Appendix 2

FRITH RESOURCE MANAGEMENT

North London Joint Waste Strategy
Options Appraisal Report

17th April 2024

Acknowledgements:

Frith Resource Management would like to thank the essential contributions from waste management officers at each the north London Boroughs (Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest) and North London Waste Authority.

Disclaimer:

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Executive Summary

Frith Resource Management (FRM) has been engaged by North London Waste Authority (NLWA) to support in the preparation of a new Joint Waste Strategy. A Municipal Waste Management Strategy requires an Options Appraisal to prioritise between alternative collection options for the purposes of service delivery, procurement and planning.

This report provides an overview of the options appraisal undertaken by FRM for NLWA and the 7 north London boroughs (Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest), hereafter referred to as 'north London' or 'NLWA and its constituent boroughs'. This document is intended to help prioritise areas of development for waste prevention, reuse and repair and also between alternative collection options for the kerbside collection of recycling and waste.

In line with the waste hierarchy, waste prevention is the most effective way in which north London can manage waste, as this aims to reduce the amount of waste generated at source. In recognition of this, NLWA developed the North London Waste Prevention Plan which outlines their approach to reducing waste, and have also held an annual conference, 'The Waste Prevention Exchange'.

A programme of waste prevention work should be maintained throughout the life of this Joint Waste Strategy, and the initiatives assessed and reviewed as to their effectiveness and in the light of their impacts.

Various methods of reuse have been explored within this appraisal, which will each suit different contexts. The impacts of the different approaches have been calculated, for example, initiatives introduced at RRCs alone have the potential to yield between 0.11kg and 0.42kg per visitor per year. Case studies have also been developed across various initiatives to supplement available data, to illustrate good practice and provide real examples of effective reuse and repair services.

Once items are already in circulation, the useful life of such products can be prolonged through reuse and repair, which can enhance resource efficiency and improve the security of critical material supply. There are already many initiatives in place within north London for residents to engage with, however there is scope to increase the coverage of these, provide a wider range of opportunities and continue to raise awareness amongst all residents.

The Joint Waste Strategy should continue to promote and deliver waste prevention activities, as well as highlighting reuse and repair, building on the case studies and good practice examined within this document.

The next most beneficial waste management method following waste prevention and reuse, as outlined within the waste hierarchy, is recycling. In exploring potential impacts this could have, three alternative recycling options were agreed with NLWA and Officers from the 7 boroughs. The options modelled (in addition to the baseline / current service) are summarised in the following table.

ES Table 1: Overview of options

	Baseline 2030 – Baseline, Year: 2030	Option 2 – Twin-stream recycling, Year: 2021/22	Option 3 – Multi-stream recycling, Year: 2021/22

Dry recycling	As per current service, based in 2030.	Alternate weekly twin stream collection (1: paper / card, 2: mixed plastic / metal / glass) via 2 wheeled bins.	Weekly multi stream collection (1: paper / card, 2: cans, plastic bottles and pots, tubs and trays, 3: glass) via 3 boxes.
Garden waste	As per current service, based in 2030.	As per current service.	As per current service.
Food waste	Separate food waste collection for all properties, implemented where not already provided and/or service expanded to include all flats.		
Residual waste	As per current service, based in 2030.	As per current service.	As per current service.

All modelling has been undertaken using a 'bottom-up' approach, modelling the impacts for each individual borough and combining these to derive results at a north London level.

Distinguishing the collection service by property type is an important factor for this Options Appraisal and for future service provision by the boroughs. As such a separate set of assumptions has been applied relating to the performance and costs for street level properties and for flats and estates properties as different operational parameters apply. Furthermore, future property growth in all boroughs is assumed to be predominately in the number of estates and flats. Good practice examples of improving recycling from Flats, Estates and Flats above shops has also been included.

The qualitative results for the collection / recycling options are presented in a 'traffic' light system, whereby green presents the 'best' option and red presents the 'worst' performing option, against each criterion, relative to other options. Amber is used for intermediate rankings. The summary of the options evaluation is as follows:

ES Table 2: Options Appraisal, Baseline and Baseline 2030

Criteria	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections, DRS/EPR, simpler recycling*
Recycling performance	30.4%	33.0%
Whole System Cost[1]	£99,628,000	£111,240,000
Carbon Evaluation [2]	-40,365 t CO_2-eq	-14,513 t CO_2-eq
Operational Flexibility		
Public Acceptability		
Alignment with National Policy Direction		
Social Value		
Deliverability		

[1] These are indicative costs using industry figures for recycling, waste treatment and disposal, and as such should not be taken as absolute values

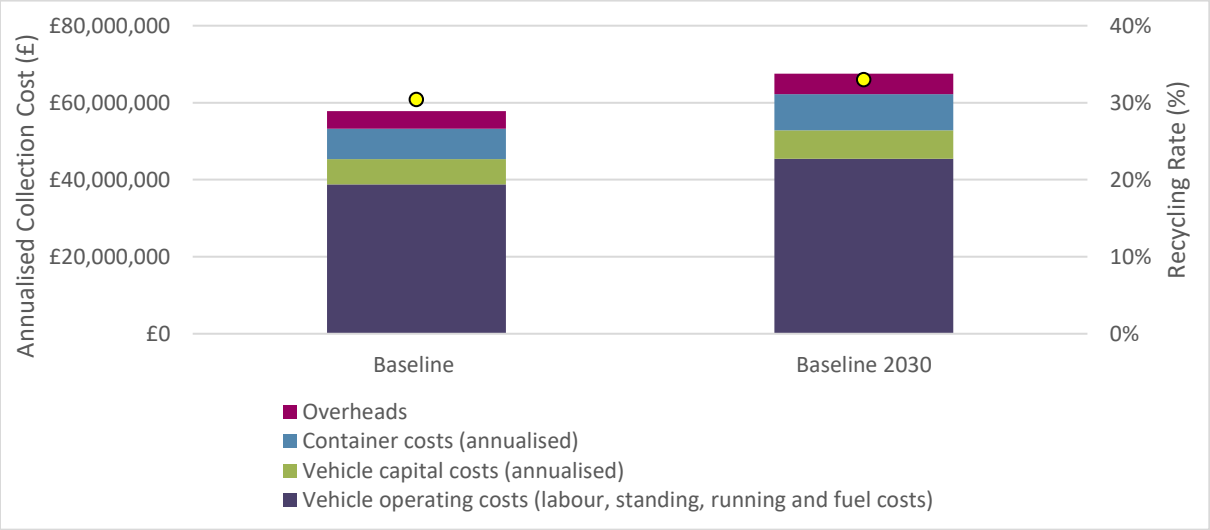
[2] These figures are based on the GLA EPS tool for calculating carbon impacts, supplemented by collection modelling outputs

Criteria	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections, DRS/EPR, simpler recycling*
Table Key	Worst performing	Best performing

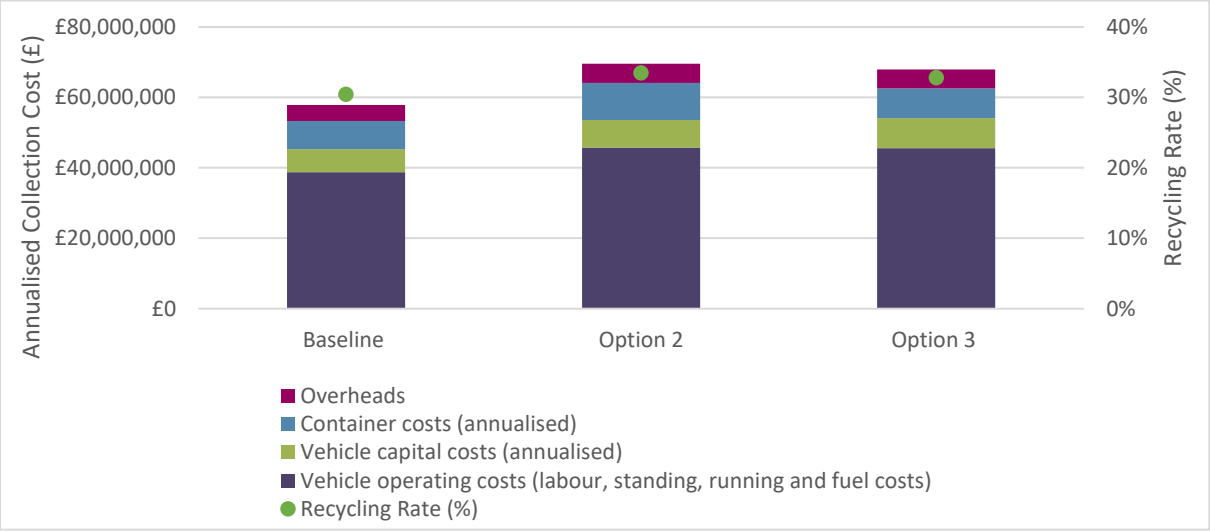
ES Table 3: Options Appraisal, Baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Recycling performance	30.4%	33.5%	32.8%
Whole System Cost	£99,628,000	£104,953,000	£100,315,000
Carbon (t CO2-eq)	-40,365	-37,370	-34,717
Operational Flexibility			
Public Acceptability			
Alignment with National Policy Direction			
Social Value			
Deliverability			
Table Key	Worst performing		Best performing

The options modelled give comparative annualised costs for different collection systems. The costs generated by the modelling will differ from actual operational costs due to the way vehicles and containers are annualised, however, the figures provide a useful comparison between different collection options.



ES Figure 1: Modelled annualised collection costs and performance, Baseline and Baseline 2030



ES Figure 2: Modelled annualised collection costs and performance, Baseline, Option 2 and Option 3

ES Figure 1 and ES Figure 2 above shows the total annualised collection costs and performance. The right axis relates to the recycling rate (yellow dot) whilst the left axis relates to the annualised collection cost. The results show that all alternative options have an increased annualised collection cost than the current baseline service and that collection costs are primarily driven by vehicle operating costs (which includes labour, vehicle running costs, vehicle standing costs and labour). Option 2, which is the twin-stream collection option, results in the highest annualised gross collection cost of all the alternative options. This is due to a higher number of containers and vehicles being required for this collection system than the baseline. The multi-stream collection option (Option 3) results in the second highest annualised gross collection cost of the options modelled. It is worth noting that it has been assumed that food waste will be co-collected with the dry recycling on a multi-compartmentalised vehicle, such as a Romaquip. Should individual boroughs choose to operate dedicated 7.5t food waste vehicles, it is likely to increase the annualised operating costs of operating this service due to the additional resource (vehicles, crew, fuel etc) that would be required to operate a dedicated food waste fleet. Baseline 2030 is more expensive than the current service due to housing growth and increased resource requirements to operate the service, as well as a roll out of food waste collections to all properties.

The collection costs have been combined with additional NLWA costs for the service, applying industry averages on gate fees, income from recycling and estimates of the disposal and treatment costs to provide an indicative total net cost to NLWA and its constituent boroughs. The summary table below illustrates a comparison of the results for all options. Please note these figures relate to the collection element of the waste management service and do not include additional costs such as street cleansing, RRC operation and management or collection and treatment of commercial waste.

ES Table 4: Modelled whole system cost and performance, Baseline and Baseline 2030

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Total Whole System Cost	£99,628,000	£111,240,000

ES Table 5: Modelled whole system cost and performance, Baseline, Option 2 and Option 3.

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Total Whole System Cost	£99,628,000	£104,953,000	£100,315,000

In terms of whole system costs, Options 2 and 3 both incur additional modelled costs to NLWA and its constituent boroughs in comparison to the baseline. The baseline results in the lowest overall whole system cost of all the options modelled at just under £100m, although it should be noted that there are fewer materials collected for recycling compared to other options. Option 3 is more expensive than the baseline but is largely comparable (c.£700K additional costs). Collection costs are the most significant cost element of the total cost incurred, ranging from between £57m (baseline) to £69m (Option 2). Residual waste treatment costs (based on industry averages) are the second highest cost element ranging from between £36.8m (Option 2) and £39.6m (Baseline 2030). Baseline 2030 results in the highest whole system cost (£111.2m) primarily due to the higher population and waste arisings in 2030. Given the financial pressure many local authorities are under, any increased costs could present a significant challenge to delivery of alternative options.

In options 2 and 3, residual waste treatment costs are lower than that of the baseline. This is in part due to increased food waste diversion through wider separate food waste collections which has a lower processing cost when sent for anaerobic digestion than for disposal via the EfW. There are also reduced residual waste treatment costs as a consequence of the introduction of plastic film within the dry recycling service and the impacts of implementing DRS and EPR diverting more packaging material out of the residual waste stream.

ES Table 6: Carbon assessment (EPS) results, Baseline and Baseline 2030

Carbon savings (t CO_2-eq)	Baseline	Baseline 2030
Total north London	-40,365 t CO_2 eq	-14,513 t CO_2 eq

ES Table 7: Carbon assessment (EPS) results, Baseline, Option 2 and Option 3

Carbon savings (t CO_2-eq)	Baseline	Option 2	Option 3
Total north London	-40,365 t CO_2 eq	-37,370 t CO_2 eq	-34,717 t CO_2 eq

In terms of carbon, all the results show a negative figure (i.e. a net reduction of carbon), this is because of the offset of carbon emissions primarily from recycling of materials 'avoiding' emissions that would have occurred through virgin material extraction and processing. Due to the subtle differences in tonnage, there are relatively small differences recorded across the three comparable collections (Baseline, Option 2 & 3). Where additional/separate food waste collection & the Deposit Return Scheme (DRS) is introduced (Baseline 2030 and Options 2 and 3), additional carbon impacts associated with separate collection and diversion via DRS are also noted, the net effect being reducing the carbon

performance to an extent. Full decarbonisation of the collection fleet across the boroughs by 2030 has beneficial impacts on carbon emissions (Baseline 2030), however, due to an increased amount of cleaner energy projected in the national grid system by 2030, the incineration impacts are considerably higher in this option (due to a lower carbon national grid meaning less emissions offset by energy recovery form waste), substantially outweighing these benefits. Overall, the baseline yields the least amount of carbon emissions (most carbon avoided).

