:

Contamination levels in plastics/metals recycling bins have increased, largely due to residents placing residual waste in them. Council is currently exploring options for a targeted communications campaign to address this issue.

Resident Satisfaction:

Clacks has not carried out any formal resident satisfaction research due to a lack of resources. However, anecdotal feedback suggests that there has been very little overall negativity in response to the service change. The most common concern related to a perceived lack of space for additional bins, although this concern appears to have diminished once residents worked out how to accommodate them.

Cost Savings:

Under the previous system, the Council paid for the disposal of co-mingled materials. Following the move to a two-stream system, recyclable materials now generate an income. As a result, the Council considers that the service change was largely self-financing.

Reflections:

Sufficient Funding:

Overall, the Council was satisfied with the level of funding available to support the service change, although additional council funding was required to cover communications.

Barriers to delivering changes:

Overall, the service change was delivered smoothly. The issues that arose were relatively minor, mainly relating to bin distribution, and were resolved quickly.

Lessons learned:

To support a smooth rollout of a reduced residual waste collection frequency and minimise resident dissatisfaction, residents most affected by the change (i.e. those required to wait up to five weeks for their next residual collection) should be offered an interim residual waste collection.

A.1.5.1.5 Edinburgh

Local Authority	City of Edinburgh
Service change to align with CoP	Increased capacity for recycling for communal properties
Previous Service	Two-stream service with paper and mixed packaging bins, limited glass collections
Date of Change	November 2021 – Ongoing
Funding	£8.5M in RIF funding (provision of new bins, corralling and associated roadworks, electric waste collection vehicles, in-cab devices, bin sensors) + other council funding (communications)
Financial Savings	Not known

Details on service change:

Edinburgh optimised their communal bin hubs by moving from paper and mixed packaging bins to segregated bins for non-recyclable waste, dry mixed recycling (paper, cardboard, plastic and tins), glass recycling, and food waste. This increased coverage for some households with a partial recycling service, with most households not having a glass or food collection. It also increased capacity for most residents and increased the collection frequency, which is every two-days for most areas for residual, recycling and food waste. Glass collections are ad-hoc, measured by new level sensors.

Communications:

ZWS supported the council in developing communication materials across a range of delivery methods, including lamppost signage, leaflets, and social media posts. Residents received a letter describing the changes and a guide containing detailed information on how to recycle with the new service.

The leaflet helped residents understand how to reduce, re-use and recycle waste, with details on what to include in bins. It includes information on why it is important to recycle, its benefits and what types of products materials can be recycled into. It also included information on how to book bulky waste collections and order food waste caddies.

Logistics and infrastructure changes:

There were no changes to infrastructure as the council outsources its sorting and makes use of two transfer stations.

Impacts of change:

Residual & Recycling Tonnages:

The communal bin review project is ongoing, so complete service change data is unavailable. But in terms of individual recycling streams, glass collected from on-street communal bins has increased 30-35% from an average of 2,900 tonnes in 2019/20 to nearly 3,800 tonnes in 2022/23.

Contamination Rate:

The interviewee did not have data to share on how contamination rates have changed since the installation of the new bin hubs.

Resident Satisfaction:

Requests for servicing overflowing communal bins has decreased 85% compared to pre-pandemic levels, indicating that issues around capacity have been addressed by the new bin hubs.

Cost Savings:

It is unclear whether the council has made cost savings, as any savings from cleansing services on litter has been offset by the increased collections. However, the council have maintained that the aim of the review was never to achieve cost savings, but to increase capacity, improve resident experience and optimise the service.

Reflections:

Sufficient Funding:

The council initially received £7.7m from the RIF for the refurbishment of bins, corralling and associated roadworks, electric refuse vehicles, in-cab devices and bin sensors. The council declared that global economic challenges led to increased costs, particularly for those associated with equipment and fuel. Therefore, the council successfully applied for an additional £792,000 to offset some of these costs. Funding was largely sufficient, however it did not cover all costs associated with the service change, as the council committed £3.2m of capital investment to upgrade communal bins.

Barriers to delivering changes:

High density urban areas led to challenges with designing the streetscape for new bin hubs due to limited space. Streetscape design had to consider parking spaces and planned roadworks as well as the introduction of new travel infrastructure including new cycle lanes and trams. The need to coordinate works and obtain permissions from several other council departments made the planning process more complex.

Making changes to streets and car parks on land that the council doesn't own also creates a challenge and limits what they can do.

Lessons learned:

- It is important to go through the rigour and detail of coordinating with various council departments at design stage before work takes place. This supports you better at later stages and results in fewer stoppages and complaints compared to a 'hope for the best' approach.

- There are more effective routes for collecting textiles, WEEE and batteries in urban areas than at the kerbside where space is limited. Residents in urban areas often have access to established routes for recycling these materials such as supermarkets.

A.1.5.1.6 Fife

Local Authority	Fife
Service change to align with CoP	Soft plastics collection and food waste collection for communal properties
Previous Service	Two-stream service with food waste collected at kerbside
Date of Change	April 2022
Funding	£470,000 (+ £30,675 for food waste collections)
Financial Savings	Unknown

Details on service change:

Fife introduced a two-stream collection service in 2015, so the majority of changes to align with the CoP occurred before it came into play. Since then, Fife has introduced **soft plastic film collection** at the kerbside, which was achieved through the purchase of an optical sorter to enable the separation of films at the MRF. This was enabled through a £470k RIF award. Fife also introduced **food waste collections to a small number of properties for mid-rise and high-rise communal properties** which previously didn't have a collection, which affected around 800 households.

Communications:

The change to include soft plastic collections at the kerbside was communicated via standard communication routes. This included updates on Fife's website, social media channels and newspapers. Although the council stated that lots of soft plastic material was already being disposed of in the recycling bin as contaminated material, so feel that communications didn't influence many residents' disposal habits.

Logistics and infrastructure changes:

The main change to Fife's waste infrastructure included the addition of the optical sorter at the MRF which enabled the sorting of soft plastics. The council's arms-length organisation built and commissioned the MRF in 2021. Fife also were able to realign their collection service so that all plastics/metals in the authority were collected in the same two-week window, allowing all plastics/metals to run through the MRF at the same time. The council do the same with paper/cardboard, which are collected in the two weeks following the plastics/metals, allowing the MRF to be cleaned down and this material to go through. This allows for a more efficient service, better bulking and less stockpiling of materials.

Impacts of change:

Residual & Recycling Tonnages:

The council set a target to collect 2,733t of flexible plastics each year from the purchase of the optical sorter. In 2023, Fife reported that 456 tonnes of flexible plastics were recycled. This

contributed to an increase of 0.3% to the recycling rate. Fife also reported carbon savings of 1,302 tCO₂e.

Contamination Rate:

Contamination rate for plastics/metals has remained steady at approximately 30% for the last two years, due to lots of 'wishcycling' for certain plastics and glass, from residents assuming glass can be collected at the kerbside.

Resident Satisfaction:

The council expects that resident satisfaction has not changed much since the changes have been made to soft film collection, due to soft films being collected previously, before being removed from the service prior to being added again.

Cost Savings:

The council did not share any cost savings from delivering the service change, in part because the processing is managed by an arm's length organisation and therefore Fife has less visibility over these costs.

Reflections:

Sufficient Funding:

The council received a £470,000 RIF award to purchase the optical sorter for the MRF, which was sufficient. Fife also received an additional £30,675 from the RIF for communal food waste bins, caddies and liners.

Barriers to delivering changes:

Challenges arise from the large geographical and population size of Fife, covering 188,000 properties, and the relatively small team size.

Lessons learned:

- Communications strategies should cover the period during and after a service change, rather than exclusively in the lead up to the rollout. Some generic communication materials that could be personalised by the council would support with this.

A.1.5.1.7 Glasgow

Local Authority	Glasgow
Service change to align with CoP	Individual/Low-Rise Properties: Two-stream collection (alternate fortnights, 240L bins) Communal Properties: Two-stream collection (1280L 4-wheel bin hubs at front of property, collected every 8 days), expansion of food waste collection
Previous Service	Individual/Low-Rise Properties: Co-mingled, glass box, Communal Properties: Co-mingled (240L wheeled communal bins at back of properties, collected every 16 days), minimal food waste collection
Date of Change	Individual/Low-Rise Properties: March 2024 – March 2025 Communal Properties: August 2025 – August 2027 (2 years)
Funding	Individual/Low-Rise Properties: £4.2M in RIF funding (provision of new 240L bin, food waste caddies and liners) Communal Properties: £7.2M funded by Council (provision of 1280L bin hubs)
Financial Savings	Individual/Low-Rise Properties: £0 as it's the same collection crews on the same frequency cycle Communal Properties: TBD

Details on service change:

- Individual/low-rise properties: Glasgow introduced two-stream recycling to 125K individual/low-rise properties over the course of a year starting in August 2025. The former 240L co-mingled recycling bin now collects paper/cardboard only and a new 240L bin was issued for plastics/metals/glass. Alongside the service change, two new policies were introduced. The contamination policy requires crews to receive additional training from external organisations to support contamination checks. The bin policy limits households to one 140L general waste bin per collection.
- Communal properties: Glasgow began introducing two-stream recycling to communal properties through a pilot in 2023, which has recently been expanded to all 185K communal properties across the city. The service change involves relocating communal recycling bins from the rear of properties to the front, replacing 240L wheeled bins with larger 1,280L four-wheel bins, and increasing collection frequency from once every 16 days to once every eight days. The full rollout, starting in August 2025, will take two years to complete and will be delivered on a geographical basis. Residents have also

been provided with reusable bags to help transport recyclables from communal properties to their front-of-property hubs. While the change aligns with the Code of Practice, it was primarily driven by the need to address collection and health and safety challenges associated with rear-of-property collections. The Council is also using this rollout to reintroduce food waste collections to communal properties where the service had previously been removed due to low participation and contamination.

Communications:

- **Individual/low-rise properties:** Glasgow's communications strategy was developed in partnership with an external consultant, funded by ZWS. The Council was very grateful for this additional support. The strategy included a letter issued four weeks before the service change, followed by an instructional leaflet one week prior. The Council also used its website, social media channels, and internal publications to keep residents and staff informed.

Logistics and infrastructure changes:

There has been no significant infrastructure investment to date to support the service change. However, a new MRF is currently under construction (ETA 2027) as part of a wider depot development that also includes a new transfer station and HWRC. The project is funded through a combination of RIF funding (£17m) and internal Council funding. Currently, all plastics/metals/glass and some paper/cardboard are sent to external contractors for processing. The new facility is intended to enable the Council to process a greater proportion of its materials in-house, reducing reliance on external contractors and providing a secure outlet for materials collected through the new two-stream service.

Impacts of change:

Contamination Rate:

- **Individual/low-rise properties:** Glasgow has submitted initial performance figures to ZWS, which are lower than expected due to issues with contamination and material quality. The Council believes this may be linked to the two policy changes introduced alongside the service change. The bin policy reduced residual waste capacity, which may have led some households to use recycling bins to dispose of residual waste. At the same time, the contamination policy has not been enforced consistently by crews, either due to limited training or to avoid abuse from angry residents, allowing contaminated recycling to continue to be collected.

Resident Satisfaction:

- **Individual/low-rise properties:** Residents' primary gripe with the service change was the addition of another bin, bringing the total to five per household. However, these complaints have since died down.
- **Communal properties:** Reception to moving bins from the rear of communal properties to the front has been mixed among residents and community councils due to concerns about aesthetics, but it has generally not been as problematic as anticipated.

