Research

Scaling UK kerbside collections for e-waste

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Update to A Review (Economic and Environmental) of Kerbside Collections for Waste Electricals

Material Focus

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1. Glossary of key terms

AATF	Approved authorised treatment facility
BEIS	Department for Business, Energy and Industrial Strategy
DCF	Designated collection facility authorised to undertake the separate collection of WEEE prior to treatment
Defra	Department for the Environment, Food and Rural Affairs
DMR	Dry mixed recycling
DSO	Direct service organisations
eRCV	Electric refuse collection vehicle
GHG	Greenhouse gas
hhd	Household
HWRC	LA household waste and recycling centres
ICER	Industry Council for Electronic Equipment Recycling
ICP	Indicative Costs and Performance (WRAP for kerbside recycling)
LA	Local Authority
LARAC	Local Authority Recycling Advisory Committee
MPG	Miles per gallon
NAWDO	National Association of Waste Disposal Officers
NISRA	Northern Ireland Statistics and Research Agency
PCS	Producer Compliance Scheme
RCV	Refuse collection vehicle
Regulation 43	Under the UK WEEE Regulations 2013, Regulation 43 collections represent household WEEE collected by distributors (e.g. retailers) via in-store takeback and returned directly into the system set up by a PCS[1]
Regulation 50	Under the UK WEEE Regulations 2013, Regulation 50 collections represent WEEE returned to a system set up by a PCS to collect WEEE directly from private households[1]
SMW	Small mixed WEEE
UA	Unitary Authority
WCA	Waste Collection Authority
WDF	WasteDataFlow
WEEE	Waste electrical and electronic equipment
WMC	Waste management contractor
WRAP	Waste and Resources Action Programme
WTS	Waste transfer station
ZWS	Zero Waste Scotland

[1] WEEE Regulations 2013 Government Guidance Notes. 2014. The Department for Business Innovation and Skills. Available from: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292632/bis-14-604-weee-regulations-2013-government-guidance-notes.pdf

2. Executive summary

The purpose of this research is to develop the evidence base on operational, cost and environmental considerations for kerbside collections of small mixed Waste Electrical and Electronic Equipment (SMW) in order to help the sector evaluate the appropriateness of rolling out the service across the UK. This research is part of a programme of work supporting the upcoming review of the Extended Producer Responsibility regulations for Waste Electrical and Electronic Equipment (WEEE). Specifically, it feeds into the evidence base for understanding the potential ramifications of extending the producers' responsibility for managing WEEE to the kerbside of households, instead of just from household waste and recycling centres (HWRCs) and other consolidation points.

The environmental motivation for this work is to reduce the estimated 155,000 tonnes of WEEE, thought to be predominantly SMW, that is being disposed of by households within their residual waste for the year 2019.[2] This is equivalent to over 5kg per household annually and represents one of the major sources of WEEE lost from authorised recycling routes. It is anticipated that these losses could be reduced by improving the convenience of SMW collection from households, primarily through kerbside collections, as well as via retailer collection points, bring banks and other mechanisms.

The first part of this research focused on the effectiveness and costs of the kerbside collection services currently in place in the UK. Surveys, both of Local Authorities (LAs) and Waste Management Contractors (WMCs), as well as engagement with other stakeholders, formed the basis of the research. Annex 6.1 contains samples of the questions used. Of the 394 UK LAs with waste collection responsibilities that have submitted collection scheme data to WRAP, 86 – which covers 22% of households, were identified as having active kerbside collection services for SMW. Of those, 47 survey responses were received (response rate of 55%) as well as 21 responses from LAs without kerbside SMW collection, some of whom provided insight as to why they have not introduced this service.

Information obtained on established kerbside collection services from the survey paint a mixed picture of effectiveness. 18 had services that been running for over 5 years, suggesting their long-term viability. However, under half of these LA collection services have household coverage greater than 95%, with communal buildings and very remote households most likely to be excluded. Furthermore, in terms of the weight of SMW collected by the kerbside collection services, approximately a quarter of these LAs collect an average of 100g or less SMW per household per year (hhd/yr). The majority (>80%) collect less than 1kg/hhd/yr on average and the maximum collection weight was 2.5kg/hhd/yr. It is important to note that these yearly household figures do not take into account the proportion of households covered by and engaging with the kerbside

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[2] Based on estimate that WEEE accounts for 0.93% of residual waste from "Mapping waste electrical flows in the UK", Material Focus/Anthesis, July 2020

collection services. As a result, it is not known if the weights collected are from the majority of the households in these LAs (meaning the figures are representative and accurate); or come from a smaller fraction of the households who engage with the service (meaning that little to no SMW is collected from the majority of households in these LAs). Furthermore, no correlations between demographic indicators or scheme characteristics and average collected weights were found. This is not surprising considering the relatively small sample size and the highly complex relationships between WEEE available for collection and WEEE presentation rates by the public.

The responses indicated that SMW is generally collected in standard carrier bags, placed either on top of bins or in boxes for dry recyclables. Though the majority of kerbside services collected SMW in containers or cages integrated into the regular dry-mixed recycling and/or residual waste collections, two survey respondents used separate pass vehicles for SMW collection. Nine respondents offer SMW collection with bulky waste, and one cited having SMW drop-off points in public facilities (e.g. libraries) in addition to at HWRCs.

No usable cost information on established kerbside collection services was obtained from the survey or through other engagement with stakeholders. Inability, rather than unwillingness, to separate out the service cost from the wider household collection service was widely cited as the reason for this. Instead, a bottom-up calculation (i.e. building typical services from the ground up using available references for specific costs such as vehicles, labour and equipment) was used to estimate costs in the model.

The second part of the research involved building a model to capture the costs of SMW kerbside collection services currently operational and understanding the cost and environmental implications of these services if they were to be scaled up nationally. The model represents the costs that would likely be entailed in the provision of a kerbside collection service for SMW, with the potential to incorporate portable battery collections too. These costs were not predicated upon, nor could be separated from, any particular organisational or institutional framework for the actual delivery of such services. A corollary of this is that although the costings in this study are presented as adjustments to LA current collection arrangements, it is not prejudged that only LAs would need to be the service providers across the board in the future.

The three types of SMW collection considered were:

- Collection of SMW in cages attached to diesel refuse collection vehicles (RCVs) already collecting dry-mixed recycling and residual waste.
- Collection in containers in kerbside sort vehicles.
- Collection via separate pass vehicles.

As batteries are also commonly collected alongside SMW, the costs of a joint SMW and battery collection service was also modelled. Given the proportion of SMW to batteries in residual waste (90:10 based on weight or 98:2 based on volume) the vehicle space and costs associated with battery collection were proportionally smaller than that for SMW.

Yearly household set-up and annualised running costs of collection services were calculated for four different SMW + battery collection models and for nine types of LA, characterised by their relative deprivation and rurality (Table 1). The scope of these costs is from kerbside to the first point of consolidation, most often a bulking container at a contractor's depot or a waste transfer station.

The set-up costs modelled represent the worst-case scenario, where all flat households would be provided with a container. The model does not capture the considerable variability in types of communal households (e.g. tower blocks, low rise flats, flats above shops, houses converted into flats, etc. as detailed by WRAP in their previous study[3]), as well as the way in which each type of communal property is set up for residents to dispose of waste. Therefore, there may be further costs for providing kerbside collection services to communal households that were not modelled (e.g. provision of dedicated receptacles in waste storage rooms for residents to dispose of WEEE into prior to waste collection). Conversely, some communal households may be able to present SMW in carrier bags or loose in secured waste storage rooms with fewer individual containers then required. More work is needed to understand and model these costs in detail, on a given LA basis. This is an important knowledge gap, as in this update, UK-wide set-up costs are entirely driven by the assumptions of container set-up for flats (£10.5M). Compared to the July 2021 version of this study, container-related assumptions have grown in significance because in the previous version, set-up cost is made up of local overheads and container costs; whereas in this update, local overheads are instead accounted for in annual operating costs, leaving container set-out as the only cost centre for set-up costs. Container replacement cost under the current assumptions make up around 9% of UK-wide annual operating costs (£608,150 per year).

This most recent estimate of UK-wide set-up costs is nearly half the previous figure, which was published in July 2021 (£21.2m). This is primarily due to the cost of providing containers reducing since the original cost data was published. Furthermore, a reduction in set-up costs can also be attributed to the fact that local overhead costs are now deemed as a negligible and have been removed from the calculation.

Operating costs vary between collection methods, mainly due to variations in the type of kerbside sort vehicle. More vehicle-related costs (such as capital, standing, and running costs) were attributed to SMW by share of volume provisioned since the waste compartment is integrated in the vehicle; these costs were not applicable in the case of RCV with a separately fitted cage.

This most recent estimate of UK-wide annual operating costs (£6.7m) is about 32% lower than the July 2021 figure (£9.9m). Largely this is due to a more refined staffing scenario (i.e. where the number of vehicle operators is now differentiated by urban and rural geographic areas) as well as the application of a new methodology for calculating

[3] WRAP, 2014: Barriers to recycling: A review of evidence since 2008. Available from: https://wrap.org.uk/sites/default/files/2020-09/WRAP-Barriers%20Synthesis%20Full%20Report%20final%20121214%20PUBLISHED%20-%20PDF.pdf

the cost of supervision. For scenarios concerning kerbside sort vehicles, it should be noted that the central estimate for their capital cost has increased, reflecting WRAP's observation that there will likely be a continued price increase for kerbside sort waste collection vehicles over the next 5-10 years.

Table 1: Per household per year[a] set-up costs[b] and annualised running costs of the various SMW and battery kerbside collection models in different types of LA

LA Category	Set up costs (£)	Annualised running cost of fortnightly kerbside collection of SMW and batteries based on existing collection models for dry mixed recycling (£/hhd)			
		Co-mingled/ residual	Two-stream	Kerbside-sort	Separate pass
Predominantly Urban, higher deprivation	0.40	0.06	0.07	N/A as no LAs fall under this category	4.40
Predominantly Urban, medium deprivation	0.72 (due to high % of flats in LAs under this category)	0.08	0.09	0.52	4.46
Predominantly Urban, lower deprivation	0.65	0.08	0.09	0.52	4.28
Mixed Urban/Rural, higher deprivation	0.25	0.07	0.08	0.64	5.54
Mixed Urban/Rural, medium deprivation	0.28	0.07	0.08	0.64	5.59
Mixed Urban/Rural, lower deprivation	0.39	0.07	0.19	0.65	5.58
Predominantly Rural, higher deprivation	0.16	0.09	0.05	0.87	14.04
Predominantly Rural, medium deprivation	0.20	0.10	0.12	0.87	13.93
Predominantly Rural, lower deprivation	0.28	0.10	0.12	0.87	14.09

NB: Costs for SMW collection only (excluding batteries) would be slightly lower, see Section 5.2.1.1
Note a: Based on a fortnightly collection frequency.
Note b: The same costs per unit were applied for both RCV and kerbside sort collection methods, as related to container provision. Variations in set-up costs per household are due to differences in the average number of households (all types) per LA served by RCV or kerbside sort vehicle.

The figures in the above table solely relate to operational costs and do not include communications by local authorities to publicise the service and drive behavioural change towards greater uptake of the service. Estimates[4] for successful local authority communications in driving engagement with recycling services range from £1.19 to

[4] Figures adjusted for inflation from Zero Waste Scotland Communications Guidance: Improving Recycling Through Effective Communications, 2012

£2.38 per household and are generally at their highest when a new service is first introduced. Based on these, the average annual communication costs for all households with at least residual collection are estimated to be around £23.9 million, which assumes a triennial cycle of spending on communication over the period 2019 to 2028. This equates to an average cost of £0.82 per year per household.

The overall capacity for collecting SMW and batteries on RCV and kerbside sort vehicles depends in practice on both competition from other niche waste streams, most notably textiles, and on vehicle configuration and under-chassis space. Some diesel RCVs are already unable to support cage attachment for collecting SMW and batteries, and space is likely to be further constrained on electric RCVs (as existing vehicle models appear to use this space to house the vehicle battery).

If all UK-wide DMR collection vehicles and RCVs collecting residual waste had cages or compartments dedicated to SMW, it is estimated that they could accommodate 2.9 kg/hhd/yr. This represents 55% of the potential volume of SMW that households could present, equivalent to 402,000 m^3 or 85,600 tonnes of annual collection capacity. This calculation is based on estimates of SMW currently ending up in the residual waste. The approach taken here is that the 155,000t of SMW in residual waste is divided into an average kg/hh/year figure, which is then compared with the expected collection service capacity per day. For reference, the mean combined weight of SMW and batteries currently presented by households with kerbside collection services is 0.7kg/hhd/yr, based on an analysis of the survey results. It follows that the capacity requirements for SMW collection should also account for the weight contribution from embedded batteries, as it is not always feasible or realistic for the public to remove and segregate these before presenting for collection.

Separately, survey responses from LAs with existing kerbside collection of SMW (through DMR RCVs and kerbside sort vehicles) indicate that the average presentation rates for SMW in practice is 0.68kg/hhd/year. On this basis, it is predicted that a UK-wide solution may collect approximately 20,000 tonnes of SMW, covering a total of 29,503,002 households. It is predicted that increased public awareness and engagement with such services could increase this tonnage figure.

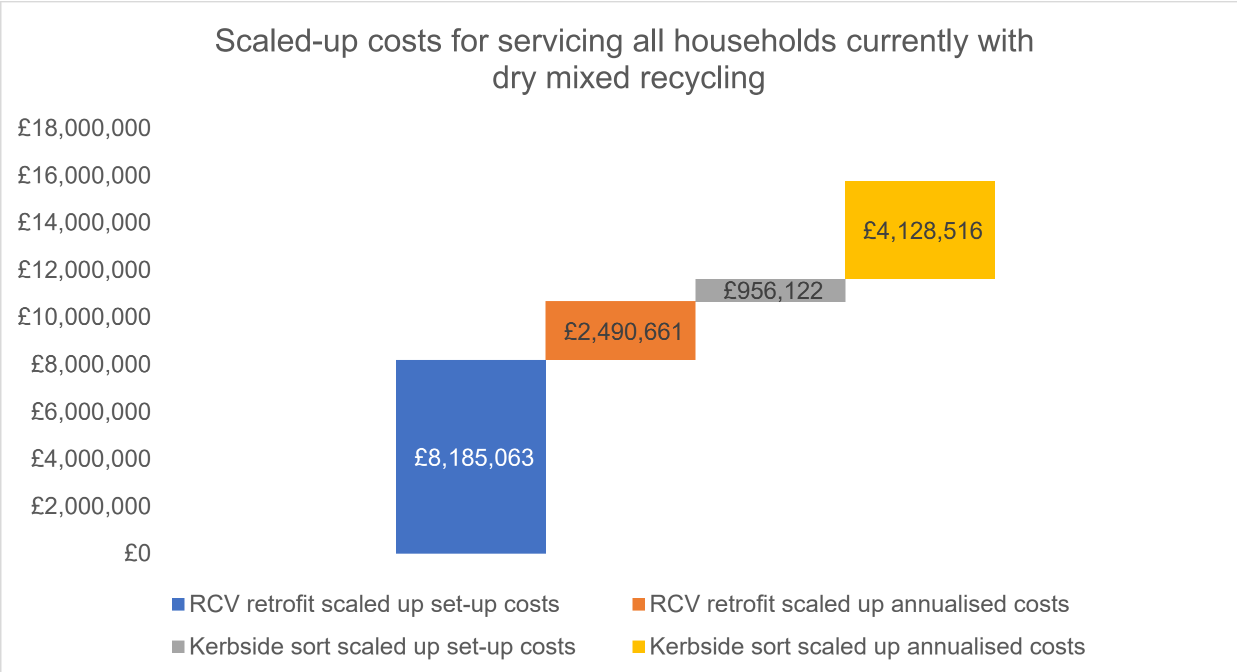
The potential capture rate of 55% noted above assumes a perfect utilisation of collection capacity, and therefore does not factor in residents setting out SMW less frequently and in larger quantities. This may be challenging in terms of on-vehicle space, particularly where RCV cages are concerned. Furthermore, the potential for cannibalisation of SMW from other means of collection, i.e. those which would otherwise be collected through other channels (e.g. retail takeback, HWRCs, bulky waste collections and bring banks) are not factored in. When batteries are also considered, if all collection vehicles could set aside 55 litres of space for battery collection, then the total annual collection capacity represents 6.7 times the volume of batteries currently estimated to be ending up in residual waste.

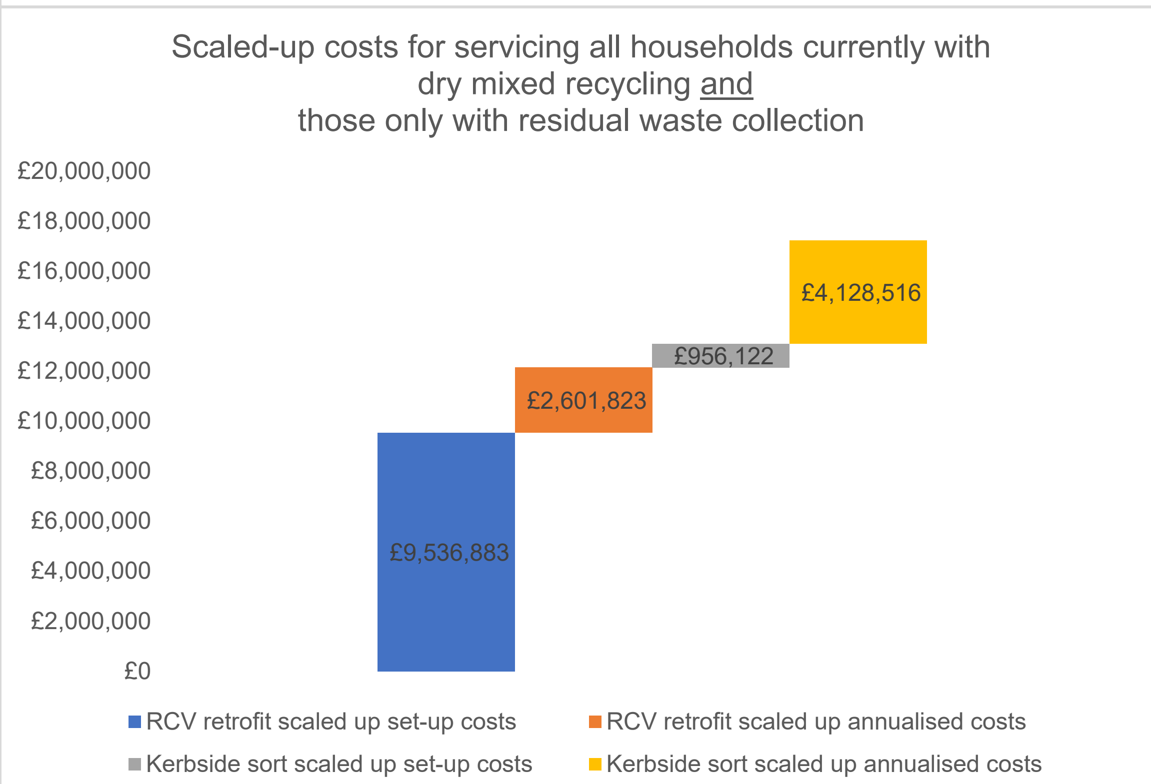
The yearly household costs were scaled up across the UK to capture the 29,056,415 households currently with DMR collection. All scale-up costs below exclude the initial set-up costs by the 86 LAs that already offer kerbside collection of SMW, but it does include their annual operating costs. Figure 1 shows that the total set-up costs were estimated at £9.1 million, with annualised operating costs of £6.6 million. In Year 1, the UK-wide costs total £15.7 million. The set-up and operating costs for SMW collection by RCV and kerbside sort vehicles are presented in Table 6, with the annual operating costs for separate pass vehicles included in Table 13.

The above scale-up excludes households who only receive residual waste collections but not DMR (a total of 446,587, or 1.5% of the total number of UK households with a residual waste collection service). These households are not serviced by DMR, likely due to practical barriers, such as being in remote/isolated locations. If these households were included in the scale-up, and assuming they are serviced by RCVs with fitted cages to collect SMW, the UK-wide costs for Year 1 would increase to £17.2 million. This represents a £10.5 million set-up cost and a £6.7 million annualised operating cost. The total national cost in Year 1 is resultingly 10% more expensive than the scenario excluding these residual waste-only households. This increase reflects the proportionally higher costs associated with serving what are believed to be very remote and/or communal households in certain areas. There may also be further costs not yet accounted for in the model that are applicable to LAs that lack collection services for some households in their area. For example, this could apply to some of the flats and remote households in the 86 LAs that already have kerbside services, but who may not actually be covered by these services.

The basis of the UK-wide scale-up was the designation of the UK's 394 LAs with waste collection responsibilities as one of the nine LA classifications listed in Table 1. The type and frequency of each LA's dry mixed recycling collections was also taken into account for the scale-up exercise, due to the assumption that any SMW collection service would be added to existing vehicle and service provision for dry mixed recycling. For households without DMR collections, SMW kerbside collections were assumed to instead be via a cage attached to the RCV providing residual collections. Set-up costs for the 86 LAs with established kerbside collection services for SMW were excluded from the national scale-up, although operating costs were included. Additionally, in feedback from various LAs, some LAs with existing kerbside collections are reticent to promote the service as they feel they lack operational capacity to deal with increased demand. Further investment may therefore be required to support some LAs to achieve minimum collection capability standards.

Figure 1: National scale-up costs (excluding the set-up costs from the 86 LAs with existing SMW kerbside collection services and including their annual operating costs). Top: for servicing all households currently on DMR schemes; Bottom: for servicing all households including those only with residual collection





Note: Excludes communications and projected cost contribution from LAs already offering SMW collection services

Notably, the overall operating costs of providing kerbside collection services for SMW and batteries using vehicles already servicing households' waste removal needs, i.e. RCVs and kerbside-sort vehicles, is significantly lower than the £233 million estimated for collection entirely via dedicated separate pass vehicles servicing all households in the UK. For the separate pass collection estimate, it was projected that 3,482 vans weighing 3.5 tonnes would be required to service all UK households with residual waste collection (i.e. 100% coverage of households). This assumes that the vans are operating on a fortnightly basis. This level of collection capacity would also be able to capture 100% of the SMW and batteries currently lost in residual waste. In addition to the £233 million of annual operating costs, the set-up cost involving provision of containers for flat households could add another £10.5 million. The container provision costs may be an underestimate, as most of the existing kerbside SMW collection services (from the 86 LAs) are unlikely to cover communal households.

Survey responses have also indicated that there would likely be surges in demand at service introduction and also throughout the year. Therefore, LAs may need to provide a separate pass vehicle in addition to RCV or kerbside sort vehicles to collect the additional SMW and batteries. Although not modelled in detail, assuming that each LA operating collections via RCV or kerb sort vehicle also require at least 1 separate pass vehicle dedicated to SMW. From this each LA could expect an additional cost of approximately £67,000 annually. Taking into account the 394 LAs that currently collect residual waste, the UK-wide cost to cope with demand is estimated to be £26 million per year, nearly 4x the annualised operating cost of other collection methods. Note that this is a very high-level estimate due to the enormous variation in LA size and the resulting need to own or hire vehicles.

These costs could also potentially be brought down if separate pass vehicles are employed at the times when they are specifically needed for SMW, rather than throughout the entire year. For example, projects recently funded by Material Focus showed that collections can surge for 6 months after a major communications campaign. Therefore, the cost of using separate pass vehicles to cope with surges in demand for kerbside SMW collection could be half the cost estimated above (around £33,500 annually, per vehicle required).

Much like the costs, the carbon impact of collecting all SMW via separate pass collection vehicles every 2 weeks is much greater than via kerbside sort vehicles and RCVs. These separate pass vehicles (and therefore the emitted CO_2) are allocated completely to WEEE (and batteries): 15,252 tonnes of carbon dioxide equivalent (tCO_2e) for separate pass compared to 152 tCO_2e for kerbside sort and RCV collections[5].

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[5] CO_2e (carbon dioxide equivalent) is a common unit for measuring the climate effects of different gases (e.g. CH_4, N_2O). It is calculated based on the global warming potential of gases. For example, CH_4 has a global warming potential of 25 over a 100-year timeframe according to the UN Framework Convention on Climate Change. This means that 2 tonnes of CH_4 have CO_2e of 50 tonnes. See more from: https://unfccc.int/resource/docs/cop3/07a01.pdf

A small-scale analysis of WasteDataFlow information was carried out to probe the impact of SMW kerbside collection on the total and also the changes in "WEEE – small domestic appliances" collections that are reported by LAs. There was no statistically significant difference in the total per household tonnages of "WEEE – small domestic appliances" reported by the 86 LAs with kerbside collection services for SMW and those without. No relationship could be established between kerbside collection methods and collected tonnages, possibly because data entries in WasteDataFlow are not consistent from one period to the next or one LA to the next. It's more likely due to complex factors that influence engagement with recycling in different regions, as well as the operational issues that can affect LAs' ability to deliver and therefore promote these services. As a result, the relationship between whether tonnages of WEEE in LAs with kerbside collections of SMW are greater in aggregate than in areas that do not have these collections likely requires further research.

Key outcomes of the survey and modelling work are the estimates of the cost and carbon impact of providing kerbside collection for SMW, which both suggest that, with respect to cost and CO_2, provision of the service via established collection vehicles is preferable to a separate pass collection. On-demand collection was a collection type not modelled but that might be a suitable alternative in some higher density LAs and very rural areas. It would save otherwise wasted journeys where SMW was not being presented.

Compatibility of current and future RCVs to fitting cages for SMW collection was not established, and no attempt was made to factor in potential increased competition for undercarriage space by other niche waste streams. Nevertheless, it was reassuring that, theoretically, the volume on existing collection vehicles could accommodate 4 times the current mean kg/hhd weights presented by households already served by kerbside collection services. In practice LAs and WMCs tend to own and operate fleets of specific makes and models of vehicles which, if unable to support SMW collection, would lead to inconsistencies in collection provision from area to area.

Collecting batteries alongside SMW (which itself often contains lithium-ion batteries) is considered to be a way to reduce the fire risk associated with these batteries/SMW otherwise entering the residual waste stream or other DMR streams (where they might otherwise become damaged and heat up considerably) and increase battery recycling rates. The inclusion of batteries, alongside SMW, for kerbside collection was found to have a relatively minor impact on cost and carbon impact, due to the relatively light touch set-up involved (i.e. placing a 55L container in each RCV cab or setting aside the equivalent volume in kerbside sort vehicle compartments). This approach assumes that in both cases the space is available and in particular, that the placement of a 55L container in RCV vehicle cabs is permitted. Additional costs from batteries therefore include the cost of containers and their replacements, and additional fuel costs from the increased load on the vehicles. The incremental cost of including batteries with SMW collection adds less than £0.01 per household per year, regardless of collection method. If a LA were to introduce kerbside collection of batteries separately from SMW collection, then additional cost items will need be accounted for (i.e. staff, vehicle, local and commercial overhead costs), and therefore the cost per household will be higher.

Collecting SMW and batteries together could also have the advantage of potentially sharing communication costs between the two waste streams.

Lastly, based on the UK-wide operating costs for households that currently have DMR collection and assuming an 80% fill level of available container volume in operation, the minimum costs per tonne of SMW and of batteries collected were calculated using bulk densities of 213 kg/m^3 and 1,350 kg/m^3 respectively[6] (Table 2). As before, the scope of these costs is from household kerbside to the first point of consolidation.

The main reason for the cost differences between collection by diesel RCV cage and by kerbside sort vehicle is the difference in collection capacity provided under each scenario. Although collection by kerbside sort vehicles is more expensive on a per household basis, its average collection capacity is 5x that of RCV cages, resulting in a slightly lower cost per tonne.

The separate pass scenario reflects the costs of using only separate pass vehicles to capture all of SMW and batteries from all UK households that currently have residual collection. As a result, the cost per tonne for SMW collected by separate pass vehicles is nearly 18x higher than the average of those collected by RCVs or kerbside sort vehicles. The cost per tonne of batteries collected by this method, including both batteries embedded in SMW and those separately presented, is 10x higher than that of SMW because the weight of batteries available per household per year is 10% of the SMW available.

[6] Bulk densities based on Scottish Environment Protection Agency publication.

Table 2: Minimum cost per tonne of SMW and batteries collected, based on the UK-wide annualised operating costs (excluding set-up or communications cost)

Collection method	Cost per tonne for SMW by collection method	Tonnes that could be collected [a]
Diesel RCV fitted with cage for SMW	£73 (retrofitting all RCVs for both DMR and residual collections)	35,600
	£85 (only retrofitting RCVs used for DMR)	29,300
Kerbside sort compartment for SMW	£84 (entire compartment used for SMW)	49,400
	£89 (if competing with batteries for compartment space)	46,300
Separate pass (assuming 70% fill level, average presentation rate and 100% participation rate – coverage for all households with at least residual collection)	£1,516	153,946 (total weight of SMW found in household residual waste in 2019, less the weight of batteries)
Collection method	**Cost per tonne for batteries alongside SMW by collection method**	**Tonnes that could be collected [b]**
Diesel RCV fitted with undercarriage cage for SMW and a 55L container for batteries	£30 (retrofitting all RCVs for both DMR and residual collections)	88,900
	£35 (only retrofitting RCVs used for DMR)	73,000
Kerbside sort compartment with space for SMW and 55L for batteries	£164 (accounting for less batteries embedded in SMW)	25,168
Separate pass (assuming 70% fill level, average presentation rate and 100% participation rate – coverage for all households with at least residual collection)	£15,195	15,364 (total weight of batteries estimated to be present in household residual waste in 2019)

NB: Operating costs allocated to SMW/batteries include: staff cost, vehicle retrofit cost (RCV), vehicle capital, standing and running costs (kerbside sort vehicle), fuel cost, container replacement (for flat households and battery containers on RCVs), and overheads.

Note a: The total weight of SMW that can be collected UK-wide is calculated by multiplying the bulk density of SMW by the total collection space available (assuming all RCVs are fitted with undercarriage cage and average size of compartment for WEEE in kerbside sort vehicles), then applying the SMW protocol to subtract 0.68% of the weight that count towards batteries.

Note b: The total weight of batteries that can be collected UK-wide (covering households with DMR) is calculated by multiplying the bulk density of batteries by the total collection space available (assuming all RCVs for DMR are fitted with a 55L container and the equivalent space is made available in kerbside sort vehicles), then adding the 0.68% by weight previously subtracted from the tonnages of collected SMW.

3. Context and objective

The lack of availability of convenient disposal/collection options for small electrical and electronic appliances is a hurdle to their reuse and recycling. Previous research commissioned by Material Focus calculated that around 155,000 tonnes of WEEE is lost in residual waste each year, partly because of the effort required by the public to access official recycling points.[7]

Local authority kerbside collection is one way to increase the convenience of SMW collections, to complement the existing provision of retailer and household waste and recycling centre (HWRC) drop-off points. There are 394 local authorities (LAs) with waste collection responsibilities in the UK, of which around 86 are believed to already offer a kerbside collection service for SMW. Understanding the dynamics and efficiencies of these kerbside SMW collection services, both in terms of their economic and environmental impacts, is an aim of this research.