Option 2 ranks highest in the recycling performance criteria, which is a twin-stream dry recycling collection whereby paper and card are collected separate from the remaining dry recycling. This option also ranks well against alignment with national policy criteria (joint first). There would be practicability issues with the two stream collection, notably not all properties may be able to accept an additional recycling container. For modelling purposes we assumed that all street level properties could receive this type of recycling collection but that flats and estates would need to remain on the existing (single stream) recycling collection.

Baseline 2030 is projected ahead to the year 2030, whereas the other models are based on a 2021/22 baseline and as such accounts for anticipated population and property growth. This is the second highest option in terms of recycling performance, reflecting the ease of the current service which when combined with Simpler Recycling, results in a relatively high performance. Despite the ease of this service, this option does not achieve optimum recycling performance as the Baseline 2030 assumes that all housing growth which will take place up to 2030 will be in the form of flats/estate properties. This negatively impacts the recycling performance as residents within flats can face a range of barriers (waste / recycling storage capacity, communications, behaviour change aspects, nature of collections, need to move the waste greater distances, etc.) which typically results in lower recycling rates from these properties. All collection options would perform worse in 2030 than their 2021/22 equivalents, unless other service changes or behaviour change is adopted. The Baseline 2030 option also performs well against a number of the qualitative criteria (public acceptability, alignment with national policy). It also ranks well in terms of deliverability, (second only to the baseline) as the additional service requirements could be rolled out quickly to householders with minimum disruption in comparison to Option 2 and Option 3.

Option 3 is the most cost effective of the alternative collection options with a comparable whole system cost to that of the baseline. This option ranks highest as regards social value criteria due to job creation associated with a multi-stream collection i.e. more vehicles relates to more crew which means more local jobs. However, for this same reason, it ranks lowest in terms of operational flexibility and deliverability due to the number of additional vehicles and containers which would be required to roll out such a service. There are concerns for both internal and external space requirements for a multi-stream option, and for many boroughs this would present a significant challenge, therefore the same modelling assumptions apply as regards the practicality of delivering this service to different types of household, as noted above for Option 2. Furthermore, additional space would be required for parking vehicles and as such depots across the NLWA area may need to be evaluated.

Specific issues and good practice relating to collection from flats and estates has also been included within this report, highlighting the challenges and opportunities bespoke to different collection environments. With the significant number of flats and flats above shops (FLASH) across the boroughs, it

is important to align options with best practice processes for these types of residences. In order for good practice to be implemented as noted, there are three key areas of importance to promote recycling with the view of enhancing performance in the long term. These areas include motivation, knowledge, and ease. Residents should be sufficiently motivated to recycle, they should be equipped with all of the required knowledge to facilitate the recycling process, and it should be an easy task for them to complete. There are different complexities associated with both flats and estates and FLASH due to the nature of waste collection processes in these areas. However, adapting and aligning to a practical best practice approach i.e. improving infrastructure, enhancing knowledge, and increasing capacity, facilitates the promotion of recycling activity enhancements. The recycling options available for most property types in north London would be the baseline and Baseline 2030.

Overall, each different collection option has its own merits and in terms of comparison the baseline and options 2 and 3 are most readily compared. The Baseline 2030 option is negatively affected (in cost, carbon and recycling terms) by dealing with more waste in 2030 in a predicted environment where energy from waste performs less well in carbon terms and where additional housing is assumed to be flats (generally lower performing in recycling terms). No weighting has been applied to the evaluation criteria used to assess these options. **Any future service planning should consider the relative importance of each of the criteria to NLWA and its constituent boroughs.**

Contents

Glossary of terms and abbreviations

Term	Abbreviation	Glossary term
Anaerobic Digestion	**AD**	*Anaerobic digestion is a process by which microorganisms break down biodegradable material in the absence of oxygen to produce biogas (consisting of methane and carbon dioxide) which can be used to generate energy. It is a common treatment method used for food waste collected by Local Authorities.*
Capital Expenditure	**CAPEX**	*Capital expenditure (CAPEX) is the money spent to purchase fixed assets relating to an organisation or corporate entity. For a Local Authority waste service this includes the purchase of vehicles and potentially containers.*
Deposit Return Scheme	**DRS**	*A Deposit Return Scheme involves paying a deposit for an item (added to the retail price at point of purchase) which is then redeemed when it is returned to a designated point.* *Through the National Resources and Waste Strategy for England, the Government has announced that a DRS for England, Wales and Northern Ireland is anticipated to be introduced from 2025 for drinks containers.[3] The aim of the scheme is to boost recycling rates, reduce littering and improve the quality of material collected for recycling.*
Emissions Performance Standard	**EPS**	*A factors-based assessment method for calculating carbon emissions. The performance methodology calculate the carbon intensity of different waste management methods in kilograms of carbon dioxide emitted per tonne of waste managed.*
Extended Producer Responsibility	**EPR**	*Extended Producer Responsibility (EPR) is a policy tool which requires producers to be responsible for the packaging they place on the market at the end of its life. It is intended to promote packaging design which considers resource inputs and easier end of life recovery (e.g. reuse or recycling) of the resources within the products. The new EPR system announced in the National Resources and Waste Strategy for England (which is intended to be implemented from 2024) will require packaging producers to pay for the full net costs of collecting, handling, recycling and disposing of packaging waste.*
Flats above shops	**FLASH**	*Households above shops or other businesses.*
Greater London Authority	**GLA**	*The devolved regional government body of Greater London.*
Kerbside Analysis Tool	**KAT**	*A modelling tool which provides a comparative assessment of cost and operational requirements of the kerbside collection service.*
Local Authority Collected Waste	**LACW**	*All waste within the remit of local authorities. This includes household waste, plus other non-household waste (e.g. bring banks, RRCs).*
Materials Recycling Facility	**MRF**	*A facility which receives mixed recycling and separates it into individual types of recyclable material (e.g. glass is separated from metals, etc.).*
Municipal Solid Waste	**MSW**	*Consists of waste from households and similar waste from businesses.*
North London Waste Authority	**NLWA**	*The statutory Waste Disposal Authority for the seven north London Boroughs. The NLWA deals with recycling, composting, treating and disposing of the waste and materials collected by the Boroughs.*

[3] Introducing a Deposit Return Scheme (DRS) in England, Wales and Northern Ireland: Executive summary and next steps - GOV.UK (www.gov.uk)

Operating Expenditure	**OPEX**	*An operating expenditure (OPEX) relates to an ongoing cost for running a service, system or business. For Local Authority waste collection services this includes maintenance costs for vehicles, staffing (driver, loader and supervision roles) and fuel.*
Residual Waste		*The waste remaining after the separation of materials for reuse, recycling, composting and/or anaerobic digestion.*
Reuse and Recycling Centre	**RRC**	*Reuse and Recycling Centres are facilities usually the responsibility of North London Waste Authority to provide a site for residents wanting to reuse, recycling and dispose of a wide range of materials, further to the service provided at the kerbside. Commonly referred to as 'tips'.*
Waste Hierarchy		*The waste hierarchy indicates an order of preference for action to reduce and manage waste. It suggests how waste should be managed with the primary goal to prevent and minimise waste, followed in turn by reuse of unwanted items, then recycling and composting, disposal with energy recovery and with disposal without energy recovery (i.e. landfill) as the least preferred option.*
Waste Collection Authority	**WCA**	*A Waste Collection Authority is a local authority responsible for the collection of municipal waste. The WCAs (Barnet / Camden / Enfield / Hackney / Haringey / Islington / Waltham Forest) pass on the waste and recycling to the Waste Disposal Authority (North London Waste Authority) that is tasked with the ultimate recycling, treatment and disposal of that waste.*
Waste Disposal Authority	**WDA**	*A Waste Disposal Authority is responsible for the management and treatment of municipal waste in its area. North London Waste Authority is the Waste Disposal Authority for north London.*
WasteDataFlow	**WDF**	*A web-based system for municipal waste data reporting by UK local authorities to government. Information can be downloaded by the public.*
Waste Electrical and Electronic Equipment	**WEEE**	*Waste Electrical and Electronic Equipment is end of life Electrical and Electronic Equipment, i.e., items that require electric currents of electromagnetic fields in order to operate. This includes (but is not limited to) small household appliances (irons, toasters, vacuum cleaners), large household appliances (fridges, cookers, washing machines), IT equipment (computers, telephones), TVs, lighting, electronic tools, medical devices, monitoring equipment.*
Waste & Resources Action Programme	**WRAP**	*A registered charity which works with businesses, individuals and communities to achieve a circular economy, by helping them reduce waste, develop sustainable products and use resources in an efficient way.*
WRAP Ready Reckoner		*A tool used to estimate projected food waste tonnages. The formula is based on indices of deprivation and is the most accurate data set available.*

1 Introduction

1.1 Project Brief

North London Waste Authority (NLWA) are working in partnership with the seven north London Boroughs (Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest), hereafter referred to as 'north London' or 'NLWA and its constituent boroughs', to prepare a new joint Waste Strategy that is fit for the future with the main goal of promoting waste reduction, reuse and recycling as part of driving forward a circular economy.

A Municipal Waste Management Strategy requires an Options Appraisal to prioritise between alternative collection options for the purposes of service delivery, procurement and planning. To compliment the collection Options Appraisal, and in alignment with the principles of the waste hierarchy (see Figure 1), Frith Resource Management (FRM) have also undertaken an appraisal of options for addressing the first two principles of waste prevention and reuse, as well as collection & recycling.

As such, this report provides a summary of the Options Appraisal exercise undertaken by FRM and includes a review of the following:

- Opportunities for increasing waste prevention (Chapter 2)
- Opportunities for development and maximising reuse (Chapter 3)
- Appraisal of alternative kerbside recycling collection operations & best practice for flats and estates (Chapters 4 & 5)

2 Waste Prevention

A guiding principle of how waste and resources should be managed is the 'waste hierarchy'[4], which is shown below in Figure 1. Waste prevention is the most beneficial method of managing waste, which aims to reduce the amount of waste generated at source.

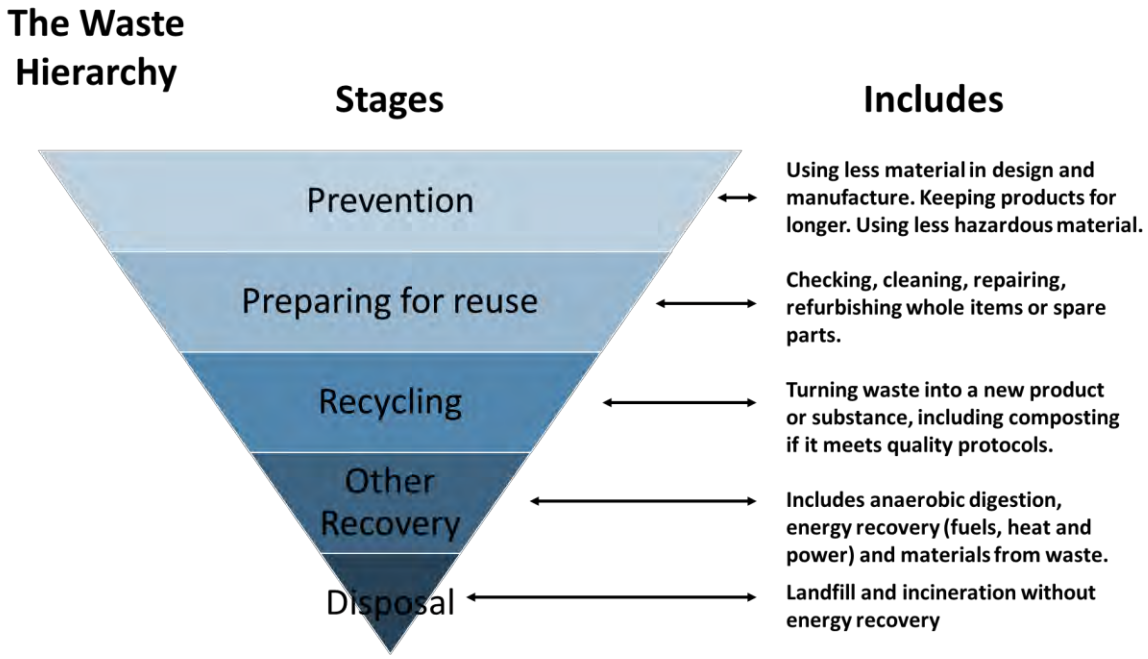


Figure 1: The Waste Hierarchy (2011)

One of the most notable benefits of waste prevention is that it creates a lower demand for products which decreases pressure on resources and in turn reduces the challenges of climate change and pollution. Initially, waste prevention can be achieved through the design of an item and ensuring that products have sufficient lifespan. Where necessary, they should also be able to be reused, repaired and remanufactured. During the manufacturing processes, secondary materials can also be used to reduce the quantity of raw materials used in products, and to prevent any additional materials from eventually ending up as waste. From a consumption perspective, items can be shared / leased / rented rather than purchased, which increases the efficiency in which products are used. Where possible, products could also be purchased within refillable containers, which prevents the consumption of common packaging types which are typically difficult to reuse or recycle (e.g. plastic film). Once an item has been consumed and is unwanted or broken, reuse and repair should be prioritised in the first instance, to prevent resources becoming waste.

[4] Article 4 of the Waste Framework Directive (WFD; Directive 2008/98/EC on waste and repealing certain Directives) established the waste hierarchy as the overarching principle of waste policies in the EU and EU Member States. In order of priority, waste prevention has the highest priority, followed by reuse, recycling and other recovery, with disposal as the least desirable option.

2.1 North London Waste Prevention Plan

In order to address waste prevention within north London itself, the North London Waste Prevention Plan (the plan)[5] was developed by NLWA, with input from borough officers and stakeholders. The plan, which runs from 2022 – 2025, prioritises waste prevention to preserve resources for future generations and save money for the councils, through outlining an approach to community engagement, communications and policy to enable a reduction in waste.

Within the plan, a number of priority areas are identified to support the ambition to reduce waste and keep useful materials in circulation for as long as possible. Each of the areas are summarised in Table 1 below.