Cost Savings:

- **Individual/low-rise properties:** No noticeable cost savings as the Council is leveraging the same collection crews on the same frequency cycle.
- **Communal properties:** There may be some eventual savings, as smaller crews are needed to deliver the service, and it may require fewer vehicles.

Reflections:

Barriers to delivering changes:

The barriers primarily related to encouraging behaviour change in both individual/low-rise properties and communal properties. For communal properties, there were challenges in re-engaging properties that had become disenfranchised from recycling and encouraging uptake of the food waste collection service. Across both collection systems, there were difficulties in educating residents to put the right materials in the right bin and to minimise residual waste in the recycling bin.

Lessons learned:

- Invest in ongoing communications, rather than only communicating with residents at the start of a service change. Ongoing communications that educate residents on the target materials for each bin are particularly helpful.
- Ensure resources are in place to check the quality of materials collected on a daily or weekly basis. This information can then be used to target areas with high levels of contamination and re-engage with residents.
- Rather than rolling out two-stream collections to communal properties immediately after the individual/low-rise properties rollout, time should have been taken to assess the service and implement any learnings first.

A.1.5.1.8 Highland

Local Authority	Highland
Service change to align with CoP	Two-stream collection (alternate fortnights, 240L bins, excluding glass), fortnightly residual (140L bin), expanded food collection
Previous Service	Co-mingled (excluding glass), fortnightly residual (240L bin), separate weekly food collection, limited food collection
Date of Change	April 2024 – October 2025 (phased over 18 months and 7 operational areas)
Funding	£7.1M in RIF funding (extending 2 existing transfer stations, 6 new food waste vehicles, bin provision), £17.5M from the Council's Capital Programme (3 new transfer stations), £300K in other Council funding (communications)
Financial Savings	£648K removed from budget in year 1 of service change (2024/2025)

Details on service change:

The new service was rolled out over the course of 18 months across the Highlands' 7 operational areas, as it was not possible to implement it in one go due to the size of the region. During the service change, the Highlands moved from a co-mingled service to a **two-stream system** and **reduced residual waste capacity** from **240L to 140L**. The former 240L residual bin was repurposed as the plastics/metals bin, while smaller residual bins were distributed to residents — 140L for most households and 180L for some rural households. The Council also **doubled food waste collection coverage**, with 60,000 households now receiving the service (around half the population). Households that do not yet have weekly food collections are primarily in remote rural areas, where low population density and long travel distances make transportation costly.

Communications:

The Council used standard communication methods, including social media posts, booklets distributed with bins, and teaser letters issued in advance of the service change. Multiple points of contact were essential to delivering a successful transition, as the changes were complex to communicate, particularly in areas where collection days were also altered alongside the service change.

Logistics and infrastructure changes:

The Council made significant infrastructure investments to support the new two-stream service, funded through RIF funding and its Capital Programme. This investment included the

construction of three new transfer stations (£13M, £3.5M, £1M) and the extension of two existing sites: one on the Isle of Skye (£1.3m) and one in Caithness (£400k).

Impacts of change:

Due to the recency of the service change, and the fact that it was rolled out using a phased approach, the Council says it is difficult to assess the full benefits at this stage. However, it notes that the previous co-mingled service had become increasingly problematic, as it was expensive and had limited market outlets. The change has already been a significant step forward for the Council, with improved value from the recycling collected and a reduction in residual waste tonnage. Together, these changes have delivered first-year cost savings of £648k.

Reflections:

Sufficient Funding:

The Highlands was committed to delivering the service change regardless of any additional costs, which were met through existing revenue budgets or staff resources. They acknowledge that full funding for service change is rare and note that their RIF funding was the third highest ever allocated in Scotland. As such, they are very grateful for this level of support and for their relationship with ZWS.

Barriers to delivering changes:

The Highlands' barriers to change primarily relate to food waste collection. There is concern that food waste collection will become a mandatory requirement for all households under the new CoP, which would be near-impossible to deliver in some parts of the authority. Food waste collection is already under pressure due to unexpected uptake, despite the addition of 6 new vehicles and route optimisation exercises. The Council has also faced challenges due to a lack of authorisation to stockpile food waste at transfer stations, resulting in half-full skips being transported from the Highlands to central Scotland for processing. However, authorisation has recently been granted to stockpile at two transfer stations.

A.1.5.1.9 Inverclyde

Local Authority	Inverclyde
Service change to align with CoP	Introduced recycling service to tenemental properties
Previous Service	Refuse bags
Date of Change	2025
Funding	£95,572 in RIF funding provision of new bins to enable communal recycling
Financial Savings	Unknown

Details on service change:

Inverclyde introduced a recycling service to 3,500 communal properties. The households affected were in tenemental, high density properties which were classed as 'difficult to manage'.

Communications:

The communications strategy utilized direct to household messaging which included leaflets and letters. The council also updated information on their website and made social media posts. However, it was reported that engagement was low with the communications that were sent, which was suspected to be due to a lack of recycling culture.

Logistics and infrastructure changes:

Inverclyde made no changes to infrastructure to enable the service change, aside from 3,500 new dry mixed recycling bins for properties. The collection crews and vehicles were also the same from the previous service.

Impacts of change:

Residual & Recycling Tonnages:

The additional recycling service to communal properties was introduced this year and therefore statistics on waste tonnages are not available yet. Inverclyde reported that residual tonnages have gradually been dropping but states that this is due to waste generated tonnages have been decreasing on average over the last few years.

Contamination Rate:

Inverclyde reported relatively consistent contamination rates since before the service change.

Resident Satisfaction:

Inverclyde reported that residents did not provide a lot of feedback on the service changes to 3,500 properties, stating that there was the usual mix of residents welcoming the change and

being opposed to it. The council also reported that there is a lot of apathy around recycling in general, particularly in areas of high deprivation, claiming that it is difficult to get people to engage in recycling over other social issues.

Cost Savings:

Due to the service change only being made this year, it is too early to conclude whether any cost savings have been made.

Reflections:

Sufficient Funding:

Capital costs for the project included bins and distribution, all of which were covered by the RIF award of £95,572.

Barriers to delivering changes:

Due to the nature of the project, the service change was tackling the most 'difficult to manage' properties. Therefore, challenges arose over demographic characteristics such as a very transient population from a high student proportion. The council also highlighted challenges in engaging their residents with recycling, explaining that there is general apathy around recycling, and it is seen as 'less important' than other social issues. This is particularly prominent in areas of high deprivation. The council also stated that this should be taken into consideration when deciding whether to move to a two-stream recycling service, explaining that as engagement with the service is already low, it may not be the most cost-effective way to increase recycling rates and minimise waste.

Lessons learned:

- The council printed leaflets in various languages in consideration of households where English was not the first language.

A.1.5.1.10 Orkney

Local Authority	Orkney
Current Service	4-Stream (glass, plastic bottles, paper & thin cardboard, metals & aluminium)
Alignment with CoP	Recycling service is not two-stream, plastic collection only includes plastic bottles, islands do not receive kerbside collection, no separate food waste collection

Council Background

Orkney has not made any significant changes to its recycling system since 2012. The Council operates a **four-stream, source-separated system**, collecting glass, plastic bottles, paper and thin cardboard, and metals and aluminium. They only collect plastic bottles. Collections run on a fortnightly cycle, with two material streams collected each week. Prior to COVID-19, all four streams were collected in the same week using the same two bins but with the addition of dividers. While bins are now fuller at collection, there has been no change in the recycling rate over the past five years. Orkney is **exempt from food waste collection**.

On the islands, residents are typically provided with bring sites for recycling, often placed at a single site at the pier. They don't collect plastic bottles as it's too expensive. On some islands, the service is provided by contractors who co-collect trade waste with domestic.

Code of Practice Alignment Perspective

Orkney would like to ensure that the next CoP recognises and allows for small, dispersed populations and low volumes of material, and that it does not disrupt existing markets and systems that are currently working well. While funding can help address many challenges, it is not the only consideration. For Orkney, aligning fully with the CoP could result in poor value for money.

The Scottish Government appears to recognise these challenges. A previous proposal for a new processing facility would have enabled the collection of food and garden waste, allowed for the co-collection of plastics and metals, and supported an expansion of plastic collections. However, despite an application for Scottish Government funding, the proposal was ultimately rejected.

Barriers to Aligning with CoP:

- **Two-Stream:** Implementing a two-stream system would require co-mingling plastic and metal streams and expanding plastic collection beyond bottles. As they do not have a sorting facility, materials would need to be sent externally for reprocessing, which is unlikely to be cost-effective given their low volumes. In addition, plastic bottles generate higher revenue than mixed plastics, further increasing costs. They currently break even on collection and disposal, and any changes could result in a negative financial balance.

- **Food Waste:** There are no plans to introduce separate food waste collections, as capture rates would be low relative to the costs involved, including the need to build dedicated processing facilities.
- **Kerbside Collection:** This is impractical on the islands due to small, sparsely populated communities, complex road networks, long ferry journeys, and other logistical challenges. These include coordinating with ferry timetables, managing weather-related disruptions, and, in some cases where ferries lack roll-on/roll-off facilities, craning lorries on and off the islands.

A.1.5.1.11 Renfrewshire

Local Authority	Renfrewshire
Service change to align with CoP	Two-stream recycling with 3-weekly residual waste collection. 100% coverage of food waste collection
Previous Service	Fortnightly co-mingled and residual collection. 80-90% food waste coverage
Date of Change	March 2019 (moved to two-stream) 2025 (increase food waste coverage to 100%)
Funding	£750k in RIF funding provision of new bins
Financial Savings	Unknown

Details on service change:

Renfrewshire moved from a fortnightly co-mingled service to a two-stream service for paper/cardboard and plastics/metals/glass. A new 240L blue bin was introduced for paper/cardboard, while the previous recycling bin was used for plastics/metals/glass. The frequency of residual waste collections was reduced from fortnightly to 3-weekly, reducing the weekly capacity from 120L to 80L. Food and garden waste is collected fortnightly in a mixed bin, which was rolled out to additional households to achieve 100% coverage.

Communications:

Renfrewshire employed a number of communication measures to promote use and engagement with the recycling service; early indications show that there has been an increase in participation rates although specific numbers were not available. Methods included: leaflets delivered with an annual supply of food waste liners, social media and included reasons why it is important to recycle.

Logistics and infrastructure changes:

The council stated that there were no changes to the infrastructure to accommodate the service change as this is all contracted out and the council do not have a transfer station. Food waste vehicles were purchased in 2014 for the initial rollout of separate food waste collections which were switched when the service moved to a mixed collection with garden waste. No additional vehicles were purchased for the service change to two-stream.

Impacts of change:

Residual & Recycling Tonnages:

The move to two-stream in 2019 saw a significant uplift in recycling tonnages in the first year of 3,213t from 2018 to 2019 according to SEPA data. The council also indicated that food and garden waste this year saw a 10% increase in tonnage.

Contamination Rate:

There were no specific rates on contamination provided.

Resident Satisfaction:

Although there were no metrics on resident satisfaction, the council indicated that the reaction to service changes to food waste collections were mostly positive. A small number of households opted out of the service, for which the council removed the bins in response. This equated to around 50 households out of 90,000. They also indicated that feedback online was very positive.