The desire for a better understanding of these dynamics and efficiencies is set against a background of significant changes in related policy, specifically an upcoming review of the Extended Producer Responsibility regulations for WEEE[8] and ongoing considerations on the consistency of household recycling collections for LAs across the UK.[9] Changes in the Distributor Takeback Scheme as of January 2021 have also meant that more retailers are obligated to take back WEEE in-store, though this additional provision is largely untested due to Covid-19 closures. Ongoing modernisation (including electrification) of waste and recycling collection fleets is also relevant. Other regulatory changes being developed that may impact SMW collections include the Deposit Return Scheme for packaging (as this would divert material from kerbside dry mixed recycling (DMR) and alter the efficiency and economies of kerbside collection in general); the Extended Producer Responsibility for packaging (which could fund additional collection infrastructure for packaging recycling); the portable batteries regulation consultation; and the Environment Bill (which may include increases in Government powers to set product and information requirements toward increasing resource efficiency).

The objective of the research was to develop the evidence base for informing discussions as to whether it is appropriate to mandate kerbside SMW collection services across all UK LAs. This included: assessing the effectiveness and costs of the various kerbside collection services that are currently in place and providing options as to the operational solutions available for the nationwide provision of mandatory LA kerbside collection services for SMW.

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[7] 155,000 figure from Electrical waste: Challenges and opportunities, 2020.
https://www.recycleyourelectricals.org.uk/report-and-research/electrical-waste-challenges-opportunities-2/
[8] Summary of EAC inquiry on Electronic Waste and the Circular Economy (which mentions EPR), 2020
https://publications.parliament.uk/pa/cm5801/cmselect/cmenvaud/220/22006.htm
[9] Letsrecycle article on the likely timing of the second round of consultations, 2021
https://www.letsrecycle.com/news/latest-news/defras-consistency-consultation-delayed/

4. Methodology

4.1 Survey and stakeholder knowledge gathering

The aim of this research element was to obtain current operational information on kerbside SMW collections from stakeholders, along with other relevant contextual information. The surveys and stakeholder engagement were conducted during February and March 2021.

Two online surveys were designed, one tailored towards LAs with waste collection responsibilities and one tailored towards waste management contractors. These can both be found in Appendix 6.1. An Excel version of the latter survey was also prepared to simplify data collation for contractors servicing multiple LAs. A summary of the questioning focus for the various stakeholders is included in Appendix 6.3.

Table 3: Information on the operational characteristics of SMW kerbside collection services asked of the different stakeholders

Information on operational characteristics targeted	Covered in LA (local authority) and/or WMC (waste management contractor) surveys	Other stakeholder questioning
Operational delivery methods	Yes – LA and WMC	Yes
Method of presentation	Yes – LA and WMC	Yes
Types of kerbside collection models	Yes – LA and WMC	Yes
Type of contract	Yes – LA	Yes
Arrangements for offtake	Yes – LA and WMC	Yes
Cost structure and total net costs	Yes – LA and WMC	Yes
Appraise funding sources and risks	Yes – LA	No
Identify potential alternative models of funding	Yes – LA	No
Commentary on performance of kerbside collection compared to other local channels	No	Yes
Key losses and potential causes	Yes – LA	Yes
Quantify capability of current collection service models to capture all WEEE discarded locally	Yes – LA and WMC	

The surveys were distributed to LA representatives through the mailing lists of the National Association of Waste Disposal Officers (NAWDO) and the Local Authority Recycling Advisory Committee (LARAC). LAs previously identified by Material Focus to operate kerbside SMW collection services were also emailed directly and invited to participate in the survey.

The WMC survey was distributed through the Environmental Services Association who then anonymised responses from participating waste contractors. Additionally, WMCs previously identified by Material Focus to provide kerbside SMW collection services were contacted directly and invited to participate.

The information collected through surveys was supplemented through one-to-many and one-to-one stakeholder interviews. These included a workshop with members of the Industry Council for Electronic Equipment Recycling (ICER) and a discussion with members of the WEEE Schemes Forum (WSF). A WEEE Producer Compliance Scheme (PCS) and a major refuse vehicle manufacturer were also interviewed.

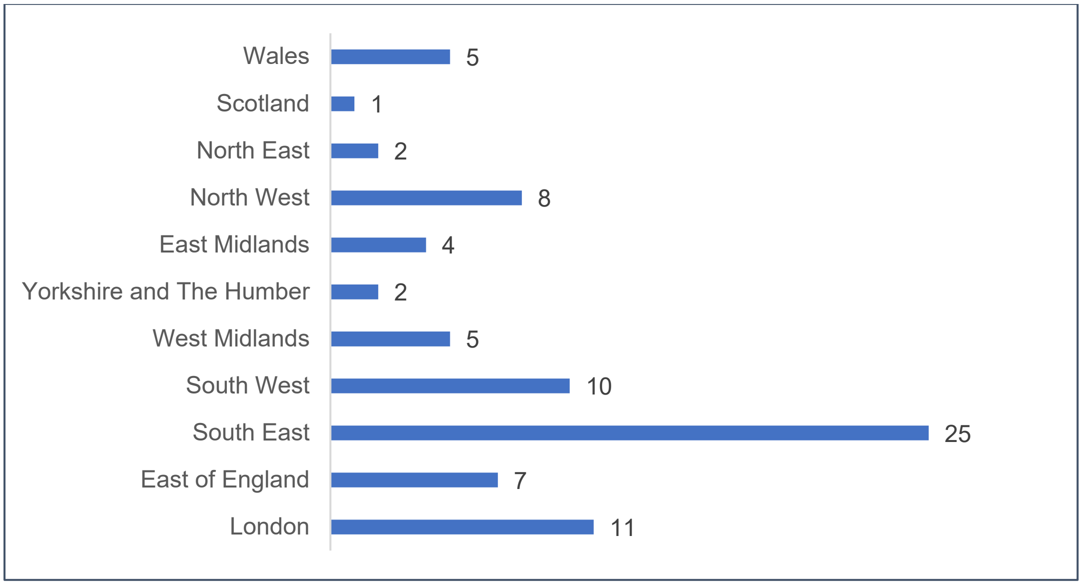
4.1.1. Characteristics of survey sample

Survey responses were received from, or on behalf of, 66 LAs or Waste Partnerships (with 80 LAs being represented overall) of which 3 were Waste Disposal Authorities. Of these, 46 have kerbside collection services in place for SMW, 9 accept SMW as part of their bulky waste collection service and 11 do not collect SMW from households. Survey responses were received from over half (53%) of the 86 LAs in the UK identified as having SMW kerbside collection services (see Appendix 6.2).

16 responses were received from WMCs, and 56 from LAs directly. There was an overlap in 6 LAs, where both the Waste Management Contractor and LA provided information in the survey. A full analysis of the survey responses is included in Appendix 6.3.

The regional and demographic groupings of the LAs covered by the survey responses is as follows:

Figure 2: (Top) Regional and (Bottom) rural/urban characterisation of the LAs included in the survey sample.



Note: Total number of LAs shown in charts is 80, which is greater than the 66 survey responses received because Waste Partnerships, such as Somerset Waste Partnership and North London Waste Partnership, represent multiple LAs.

Survey responders were emailed with follow-up questions and requests for clarification if required.

Most questions in the survey were generally well-answered, although fewer usable responses were received for the questions requiring numerical answers, including:

- The tonnage of SMW collected per year (37 responses).
- The size of the on-vehicle cage or compartment for SMW collection (26 responses).
- The cost of the service (1 response).

The difficulty in obtaining cost data through surveys was recognised early on, and mitigating measures were put in place for the development of the model. The main reason given for not providing cost information, by both LAs and WMCs, was an inability (rather than an unwillingness) to disaggregate the cost of kerbside SMW collection from other collections.

4.2 Modelling of economic and environmental impact

The aims of this research element were to:

- Quantify and compare the set-up and operating costs of various collection models, for SMW-only collection and SMW-plus-batteries collection, between kerbside and the first point of consolidation.
- Estimate the scaled-up national set-up and steady state operating costs, taking into account regional differences and the suitability of different collection models.
- Quantify the maximum available collection capacity under the scaled-up scenarios.
- Derive the amount of small electricals and batteries that can be captured under steady state operating conditions versus the amount that requires a separate pass for collection, and the cost implication.
- Estimate the greenhouse gas (GHG) emissions from kerbside collection services from household kerbside to the first point of consolidation.

The model represents the costs that would likely be included in the provision of a kerbside collection service for SMW with the potential to incorporate battery collection. These costs were not projected on, and therefore could be separated from, any particular organisational or institutional framework for the actual delivery of such service. A result of this is that although the costings in this study are presented as adjustments to LA current collection arrangements, it is not prejudged that only LAs would need to be the service providers across the board in the future.

The detailed methodology is described below in nine steps:

1. Establish cost structure by collection model for SMW-only collection and SMW-plus-batteries collection.
2. Categorise UK local authorities by current dry mixed recycling scheme.
3. Further categorise UK local authorities by rurality and deprivation.
4. Calculate steady state cost and GHG impact per household for SMW-only collection and SMW-plus-batteries collection.
5. Calculate steady state scale-up cost and GHG impact for the UK for SMW-only collection and SMW-plus-batteries collection.
6. Calculate cost-effectiveness of current kerbside SMW collections and total costs for the 86 LAs that already offer kerbside collection of SMW.
7. Calculate the cost of providing additional collection capacity / alternative collection methods by separate pass vehicles, including for accommodating potential demand surges at introduction of service.
8. High-level quantification of opportunity cost related to adoption of electric RCVs.
9. Sensitivity analysis.

The project steering group agreed to use 2019 as the baseline year for the modelling, unless certain data points were only available for earlier years and could not be robustly extrapolated.

4.2.1 Establish cost structure by collection model

SMW is a niche waste stream and its collection is typically an add-on service to existing kerbside recycling contracts.[10] As a result, waste management companies do not tend to explicitly cost up SMW collection, but rather absorb it into general waste management contracts. This is reflected by an inability (rather than unwillingness) by both local authorities and waste management companies to provide a cost per tonne estimate for SMW collection via a survey.

Based on survey results, there are currently three main models for SMW collection (see report section 5.1 for supporting evidence):

- Collection via RCVs fitted with undercarriage cages (Figure 3 and Figure 4). These can be RCVs for dry recycling collections and/or residual collections.
- Collection via kerbside sort vehicles with a built-in compartment for wastes other than dry recyclables, assuming that the compartment is dedicated for SMW and not shared with other niche waste streams. Occasionally, this compartment is shared with other waste streams such as textiles (Figure 5), but for the purpose of the modelling undertaken throughout the report, it was assumed that this space would be dedicated to WEEE.
- Separate pass collections (i.e. using a separate vehicle to collect WEEE), including on-demand services (Figure 6). Note that this model is currently limited to a small-scale operation. Stakeholder comments indicated that this is potentially most suited for high-rise flats and for collecting electricals for reuse (such as Tech-Takeback's 'RevaluElectricals' service currently operating in Brighton & Hove).[11]

In terms of the overall operational safety of kerbside SMW collection, one major WMC indicated that there is little difference between loading a kerbside sort vehicle and loading an undercarriage cage fitted on a RCV, as in both scenarios, the operators are loading with no stop buttons at the side of the vehicle whilst the vehicle is running. The WMC has highlighted that procedural training will be important for introducing safe kerbside SMW collection. Examples include:

- When loading WEEE into cages, this should be done kerbside (i.e. near side of vehicle) and therefore not standing in live traffic flows (i.e. working on the off-side). This is to ensure that the employee will be in a safe position for loading.
- Communication is paramount, and the rule of the driver should be to stop if at any time they lose sight of their loaders or are unsure of their positioning.
- Wing mirror and additional camera systems can provide a detailed view of the side of the vehicle giving clear visibility of someone loading, as the loaders should also be wearing hi-visibility clothing.

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[10] There also exists on-demand collection of SMW, though currently at smaller scale than kerbside drop-off

[11] Tech Take-back. https://www.techtakeback.com/

- Loading should only ever be done on stationary vehicles, regardless of how the WEEE is presented at kerbside.

The WMC also highlighted that the SMW collection cage should be designed securely, so as to ensure cages do not open in transit.

Figure 3 Examples of kerbside collection of SMW by RCV. Left: Example of undercarriage cage installed under RCV in Mid Sussex where WEEE are presented in carrier bags; Right: Example in Urbaser where the compartments are used for clothing, SMW and batteries

Figure 4 Example in Burnley where pods were fitted between wheels of the RCV for batteries.

Figure 5 Example of kerbside sort vehicle, where electricals and textiles are collected in the same compartment, located above the rear wheel.

Photo credit: Online via [Letsrecycle]

Figure 6 Example of separate pass vehicle

Photo credit: Online via [Flickr]

Additionally, one major Producer Compliance Scheme indicated that portable batteries are considerably easier to collect than WEEE due to the comparatively lower total weight and volume collected on a typical round. It is believed that most waste collection vehicles can be adapted to have a container attached somewhere on the vehicle, or alternatively, some LAs put a small box (commonly 55L in size) inside the cab itself. For the purpose of the model, it was assumed space is available for a 55L container in all RCVs (for DMR and residual), that batteries do not compete for space with SMW and that the addition of a 55L container inside the cab would be permitted. Based on the scheme's feedback that the typical amount of batteries collected per round falls well below the threshold established in the *European Agreement concerning the International Carriage of Dangerous Goods by Road* (commonly known as the ADR threshold)[12], the model does not include potential costs for putting in place any additional mitigating measures required to meet relevant health and safety regulations.

To allow for fair comparison of cost per tonne, it was assumed that the same space is available for batteries on kerbside sort vehicles, i.e. 55L of the compartment available for SMW would be taken up by batteries. This was sense checked by calculating the ratio of batteries to SMW collected via survey respondents, which was:

- by weight 14:86 (batteries:SMW)
- by volume 3:97

Based on WRAP's study of the national household waste composition[13], the weight of batteries in household residual waste across the UK was estimated to be 15,400 tonnes (scaled by 0.22kg per capita per year in England, 2017). The ratio of batteries to SMW available for collection from household residual across the UK was:

- by weight 10:90
- by volume 2:98

The assumption that 55L of space is available on both RCV and kerbside sort vehicles for battery collections allows the following volume proportions of batteries to SMW to be collected, which exceed the ratios of SMW and batteries arising:

- RCV 24:76 (ratio indicates scale of volume available for batteries and SMW; batteries do not compete with SMW for space)
- Kerbside sort: 6:94 (batteries could compete with SMW for space if the volume exceeds 6% of the dedicated waste compartment)

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[12] ADR, CDG Regs and Dangerous Goods Safety Advisors. https://www.hse.gov.uk/cdg/manual/adrcarriage.htm#adr

[13] WRAP. National Household Waste Composition 2017. 2020. https://wrap.org.uk/sites/default/files/2020-11/WRAP-National%20municipal%20waste%20composition_%20England%202017.pdf

The cost structure of each collection model was developed with a bottom-up approach. This first involves identifying the relevant cost items for SMW collection, and the range of such costs, from literature on kerbside DMR. Three key references used in the July 2021 version of this study were WRAP's *ICP 2 methodology and assumptions*[14], *Harmonised Recycling Collections Costs Project: Phase One*[15] and *National household waste composition 2017*[13]. The July 2021 version of this study referenced cost assumptions from the first two studies which were adjusted for inflation using the Office for National Statistics' Consumer Price Index. Since then, WRAP has updated its ICP methodology and cost assumptions, with the latest version being ICP3. Since this study and the underlying model will be a primary source for the upcoming Impact Assessment, Defra initiated an update to the July 2021 version of this study to incorporate both methodological and cost-related changes in ICP3. In the updated version of this study, several cost assumptions were refined using primary data gathered by WRAP through its industry network, instead of previously inflation-adjusted estimates.

The costs attributable to SMW were calculated along three lines of logic:

- Additional costs are incurred as a direct consequence of introducing SMW collection: e.g. the cost of retrofitting RCVs with undercarriage compartments.
- Additional costs are incurred due to inclusion of SMW: e.g. additional fuel costs resulting from the weight of SMW being transported by vehicles.
- A proportion of the DMR operating costs are allocated to SMW collection based on the sharing of resources: e.g. kerbside sort vehicle capital/standing/operating costs and staff costs.

Table 4 summarises the costs for SMW collection which is derived from the DMR cost structure. Direct costs such as the cost of retrofitting undercarriage cages are omitted from the table. Note that the model assumes an 80% fill level for both cage/compartment and total vehicle volume to reflect actual operations as per stakeholder feedback. Since this assumption is effectively cancelled out in calculations and does not affect cost per household, it is not included in equations in Table 4. The fill volume later impacts conversion from cost per household to cost per tonne, using the bulk densities of SMW and batteries of 213 kg/m^3 and 1,350 kg/m^3 respectively, according to data provided by the Environment Agency.[16] Furthermore, the weight of batteries in SMW was accounted for when calculating the cost per tonne of SMW and

[14] WRAP. ICP2 – Online Tool Modelling Assumptions Technical Annex. 2015. http://laportal.wrap.org.uk/Documents/ICP online tool assumptions.pdf
[15] WRAP. Harmonised Recycling Collections Costs Project: Phase One. 2016. WRAP-harmonised-recycling-report-2016 (wrapcymru.org.uk)
[16] Scottish Environment Protection Agency. https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx

batteries; this was performed by deducting 0.68% from the total weight of SMW, as per to the SMW protocol.[17]

A key assumption related to staff costs is that no overtime would be incurred because of handling of SMW. WRAP highlighted the additional handling time for SMW as a key parameter for considering the sensitivity of overtime (and therefore additional staff cost as well as impact on collection of other waste streams) depending on households' participation rate and amount of SMW presented. Drawing from WRAP's in-field measurement of handling time of various dry recyclables, it is estimated that the additional handling time for collecting SMW alongside other dry recyclables set out by residents would be approximately 7 seconds per household. The extra handling time is associated only with gathering and loading the SMW (excluding time taken for operators to walk out and return), and therefore is the same across urban and rural areas. A waste management company interviewed during this research estimated that collection of SMW could add 20 minutes (in rural areas) to 1 hour (in urban areas) of extra handling time, which is within the acceptable range for a regular round. According to feedback from one major waste management company it is likely that a small time impact (10 to 20 mins) could be absorbed within the round, but this would reduce the crew's contingency to absorb any other issues that occur while operating the round (e.g. heavier traffic than usual, impacts from road works etc). An overrun of 1 to 1.5 hours on a single round should be able to be accommodated by nearby crews assisting with the remaining workload. Although not included in the steady state model, it should be highlighted that, if there were delays on more than one round, then either additional costs in the form of overtime would be incurred or work would be dropped and caught up on other days.

It is also possible that SMW presented for collection by the public that is in excess of round capacity might not be collected at all, in which case residents may be asked to put out SMW again at the following opportunity. This would likely reduce their faith in, and engagement with, the service. Depending on local arrangements between waste contractors and LAs, not collecting the SMW may also be seen as being in breach of contractual obligations, which in turn could incur significant penalties. It is therefore often in the collecting organisation's interest to find a solution to this issue.

Table 4: Overview of SMW collection cost attribution, following ICP3 methodology

Cost item	Basis for cost attribution	Equation applied
Applicable to both collection by RCV cage and by kerbside sort compartments		

[17] Environment Agency. Waste electrical and electronic equipment (WEEE): evidence and national protocols guidance. 2020. https://www.gov.uk/government/publications/weee-evidence-and-national-protocols-guidance/waste-electrical-and-electronic-equipment-weee-evidence-and-national-protocols-guidance#batteries-in-weee

Cost item	Basis for cost attribution	Equation applied
Overheads	Proportional to collection costs	$$Overheads\ (Local\ and\ commercial)\ of\ SMW = 10\%\ of\ total\ collection\ costs$$ N.B. Overheads were previously split into local and commercial overheads in July 2021 of this study, following ICP2 methodology. In ICP3, these have been merged and local overheads are no longer distinguished by LA size or by in-house/contracted collections, as the difference is noted as negligible by WRAP.
Applicable to collection by RCV cage		
Staff costs (ICP3 assumption) Rural: 1 loader Urban/Suburban: 2 loaders (cost of 1 driver not attributed to SMW) Supervision: 1 supervisor for every 10 crews	Cage volume compared to RCV body volume.[18] Full RCV volume assumed to be 21.5m^3 (average of split-bodied and generic RCV from ICP2 assumptions[7])	Staff cost of SMW collection $$= Cost\ of\ DMR\ loaders * \frac{Volume\ of\ cage}{Volume\ of\ cage + Volume\ of\ RCV} * 100\% + Cost\ of\ supervision\ per\ crew$$
Vehicle fuel costs: SMW only	Additional weight of cage (27.6kg[19]) and SMW reduces miles per gallon (MPG). Assumption: 0.33% of improvement in MPG from 1% reduction in weight[20]	Impact of additional weight on MPG (expressed as % reduction) is calculated solving the following: $$(0.33\% * original\ MPG)/(Vehicle\ tonnage * 1\%) = (\%\ reduction * original\ MPG)/(cage\ weight + SMW\ load\ in\ tonnes)$$ Low/average/high range of fuel costs assumes empty cage/half-filled cage/full cage respectively.

[18] RCV volume refers to non-compressed volume. The ratio between the cage volume and the RCV volume is likely larger given that RCV volume is compressible and the cage volume is not.
[19] One WEEE cage specification provided through Material Focus network.
[20] Ricardo. Impact of Vehicle Weight Reduction on Fuel Economy for Various Vehicle Architectures. 2008. https://www.h3xed.com/blogmedia/Ricardo_FE_MPG_Study.pdf

Cost item	Basis for cost attribution	Equation applied
Vehicle fuel costs: SMW and batteries	Additional weight of cage, SMW, battery container (1.5kg[21]), and batteries reduces miles per gallon (MPG). Same assumption as above	Impact of additional weight on MPG (expressed as % reduction) is calculated solving the following: $(0.33\% * original\ MPG)/(Vehicle\ tonnage * 1\%) = (\%\ reduction * original\ MPG)/(cage\ weight + SMW\ load + 55L\ container\ weight + battery\ load\ in\ tonnes)$ Low/average/high range of fuel costs assumes empty SMW cage and battery container/half-filled SMW cage and battery container/full SMW cage and battery container respectively.
Applicable to collection by kerbside sort compartment		
Staff costs (ICP3 assumption) Rural: 1 driver + 1 loader Urban/Suburban: 1 driver + 2 loaders Supervision: 1 supervisor for every 10 crews	Compartment volume compared to total volume, averaged between two vehicle sizes (Appendix 6.5).	Staff cost of SMW collection $= Cost\ of\ DMR\ loaders\ and\ drivers * (volume\ of\ SMW\ compartment)/(volume\ of\ kerbsort\ vehicle) * 100\% + Cost\ of\ supervision\ per\ crew$
Vehicle capital, standing, and running costs (These costs are only applicable to the kerbside sort method because the WEEE compartment is an integrated part of the vehicle. These are not applicable to the RCV cage method because the operation and depreciation of the RCV is independent of the cage.)	Vehicle costs depreciated on the basis of volume taken up by SMW. From waste management companies and PCS inputs, weight is not a key contributing factor to vehicle running costs	Vehicle capital cost attributed to SMW collection $= Vehicle\ capital\ cost * (Volume\ of\ SMW\ compartment)/(Volume\ of\ kerbsort\ volume) * 100\%$ $Vehicle\ standing\ cost\ of\ SMW\ collection = Vehicle\ capital\ cost\ attributed\ to\ SMW\ collection * 5\%$ $Vehicle\ running\ cost\ of\ SMW\ collection = Vehicle\ capital\ cost\ attributed\ to\ SMW\ collection * 10\%$

[21] Online listings of 55L kerbside containers. Example: https://www.amazon.co.uk/55L-Kerbside-Box-Outdoor-Recycling/dp/B01CRBGWV0

Cost item	Basis for cost attribution	Equation applied
Vehicle fuel costs: SMW only	Weight of SMW	Same logic as applied in RCV scenario, based on additional weight of SMW. Low/average/high range of fuel costs assumes empty compartment (no additional weight)/half-filled compartment/full compartment respectively.
Vehicle fuel costs: SMW and batteries	Weight of SMW and batteries	Same as above, based on additional weight of SMW and batteries. Low/average/high range of fuel costs assumes empty compartment (no additional weight)/half-filled compartment/full compartment respectively.

The output from this step is a cost structure per unit, covering set-up and annualised operating costs for each collection model. In addition, communication costs are applicable to all collection models. A 2012 study by Zero Waste Scotland (ZWS) disclosed the range of costs per household for local authority recycling communications [22]. In 2012 values, the study recommended a budget figure of around £1.00 for standard communications; and £1.50 to £2.00 per household when communicating major service changes or activities affecting "hard to engage" residents.

The communication costs utilised in this model were the average costs per household (derived from the ZWS study), adjusted for inflation. In discussion with Defra, the project steering group agreed to apply the following assumptions to reduce the communication costs (based on the size of the LA and the cycle of communications):

- The smallest 1/3 of LAs in the UK by number of households: £1.79/hhd (average cost from ZWS study adjusted for inflation).
- The middle 1/3 of LAs in the UK by number of households: £1.49/hhd (average of smallest and largest LAs).
- The largest 1/3 of LAs in the UK by number of households: £1.19/hhd (lowest cost from ZWS study adjusted for inflation).
- One possible cycle of communications is triennial: at year 1, the cost of communication is 100% of the above; at years 2 and 3 the cost for each drops to 33.3% of year 1; by year 4 the cost is again at 100% of the above and this cycle continues. These patterns have been used as an example throughout the model.

Larger LAs have lower average costs per household than smaller LAs because as the ZWS study highlighted, there will be sizeable fixed costs incurred in communications which can therefore be spread over more households.

Table 5 and Table 6 summarise the central values for each cost centre used in the model, on a per unit basis. Households comprising of flats contribute additional costs of container set-up and replacement, assuming one container per flat for both SMW and batteries. Container-related costs are assumed to be applicable to all collection methods (by RCV, kerbside sort vehicle, and separate pass vehicle). It should be emphasised that the assumption of one container per flat is a simplification made in this model due to a lack of quantitative data to represent the considerable complexity associated with the types of flats as well as the different types of waste storage and collection arrangements found in communal households. For example, WRAP has previously developed a typology consisting of 12 distinct types of premises loosely termed 'flats'.[3] Within each type of flat, storage and collection of SMW could range from a small container per flat to a large dedicated container in bin storage rooms shared between tenants, or loose presentation of SMW in a separate and secure space. The

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[22] Zero Waste Scotland. Zero Waste Scotland Communications Guidance. 2012. https://www.zerowastescotland.org.uk/sites/default/files/Improving%20Recycling%20Through%20Effective%20Communications_ZWS_0.pdf

significant data gap on waste storage and collection methods across different types of flats could be one focus area for future research and call for evidence.

The additional set-up cost of including 55L containers on RCVs was included for collection of batteries alongside SMW. In the July 2021 version of this study, set-up costs also included local overheads which are distinguished by LA size, following ICP2 methodology. In this update following ICP3 methodology, local overheads have been merged with commercial overheads and therefore are no longer listed as a separate set-up cost. Furthermore, according to WRAP, the capital cost of 55L containers has generally decreased since ICP2 was published, though the estimated replacement rate has increased from 4% to 5%. In this update, the latest container costs and replacement rate from ICP3 are used.

Note that the cost of environmental permits was not included in the model. One major WMC put the cost of converting a Designated Collection Facility to accept WEEE in the range of £4,000 to £9,000, with higher costs for new permits, medium costs for existing permits with substantial variation and low costs for existing permits with normal variation. Variations refer to cases where a facility, for example a waste transfer station, has an existing permit and would like to expand its operation to achieve a DCF status. The level of variations depends on site activity in terms of the amount of WEEE that would be handled by the site, and potential adaptations required for the site set-up.

Table 5: Summary of average values for initial set-up costs applicable to SMW collection by RCV/kerbside sort vehicle; not applicable to separate pass collection

Set-up costs of providing SMW collection space for flat households, equivalent to 55L per household[7]	
Unit cost plus rural delivery (£/container/hhd)	£1.93 + £1.50 = £3.43
Unit cost plus average of urban and rural delivery cost (£/container/hhd)	£1.93 + £1.00 = £2.93
Unit cost plus urban delivery (£/container/hhd)	£1.93 + £0.70 = £2.63
Additional set-up costs of including 55L containers in RCV cabs for collecting batteries alongside SMW[a] (same across regions assuming delivery cost is not applicable)	
Unit cost, rural (£/container/vehicle)	£1.93
Unit cost, mixed urban and rural (£/container/vehicle)	£1.93
Unit cost, urban (£/container/vehicle)	£1.93

Note a: This assumes that no delivery is needed for putting a container in an RCV cab.

Table 6: Summary of annualised cost structure for collection by RCV/kerbside sort in baseline year (2019). Vehicle and undercarriage cage costs were annualised over 7 years.

Collection model	Cost item	Unit	Central value (2019 baseline)
Applicable to all collection models	Communication costs	£/hhd/year	Small / Medium / Large LA £1.79 / £1.49 / £1.19
Diesel RCV cage (Co-mingled / Two-stream / residual): SMW only	Allocated staff cost per vehicle (Cost of loaders only. Supervision cost applied separately based on number of crews needed per LA)	£/vehicle/year	£437.99 (ICP2 data, inflation adjusted) ICP3 data to be finalised and published by WRAP.
	Vehicle retrofit: cage purchase	£/vehicle/year	£72.00
	Vehicle retrofit: cage installation	£/vehicle/year	£22.50
	Vehicle fuel costs due to SMW load	£/vehicle/year	Urban / Mixed / Rural £11.83 / £12.61 / £13.40
	Replacement of containers for flat households @ 5% replacement rate[8]	£/container purchased/year	Urban / Mixed / Rural £0.13 / £0.15 / £0.17
Diesel RCV cage (Co-mingled / Two-stream / Residual): additional annualised costs to collect batteries with SMW	Replacement of on-vehicle battery containers @ 5% annual replacement rate[8]	£/vehicle/year	£0.10
	Vehicle fuel costs due to SMW and batteries load	£/vehicle/year	Urban / Mixed / Rural £20.10 / £21.43 / £22.75
Kerbside sort compartment: SMW only	Allocated staff cost per vehicle (Cost of driver and loaders. Supervision cost applied separately based on number of crews needed per LA)	£/vehicle/year	£2,381.35 (ICP2 data, inflation adjusted) ICP3 data to be finalised and published by WRAP.
	Vehicle capital cost allocated to WEEE	£/vehicle/year	£279.32 (ICP2 data, inflation adjusted. ICP3 data for this cost is moderately higher.)
	Vehicle standing + running costs allocated to WEEE	£/vehicle/year	£425.66 (ICP2 data, inflation adjusted. ICP3 data for this cost is slightly higher)
	Vehicle fuel costs due to SMW load	£/vehicle/year	Urban / Mixed / Rural £19.23 / £20.41 / £21.59
	Replacement of containers for flat households @ 5% replacement rate[8]	£/container purchased/year	Urban / Mixed / Rural £0.13 / £0.15 / £0.17

Kerbside sort compartment: additional annualised costs to collect batteries with SMW	Vehicle fuel costs due to SMW and batteries load	£/vehicle/year	Urban / Mixed / Rural £25.70 / £27.27 / £28.85

Note: All figures are central values of costs per unit. Overheads excluded (see Table 3). Exact figures for staff- and vehicle-related costs are kept confidential until publication of ICP3 by WRAP.