Table 1: Summary of priority areas as outlined within the North London Waste Prevention Plan

Priority area	Summary
Enable communities to deliver change on the ground	• Using the North London Community Fund[6] to financially support community based / non-profit organisations who tackle waste issues and work with residents at community level. • Organisations are supported in promoting their work and monitoring their approaches with a view to understanding the potential for scaling up or rolling successful initiatives out to other areas / over longer periods of time.
Provide prevention, reuse and repair opportunities	• Provide opportunities for residents to access repair services and learn repair skills. • Explore existing reuse, repair and sharing organisations, and develop a community-based hub network which provides activities and resources to residents. • Promote item sharing and hiring, reusable products (e.g. nappies) and the reuse of materials such as textiles. • Seek to provide reuse and recycling options for hard to recycle items / materials. • Lobby government to legislate out poorly designed products, ensure repairability and provide infrastructural investment needed for the reuse and repair sector.
Educate and inform residents	• Use targeted communication campaigns to tailor messages and address barriers. • Deliver three high profile behaviour change campaigns each year of the Plan, with priority themes including household recycling, food waste prevention, alternatives to single-use, out of home recycling / reuse and increased use of repair services. • Work with primary schools to embed waste education into school culture.
Support our Boroughs	• Work with recycling contractors and the north London boroughs to deliver recycling initiatives, projects and campaigns which align with objectives of the Borough Recycling Fund[7]. • Work with boroughs to trial new initiatives which could increase recycling rates.
Work with businesses	• Work with north London businesses to encourage their customers to use reusable alternatives to single-use plastics.
Campaign for change	• Work with the north London boroughs to develop an NLWA call to action, setting out policies and best practice to reduce waste and create a circular economy.

[5] https://www.nlwa.gov.uk/sites/default/files/2022-10/06%20North%20London%20Waste%20Prevention%20Plan.pdf

[6] The North London Community Fund supports community-based organisations who undertake waste prevention initiatives, which enables change at grassroots level, taps into existing community networks and creates local advocates.

[7] The Borough Recycling Fund awards funding to participating boroughs (Camden, Hackney, Haringey and Waltham Forest) to enable them to run innovative projects to tackle some of the issues impeding recycling.

	• Campaign on key policy issues such as powers for local authorities to make recycling compulsory or banning a greater range of single-use packaging. • Respond to government consultations relating to waste and resources policy. • Lobby producers to make products more sustainable; end planned obsolescence[8]; offer reusable or hire options; improve product repairability or increase the recyclability of packaging.
Work in partnership	• Strengthen existing partnerships and build new ones with public sector authorities, environmental groups, campaigners and grassroots organisations. • Work with organisations to amplify existing work and deliver projects together. • Contribute to pan-London and national campaigns and add value through additional outreach and engagement within north London communities. • Continue to provide a forum to share good practice on waste prevention activities through the annual conference 'The Waste Prevention Exchange'.
Stay accountable	• Projects will be planned, delivered and evaluated to ensure value for money and maximum impact. A monitoring and evaluation framework will be developed to ensure projects can be continuously improved. • Provide progress updates on development and delivery of the Plan at authority meetings.

2.2 Summary

As discussed, waste prevention is the most beneficial activity that the NLWA and its constituent boroughs can undertake, as this reduces the demand for new products and preserves the use of resources. As recognised in the North London Waste Prevention Plan (Section 2.1), there are several steps which can be taken to encourage an uptake in such behaviours, including education for residents, working with businesses and the provision of opportunities for reuse and repair.

A programme of waste prevention work should be maintained and revised throughout the life of this Joint Waste Strategy, and the initiatives therein assessed and reviewed as to their effectiveness and in the light of their impacts.

[8] Obsolescence is where an item is designed to only have a limited life before breaking / failing

3 Reuse

In line with the second highest priority of the waste hierarchy (Figure 1), 'preparing for reuse', the following options aim to highlight the impact of facilitating and promoting reuse and repair activities across north London. The aim of reuse and repair is to extend the useful life of a product or service with wide ranging benefits from cost savings, enhancing resource efficiency, improving security of critical material supply, enhancing the local economy, less material consumption and fewer carbon emissions.

Despite the benefits that reuse and repair can bring, there can be barriers for individuals to access these initiatives. With entrenched disposal habits and the concept of a 'throwaway society', this means that reuse and repair are not always considered. In addition, these activities can be perceived as time consuming and re-used items may be seen as inferior / unreliable. A lack of knowledge regarding the services available, where to donate and where such activities take place, may also be a barrier for some. However, although some barriers are present, a listening exercise for north London residents[9] found that there was overall strong support and demand for reuse and repair initiatives. Respondents called for their respective boroughs and NLWA to support reuse schemes and community initiatives, including swap shops and repair workshops.

With a lack of knowledge potentially influencing the level of reuse uptake achieved, the following infographic provides insight into the different opportunities available to individuals.

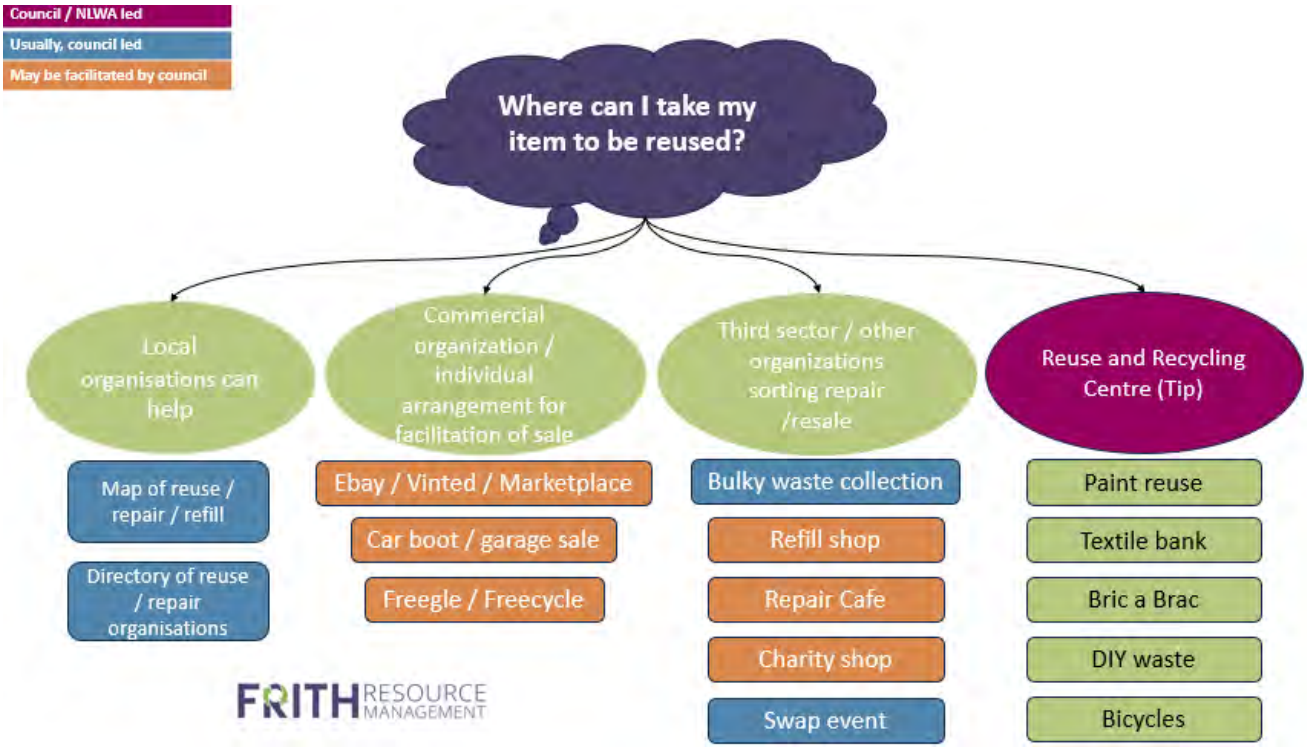


Figure 2: Infographic demonstrating different potential options to support the reuse of items

[9] A listening exercise survey was held by NLWA and the seven boroughs of Barnet, Camden, Enfield, Hackney, Haringey, Islington and Waltham Forest between June and September 2023, to help guide the development of a new Joint Waste Strategy.

Within north London specifically, there are a range of reuse facilities available to residents, as outlined in Figure 3. Overall, there is access to a variety of different reuse and repair types across all boroughs, however this appears to be much more concentrated within the central, Inner London boroughs (Camden, Hackney and Islington), as well as Haringey and Waltham Forest. All of the eight Reuse and Recycling Centres (RRCs) within north London[10] provide visitors with the opportunity to deposit items for reuse, while two also have an on-site reuse shop. Of the repair outlets, electrical repair facilities appear to be most dominant, which may reflect the skills required to undertake such repairs; in light of this, there are fewer locations for furniture and textile repair, with less demand for these possibly being driven by the higher likelihood that individuals would be more confident in repairing such items at home.

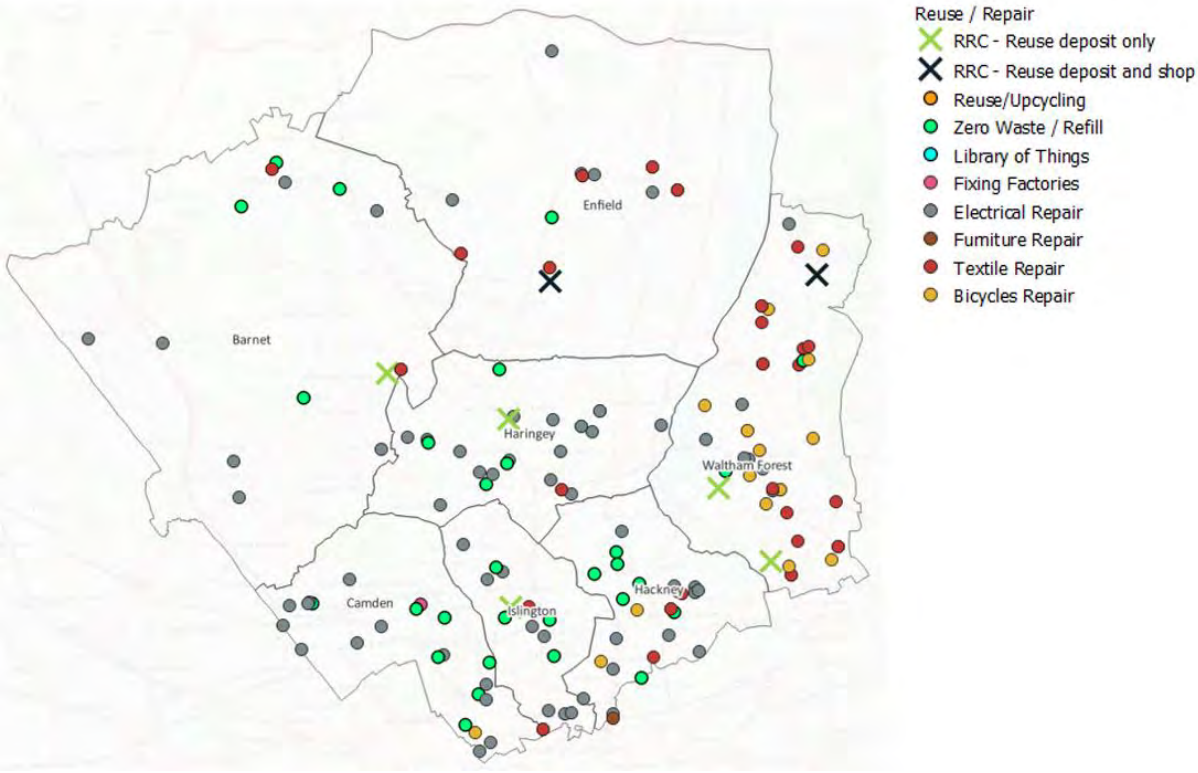


Figure 3: A map outlining different locations of reuse facilities and services within north London (data compiled by Frith Resource Management from various sources, September / October 2023)

The following appraisal explores the impact of different reuse initiatives, and where possible, considers the resourcing requirements needed. Using case studies and data from north London and beyond, the prevention of waste and carbon emissions avoided, as well as potential cost savings for those participating in reuse, are also discussed.

3.1 Reuse (Reuse and Recycling Centres)

The need for greater reuse activity at RRCs was highlighted within the 2018 Resources and Waste Strategy for England. It is acknowledged that RRCs provide an opportunity to prevent reusable items

[10] There are eight RRCs within north London, NLWA operate 7 of these sites while Enfield operates 1.

from entering the waste stream, through identifying and segregating good quality or otherwise reusable goods and products.

There are a number of drivers for local authorities to introduce reuse initiatives at RRCs, which are outlined below:

- **Social** – opportunity to partner with a charity which supports the wider community, jobs through staffing of the shops and services (this can be enhanced if the reuse shop is set up for repair or is connected to a repair service elsewhere).
- **Economic** – reduced disposal costs, generation of income from the sale of goods (where appropriate), residents have access to products at a reduced cost.
- **Environmental** – increased site recycling / reuse performance, reduced carbon impact (avoided carbon impacts from making a new product, less transport, minimal processing etc.).

3.1.1 Reuse donations / shops

Over more recent years, there has been an increase in the provision of reuse initiatives at RRC sites, through developing donation areas where residents can leave their unwanted goods and on-site reuse shops where these items can later be sold. There is growing public demand for such initiatives, with 85% of people agreeing that all RRCs should have a charity reuse shop nearby or on site[11].

Case Study – Abbey Road Reuse Hub, West London Waste Authority

On site at the Abbey Road Household Reuse & Recycling Centre (HRRC), a reuse tent is available for visitors to donate items which are in good working order / have potential to be repaired. From here, partner organisations repair and redistribute items as necessary, which diverts a range of items from the waste stream.

The HRRC also partners with Petit Miracles, a local business who hold educational workshops for the local community, to enable them to find employment; these courses are aimed at those who are disabled or from disadvantaged backgrounds. Wooden furniture which is collected at Abbey Road is collected by Petit Miracles and then sold in their Shepherd's Bush shop, this enables them to fund their classes and workshops.

Bikes which are donated through the site are either redistributed to organisations which support disadvantaged people or are passed onto small local businesses who can generate income from these items.

For 18 months, the Abbey Road Reuse Hub was also home to Brent's Fixing Factory (a partnership between Possible and The Restart Project). With support from West London Waste Authority (WLWA), donated laptops were refurbished and rehomed to those in need or experiencing digital isolation. During their time at the hub, they redistributed 206 laptops, ran 10 community repair sessions (fixing an additional 85 devices) and offered work experience to 22 local young people. In terms of environmental impact, it is estimated that 585kg of waste has been prevented, and 44,371kg of carbon emissions saved.