Cost Savings:

There was no cost savings reported as a result of the service change, although it is unclear whether there were any.

Reflections:

Sufficient Funding:

The council did not receive a RIF award for the service change, and this was covered by council capital and revenue budgets.

Barriers to delivering changes:

Glass being collected in a mixed plastics/metals/glass bin was due to the desire to minimise the number of bins and higher collection costs, the council also stated that this would have resulted in minimal benefits for recycling rates. Renfrewshire stated that collecting glass separately would require additional vehicles and a reduction in the residual waste collection frequency to 4-weekly, which may not be politically acceptable.

Lessons learned:

- The council stated that the current collection schedule makes it difficult to route the collection vehicles. If designing the service change again, they stated that it might make more sense to look at a 3 weekly 1,2,3 scheme with paper/cardboard collected in week 1, plastics/metals/glass in week 2, and residual waste on week 3. This would make it easier operationally, and to understand as a service user.
- The council also stated that in hindsight, the move to collect garden and food waste in a mixed container has made it more difficult to find outlets for the material due to there being very little capacity for in-vessel composting. This was done at the time due to getting a good deal in the contract, but an AD plant close by might make separate food waste disposal more cost effective, despite the higher collection costs.
- Renfrewshire also stated the need for operational performance targets to be included in the revised code of practice, e.g. numbers of missed bins.

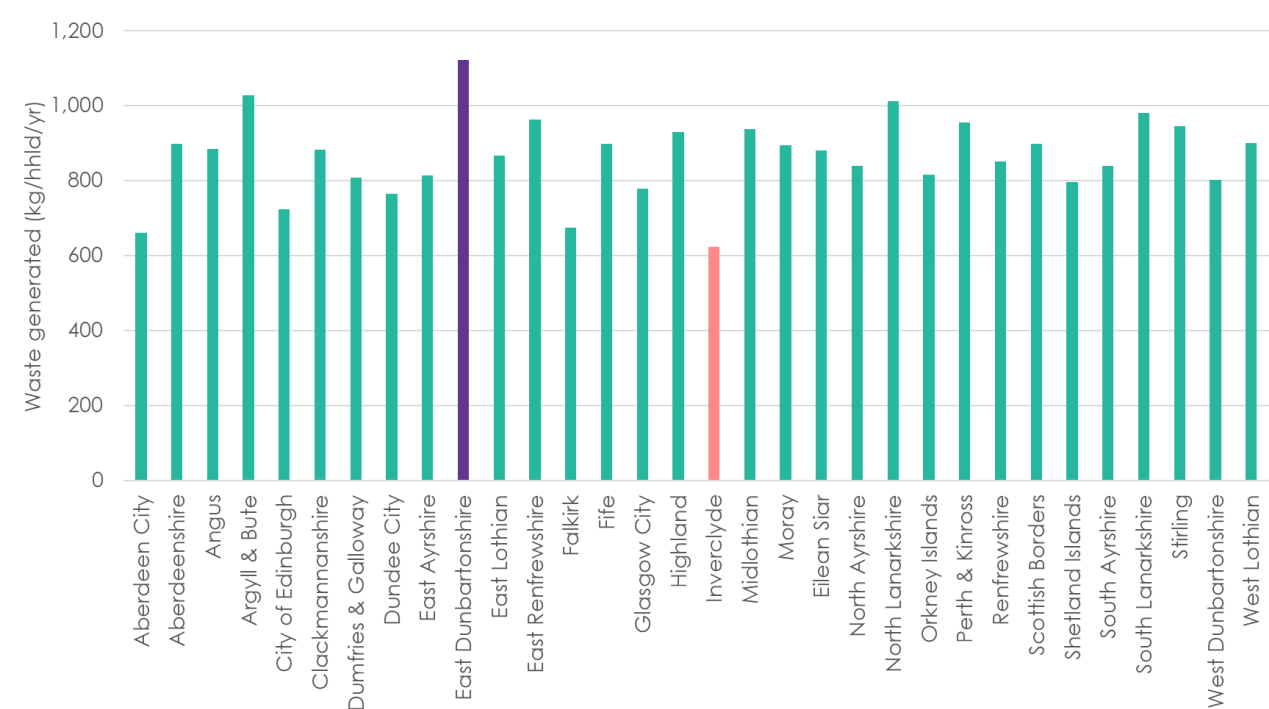
A.2.0 Detailed Statistical Analysis Results

A.2.1 Factors with no Significant Influence on Waste Reduction

A.2.1.1 Total Household Waste Generated

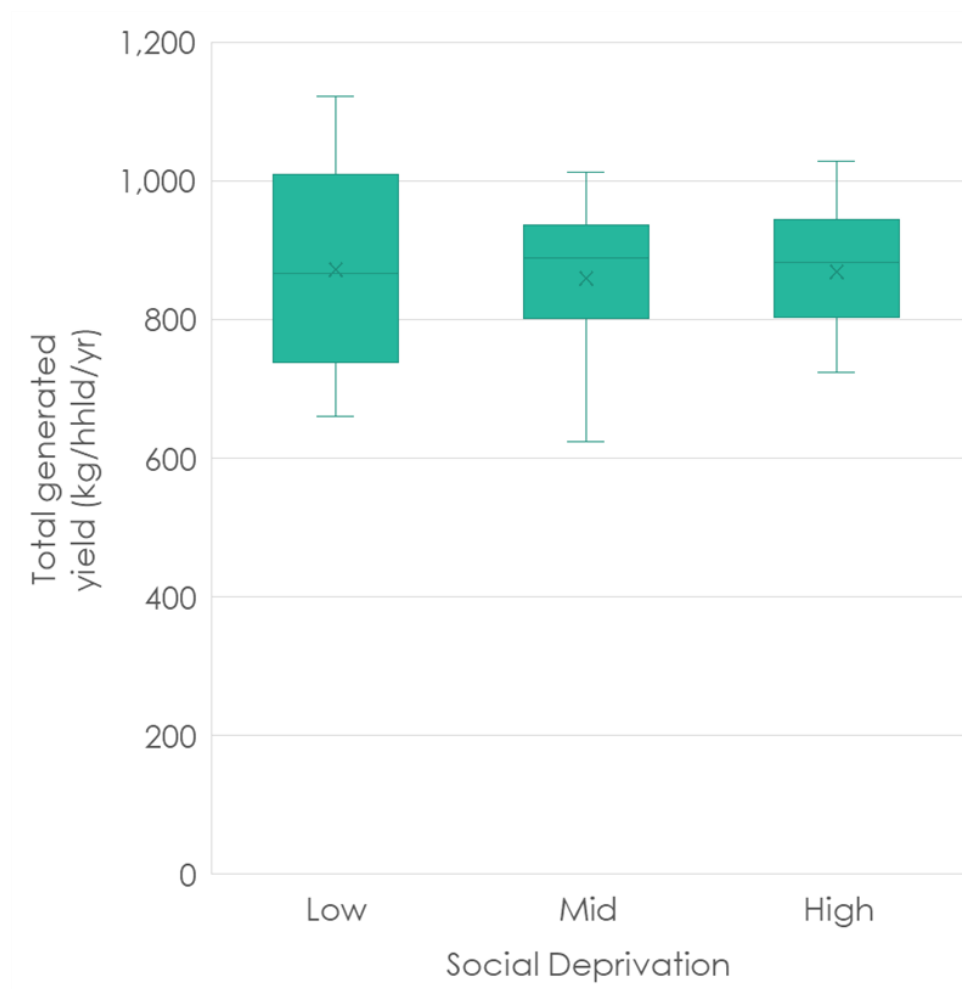
Figure 7-1 shows that East Dunbartonshire had the highest waste generated per household, over 1100 kg/household/year (kg/hhld/yr), whereas Inverclyde stood out as the authority with the lowest waste generated – just over 600 kg/hhld/yr.

Figure 7-1: SEPA Tonnes Generated (kg/hhld/yr) by Local Authority



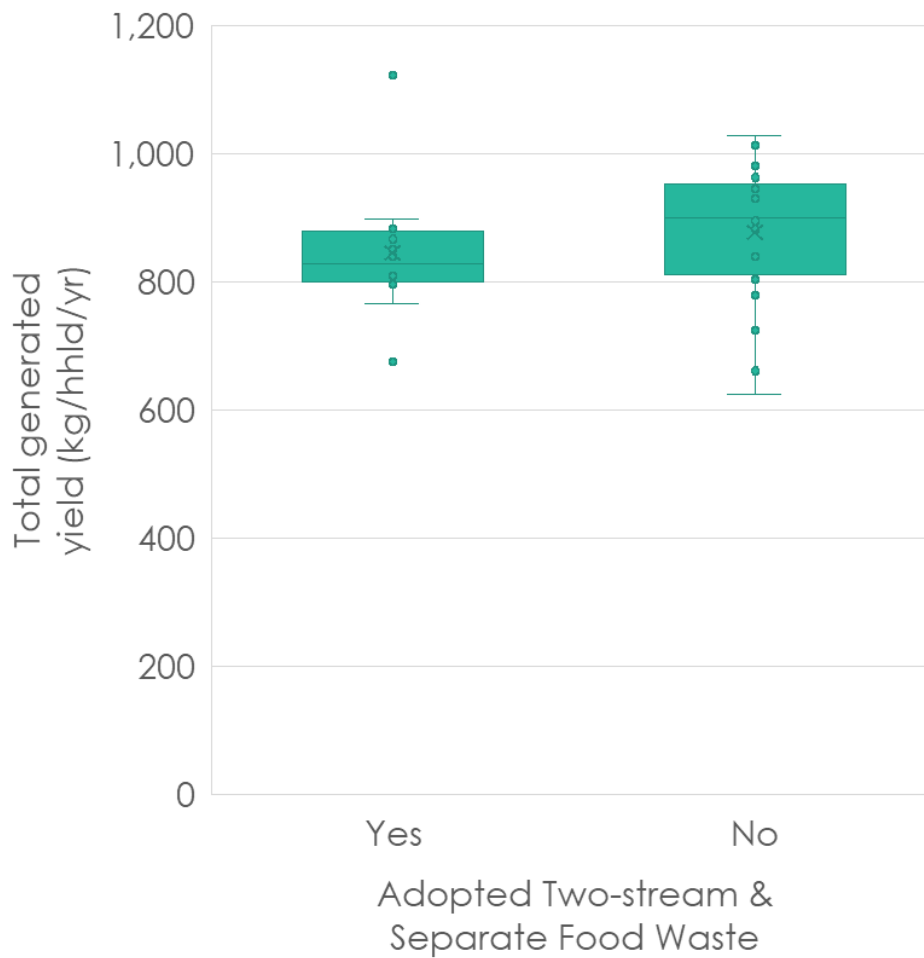
When grouping local authorities by social deprivation, this showed no statistically significant relationship between the mean of the yield generated, as the ANOVA test presented a p-value of 0.96. A p-value only shows statistical significance if it is lower than 0.05, in this context. Additionally, there is no correlation between SEPA tonnes generated and social deprivation group, Figure 2-10.