4.2.2 Categorise UK local authorities by current dry mixed recycling scheme

A key assumption in deriving the cost per household and the national scale-up cost is that collection of SMW as part of a DMR scheme will be the predominant service arrangement to facilitate consistency in public communication for recycling.

However, it should be noted that some LAs also collect SMWs alongside residual waste collections. Half of survey responses with non-multi-stream collections (26 responses) collect SMW with residual waste collections as well as dry recycling collections. Based on this finding, additional collection capacity could be available from RCVs on residual rounds to serve households that are not currently on DMR schemes. This means that apart from RCVs and kerbside sort vehicles dedicated to DMR collection, LAs may expand their capacity for SMW collection by retrofitting RCVs dedicated to residual collection. This extra capacity is quantified in a later section of this report (Table 22). For calculating the UK-wide scale-up costs and GHG impact, two scenarios were considered: a) scaling kerbside SMW collection to only households with DMR, and b) scaling the service to all households with DMR plus the 446,587 households that only receive residual waste collection, therefore tapping into the extra capacity from residual-collection RCVs.

From the unitary costs, the second step to modelling was to categorise all UK LAs by their current DMR scheme features. This serves two purposes:

- It gives a basis for applying RCV or kerbside sort collection models and their respective unitary cost structures, and for calculating the cost per household and the cost contribution from the 86 LAs already offering kerbside SMW collection. This is elaborated in Sections 4.2.4 and 4.2.6.
- It informs the scale-up scenario based on the current national split of DMR schemes, for calculating UK-wide scale-up costs and GHG impact. This is elaborated in Section 4.2.5.

Categorisation by DMR scheme was based on two parameters, using WRAP's *Local Authority Scheme Data.* The July 2021 version of this study used the version updated on the18th of August 2020[23]. The update is based on the latest version of this dataset, updated by WRAP in Spring of 2021. Note that WRAP no longer publishes this dataset through the LA Portal and the dataset was shared with the project steering group confidentially.

- Current DMR scheme type (co-mingled, two-stream, multi-stream)[24]: this relates to the type of vehicle used. The model assumes that co-mingled/two-stream

[23] Available from WRAP portal: https://laportal.wrap.org.uk/. Accessed in March 2021.
[24] Co-mingled recycling means all materials are collected together in one compartment on the same vehicle and require sorting at a Materials Recovery Facility. Under two-stream recycling, materials are collected as two material streams, typically either fibres and containers, or glass separate to other mixed

recycling schemes use diesel RCVs though with different average round sizes[25]; multi-stream schemes use kerbside sort vehicles. Round sizes for co-mingled DMR were obtained from a study by SUEZ.[26] Round sizes for two-stream DMR were assumed to be 20% less than those of co-mingled, based on stakeholder input. This means a two-stream DMR set-up would require more vehicles to serve the same number of households. This is later reflected in the per household cost calculations.
- Current DMR scheme service frequency is based on a 5-day collection week[3], with collection frequency for a given household being either weekly, fortnightly, three-weekly, four-weekly or more than once per week (assumed twice a week): this relates to the number of vehicles operating per day, and therefore staff and fuel costs. Following the ICP2 methodology (the same as ICP3), the number of vehicles operating per day is calculated by:

$$No. of\ vehicles\ operating\ per\ day\ = \frac{No. of\ households\ in\ a\ LA\ on\ DMR\ scheme}{Average\ round\ size\ expressed\ in\ No. of\ households * Collection\ frequency\ expressed\ in\ No. of\ days}$$

This step estimates that, for example, for weekly co-mingled collections, the daily number of DMR vehicles required for an average-sized LA (see Table 7 in Section 4.2.3) is in the range of 9 to 26 vehicles and more rural LAs would require more vehicles for a given number of households. For weekly two-stream collections with a 20% smaller DMR collection round size, this range can increase to 17 to 30 vehicles per LA. For weekly kerbside sort collections, the model estimates 20 to 34 vehicles per LA depending on their average size and rurality. Across the UK, it was estimated that 4,094 RCVs operate per day for residual collection. This was derived by dividing the total number of households with residual collection (for a given collection frequency) by the average round size of residual collection, where the average round size is weighted by the proportion of households that are categorised as urban, rural, and mixed urban/rural.

The output from this step is effectively an aggregated version of the WRAP Local Authority Scheme Data (Spring 2021 version). This database is enhanced in the next step by adding rurality and deprivation data.

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material. Under multi-stream recycling, materials are separated by the householder or, on collection at the kerbside, into multiple material streams. (ICP2 definitions)

[25] Electric RCVs are not modelled separately for the national scale up scenario due to lack of undercarriage space for cages in most models

[26] SUEZ. Unpackaging Extended Producer Responsibility Consultation Proposals. 2019. https://www.suez.co.uk/-/media/suez-uk/files/publication/suez-unpackagingeprconsultationproposals-1904-1.pdf

4.2.3 Further categorise UK local authorities by rurality and deprivation

Studies by WRAP highlighted that rurality and deprivation affect the cost and performance of kerbside DMR. Rurality is a function of the number of households in a LA, the collection round size and travel distance between households; increased rurality was found to be associated with higher recycling rates. Higher deprivation was found to be associated with lower yields of dry recyclables and lower total arisings (of dry, organic and residual wastes).[27]

The third step to modelling was to further categorise UK LAs by rurality and deprivation, since the project steering group agreed that these factors are relevant and necessary for accounting for regional differences in the UK-wide scale-up.

ICP2 documentation originally split English LAs into six categories according to their level of deprivation and rurality.[8] The July 2021 version of this study used the ICP2-categorised results for English LAs, and replicated the methodology for Wales, Scotland, and Northern Ireland using official datasets for number of households, deprivation and rurality for each LA. Example data sources included StatsWales[28], National Records of Scotland[29], Office for National Statistics[30], the Northern Ireland Statistics and Research Agency (NISRA)[31], Public Heath Scotland[32], and data on Index of Multiple Deprivation from each nation[33,34,35]. This update adopts the latest ICP3

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[27] WRAP. 2015. Analysis of recycling performance and waste arisings in the UK 2012/13. https://archive.wrap.org.uk/sites/files/wrap/WRAP-anaylsis-recycling-performance-2012-13.pdf

[28] StatsWales. Households by Local Authority and Year. https://statswales.gov.wales/Catalogue/Housing/Households/Estimates/Households-by-LocalAuthority-Year

[29] National Records of Scotland. Estimates of Households and Dwellings in Scotland. https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/households/household-estimates

[30] Office for National Statistics. Rural Urban Classification (2011) of Lower Layer Super Output Areas in England and Wales. https://data.gov.uk/dataset/b1165cea-2655-4cf7-bf22-dfbd3cdeb242/rural-urban-classification-2011-of-lower-layer-super-output-areas-in-england-and-wales

[31] NISRA. Northern Ireland Household Projections (2016 based). https://www.nisra.gov.uk/publications/northern-ireland-household-projections-2016-based
Urban Rural Status 2015. https://www.ninis2.nisra.gov.uk/Download/People%20and%20Places/Urban%20Rural%20Status%202015.ods

[32] Public Heath Scotland. Data Zone (2011) Urban Rural Classification 2016. https://www.opendata.nhs.scot/dataset/urban-rural-classification/resource/c8bd76cd-6613-4dd7-8a28-6c99a16dc678

[33] Welsh Government. Welsh Index of Multiple Deprivation (full Index update with ranks): 2020. https://gov.wales/welsh-index-multiple-deprivation-full-index-update-ranks-2019

[34] Scotland Deprivation Map. https://datamap-scotland.co.uk/2020/03/areas-deprivation-scotland-councils/

[35] NISRA. NI Multiple Deprivation Measure 2017. https://www.ninis2.nisra.gov.uk/InteractiveMaps/Deprivation/Deprivation%202017/SA_Deprivation_Map/atlas.html

methodology, whereby the LAs are categorised into nine categories chiefly to bring more granular differentiation to the level of deprivation:

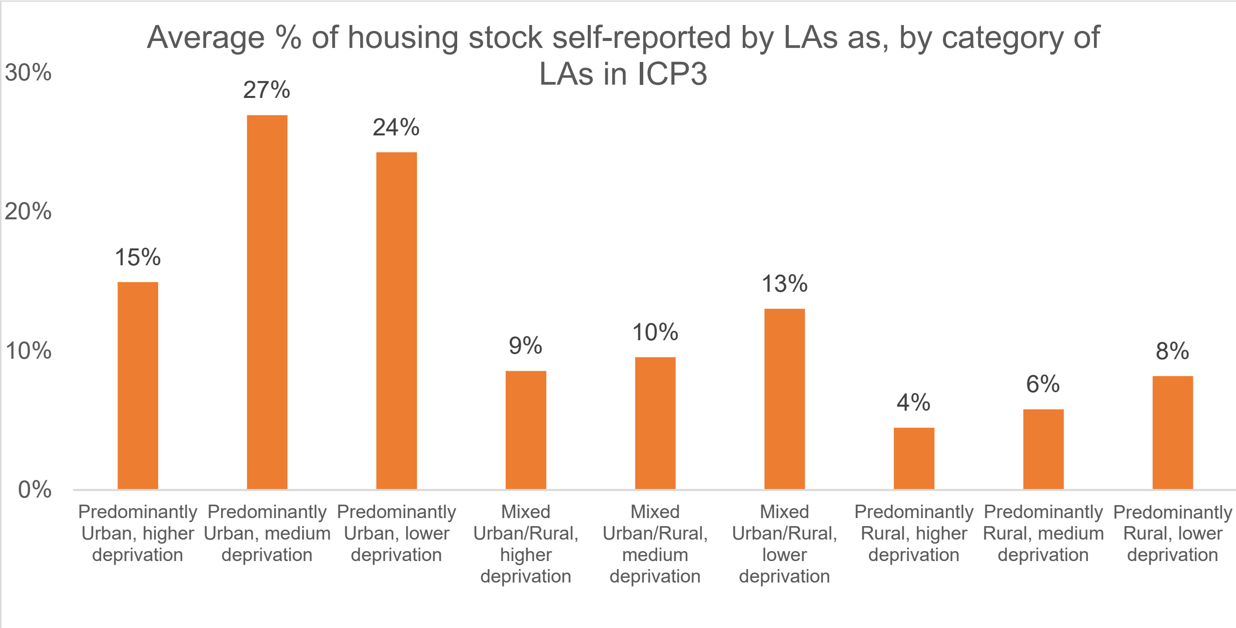
- Category 1: Predominantly Urban, higher deprivation
- Category 2: Predominantly Urban, medium deprivation (not applicable in ICP2)
- Category 3: Predominantly Urban, lower deprivation
- Category 4: Mixed Urban/Rural, higher deprivation
- Category 5: Mixed Urban/Rural, medium deprivation (not applicable in ICP2)
- Category 6: Mixed Urban/Rural, lower deprivation
- Category 7: Predominantly Rural, higher deprivation
- Category 8: Predominantly Rural, medium deprivation (not applicable in ICP2)
- Category 9: Predominantly Rural, lower deprivation

WRAP shared the ICP3 categorisation results for all LAs in the UK. Note that as of the time of writing, the results for the Welsh, Scottish and Northern Irish LAs used in this update still require validation from the national counterparts of WRAP. ICP3 categorisation results are not published in this report and readers are referred to future publication of ICP3 by WRAP for details.

The July 2021 version of this study also estimated the average proportion of flats in each category using 2011 census data on proportion of unshared dwelling (flat, maisonette or apartment).[36] This was done in an attempt to capture relevant changes in the housing stock since ICP2 was published. In this update, WRAP shared the proportion of flats self-reported by each LA as part of the ICP3 update. The averages for each of the nine LA categories are shown in Figure 7.

[36] Table ID QS402EW, Census 2011. https://www.nomisweb.co.uk/census/2011/qs402ew

Figure 7: Average proportions of flats self-reported by LAs for each category of LA according to ICP3 methodology



Once all LA categorisations were added to the database from the previous step, it was then possible to query the database to produce summed or averaged figures by certain features. This database was used in three ways:

- To develop 27 (3x9) representative example LAs for each combination of collection scenario (co-mingled, two-stream, multi-stream) and LA category (1-9), to calculate the average number of households in a LA in each case (Table 7). These representative LAs are the foundation for the per-household cost calculations elaborated upon in Section 4.2.4.
- To develop a scale-up scenario: to calculate the total number of households covered by RCV cage or kerbside sort model, under each of the nine LA categories. As elaborated upon in Section 4.2.5, this was used to calculate potential costs and GHG impacts if kerbside collections were rolled out UK-wide.
- To categorise the 86 LAs that already have kerbside SMW collection (Table 8): Survey responses show that existing SMW configurations mostly correspond with the DMR set-up. For example, only 2 responses showed a mismatch where the LA has multi-stream DMR but indicated that SMW is collected by RCVs. The model includes a generalisation that SMW collection always follows the DMR set-up. It is recognised that there may be outliers in practice. Based on the DMR type, collection frequency, and LA categorisation, the appropriate cost per household for each of the 86 LAs was multiplied by their respective size to calculate the share of set-up and operational costs likely already invested. The total set-up cost from these 86 LAs was subtracted from the final UK scale-up figure. The total annual operating cost from these 86 LAs are included in the UK scale-up figure as it contributes to future costs of running these services. Note that LAs are continually creating new services, some are retiring existing

kerbside services, and others with existing services may need further investment to meet minimum standards for service provision. Therefore, it is assmed that this proportion is approximate.

Table 8 summarises the breakdown of the 86 LAs.

Table 7: Average number of households per LA by type, and total number of households under each combination of DMR type and LA category

LA category	Average number of households with RCV Co-mingled DMR	Average number of households with RCV Two-stream DMR	Average number of households with multi-stream DMR	Total number of households with RCV Co-mingled DMR	Total number of households with RCV Two-stream DMR	Total number of households with multi-stream DMR
1	112,050	124,667	N/A	2,353,042	1,870,004	N/A
2	89,446	114,691	121,599	2,146,697	688,145	364,797
3	87,505	108,568	88,538	1,662,602	1,411,384	265,615
4	77,293	79,682	61,096	1,236,695	1,593,641	610,963
5	85,304	82,352	83,085	1,023,650	988,225	664,682
6	54,871	54,816	81,704	987,684	1,205,943	408,519
7	55,786	90,250	46,679	1,004,155	541,501	560,150
8	62,884	57,357	59,331	1,697,870	1,319,212	1,127,292
9	53,866	54,852	49,080	1,993,059	987,329	343,559

Note: There are no households in Category 1 (predominantly Urban, higher deprivation) LAs that are served by multi-stream DMR, based on WRAP's LA Scheme Data (Spring 2021 Version)

Table 8: Characteristics of the 86 LAs currently offering SMW kerbside collection

LA category	**Number of LAs in each category out of the 86 LAs already with kerbside SMW collection**
Predominantly Urban, higher deprivation	5
Predominantly Urban, medium deprivation	8
Predominantly Urban, lower deprivation	8
Mixed Urban/Rural, higher deprivation	9
Mixed Urban/Rural, medium deprivation	3
Mixed Urban/Rural, lower deprivation	13
Predominantly Rural, higher deprivation	6
Predominantly Rural, medium deprivation	13
Predominantly Rural, lower deprivation	21[a]
Dry recycling set-up	**Number of LAs with RCV or kerbside sort set-up out of the 86 LAs with kerbside SMW collection**
Co-mingled/Two-stream (RCV cage)	66
Multi-stream (kerbside sort vehicle)	20

Note a: ICP 3 urban/rural and WRAP LA Scheme data were not available for one LA that was previously identified as one of the 86 that offer kerbside SMW collection. This is because the LA is a unitary council that replaced multiple district councils. ICP3 data for the corresponding district councils were used for estimating the set-up and operating cost for providing kerbside SMW collection in the unitary council area, however simplifications were necessary (e.g. not all district council areas had the same ICP3 categorisation, type of DMR or frequency of collection).

4.2.3.1 Summary of LA characteristics used to scale up SMW collection costs

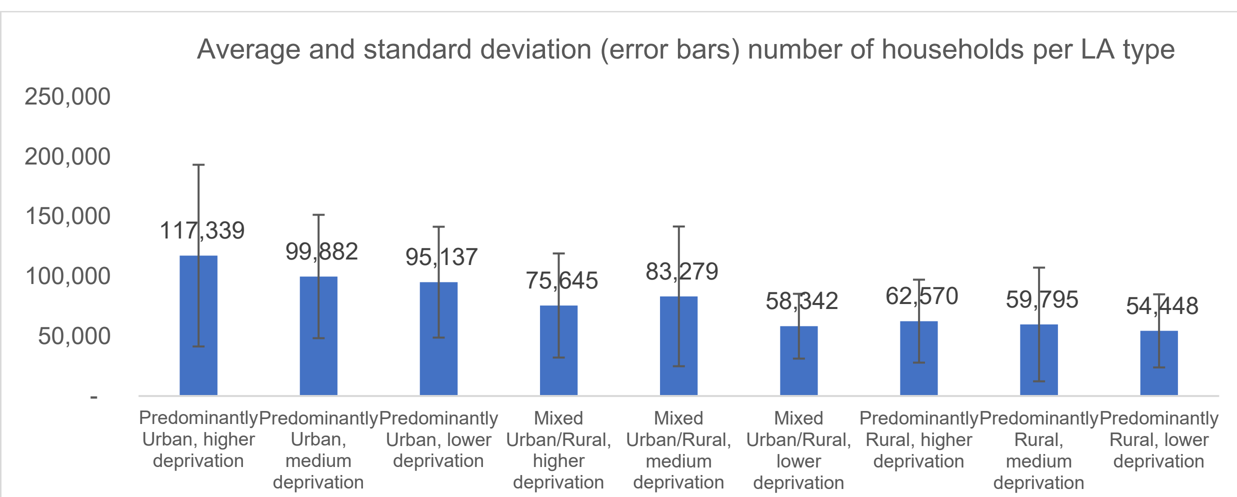
The methodology and assumptions described in Sections 4.2.2 and 4.2.3 resulted in the characterisation of LAs below.

High-level LA category characteristics are summarised in Table 7. The average LA size and range of variation by each of the nine categories is shown in Figure 8. Detailed LA characteristics differentiated by DMR type and LA category are summarised in Table 9.

Table 9: Summary of household characteristics by category used in the model

LA category	Number of LAs (all of UK)	Average number of households on DMR schemes, by category	Total number of households on DMR schemes, by category	Additional households with residual collection only	Average proportion of flats
Predominantly Urban, higher deprivation	36	114,136	4,223,046	74,475	15%
Predominantly Urban, medium deprivation	33	96,959	3,199,639	22,452	27%
Predominantly Urban, lower deprivation	35	95,417	3,339,601	95,437	24%
Mixed Urban/Rural, higher deprivation	46	71,471	3,287,685	29,245	9%
Mixed Urban/Rural, medium deprivation	32	83,642	2,676,557	32,134	10%
Mixed Urban/Rural, lower deprivation	45	53,957	2,428,076	23,257	13%
Predominantly Rural, higher deprivation	36	55,570	2,000,505	138,112	4%
Predominantly Rural, medium deprivation	69	57,212	3,890,414	20,373	6%
Predominantly Rural, lower deprivation	62	52,893	3,279,337	9,096	8%

Figure 8: Illustration of the wide range of LA sizes in each category, from which the mean was derived.



Note: The mean number of households for each LA category is given by the height of the blue bar. The lower and upper bounds for the range in number of households within each LA in the group is given by the 'error bars'.

The LA categories were also characterised by type and frequency of DMR collection, see Figure 9 and Figure 10.

Figure 9: Breakdown of UK households by type of DMR scheme and LA category

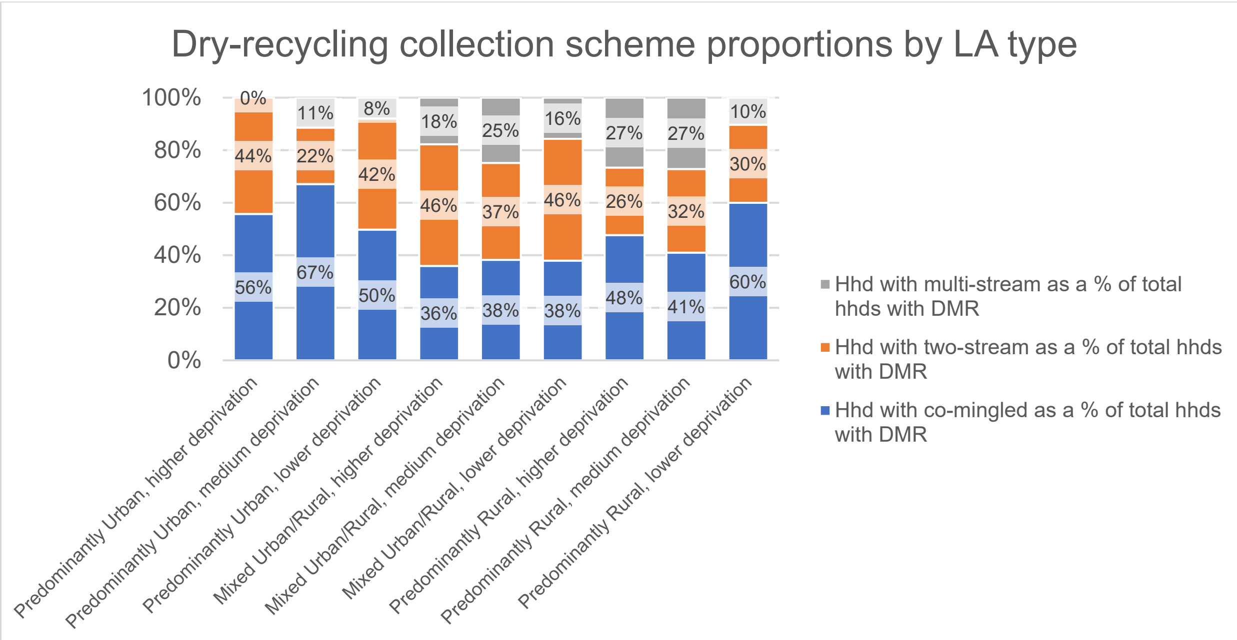
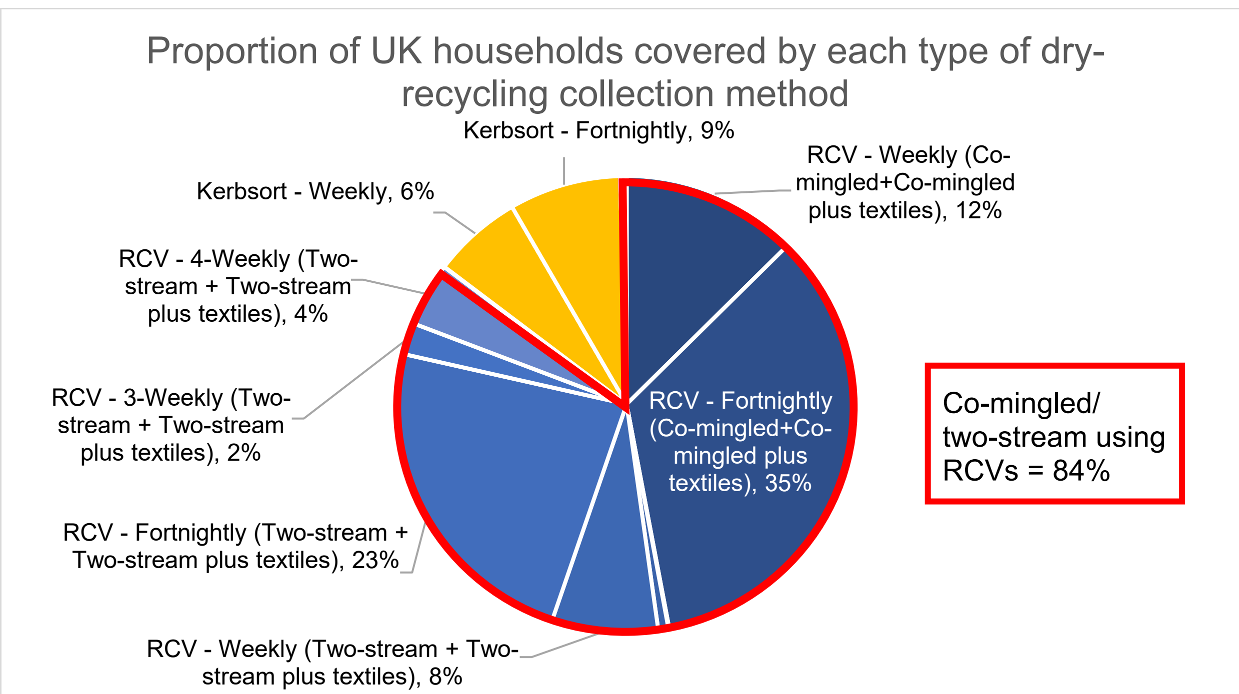


Figure 10: Type and frequency of DMR collection services established across the UK



Note: Only categories with at least 0.5% of households represented were labelled in pie-chart.

4.2.4 Calculate steady state cost and GHG impact per household

'Steady state operation' refers to collection occurring within planned capacity and where no separate pass is needed to account for missed collections. A recycling service typically settles into steady state operation after a service introduction or service change has occurred and after local residents have become accustomed to it. This is typically after an initial period involving a surge in participation and therefore higher than usual weights collected.

The economic model contains six steady state modules, namely SMW-only collection and SMW plus batteries collection alongside co-mingled (RCV), two-stream (RCV), and multi-stream (kerbside sort) collection. Note that per household costs alongside two-stream collections were calculated separately, since the reduced round size typically leads to larger fleet sizes and therefore higher costs for LAs compared to co-mingled collection.

Each module lays out all potential cost and GHG impacts per household within a type of LA, differentiated by LA category, DMR set-up, and service frequency. The output from these modules is effectively a look-up table for LAs to identify which costs are most applicable to them. The steps to these calculations were:

- Establish the average number of households in each combination of DMR set-up and LA category (Table 7). As described in Section 4.2.3, these are the 27 representative examples of LAs: nine each for co-mingled, two-stream, and multi-stream DMR.
- Apply the average proportion of flats associated with each LA category to derive the number of flat and non-flat households in the 27 examples.
- Calculate the number of vehicles operating per day if the LA collected dry recyclables weekly, fortnightly, every three weeks, every four weeks, or more than weekly (twice a week).
- Calculate the initial set-up cost of containers and annual cost of container replacements. The former involved multiplying the unit cost of a 55L[37] container by the number of flat households in the example LAs. The annual replacement rate has been updated from 4% (used in the July 2021 version following ICP2 assumptions14) to 5% according to ICP3 assumptions.
- For modules that include battery collection with SMW, calculate the initial set-up costs of on-vehicle containers and the annual cost of container replacements. The former involved multiplying the unit cost of a 55L container by the number of vehicles operating per day. The annual replacement rate has been updated from 4% (used in July 2021 version following ICP2 assumptions[8]) to 5% according to ICP3 assumptions.

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[37] Camden guidance recommended 30L per flat household per week. The next closest standard container size is 55L.

- Calculate the staff cost. This involved multiplying the number of vehicles operating per day in the example LAs by the staff cost attributed to SMW using the equation described in Table 4. Note the key difference in this update compared to the July 2021 version is that this update differentiated the number of loaders required per vehicle for rural versus urban/suburban areas.
- Calculate vehicle-related costs, including cage installation (applicable to RCV method only), annualised capital, standing and running costs (applicable to kerbside sort method only), and fuel costs in the example LAs.
    - Total cost of cage installation: annualised cost of cage purchase and installation were multiplied by the number of vehicles operating per day. The life span of the cage was assumed to equate to the age of the vehicles.
    - Total annualised capital cost of kerbside sort vehicle: capital cost from ICP3 were used in this update following WRAP's assumption of a 7-year period for depreciation. The annualised capital cost was then attributed to SMW by volume using the equation described in Table 4. This was then multiplied by the number of vehicles operating per day to obtain the output.
    - Standing and running costs: both ICP2 and ICP 3 assumed the annual standing cost (including insurance, tax and licensing) of all collection vehicles to be 5% of the capital plus road tax, and the annual running costs (covering maintenance, tyres and oil) as 10% of the capital. Annualised capital cost from ICP3 as calculated above were filled into the equation described in Table 4. This replaces the ICP2-based, inflation-adjusted figures in the July 2021 version. The per-vehicle standing and running costs were then multiplied by the number of vehicles operating per day to obtain the output.
    - Fuel costs: The additional fuel consumption, based on various loading levels of the SMW (and batteries) in cage or compartments, were calculated using the formula described in Table 4. The average additional fuel consumption was multiplied by a cost of road diesel of £1.28 per litre for the 2019 baseline and then by the number of vehicles operating per day to obtain the output. Furthermore, projections of cost of diesel up to 2030 were applied to calculate future fuel costs and the resultant change in annual operating costs. See Table 10 for the baseline and projected cost of diesel from existing literature used in the model.[32]
- Calculate overheads (local and commercial). This involved multiplying the total annual operating costs from above by a flat rate of 10%, according to ICP3 methodology. Based on stakeholder inputs, small WEEE training would be included in normal training; even if small WEEE were added to the service part way through a contract, the training costs were still negligible. Furthermore, no specialist personal protection equipment or additional equipment is anticipated for WEEE collections. On this basis, the current methodology for overheads was deemed sufficient.
- The above costs make up the initial set-up and annual operating costs for SMW collection under various scenarios based on LA type, size, and dry recycling

service frequency. An additional cost for local authority communications was calculated separately as described in Section 4.2.1, though not included in the annual operating costs.

- The GHG impact from additional diesel usage was calculated. The total amount of additional diesel from operating vehicles calculated previously was multiplied by the UK Government GHG conversion factor for diesel (2019 version), which is 2.59 $kgCO_2e$/litre.[38] Then, the central case of carbon values forecasted until 2030 by BEIS (Table 11)[39] were applied to calculate the equivalent total cost of carbon for each example LA.
- All above costs and GHG impacts were calculated at the scale of the 27 representative examples of LA. This is because staff and vehicle-related costs can only be calculated at the LA level rather than directly at household level. To obtain the cost per household, these costs were divided by the number of households in each example of LA, as established in the first step.