[11] https://www.letsrecycle.com/news/fcc-yougov-reuse-research/

NLWA currently accept donations for reuse at all eight of their RRCs. Items which are deposited are taken to the 'Reuse Shop' located at Kings Road RRC, where they are inspected and safety checked before being sold. This shop first opened in 2015 and accepts a range of goods including furniture, crockery and bric-a-brac. Enfield Council (through their separately managed RRC) also provide residents with access to a reuse donation area and on-site shop, 'Revive'. Available reuse data from NLWA's RRCs is presented in Table 2 below, alongside data from other London authorities.

Table 2: Reuse data from NLWA RRCs and other RRCs within London

	North London Waste Authority					Other London Authorities		
	Summers Lane	**Regis Road**	**Western Road**	**Hornsey Street**	**South Access Road**	**Smugglers Way**	**Abbey Road**	**Kimpton Park Way**
Level of reuse	Reuse deposit only	Reuse deposit only	Reuse deposit only	Reuse deposit only	Reuse deposit only	Reuse deposit only	Reuse deposit only	Reuse deposit and shop
Weight of items donated (2022)	8,240	5,800	1,140	4,460	4,200	87,610	16,300	33,340
Estimated number of items donated (2022) [12]	1,030	725	143	558	525	10,952	2,038	4,168
Estimated annual visitors	125,280	29,460	52,812	45,516	20,760	240,000	46,572	74,964
KG / visitor / year	0.07	0.20	0.02	0.10	0.20	0.37	0.35	0.44

As shown above, through the reuse deposit areas at NLWA's RRCs, an estimated 23,800kg (approximately 3,000 items) worth of products were donated in 2022. When looking at this in relation to visitor numbers, approximately 0.1kg is donated per visitor per year at the north London RRCs. This is relatively low in comparison to other RRCs within London, where annually, an estimated 0.4kg of items for reuse are donated per visitor. However, it is noted that NLWA's RRCs do not currently accept electrical items for reuse, whereas other RRCs in London do. In the accompanying Joint Waste Strategy, NLWA and the boroughs commit to engage with community groups working on electrical waste prevention and aim to collect as much electrical waste as possible for repair and reuse. This will positively impact the level of reuse able to be achieved in north London.

[12] Rounded up to the nearest whole number, using an assumption of 8kg per item, based on average 2021 Fixometer reference data for non-electrical items (https://docs.google.com/spreadsheets/d/1TBhczzDaJhANTMh3eoouMOFZ7PvlmyrEQMqnw9WfdHY/edit#gid=583017345)

The resourcing requirements needed to incorporate reuse at RRCs will depend on the approach which is taken. Three common approaches, and their considerations, are outlined in Table 3.

Table 3: Resourcing considerations for different levels of reuse at RRCs

Type of reuse	Considerations
Reuse deposit only	This is simple to operate and requires a relatively small covered area for dropping off items. However, a dedicated space must be big enough to safely hold all of the donated goods and be obvious to users, so that it doesn't remain unused. As well as this, suitable containers must be available for holding the items to protect them from any damage.
On-site reuse shop (run by existing RRC operator on behalf of NLWA / Council)	On-site reuse shops can generate income for RRCs through the sale of goods. Their presence can attract residents who wouldn't otherwise visit an RRC and would reduce requirements to transport goods off site. However, this requires dedicated staff members, would lead to increased overheads (utility, bills etc.), and consideration would be needed for visitor parking and management of traffic flows. There is also an increased burden of liability on the authority, for second hand goods sold at the shops.
On-site reuse shop (partnership with external charity / organisation)	If an on-site reuse shop is desired, there is also the opportunity to partner with external charities / organisations, potentially via a procurement process. The benefits of this include a reduced operational burden on the authority, and partner charities / organisations are likely to have established networks, outlets, vehicles and staff already. However, significant time and resources would be required to set up the partnership / procurement, and there would be less income for the authority operating the RRC, as there should be profit for the operating party. Partners may also have little experience of waste management sector, so some training may be required, and there may be interface issues on site whilst the operation becomes established.

3.1.2 Paint Reuse

In the UK, it is estimated that 50 million litres of paint go to waste each year[13], highlighting a significant opportunity for reuse. RRCs are sites which can be utilised for the collection and redistribution of unwanted paint; however, it is thought that only one in three RRCs across the UK currently accept liquid paint[14].

Community RePaint, a UK wide paint reuse network, aims to collect leftover paint and redistribute it to benefit individuals, families, communities and charities in need at an affordable cost. Community RePaint have over 70 schemes across the UK and in 2022, over 450,000 litres of leftover paint were collected by schemes and 285,000 litres were redistributed into the community, saving over 1,200 tonnes of carbon emissions. One of the models of this scheme is to redistribute unwanted paint through drop off points made available at council run HWRCs, this paint can then be collected for free by residents or charities.

Socially, community paint reuse can assist low-income groups and individuals in accessing affordable paint which can be used to improve their living environment. It also provides a reduced cost of waste paint management for an authority and the development of a paint reuse scheme can generate

[13] https://communityrepaint.org.uk/the-uks-paint-reuse-network/
[14] https://www.paintcare.org.uk/recycle-the-rest/

employment opportunities. Through diverting this material for reuse, energy consumption associated with paint manufacturing is reduced, resources are conserved, and disposal is avoided.

In terms of the resourcing requirements recommended by Community RePaint[15], start-up costs include the purchasing of safety equipment, protective clothing and shelving / storage containers. For small to medium sized schemes, an area of 25m^2 is recommended (this should be sufficient to include areas for sorting and logging of stock, storage, display and sale of paint).

Six of NLWA's RRCs are part of the Community RePaint scheme, where paint reuse points have been developed for residents to drop off and / or collect unwanted paint free of charge. Available data regarding levels of paint reuse from the three RRCs in Waltham Forest is outlined in Table 4 below.

Table 4: Levels of paint reuse achieved by the three RRCs in Waltham Forest

Paint Reuse	Waltham Forest		
	Gateway Road	Kings Road	South Access Road
2022 /23 (KG)	4,700	4,960	5,380
Estimated annual visitors	28,956	26,736	20,760
KG / visitor / year	0.16	0.19	0.26

At the RRCs located within Waltham Forest, approximately 0.2kg of unwanted paint was donated via the Community RePaint scheme per visitor per year.

3.1.3 DIY Reuse

Following an announcement from government in June 2023, which proposes to ban charges for DIY waste at RRCs from late 2023[16], the prospect of introducing dedicated DIY reuse at RRCs may become appealing for a number of authorities. Introducing a DIY reuse scheme, where residents are able to drop off and collect unwanted DIY supplies free of charge, could help local authorities to reduce their disposal costs (particularly for those who previously had charges in place). Adoption of such a reuse scheme would also provide environmental benefits through lower emissions associated with the transport and disposal of this waste.

From February 2023, NLWA have been trialling a DIY reuse scheme at two of their RRCs – South Access Road (Waltham Forest) and Summers Lane (Barnet). Residents are able to deposit unwanted DIY materials such as bricks, tiles and timber, which then become available for others to use free of charge. Over the first eight months of this trial (February – September 2023), 27,000kg of DIY waste have been collected over the two sites. Using visitor number across these two sites, it is estimated that over this 8-month period, 0.28kg of DIY waste has been deposited per visitor, and when based on a full year, this could equate to approximately 0.42kg per visitor (40,891kg overall). This has been scaled up below to

[15] https://communityrepaint.org.uk/wp-content/uploads/2022/08/Getting-started-guide_web-version-1.pdf
[16] https://www.gov.uk/government/news/council-diy-waste-charges-abolished#:~:text=Following%20overwhelming%20public%20support%2C%20the,responsible%20manner%20and%20encourage%20recycling.

estimate the potential annual impact, should this be introduced across the six other RRCs within north London.

Table 5: Estimated levels of DIY reuse for those RRCs who do not already offer this service

	Estimated data (assuming 0.42kg / visitor / year)					
	Regis Road	**Western Road**	**Hornsey Street**	**Kings Road**	**Gateway Road**	**Barrowell Green**
Estimated annual visitors	29,460	52,812	45,516	26,736	28,956	213,504
Estimated annual DIY reuse (KG)	12,373	22,181	19,117	11,229	8,108	59,781

Following discussion of the different forms of reuse which can be incorporated at RRCs, Figure 4 summarises the range and average level of reuse which may be achieved by each initiative.

Figure 4: Average levels of reuse achieved through different initiatives at RRCs, with range bars to show the variance of data

As shown above, and based on the data from the RRC benchmarking exercise, the yield of general items for reuse is significantly lower when electricals are not accepted (c. 0.1kg / visitor / year), compared to when they are (c. 0.4kg / visitor / year). If a smaller range of items are accepted for reuse, it may turn away potential donators who will either redistribute or dispose of their reusable items via a different means. This could also reflect the large differential between the two yields and indicates that the bigger the range of items accepted, the higher the potential impact can be.

DIY waste has the highest rate of deposit (0.42kg / visitor / year), which is likely to be contributed to these materials typically being heavier. As well as this, this data is taken from a trial period, where

participation rates can differ from what they may be in the longer term, should this service be introduced permanently.

3.2 Reuse (bulky waste)

Large items of furniture and other household goods are often referred to as 'bulky waste' and can include items such as furniture (beds, wardrobes), white goods (fridges, freezers) and other electrical items (e.g. televisions). With these being common household items, it is likely that at some point, an individual will require a method of disposal for such items which they no longer require or are broken. Individuals may not always be aware of the best way to dispose of these items and may not consider reuse / repair as an option, therefore this provides an opportunity to signpost residents to suitable avenues such as charity and second-hand shops. This could be done via authority websites, or through a call centre where it can be determined whether the item in question is suitable for reuse, and if so, individuals can be directed to the most appropriate means of donating items.

However, it is not always possible, convenient, or accessible for individuals to transport their own bulky waste items. Instead, some charities offer free household collections of bulky waste for reuse, which can be publicised on authority websites.

Case Study – Furniture Recycling Project

The Furniture Recycling Project (FRP) is a charity in Gloucestershire which collects and redistributes unwanted furniture and electrical items.

The charity, which is signposted to on the Gloucestershire Recycles website, operates a free collection service for household items which are in a reusable condition. Donated items are repaired, restored and / or refurbished, and all electrical items are tested and are sold under warranty. All of these donated items are then sold within FRP's reuse store within Gloucester.

Since their formation in 1996, over 250,000 items have been saved from landfill and last year, FRP supplied 18,820 items to over 8,000 households.

While signposting charity-run collections of bulky waste can be effective, it is also a possibility for an authority to partner with a third sector organisation and work together to provide kerbside bulky waste collections. Bulky waste composition analysis undertaken by WRAP suggests that 30% of items which are collected through such schemes would be suitable to reuse or repair[17]. This poses a significant opportunity for items which are collected through kerbside bulky waste collections to be reused. Depending on the chosen charity for partnership, reusable / repairable items may be sold in local shops

[17] https://wrap.org.uk/resources/guide/bulky-waste

at a low cost or redistributed to those in need within the community. These social benefits are achieved alongside the positive environmental impacts of keeping resources in use for as long as possible and diverting reusable items away from the waste stream.

Case Study – Bulky waste collections, Lancaster City Council and Furniture Matters

Since 2006, Lancaster City Council and Furniture Matters (a furniture reuse charity which aims to divert items from landfill through redistributing reusable items to those on low incomes) have worked in partnership as 'Bulky Matters' to provide bulky waste collections for residents of Lancaster.

The aim of the partnership is to provide a better service for residents and increase levels of reuse and recycling from bulky waste collections. Under the partnership agreement, each partner provides some aspect of the service – the council provide the vehicles and fuel, while Furniture Matters provide the staff. Residents can book a bulky waste collection via the council for a small fee, and items are then collected by Furniture Matters within 3 days, on an appointment basis. Once items are collected, they're taken to their 'Sort It' centre where goods are categorised by streams for reuse, repair, recycling and landfill.

Items which are suitable for reuse are redistributed to people in need at a low cost. Furniture Matters provide accredited training to local people, who undertake repairs of bulky waste items where necessary.

3.3 Reuse (business waste)

Promoting the prospect of reuse amongst businesses not only helps to minimise environmental impacts, but also supports the efficient use of resources and can offer cost savings through avoiding disposal.

Dependent on the type of businesses, there is the opportunity to implement reuse through managing typical operations. For example, an office-based business can promote the use of refillable toner / printer cartridges and encourage use of glasses and mugs rather than disposable alternatives.

It is also possible for businesses to practice reuse through redistributing unwanted / surplus items to other businesses or charities who many need them. Focussing on office furniture alone, a study by WRAP estimates that 1.2 million office desks and 1.8 million chairs go to waste annually[18], which poses a significant opportunity for reuse.

Case Study – A Good Thing

A Good Thing is a not-for-profit Community Interest Company (CIC) which aims to facilitate the reuse of business waste. With businesses generating too much waste, and many charities needing resources, A Good Thing connects the two, in order to prevent the number of items which end up in landfill.

[18] https://www.agoodthing.org.uk/business

Businesses can donate unwanted items (which could range from office equipment and furniture to surplus stationary items) through the A Good Thing App. Businesses submit information regarding the items they have, where they are located, the timeframe they are working to, and any preference for the charity they would like to support. The app will then alert appropriate charities with the items which are being offered by nearby businesses, and charities are able to submit requests for what they need. Businesses then select the charity they wish to support, and arrangements can be made for the collection of the items.

Within London, there are currently 308 charities registered[19], as well as a range of businesses (which are outlined on the map below).

A Good Thing has also been supporting Hounslow Council and 'ReLondon: Heston in the Loop' with a circular neighbourhood project in West London, where they are aiming to connect local businesses in the sharing and circular economy.