Figure 2-10: Box and Whisker plot of SEPA Tonnes Generated by Social Deprivation Group



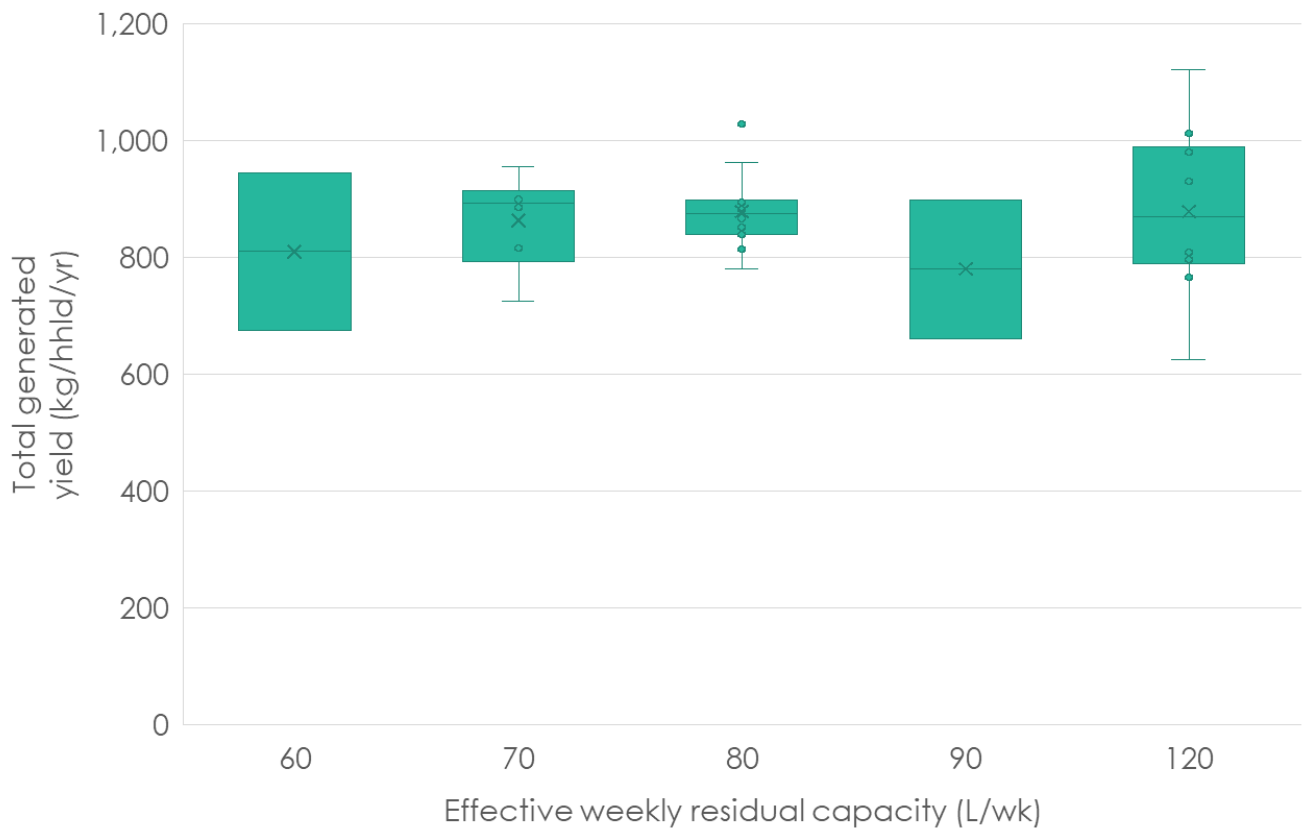
When testing the correlation between the authorities that adopted two-stream recycling and separate food waste collections compared to those that did not, a two-tailed t-test was carried out instead. From Figure 2-12, we can see that the group that did comply with the CoP have a lower generated yield (845 kg/hhld/yr) in comparison to the mean of the group that did not comply (877 kg/hhld/yr). However, as the p-value calculated was of 0.41, the null hypothesis cannot be rejected. This means that there is no statistical significance in the difference of these mean values.

Figure 2-12: Box and Whisker plot of SEPA Tonnes Generated grouped by Adoption of Two-stream Recycling and Separate Food Waste CoP Requirements



When looking at the total generated tonnes for local authorities grouped by effective weekly residual capacity, Figure 2-13, there is no clear relationship. The groups with the highest average yield are those with a weekly capacity of 80 L/W and 120 L/W, both of which generated an average of 878 kg/hhld/yr. Furthermore, the calculated p-value was 0.74, which is higher than 0.05, indicating no statistical significance between weekly residual capacity and generated yield.

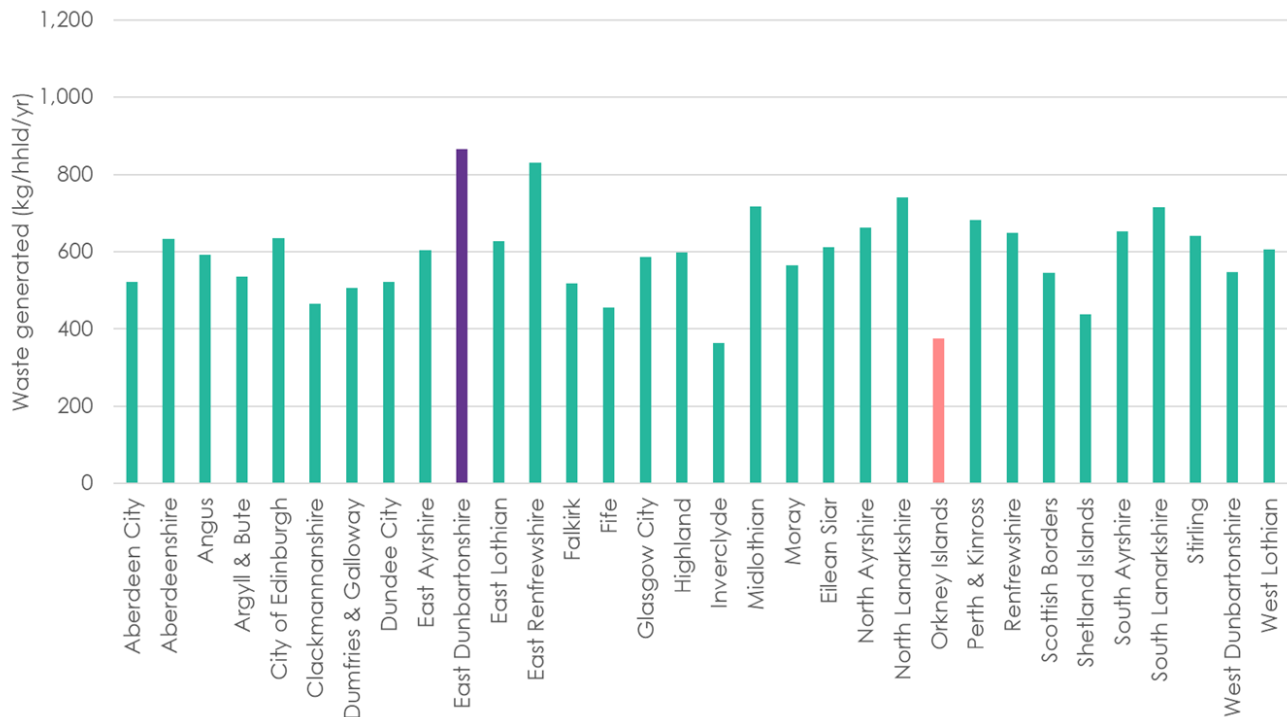
Figure 2-13: Box and Whisker plot of SEPA Tonnes Generated grouped by Effective Weekly Residual Waste Capacity (L/W)



A.2.1.2 Kerbside Yield

At a local authority level, East Dunbartonshire was still the authority which recorded the highest tonnes generated, Figure 7-2, slightly under 900 kg/hhd/yr. The authority with the lowest tonnes changed to Orkney Islands, with just over 350 kg/hhd/yr.

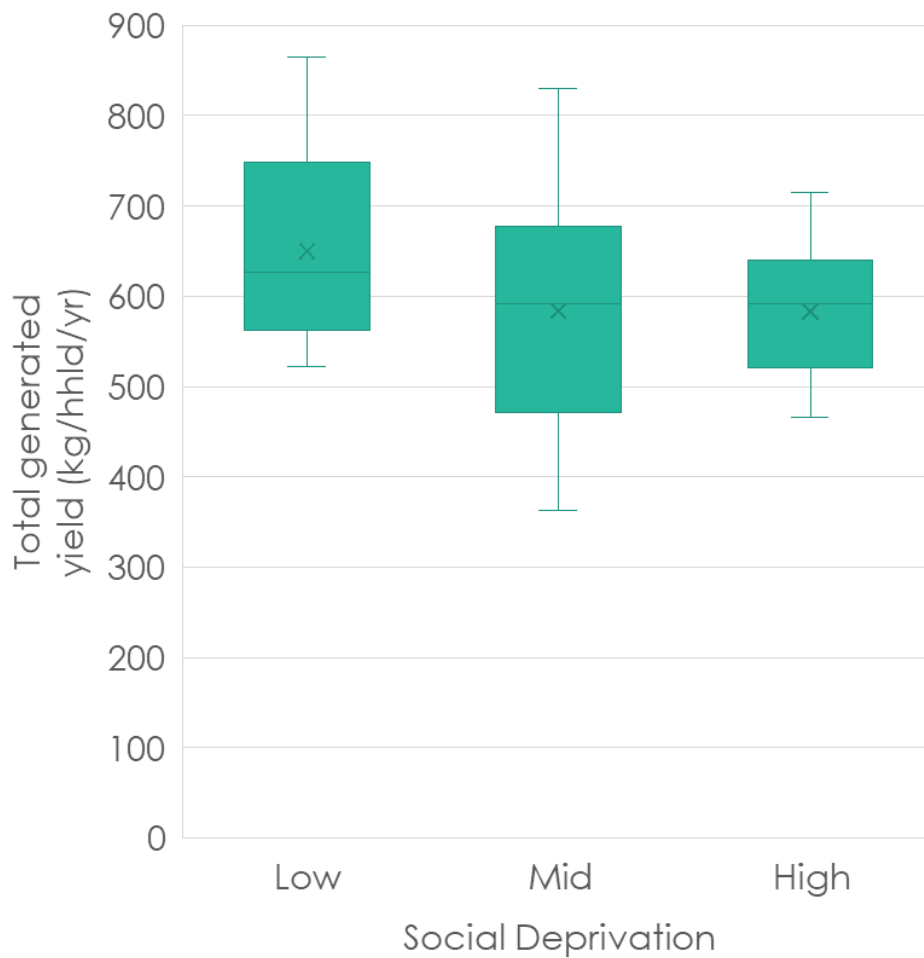
Figure 7-2: Kerbside Yield (Excluding Bring Bank and HWRC Waste) (kg/hhld/yr) by Local Authority



When looking at social deprivation, Figure 2-15, Mid and High deprivation groups had equivalent average kerbside tonnes generated: 583 kg/hhld/yr. Low deprivation had a higher yield of 650 kg/hhld/yr. WRAP (2015)¹⁸ highlight that higher social deprivation is associated with lower total kerbside arisings. However, our results are not statistically significant, as the p-value determined was 0.5.

¹⁸ WRAP (2015): [Analysis of recycling performance and waste arisings in the UK 2012/13](#)

Figure 2-15: Box and Whisker plot of Kerbside (excl. Bring Banks and HWRC) Tonnes Generated by Social Deprivation Group



Grouping by socio-demographic group, Figure 2-16, showed no statistical significance, as its p-value was 0.07. Although, as before we can highlight that the group with the highest mean yield, 776 kg/hhld/yr, was the Mixed Rurality and Low Deprivation group. The group with the lowest average was the Rural and Mid Deprivation group, with 540 kg/hhld/yr.