Additionally, WRAP estimated the initial set-up and annualised operating costs for Wales to transition to fully source-separated kerbside recycling (including WEEE and other dry recyclables).[7] A proxy cost per household attributed to WEEE collected in this scenario was calculated, by multiplying the total cost per household by the weight percentage (0.36%) of WEEE in total potential dry recyclables collected for recycling in Wales.[8] The result (Table 12) was then used to sense-check the kerbside sort costs for SMW collection calculated with the bottom-up approach described above; ultimately, these figures were found to underestimate the costs as calculated by the main bottom-up approach and therefore the WRAP transition costs were not utilised.

Table 10: Projected cost of diesel (£/L)

Year	Cost of diesel £/L	Year	Cost of diesel £/L
2019	1.28	2025	1.34
2020	1.29	2026	1.36
2021	1.3	2027	1.37
2022	1.31	2028	1.38
2023	1.32	2029	1.40
2024	1.33	2030	1.41

[38] BEIS and Defra. 2019. UK Government GHG Conversion Factors for Company Reporting. https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019
[39] Department for Business, Energy & Industrial Strategy. Updated Short-term Traded Carbon Values - Used for UK public policy appraisal. 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794186/2018-short-term-traded-carbon-values-for-appraisal-purposes.pdf

Table 11: Carbon values for policy appraisal (£/tCO_2e)

Year	Low	Central	High
2018	2.33	12.76	25.51
2019	0.00	13.15	26.30
2020	0.00	13.84	27.69
2021	4.04	20.54	37.04
2022	8.08	27.24	46.40
2023	12.12	33.94	55.75
2024	16.17	40.64	65.11
2025	20.21	47.33	74.46
2026	24.25	54.03	83.82
2027	28.29	60.73	93.17
2028	32.33	67.43	102.53
2029	36.37	74.13	111.88
2030	40.41	80.83	121.24

Table 12: WRAP cost per household for full transition to source separated recycling in Wales, attributed to SMW by weight

Urban Source Separated (assuming an average urban authority of 60,293 households)						
	2016 original figures			Adjusted for inflation (to 2019)		
Initial outlay	Urban Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)	Urban Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)
Containers	1,636,219	5,890	0.10	1,768,261	6,365	0.11
Depot	2,602,347	9,368	0.16	2,812,356	10,124	0.17
					Total cost per household	**0.27**
	2016 original figures			Adjusted for inflation (to 2019)		
Annualised Costs	Urban Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)	Urban Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)
Staff	1,557,825	5,608	0.09	1,683,541	6,060	0.10
Vehicles	1,063,187	3,827	0.06	1,148,986	4,136	0.07
Containers	173,105	623	0.01	187,074	673	0.01
Depot operating costs	258,439	930	0.02	279,295	1,005	0.02
					Total cost per household	**0.20**
Rural Source Separated (assuming an average rural authority of 60,293 households)						
	2016 original figures			Adjusted for inflation (to 2019)		
Initial outlay	Rural Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)	Rural Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)
Containers	1,612,634	5,805	0.10	1,742,773	6,273	0.10

Depot	3,980,975	14,331	0.24	4,302,239	15,488	0.26
					Total cost per household	**0.36**
	2016 original figures			Adjusted for inflation (to 2019)		
Annualised Costs	Rural Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Rural Source Separated total cost (£)	Rural Source Separated total cost (£)	Contribution of WEEE @ 0.36%	Cost per house-hold (£)
Staff	1,988,471	7,158	0.12	2,148,940	7,736	0.13
Vehicles	1,372,691	4,941	0.08	1,483,467	5,340	0.09
Containers	173,738	625	0.01	187,758	675	0.01
Depot operating costs	439,290	1,581	0.03	474,740	1,709	0.03
					Total cost per household	**0.26**

4.2.5 Calculate steady state scale up cost and GHG impact for the UK

The cost and GHG impact of offering kerbside collection of SMW and batteries across the UK was calculated for two scenarios: scale-up by only households currently on a DMR scheme (abbreviated as "DMR-only"); and scale-up by household on a DMR scheme plus households only with residual collection (abbreviated as "DMR + Residual").

The DMR-only scenario further consisted of two modules. The first was diesel RCV scale-up costs; under this module the totals of households with co-mingled and two-stream collections were separately calculated and then aggregated into the nine LA categories based on the aggregated WRAP database described in Section 4.2.3. Under each LA category, these households were further split by their DMR collection frequency according to WRAP data, and the corresponding proportion of flats in a LA category was applied. After these steps, the total number of flat and non-flat households for any given collection method, collection frequency, and LA category was tabulated. On this basis, the total number of vehicles operating per day was calculated and the reduced round size of two-stream collections was again accounted for. Finally, the initial set-up and annualised costs were calculated in the same way as in Section 4.2.4, for collection of only SMW and SMW plus batteries by diesel RCVs on DMR rounds.

A key assumption made was that all of the RCVs used for dry recycling and residual collection would have undercarriage space for fitting a cage, due to a lack of data on what percentage of RCVs have the space or not in practice. Also, it should be noted that the total available collection capacity derived in the model could overestimate what would actually be used for SMW, as SMW could compete for space in undercarriage cages with other waste streams such as batteries and textiles.

The second module of the DMR-only scenario is kerbside sort scale-up costs. Under this module the total of households with multi-stream collections were calculated and then aggregated into the nine LA categories. These households were again further split by flat vs. non-flat, and by their DMR collection frequency. Note that there is currently no 3-weekly or more-than-weekly multi-stream collection in the UK according to the latest WRAP LA Scheme Data (Spring 2021 version). The initial set-up and annualised costs were calculated for SMW and battery collections using the same approach as in Section 4.2.4.

The sum of diesel RCV and kerbside sort modules yields the DMR-only scale-up of initial set-up and annual operating costs for kerbside SMW (and battery) collection, for a 10-year period of 2019 to 2028, accounting for changes in diesel and carbon costs.

For the DMR + Residual scenario, WRAP's LA Scheme Data showed a total of 446,587 households across the UK that only have residual collection. These households were split into the nine LA categories according to their originating LAs. It was assumed that residual RCVs operate with similar round sizes to RCVs for co-mingled DMR; therefore, the cost structure for collection of SMW and batteries using a residual RCV was equated to that of a RCV for co-mingled collection. Furthermore, it was assumed that the households only covered by residual collection were all flats, because the flat vs. non-flat split of these households were not known. However, it is acknowledged that this is a simplification (and indeed, a worst-case scenario), as a certain proportion of these households may not be flats but do not have DMR collections due to other practical barriers such as being located in very remote, rural areas. This assumption meant that under DMR + Residual scenario, the scale-up costs were higher due to more container-related costs. The rest of the calculations were the same as described above for DMR-only scenario.

4.2.6 Calculate cost-effectiveness of current kerbside SMW collections

Once cost per household was established, it was then possible to derive the current cost per tonne of collection using collection quantities provided by LA survey responses. Costs per household that fit the LA characteristics were applied. Only responses from an established collection service (5 years or more) were included in this calculation, as the collection figures originating from these responses were considered to be a truer reflection of embedded, functional kerbside collection service.

WasteDataFlow was also interrogated to try to establish whether kerbside collection services have a net benefit on SMW collection tonnages. Detailed methodology along with findings are presented in Section 5.2.2.

4.2.7 Calculate the cost of providing additional collection capacity / alternative collection methods by separate pass vehicles

Separate pass vehicles are an option to collect the SMW which could be presented by households but which the RCV/kerbside sort vehicles currently servicing households may be unable to accommodate on a round. Total available SMW for collection was assumed to be, as estimated in a recent report for Material Focus[2], 0.93% of residual waste. However, this does not take into account potential cannibalisation of SMW that would otherwise be collected by other channels such as retail takeback, HWRCs, bulky waste collections and bring banks. Therefore, the potential upper bound of SMW that could be collected by kerbside services could exceed the 155,000 tonnes in residual waste. The typical separate pass vehicle was based on insight from several LAs (through Material Focus) that use such a mop-up vehicle to respond to peaks in SMW presentation by residents.

Separate pass vehicles are also an alternative method for LAs that do not have RCV undercarriage space or kerbside sort vehicles; for example, LAs with eRCVs could be faced with this challenge, though it is believed that at the time of writing, only one LA is relying solely on eRCVs for waste collection, though increasingly LAs are beginning to incorporate eRCVs into their fleets. [40,41]

The initial set-up cost per household as previously presented in Table 5 is also valid for the separate pass scenario. For each LA, the scale of set-up costs depends on the size of the LA (relating to varied level of overheads per household) as well as the rurality/deprivation characteristics (relating to the proportion of communal households and cost of bins). Table 13 summarises the annualised operating costs for separate pass collection that were shared with Material Focus by three LAs, including vehicle-related costs (e.g. vehicle hire and maintenance, insurance, fuel, AdBlue, damage, tyres, sundries), and staff costs (driver and operative salary, pension, holiday and sick cover); note that for separate pass, communication costs, cost of containers, and overheads were calculated separately (see section 5.2.3 for more details). The average annualised operating cost of a separate pass vehicle was approximately £67,000 per vehicle required, per year.

Table 13 Summary of annualised operating costs of separate pass vehicle

Category	Reference 1	Reference 2	Reference 3
One 3.5t Box Van (£/year)			
Vehicle hire & maintenance	7,290	10,788	5,200
Insurance	1,500		875
Fuel	6,968		400
AdBlue	244		30

[40] City of London. 2021. https://news.cityoflondon.gov.uk/clean-air-city-corporation-to-become-first-uk-authority-to-run-fully-electric-refuse-truck-fleet/
[41] Eunomia. 2020. https://www.eunomia.co.uk/reports-tools/ditching-diesel-analysis-electric-refuse-collection-vehicles/

Damage	2,500		700
Tyres	900		450
Sundries	250		100
Driver and operative (£/year)			
Driver: Salary	26,104	47,190	18,720
Driver: ENI/Pension/Levy (17.30%)	4,516		3,239
Driver: Holiday & Sick Cover (12%)	3,132		2,246
Operative: Salary	21,944		15,737
Operative: ENI/Pension/Levy (17.30%)	3,796		2,722
Operative: Holiday & Sick Cover (12%)	2,633		1,888
Total (£/year)	81,776	57,978	52,308
Average annualised cost (£/year)	67,042		

NB: References 2 and 3 were based on separate pass vehicles used for WEEE collection; whereas Reference 1 was not WEEE-specific.

Two factors were considered as relevant for estimating the number of separate pass vehicles needed: the amount of SMW and batteries that are available for collection, and the number of households that need to be serviced. These two operating scenarios were modelled to determine which one dictates the number of separate pass vehicles required. Both scenarios assumed fortnightly collection.

In the first scenario, the number of vehicles was determined by the amount of SMW that could be diverted from household residual waste (assuming this was the upper threshold for WEEE to be collected from households). The steps of the calculation were:

- Calculate kg of SMW in household residual waste per year (UK total).
- Calculate kg of SMW per household per year by dividing the above figure by the total number of UK households with (at least) residual collection.
- Calculate kg of SMW arising per household per work day, assuming 256 work days per year.
- Calculate kg of SMW presented by each household serviced on collection day, by multiplying the previous figure by 10 (i.e. each household serviced presents 10 days' worth of SMW, as they were assumed to receive a collection once every 10 working days, i.e. once every 2 calendar weeks). This assumes a little-and-often presentation rate of SMW by households, when in fact, disposal patterns may differ according to various factors e.g. seasonal changes, response to behaviour change campaigns etc.
- Calculate the total kg of SMW to be collected each day, by multiplying the above figure with the round size. On a fortnightly schedule, the round size equals to 1/10th of the total number of households in the LA that have (at least) residual collection.
- Convert the above figure into volume (in cubic metres), this yields the total volume required per collection day.
- Divide the total volume requirement by assumed operational volume of a box van (up to 3.5 tonne capacity, converted into volume using bulk density of SMW and further assume a maximum fill level of 70%, as agreed by the project steering

group). The output is the number of vehicles required to capture 100% of the SMW in household residual waste for each LA.

In the second scenario, the number of vehicles was determined by size and rurality of the LA, assuming that there need to be enough vehicles to cover all households (DMR + Residual). This is the worst case scenario as in reality, where the separate pass is being used to add collection capacity to one of the other collection models, collection crews on the main DMR round could communicate with the separate pass crew to instruct them where the excess SMW is. The steps of the calculation were:

- Determine, for each LA in the WRAP database, the corresponding round size assuming the same round size as co-mingled DMR collection according to their rurality.[21]
- Determine the number of households that need be serviced per day, on a fortnightly collection schedule this is equivalent to 1/10th of all households in the LA that have (at least) residual collection.
- Divide the total number of households that need to be serviced per day by the round size. The output of this step is the number of vehicles needed on each collection day to service the households on a fortnightly schedule, assuming 100% participation rate where all households present SMW for collection.

For each LA, the number of vehicles required equals to the larger of the two outputs from the above scenarios under the same assumptions of capture rate and participation rate. For instance, for a small and rural LA it is likely the scenario 1 (volume-constrained) will estimate a smaller number of vehicles needed compared to scenario 2 (mileage-constrained); in this case, the number of vehicles needed for the LA is dictated by results from scenario 2.

Due to a lack of primary data on practical capture rate and participation rate for kerbside collection of SMW and batteries, a simplified baseline scenario of 100% capture rate and 100% participation rate was used. Under this scenario, the model projects that the number of vehicles would always be constrained by the number of households to be serviced rather than by the tonnages of SMW presented. The number of vehicles needed for this baseline scenario was used to calculate the UK-wide scale up cost, cost per household, cost per tonne of SMW (and batteries) collected, and the GHG impact. The sensitivity of these figures, which can depend on various capture rates and participation rates, is elaborated in Section 5.2.3. Once the number of vehicles is determined, the GHG impact was calculated as follows:

- Calculate mileage per year of all separate pass vehicles by multiplying the number of households serviced per day (i.e. 1/10th of the LA size) by the average distance between households according to the rurality of the LA and 256 working days per year. The average mileage per household for separate pass collection of food waste in Wales was used as a proxy (see Table 14).[42] The per-household mileages were sense-checked using the average daily mileage provided by a LA, and the corresponding round size for co-mingled collection. The proxy value corresponds more closely to the lower end estimate of daily mileage provided by the LA.

- Calculate the GHG impact based on the total mileage per year. The UK GHG factor for a Class III van (1.74 to 3.5 tonnes) of 0.45 $kgCO_2e$ per mile was used.[36]

Table 14: Mileage assumptions for separate pass vehicles

<table>
<tr><th>LA rurality</th><th colspan="2">Proxy value for per household mileage for separate pass collection (miles per hhd)</th></tr>
<tr><td>Urban</td><td colspan="2">0.028</td></tr>
<tr><td>Mixed urban/rural</td><td colspan="2">0.046</td></tr>
<tr><td>Rural</td><td colspan="2">0.065</td></tr>
<tr><th>Sense-check of proxy value based on figures from a mixed urban/rural authority</th><th>Average daily mileage</th><th>Equivalent households per round (% difference from round size of 1,200 for mixed urban/rural co-mingled collection[21])</th></tr>
<tr><td>Low</td><td>60</td><td>1,294 (4%)</td></tr>
<tr><td>High</td><td>100</td><td>2,157 (80%)</td></tr>
</table>

4.2.8 High-level quantification of opportunity cost related to electric RCVs

In discussion with industry stakeholders, it was raised that increasing adoption of eRCVs could mean that installing cages for SMW collection may no longer be a viable option, since the undercarriage space would be taken up by the battery. If the introduction of new SMW collections via retrofitting diesel RCVs hindered the adoption of eRCVs that would otherwise occur, this would generate opportunity costs. This step quantifies, at a high-level, both the positive (i.e. cost of cage, diesel, and carbon) and negative (i.e. capital and operating costs of eRCV) opportunity costs.

In a recent study, Eunomia presented the cost-benefit analysis of an electric versus diesel RCV in terms of net present value (NPV) for the period of 2020-2028 (Table 15). The aforementioned costs for SMW collection were added onto the original capital and operating costs for diesel RCV to arrive at a new cost-benefit comparison. To be consistent with Eunomia's methodology, the NPV calculation of SMW-related fuel and carbon costs for 2020-2028 assumed a discount rate of 3.5%. The output of this analysis is a comparison between the total cost of ownership of an eRCV and a diesel RCV that has been retrofitted to collect SMW.

It should be noted that this is not a like-for-like comparison and is only meant to illustrate at a high level the potential trade-offs. The potential downstream

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[42] Eunomia. 2016. The Climate Change Impact of Recycling Services in Wales. https://www.eunomia.co.uk/reports-tools/the-climate-change-impacts-of-recycling-services-in-wales/

environmental benefits of SMW collected for recycling via diesel RCVs were excluded from this comparison, since the scope of this study is limited up to the first point of consolidation.

Table 15: Opportunity costs per vehicle associated with eRCV

	Without SMW collection			With SMW collection	
Cost category	**eRCV**	**Diesel RCV**	**Net cost**	**Diesel RCV + Cage**	**Net cost**
Capital cost (£)	365,374	163,791	201,583	Diesel RCV capital cost + cost of cage 164,550	200,825
Operational cost (£)	237,331	409,306	-171,975	Diesel RCV operating cost + NPV of additional fuel cost due to SMW 409,311	-172,092
Externalities (£)	7,979	49,952	-41,973	Diesel RCV externalities + NPV of additional carbon cost due to SMW 50,025	-41,982
Total (£)	610,684	623,049	-12,365	Sum of above 623,885	-13,249
Total excluding externalities (£)	*602,705*	*573,097*	*29,608*	Sum of above 573,860	28,733

4.2.9 Sensitivity analysis

Staff cost has been identified as the highest cost item contributing to the annual operating costs, and therefore presents a sensitivity in both diesel RCV cage and kerbside sort scenarios. A sensitivity analysis was carried out for SMW-only collection using low, medium and high wage estimates. The higher-end estimates were based on ICP3 assumptions, and the lower-end estimates were sourced from stakeholder inputs. Calculating the impact of staff wage level on UK-wide operating costs involved two steps. First, scale-up costs for the whole UK (including the set-up and operating costs of 86 LAs that currently offer SMW kerbside collection) which were re-calculated using low and high wage assumptions; then, the cost per household scenarios were also re-calculated, so that the corresponding set-up cost contribution from the 86 LAs could be subtracted from the national total in low and high wage scenarios. The operating costs of these 86 LAs are included in the sensitivity analysis.

5. Key findings

5.1 Key findings related to current kerbside SMW collection services

A summary of the key findings from the survey and other stakeholder engagement is included in Table 16.

Table 16: Operational features of current SMW kerbside collection services identified from the survey and other stakeholder engagement

Operational characteristics	Finding	Evidence
Operational delivery methods	SMW collection generally compatible with RCV and Kerbsider collection services. Small number of LAs also operate on-demand SMW collection using dedicated vehicles.	Survey responses and insight from WMCs as to how cages can be fitted to RCVs and how Kerbsider compartments are typically used (either dedicated to SMW or used to collect SMW alongside other niche waste streams (typically textiles and/or batteries).
	There are instances where current collection fleets are incapable of accommodating SMW collection.	5 surveyed LAs (out of the 11 without kerbside SMW collections) stated fleet incompatibility as a reason for not offering the service. Also, an RCV manufacturer highlighted airtank position on some existing diesel RCVs prevents side-cages being fitted, whilst tailgate mounted cages cannot be fitted to narrow vehicles.
Method of presentation	SMW is generally collected loose or in standard carrier bags, placed either on top of bins or in boxes for dry recyclables.	Of the survey responses 27 collected SMW in standard carrier bags, 13 collected them loose and 7 in boxes.
	Size guidance given by LAs to residents as to what constitutes SMW is varied.	Some example LA guidance from survey responses includes: • No larger than A4 • Must fit inside a standard carrier bag • Must fit inside a binbag • Must be smaller than a microwave • Must fit into a recycling box
	Some LAs provide additional guidance to residents as to what SMW can/cannot be collected.	A third of survey responses indicated that they instruct residents that they do not collect items such as screens and bulbs. 29 survey respondents provided information related to this finding.
Types of kerbside collection models	SMW collection is on a weekly or fortnightly basis.	SMW is more often collected weekly (31 survey respondents) than fortnightly (15 survey respondents). This can mean SMW is collected on a residual waste round as well as a dry recycling round.
	Co-collection with batteries is common but not universal.	Over 70% of LAs who responded to this survey question stated that they collect batteries alongside SMW (25 respondents). However, two, in their survey responses, explicitly stated that they do not accept batteries, or ask for batteries to be taken out of appliances.
	Coverage of SMW kerbside collection service can be less than 50% of households.	15% of survey respondents provide the SMW kerbside collection service to less than 50% of households. 53% offer the service to less than 75% of households. 47 survey respondents provided information related to this finding.
	Communal buildings with restricted storage are usually omitted from the SMW kerbside collection service.	59% of survey respondents exclude communal buildings with restricted storage from their SMW kerbside collection service. 10% also exclude very rural households. 39 survey respondents provided information related to this finding.

Operational characteristics	Finding	Evidence
Type of contract	SMW kerbside collection service can be provided by DSOs, WMCs and Teckal Companies.	In the survey 34% of respondents collected waste through Direct Service Organisations (DSOs), 57% via WMCs and 6% employed Teckal companies. The number of survey respondents who provided information related to this finding was 47.
	Period of time left on waste management contracts is typically less than 10 years.	The number of years left on contracts is less than 10 years in 95% of survey responses, and less than 5 years in 60% of responses. 17 survey respondents provided information related to this finding.
Arrangements for offtake	Kerbside collected SMW is most often consolidated at contractor or council operated depots, followed by WTSs and HWRCs. It can also be brought directly to AATFs in some cases.	57% of usable survey responses specified a depot for kerbside collected SMW consolidation, whereas 30% stated Waste Transfer Stations (WTSs), 9% HWRCs and 4% Approved Authorised Treatment Facilities (AATFs). 47 survey respondents provided information related to this finding.
	Two-stage consolidation employed by some LAs.	Two LAs first consolidate at depot before transferring to a HWRC site.
	Onward treatment most often organised by compliance schemes.	23 survey respondents work with compliance schemes. Another 7 respondents indicated that they work directly with a treatment facility after the SMW arrives at the consolidation points, however the corresponding consolidation points from these latter responses were not AATFs, and instead council or contractor's depot, HWRC, and WTS (suggesting the question was not well understood).
Cost structure and total net costs	Neither LAs or WMCs could disaggregate SMW collection costs from general overall waste collection service costs.	Only one LA responded with an estimate of collection cost. SUEZ explained that as a 'parasitic' waste stream, SMW doesn't materially increase weight collected or time to carry out collections. At least one WMC offers SMW collection as a non-costed value-adding service at the start of any contract.
Appraise funding sources and risks	Most SMW kerbside collection is paid for directly by LAs	Over half of respondents to this question stated that the SMW collection service was wholly paid by the tax-payer. The number of survey respondents who provided information related to this finding was 27.
Identify potential alternative models of funding	Some LAs receive start-up funding for setting up schemes and others recover some costs from compliance schemes.	2 survey respondents had received some start-up funding for their schemes whilst 3 stated that some costs were recovered from compliance schemes. There was follow-up questioning to local authorities regarding reimbursements costs, but there was no response providing an estimate of these costs.
	Indirect benefits, in terms of reduced contamination and value recovery from other waste streams, are also motivators for kerbside SMW collections.	Some (n=5) LAs stated that costs offset by the avoided costs of WEEE contamination was a factor they considered (if only qualitatively) in their appraisal of their SMW collection service's value. Some LAs (n=8) also reported that they receive some revenue from materials that can be recycled or sold for reuse.

Operational characteristics	Finding	Evidence
Key losses and potential causes	Theft is not generally a major issue for SMW kerbside collection.	All but one survey respondent indicated that theft wasn't a major issue for SMW kerbside collection. One stakeholder in the ICER workshop raised theft as an issue in their area. For the survey respondent who said it was an issue, they reported receiving "10 or so" notifications/complaints from the public a year related to theft by "illegitimate organisations". The number of survey respondents who provided information related to this finding was 35. Note that theft could be occurring before the collection service arrives and not be noticed (and thus reported) by residents or the local authority waste collectors.
Quantify capability of current collection service models to capture all WEEE discarded locally	Peak at service launch is bigger than seasonal peaks throughout the year.	Survey respondents reported peaks in the first months after service launch of <5% (n=4), between 5% and 10% (n=5), between 10% and 25% (n=12), between 25% and 50% (n=4) and greater than 50% (n=1). Relating to seasonal peaks, 9 respondents reported a spike <5%, 21 between 5% and 10%, 1 between 10% and 25%, and 1 between 25% and 50%.
	SMW disposal/collection is generally not steady through the year.	Survey respondents report a peak in SMW collections after Christmas (n=25), in response to local/national communications (n=10) and Spring cleans (n=7). A few survey respondents said there was no appreciable change in SMW weight throughout the year (n=3).
	Approximately a third of kerbside collection services have had difficulty responding to peaks in SMW disposal	A third of survey respondents (n=14) who answered this question indicated that they weren't able to easily accommodate the peaks in SMW disposal at service launch or at particular times of year. This included LAs which experienced only peaks of less than 5% above average (n=1) and between 5% and 10% above average (n=7).
	Mop-up vehicles and communication measures are the main measures used to alleviate service disruption due to peaks in collection	Some survey respondents (n=19) reported using mop-up vehicles and/or communication measures (n=12) to respond to temporary peaks in SMW disposal. One reported emptying cages part way through a round and another that crews use stillages meant for other materials.

5.2 Key findings from the economic and environmental model

The model, as described in Section 4.2, produced estimates of the per household and whole-UK costs as well as the GHG impact of providing kerbside SMW and battery collection services. Results for SMW and batteries are presented separately in this section.

5.2.1 Results for kerbside collection of SMW and batteries by RCV and kerbside sort vehicles

5.2.1.1 Cost per household

For households with a co-mingled or two-stream DMR collection service carried out by an RCV, the steady state operating cost for SMW collection is between £0.04 and £0.68 per household per year, depending on collection frequency (see Figure 11 and Table 17). Note that this includes the £0.13 to £0.17 per year for container replacement that is applicable for each flat household in a LA, with these costs being evenly shared out among all households in order to arrive at an average operating cost per household.

In general, two-stream collections are more expensive than co-mingled, due to the smaller round size and the need to operate more vehicles for a given round. In terms of the initial set-up cost of containers for collecting SMW alongside co-mingled or two-stream DMR, the costs range from £0.16 to £0.72 per household, averaged across all households (i.e. the cost of containers for flats are evenly distributed across all households currently with DMR collection). Note that the set-up cost per household in this update is lower than the July 2021 version because the ICP3 methodology removes local overheads from the set-up costs and instead merges these with commercial overheads as part of the annual operating costs. The set-up cost for households in LAs classified as “Predominantly Urban, higher deprivation” (Category 1) was 37% lower than those in LAs classified as “Predominantly Urban, lower deprivation” (Category 3). This is because, given the current categorisation of UK LAs, the representative example of a Category 1 LA was larger in size (approximately 117,307 households versus 95,417 for Category 3) and therefore lower set-up costs would be incurred on a per household basis for a Category 1 LA. Furthermore, a Category 3 LA has a higher proportion of flats than a Category 1 LA (27% vs 15%), meaning that the costs for providing containers are proportionally higher; this leads to higher overall cost when shared across all households in the LA.

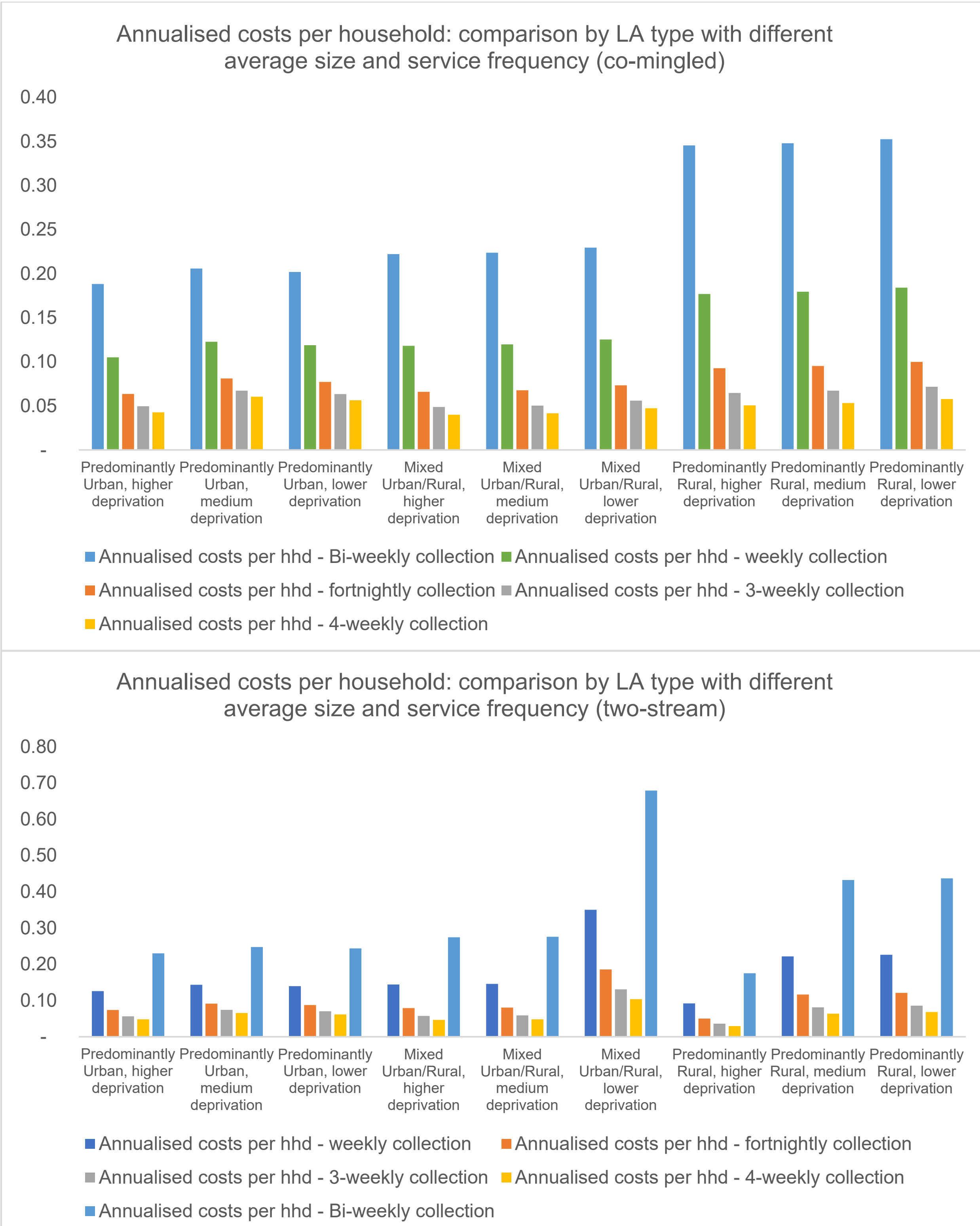
For households with kerbside-sorted DMR collections, while the set-up costs are similar to that for RCV collections, the annualised costs are higher, between £0.44 and £1.72 per household (Figure 12). This is also significantly higher than the proxy cost per household derived from WRAP’s cost estimates for source-separated recycling in Wales (Table 13). This difference reveals that the top-down approach of attributing a percentage of dry recycling cost to WEEE by weight risks under-estimating the costs involved, especially since WEEE is a niche waste stream compared to other dry recyclables.