3.4 Reuse (additional initiatives)

3.4.1 Reusable nappies

It is estimated that c.10% of north London's residual household waste is made up by disposable nappies. Some local authorities in the UK, particularly those who are operating 3 or 4 weekly residual waste collections, have separate absorbent hygiene product (AHP)[20] collections in place; however, with only one AHP treatment facility operating in the UK[21], the majority of this waste goes for energy recovery or disposal. Therefore, reusable nappies provide an opportunity to reduce the scale of this issue, through

[19] Within a 20-mile radius of N17 9LJ
[20] AHP waste includes disposable nappies, adult incontinence and hygiene products, feminine hygiene products and nappy changing waste such as wipes.
[21] Currently, the only facility in the UK which is capable of recycling AHP waste is Nappicycle Ltd, Carmarthenshire

supporting waste reduction and having a 25% lower carbon footprint than the single use alternatives[22]. However, some barriers, such as a lack of convenience, cost, and the use of real nappies not being perceived as 'the norm', means that the uptake for reusables is not significant.

Real Nappies for London (RNfL) is a local charity which aims to encourage use of reusable nappies as an alternative to disposables. In order to nudge residents to try this method, a voucher incentive scheme is available, where parents / carers with a baby under 18 months can apply for a free reusable nappy voucher. In north London, this voucher is worth £70 and can support with the initial cost of buying reusable nappies or for a paid-for washable nappy laundry service. The voucher is funded by NLWA, with the level of subsidy reflecting the savings they make through not having to dispose of nappies and is administered by RNfL. In addition to this, RNfL and local reusable nappy groups (e.g. Hackney Nappy Network) hold frequent events which provides a network for local residents who have adopted reusables, as well as an opportunity for parents / carers to find out more information. All seven north London boroughs are a part of this scheme, and signpost residents to the charity through their respective websites.

Data regarding the number of vouchers issued and redeemed, and the quantity of waste prevented through the RNfL voucher incentive scheme, is outlined in Table 6 below. Of the vouchers issued, approximately three quarters of these are redeemed, with an estimated waste prevention value of 0.99 tonnes per voucher.

Table 6: Study results showing the update of the RNfL voucher scheme, and the waste prevention impacts

Period	No. of participating London boroughs	Vouchers issued	Vouchers redeemed	Waste prevention (tonnes)	Waste prevention (tonnes) / voucher
2007 - 2012[23]	15[24]	9,653	7,047 (73%)	6,962	0.99
2012 - 2016[25]	9[26]	4,192	3,188 (76%)	3,145	

Based on the evidence above, and available data regarding the number of vouchers issued and redeemed in two north London boroughs, estimates have been made regarding the level of waste prevention this initiative has provided.

[22] https://randd.defra.gov.uk/ProjectDetails?ProjectId=20622
[23] https://www.researchgate.net/publication/275891279_The_'Real_Nappies_for_London'_Scheme_2007-2012_Key_Findings_to_Drive_a_Future_Waste_Prevention_Agenda_Through_Landfill_Reduction#x27;Real_Nappies_for_London'_Scheme_2007-2012_Key_Findings_to_Drive_a_Future_Waste_Prevention_Agenda_Through_Landfill_Reduction
[24] This includes the London boroughs of Bexley, Camden, Enfield, Hackney, Hammersmith & Fulham, Haringey, Hounslow, Islington, Kensington & Chelsea, Lambeth, Lewisham, Newham, Redbridge, Southwark and Tower Hamlets
[25] https://www.icevirtuallibrary.com/doi/full/10.1680/jwarm.17.00028
[26] This includes the London boroughs of Bexley, Camden, Hackney, Haringey, Islington, Lewisham, Southwark, Tower Hamlets and Waltham Forest

Table 7: Estimates of the level of waste prevention which could be achieved through the RNfL voucher scheme in Camden and Islington

Borough	Period	Vouchers issued	Vouchers redeemed	Waste prevention (tonnes)
Camden	Mar 2018 – Dec 2021	433	323 (estimate)	320
Islington	2020 – 2021	216	169	168

3.4.2 Item Sharing

Item sharing is where a range of goods (commonly larger items which are infrequently used such as DIY tools, gardening equipment and home appliances) are made available within the community for individuals to temporarily rent items for a small fee. As well as improving sustainability through reducing the demand for new products to be created, it is a cheaper alternative to buying and helps to support local communities. If centrally held, it also facilitates repair of items that are loaned out. A common example of a tool / equipment loaning service is known as the 'Library of Things'.

However, this method of reuse does present itself with barriers which may impact the level of uptake from residents. For example, there may be a lack of trust in other borrowers using items correctly or hygienically, and the time / inconvenience of arranging a collection may also be off-putting for some. There is also an aspect of behaviour change which needs to be considered when introducing such system, to change the societal 'norm' from individual ownership to sharing and community access. Significant levels of continued publicity and engagement are also required in order to make the public aware that these facilities exist, rather than relying on residents becoming aware through their own research, word of mouth etc.

Case study – Item sharing in Essex[27]

Between September 2021 and March 2022, a Library of Things scheme was developed within Essex, with funding support from The BLUEPRINT Project[28]. 5 libraries within Essex were identified as suitable locations to set up item sharing projects, due to their central locations and adequate storage spaces. Access to this scheme was also available through the council's mobile library. The categories of items available for borrowing included DIY (drills, pressure washers), gardening tools (leaf blowers), home appliances (food processors, sewing machines), outdoor and hobby (tents, gazebos) and musical instruments (guitars, keyboards).

In terms of cost and staff resourcing, £11,000 was required for the purchasing of items, £10,000 for logistics and £1,000 for promotion. One full time employee was also required, as well as contributions from other teams within the council.

Over the 6-month period, there were 130 unique visits to the item library, with 228 items reserved and 98 items collected. It is estimated that as a result, 497kg of waste was diverted from landfill. Strengths of the pilot included low damage to stock, high engagement (particularly with those age groups not using libraries often) and appreciation from residents who supported the

[27] https://projectblueprint.eu/campaigns/essex-library-of-things
[28] The BLUEPRINT Project is led by Essex County Council and utilises funding from the European Regional Development Fund to help local authorities in England and France to implement a circular economy.

initiative and the sharing economy. Some weaknesses included a long turnaround between booking and collection time, limited locations and a lack of maintenance and repair (they could not find an external contractor to undertake this task). To further improve and remove barriers, it was suggested that all internal staff members would be trained to undertake PAT testing and contract a repair service from the beginning of the project.

One company specialising in item sharing is Library of Things Ltd (LoT), who currently have 14 item libraries around London and Brighton. Since their inception in 2014, 110 tonnes of e-waste have been saved from landfill, 220 tonnes of carbon emissions have been prevented and borrowers have collectively saved up to £600,000[29]. Within the north London area, LoT have four active projects, two are located in Hackney (Dalston and Hackney Wick[30]) and two in Camden (Kentish Town and Kilburn).

Table 8: LoT data received from schemes in Hackney (Dalston) and Camden (Kentish Town and Kilburn)

Borough	LoT	People borrowing	Items borrowed	£ saved by residents[31]	Waste avoided	Carbon saved
Hackney[32]	Dalston (Since Dec 2021)	1,920	2,829	£92,000	18 tonnes	35 tonnes
Camden[33]	Kentish Town (Since Sept 2021)	1,491	2,292	£74,000	14 tonnes	28 tonnes
	Kilburn (Since March 2023)	353	472	£15,000	3 tonnes	6 tonnes

The impacts of three of the schemes within north London are outlined above in Table 4; Library of Things apply a range of assumptions which help to derive estimated impacts, in terms of cost, waste and carbon saved[34]. Collectively across the three north London schemes for which we have data, over 5,000 items have been borrowed which is expected to have saved users approximately £180k, avoided 35 tonnes of waste and saved nearly 70 tonnes of carbon.

3.4.3 Clothing / textiles

With approximately 300,000 tonnes of textiles ending up as household waste in the UK each year (and being disposed of via incineration or landfill) and less than 1% of material used to produce clothing being recycled into new clothing[35], the opportunity posed by clothing and textile reuse is significant.

Events specifically targeted at textiles reuse can provide an opportunity to engage with the community to inform them about the impact that textiles have on the environment, as well as facilitating a local space where individuals can bring clothes they no longer use and swap it for those that they need (often referred to as 'swishing' events). In light of the cost-of-living crisis, these events also offer a cheaper alternative to buying new. Such events are typically held by local community groups and volunteers, and are informed by best practice, including how to choose a suitable venue, publicise the event, recruit

[29] https://www.libraryofthings.co.uk/
[30] This facility is held in partnership with London Legacy Development Corporation and Stour Studios
[31] Based on average price of £140 to buy new, versus the average item rental cost of £10.50.
[32] All-time data recorded up to June 2023.
[33] All-time data recorded up to September 2023.
[34] How we calculate our impact | Library of Things
[35] https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1952/1952.pdf

volunteers and what should be done on the day of the event. Many authorities / councils / groups distribute information regarding this, and some have 'swishing kits' which are available to hire and use for the event, including resources such as clothing rails, clothes hangers and mirrors. In order to gain effectiveness, clothing reuse events can be aimed at certain demographics (e.g. men / women, children) or specific items (e.g. school uniform).

Case Study – East London Waste Authority (ELWA) School Uniform Bank

The school uniform bank project is delivered by Recycle for Your Community (Keep Britain Tidy) in partnership with ELWA and their four east London boroughs. The aim of the project is to reduce textile waste through school uniform reuse, while helping families to save money and promote sustainable shopping.

Through the project, advice is given as to how a pre-loved uniform stall can be set up, including how to engage volunteers, locating space for storage, the running of the stalls and how to source equipment (e.g. hangers and clothes rails). Participating schools receive a free labelled donation bin to aid with the collection of reusable school uniform, which is then redistributed through these events. During these events, the number of items being reused is recorded and shared with the project team.

Year	Borough	Number of schools	Items reused	Environmental / economic impact		
				Weight	CO2 emissions prevented[36]	Cost savings
2023/24 (April-Oct 23)	Havering	8	975	190.85kg	528.62kg	£6,038.47
	Redbridge	6	111	22.46kg	82.32kg	£922.29
2022/23	Barking & Dagenham	4	52	10.27kg	36.31kg	£355.11
	Havering	8	1,012	157.75kg	649.10kg	£5,563.32

Using the data outlined above, each piece of school uniform that is reused through these events has the potential to prevent between 0.54kg and 0.74kg of carbon emissions and save individuals between £5.49 and £8.30.

In the UK, appetite for purchasing second hand good is increasing, with 55% of individuals stating that they have bought at least one second hand item within the last six months (an 8% increase from the previous year)[37]. There are a variety of means in which textiles and clothing can be resold, with some popular online platforms for doing this including eBay, Vinted and Facebook Marketplace. For those without access to digital sites, there is opportunity to visit second hand outlets and charity shops on the high street. Charity shops rely on donations through clothing banks and donations in-store, and then redistribute items through their stores at a low cost. There are also options for those unable to travel to clothing banks / charity shops to donate unwanted textiles through a charity collection service. TRAID, a London based charity with 12 shops on the high street, are one of many charities who offer a free clothes collection service.

[36] To estimate this impact, Fixometer reference data was used: Fixometer reference data - 2021 - Google Sheets
[37] https://www.letsrecycle.com/news/fcc-yougov-reuse-research/

3.5 Repair

Sitting alongside reuse towards the top of the waste hierarchy, the repair of damaged / malfunctioning items is an effective way in which the useful life of an item can be prolonged and therefore prevented from becoming waste. This is environmentally beneficial, as carbon emissions from the manufacturing process of buying new are avoided.

Figure 5 below outlines the different avenues for repair which can be accessed within north London. It appears that there is a higher concentration of outlets for repair within the more central boroughs, while this is much sparser for Barnet and Enfield. The majority of outlets for repair relate to electricals, which may lend itself to the type of product and safety risks which could come with undertaking such repairs at home / unprofessionally, therefore creating a demand for these businesses. In light of this, there are much fewer dedicated outlets for textiles and furniture repair, as many residents may already have the appropriate skills or be willing to learn repair techniques relating to these items, due to there being less perceived risk associated with this.

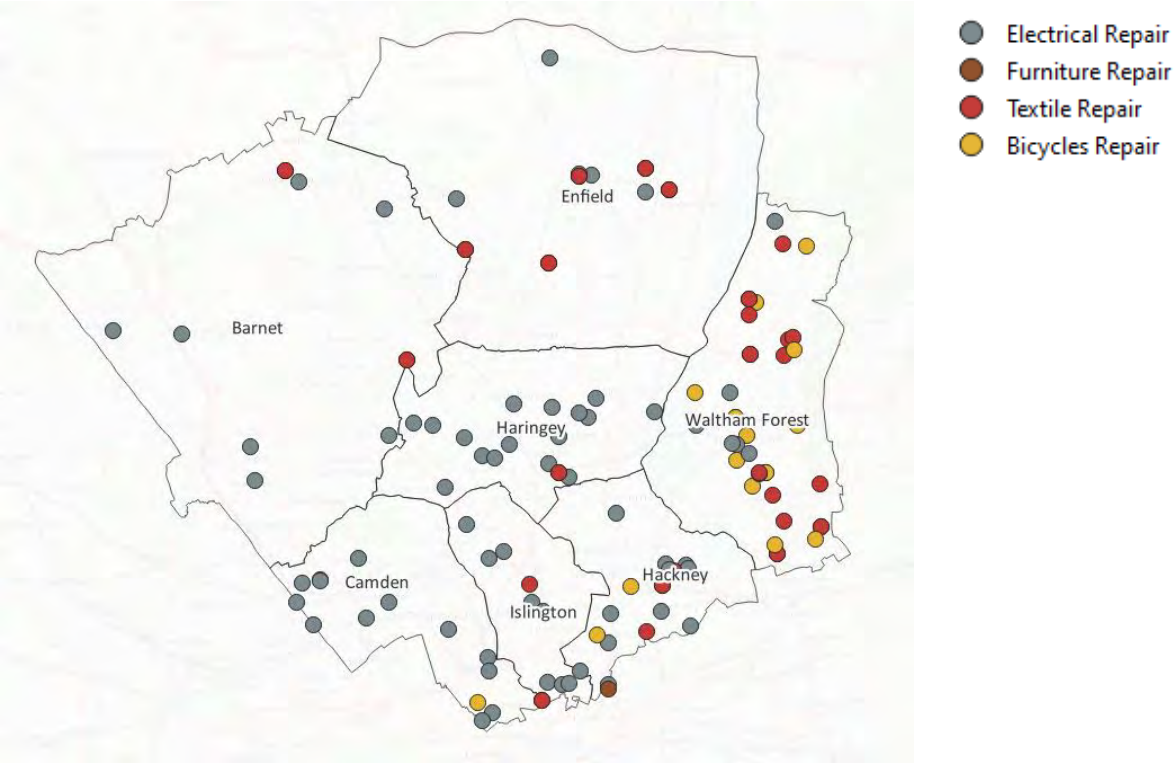


Figure 5: A map outlining different locations for repair within north London (data compiled by Frith Resource Management from various sources, September / October 2023)

3.5.1 Repair Groups

One way that individuals can access repair services is through repair events (sometimes referred to as 'pop up' repair cafes), where people can bring items to be repaired for free, or a small charge. These are typically held by community repair groups and volunteers, and often take place in locations such as village halls and community centres. The types of items which are able to be repaired at such events will depend on the capability of the repair volunteers available, but examples may include electrical items, garden tools, furniture and bikes.