Figure 2-16: Box and Whisker plot of Kerbside (excl. Bring Banks and HWRC) Tonnes Generated by Social Deprivation Group

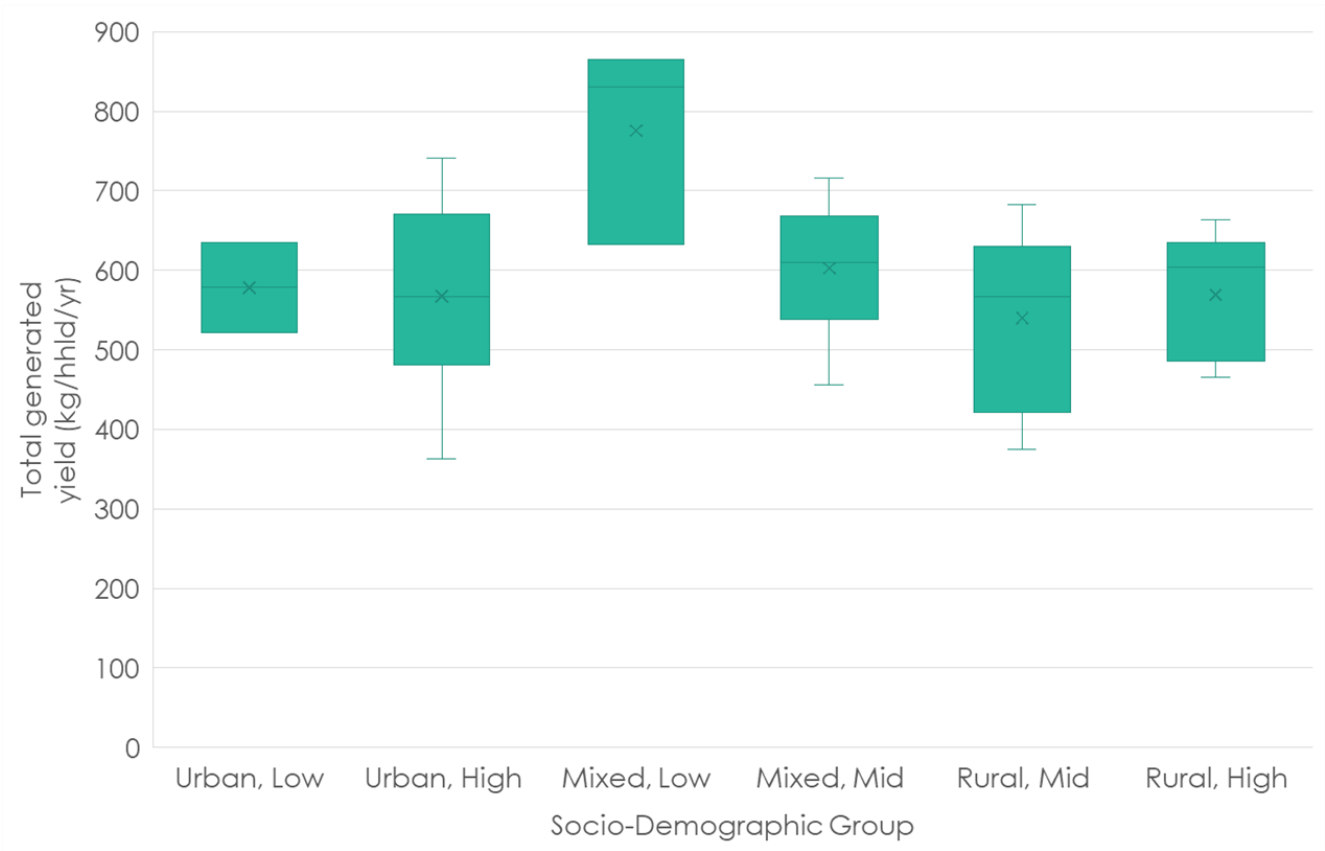
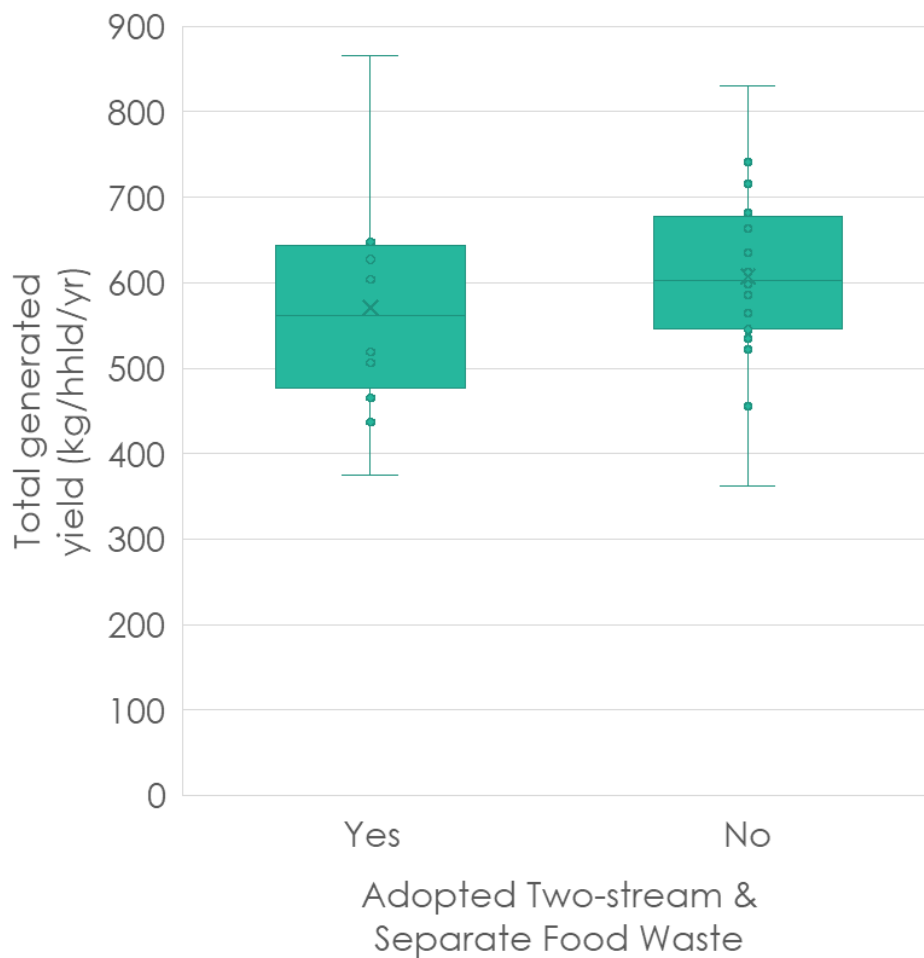


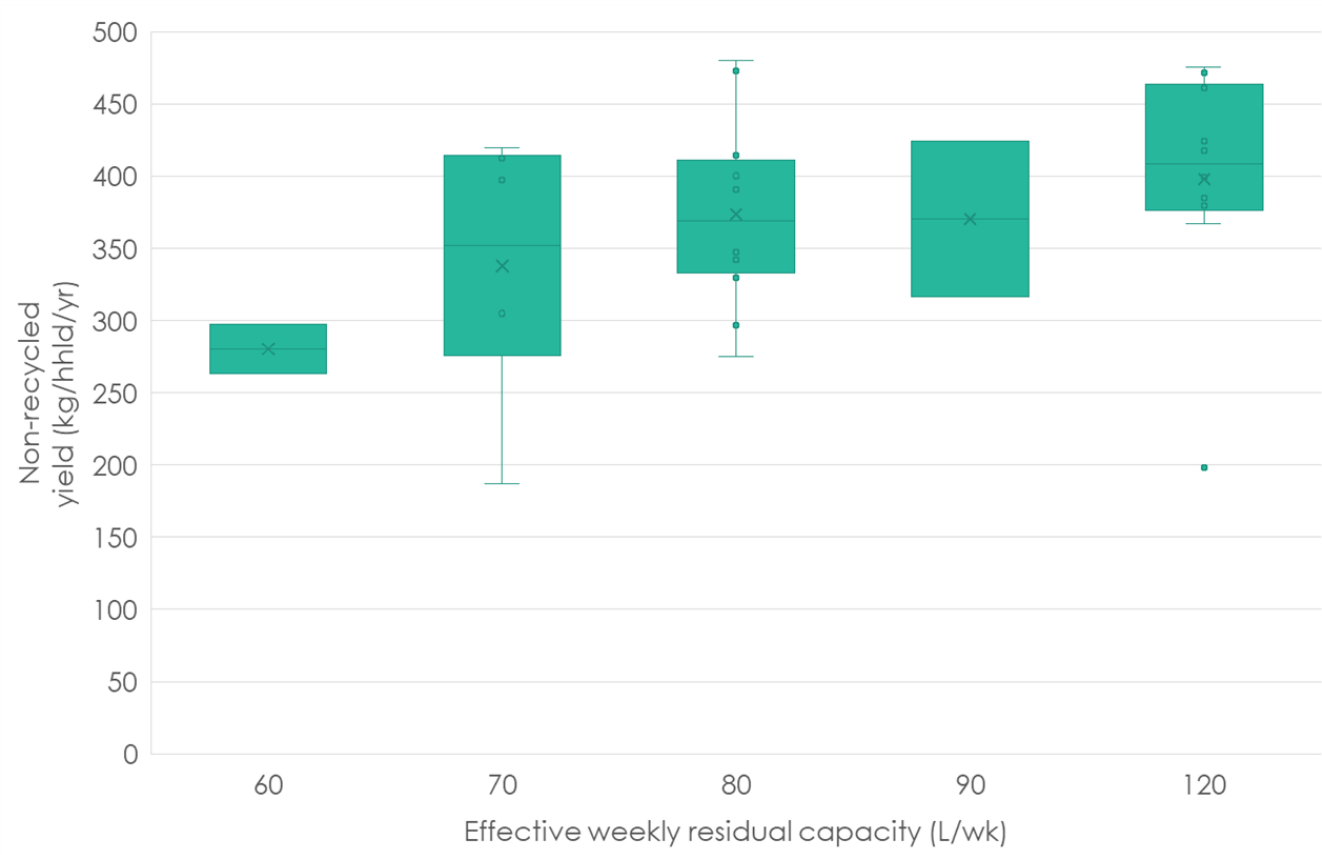
Figure 2-17 shows that the average generated waste at the kerbside for authorities which do not comply with the CoP criteria is slightly higher (608 kg/hhld/yr) than those that do comply (571 kg/hhld/yr). However, the two tailed t-test resulted in a p-value which was again greater than 0.05 (p-value = 0.42) proving no statistical significance between this difference in kerbside yield.

Figure 2-17: Box and Whisker plot of Kerbside (excl. Bring Banks and HWRC) Tonnes Generated grouped by Adoption of Two-stream Recycling and Separate Food Waste CoP Requirements



Finally, for the effective weekly residual capacity, the average non-recycled (excluding bring banks and HWRC) tonnes generated increases gradually as the grouped weekly capacity increases, Figure 2-18. Tonnes generated increase from 280 kg/hhld/yr for authorities with 60L per week residual capacity, up to 398 kg/hhld/yr for those with 120L/W. The difference in means is not statistically significant as the p-value = 0.27.