The main reason that the annualised costs for SMW collection alongside kerbside-sort collection is higher is that the average vehicle volume allocated to SMW in kerbside-sort vehicles is higher (lower end: 0.25m^3 for WEEE out of 18.3m^3 in a 3.5m example Romaquip model; higher end: 1.5m^3 out of 37.2m^3 in a 5.0m model; on average 2.70% of available vehicle volume) than in RCVs (0.176m^3 out of (21.5 + 0.176 m^3); 0.81%). This raises the staff cost as well as the vehicle-related costs (capital, standing and running costs) that were attributed to SMW in the case of the kerbside-sort method, since the waste compartment is integrated in the vehicle. In the case of collection by RCV, given that an undercarriage cage is a separate add-on, vehicle-related costs were not considered to be applicable.

Regardless of the collection method, inclusion of battery collection with SMW kerbside services would result in minimal (<£0.01 per household) incremental costs per household per year. This incremental cost reflects only the additional costs of equipping RCVs with battery containers, annual replacement of these containers, and the additional fuel costs due to the load of batteries. If a LA were to introduce a kerbside collection service for only batteries, additional costs items that were previously apportioned to SMW collection (e.g. staff, vehicle, overhead costs) would need to be apportioned to batteries instead.

Also of note is that, based upon current assumptions, the cost of communications to inform householders and support behaviour change in recycling behaviour, such as towards using a kerbside collection service for SMW, is generally higher than the operational costs of the collection service.

Figure 11: Annualised costs per household for RCV collections of SMW by LA type and service frequency. Top: Co-mingled collections by RCV; Bottom: Two-stream collections by RCV



N.B. The annualised cost per hhd for bi-weekly two-stream collection in Category 6 LA is notably higher than the rest because the average number of households falling under this category is lower than other scenarios.

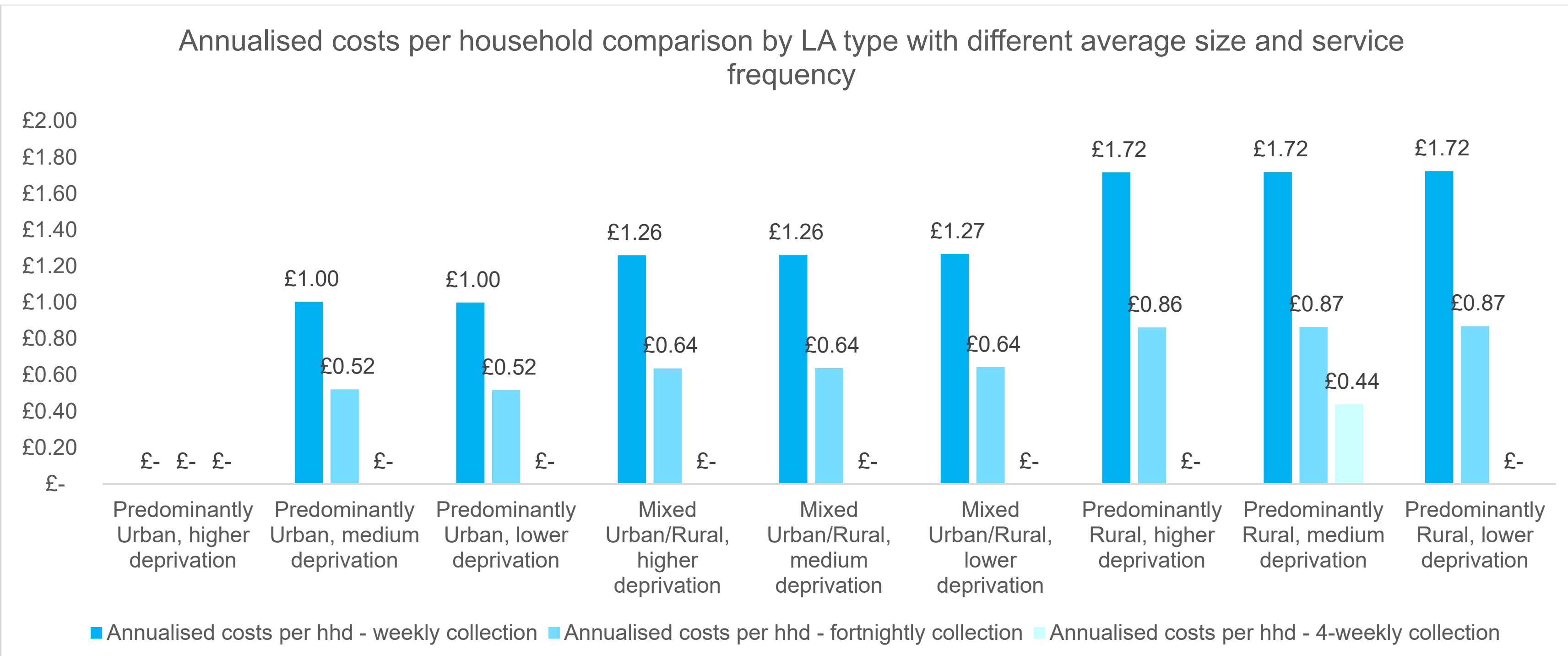
Table 17: Comparison of set-up and annualised costs per household for RCV-based collections of SMW, versus SMW and batteries

Set-up and annualised costs per household currently with co-mingled DMR collection						
	Set-up costs £/hhd	Annualised costs £/hhd – Bi-weekly collection	Annualised costs £/hhd – weekly collection	Annualised costs £/hhd – fortnightly collection	Annualised costs £/hhd – 3-weekly collection	Annualised costs £/hhd - 4-weekly collection
Predominantly Urban, higher deprivation	0.40	0.19	0.11	0.06	0.05	0.04
Predominantly Urban, medium deprivation	0.72	0.21	0.12	0.08	0.07	0.06
Predominantly Urban, lower deprivation	0.65	0.20	0.12	0.08	0.06	0.06
Mixed Urban/Rural, higher deprivation	0.25	0.22 (0.23 for SMW+batteries)	0.12	0.07	0.05	0.04
Mixed Urban/Rural, medium deprivation	0.28	0.22 (0.23 for SMW+batteries)	0.12	0.07	0.05	0.04
Mixed Urban/Rural, lower deprivation	0.39	0.23	0.13	0.07	0.06	0.05
Predominantly Rural, higher deprivation	0.16	0.35	0.18	0.09	0.06 (0.07 for SMW+batteries)	0.05
Predominantly Rural, medium deprivation	0.20	0.35 (0.36 for SMW+batteries)	0.18	0.10	0.07	0.05
Predominantly Rural, lower deprivation	0.28	0.35 (0.36 for SMW+batteries)	0.18 (0.19 for SMW+batteries)	0.10	0.07	0.06
Set-up and annualised costs per household currently with two-stream DMR collection						
	Set-up costs £/hhd (SMW-only)	Annualised costs £/hhd – Bi-weekly collection	Annualised costs £/hhd – weekly collection	Annualised costs £/hhd – fortnightly collection	Annualised costs £/hhd - 3-weekly collection	Annualised costs £/hhd - 4-weekly collection
Predominantly Urban, higher deprivation	0.40 (0.41 for SMW+batteries)	0.23	0.13	0.07	0.06	0.05
Predominantly Urban, medium deprivation	0.72	0.25	0.14 (0.15 for SMW+batteries)	0.09	0.07	0.07
Predominantly Urban, lower deprivation	0.65	0.24 (0.25 for SMW+batteries)	0.14	0.09	0.07	0.06
Mixed Urban/Rural, higher deprivation	0.25	0.27 (0.28 for SMW+batteries)	0.14 (0.15 for SMW+batteries)	0.08	0.06	0.05

Mixed Urban/Rural, medium deprivation	0.28	0.28	0.15	0.08	0.06	0.05
Mixed Urban/Rural, lower deprivation	0.39	0.68 (0.69 for SMW+batteries)	0.35 (0.36 for SMW+batteries)	0.19	0.13	0.10
Predominantly Rural, higher deprivation	0.16	0.18	0.09	0.05	0.04	0.03
Predominantly Rural, medium deprivation	0.20	0.43 (0.44 for SMW+batteries)	0.22 (0.23 for SMW+batteries)	0.12	0.08	0.06
Predominantly Rural, lower deprivation	0.28	0.44 (0.45 for SMW+batteries)	0.23	0.12	0.09	0.07

Note: Average comms cost = £1.79/£1.49/1.19 per hhd for small/medium/large LAs respectively

Figure 12: Annualised costs per household for kerbside-sort collections of SMW by LA type and service frequency

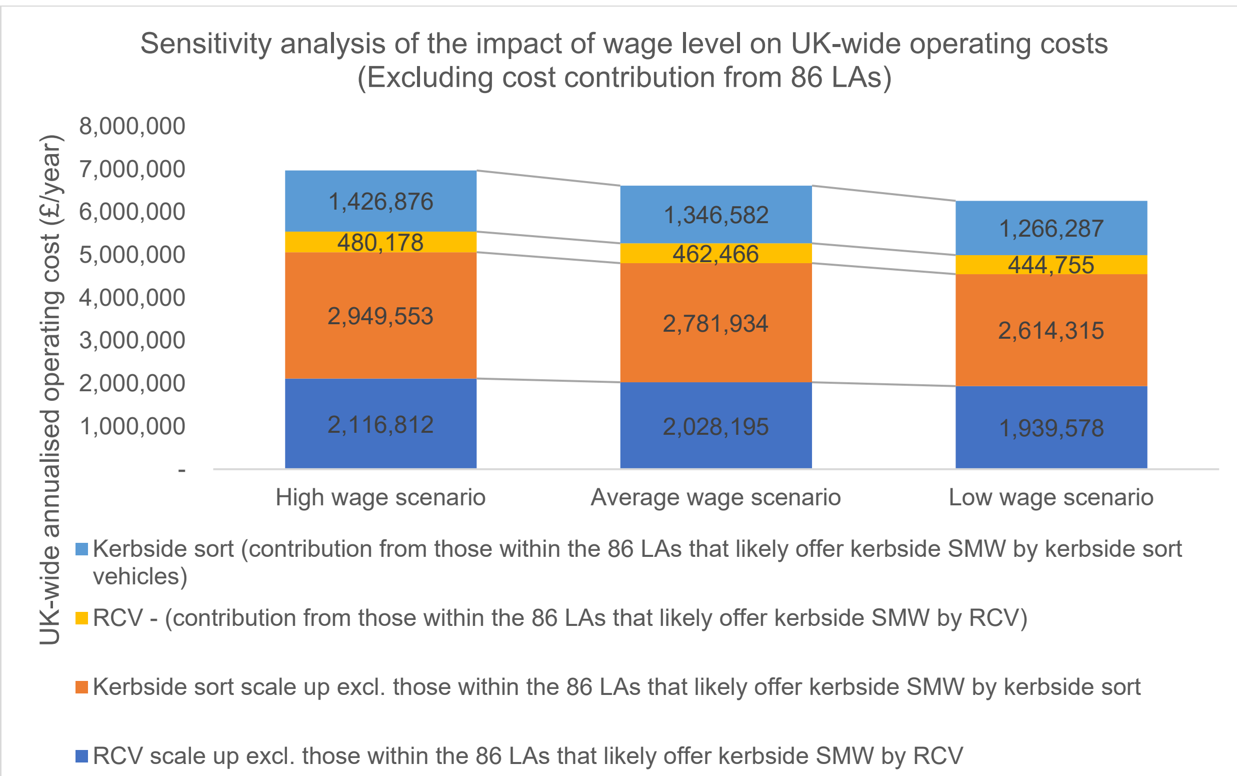


Note: Cost of 4-weekly collection is only available for one LA category because there were no other LAs with this service combination that fall under other LA categories, based on the WRAP LA Scheme data and categorisation of LAs applied in Section 4.2.3. There were no households under category 1 that have multi-stream DMR collection.

5.2.1.2 UK-wide annual operating cost and sensitivity (DMR-only scale up for SMW-only collections)

Independent of the collection method, the cost structure varies by service frequency and LA category. The share of vehicle and staff costs decrease with lower service frequency; and the importance of container replacement costs lessens in increasingly rural areas with fewer flats. The high wage scenario uses ICP3 assumptions, and the low wage scenario was developed in the July 2021 version of this study drawing from industry stakeholder inputs. The low wage scenario for drivers and loaders is about 12% lower than ICP2 inflation-adjusted figures. The impact of low/average/high wage assumptions on the DMR-only UK-wide scale-up cost is shown in Figure 13. Under a high-wage scenario, where the costs of drivers and loaders are approximately 13% higher than the central case, the national operating costs for the 2019 baseline would increase by 5% (including the operating cost contribution from the 86 LAs with existing service, and excluding all communication costs); most of the increase is attributed to an increase in staff costs under the kerbside sort scenario.

Figure 13: Sensitivity analysis of the impact of wage assumption on UK-wide annualised operating costs.



5.2.1.3 UK-wide initial set-up and operating cost in Year 1 (DMR-only and DMR + Residual scale up for SMW-only collections)

Assuming that no separate pass vehicles are needed under steady state operation, the cost implication of UK-wide kerbside collection of SMW was estimated to be £15.7M in the first year, covering all UK households currently with DMR collection served by either

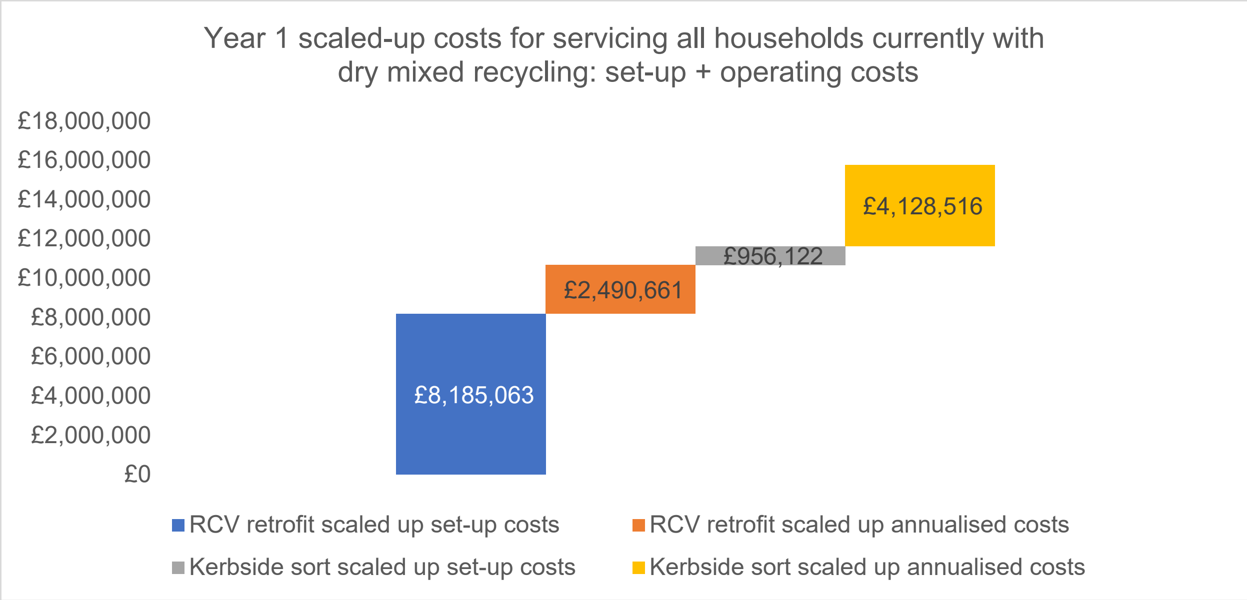
RCV or kerbside sort vehicles. This total can be further broken down into £9.1M for initial set-up costs and £6.6M for the annualised operating costs. These costs excluded the set-up costs for the 86 LAs who are already anticipated to have kerbside collections of SMW but include their estimated annual operating costs. It should be noted that these costs do not include the potential need for separate pass vehicles to provide additional collection capacity for surges in demand during the introduction of the new services or at peaks throughout the year. The additional costs associated with provisioning separate pass vehicles is elaborated in Section 5.2.3.

Figure 14 shows the cost breakdown by collection method for the first year. The set-up cost contribution from the diesel RCV cage scenario is notably higher than for kerbside-sort, because 84% of UK LAs operate co-mingled or two-stream dry recycling. The difference is less pronounced when it comes to annualised operating costs because of the higher costs for kerbside-sort.

Under the alternative scenario of including households who only receive residual waste collections but not DMR (a total of 446,587, or 1.5% of all UK households with at least residual collection), the UK-wide costs in Year 1 increase to £17.2M, excluding the set-up costs for the 86 LAs who are already anticipated to have kerbside collections for SMW and including their estimated annual operating costs. This constitutes £10.5M set-up cost and £6.7M annualised operating costs. The national total cost in Year 1 is 10% more expensive than the DMR-only scenario. This increase reflects the proportionally higher costs of serving what are believed to be very remote and/or communal households in certain areas. Note that the July 2021 version of this study had over-estimated the additional number of households that would be included in the DMR+Residual scenario; this update has addressed the issue and hence the level of reduction in operating cost for the DMR+Residual scenario compared to the July 2021 version which is greater than that for the DMR-only scenario.

Lastly, it is important to note that in this update, 100% of the set-up cost is associated with set-up of containers for communal households. Figure 15 shows that container replacement cost makes up 9% of the UK-wide operating cost in the DMR+Residual scenario for scale up. When considering both container set-out and replacement costs, container-related costs make up 64% of the UK-wide set-up and operating cost in Year 1 (DMR+Residual, excluding container set-out in the 86 LAs) (Figure 16). Given the significance of container-related costs, it is highly advisable that further evidence is gathered to refine the assumptions associated with providing kerbside collection services of SMW and batteries for flats and communal households.

Figure 14: National scale-up costs for Year 1 (excluding the set-up costs from the 86 LAs with existing SMW kerbside collection services and including their annual operating costs). Top: for servicing all households currently on DMR schemes; Bottom: for servicing all households including those only with residual collection



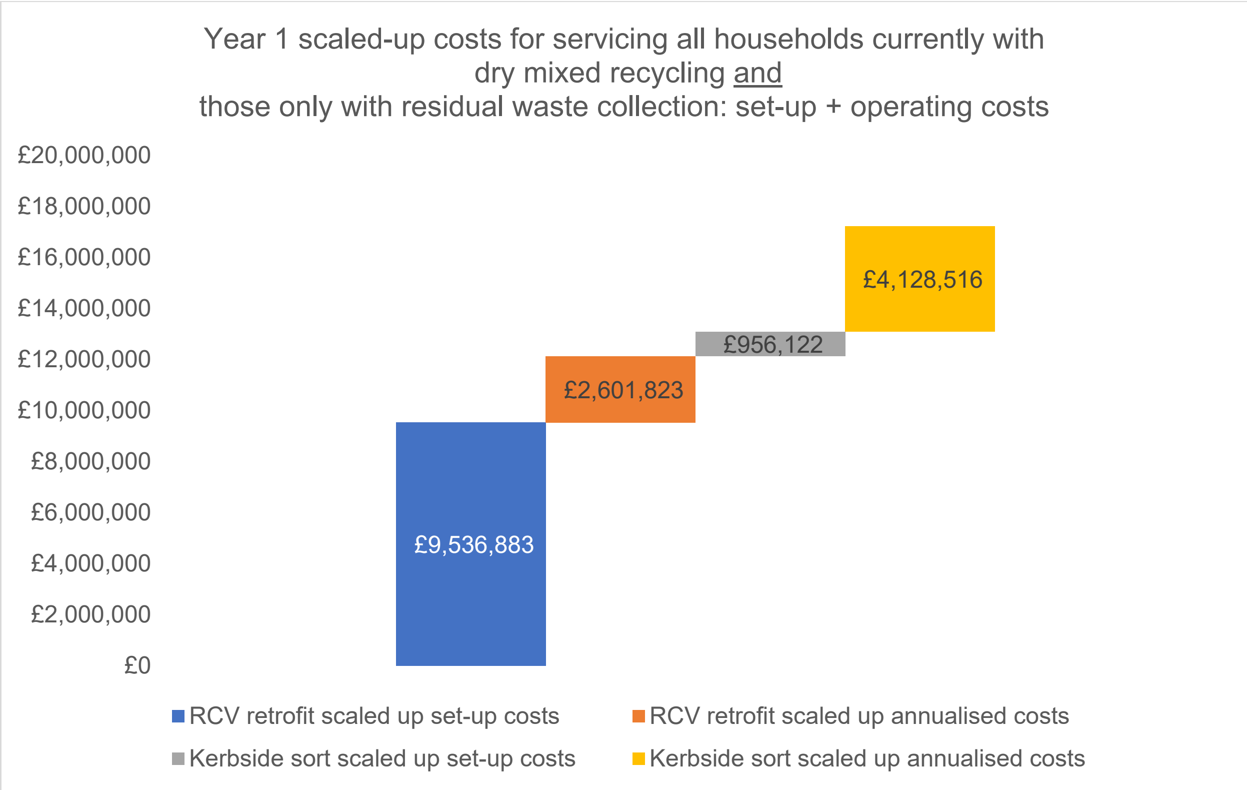


Figure 15 Breakdown of UK-wide annual operating cost (DMR+Residual scale-up)

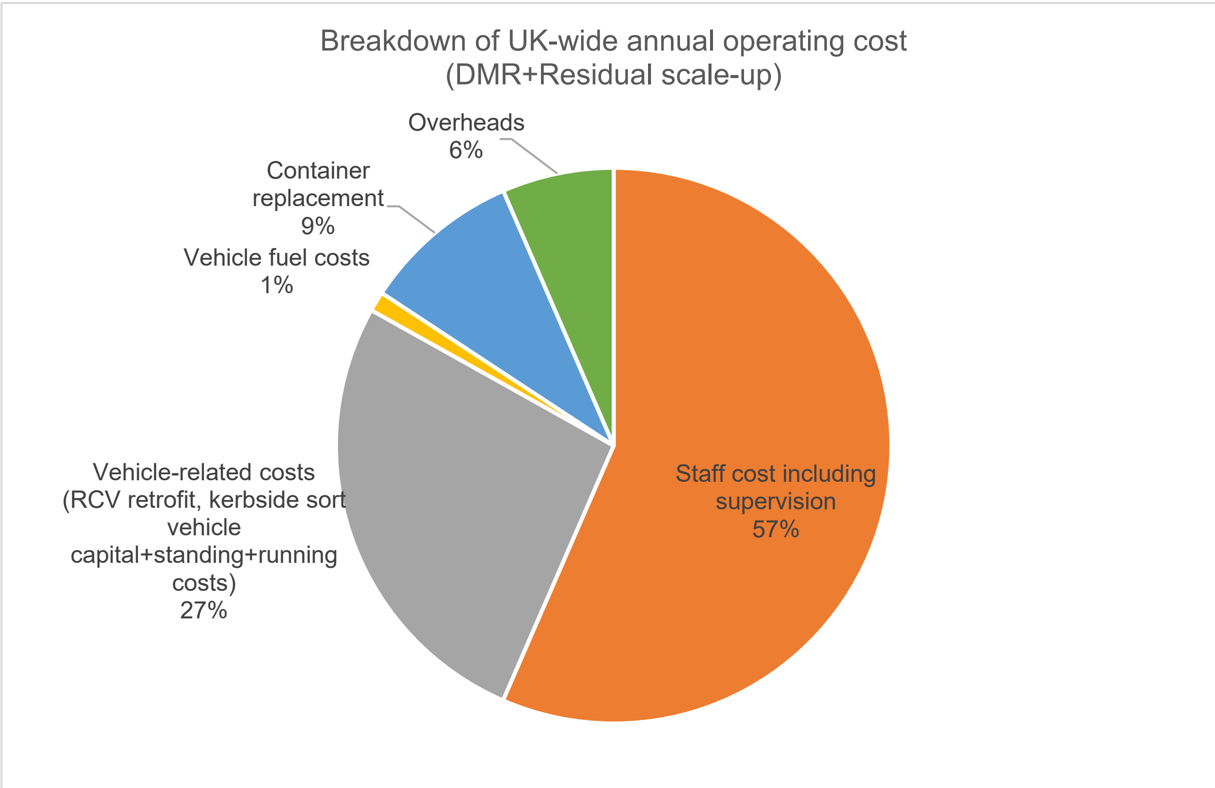
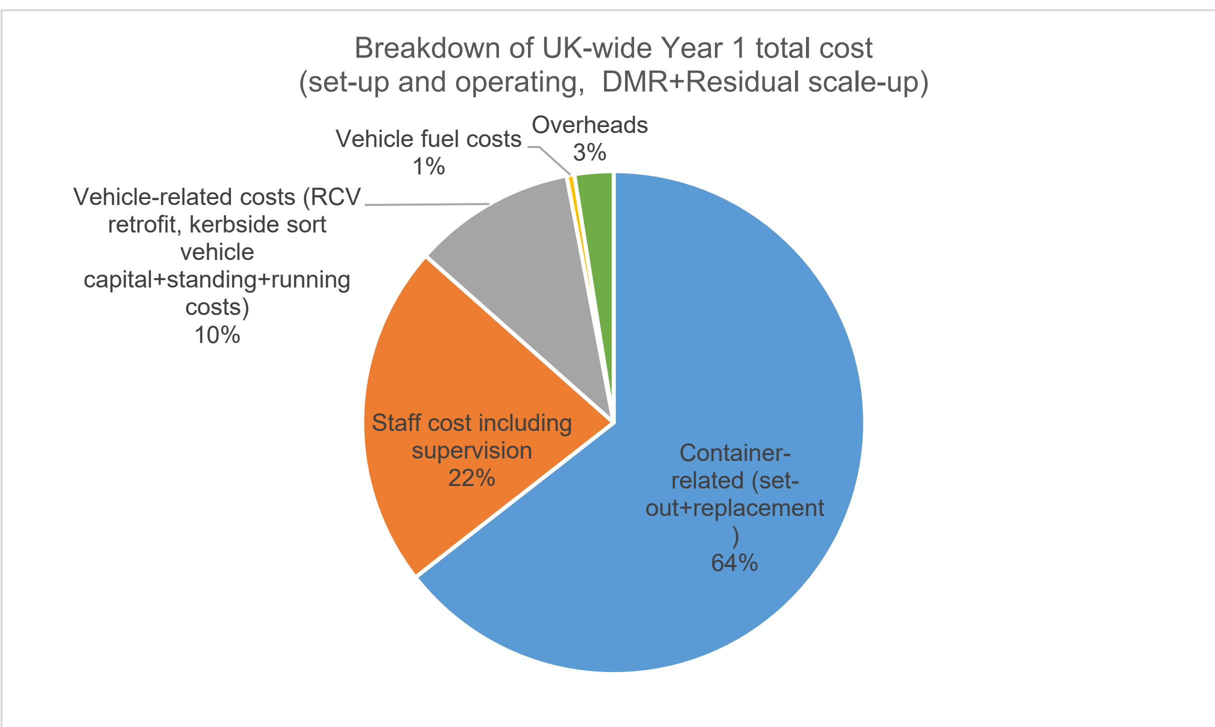


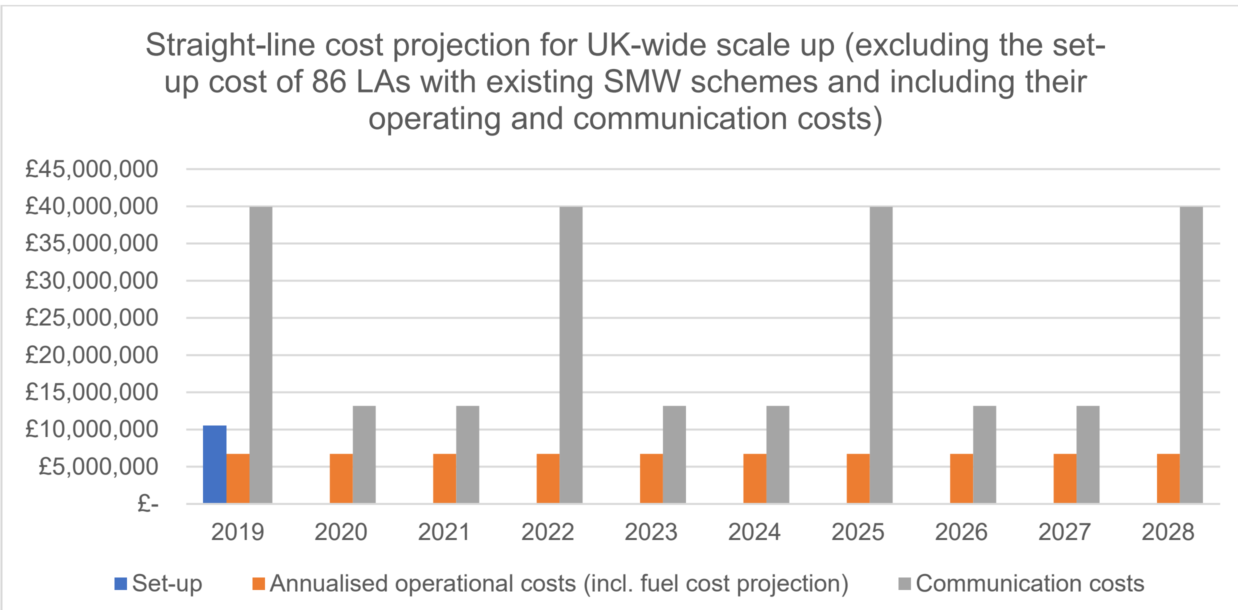
Figure 16 Breakdown of UK-wide total cost (set-up and operating) in Year 1 (DMR+Residual scale-up, excluding the set-up cost contribution from the 86 LAs)



5.2.1.4 10-Year cost projections (DMR+Residual scale up for SMW-only collections)

Figure 17 presents a straight-line projection of UK-wide costs (DMR-only) for steady state collection of SMW using diesel RCV cages and kerbside-sort vehicles. The unit cost of diesel was projected to rise by 10.2% between 2019 and 2028, as reflected by the small increase in annualised costs. Though not modelled, due to lack of supporting data, it is recognised there may be a reduction in operating costs as the kerbside collection services develop. The 10-year average cost (including initial set-up) is £7.8M per year without communication costs, and £31.7M including the triennial cycle of communication costs.