As well as providing the environmental benefits of repair services, these events create welcoming spaces to bring people together and make repair easy and accessible. They also provide an opportunity for individuals to gain skills and advice from volunteers, while volunteers can take value from knowing they have helped to make a difference within their community. There are also financial benefits for residents taking items for repair to avoid the need to buy a new item.

The Restart Group is a network of over 600 repair groups in more than 20 countries who hold repair and fixing events. They provide a platform for individuals to share skills and gain confidence in repair, they also campaign for the Right to Repair, which aims to change regulations on how products are made, to ensure that they are able to be repaired. As part of this network is Restarters.net, a unique tool which measures the impact that each fixing event has had. Taking available information from fixing groups across London, the data below estimates the impact that may be achieved through hosting one event.

Table 9: Potential impact of holding one repair event, based on data from 30 fixing groups within London[38]

Averages based on data taken from 30 fixing groups operating within London. Source: Restarters.net				
Number of items brought to event	**Repair rate**	**Number of repaired items**	**Total waste prevented**	**Total CO_2 prevented[39]**
32	49%	16	45kg	487kg

Although repair events are typically held by community groups, there is opportunity for councils and authorities to publicise and raise awareness about such events, or support with the provision / facilitation of venues.

Case Study – The Big Fix, Recycle Devon

The Big Fix is a project developed by Recycle Devon, which aims to counteract throwaway culture by promoting and encouraging residents to make use of their local repair cafes. The first Big Fix event in 2019 saw over 40 volunteers from repair cafes across Devon repair 268 items in just one day.

Following the success of the first event in Devon, the event has been held nationally every year since. In 2022, 50 repair cafes and 580 volunteers took part in the event across the UK, mending 1,100 items and saving 31 tonnes CO_2e. Most recently in 2023, the Big Fix ran throughout the whole month of May.

3.5.2 Upskilling / Workshops

As well as encouraging the use of repair cafes and events, it is also useful to upskill individuals and teach them how they can undertake repairs themselves. A number of councils provide courses, such as basic sewing skills and how to make garments from existing fabric, through their respective adult education / learning services. Some courses are offered to the public at no cost, while others incur a small fee.

[38] Data based on the average event length of approximately 3 hours
[39] https://talk.restarters.net/t/how-do-we-measure-the-environmental-impact-of-events/6077

For minor / common repairs, local authorities may also distribute advice and tutorials via their websites, for residents to fix their own items.

Case study – Repair Week, London Recycles

Repair Week is an annual event in London (organised by London Recycles, the recycling campaign for London) which aims to increase awareness around repair. A number of events are held throughout the week including repair cafes for residents to take broken items and workshops where skills are taught to repair a number of goods (bicycles, musical instruments, clothing).

Repair hacks are also shared throughout the week and are available on the dedicated 'Repair Week' website, which is available all year round. These 'hacks' give advice on how to repair bicycles and certain electricals, how to repair and remove stains from textiles, and tips for repairing general items around the home.

3.6 Refill

Refill is the act in which individuals can purchase goods within their own containers, creating less waste. Through the uptake of this approach to shopping, packaging can remain in the system, and enables a move away from single use packaging. This creates a more efficient process in terms of energy, materials and waste generation, as individual packaging and containers do not need to be manufactured.

Some may be hesitant about participating in this sustainable form of shopping due to unfamiliarity with the system and a lack of clarity around pricing, due to this being predominantly weight based. Therefore, there has been a low uptake of refill within mainstream supermarkets, so there is dependence on local refill shops within the community. To encourage more users to participate, price differences between packaged and refill products could be clearly communicated, and having staff on hand to assist shoppers, should they be confused or using the system for the first time, may also prove useful.

Case Study – Top Up Truck, north and east London

Top up Truck was an idea born out of the pandemic, which used an electric milk float to drive around neighbourhoods in north and east London to provide a door-to-door service offering refill of groceries. Not only did this concept reduce the quantity of single-use packaging encountered by consumers, but it also created a sense of community amongst shoppers who were otherwise isolating within their homes. Following the pandemic, the scope of the business was increased to make this opportunity more accessible for a wider demographic.

Top Up Truck received a business grant by ReLondon, from the Mayor of London's Green New Deal fund. This resource meant that a trial could be undertaken which added the option for people to pre-order items in reusable containers, which could then be refilled on the truck's future rounds. Results from the trial (December 2021 – March 2022) found that 7,567 pieces of plastic had been saved through this model, with 96% of their products continuing to be sold in customers' own containers.

Through offering both initiatives (ability to bring your own containers, or order products in reusable containers), it enabled them to engage with existing customers, as well as acquire new ones.

A map of current refill shops and facilities within north London, with a permanent address, are shown in Figure 6. As observed with the distribution of all reuse locations, areas for refill are more densely located within Camden, Islington and Hackney, the most central, Inner London boroughs, suggesting a demand for such facilities within these areas.

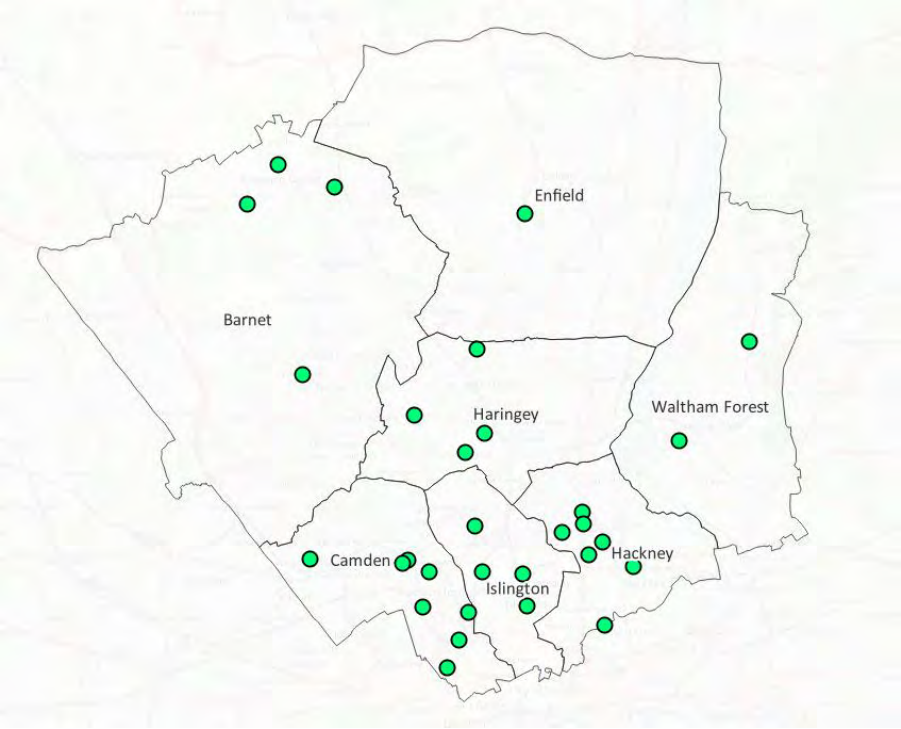


Figure 6: A map outlining the different shops / opportunities for refill within north London (data compiled by Frith Resource Management from various sources, September / October 2023)

Case Study – Refill Station, Camden

Refill Station in Camden is a stall where household cleaning and body care products can be dispensed into customers' own containers. These products are available to purchase over four days of the week at 3 different markets within the borough.

An e-cargo bike is also used, which sells a range of dried herbs, spices and teas. These products are available to purchase over three days at 2 different markets within the borough.

This project was originally funded by ReLondon and is supported by NLWA and a number of other partners.

3.7 Signposting

It is good environmental practice for residents to be made aware of, and signposted to, activities related to the reuse and repair of goods. As a society, we have high levels of consumption, and the instinct when something is unwanted or broken, is to get rid of or replace it. This has negative consequences, as materials which could be used elsewhere become wasted, additional environmental impacts occur from making a new product and more items end up being disposed of. The available routes to reuse and

repair need to be obvious to the public, as individuals may not always consider reuse or repair as an option. The ideal situation, from an environmental viewpoint, is to make it easier for residents to reuse or repair an item, than dispose of it, and / or purchase a replacement.

At present, NLWA currently provide residents with access to an electrical repair directory which covers north London and beyond. Users are able to filter outlets by the type of product they wish to repair, in order to make the experience as efficient as possible.

Case Study – Signposting zero waste facilities, Buckinghamshire Recycles

Buckinghamshire Recycles, Buckinghamshire Council's dedicated recycling webpage, hosts a 'Bucks Zero Waste Map' on their site. Information has been collected about all the facilities available within the county to help residents reduce, reuse, repair and recycle their waste.

The map shows zero waste shops (including refill and library of things), places for repairs / upcycling / crafts, nappy libraries (different types of reusable nappies can be borrowed), community fridges, recycling drop off points and Household Waste Recycling Centres (HWRCs).

3.8 Funding

Despite the positive benefits that different methods of reuse can have, difficulty can often be faced regarding the funding of such initiatives. Businesses and organisations can be reluctant to uptake reuse initiatives as it does not always align with motivations to increase profitability, which takes precedence over any social benefits which can be achieved through reuse[40]. Therefore, opportunities for reuse are often up taken by the third sector, and although this may provide opportunities to raise funds (e.g. through selling second-hand items, repairing goods), initial funding to start up reuse initiatives is not always readily available and can present barriers. A number of funding avenues are outlined below.

3.8.1 NLWA reuse and recycling credits

In order to support third sector organisations operating in north London whose work contributes to diverting items from the waste stream through reuse and recycling, NLWA pay reuse and recycling credits. The value of the credit is paid on each tonne of material reused or recycled and recognises the disposal savings to the authority made by this reuse or recycling activity.

In 2022/23 the value of the credit was £83.67 per tonne. Nine charities took advantage of this scheme during this period, worth a total of £188,600. Overall, these charities collected 2,254 tonnes of furniture, textiles and books for recycling. This was an increase from 1,888 tonnes in the previous year.

[40] https://www.circularonline.co.uk/research-reports/barriers-to-reuse-at-organisational-level/

3.8.2 NLWA community fund

NLWA have established a community fund which supports community-based organisations who undertake waste prevention initiatives, which enables change at grassroots level, taps into existing community networks and creates local advocates.

In 2022/23, the authority rewarded £75,625 to seven projects delivering activities at the local community level. Organisations provided a variety of in-person waste prevention focused activities for residents to participate in. Activities included electrical repair delivered by young trainees, woodwork training events and infrastructure support for refill distribution activities. Some also used the funding to improve infrastructure associated with their operations that directly benefit residents.

In recognition of the success, the fund has increased to £250,000 for 2023/24 (£150,000 available for small to medium projects and £100,000 available for large projects).

Case Studies – Recipients of the North London Community Fund

2econd Chance

2econd Chance (Barnet) is a not-for-profit computer recycling group who are committed to reducing e-waste and providing IT training for those with specialist needs or disabilities. Trainees learn how to refurbish donated machines (desktops, laptops, tablets), which are then sold to the community at affordable prices.

As a recipient of the community fund in 2022/23, they will be running a refurbished machine donation scheme. The aim of this is to reduce the quantity of IT equipment going to waste, as well as supporting Barnet's most vulnerable residents.

Fashion for Future

Fashion for Future (Hackney) is a community group aiming to reimagine textile waste. Their shop, based in Dalston, holds swap events where individuals can donate their unwanted textiles in exchange for a voucher (based on the brand, usage and quality of the items) which can be spent within the shop. Since opening the shop in April 2022, they have prevented 25.8 tonnes of carbon, 11.62 million litres of water and 606kg of waste.

Fashion for Future received funding within the 2022/23 period and will be offering 112 workshops around clothes mending and redesigning, aiming to reach 1,120 residents of north London.

3.8.3 Green New Deal Fund

The Green New Deal Fund is part of the Mayor of London's ambition to make London a zero carbon city by 2030. To achieve this, funding is available to boost green jobs, tackle the climate and ecological emergencies, improve air quality and address inequalities.

The Mayor of London engaged ReLondon to deliver a range of interventions with part of this funding, who supported 54 businesses with £590,000 worth of Green New Deal grants. These businesses also received 550 hours of expert business advice from the ReLondon team between February 2021 and June 2022.

In a 6-month period, the businesses who received the funding and were piloting new products and services and managed to divert more than 11,500kg of materials from waste streams.

3.8.4 National Lottery Community Fund

The National Lottery Community Fund gives grants to organisations in the UK to help improve their communities, through delivering projects focussed on several areas, including the environment. Voluntary or community organisations can apply for funding of between £300 and £10,000; in 2022/23 the scheme awarded more than £615 million in over 13,800 grants, 1,719 of which had an aspect of environmental action[41].

Case Study – Malvern Hills Repair Café[42]

In May 2015, Malvern Hills Repair Café was awarded £9,305 by the fund to allow them to expand by developing a training plan for volunteers to run their own repair cafes, which led to the establishment of the Repair Café Herefordshire and Worcestershire. They were also able to develop an outreach programme of visits to schools and colleges. Malvern Hills Repair Café received a second grant of £10,000 in July 2019, which allowed for them to establish Repair Café West Midlands and consider the introduction of a mobile repair café for the smaller, outlying parishes in the District.