Figure 2-18: Box and Whisker plot of Kerbside (excl. Bring Banks and HWRC) Tonnes Generated grouped by Effective Weekly Residual Waste Capacity (L/W)



A.3.0 Benchmarking

A.3.1 Introduction

Benchmarking is a process to estimate waste flow changes under different collection systems. It is carried out by identifying similar local authorities who already operate the proposed collection system in each option and assessing the performance in order to determine how waste flows are likely to change. The aim of the benchmarking was to determine the impact of service changes on waste flows for each waste stream, measured in kilograms per household per year (kg/hhld/yr).

The service changes that were benchmarked for all Scottish local authorities are described below:

- **Food waste service arrangements:**
 - Separate food waste collections.
- **Garden waste service arrangements:**
 - Free kerbside garden waste collections.
 - Introducing a charged garden waste collection.
- **Recycling service arrangements:**
 - Co-mingled services changing to twin-stream, and vice versa.
 - Introduction of glass collections at the kerbside, either as a source separated, as part of the plastics/metal/cartons stream or within a fully co-mingled stream.
- **Reducing residual waste collection frequency:**
 - Measuring the impact of three and four-weekly residual waste collections on food waste, garden waste and residual waste yield.

Benchmarking aims to include as many local authorities with similar socio-demographics for each system change as possible, to increase the accuracy. However, as this analysis is constrained to only Scotland, fewer authorities are available to compare against within each group.

The 32 Scottish local authorities were categorised into five groups based on levels of deprivation and rurality. This approach was used as these factors are widely recognised to influence waste arisings. The definition for these measures is as follows:

- **Deprivation:** Measured as the percentage of the population within the approximated social grades D and E.

- **Rurality:** Calculated using the number of rural inhabitants in a local authority, which is based on the total population of LSOAs (Census 2011), with a population density of less than 750 inhabitants/km² being classified as rural.

The boundaries of these metrics were established to define the groups. This approach and the boundaries were drawn from the method used to determine Extended Producer Responsibility for Packaging (pEPR) payments groups¹⁹, but adjusted to be more Scotland-specific. Figure 7-3 presents the groupings used in this analysis.

Figure 7-3: Benchmarking Groups (Rurality Metric Indicated in Brackets)

Deprivation → Rurality ↓	Low	Mid	High
Urban (0 – 11%)	City of Edinburgh (5.1%) Aberdeen City (9.9%)		Glasgow City (2.1%) Dundee City (3.5%) Inverclyde (6.2%) West Dunbartonshire (7.8%) Renfrewshire (8.4%) North Lanarkshire (10.5%)
Mixed (urban) (11% - 20%)	East Dunbartonshire (12.7%) East Renfrewshire (13.2%)	Falkirk (13.3%) South Lanarkshire (17.2%) Fife (17.4%)	North Ayrshire (12.5%) East Ayrshire (12.9%) West Lothian (17.9%) Clackmannanshire (18.3%)
Mixed (rural) (20% - 40%)		Midlothian (23.6%) South Ayrshire (24.4%) Angus (24.5%) Stirling (25.5%) Scottish Borders (31.1%) East Lothian (32.1%) Moray (33.3%)	
Rural and (40%+)	Aberdeenshire (41.8%)	Perth & Kinross (41.8%) Argyll & Bute (41.5%)	Dumfries & Galloway (41.8%)
Inaccessible rural (40%+)		Highland (47.9%) Orkney (68.1%) Shetland (79.6%) Comhairle Nan Eilean Siar (84.5%)	

Food waste was benchmarked according to deprivation levels (medium to high), as deprivation is generally understood to be a key driver of food waste yields.²⁰ Local authorities classified as 'urban' were benchmarked in separate groups as the wider socio demographics and waste

¹⁹ DEFRA (2024) Guidance for relevant authorities on the first iteration of estimated 2025/26 Extended Producer Responsibility for Packaging (pEPR) payments

²⁰ WRAP (2015) Analysis of recycling performance and waste arisings in the UK 2012/13

arising from these local authorities is considerably different from mixed and rural authorities. (There were no local authorities in a 'Mid Deprivation (Urban)' group).

While some patterns were observed (e.g., higher deprivation associated with lower kerbside yields), the Stage 2 analysis found no statistically significant relationship between socio-economic variables and total waste yields (p-values > 0.05). Given the evidence presented in other work that does find a link, we assumed that this lack of statistical relationship was due to the small sample sizes available in Scotland as well as confounding variables such as collection system.

The food waste benchmarking groups were:

- Low Deprivation (Urban)
- High Deprivation (Urban)
- Low Deprivation
- Mid Deprivation
- High Deprivation

Garden waste arising is more closely associated with rurality as houses in rural areas tend to have larger gardens. Four groupings were benchmarked for garden waste:

- Urban
- Mixed (Urban)
- Mixed (Rural)
- Rural and Inaccessible Rural

Fourteen local authorities in Scotland operated mixed organic collections in the baseline year (2023). This tonnage is reported in WasteDataFlow (WDF) as 'Mixed garden and food'. Therefore, the first step within the benchmarking process was to establish the proportion of 'mixed food and garden' tonnage which comprised of food and garden waste. The following section outlines the approach taken to calculate these proportions.

Research generally agrees that separate food collections outperform mixed organic collections:

- 2008 Remade Scotland trials showed that food waste collections yielded 1.2-1.4 kg/hhld/wk compared to 0.8 kg/hhld/wk when co-collected with garden waste.²¹

²¹ Remade Scotland (2009), Food Waste Trials in Scotland Presentation. Accessed Here: [Food Waste Trials in Scotland](#)

- WRAPs 2010 report looking at the performance of mixed food and garden schemes found weekly mixed organic scheme collected more food waste (+81%), but that yields were much lower than for separate food collections.²²

While this data is not recent, as recently as 2024 WRAP includes frequency and scheme (whether food is collected separately or mixed with garden waste) as key factors determining the quantity of food waste collected for recycling.²³

As the most detailed dataset containing data on the relative performance of separate food versus mixed organic collections, findings from the 2010 report were used to estimate relative yields of food waste in mixed organics streams and the relative performance of mixed organic collections when compared to separate food waste collections.

Comparing trial yield data with current average separately collected food waste yields (calculated through waste flow modelling), the relative performance of the two systems was calculated. As trials only included local authorities with either weekly or fortnightly residual collections, the observed performance difference between weekly and fortnightly collections were used to estimate the likely performance for three and four-weekly residual collections. (Note that these estimates assumed that an increase in food was smaller with each subsequent reduction in residual collection frequency. This was to reflect that the residual frequency reduction is also gradually smaller, i.e. weekly to fortnightly halves the collection frequency, whereas three-weekly is only one-third, etc.). The relative performance calculated for each collection frequency was then used to estimate the amount of food and garden within the mixed organic waste. To apply these findings, the model identified the most demographically and operationally similar local authorities (in terms of residual waste collection frequency) that operate separate food waste collections. Food waste yields were adjusted using the calculated relative performance.

A.3.2 Food Waste

Food waste in mixed organic composition was determined using waste composition analysis provided by Zero Waste Scotland. Weekly separate food waste collections were found to have significantly higher yields than mixed organics services (Section 4.3.2). This finding underpins the assumptions carried forward to the modelling in Stage 3.

For separate food collections, food waste yields were estimated individually for authorities which do not currently operate separate weekly food waste collections. Assumed yields were based on performance seen in similar authorities (i.e. by deprivation group, see Figure 7-3).

- Changes in food waste yields when residual frequency was reduced were benchmarked based on performance in other authorities and case studies of authorities making those changes.
- Additional uplift in captured food waste was assumed when residual waste capacity is reduced, based on statistical analysis highlighting the inverse correlation between residual capacity and food waste capture.

²² WRAP (2010) Performance analysis of mixed food and garden waste collection schemes. Available [here](#)

²³ WRAP (2024) *Household Food Waste Collections Guide*. Available [here](#).

- Yields for communal properties were estimated using group averages from similar local authorities. These yields were significantly lower than those seen in standard access households with their own bins.

The benchmarking approach followed was:

- Existing data was analysed by yield, deprivation group and residual waste frequency. The percentage change between data points was applied to determine assumptions.
- Where data was not available to calculate a difference in performance under different residual frequency, the relative performance change was estimated using results from other groups. (i.e. findings from the mid-deprivation group were applied to low and high deprivation groups, which do not have data points across all residual frequency categories).
- For Orkney and Shetland (the only two local authorities that do not currently operate a separate or mixed kerbside food waste collection). Separate food waste yields were modelled using the average capture rate for the mid deprivation group, rather than the average group yield.

A.3.3 Garden Waste

This section outlines the approach used in estimating garden waste yields at the kerbside under free of charge and charged collections. As already outlined, local authorities are grouped and benchmarked based on rurality.

Unlike when benchmarking food waste, residual waste and dry recycling, it is not possible to measure performance using capture rates or the total fraction of waste arisings. This is primarily because so much garden waste is collected through household recycling centres (HWRCs), alongside home composting. Changes to collection methodology often result in waste moving between systems or garden waste entering or leaving the system entirely. Additionally, differences in the number of participating households and the cost of the service to the household can influence arisings.

A second challenge was data accuracy. Benchmarking and waste flow modelling relies on accurate data, yet a number of local authorities had either not reported HWRC garden waste tonnages at all, or separately from kerbside collected garden waste. While WDF was checked for garden tonnage sent to composting to try and correct these issues, it is likely that modelled yields may not be entirely accurate.

When moving from a free service to a charged for service, the total tonnage of garden waste will decrease as not all service users choose to pay for a kerbside collection. However, the average yield per participating property increases, as only those with higher garden waste arisings pay to continue using the service. Across Scotland it was estimated that under a charged service only around half of households with gardens took up a charged service in the baseline.

It is difficult to quantify exactly what this reduction in tonnage would be, as the participation in the service will depend on several factors such as the charge imposed, the number of collections per year and whether there was a free service in place beforehand, amongst other

factors. Largely, it is expected that local authorities will see higher participation rates if there was a free service in place beforehand, though again, this is difficult to quantify and has not been accounted for here.

The benchmarking looked at waste flow changes for eight Scottish local authorities that have imposed a charge in the past eight years. The following has been concluded from the data:

- In all cases, kerbside garden waste tonnage decreased;
- There was no clear relationship between the size of reduction and the rurality group;
- Three local authorities introduced a charge during the height of the Covid-19 pandemic (2020-2021), with two of these local authorities seeing the largest reduction in kerbside tonnages (although for assessing case studies, 2020 was excluded from the analysis);
- There was no clear trend in the percentage change in kerbside residual waste, with three authorities seeing a decrease in kerbside tonnages; and
- There was no clear relationship between the charge, or rurality and the percentage change in HWRC garden waste.