Figure 17: Straight-line cost projection for national scale up to service all households currently with at least residual collection (excluding the set-up costs of the 86 LAs with existing SMW kerbside collection services and including their operating and communication costs)



5.2.1.5 UK-wide GHG impact (DMR-only and DMR + Residual scale up for SMW and battery collections)

In terms of environmental impact, the main source of additional GHG associated with steady state SMW collection is the additional fuel usage as a result of additional load on the RCV or kerbside sort vehicles. The total estimated GHG emission from all RCVs and kerbside sort vehicles is in the range of 172 to 174 tCO_2e/year for the 2019 baseline year, for DMR-only and DMR + Residual scenarios respectively. The externality cost associated with GHG emissions over a 10-year period is summarised in Table 18.

Table 18: 10-year projection of GHG impact and externalities cost for kerbside SMW and battery collection for DMR-only and DMR + Residual scale-up scenarios

Year	UK-wide externalities cost (£ per year) : DMR-only scale up of SMW	UK-wide externalities cost (£ per year): DMR + Residual scale up of SMW	UK-wide externalities cost (£ per year): DMR-only scale up of SMW + batteries	UK-wide externalities cost (£ per year): DMR + Residual scale up of SMW + batteries
2019	2,256	2,286	3,412	3,460
2020	2,374	2,405	3,591	3,641
2021	3,523	3,570	5,330	5,404
2022	4,672	4,734	7,068	7,167
2023	5,822	5,899	8,806	8,930
2024	6,971	7,063	10,545	10,693
2025	8,119	8,226	12,281	12,453
2026	9,268	9,391	14,019	14,216
2027	10,417	10,555	15,758	15,978
2028	11,566	11,720	17,496	17,741

Note that by including batteries with kerbside SMW collection this increases the fuel usage due to the higher bulk densities of batteries, and therefore raises the associated externality cost. The model assumed that containers dedicated for battery collection would have an average fill volume of 50%, which in practice may be an overestimation of the quantity of batteries that would be presented by households.

5.2.1.6 Opportunity cost

Fuel usage and carbon cost also incur an opportunity cost, considering that the use of undercarriage cages for SMW collection could hinder the adoption of electric RCVs. On a per-vehicle basis, the total cost of ownership of an eRCV is £28,733 more expensive than operating a diesel RCV that also collects SMW; this difference is 3% lower than the original cost-benefit analysis comparing eRCV and diesel RCV used for residual waste collection. The comparison is on a per-vehicle basis and could not be scaled across the UK due to a lack of robust data on the number of diesel RCVs on the road.

5.2.1.7 Cost per tonne and cost effectiveness

Cost effectiveness of existing kerbside collection services was assessed by applying the costs as derived from the model to the responses from those who provided information in the survey on the collection weights and other service attributes (DMR collection mode and service frequency). The 15 usable responses and the assumed cost effectiveness, in £/tonne, of each scheme is summarised in Table 19. The mean cost effectiveness of the kerbside collection services is £1,289 per tonne and the median is £898 per tonne. These figures reflect the standalone cost per tonne of collection between the kerbside of the householder to the first point of consolidation, and therefore does not include onward transport and treatment costs of the SMW. Note that in reality, the actual cost effectiveness will depend on the actual costs to the LAs for providing these collection services, which can vary from the modelled results in Table 19, depending on factors such as the LA size, rurality, collection frequency, and collection set-up.

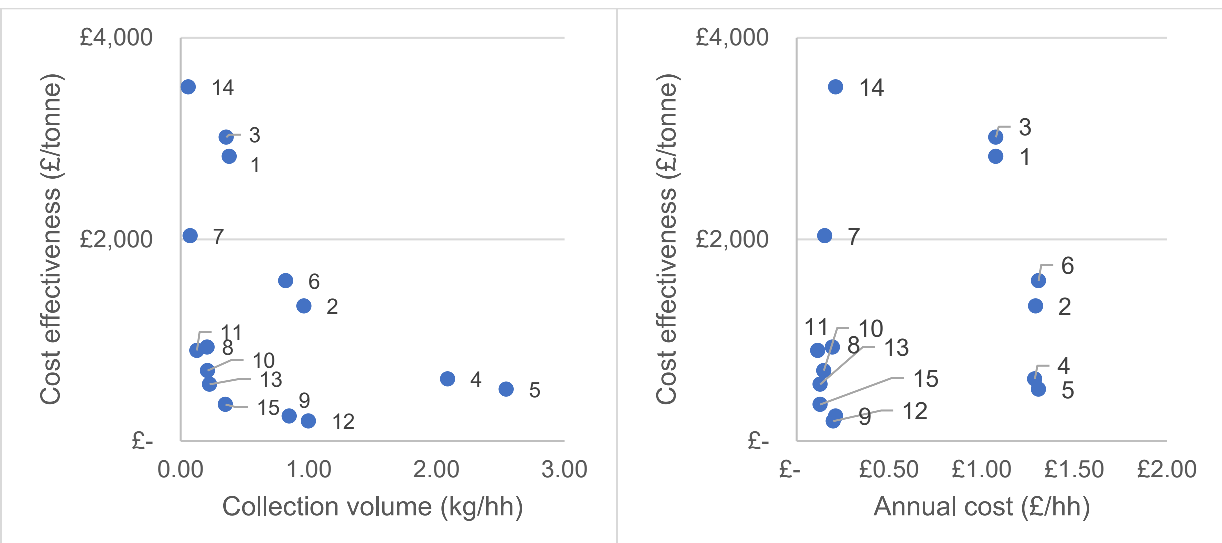
Table 19: Cost effectiveness of established (>5 years) SMW kerbside collection services, excluding communication costs

ID	Current DMR provision	Frequency of SMW collection	Kilogram SMW /household/year	Averaged annual cost (10 years) /household	£/tonne
1	Kerbside sort vehicle	Weekly	0.38	£1.08	£2,822
2	Kerbside sort vehicle	Weekly	0.96	£1.29	£1,338
3	Kerbside sort vehicle	Weekly	0.36	£1.08	£3,012
4	Kerbside sort vehicle	Weekly	2.09	£1.29	£616
5	Kerbside sort vehicle	Weekly	2.54	£1.31	£513
6	Kerbside sort vehicle	Weekly	0.82	£1.31	£1,589
7	RCV with cage attached	Fortnightly	0.08	£0.15	£2,035
8	RCV with cage attached	Weekly	0.21	£0.19	£931
9	RCV with cage attached	Weekly	0.85	£0.21	£248
10	RCV with cage attached	Weekly (DMR collection fortnightly)	0.21	£0.15	£699
11	RCV with cage attached	Fortnightly	0.13	£0.11	£898
12	RCV with cage attached	Weekly (DMR collection fortnightly)	1.00	£0.20	£198
13	RCV with cage attached	Fortnightly	0.23	£0.13	£562
14	RCV with cage attached	Weekly (DMR collection fortnightly)	0.06	£0.21	£3,511

ID	Current DMR provision	Frequency of SMW collection	Kilogram SMW /household/year	Averaged annual cost (10 years) /household	£/tonne
15	RCV with cage attached	Fortnightly	0.35	£0.13	£363

As is evident in Figure 18, it is the weights of SMW collected rather than the operational costs of the kerbside collection service that has a bigger impact on overall cost efficiency of the established kerbside collection services. It should be noted that greater public awareness and participation rates with these collection services, and therefore higher collections of SMW, would necessarily decrease the cost per tonne, as long as the extra collections did not lead to additional costs to the LA (e.g. requiring a mop-up service if presentation rates exceeded normal round capacity).

Figure 18: Relationship between (Left) cost effectiveness and collection weights (negative correlation) and (Right) cost effectiveness and annual cost of SMW kerbside collection service (no correlation) for the 15 survey responses in Table 18



5.2.2 Kerbside collection services' impact on overall SMW collection weights

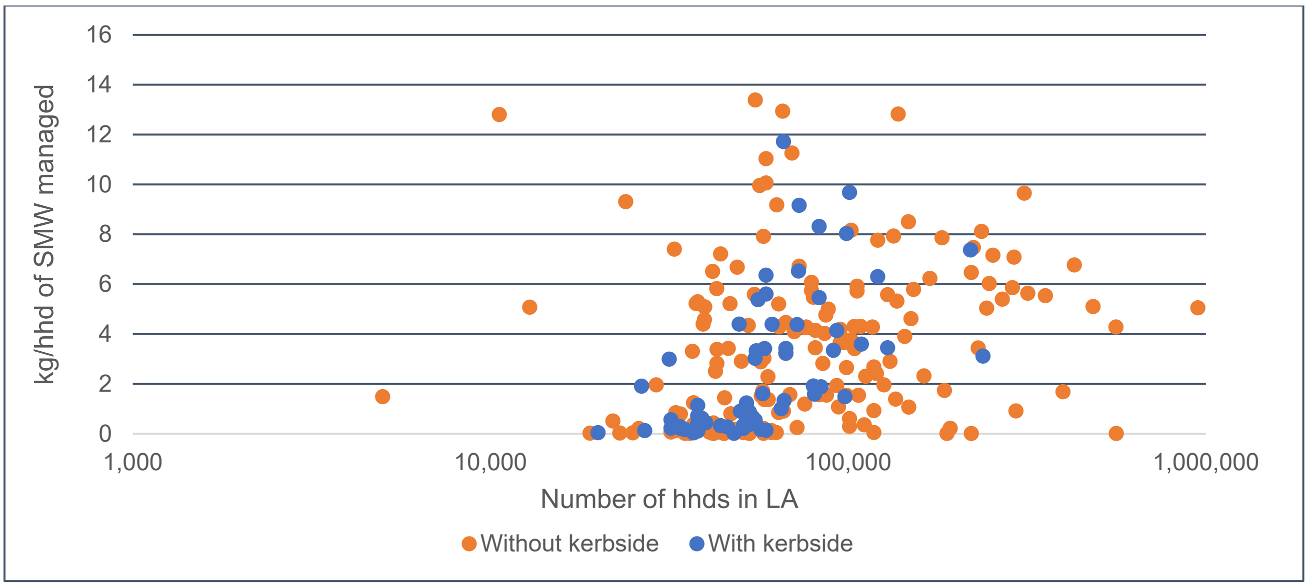
WasteDataFlow (WDF) was analysed to try an establish whether SMW kerbside collection services have an overall positive impact on SMW collection weights. WDF is the system by which LAs (Waste Collection Authorities (WCAs), Waste Disposal Authorities (WDAs) and Unitary Authorities (Uas)) report on the municipal wastes that they manage. For 'WEEE – Small Domestic appliances', here taken to be a proxy for SMW, there is information on types of collection and ultimate end fates of collected materials. There are differences in how LAs from different UK regions report (e.g. Scotland reports per calendar year, while other regions report per financial year) as well as differences in quality and completeness of individual LA submissions. Of the 393 LAs with waste collection responsibilities, only 232 reported any 'WEEE – Small Domestic appliances' management in the period April 2018-March 2019 (or calendar year 2018 for Scotland).[43] Non-reporting LAs likely do not have the data, or have chosen not to report on the disaggregation of the WEEE they manage into its constituent waste streams.

For the 2018/2019 period there is no significant difference between the average kg/household of SMW managed for LAs with and without kerbside collection services in place, see Table 19. As can be seen in the scatter plot, there is a large amount of variability between kg/hhd collection rates for SMW for all LAs.

Table 20: Average weight of SMW managed by LAs with and without kerbside collection services, based on WasteDataFlow analysis of 2018/19 data

Kerbside SMW collection?	No. of LAs with 'WEEE-Small Domestic Appliance' collection reported	Average kg/hh (from all collection channels including kerbside where applicable)	Standard deviation kg/hh
Yes	63	2.6	2.8
No	169	3.7	3.7

Figure 19: Scatter plot of SMW weights reported in WDF for LAs with and without SMW kerbside collection services



Note: Isles of Scilly (hhds = 1000) collect 33kg of SMW per hhd was removed from the plot so that other entries could be displayed better.

Secondly, the research looked at whether the implementation of a kerbside collection service for SMW had a significant impact on the overall weights of SMW managed by individual LAs. For this, three samples of LAs were selected, drawn from respondents to the survey. The samples were:

- LAs without a kerbside collection service for SMW (sample size=10);

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[43] Please note that the total number of LAs with waste collection responsibilities have since changed from 393 (in 2020) to 394 (according to WRAP data for ICP3 and LA Schemes). Correspondingly, the number of LAs that reported WDF data may have also changed from the original 232. This however does not affect the rest of the analysis.

- LAs that introduced a kerbside collection service for SMW between 3 and 5 years ago (sample size=9); and
- LAs that introduced a kerbside collection service for SMW between 5 and 10 years ago (sample size=11).

A downside to the approach was that the data submitted into WDF of the sampled LAs may not be the most complete or accurate. A summary of this analysis is included in Appendix 6.4. Additionally, this method of sampling may be prone to biases associated with reasons as to whether or not LAs chose to engage with the survey.

A step change in the kg/hhd SMW collected via kerbside is seen only in the two samples that introduced the kerbside collection service. However, the analysis of the data does not support any statement as to whether kerbside collection increases the overall quantity of SMW collected.

Reasons why no firm conclusions could be drawn from this analysis include:

- Inherent inconsistencies in the classification and recording of SMW in WDF, both between different LAs as well as over time.
- Some WCAs, that report kerbside SMW collection, are not responsible for managing HWRC sites and so have data on kerbside collection but not on Bring site/CA site collections. The opposite is true for WDAs.

An alternative approach was attempted: WDF data, from 2011 to 2019, was analysed for 10 unitary authorities (UAs) with and without SMW kerbside collection services (as UAs are typically responsible for both waste collections and operating HWRC sites). However, this analysis also failed to support any statements as to whether kerbside collection increases the overall quantity of SMW collected. Both samples saw similar levels of SMW collection growth between 2011-2013 and 2017-2019: 9% for the UAs with kerbside collection and 10% for the LAs without kerbside collection, see Appendix 6.4.

5.2.3 Separate pass collection

The motivation for looking at separate pass provision for kerbside SMW collections services includes the uncertainty as to whether all existing and future RCVs are compatible with WEEE collection cages. As shown in Table 21 and Table 22, calculations suggest that if all kerbside sorts and RCV vehicles currently servicing households' dry mixed recycling and residual waste collections are fitted for SMW collection, at a 80% fill level in practice, they would be able to capture 55% of the 155,000 tonnes of SMW (727,000m^3 in volume) assumed to be entering household residual waste each year. Capacity requirements for SMW collections should also account for potential weight contribution from embedded batteries, as it is not always feasible for the public to remove and segregate them before presenting for collection. This analysis assumes 100% presentation rates of WEEE and batteries that are normally put in residual waste by residents, and therefore represents a potential upper bound of collections (with caveats as discussed previously).

Table 21: Total SMW and battery weight and volume that UK households could present for kerbside collection annually

Waste stream	Tonnes/year	Density (kg/m³)	Volume (m³/year)	kg/hhd/year
SMW	155,000	213	727,358	5.25
…of which batteries (often embedded)	1,054	1,350	781	0.04
Batteries	14,310	1,350	10,600	0.49
Total	**169,310**		**737,958**	**5.76**

Sources: SMW tonnage from Mapping waste electrical flows in the UK, *Material Focus/Anthesis, July 2020; Battery tonnage from* National Municipal Waste Composition, England 2017, *WRAP/Eunomia, 2019; Waste densities from SEPA reference[15]; Total number of UK households (including those with only residual waste collection) = 29,503,002 (WRAP LA Scheme Data Spring 2021 version).*

Table 22: Summary of the scaled up maximum collection volume for SMW and batteries on RCVs and kerbside sort vehicles, compared to the total available volumes of material households could present.

Type of vehicle	Type of collection	Scaled up maximum volume capacity at 80% fill (m³)	Service collection capacity as a % of available SMW, by volume	Service collection capacity as a % of available batteries, by volume
RCV – DMR collection	SMW (175L)	138,000	51%	590%
	Battery (55L)	43,000		
RCV collection subtotal		**181,000**		
Kerbside sort	SMW (175L)	233,000		
	Battery (55L)	15,000		
Total collection volume: RCV for DMR (SMW+battery) and kerbside sort for DMR collections (SMW+battery)		**429,000**		
RCV – Residual collection (for households with only residual collection as well as those that already have DMR collection)	SMW (175L)	30,000	55%	673%
	Battery (55L)	9,000		
Total collection volume available for SMW and batteries (DMR and residual only collection vehicles): 468,000 m³				

NB: Percentages in each column are cumulative

The above table shows that the expected annual collection capacity created by adaptation of DMR RCVs, kerbside sort vehicles and residual waste RCVs (for households with only residual collections as well as those that already have DMR collections) is 85,438 tonnes of SMW (or 84,670 tonnes if excluding the weight of embedded batteries) and 96,306 tonnes of batteries (plus an additional of 580 tonnes embedded in SMW). The tonnages for batteries are comparatively higher due to the density of batteries being 6.3x that of SMW. This represents 55% of the SMW and 673% of the batteries expected to be entering households' residual waste each year.[2]

To model the separate pass scenario, it was assumed that all SMW and batteries that could be presented by households are collected solely by separate pass vehicles servicing each household on a fortnightly basis, and that a typical separate pass van is filled to 70% capacity (as it was assumed that in practice, it would not be realistic to pack the entirety of the available vehicle volume from floor to ceiling).

Like collection by retrofitted diesel RCVs or by kerbside sort vehicles, the initial set-up cost per household for the separate pass scenario is entirely driven by container cost and no other set-up costs were modelled in this study. The number of containers required for set-up depends on the proportion of households living in flats that are associated with the LA's rural/deprivation category (Table 5). The average size of LAs in each category is determined based on the number of households that currently have at least residual collection per LA by each category. The cost of container set-up is calculated by multiplying the corresponding proportion of flat households by the average size of the LA and the unit cost of containers. This quantifies the set-up cost for an average-sized LA in each category. This was then multiplied by the number of LAs under each category to project the UK-wide set-up cost for the separate pass scenario.

Table 23 presents the indicative initial set-up costs under the separate pass scenario. The set-up costs are differentiated by LA categories and their average sizes based on the number of households with residual collection. The projected UK-wide set-up cost for servicing all households with residual collection under the separate pass scenario amounts to nearly £9M after subtracting the cost contribution from the 86 LAs that already offer the service. This cost is £1.5M lower than the total set-up costs for collection by RCV and kerbside sort vehicle for the same service coverage. The reason for this discrepancy is that the average LA size determined from the number of households with residual collection is larger than the average LA size derived from households with DMR collection; consequently, the corresponding overhead cost applied to each household is lower. Communication requirements and costs are assumed to be equivalent to those listed in the sections relating to DMR + Residual and kerbside sort collection models.

Table 23 Set-up cost per average-sized LA by category and the UK-wide total, based on number of households across the UK with residual collection

LA category	Average size of LA by category (number of households)	Set-up costs per LA (£)	No. of LAs by category	UK-wide set-up costs (£)
Predominantly Urban, higher deprivation	117,524	46,854	36	1,686,729
Predominantly Urban, medium deprivation	97,538	70,116	33	2,313,817
Predominantly Urban, lower deprivation	94,030	60,907	35	2,131,756
Mixed Urban/Rural, higher deprivation	74,882	19,026	46	875,183
Mixed Urban/Rural, medium deprivation	84,647	23,976	32	767,247

Mixed Urban/Rural, lower deprivation	58,268	22,527	45	1,013,706
Predominantly Rural, higher deprivation	62,002	9,618	36	346,249
Predominantly Rural, medium deprivation	59,493	11,969	69	825,842
Predominantly Rural, lower deprivation	53,676	15,247	62	945,342
Total (including 86 LAs that currently have kerbside collection of SMW)				10,905,872
Total (excluding 86 LAs that currently have kerbside collection of SMW)[a]				9,157,017

Note a: The cost contribution from the 86 LAs is scaled based on the number of households with DMR collection, assuming that none of these LAs offer kerbside collection of SMW to households beyond the DMR coverage

For annualised operating costs, the model assumes a simplified scenario of 100% capture rate of SMW currently lost in residual waste, and 100% household participation rate. Following this assumption, the number of separate pass vehicles needed can be constrained either by the volume of SMW in residual waste, or by the number of households in a LA that need to be covered on a given collection day.

In the first case where the number of vehicles provisioned is based on the average weight of SMW per household (5.3 kg/hhd/year) potentially diverted from residual waste, then a minimum of 981 3.5 tonne vans are needed. Note that this is a conservative estimate as it represents a 'few-and-often' approach to SMW presentation by residents, and the assumed average weight of SMW available for collection is based on the 155,000t of SMW found in residual waste in 2017.[2] As uptake grows, more vehicles would be needed.

In the second case where distance between households is the limiting factor, a minimum of 3,482 vehicles are needed to visit all households with residual collection following a fortnightly collection schedule. This is a worst case scenario as separate pass vehicles may not need to visit all households and instead adopt a more targeted approach.

If across the UK, LAs were to plan for the worst case scenario, then 3,482 vans would be required. Multiplying this figure by the average annualised operating cost of a separate pass vehicle, the UK-wide annualised cost of collecting SMW and batteries entirely by separate pass vehicles amounts to £233.4 million. As summarised in Table 24, this equates to £1,516 per tonne of collected SMW, excluding the 0.68% weight fraction attributed to batteries. The cost per tonne for batteries (both those embedded in SMW and those separately collected) amounts to £15,195 which is 10x higher than that of SMW because the tonnages of batteries currently lost in residual waste are approximately 10% that of SMW.

In practice, both capture rates and participation rates would vary by LA and by collection frequency. For instance, if collections occur less frequently, or if residents present more than the average amount in cases of clear-out, more vehicles could be required to capture the additional SMW. The minimum incremental cost of capturing this SMW, based on the maximum tonnage that can be collected by each separate pass vehicle over 256 work days per year, is £338/tonne/vehicle.

The GHG current impact associated with servicing all UK households with at least residual collection is projected at 15,252 tCO_2e/year. The GHG impact of a separate pass service for SMW and batteries is determined by the mileage travelled and is therefore dependent on the participation rate.

Table 24: Costs and carbon impacts associated with scaled-up separate pass collection for SMW and batteries

Average participation rate across the UK	Capture rate (% of average weight put in residual waste)	No. of vehicles needed across the UK	National annualised operating cost (£/year)	Cost /hhd (£)	Cost/tonne SMW (excluding weight fraction of batteries)	Cost/tonne batteries (SMW fraction and separately collected) (£)	GHG impact (tCO_2e/ year)
100%	100%	3,482	233,443,000	7.91	1,516	14,710	15,252

Mean and median presentation weights of SMW from households were extrapolated from the survey responses, with a capture rate then calculated - see Table 25. Given current representative SMW and battery presentation weights, the cost per tonne for a separate pass-based collection service in the order of £11,500 - £23,000 per tonne, based respectively on the mean and median tonnages presented per household according to survey response. Since the number of participating households is not known from the survey responses, the calculation assumes the number of separate pass vehicles sent out by a LA would visit all households. This is a worst case scenario estimate, as not all households within a LA would be serviced by a separate pass vehicle. In practice where separate pass vehicles act more commonly as additional mop-up crews - rather than the only method of collection, fewer households would be targeted. This leads to fewer vehicles being required to provide enough collection capacity for the expected weights of SMW arising, and therefore the cost per tonne will fall further. Costs could fall further still if the vehicles were only employed (and therefore incur costs) at times of the year when they were needed.

Table 25: Summary of representative average annual SMW and battery presentation weights (kg/hhd/yr) for kerbside collection via RCVs and kerbside sort vehicles, based on results from the survey (for services that are at least 5 years old). Scaled-up tonnages for the whole UK are calculated assuming all households (DMR+Residual) present the average amounts as per the survey.

Measure of representative material presentation from hhds	SMW		Batteries		Total (SMW + Batteries)		Equivalent capture rate (weight)
	Kg/hhd/yr	Scaled-up annual tonnage	Kg/hhd/yr	Scaled-up annual tonnage	Kg/hhd/yr	Scaled-up annual tonnage	
Mean	0.68	20,062	0.05	1,475	0.73	21,537	13%
Median	0.36	10,621	0.02	590	0.38	11,211	7%
LA sample size	15		17				

The separate pass figures above are estimates based on a small number of operating cost estimates (and therefore do not benefit from the sample size of the data from the

DMR and residual collections) and without consideration of geographic variation in costs beyond differences in round size in urban versus rural environments. Also, the mileage travelled by vehicles was based on read-across from food waste separate pass collections in the Welsh context and would benefit from further refinement.

The high costs associated with the separate pass service, based on current SMW and battery capture rates, could reduce over time if presentation weights increased or more targeted approaches such as prior booking was adopted. Furthermore, once the occupants of a household have cleared what they have hoarded/accumulated, the amount of WEEE a given household will subsequently present may in fact decline and be presented relatively infrequently. This could be better managed by employing services that respond to demand and utilise route optimisation solutions to bulk up nearby collections, rather than having services that operate regardless of demand. Additionally, if separate pass vehicles were used to collect a combination of niche waste streams (e.g., SMW, batteries, textiles), the costs could be split amongst these, which could reduce the cost per tonne and CO_2 emissions for any one of the waste streams.

6. References

- The Department for Business Innovation and Skills, WEEE Regulations 2013: Government Guidance Notes, 2014: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/292632/bis-14-604-weee-regulations-2013-government-guidance-notes.pdf

- Material Focus, 2020, Electrical Waste - Challenges and Opportunities: An investigation into Waste Electrical and Electronic Equipment (WEEE) flows in the UK: https://www.recycleyourelectricals.org.uk/report-and-research/electrical-waste-challenges-opportunities-2/
- Summary of EAC inquiry on Electronic Waste and the Circular Economy, 2020: https://publications.parliament.uk/pa/cm5801/cmselect/cmenvaud/220/22006.htm
- Letsrecycle, 2021, Defra's consistency consultation delayed: https://www.letsrecycle.com/news/latest-news/defras-consistency-consultation-delayed/
- WRAP, 2014, Barriers to recycling: A review of evidence since 2009: https://wrap.org.uk/sites/default/files/2020-09/WRAP-Barriers%20Synthesis%20Full%20Report%20final%20121214%20PUBLISHED%20-%20PDF.pdf
- WRAP, 2017, National municipal waste composition: England: https://wrap.org.uk/sites/default/files/2020-11/WRAP-National%20municipal%20waste%20composition_%20England%202017.pdf
- ADR, CDG Regs and Dangerous Goods Safety Advisors. https://www.hse.gov.uk/cdg/manual/adrcarriage.htm#adr
- WRAP, 2015, ICP2 Online Tool Modelling Assumptions: http://laportal.wrap.org.uk/Documents/ICP online tool assumptions.pdf
- WRAP, 2016, Harmonised Recycling Collections Costs Project: Phase one: WRAP-harmonised-recycling-report-2016 (wrapcymru.org.uk)
- WRAP, 2020, National Household Waste Composition 2017: https://wrap.org.uk/resources/report/quantifying-composition-municipal-waste

- WRAP, 2022, private correspondence about ICP3 updated cost assumptions
- Scottish Environment Protection Agency, 2015, UK conversation factors for waste: https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx
- Environment Agency, 2020, Waste electrical and electronic equipment (WEEE): evidence and national protocols guidance: https://www.gov.uk/government/publications/weee-evidence-and-national-protocols-guidance/waste-electrical-and-electronic-equipment-weee-evidence-and-national-protocols-guidance#batteries-in-weee
- Ricardo, 2007, Impact of Vehicle Weight Reduction on Fuel Economy for Various Vehicle Architectures: Impact of Vehicle Weight on Fuel Economy for Various Vehicle Architectures (h3xed.com)
- Zero Waste Scotland, 2012, Zero Waste Scotland Communications Guidance: Improving Recycling Through Effective Communications: https://www.zerowastescotland.org.uk/sites/default/files/Improving%20Recycling%20Through%20Effective%20Communications_ZWS_0.pdf
- SUEZ, 2019, Unpackaging extended producer responsibility consultation proposals: https://www.suez.co.uk/-/media/suez-uk/files/publication/suez-unpackagingeprconsultationproposals-1904-1.pdf
- WRAP, 2015, Analysis of recycling performance and waste arisings in the UK 2012/13: https://archive.wrap.org.uk/sites/files/wrap/WRAP-anaylsis-recycling-performance-2012-13.pdf
- City of London. 2021. https://news.cityoflondon.gov.uk/clean-air-city-corporation-to-become-first-uk-authority-to-run-fully-electric-refuse-truck-fleet/
- StatsWales, 2019, Households by Local Authority and Year: https://statswales.gov.wales/Catalogue/Housing/Households/Estimates/Households-by-LocalAuthority-Yea
- National Records of Scotland, no date, Estimates of Households and Dwellings in Scotland: https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/households/household-estimates

- NISRA, 2018, Northern Ireland Household Projections (2016 based): https://www.nisra.gov.uk/publications/northern-ireland-household-projections-2016-based
- Office for National Statistics, 2018, Rural Urban Classification (2011) of Lower Layer Super Output Areas in England and Wales: https://data.gov.uk/dataset/b1165cea-2655-4cf7-bf22-dfbd3cdeb242/rural-urban-classification-2011-of-lower-layer-super-output-areas-in-england-and-wales
- Public Health Scotland, 2020, Data Zone (2011) Urban Rural Classification 2016: Urban Rural Classification - Data Zone (2011) Urban Rural Classification 2016 - Scottish Health and Social Care Open Data (nhs.scot)
- NISRA, 2016, Urban Rural Status 2015: https://www.ninis2.nisra.gov.uk/Download/People%20and%20Places/Urban%20Rural%20Status%202015.ods
- Welsh Government, 2020, Welsh Index of Multiple Deprivation (full Index update with ranks): https://gov.wales/welsh-index-multiple-deprivation-full-index-update-ranks-2019
- Scotland's data on a map, 2020, Areas of Deprivation in Scotland's Councils: https://datamap-scotland.co.uk/2020/03/areas-deprivation-scotland-councils/
- Census, 2011, Accommodation type – Households: https://www.nomisweb.co.uk/census/2011/qs402ew
- BEIS and Defra, 2019, Greenhouse gas reporting: conversion factors 2019: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019
- BEIS, 2019, Updated Short-term Traded Carbon Values: Used for UK public policy appraisal, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794186/2018-short-term-traded-carbon-values-for-appraisal-purposes.pdf
- Eunomia, 2020, Ditching Diesel: A Cost-benefit Analysis of Electric Refuse Collection Vehicles: https://www.eunomia.co.uk/reports-tools/ditching-diesel-analysis-electric-refuse-collection-vehicles/

7. Appendix

6.1 Link to online surveys sent to LAs and WMCs

Online survey for LAs: https://forms.office.com/r/7EFDs4137M

Online survey for WMCs: https://forms.office.com/r/UqG0ZZ3RbW

6.2 Local Authorities with kerbside collection services for SMW

This list of Local Authorities with SMW kerbside collection services, compiled by Material Focus, was used to direct who the surveys were targeted at (in addition to their circulation through NAWDO and LARAC).