3.8.5 Procurement and social value

Social value refers to the positive value (financial or non-financial) that organisations can create for a local community, the economy and the environment, through their activities. A method in which social value can be created within local communities, is through its inclusion in procurement activities. Under the Social Value Act 2012, all public bodies should 'consider' social, environmental and economic impacts when procuring services. Within Central Government procurement contracts, social value must have a minimum 10% weighting. While there is no prescribed weighting for local authority contracts, the current average is between 10% and 20%, with some authorities going as high as 30%. Whilst not a funding body in itself, effective procurement with social value evaluation encourages private sector funding for activities such as repair and reuse.

Case study – Manchester Renew Hub

The Renew Hub in Manchester is a collaboration between SUEZ and Recycle for Greater Manchester (R4GM), in partnership with Greater Manchester Combined Authority (GMCA) and nine local authorities in Greater Manchester. In 2018, GMCA began the procurement process for their waste management contracts and allocated a 15% weighting to social value within the evaluation. In response to this, SUEZ (the successful bidder for this

[41] The National Lottery Community Fund, Annual Report and Accounts 2022-2023

[42] https://www.malvernhillsrepaircafe.co.uk/about#:~:text=In%202015%2C%20a%20Big%20Lottery,Caf%C3%A9s%20in%20the%20two%20counties.

contract) developed a set of 54 commitments which were designed to achieve value from Greater Manchester's waste. One of these commitments was the development of a Renew Hub within the area. The Renew Hub, which is located within a former In Vessel Composting building, opened in 2021 and aims to reclaim the value of household items through repair and upcycling.

Dedicated deposit areas are located at each of the 20 Household Waste and Recycling Centres (HWRCs) within Greater Manchester, where residents are able to donate their unwanted items for reuse. Donated items are taken to the Renew Hub where they are cleaned, mended and upcycled where necessary. These items are then sold at an affordable price at one of three Renew shops in Manchester or sold on the hub's eBay page. Profits from the sale of goods are distributed to local charities, as a minimum, Suez guarantees donations of £100,000 per year to Greater Manchester Mayor's Charity, and £220,000 every year to the R4GM Community Fund. The R4GM fund supports projects aimed at reducing waste and increasing recycling and re-use. Within the first two years 46 groups were funded across Greater Manchester.

The Hub is also equipped with dedicated pods which focus on the repair of specific streams, such as electricals, furniture and bicycles. There is also a dedicated space for community events, where classes and workshops are held to teach repair skills to residents. Alongside efforts to drive towards a circular economy, the Renew Hub provides social value to the area through providing training opportunities; through partnering with local charities, hundreds of hours of training and work experience are delivered each year, helping individuals to gain experience and secure job opportunities. The Renew Hub has employed more than 30 people and supported 18 more through a placement or training.

In the Hub's first year of operations, the facility renovated and resold c.50,000 items, diverting over 500 tonnes of material from landfill. The authority has increased the amount of waste diverted from landfill (through this and other measures) from 90% to 98% between 2017 and 2021.

3.9 Summary

Once items are already in circulation, the useful life of such products can be prolonged through reuse and repair, which can enhance resource efficiency and improve the security of critical material supply. As discussed above, there are already many initiatives in place within north London for residents to engage with, however there is scope to increase the coverage of these, provide a wider range of opportunities and continue to raise awareness amongst all residents.

4 Collection Modelling Overview

This section of the report focuses on the approach undertaken to appraise a variety of different kerbside collection services. It is underpinned by an understanding of the current waste collection systems operated by each of the boroughs and uses industry benchmarks to assess the potential performance and cost of alternative collection systems. All modelling has been undertaken using a 'bottom-up' approach, modelling the impacts for each individual borough and combining these to derive results at a north London level. For the purposes of this report all results are presented at the north London level however the individual results have been presented to each borough.

4.1 Summary of the current waste collection systems

The waste collection systems delivered by the boroughs in the baseline year (2021/22) are outlined in Table 10 and

Table 11 below. For street level properties, all boroughs provide collection services for dry recycling, garden waste, food waste and residual waste. All residents in estates and flatted properties receive dry recycling, food waste and residual waste collections. This is except for Barnet who do not currently have a dedicated food waste collection service in place.

All boroughs operate a single stream commingled[43] collection method for dry recycling (through varying frequency and container types) and the majority have a subscription-based garden waste collection service[44] in place for appropriate properties (in the majority of cases there is no, or a minimal, garden waste collection service from flats and estates). Food waste collections are operated on a weekly basis and residual waste is collected within varying containers sizes and frequencies.

NB: There may have been changes to how services are delivered since 2021/22 which will not have been reflected here.

Table 10: Current waste collection system – Street level properties

		Barnet	Camden	Enfield	Hackney	Haringey	Islington	Waltham Forest
Street Level properties	Residual	Weekly, 240L WHB	Weekly 120L WHB/ Fortnightly 240L WHB[45]	Fortnightly, 140L WHB	Fortnightly, 180L WHB	Fortnightly, 240L WHB	Weekly, Sacks	Weekly, 140L / 240L WHB
Dry Recycling (commingled)	Weekly, 240L WHB	Weekly, Sacks / 240L WHB	Fortnightly, 240L WHB	Weekly, Sacks	Weekly, 240L WHB	Weekly, Sacks	Weekly, 240L WHB + Sacks	
Garden	Fortnightly (charged), 240L WHB	Weekly (charged), Sacks / 120L WHB	Fortnightly (charged), 140L / 240L WHB	Fortnightly (free) 140L WHB / reusable sack	Weekly (charged), 140L / 240L WHB / sacks	Fortnightly (free), sacks[46]	Commingled organics, Fortnightly Kitchen	

[43] This means all recycling placed in a single container (e.g. the glass, cans, plastic, paper and card)
[44] There is a separate charge levied for the use of the garden waste collection service
[45] Camden operate a combination of weekly and fortnightly residual waste collections across the borough. Residents with a weekly collection have a 120L WHB whilst residents with a fortnightly collection have a 240L WHB, therefore all residents receive the same average weekly capacity regardless of collection frequency.
[46] Organics are co-collected across Islington.

							caddy / 240L WHB	
Food	No service	Weekly, Kerbside + kitchen caddy	Weekly, Kerbside + kitchen caddy	Weekly, Kerbside + kitchen caddy	Weekly, Kitchen caddy + 240L WHB	Weekly, Kerbside + kitchen caddy		

Table 11: Current waste collection system – Flats and Estates properties

		Barnet	Camden	Enfield	Hackney	Haringey	Islington	Waltham Forest
Flats & Estates	Residual	Weekly, 240L WHB / Sacks / communal	More than weekly, 240L WHB / Sacks / communal	Fortnightly, Sacks / communal	More than weekly, Sacks / communal	More than weekly, Sacks / communal	Weekly Sacks / communal	Weekly, 140L / 240L WHB
	Dry Recycling (commingled)	Weekly, 240L WHB / sacks / communal	Weekly, Sacks / communal	Fortnightly, 180L / 240L WHB	More than weekly, Sacks /communal	More than weekly, sacks / communal	Weekly Sacks / communal	Weekly, 240L WHB + Sacks
	Garden	Minimal service[47]	Minimal service	Minimal service	Minimal service	No service	No service	Minimal service
	Food	No service	Weekly, Kitchen caddy / communal bin	Minimal service[48]	Weekly, 140L WHB	Weekly, 140L WHB	Weekly, Kerbside + kitchen caddy	Weekly 140L WHB

Distinguishing the collection service by property type is an important factor for this Options Appraisal and for future service provision by the boroughs. As such a separate set of assumptions has been applied relating to the performance and costs for street level properties and for flats and estates properties. Furthermore, property growth in all boroughs is assumed to be predominately in the number of estates and flats. Flats above shops (FLASH) were modelled according to the collection service in operation across each borough, for example, in some boroughs waste and recycling arisings from FLASH are collected with the street level properties, whilst in other cases it may be collected on other rounds such as those collecting from flats and estates. For best practice on flats, estates and FLASH collections, see section 5.9.

4.2 Current performance

Figure 7 below shows the recycling performance of the seven north London boroughs between 2005/06 and 2021/22, as well as the north London average. Generally, there has been an improvement in performance since 2005/06, with the average recycling rate increasing from 20.5% in 2005/06 to 30% in 2021/22. A peak in performance was observed during 2014/15, after which there has been a gradual decline.

[47] Minimal garden waste collection from flats. Where there is any garden waste arising from flats it is assumed that this is collected with the street-level collection service.
[48] Minimal food waste collection from flats. Any food waste arising from flats is collected with the kerbside food waste collection.

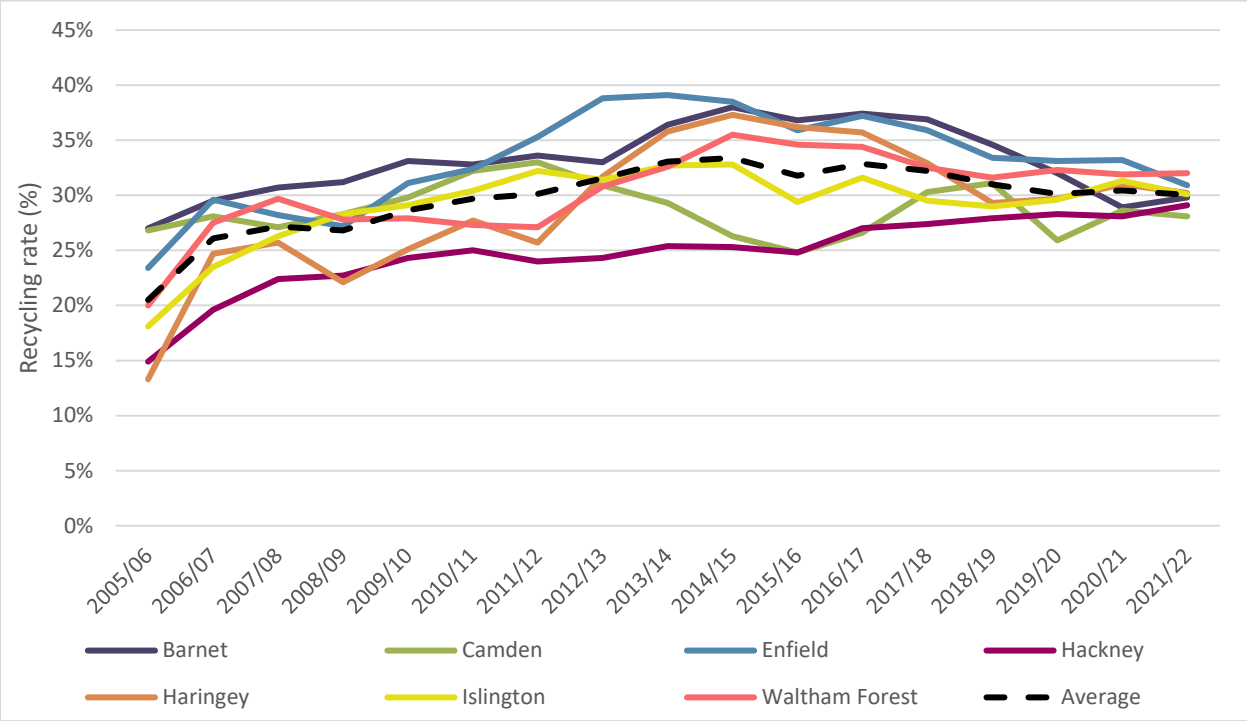


Figure 7: Historic recycling rate of all seven Boroughs, and the combined average (2005/06 - 2021/22)

Analysis has been undertaken to benchmark the seven north London boroughs with all other London authorities, the results of which are shown in Figure 8. Waltham Forest and Enfield are the mid-performers within this group, with recycling rates of 32% and 30.9% respectively. All other north London boroughs are amongst the middle to lower performers. The two top performing authorities include London Borough of Bromley (48.7%) and the Royal Borough of Kingston upon Thames (48.1%). However, it must be noted that both boroughs, and the eleven other highest performers within this group, are all outer London boroughs, which can impact the level of recycling able to be achieved. Inner London boroughs (which include Camden, Hackney and Islington) typically have higher levels of housing density and transiency, which can make it more difficult to get residents to engage with recycling collections. In addition to this, deprivation levels are generally elevated, which may also have a negative impact on recycling performance, with studies showing that higher deprivation rates can be linked to lower levels of recycling[49].

[49] https://wrap.org.uk/resources/guide/increasing-recycling-urban-areas#download-file

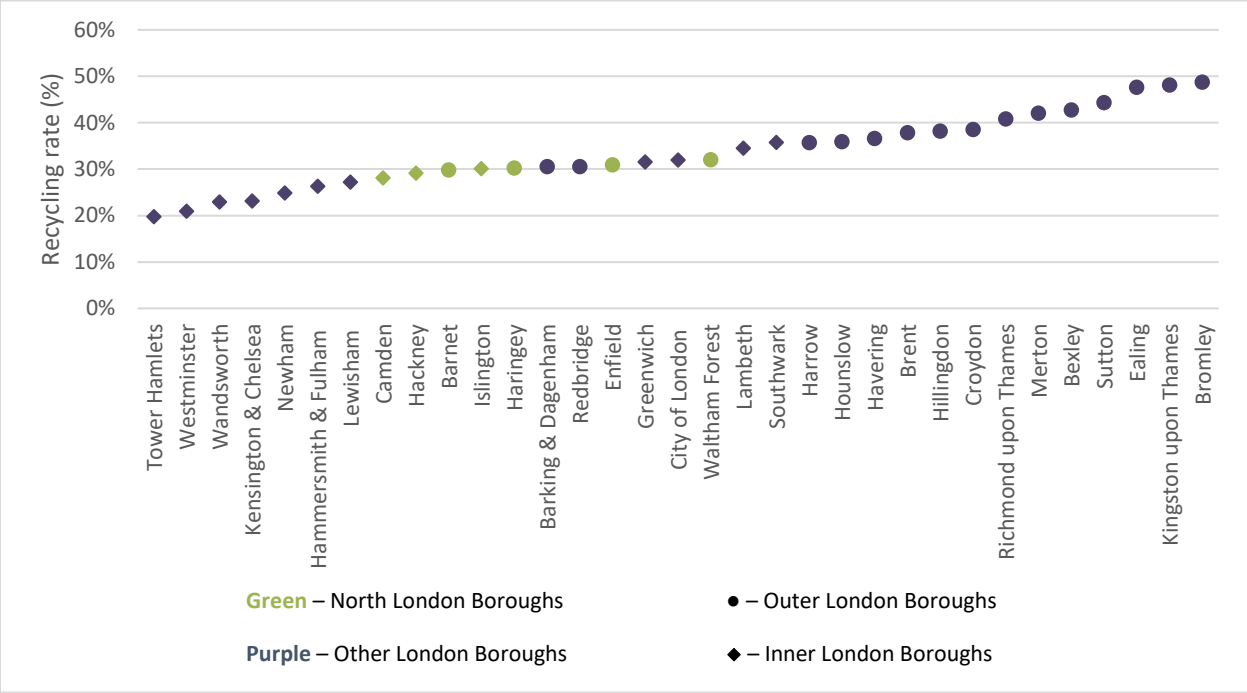


Figure 8: Recycling rates of the seven north London boroughs, compared to all other London boroughs (2021/22)

4.3 Alternative Options

The alternative options which have been modelled as part of the Options Appraisal are outlined in Table 12 below. These options have been designed to reflect the key aspects of the Government's Consistent Collections proposals and were agreed by NLWA and its constituent boroughs in May 2023. NB: this was prior to the outcomes of the public consultation and the announcement that 'Consistent Collections' would be replaced by 'Simpler Recycling'. The evaluation of the results have been undertaken based on our current understanding of the Government's proposals (as of November 2023).