Table 7-4: Scottish Local Authorities introducing charged garden waste collections

Group	Local Authority	Year of Change	Percent Reduction in KS GW Tonnage	Percent Change in KS Residual	Percent Change in HWRC GW
Urban	Inverclyde	2020	-28%	+2%	+47%
	Aberdeen City	2019	-6%	+36%	-29%
	Edinburgh	2018	-15%	-15%	+37%
Average			-17%	+8%	+18%
Mixed Urban	Falkirk	2023	-21%	+3%	No Data
	East Ayrshire	2021	-47%	-20%	-11%
	Clackmannanshire	2020	-47%	+9%	+7%
Average			-38%	-3%	-2%
Mixed Rural	Midlothian	2019	-36%	+13%	+10%
Rural & Inaccessible	Highland	2017	-33%	-3%	+28%
Overall Average			-25%	+4%	+13%

Because garden waste data is so variable and with case study data also showing no clear trends as to the scale of change, a blend of approaches was taken. The following general rules were followed when modelling garden waste yields:

- Moving from free to charged collections would result in reductions in kerbside tonnages. As per case study data, this would be between 17% and 38% (based on rurality group medians).
- Local authorities that are similar (i.e. same rurality group and population size) would be used as a touchstone to moderate changes in household yield estimates, helping to avoid unrealistic fluctuations in projected arisings.

Where a local authority operated a free service in the baseline, the yield in the charged option was changed according to these general rules. Where an authority operated a charged service in the baseline, the yield in the free option was changed.

In some cases, where local authorities had high participation rates in the baseline, the increase in yields under a free service resulted in only a small increase in yields. For example, Stirling (according to the WRAP LA Portal¹) has a high take-up of the service, making the difference between the free service and charged service yields smaller.

Case study data showed a range of results in terms of garden waste diversion to HWRC and changes to residual waste from introducing a charged service. However, generally, the introduction meant a small increase in kerbside residual and a larger increase in HWRC garden waste. Table 7-5 presents the modelled changes for each group, which were adapted from case study impacts.

Table 7-5: Modelled Garden Waste Displacement Under a Charged Service

Rurality Group	% Change in Kerbside Residual	% Change in HWRC Garden
Urban	+5%	+18%
Mixed (Urban)	+5%	+12%
Mixed (Rural)	+5%	+10%
Rural and Inaccessible	+5%	+28%

A.3.4 Recycling

Dry Recycling Scheme Types

As outlined in Section 4.0 and further informed by the 2015 WRAP study assessing factors impacting recycling performance, there was expected to be no change in the yield of target dry recyclables when moving between different recycling services, as long as sufficient capacity is available to accommodate the dry recycling.

Eunomia has not modelled a yield change in target dry recycling materials when authorities move between co-mingled and twin-stream recycling.

Contamination

Contamination arisings within the recycling streams are expected to change; while the amount of target dry recyclables are not expected to change, the weight of non-target and contradictory materials were expected to differ between co-mingled and twin-stream recycling.

Contamination was measured as the fraction of non-target, or contradictory material in the recycling container that is ultimately rejected from the stream during sorting.

The baseline waste flow data showed that contamination rates fluctuated between authorities; although co-mingled recycling systems saw higher contamination arisings in the main. Notably, contamination rates were higher in co-mingled collections than in authorities operating two-stream recycling with two wheeled bins, even though the two-bin system allows non-recyclable materials to be hidden from view.

High deprivation co-mingled authorities saw higher rates of contamination high-deprivation twin-stream authorities.

We have modelled the following:

- **Low and Mid Deprivation Authorities:** Co-mingled recycling will have 50% more contamination arisings than two-stream systems.
- **High Deprivation Authorities:** Co-mingled recycling with double the contamination of two-stream systems.

A.3.5 Glass

Similar to food waste, glass yields varied individually by authority and collection system based on factors such as socio-demographics, geography, residual waste capacity and glass collection configuration. Across all authorities, the following general assumptions underly the changes:

- Separate kerbside glass collection was found to deliver the highest average yield, statistically higher than bring systems (Figure 4-8).
- Removing kerbside glass is assumed to shift 62% of material to bring sites/HWRCs and 38% to residual waste.
- Adding kerbside glass collections is assumed to draw 70% from bring/HWRC services and 30% from residual waste.
- The way in which glass was collected (separately vs mixed with other materials) was not found to influence the quantity of glass collected at the kerbside.

When determining yields for Stage 3:

- No changes in yield were assumed when moving from source-separated glass collections to glass collected within a commingled or container stream. Therefore, where authorities are already collecting glass at the kerbside, the collection method has no impact on glass yields.

- When introducing a new kerbside glass collection service, overall glass tonnages were expected to increase. As with adding a garden waste service, kerbside services tend to engage a greater proportion of residents than non-kerbside alternatives.

The changes applied when moving between kerbside and bring glass was determined from analysis examining glass waste flows for case studies in which a kerbside service was either removed or added. These included both Scottish authorities and broader UK authorities, with three authorities in each case study group. The analysis accounted for glass moving to and from bring sites and HWRCs, or kerbside collections, depending on the transition being assessed. Any remaining tonnage required to account for changes in yield was assumed to be diverted from the residual waste stream. Tonnage results are presented in Table 7-6 and Table 7-7.

Overall, the following was observed:

- **When removing a kerbside glass service**, HWRC site yields increased, equating to roughly 62% of the previous kerbside yield. The remaining 38% is assumed to have been diverted to the residual waste stream.
- **When adding a kerbside glass service**, HWRC site tonnages decreased. This decrease accounted for approximately 70% of the kerbside yield, with the remaining 30% assumed to have been diverted out of the residual waste stream.

Eunomia's waste flow modelling assumed that when a kerbside service is removed, 67% of glass is diverted to bring sites and 33% to residual waste. The reverse is assumed when a kerbside service is added where only bring site collections previously existed. Where authorities do not currently collect glass at the kerbside, a kerbside glass yield was estimated to ensure that resulting glass capture rates aligned with the average capture rates observed across the group.

Table 7-6: Glass Tonnage Changes Where Kerbside Glass Services were Removed

Kerbside Glass to Bring-only Collection	Date Service Removed	Proportion Kerbside Glass to Bring/HWRC Sites	Proportion of Kerbside Glass to Residual
Kirklees	2013	54%	46%
Inverclyde	2018	63%	37%
Clackmannanshire	2019	69%	30%
	Average	62%	38%

Table 7-7: Glass Tonnage Changes Where Kerbside Glass Services were Added

Bring-only to Kerbside Glass Collection	Date Service Added	Proportion Bring/HWRC Glass to Kerbside Recycling	Proportion of Bring Glass to Residual
Winchester	2019	54%	46%
New Forest	2013	67%	33%
Carmarthenshire	2013	90%	10%
	Average	70%	30%

A.3.6 Residual Waste

To model residual waste performance, the percentage of total waste arisings, excluding garden waste was used as the benchmarking figure. In this case, this approach helps understand the recycling performance between local authorities over absolute yields. For example, Orkney has low residual waste arisings as a fortnightly 240-litre local authority, though its total arisings are also low, meaning that the residual proportion of total waste arisings (79%) are actually above the group median (72%).

A similar approach to that for modelling food waste yields was adopted for modelling changes in residual waste arisings under reduced residual frequencies. Performance changes from other groups were used to estimate reductions for groups that did not have local authorities in the three or four-weekly residual categories

Dry recycling will be diverted out of the residual waste stream in addition to an increased food waste capture. The approach to modelling dry recycling capture increases, followed the following logic:

- After increases in food waste yields, the remaining diversion of residual waste was assumed to be dry recycling (increased contamination of dry recycling was already accounted for);
- Individual dry recycling material capture rates were capped at 95% (or at the baseline value if this was over 95%). This was to avoid over-capture of materials; and
- Where reductions in residual were estimated to be greater than increases in dry recycling (after capping material capture rates) and food, the majority residual waste was diverted to HWRCs:
 - Fortnightly to three-weekly residual waste collections: 98% of residual waste was diverted to HWRCs. The three-weekly figure applied was more conservative than the benchmarking average excluding East Renfrewshire, which was an outlier (Table 7-8).
 - Three-weekly to four-weekly residual waste collections: 99% of residual waste was diverted to HWRCs. While case studies showed a very large reduction in total

arising (Table 7-8), there are only two examples. We can see from the much larger fortnightly to three-weekly data that the impact of such changes can be highly variable. As applying the high average from Falkirk and Stirling data would result in a large recycling rate increase, which could be unrealistic Scotland-wide, a smaller reduction was applied. The logic for this was based on the volume reduction with 240-litre bin being less when reducing to four-weekly (25%) compared to three-weekly (33%).

Table 7-8: Case study total arisings data for Local Authorities reducing residual waste collection frequency

Local Authority	Change	Estimated Coverage (% Households)	Year of Change	% Change in Total Arisings (At 100% Coverage)
Falkirk	F-240 to 3W-240	97%	2014	-1.6%
Glasgow City	F-240 to 3W-240	30%	2022	<-0.1% (-0.14%)
Renfrewshire	F-240 to 3W-240	90%	2018	<-0.1% (-0.1%)
East Renfrewshire	F-240 to 3W-240	85%	2016	+14.0% (+16.4%)
Moray	F-240 to 3W-240	95%	2018	-6.8% (-7.2%)
North Ayrshire	F-240 to 3W-240	96%	2018	-9.7% (-10.1%)
East Ayrshire	F-240 to 3W-240	97%	2015	+0.9%
Average				-0.5% (-0.3%)
Average, excluding East Renfrewshire				-2.9% (-3.0%)
Falkirk	3W-240 to 4W-240	97%	2016	-6.0% (-6.2%)
Stirling	3W-240 to 4W-240	96%	2021	-10.4% (-10.8%)
Average				-8.2% (-8.5%)

Kerbside Residual Waste Diverted to HWRCs

Table 7-9 presents the local authorities observed as part of this case study analysis, the year of change and changes in residual tonnages. All examples looked at showed an increased in residual waste at the HWRC after reducing residual waste frequency. However, the amount of

waste was highly variable, with some local authorities seeing significant increases in arisings, while others saw only a small increase.

Table 7-9: Case study HWRC data for Local Authorities Reducing Residual Waste Collection Frequency

Local Authority	Change	Year of Change	HWRC Residual Tonnage Change
Glasgow City	F-240 to 3W-240 (only 30% of hhlds)	2022	+7,142 (+96%)
Renfrewshire	F-240 to 3W-240	2018	+815 (+6%)
East Renfrewshire	F-240 to 3W-240	2016	+2,174 (+34%)
Moray	F-240 to 3W-240	2018	+266 (+4%)
North Ayrshire	F-240 to 3W-240	2018	+644 (+13%)
East Ayrshire	F-240 to 3W-240	2015	+791 (+13%)
Falkirk	3W-240 to 4W-240	2016	+4,111 (+95%)
Stirling	3W-240 to 4W-240	2021	+1,950 (+44%)

A.4.0 Cost Assumptions

A.4.1 Vehicles and Containers

Cost parameters—staff, fuel, vehicle, container and treatment costs—reflect specific LA-provided data wherever this is possible.

Where Local Authorities did not provide data, default values were used based on data supplied by other authorities. Wherever possible, data was taken from statistically similar authorities operating similar collection systems, although in some cases this was not possible. If data from a directly comparable authority could not be used, default values were applied. This approach was taken for vehicle, staff, fuel and container costs.