Table 26: List of Local Authorities with kerbside collection services for SMW collated by Material Focus, accurate as of March 2021.

Armagh City, Banbridge and Craigavon	Falkirk	Runnymede
Arun	Forest of Dean	Rushmore
Ashford	Gedling	South Bucks
Aylesbury Vale	Gloucester city	South Gloucestershire
Bath and North East Somerset	Greenwich	South Northamptonshire
Blackburn with Darwen	Guildford Borough	South Oxfordshire
Blaenau Gwent	Hastings	South Staffordshire
Bridgend	Havering	South Tyneside
Bristol, City of	High Peak	Southend
Bromley	Hounslow	Spelthorne
Calderdale	Kingston	St Albans
Camden	Maidstone	Stafford
Causeway Coast and Glens	Melton	Stratford on Avon
Central Bedfordshire	Merthyr Tydfil	Surrey Heath
Chelmsford	Mid Devon	Swale
Cheltenham	Mid Sussex	Tandridge
Cherwell	Mole Valley	Tonbridge & Malling
Cheshire West & Chester	Newport	Torbay
Conwy	Northampton	Torridge
Crawley	North Devon	Tunbridge Wells
Doncaster	North Lincolnshire	Vale of the White Horse
East Ayrshire	North Somerset	Waltham Forest
East Devon	Norwich	Waverley
East Northamptonshire	Oxford	Wealden
East Staffordshire	Peterborough	West Oxfordshire
Edinburgh	Portsmouth	Windsor & Maidenhead
Elmbridge	Reading	Woking
Epping forest	Rother	Wychavon

6.3 Analysis of survey responses: organised by Annex A of the RFQ

6.3.1 Overall response profile to the survey

Survey responses were received from, or on behalf of, 66 LAs or waste partnerships. Of these 46 have kerbside collection services in place for SMW, 9 accept SMW as part of their bulky waste collection service and 11 don't collect any SMW directly from households.

16 responses were received from Waste Management Contractors, and 56 from LAs directly. There was an overlap of 6 LAs, where both the Waste Management Contractor and LA provided information in the survey.

The main reasons provided for offering or not offering SMW kerbside collection were as follows:

What are the main reasons behind the introduction of this service?	No. of responses	What are your main reasons for not offering this service?	No. of responses
To increase the recycling rate	30	Cost	6
To reduce contamination of other waste streams	12	Incompatible collection fleet	5
To reduce fly tipping	6	Minimal impact of recycling	1
Political will/pressure	2	Lack of local reprocessing facility	0
To generate additional revenue	1	Tried it previously, but service failed	0
'Other	7	Contract restrictions	0
		Other	6

'Other' reasons for having the service included wanting to provide a better service for residents and to make SMW recycling more convenient. 'Other' reasons for not having the service included plan to use bring-banks for SMW collection instead.

6.3.2 Types of operational delivery method

Vehicles

Local Authorities (LAs) and Waste Management Contractors (WMCs) were asked to identify the type of vehicle they use for their kerbside collection service for SMW. Most respondents (62%) use an RCV with a cage attached. 34% use a kerbside sorting vehicle (such as Terberg Kerbsider, CWS 410 Kerbsider, or Romaquip Kerb-sort). Of the two responders who indicated they use a dedicated vehicle for SMW collections, one specified it as being a fully electric van.

	Number of responses	Proportion of responses
RCV	29	62%
Kerbside sorting vehicle	16	34%
Dedicated vehicle for SMW	2	4%
Total	**47**	

Cage or compartment for WEEE

LAs and WMCs were asked what, approximately, were the dimensions (or volume) of the space on the collection vehicle dedicated to WEEE. They were also advised to try to only include usable space – i.e. not space above an opening used to put material into the compartment, from which SMW would fall out from in practice. The 26 usable responses received were converted into m^3 and are summarised here:

	Number of responses	Mean volume (m^3)	Median volume (m^3)
RCV	16*	0.7	1
Kerbside sorting vehicle	9	0.8	0.45
Dedicated vehicles for WEEE	1	5	5
Total	**26**		

*4 LAs reported cage volumes of 2m^3 which were removed from the analysis for being unrealistic.

Methods of presentation of WEEE by residents

LAs and WMCs were asked what instructions they give to the residents on how to present their SMW for collection. A standard carrier bag was the most common response (57%), followed by loose unbagged on top of another bin (28%), and box for WEEE (15%). One responder indicated: "*We ask residents to place Small WEEE in their green recycling box, if there is insufficient room within the box, they can put the Small WEEE item next to or on top of their recycling boxes*".

	Number of responses	Proportion of responses
Bag	27	57%
Loose	13	28%
Box	7	15%
Total	**47**	

Types of kerbside collection models

LAs and WMCs were asked about the frequency of the SMW collections they provide. 66% of the respondents offer a weekly service, while 32% offer a fortnightly service. One respondent indicated they offer a service bookable through an mobile phone application.

	Number of responses	Proportion of responses
Weekly	31	66%
Fortnightly	15	32%
Bookable	1	2%
Total	**47**	

LAs and WMCs were asked what, if any, types of household are excluded from the SMW collection service. The majority of the respondents (49%) indicated they exclude communal buildings with restricted storage or other factors that limit ease of service from the SMW collection service. 36% said there are no exclusions as they offer the service to all households. Three respondents indicated they exclude both communal buildings and very rural/isolated properties, and two respondents indicated they exclude only flats from the service. One respondent indicated very rural/isolated properties are only excluded from the service.

	Number of responses	Proportion of responses
Communal buildings	19	49%
No exclusions	14	36%
Communal buildings *and* very rural/isolated properties	3	8%
Flats	2	5%
Very rural/isolated properties	1	2%
Total	**39**	

The LAs and WMCs were asked to estimate the proportion of households (%) served by the SMW collection service:

	Number of responses	Proportion of responses
>95%	22	47%
Between 75% and 95%	18	38%
Between 50% and 75%	6	13%
<25%	1	2%
Total	**47**	

The one respondent that indicated the number of households covered is less than 25% commented that the "service is in its infancy". It is a new service that has been operating for less than a year.

Type of contract for delivery of collections

LAs and WMCs were asked who they contract with to provide the SMW collection service. The majority of the responders (57%) use a WMC, while 34% use a DSO. Three LAs use a Teckal company: a private company wholly owned by the LA, while one LA uses a charity or community organisation.

	Number of responses	Proportion of responses
WMC	27	57%
DSO	16	34%
Teckal company	3	6%
Charity or community organisation	1	2%
Total	**47**	

Arrangements local authorities make for the offtake of the WEEE collected

LAs and WMCs were asked where SMW is brought for consolidation. 27 respondents mentioned that SMW is brought for consolidation at a contractor's depot, while 14 bring it for consolidation at a Waste Transfer Station (WTS), 4 at a Household Waste Recycling Centre (HWRC) recycling centre, and 2 at an AATF.

	Number of responses	Proportion of responses
Depot	27	57%
WTS	14	30%

HWRC	4	9%
AATF	2	4%
Total	**47**	

Battery collection alongside kerbside SMW collection

LAs and WMCs were asked if they target battery collection alongside kerbside SMW collection, and the majority indicated that they do:

	Yes	No
Number of responses	29 (62%)	18 (38%)

LAs and WMCs were then asked to estimate roughly how many tonnes of batteries they collect a year, through kerbside collections. The responses indicated an average of 3.7 tonnes/year.

Commentary on how the kerbside collection services have performed over time

LAs and WMCs were asked how has the weight (kg/household) of SMW collected changed since they started operating the service. Most of the respondents (37%) indicated that it hasn't changed.

	Number of responses	Proportion of responses
Reduced a lot (>10% decrease)	3	7%
Reduced a little (<10% decrease)	10	23%
Unchanged	16	37%
Increased a little (<10% increase)	10	23%
Increased a lot (>10% increase)	4	10%
Total	**43**	

Key losses of WEEE between what is set-out by residents and what is processed by AATF's

The LAs were asked whether theft is an issue with SMW kerbside collection. Only one LA responded that it is, and commented that this is happening by illegitimate organisations and that they receive approximately 10 complaints a year.

	Yes	No	N/A
Number of responses	1 (3%)	34 (97%)	0

SMW collections by existing bulky collection service

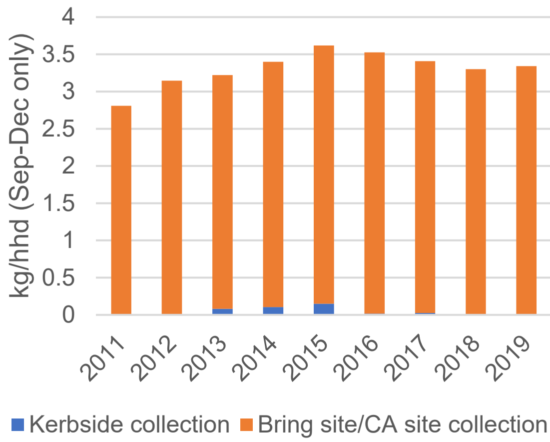
The number of LAs participating in the survey that indicated they offer SMW collection through a bulky waste collection service were 9. Out of these, 56% said the service is not effective. The main reasons given were the high costs associated with bulky waste collections, and the small quantities collected.

	Yes	No	N/A
Number of responses	4 (44%)	5 (56%)	0

One LA commented: “There is a cost to a bulky collection therefore doesn’t seem like the take up is great for this type of waste”.

6.4 Waste data flow analysis of samples of LAs

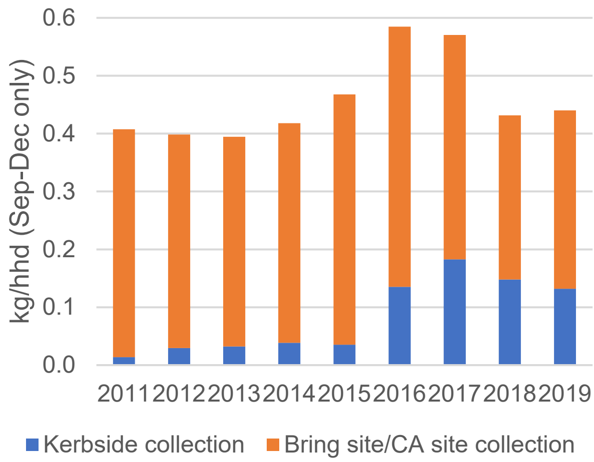
Figure 18 20: Total SMW treatment reported in WasteDataFlow for (Top) LAs without a kerbside collection service for SMW; (Middle) LAs that introduced a kerbside collection service for SMW between 3 and 5 years ago; and (Bottom) LAs that introduced a kerbside collection service for SMW between 5 and 10 years ago



		kg/hhd collected	
		Average	StDev
2011-2013 average	Kerbside	0.03	0.05
	Bring site	3.03	0.19
	Total	3.06	0.20
	% kerbside	**1%**	

		Average	StDev
2017-2019 average	Kerbside	0.01	0.00
	Bring site	3.31	0.03
	Total	3.32	0.03
	% kerbside	**0%**	

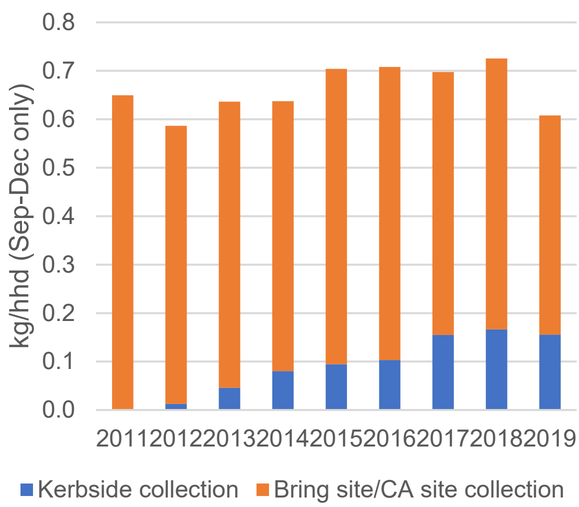
% change 2011-2013 to 2017-2019	Kerbside	-74%
	Bring site	9%
	Total	**9%**



		kg/hhd collected	
		Average	StDev
2011-2013 average	Kerbside	0.03	0.01
	Bring site	0.37	0.02
	Total	0.40	0.02
	% kerbside	**6%**	

		Average	StDev
2017-2019 average	Kerbside	0.15	0.03
	Bring site	0.33	0.05
	Total	0.48	0.06
	% kerbside	**32%**	

% change 2011-2013 to 2017-2019	Kerbside	511%
	Bring site	-13%
	Total	**20%**



		kg/hhd collected	
		Average	StDev
2011-2013 average	Kerbside	0.02	0.02
	Bring site	0.60	0.04
	Total	0.62	0.05
	% kerbside	**3%**	

		Average	StDev
2017-2019 average	Kerbside	0.16	0.01
	Bring site	0.52	0.06
	Total	0.68	0.06
	% kerbside	**23%**	

% change 2011-2013 to 2017-2019	Kerbside	715%
	Bring site	-14%
	Total	**8%**

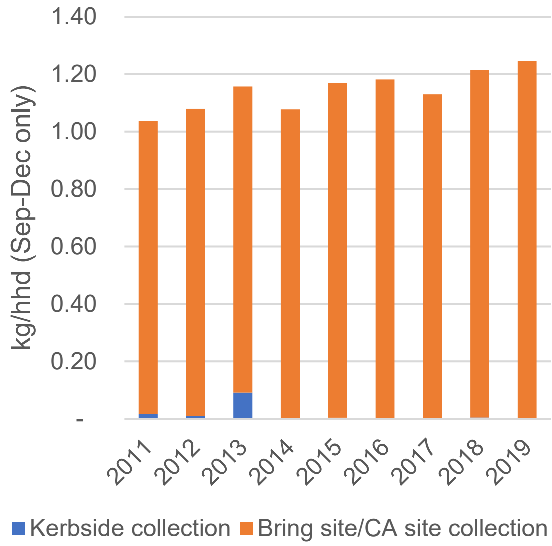
Table 27: List of LAs in the survey samples used in Figure 18

Without kerbside	With kerbside 3-5 years	With kerbside 5-10 years
Cumbria County Council	Blackburn with Darwen Borough Council	Bath and North East Somerset Council
Cumbria Strategic Waste Partnership	East Devon District Council	South Gloucestershire Council
Hampshire County Council	Forest of Dean District Council	Oxford City Council
Hart District Council	Mole Valley District Council	Guildford Borough Council
Leicestershire County Council	Newcastle-under-Lyme Borough Council	South Oxfordshire District Council
Medway Council	Reading Borough Council	Vale of White Horse District Council
Middlesbrough Borough Council	South Northamptonshire District Council	Bristol City Council
Northumberland	Surrey Heath Borough Council	Swale Borough Council
Pendle Borough Council	Woking Borough Council	Stratford-on-Avon District Council
Shropshire		Cannock Chase Council
South Norfolk and Broadland Councils		Calderdale MBC

Table 28: List of LAs in the Unitary Authority samples used in Figure 19

Without kerbside	With kerbside
Blackpool Borough Council	Bath and North East Somerset
Bracknell Forest Borough Council	Blackburn with Darwen
Brighton and Hove Council	Bristol, City of
Cheshire East	Central Bedfordshire
Cornwall	Cheshire West and Chester
Derby City Council	North Lincolnshire Council
East Riding of Yorkshire Council	North Somerset
Herefordshire Council	Peterborough
Plymouth City Council	Portsmouth
Redcar and Cleveland Borough Council	Reading
	Southend-on-Sea

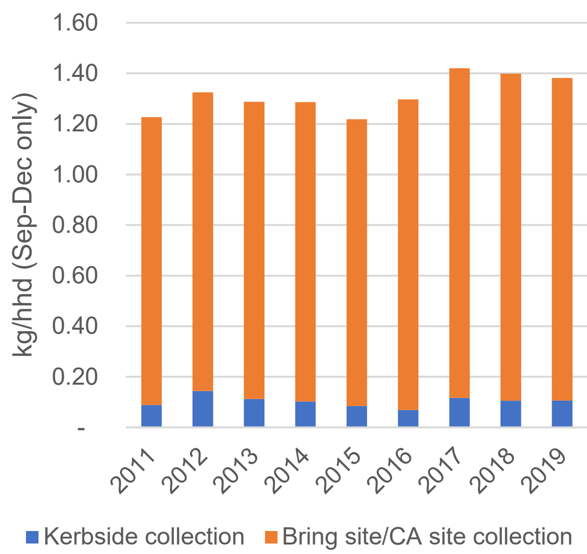
Figure 21: Total SMW treatment reported in WasteDataFlow for (Top) Unitary authorities (UAs) without a kerbside collection service for SMW; (Bottom) UAs with a kerbside collection service for SMW



		kg/hhd collected Average	StDev
2011-2013 average	Kerbside	0.11	0.03
	Bring site	1.17	0.02
	Total	1.28	0.04
	% kerbside	**9%**	

		Average	StDev
2017-2019 average	Kerbside	0.11	0.01
	Bring site	1.29	0.01
	Total	1.40	0.02
	% kerbside	**8%**	

% change 2011-13 to 2017-19	Kerbside	-5%
	Bring site	11%
	Total	**9%**



		kg/hhd collected Average	StDev
2011-2013 average	Kerbside	0.11	0.03
	Bring site	1.17	0.02
	Total	1.28	0.04
	% kerbside	**9%**	

		Average	StDev
2017-2019 average	Kerbside	0.11	0.01
	Bring site	1.29	0.01
	Total	1.40	0.02
	% kerbside	**8%**	

% change 2011-13 to 2017-19	Kerbside	-5%
	Bring site	11%
	Total	**9%**

6.5 Overview of cost assumptions

Cumulative price change due to inflation (Used in July 2021 version)

Cumulative price change due to inflation 2016-2019 (Wales sources)	8%
Cumulative price change due to inflation 2015-2019 (WRAP ICP2 sources)	10%

Bulk densities

	Average kg/m^3	Source
Mixed WEEE SMW	213.1	*https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx*
Portable batteries	1,350	

Container costs and assumptions

	High (Rural)	Average	Low (Urban)	Source
55L box with lid – ICP2 values (£/box)	4.45	4.37	4.29	*ICP2 – Online Tool Modelling Assumptions Technical Annex Technical report templates (wrap.org.uk)* *Working file v2.xlsx (relondon.gov.uk)* *Technical report templates (wrap.org.uk)* *Working file v2.xlsx (relondon.gov.uk)*
55L box annual replacement rate – ICP2 values (%)	N/A	4	N/A	
55L box annual replacement rate – ICP3 values (%)	N/A	5	N/A	*WRAP, preliminary figure for ICP3*

Vehicle and cage (July 2021 version)

Capital costs below including bin lift where required (WRAP ICP2 figures)

Note: ICP3 cost assumptions were used in the 2022 update. Specific figures will be separately published by WRAP when finalised.

	High	Average	Low	Source
Kerbside sort vehicle capital cost (£/vehicle)	138,447	119,797	101,1478	*High: https://www.eunomia.co.uk/reports-tools/the-climate-change-impacts-of-recycling-services-in-wales/* *Low: ICP2 – Online Tool Modelling Assumptions Technical Annex Technical report templates (wrap.org.uk),* *Ditching Diesel - A Cost-Benefit Analysis of Electric RCVs (eunomia.co.uk)*
RCV/Kerbside sort vehicle salvage value (£/vehicle)	N/A	1000	N/A	*1000: Industry average as indicated by one major WMC from waste management company input* *Note: this is replaced by the ICP3 methodology in the 2022 update*

RCV cage (£/cage)	657	579	500	*High: Proposal for an Enhanced Recycling Collection Service for Textiles and Small Waste Electrical and El.pdf (moderngov.co.uk)* *500:* *Low: Estimate by one major WMC (Waste contractor 2021) estimate*
RCV cage installation (£/vehicle)	N/A	180	N/A	*Proposal for an Enhanced Recycling Collection Service for Textiles and Small Waste Electrical and El.pdf (moderngov.co.uk)*
RCV cage size (m^3/cage)	0.29	0.18	0.07	*High: RCV cage specifications from one major RCV manufacturer* *Low: Specification document shared by one LA*
SMW bulk density (kg/m^3)	N/A	213.1	N/A	*https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx SMW bulk density by SEPA: 0.2131kg/L (EWC 20 01 35&36)*
RCV volume (m^3/vehicle)	22	21.5	21	*ICP2 – Online Tool Modelling Assumptions Technical AnnexTechnical report templates (wrap.org.uk) https://www.sepa.org.uk/media/163323/uk-conversion-factors-for-waste.xlsx*
RCV cage as % of RCV body volume	1.3%	0.81%	0.3%	

Cost of permits (excluded in the model)

	High	Medium	Low	Source
Securing permits to handle WEEE (£/permit)	9,000	8,000	4,000	*Inputs from waste management company. Higher costs for new permit, medium cost for existing permit with substantial variation, low cost for existing permit with normal variation. Variation refers to the level of change anticipated for site activity in terms of the amount of WEEE that would be handled by the site, and potential adaptations required for the site set-up.*

Vehicle maintenance and operation (July 2021 version)

Note: ICP3 cost assumptions were used in the 2022 update. Specific figures will be separately published by WRAP when finalised.

	Annual standing costs ICP2Average	Source
Diesel RCV annual standing costs (£ per vehicle per year)	5,277	*ICP2 – Online Tool Modelling Assumptions Technical Annex Technical report templates (wrap.org.uk)*

	High: Wales	Average	Low: ICP2	Source
Diesel RCV running costs (£ per vehicle per year)	10,861	10,488	10,115	*High: https://www.eunomia.co.uk/reports-tools/the-climate-change-impacts-of-recycling-services-in-wales/* *Low: ICP2 – Online Tool Modelling Assumptions Technical Annex*

Labour cost (July 2021 version)

Source: ICP2 – Online Tool Modelling Assumptions Technical Annex and WMC feedback

Note: ICP3 cost assumptions were used in the 2022 update. Specific figures will be separately published by WRAP when finalised.

	ICP2 values applicable to kerb sort			ICP2 values applicable to RCV			
	High	**Average**	**Low**	**High**	**Average**	**Low**	**Source**
Driver, £ per worker per year	30,816.00	28,967.04	27,118.08	Not applicable since not specific to SMW.			*Technical report templates(wrap.org.uk)*
Loader, £ per worker per year	26,349	24,768	23,187	26,349	24,768	23,187	*Technical report templates(wrap.org.uk)*
Supervision costs, %of total crew costs	9%	9%	9%	9%	9%	9%	*Technical report templates(wrap.org.uk)* *Note: this is not applicable in the ICP3 methodology*
Total staff cost, £ per year	91,030	85,568	80,107	57,441	53,994	50,548	

Note: July 2021 version (figures below) assumed 2 loaders for every vehicle, regardless of rurality. The 2022 update has since refined the staffing scenario, as detailed in Section 4.2.4

Kerbside sort	**High**	**Average**	**Low**
Driver (£ per worker per year)	30,816	28,967	27,118
Loader (£ per worker per year	26,349	24,768	23,187
Supervision costs (% of total crew costs)	9%	9%	9%
Total staff cost (£ per year)	91,030	85,568	80,107
RCV	**High**	**Average**	**Low**
Driver (£ per worker per year)	N/A	N/A	N/A
Loader (£ per worker per year	26,349	24,768	23,187
Supervision costs (% of total crew costs)	9%	9%	9%
Total staff cost (£ per year)	57,441	53,994	50,548

Communication costs

	High	Average	Low	Source
Communication costs (£ per hhd per year)	2.38	1.79	1.19	*Improving recycling through effective communications (zerowastescotland.org.uk)*

Fuel usage and costs derived from Climate Change Impacts of Recycling Services in Wales attributed to WEEE and batteries

Assumed operational fill level (RCV and kerbside sort vehicle): 80% based on feedback from one major WMC

RCV tonnage	26		
Kerbside sort tonnage	12		
Assumptions of RCV operation	**Urban**	**Rural**	**Source**
Miles per vehicle	13,780	19,500	*https://www.eunomia.co.uk/reports-tools/the-climate-change-impacts-of-recycling-services-in-wales/*
Miles per gallon	4	5	
Annual gallons of fuel used per vehicle	3,445	3,900	
Annual litres of fuel used per vehicle	13,041	14,763	
Assumed cost of diesel per litre (£, incl. VAT; 2019)	1.28	1.28	*https://www.eunomia.co.uk/reports-tools/ditching-diesel-analysis-electric-refuse-collection-vehicles/*
Annual fuel cost per vehicle **(£)**	16,692	18,897	*Derived from above*

Assumptions of kerbside sort vehicle operation	Urban	Rural	Source
Miles per vehicle	12,350	15,600	*https://www.eunomia.co.uk/reports-tools/the-climate-change-impacts-of-recycling-services-in-wales/*
Miles per gallon	4	5	
Annual gallons of fuel used per vehicle	1,544	1,733	
Annual litres of fuel used per vehicle	5,844	6,561	
Assumed cost of diesel per litre (£, incl. VAT; 2019)	1.28	1.28	*https://www.eunomia.co.uk/reports-tools/ditching-diesel-analysis-electric-refuse-collection-vehicles/*
Annual fuel cost per vehicle **(£)**	7,480	8,399	

Assumptions of separate pass vehicle operation (data for food used as proxy)	Urban	Rural	Source
Households served	439,662	506,349	*The Climate Change Impacts of Recycling Services in Wales – Eunomia*
Pass rate (round size)	2,424	1,471	
Miles per vehicle	17,604	24,911	

Miles per vehicle per round (assuming 261 working days/year)	67	95	
Miles/household served	0.03	0.06	

Additional load on kerbside sort vehicle	**High (80% full, capacity = av. vol of 5.0m and 3.5m models)**	**Average**	**Low (empty)**
Additional weight from cage and WEEE (kg)	149	75	0
Additional weight from batteries (55L of available space), separate from WEEE load (kg)	199	99	0

Additional fuels – kerbside sort vehicle	**Urban**	**Mixed Urban/Rural**	**Rural**
Fuel costs due to SMW alone (£/year/vehicle)	19	21	22
Additional fuels due to SMW (L/year/vehicle)	15	16	17
Fuel costs due to SMW+batteries (55L) (£/year/vehicle)	26	28	29
Additional fuel due to SMW+batteries (L/year/vehicle)	20	22	23

Additional load on RCV	**High (80% full)**	**Average**	**Low (empty)**
Additional weight from cage and WEEE (kg)	62	45	28
Additional weight from 55L container and batteries, separate from WEEE load (kg)	61	31	1.5

Additional fuels - RCV	**Urban**	**Mixed Urban/Rural**	**Rural**
Fuel costs due to SMW alone (£/year/vehicle)	12	12.5	13
Additional fuels due to SMW (L/year/vehicle)	9	9.5	10
Fuel costs due to batteries alone(£/year/vehicle)	8	8.5	9
Additional fuels due to batteries(L/year/vehicle)	6	6.5	7
Fuel costs due to SMW+batteries (£/year/vehicle)	20	21.5	23
Additional fuel due to SMW+batteries (L/year/vehicle)	15	16	17

Table 37

RCV (with WEEE cage and load)	**High (full cage)**	**Average**	**Low (empty cage)**
Assumed additional weight (kg)	70.22	48.91	27.6

Table 38

	Urban high	Rural high	Urban average	Rural average	Urban low	Rural low	Source
Miles per vehicle	13,780	19,500	13,780	19,500	13,780	19,500	*A fuel economy improvement of 0.33% per 1% reduction in weight as estimated by Ricardo Inc.*
Miles per gallon	3.9964	4.9955	3.9975	4.9969	3.9986	4.9982	*EPA: Fuel Economy*
Annual gallons of fuel used per vehicle	3,448	3,903	3,447	3,902	3,446	3,901	*Impact of Vehicle Weight Reduction on Fuel Economy, Ricardo*
Annual litres of fuel used per vehicle	13,052	14,776	13,049	14,772	13,045	14,768	
Assumed cost of diesel per litre (£, incl. VAT; Eunomia eRCV report 2019 data)	1.28	1.28	1.28	1.28	1.28	1.28	
Annual fuel cost per vehicle (£)	16,707	18,914	16,703	18,909	16,698	18,903	
Fuel costs due to SMW (£/year/vehicle)	14.89	16.86	10.37	11.74	5.85	6.62	
Additional fuel due to SMW (L/year/vehicle)	11.63	13.17	8.10	9.17	4.57	5.17	

Table 39

Kerbsort	Urban	Rural
Miles per vehicle	12,350	15,600
Miles per gallon	8	9
Annual gallons of fuel used per vehicle	1,544	1,733
Annual litres of fuel used per vehicle	5,844	6,561
Assumed cost of diesel per litre (£, incl. VAT; *Eunomia eRCV report 2019 data*)	1.28	1.28
Annual fuel cost per vehicle	7,480	8,399

Table 40

	High (average of full large and small compartment)	Medium (average of half full large and small compartment)	Low (empty compartment)
Assumed additional weight (kg)	219	109.5	0

Table 41

	Urban high	Rural high	Urban average	Rural average	Urban low	Rural low
Miles per vehicle	12,350	15,600	12,350	15,600	12,350	15,600
Miles per gallon	7.9518	8.9458	7.9759	8.9729	8.0000	9.0000
Annual gallons of fuel used per vehicle	1,553	1,744	1,548	1,739	1,544	1,733
Annual litres of fuel used per vehicle	5,879	6,601	5,861	6,581	5,844	6,561
Assumed cost of diesel per litre (£, incl. VAT; Eunomia eRCV report 2019 data)	1.28	1.28	1.28	1.28	1.28	1.28
Annual fuel cost per vehicle	7,525	8,449	7,503	8,424	7,480	8,399
Fuel costs due to SMW (£/year)	45.32	50.89	22.59	25.37	0.00	0.00
Additional fuel due to SMW (L/year/vehicle)	35.41	39.76	17.65	19.82	0.00	0.00

Allocation of kerbside sort vehicle costs based on weight/volume capacity available for WEEE Romaquip capital cost allocation by specs

Source: https://static1.squarespace.com/static/58cfeacce4fcb507621d9574/t/5ab51f05f950b7039c7756aa/1521819399036/5standard.pdf 5.0m standard roof PowerPoint Presentation (squarespace.com)

Table 42

Model: 5.0m standard roof	**Volume (m^3)**	**Weight (Kg)**
Additional compartment (e.g. WEEE)	1.5	375
Total	37.2	6,813
Additional %	4%	5.50%

Source: https://static1.squarespace.com/static/58cfeacce4fcb507621d9574/t/5ab51e5c758d46d6fb54e1ae/1521819249459/35standard.pdf 3.5m standard roof PowerPoint Presentation (squarespace.com)

Table 43

Model: 3.5m standard roof	**Volume (m^3)**	**Weight (Kg)**
Additional compartment (e.g. WEEE)	0.25	63
Total	18.3	3,142
Additional %	1.40%	2%

6.7 Overview of rurality and deprivation categorisation for the UK

Please note that the following are the original results from the July 2021 version of this study. ICP3 categorisation of LA rurality and deprivation will be published by WRAP. The latest number of household on DMR as well as their frequency and set-up is maintained by WRAP.