- Table 7-10 shows vehicle cost assumptions
- Table 7-11 shows container cost assumptions

Table 7-10: Vehicle Cost Assumptions

[illegible]

Table 7-11: Container Cost Assumptions

Description: Volume and type	Cost/unit (£)	Annual Replacement Rate (%)
360L wheeled bin	£40.00	2.5%
240L wheeled bin	£22.00	2.5%
180L wheeled bin	£21.00	2.5%
140L wheeled bin	£18.50	2.5%
120L wheeled bin	£16.00	2.5%
1280L wheeled bin	£300.00	1.5%
1100L wheeled bin	£270.00	1.5%
660L wheeled bin	£230.20	1.5%
500L wheeled bin	£200.00	1.5%
55L box	£8.00	7.5%
40-45L box	£6.00	7.5%
35L box	£5.00	7.5%
Stacked Trolibocs (3 boxes stacked)	£41.00	2.5%
60L Reusable sack	£3.00	10.0%
90L Reusable sack	£4.00	10.0%
5L Indoor Food Waste Caddy	£1.00	5.0%
23L Outdoor Food Waste Caddy	£5.00	10.0%
Single-Use Sack (approx. 60L)	£0.02	N/A

A.4.2 Gate Fee Cost Assumptions

A.4.2.1 Overview

Material values were based on mid-point prices from 2023 Let's Recycle data, whilst WRAP's Gate Fees report for 2023/24 provided data on gate fees for different sorting and treatment routes. This was combined with data provided by the authorities to create basket prices and gate fees where possible; again, where this data was not provided, authorities were assigned default data based on their collection system that was derived from the LetsRecycle mid-point material prices and WRAP material handling and gate fee costs. Bulking and haulage costs

were also applied to material values (haulage costs were not applied where material is direct tipped).

For alternative systems, the default value for materials costs was determined from Let's Recycle/WRAP data, as per missing data in the baseline. New costs were determined by calculating the value for the new system relative to the default values for the current and new systems. For example:

- where a LA has the 'default' cost in the baseline for System A, they would also have the 'default' cost for System B.
- where a LA provided data. The difference between the actual cost and the 'default' cost from System A was applied to System B. An example: System A glass is £12 compared with a default value of £10. Under System B, the cost would also be 20% greater (or the income 20% less) so that the same financial position was maintained under all systems.

A.4.2.2 Dry Recycling

Where a local authority did not provide dry recycling treatment costs as part of their data response, default values were applied based on the 2023/24 WRAP UK Gate Fees Report data on MRF gate fees, and that Report's data on bulking, storage and haulage costs, and Let's Recycle material prices. These costs differ based on the system used to collect recyclables, allowing an examination of the impact of collection method.

Authorities across Scotland will have differing contractual arrangements with MRFs, which mean that the default values used may not closely reflect the prices paid or income received in each authority. However, where this information was not provided during the data request stage, using assumptions from publicly available information was the only way of measuring the cost impact of recycling system changes.

For local authorities that provided costs of managing materials, these costs were in the baseline. To assess the cost impact of recycling system changes, costs were accounted for by applying the relative difference between the relevant system default value for each material to calculate the treatment cost. For example, a local authority with two-stream recycling system reported £12.00 per tonne revenue for mixed paper and cardboard, which was nearly 26% higher than the default value of £9.54. So, where the co-mingled collection system default cost was £94.45 per tonne, this local authority's cost for co-mingled was also assumed to be £70.10, which is 26% more favourable.

There are also other factors which impact the cost of recycling which are not measured here, notably the access to and availability of sorting capacity dedicated to each different waste stream, and the distance that waste requires hauling to reach the facilities. These issues were not considered in the modelling, due both to a lack of data on available capacity and the uncertainty over how this picture would change were wholesale changes to collections to be made across Scotland.

Table 7-12 to Table 7-14 show the MRF gate fees, combined bulking, storage and hauling costs, and material values used to inform the modelling.

Table 7-12: WRAP MRF gate fees used to inform modelling

Collection method	Median (£/t)
Fully commingled	90
Material presented in at least three containers at the kerbside	75
Twin stream (Stream 1 = paper and cardboard; Stream 2 = glass, metal and plastic containers)	65
Twin stream (Stream 1 = glass; Stream 2 = paper, cardboard, metal and plastic containers)	125
<i>Source: WRAP UK Gate Fees Report 2023/24</i>	

Table 7-13: WRAP bulking, haulage and storage costs used to inform modelling

UK	Median (£/t)	Mode (£/t)	Mean (£/t)	Range (£/t)
Cost of bulking, storing and hauling to MRF	26	28	27	8 to 59
<i>Source: WRAP UK Gate Fees Report 2023/24</i>				

Table 7-14: Let's Recycle material prices used to inform modelling

Let's Recycle Mid Point Prices	2023 Mid Point
Glass: Mixed	£27.1
Glass: MRF glass	£3.1
Paper: Mixed papers	£36.5
Paper: Cardboard	£91.3
Paper: News and pams	£90.2
Plastics: Mixed Plastics	£108
Plastics: Pots, Tubs and Trays	£19.6
Plastics: Plastic Film	
Plastics: MRF Film	-£56.3

Let's Recycle Mid Point Prices	2023 Mid Point
Aluminium Cans	£926.3
Steel Cans	£157.1

Source: Let's Recycle material prices for 2023, mid point averages

A.4.2.3 Residual Waste

Table 7-15 shows the default per tonne residual treatment costs, which were applied where local authorities did not provide data. These values are taken from WRAP's 'Gate Fees Report 2023-24' and represent the mean residual treatment cost for Scottish local authorities.

Table 7-15: Default Residual Waste Treatment Costs by Treatment Technology

Treatment method	Gate fee	Bulking, Storage & Haulage	Total
Landfill ²⁴	£108.00	£23.00	£131.00
Incineration (EfW)	£108.00	£23.00	£131.00
Residual MRF	£200.00	£23.00	£223.00

A.4.2.4 Organic Recycling

Table 7-16 shows the default per tonne organic waste treatment costs, which were applied where local authorities did not provide data. These values are taken from WRAP's 'Gate Fees Report 2023-24' and represent the mean organic waste treatment cost for Scottish local authorities. Where a local authority provided organic waste treatment costs, the relative difference between their per tonne cost provided for a given technology, and the default cost for that technology was used to calculate the treatment cost. For example, a local authority provided data to suggest that their gate fee for mixed organic waste sent to in-vessel composting was £70.00 per tonne. This gate fee is ~1.1 times greater than the average gate fee across Scottish local authorities, and therefore, the anaerobic digestion gate fee was assumed to be £38.88 per tonne.

Table 7-16: Default Organic Waste Treatment Costs by Treatment Technology

Treatment method	Waste stream	Gate fee	Bulking, Storage & Haulage	Total
Anaerobic digestion	Food waste	£35.00	£26.00	£61.00

²⁴ Landfill gate fee was provided as £145.00 per tonne. However, it was assumed to be equal to the cost of incineration in options modelling to reflect the anticipated shift in treatment from landfill to incineration following the upcoming ban on waste sent to landfill. This was agreed with Scottish Government following Workshop 2.

Treatment method	Waste stream	Gate fee	Bulking, Storage & Haulage	Total
In-vessel composting	Food waste	£51.00	£12.00	£63.00
In-vessel composting	Mixed organics	£63.00	£12.00	£75.00
Windrow	Garden waste	£25.00	£5.00	£30.00

A.5.0 Assumptions for Table 5-3

Table 5-3 shows vehicle and container capital. The differences in capital costs between the baseline and ‘Food Waste UR1-3’ (a scenario which establishes food waste at all UR1-3 properties) is based on:

- 1. Introduction of weekly separate food waste collections across households in UR1-3 in LAs where there are no collections of food waste.
- 2. An increase in the coverage of weekly separate food collections where food collections are already in place for LAs where coverage was below the number of households in UR1-3.
- 3. An increase in frequency where separate food waste collections were not weekly.
- 4. Switch from mixed organic to weekly separate food collections. Coverage was increased where not all UR1-3 properties were collected from in the baseline.

In terms of household numbers:

- 2.215m households are in UR1-3. Of these 1.9m households had food waste collections in 2023, of which 1.1m had a mixed organics collection.
- 360k of these households had no food collection in the baseline.

The total container capital is very high for the baseline and ‘Food Waste UR1-3’ in Table 4-4 because all container costs for containers used in across all services were included in the total. This is slightly different to other tables, where only container capital is shown for the relevant change. This was necessary because of the complexity of organic collections (collections can be separate, mixed with garden or collected on the same vehicles used for residual and recycling). The only difference between the figures is the cost of changes identified above. A breakdown of container types, numbers and costs is shown in Table 7-17.

Table 7-17: Food Waste Container Changes

Household Category in Baseline	Kitchen Caddies	Kerbside Caddies	Wheeled Bins
No food collections			33k / £720k
Mixed organic collections	360k / £540k	1.1m / £5.3m	0 (existing bins repurposed)
Total			£6.6m

Note that:

- Households with mixed organic collections already had kitchen caddies. New kitchen caddies were only required for the 360k households without any food collection. Many of these were communal properties and did not require a kerbside caddy.

- Some local authorities with mixed organics have provided households with a mixture of wheeled bins and kerbside caddies. This reduced the number of new kerbside caddies purchased.
- Organic wheeled bins were repurposed for communal collections, allowing bins used for mixed organics may be swapped to communal food waste.

With most properties already having kitchen caddies and wheeled bins often repurposed, the additional container cost was relatively low. Most of the change (£5.3m of £6.6m) was from the provision of new kerbside caddies.

Vehicle costs were much easier to break down as dedicated food waste vehicles are used for separate collections, so for vehicles the capital cost is only for the new vehicles.

A.6.0 Carbon Factors

The environmental impact was determined by applying carbon factors from WRAP (2025) Carbon Waste and Resources Metric version 2. Available at: <https://www.wrap.ngo/sites/default/files/2025-03/WRAP-CarbonWARM2.v0.3.pdf>. These values differentiate between treatment route (such as type of residual or organic treatment), and recycling system (co-mingled or separate) and treatment route (closed or open loop). The following table shows the factors used for co-mingled and separate collection routes for key recyclable materials other than glass, as well as the recycling route selected.

The following table shows the factors used for co-mingled and separate collection routes for key recyclable materials other than glass, as well as the recycling route selected.

Table 7-18: Carbon Factors Used

Material	Route	Co-mingled	Separate
News and Pams	Closed Loop	-0.097	-0.147
Other paper	Closed Loop	-0.097	-0.147
Cardboard	Closed Loop	-0.043	-0.071
Cartons	Closed Loop	-0.097	-0.147
Plastic film	Closed Loop	-0.549	-0.796
Plastic Bottles	Closed Loop	-0.816	-0.918
Dense plastic	Closed Loop	-0.589	-0.854
Glass	Closed Loop	-0.443	-0.571
Ferrous	Closed Loop	-1.020	-1.234
Non ferrous	Closed Loop	-5.920	-7.454
Mixed metals	Closed Loop	-3.470	-4.344
WEEE	Open Loop	-0.978	-0.978
Wood	Open Loop	-0.482	-0.482

For glass, the suitability of closed or open loop recycling processes varies based on the collection type. Separate kerbside glass was associated with substantial carbon savings, because more glass enters closed-loop recycling (Section 4.3.4). Closed loop glass recycling is estimated to save 0.571 tCO₂e per tonne recycled, compared to a cost of 0.009 tCO₂e per tonne for glass to aggregate.

- Co-mingled glass collections are assumed to produce glass recyclate that is not suitable for remelt, decreasing closed-loop recycling and increasing emissions (e.g., +12,000 tCO₂e for bring → non-separate kerbside scenario; Section 4.3.4).

- A Scotland-wide shift to separate glass collection was modelled to deliver –34,000 tCO₂e (Table E-4; Section 4.3.4).