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Stockton-on-Tees Borough Council	3	82,955	Fortnightly	Multi-stream
Redcar and Cleveland Borough Council	5	61,549	Fortnightly	Two-stream
Middlesbrough Council	1	60,510	Fortnightly	Co-mingled
Hartlepool Borough Council	4	42,300	Fortnightly	Co-mingled
Darlington Borough Council	3	51,054	Fortnightly	Multi-stream
Sunderland City Metropolitan Borough Council	1	124,770	Fortnightly	Two-stream
South Tyneside Council	1	71,780	Fortnightly	Two-stream
North Tyneside Metropolitan Borough Council	3	89,000	Fortnightly	Two-stream
Newcastle upon Tyne City Council	3	128,000	Fortnightly	Two-stream
Gateshead Council	3	86,135	Fortnightly	Two-stream
Warrington Borough Council	4	91,770	Fortnightly	Co-mingled
Halton Borough Council	3	50,572	Fortnightly	Co-mingled
South Lakeland District Council	6	50,000	Fortnightly	Multi-stream
Eden District Council	5	26,000	Fortnightly	Multi-stream
Copeland Borough Council	5	30,191	Fortnightly	Multi-stream
Carlisle City Council	3	52,443	Fortnightly	Multi-stream
Barrow-in-Furness Borough Council	3	33,000	Fortnightly	Two-stream
Allerdale Borough Council	5	38,000	Fortnightly	Two-stream
Wigan Metropolitan Borough Council	3	148,150	3-Weekly	Co-mingled
Trafford Metropolitan Borough Council	2	97,090	4-Weekly	Two-stream
Tameside Metropolitan Borough Council	1	103,259	Fortnightly	Two-stream
Stockport Metropolitan Borough Council	3	127,960	Fortnightly	Two-stream
Salford City Council	1	116,440	Fortnightly	Two-stream
Rochdale Metropolitan Borough Council	3	94,263	3-Weekly	Two-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Oldham Metropolitan Borough Council	3	96,670	3-Weekly	Two-stream
Manchester City Council	1	228,300	Fortnightly	Two-stream
Bury Metropolitan Borough Council	3	82,000	3-Weekly	Two-stream
Bolton Metropolitan Borough Council	3	123,210	Fortnightly	Two-stream
Wyre Borough Council	4	50,884	Fortnightly	Two-stream + Textiles
West Lancashire District Council	5	47,570	Fortnightly	Two-stream
South Ribble Borough Council	4	48,810	Fortnightly	Two-stream + Textiles
Rossendale Borough Council	3	31,200	Fortnightly	Two-stream
Ribble Valley Borough Council	6	25,879	Fortnightly	Two-stream
Preston City Council	3	64,161	Fortnightly	Two-stream
Pendle Borough Council	3	39,908	4-Weekly	Two-stream
Lancaster City Council	3	63,290	Fortnightly	Two-stream + Textiles
Hyndburn Borough Council	3	37,000	4-Weekly	Multi-stream
Fylde Borough Council	6	38,530	Fortnightly	Two-stream + Textiles
Chorley Borough Council	5	49,335	Fortnightly	Two-stream
Burnley Borough Council	3	40,590	Fortnightly	Two-stream + textiles
Blackpool Borough Council	1	70,490	Fortnightly	Two-stream + textiles
Blackburn with Darwen Borough Council	3	63,261	Fortnightly	Co-mingled
Wirral Metropolitan Borough Council	3	148,215	Fortnightly	Co-mingled
St Helens Metropolitan Borough Council	3	80,200	Weekly	Multi-stream
Sefton Metropolitan Borough Council	3	127,190	Fortnightly	Co-mingled
Liverpool City Council	1	214,938	Weekly	Co-mingled
Knowsley Metropolitan Borough Council	1	62,000	Fortnightly	Co-mingled
East Riding of Yorkshire Council	5	154,411	Fortnightly	Co-mingled
Kingston upon Hull City Council	1	119,600	Fortnightly	Co-mingled
North East Lincolnshire Council	1	73,963	Fortnightly	Multi-stream
North Lincolnshire Council	5	75,708	Fortnightly	Multi-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
York City Council	4	82,070	Fortnightly	Multi-stream
Selby District Council	6	37,070	Fortnightly	Multi-stream
Scarborough Borough Council	5	56,000	Fortnightly	Co-mingled
Ryedale District Council	5	24,560	Fortnightly	Multi-stream
Richmondshire District Council	6	22,720	Fortnightly	Multi-stream
Harrogate Borough Council	6	70,310	Fortnightly	Multi-stream
Hambleton District Council	6	42,133	Fortnightly	Two-stream
Craven District Council	6	27,506	Fortnightly	Co-mingled
Sheffield City Council	3	247,925	4-Weekly	Two-stream
Rotherham Metropolitan Borough Council	5	117,526	Fortnightly	Two-stream
Doncaster Metropolitan Borough Council	3	132,000	Fortnightly	Two-stream + Textiles
Barnsley Metropolitan Borough Council	3	114,000	Fortnightly	Two-stream
Leeds City Council	3	328,000	Fortnightly	Co-mingled
Kirklees Metropolitan Council	3	188,800	Fortnightly	Co-mingled
Wakefield City Council	3	153,614	Fortnightly	Co-mingled
Bradford Metropolitan District Council	3	220,000	Fortnightly	Co-mingled
Calderdale Metropolitan Borough Council	3	96,000	Weekly	Multi-stream
Derby City Council	1	100,446	Fortnightly	Co-mingled
South Derbyshire District Council	6	41,000	Fortnightly	Two-stream + textiles
North East Derbyshire District Council	5	46,200	Fortnightly	Two-stream + Textiles
High Peak Borough Council	5	42,240	Fortnightly	Co-mingled + Textiles
Erewash Borough Council	4	50,400	Fortnightly	Co-mingled
Derbyshire Dales District Council	6	33,580	Fortnightly	Two-stream
Chesterfield Borough Council	3	48,918	Fortnightly	Two-stream
Bolsover District Council	5	36,850	Fortnightly	Two-stream + Textiles
Amber Valley Borough Council	5	54,976	Fortnightly	Two-stream
Rutland County Council	6	16,500	Fortnightly	Co-mingled
Leicester City Council	1	137,014	Weekly	Co-mingled

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Oadby and Wigston Borough Council	2	22,790	Weekly	Co-mingled
North West Leicestershire District Council	5	46,500	Fortnightly	Multi-stream
Melton Borough Council	6	22,300	Fortnightly	Co-mingled
Hinckley and Bosworth Borough Council	4	50,583	Fortnightly	Co-mingled + Textiles
Harborough District Council	6	36,000	Fortnightly	Co-mingled
Charnwood Borough Council	4	68,000	Fortnightly	Co-mingled
Blaby District Council	4	39,410	Fortnightly	Co-mingled
West Lindsey District Council	5	41,300	Fortnightly	Co-mingled
South Kesteven District Council	6	65,000	Fortnightly	Co-mingled
South Holland District Council	5	37,923	Weekly	Co-mingled
North Kesteven District Council	6	46,568	Fortnightly	Co-mingled
Lincoln City Council	1	45,220	Fortnightly	Co-mingled
East Lindsey District Council	5	68,060	Fortnightly	Co-mingled
Boston Borough Council	5	28,700	Fortnightly	Co-mingled
Wellingborough Borough Council	5	34,000	Fortnightly	Co-mingled + Textiles
South Northamptonshire Council	2	39,865	Fortnightly	Co-mingled
Northampton Borough Council	2	99,873	Weekly	Multi-stream
Kettering Borough Council	4	44,670	Fortnightly	Two-stream
East Northamptonshire District Council	6	43,000	Fortnightly	Co-mingled
Daventry District Council	6	37,024	Fortnightly	Co-mingled
Corby Borough Council	3	27,147	Fortnightly	Co-mingled
Rushcliffe Borough Council	6	48,640	Fortnightly	Co-mingled
Nottingham City Council	1	131,000	Fortnightly	Two-stream
Newark and Sherwood District Council	5	53,330	Fortnightly	Co-mingled
Mansfield District Council	3	46,000	Fortnightly	Co-mingled
Gedling Borough Council	4	51,980	Fortnightly	Two-stream
Broxtowe Borough Council	4	50,169	Fortnightly	Two-stream + Textiles
Bassetlaw District Council	5	49,647	Fortnightly	Co-mingled
Ashfield District Council	1	55,415	Fortnightly	Two-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Wyre Forest District Council	5	46,206	Fortnightly	Co-mingled
Wychavon District Council	6	52,300	Fortnightly	Co-mingled
Worcester City Council	2	45,742	Fortnightly	Co-mingled
Redditch Borough Council	3	36,649	Fortnightly	Co-mingled
Malvern Hills District Council	6	34,450	Fortnightly	Co-mingled
Herefordshire Council	5	85,183	Fortnightly	Co-mingled
Bromsgrove District Council	4	41,461	Fortnightly	Co-mingled
Telford and Wrekin Borough Council	3	76,569	Fortnightly	Two-stream + Textiles
Stoke on Trent City Council	1	115,912	Fortnightly	Two-stream
Tamworth Borough Council	2	32,368	Fortnightly	Co-mingled
Staffordshire Moorlands District Council	6	44,340	Fortnightly	Co-mingled + Textiles
Stafford Borough Council	6	56,850	Fortnightly	Two-stream + Textiles
South Staffordshire District Council	6	46,760	Fortnightly	Co-mingled
Newcastle-under-Lyme Borough Council	3	56,000	Weekly	Multi-stream
Lichfield District Council	6	44,998	Fortnightly	Co-mingled
East Staffordshire Borough Council	5	49,991	Fortnightly	Two-stream
Cannock Chase District Council	5	44,653	Fortnightly	Co-mingled
Warwick District Council	4	62,858	Fortnightly	Two-stream
Stratford-on-Avon District Council	6	56,350	Fortnightly	Co-mingled
Rugby Borough Council	4	43,850	Fortnightly	Co-mingled
Nuneaton and Bedworth Borough Council	3	54,105	Fortnightly	Two-stream + Textiles
North Warwickshire Borough Council	5	28,195	Fortnightly	Co-mingled
Wolverhampton City Council	1	104,000	Fortnightly	Co-mingled
Walsall Metropolitan Borough Council	1	110,140	Fortnightly	Co-mingled
Solihull Metropolitan Borough Council	4	91,160	Fortnightly	Two-stream + Textiles
Sandwell Metropolitan Borough Council	1	131,820	Weekly	Co-mingled
Dudley Metropolitan District Council	2	136,600	Fortnightly	Multi-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Coventry City Council	1	133,000	Fortnightly	Co-mingled
Birmingham City Council	1	390,000	Fortnightly	Two-stream
Luton Borough Council	1	147,659	Fortnightly	Co-mingled + Textiles
South Cambridgeshire District Council	6	62,970	Fortnightly	Co-mingled
Peterborough City Council	3	84,842	Fortnightly	Co-mingled
Huntingdonshire District Council	6	77,400	Fortnightly	Co-mingled
Fenland District Council	5	45,500	Fortnightly	Co-mingled
East Cambridge District Council	6	37,040	Fortnightly	Co-mingled
Cambridge City Council	2	48,431	Fortnightly	Co-mingled
Thurrock Borough Council	3	63,899	Weekly	Co-mingled
Southend-on-Sea Borough Council	2	80,680	Weekly	Two-stream + Textiles
Uttlesford District Council	6	36,000	Fortnightly	Co-mingled
Tendring District Council	5	71,000	Fortnightly	Two-stream
Rochford District Council	4	36,104	Fortnightly	Co-mingled
Maldon District Council	6	27,170	Fortnightly	Two-stream
Harlow District Council	2	38,363	Fortnightly	Co-mingled
Epping Forest District Council	5	54,200	Fortnightly	Two-stream + Textiles
Colchester Borough Council	5	82,695	Fortnightly	Multi-stream
Chelmsford City Council	4	65,000	Fortnightly	Multi-stream
Castle Point Borough Council	2	38,430	Fortnightly	Two-stream + Textiles
Brentwood Borough Council	1	29,720	Weekly	Two-stream
Braintree District Council	5	64,943	Fortnightly	Co-mingled
Basildon District Council	2	77,685	Weekly	Two-stream + Textiles
Welwyn Hatfield District Council	4	46,800	Fortnightly	Two-stream
Watford Borough Council	2	41,600	Weekly	Co-mingled
Three Rivers District Council	4	37,670	Weekly	Co-mingled
Stevenage Borough Council	2	36,490	Fortnightly	Multi-stream
St Albans City and District Council	4	56,326	Fortnightly	Two-stream + Textiles

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
North Hertfordshire District Council	4	56,150	Fortnightly	Two-stream + Textiles
Hertsmere Borough Council	6	45,700	Fortnightly	Two-stream
East Hertfordshire District Council	4	56,850	Fortnightly	Two-stream
Dacorum Borough Council	6	66,000	Fortnightly	Co-mingled
Broxbourne Borough Council	4	32,409	Fortnightly	Multi-stream
South Norfolk District Council	6	59,150	Fortnightly	Co-mingled
Norwich City Council	1	59,060	Fortnightly	Two-stream
North Norfolk District Council	5	55,040	Fortnightly	Co-mingled
Kings Lynn and West Norfolk Borough Council	5	70,125	Fortnightly	Co-mingled
Great Yarmouth Borough Council	3	47,380	Fortnightly	Co-mingled
Broadland District Council	6	54,893	Fortnightly	Co-mingled
Breckland District Council	5	61,310	Fortnightly	Co-mingled
Waveney District Council	5	55,990	Fortnightly	Co-mingled
Suffolk Coastal District Council	6	60,240	Fortnightly	Co-mingled
St Edmundsbury Borough Council	6	48,170	Fortnightly	Co-mingled
Mid Suffolk District Council	6	44,610	Fortnightly	Co-mingled
Ipswich Borough Council	2	60,750	Fortnightly	Co-mingled
Forest Heath District Council	6	29,470	Fortnightly	Co-mingled
Babergh District Council	6	38,970	Fortnightly	Co-mingled
Bexley London Borough Council	2	96,430	Weekly	Multi-stream
Tower Hamlets London Borough Council	1	128,610	Weekly	Co-mingled
Corporation of London	2	7,200	MoreThanWeekly	Co-mingled
Westminster City Council	1	124,400	Weekly	Co-mingled
Redbridge London Borough Council	2	101,053	Weekly	Two-stream
Newham London Borough Council	1	112,560	Fortnightly	Co-mingled
Havering London Borough Council	2	104,637	Weekly	Co-mingled
Barking and Dagenham London Borough Council	1	77,136	Fortnightly	Co-mingled
Waltham Forest London Borough Council	1	94,080	Weekly	Co-mingled

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Islington London Borough Council	1	95,500	Weekly	Co-mingled
Haringey London Borough Council	1	102,000	Weekly	Co-mingled
Hackney London Borough Council	1	119,383	Weekly	Co-mingled
Enfield London Borough Council	1	120,000	Weekly	Co-mingled
Camden London Borough Council	1	104,428	Weekly	Co-mingled + Textiles
Barnet London Borough Council	2	148,000	Weekly	Co-mingled
Southwark London Borough Council	1	134,420	Fortnightly	Co-mingled
Lewisham London Borough Council	1	203,252	Weekly	Co-mingled
Greenwich London Borough Council	1	119,675	Weekly	Co-mingled
Sutton London Borough Council	2	80,370	Fortnightly	Two-stream + Textiles
Merton London Borough Council	2	80,000	Fortnightly	Two-stream + Textiles
Royal Borough of Kingston upon Thames	2	63,874	Fortnightly	Two-stream + Textiles
Croydon London Borough Council	2	154,864	Fortnightly	Two-stream + Textiles
Bromley London Borough Council	2	139,187	Fortnightly	Two-stream
Richmond upon Thames London Borough Council	2	82,000	Weekly	Two-stream
Hounslow London Borough Council	2	92,000	Weekly	Multi-stream
Hillingdon London Borough Council	3	100,000	Weekly	Co-mingled + textiles
Harrow London Borough Council	2	86,905	Fortnightly	Co-mingled
Ealing London Borough Council	1	130,385	Fortnightly	Co-mingled + Textiles
Brent London Borough Council	1	114,420	Fortnightly	Co-mingled + Textiles
Wandsworth London Borough Council	2	146,293	Weekly	Co-mingled
Lambeth London Borough Council	1	134,000	Weekly	Co-mingled
Royal Borough of Kensington and Chelsea	2	88,588	MoreThanWeekly	Co-mingled
Hammersmith and Fulham London Borough Council	1	90,579	Weekly	Co-mingled
Wokingham Council	4	70,020	Weekly	Co-mingled

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Windsor and Maidenhead Borough Council	4	61,054	Weekly	Co-mingled
Slough Borough Council	2	53,000	Weekly	Co-mingled
Reading Borough Council	2	66,681	Fortnightly	Co-mingled
West Berkshire Council	6	66,973	Fortnightly	Multi-stream
Bracknell Forest Borough Council	4	48,800	Fortnightly	Co-mingled
Milton Keynes Council	4	115,222	Weekly	Two-stream
Wycombe District Council	6	69,246	Fortnightly	Two-stream + Textiles
South Bucks District Council	6	29,030	Fortnightly	Two-stream + Textiles
Chiltern District Council	6	39,829	Fortnightly	Two-stream + Textiles
Aylesbury Vale District Council	6	80,200	Fortnightly	Co-mingled
Brighton and Hove City Council	1	125,570	Fortnightly	Two-stream
Wealden District Council	6	70,000	Fortnightly	Co-mingled
Rother District Council	5	44,000	Fortnightly	Two-stream
Lewes District Council	5	46,576	Fortnightly	Co-mingled
Hastings Borough Council	1	43,606	Fortnightly	Two-stream
Eastbourne Borough Council	2	48,200	Fortnightly	Co-mingled
Southampton City Council	1	101,320	Fortnightly	Two-stream
Portsmouth City Council	1	90,604	Weekly	Co-mingled
Winchester City Council	6	51,500	Fortnightly	Two-stream
Test Valley Borough Council	6	55,687	Fortnightly	Co-mingled
Rushmoor Borough Council	2	40,050	Fortnightly	Two-stream
New Forest District Council	6	79,203	Weekly	Two-stream
Havant Borough Council	3	51,245	Fortnightly	Co-mingled
Hart District Council	4	36,467	Fortnightly	Two-stream
Gosport Borough Council	2	37,200	Fortnightly	Co-mingled
Fareham Borough Council	4	50,823	Fortnightly	Co-mingled
Eastleigh Borough Council	4	53,570	Fortnightly	Two-stream
East Hampshire District Council	6	52,000	Fortnightly	Two-stream
Basingstoke and Deane Borough Council	4	73,028	Fortnightly	Two-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Isle of Wight Council	5	70,700	Fortnightly	Two-stream + Textiles
Tunbridge Wells Borough Council	6	47,889	Fortnightly	Multi-stream
Tonbridge and Malling Borough Council	6	54,905	Fortnightly	Two-stream + Textiles
Thanet District Council	3	63,000	Fortnightly	Two-stream
Swale Borough Council	5	63,323	Fortnightly	Co-mingled + Textiles
Folkestone and Hythe District Council	5	42,000	Fortnightly	Two-stream
Sevenoaks District Council	6	49,830	Weekly	Co-mingled
Medway Council	3	114,850	Weekly	Co-mingled
Maidstone Borough Council	4	73,138	Fortnightly	Co-mingled + Textiles
Gravesham Borough Council	3	43,624	Fortnightly	Co-mingled
Dover District Council	5	48,000	Fortnightly	Two-stream
Dartford Borough Council	4	41,700	Fortnightly	Two-stream
Canterbury City Council	4	67,350	Fortnightly	Two-stream
Ashford Borough Council	5	52,200	Fortnightly	Co-mingled
West Oxfordshire District Council	2	47,600	Fortnightly	Multi-stream
Vale of White Horse District Council	6	58,530	Fortnightly	Co-mingled
South Oxfordshire District Council	6	62,317	Fortnightly	Co-mingled
Oxford City Council	2	60,750	Fortnightly	Co-mingled
Cherwell District Council	6	64,149	Fortnightly	Co-mingled
Woking Borough Council	4	42,751	Fortnightly	Co-mingled + Textiles
Waverley Borough Council	6	52,740	Fortnightly	Co-mingled
Tandridge District Council	6	35,705	Fortnightly	Co-mingled + Textiles
Surrey Heath Borough Council	4	35,270	Fortnightly	Co-mingled + textiles
Spelthorne Borough Council	2	41,000	Fortnightly	Co-mingled + Textiles
Runnymede Borough Council	4	35,424	Fortnightly	Co-mingled + Textiles
Reigate and Banstead Borough Council	4	60,000	Weekly	Two-stream
Mole Valley District Council	6	37,071	Fortnightly	Co-mingled + textiles

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Guildford Borough Council	4	57,256	Fortnightly	Co-mingled + Textiles
Epsom and Ewell Borough Council	4	32,328	Weekly	Two-stream + Textiles
Elmbridge Borough Council	4	53,915	Fortnightly	Co-mingled
Worthing Borough Council	2	49,000	Fortnightly	Co-mingled
Mid Sussex District Council	6	64,035	Fortnightly	Co-mingled
Horsham District Council	6	55,632	Fortnightly	Co-mingled
Crawley Borough Council	2	45,855	Fortnightly	Co-mingled + Textiles
Chichester District Council	6	57,258	Fortnightly	Co-mingled
Arun District Council	4	71,600	Fortnightly	Co-mingled
Adur District Council	2	29,000	Fortnightly	Co-mingled
Council of the Isles of Scilly	5	-	Weekly	Co-mingled
Bath and North East Somerset Council	6	82,320	Weekly	Two-stream
Bristol City Council	1	191,707	Weekly	Multi-stream
West Devon Borough Council	5	25,881	Weekly	Multi-stream
Torridge District Council	5	30,733	Weekly	Multi-stream
Torbay Council	3	67,210	Weekly	Two-stream
Teignbridge District Council	5	62,040	Weekly	Multi-stream
South Hams District Council	5	44,792	Fortnightly	Two-stream
Plymouth City Council	1	115,744	Fortnightly	Co-mingled
North Devon District Council	5	46,000	Weekly	Multi-stream
Mid Devon District Council	5	34,940	Fortnightly	Two-stream + Textiles
Exeter City Council	3	55,930	Fortnightly	Co-mingled
East Devon District Council	5	65,000	Weekly	Two-stream
Poole Borough Council	4	68,420	Fortnightly	Co-mingled
Bournemouth Borough Council	2	84,479	Fortnightly	Co-mingled
Weymouth and Portland Borough Council	3	31,020	Fortnightly	Two-stream
West Dorset District Council	5	49,260	Fortnightly	Two-stream
Purbeck District Council	5	22,040	Fortnightly	Two-stream
North Dorset District Council	5	30,860	Fortnightly	Two-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
East Dorset District Council	6	39,160	Fortnightly	Two-stream
Christchurch Borough Council	2	23,380	Fortnightly	Two-stream
Tewkesbury Borough Council	6	36,000	Fortnightly	Co-mingled
Stroud District Council	6	53,178	Fortnightly	Two-stream
Gloucester City Council	2	54,800	Weekly	Two-stream
Forest of Dean District Council	5	38,270	Weekly	Multi-stream
Cotswold District Council	6	43,457	Fortnightly	Multi-stream
Cheltenham Borough Council	2	51,000	Fortnightly	Multi-stream
North Somerset Council	5	90,677	Weekly	Two-stream
West Somerset District Council	5	17,910	Weekly	Two-stream
Taunton Deane Borough Council	5	52,370	Fortnightly	Multi-stream
South Somerset District Council	5	75,870	Weekly	Two-stream
Sedgemoor District Council	5	53,880	Weekly	Two-stream
Mendip District Council	5	50,800	Weekly	Two-stream
South Gloucestershire Council	4	118,754	Weekly	Multi-stream
Swindon Borough Council	4	90,700	Fortnightly	Multi-stream
Isle of Anglesey County Council	6	33,600	Weekly	Multi-stream
Conwy County Borough Council	4	5,500	Weekly	Multi-stream
Flintshire County Council	4	69,500	Weekly	Multi-stream
Denbighshire County Council	5	44,963	Fortnightly	Co-mingled
Gwynedd County Council	6	61,762	Weekly	Multi-stream
Wrexham County Borough Council	3	62,450	Weekly	Multi-stream
Powys County Council	6	67,000	Weekly	Multi-stream
Ceredigion County Council	6	35,600	Weekly	Two-stream
Pembrokeshire County Council	6	65,613	Weekly	Multi-stream
Carmarthenshire County Council	6	88,262	Fortnightly	Co-mingled
Neath Port Talbot County Borough Council	3	65,000	Weekly	Multi-stream
Swansea City and County Council	3	112,334	Fortnightly	Multi-stream
Merthyr Tydfil County Borough Council	3	28,569	Weekly	Multi-stream
Blaenau Gwent County Borough Council	3	30,968	Weekly	Multi-stream

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Monmouthshire County Council	6	42,487	Weekly	Multi-stream
Torfaen County Borough Council	4	40,860	Weekly	Two-stream
Caerphilly County Borough Council	3	77,980	Weekly	Co-mingled
Rhondda Cynon Taf County Borough Council	3	105,301	Weekly	Two-stream
Bridgend County Borough Council	3	64,029	Weekly	Multi-stream
Newport City Council	3	70,120	Weekly	Multi-stream
Cardiff County Council	1	170,008	Weekly	Co-mingled
Vale of Glamorgan Council	4	55,861	Weekly	Co-mingled
Shetland Isles Council	6	11,173	4-Weekly	Two-stream
Orkney Islands Council	6	3,000	Fortnightly	Multi-stream
Western Isles Council (Eilean Siar)	6	12,452	4-Weekly	Two-stream
Highland Council	6	110,000	Fortnightly	Co-mingled
Moray Council	6	43,074	Fortnightly	Multi-stream
Aberdeenshire Council	6	119,090	Fortnightly	Co-mingled
Aberdeen City Council	2	81,600	Fortnightly	Co-mingled
Angus Council	4	56,597	Fortnightly	Co-mingled
Perth and Kinross Council	6	69,399	Fortnightly	Co-mingled
Argyll and Bute Council	6	47,878	Fortnightly	Two-stream
Stirling Council	6	39,377	Fortnightly	Multi-stream
Dundee City Council	1	75,371	MoreThanWeekly	Two-stream
Fife Council	3	169,700	4-Weekly	Two-stream
Clackmannanshire Council	3	24,456	Fortnightly	Co-mingled
Falkirk Council	3	76,659	Fortnightly	Multi-stream
East Dunbartonshire Council	4	44,760	Fortnightly	Two-stream
West Dunbartonshire Council	1	42,868	Fortnightly	Co-mingled
Inverclyde Council	3	32,096	Fortnightly	Co-mingled
North Lanarkshire Council	3	145,000	3-Weekly	Two-stream
Glasgow City Council	1	298,000	Fortnightly	Two-stream
West Lothian Council	3	79,389	Fortnightly	Co-mingled
Edinburgh City Council	2	253,538	Fortnightly	Two-stream + Textiles

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Midlothian Council	3	40,204	Fortnightly	Two-stream
East Lothian Council	4	48,848	Fortnightly	Two-stream
Renfrewshire Council	3	87,802	Fortnightly	Two-stream
North Ayrshire Council	3	68,291	3-Weekly	Two-stream
East Ayrshire Council	3	58,000	Weekly	Multi-stream
East Renfrewshire Council	4	38,324	3-Weekly	Two-stream
South Lanarkshire Council	3	149,000	Fortnightly	Two-stream
Scottish Borders Council	6	57,000	Fortnightly	Co-mingled
South Ayrshire Council	3	54,632	Fortnightly	Multi-stream
Dumfries and Galloway Council	5	14,829	Fortnightly	Multi-stream
Antrim and Newtownabbey District Council	4	56,500	Fortnightly	Co-mingled
North Down and Ards District Council	4	68,228	Fortnightly	Two-stream
Belfast City	1	155,000	Fortnightly	Co-mingled
Lisburn City and Castlereagh District Council	3	58,170	Fortnightly	Co-mingled
Mid and East Antrim District Council	6	55,167	Weekly	Two-stream
Newry City, Mourne and Down District Council	6	68,614	Fortnightly	Co-mingled
Armagh City, Banbridge and Craigavon District Council	6	79,958	Weekly	Two-stream
Causeway Coast and Glens District Council	6	58,750	Fortnightly	Co-mingled
Derry City and Strabane District Council	3	53,467	Fortnightly	Co-mingled + Textiles
Fermanagh and Omagh District Council	5	48,709	Fortnightly	Co-mingled
Mid-Ulster District Council	5	55,000	Fortnightly	Co-mingled
Durham County Council	5	236,470	Fortnightly	Two-stream
Northumberland Council	5	148,000	Fortnightly	Co-mingled
Cheshire East Council	5	174,070	Fortnightly	Co-mingled
Cheshire West and Chester Council	4	150,790	Weekly	Multi-stream
Shropshire Council	5	142,180	Fortnightly	Two-stream
Central Bedfordshire Council	4	122,566	Fortnightly	Two-stream + Textiles
Bedford Council	4	74,010	Fortnightly	Co-mingled

Area Name	LA category by rurality and deprivation	No. of hhd on DMR scheme	Frequency of DMR collection	DMR set-up for majority of households
Cornwall Council	5	273,510	Fortnightly	Multi-stream
Wiltshire Council	6	217,350	Fortnightly	Two-stream
Cambridge and South Cambs District Council	6	120,184	Fortnightly	Co-mingled
Somerset Waste Partnership	5	256,010	Weekly	Two-stream

Material Focus is an independent, not-for-profit organisation on a mission to save valuable, critical and finite materials inside electricals from going to waste. We do this through

Insights

We identify, produce and share insights to improve the UK e-waste system and inform policy decisions.

Investments

We identify and fund projects that make it easier to reuse and recycle; or that encourage circular design.

Inspiration

We inspire, educate and encourage the UK public to fix, donate, sell and recycle their unwanted electricals through our Recycle Your Electricals campaign.

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