An additional 'bespoke' Option 4 has been modelled for each borough to allow them to explore the potential cost, performance and operational impacts of a collection system of their choosing. The results of which are provided to each borough.

Table 12: Alternative collection options modelled for all boroughs

	Baseline 2030	**Option 2**	**Option 3**
	Baseline in 2030 *+ separate food waste collections, DRS/EPR, simpler recycling*	***Twin stream, year: 2021/22*** *+ separate food waste collections, DRS/EPR, simpler recycling*	***Multi stream, year: 2021/22*** *+ separate food waste collections, DRS/EPR, simpler recycling*
Dry recycling	As per current service, based in 2030.	Alternate weekly twin stream collection (1: paper / card, 2: mixed plastic / metal / glass) via 2 wheeled bins.	Weekly multi stream collection (1: paper / card, 2: cans, plastic bottles and pots, tubs and trays, 3: glass) via 3 boxes.
Garden waste	As per current service, based in 2030.	As per current service.	As per current service.

Food waste	Separate food waste collection for all properties, where not already provided, including flats.		
Residual waste	As per current service, based in 2030.	As per current service.	As per current service.

In all alternative options, separate food waste collections are introduced, for both street-level properties and flats (where not currently delivered). Each option has been evaluated against an agreed set of evaluation criteria, which includes both quantitative (performance, cost, carbon) and qualitative criteria (deliverability, alignment with policy, social value etc). For further information on evaluation criteria, see section 5.

A baseline model has been modelled for each borough to provide a summary of the current collection service operated in each area, and to provide a basis in which to compare each of the alternative collection options against. The year 2021/22 has been chosen as the baseline year. The 'Baseline 2030' option models the current service projected ahead to 2030, using household and property numbers from a waste growth projection model developed as part of the wider Strategy development process. Alternative options 2 and 3 are modelled using the baseline year of 2021/22 for comparison purposes.

4.3.1 Modelling assumptions

For each borough a full set of assumptions has been applied to model the baseline and alternative collection options. These include a combination of common and bespoke option assumptions, as agreed with respective boroughs.

As mentioned, distinguishing the collection service by property type is an important factor for this Options Appraisal and for future service provision by the boroughs. As such a separate set of assumptions has been applied relating to the performance and costs for street level properties and for flats and estates properties. Furthermore, property growth in all boroughs is assumed to be predominately in the number of estates and flats. FLASH properties were modelled according to the collection service in operation across each borough.

The common assumptions that have been applied in all alternative options include the following:

- Separate weekly food waste collections
- Implementation of Deposit Return Scheme (DRS) and Extended Producer Responsibility (EPR)
- Introduction of plastic film collections within dry recycling stream
- Contamination levels of dry recyclable materials
- Consistent container types and size requirements for dry recycling and food waste collections.
- All vehicle fleet operated in 2030 (Baseline 2030) will be electric[50]
- Flats and estates and FLASH properties will retain a commingled collection service across all alternative options.[51]

[50] The majority of boroughs have already committed to low / zero emission or electric fleets by 2030
[51] We have assumed for the purposes of modelling that the flatted properties, flats above shops and estates will not be able to, in general, switch to a twin-stream or multi-stream dry recycling collection and so would maintain a single stream commingled collection.

Individual borough-specific assumptions were then applied where necessary to reflect particular local operations. These were each presented and agreed with boroughs and include the following:

- Number and type of property (i.e. street level, flats and estates, flats above shops)
- Estimates for tonnages arising by each property type (dry recycling, garden waste, food waste and residual)
- Number and type of collection vehicle per service
- Dry recycling composition & contamination
- Cost indicators (salaries, vehicle costs, supervision rates etc)
- Operational indicators (no. of crew, average no. of loads)

4.3.1.1 Food waste assumptions

The WRAP[52] 'ready reckoner' for food waste yields was applied as a basis to consider tonnages of food waste that could potentially be collected (notably where food is not currently collected). The ready reckoner formula is based on indices of deprivation and is the most accurate data set available to estimate projected food waste tonnages. The yield selected in each option is influenced by the average weekly residual waste capacity for each borough, and the level of set out and participation are based on evidence from WRAP food waste collection trials. The specific assumptions made for each option are defined in the option descriptions.

4.3.1.2 DRS / EPR assumptions

It was agreed that the potential impact of the introduction of a DRS and EPR, as per the Resources and Waste Strategy for England, will be modelled in all options. The implications of EPR and DRS were both modelled using the 'Resource and Waste Policy Impact Calculator' (RAWPIC)[53].

The RAWPIC tool uses a series of assumptions to model the impact of a DRS and EPR, some inbuilt within the model and others which are 'user defined'. For the purposes of this project, the RAWPIC tool was used to calculate the percentage tonnage change on each borough's dry recycling (by material) and residual collection services (Table 13 below). These new tonnages were then run through the collection model to determine the impact on collection operations.

Table 13: DRS and EPR percentage tonnage changes[54]

	Pre DRS/EPR		Post DRS/EPR	
	Recycling	Residual	Recycling	Residual
North London tonnage impact	117,118	412,404	118,928	401,573
North London percentage change	-	-	+1.5%	-2.6%

[52] The Waste & Resources Action Programme (WRAP) was set up by Government initially and is now a Charity providing guidance on waste and recycling issues.
[53] This is a product developed by Suez and Anthesis with support from LARAC and Kent Waste Partnership
[54] Note, the RAWPIC calculations were based on baseline tonnages and therefore did not account for any changes to collection. Therefore, the tonnages presented here differ to those outlined in Table 14

Reforming the UK packaging producer responsibility (EPR) system aims to achieve better design of packaging (e.g. through increasing recycled material content, improving recyclability of packaging products, light weighting of material or producing refillable packaging). As part of the proposals for reforming Producer Responsibility, Government are proposing that from 2025, packaging producers will be responsible for covering the full net recovery costs of packaging items placed on the market. For local authorities, it is assumed that this includes the cost of collecting, transporting and treating/disposing of materials obligated within the reformed EPR scheme, both recycled and recovered i.e. Energy from Waste (EfW). Although, the detail on how the financing arrangements will be determined is yet to be known, its aim is to transfer the whole cost of managing the packaging waste back to the producers in order to fund local authorities directly rather than via the taxpayer.

One of the potential impacts will be a change in the design and materials used for packaging which in turn may impact the composition and volume of materials collected by councils. This may impact the speed at which various material compartments fill on waste collection vehicles and round design. It is therefore assumed that more packaging items are able to be recycled and/or diverted from the residual waste stream.

A DRS aims to improve overall recycling and resource recovery by placing a redeemable deposit on 'in scope' materials. The system, which is set to be introduced in 2025, is classified as an 'all in' system which means it applies to all single use drinks containers (excepting glass and HDPE plastics, primarily milk bottles). The deposit is modelled as a 20p value added to plastic and metal beverage containers.

There is still uncertainty around what will happen to unredeemed deposits i.e., those packaging items that are covered by the Deposit Return Scheme but that are not returned by a Reverse Vending Machine (RVM), and as such fall into the management of Local Authorities (either through the kerbside collection, street cleansing of litter). Within the latest round of consultation on the RWS, it is proposed that unredeemed deposits will form one of the funding mechanisms for the Deposit Management Organisation (DMO) (for example through the value of unredeemed deposits, revenue from the sale of materials and a producer fee). However, it is anticipated that Local Authorities should be able to claim deposits from the DMO if they collect (and separate) relevant drinks containers in their waste streams.

Similarly to the EPR scheme, this may impact the volume of materials collected at the kerbside, in communal collections or deposited at RRCs.

4.4 Methodology

4.4.1 Collections Modelling (Cost and Resourcing)

The Kerbside Analysis Tool (KAT)[55] was utilised to provide a comparative assessment of cost and operational requirements for the baseline (current) service and has been used to model the agreed alternative collection scenarios. KAT was used to model the performance of the street-level properties and a bespoke excel-based model was developed to model the cost and operational performance of the flat and estate properties[56]. Data proformas were originally completed by council officers and further

[55] KAT is a modelling tool which provides a comparative assessment of cost and operational requirements of the kerbside collection service.

[56] FLASH properties were modelled in accordance with the collection system in operation for each borough.

clarifications were provided on request. Results of the street-level and flats modelling are amalgamated within this report.

The baseline models are designed to reflect the current service operation, at the time of modelling, and are therefore a good representation of the service. All cost elements are **annualised**, including existing bins, vehicles etc and consist of a mixture of actual and standardised costs so should be considered to be indicative (only). This approach allows a 'like for like' comparison against alternative collection systems but would not be reflective of the differential capital investment required to install a new system straight away. In order to calculate actual costs of an alternative system that takes account of existing infrastructure and vehicles, a more bespoke analysis should be undertaken including practical aspects of service implementation (e.g. swapping bins for different elements of the service, transferring/ selling redundant vehicles etc.).

Please note that the costs identified for each scenario are annualised as noted above and the recycling rates outlined within this section are 'kerbside / communal recycling rates' of the core[57] service rather than the total recycling rate of the council.

4.4.2 Whole System Cost Modelling

At present, recycling and the treatment and management of municipal waste across north London is managed by NLWA through a waste levy; a tax on Councils for the cost of managing, transporting, recycling by the Authority.

Due to the complexity of the Levy mechanism, for the purposes of this report, industry standard gate fees for recycling, treatment and disposal have been applied to all options including the baseline, for comparison purposes. Therefore, any treatment and disposal costs are presented as 'notional' costs.

Notional treatment and disposal costs associated with each option have been added onto the collection modelling costings in order to derive an anticipated 'whole system' costs. This takes into consideration the costs of waste handling, processing, treatment and disposal and any revenues for the sale of recyclable materials[58]. **They are not provided as budget setting costs and a further business case will be required to explore the implications on the Waste Levy of any service changes.**

See Appendix A for a summary of the rates applied.

4.4.3 Carbon assessment

The Emissions Performance Standard (EPS) tool[59] was used to calculate the carbon impacts from recycling, transport, treatment and disposal of the waste. The individual arrangements for each of the boroughs were taken into account (destinations, tonnages and materials collected). In doing so, the tonnage and transport information was entered within the tool as appropriate for each option and borough.

[57] This does not include other elements of the collection service such as RRCs, bulky waste and certain specialist collections such as potentially from flats or clinical waste.
[58] Note, although Baseline 2030 models the service in 2030, no costs have been indexed to reflect this.
[59] The EPS performance methodology calculates the carbon intensity of different waste management methods in kilograms of carbon dioxide emitted per tonne of waste managed. https://www.eunomia.co.uk/reports-tools/eps-ready-reckoner-greenhouse-gas-guidance/

The EPS tool is a factors based assessment method for calculating carbon emissions. For Baseline 2030, the factors used have been the ones present within the tool for the year 2030.

As the tool has been prepared by a separate independent consultancy, some input cells have been locked and as such, in some cases factors have had to be applied out of the tool to perform calculations separately.

5 Collection Options Appraisal Results

This section presents and evaluates the performance of all the modelled options (see Table 12) based on their performance against an agreed set of evaluation criteria. The results are presented both quantitatively and qualitatively. For example, quantifiable results are shown for cost or carbon outputs. Qualitative results are demonstrated using a colour coded traffic light scheme whereby green represents the 'best' option and red represents the 'worst' performing option, amber is used for the intermediate ratings.

The criteria with which each of the options are assessed was agreed during a workshop with council officers on 12th May 2023. The agreed criteria are as follows:

- **Recycling Performance** – as modelled through KAT, using agreed assumptions
- **Cost** – developed through collection costs derived from KAT, in addition to cost information from the councils and notional recycling, treatment and disposal costs based on industry data
- **Carbon** – as modelled through the EPS tool
- **Operational Flexibility** – considers how future proofed the service is in relation to vehicle and container requirements
- **Public Acceptability** – an assessment of how each option will be / is accepted by the householder, this considers the level of change required by residents and the number of containers required
- **Alignment with National Policy Direction** – considers how well each option aligns against proposals within the National Resources & Waste Strategy & Simpler Recycling
- **Social Value** – access to a full recycling service, job creation and any other wellbeing or community benefits
- **Deliverability** – considers the operational changes and resourcing required to deliver the options

As mentioned, all modelling has been undertaken using a 'bottom-up' approach, modelling the impacts for each individual borough to derive results at a north London level. For the purposes of this report all results are presented at the north London level however bespoke appendix reports have been developed for each borough to demonstrate the impacts of the alternative collection options for each individual borough.

Note, due to the modelling undertaken in Baseline 2030 being based on a 2030 projection, it should not be compared against other alternative options. Comparison can be made between the Baseline and Baseline 2030 to explore the difference between current and future performance. The Baseline model can also be compared against Options 2 and 3, to review the impact of alternative collection systems with the current service.

5.1 Recycling Performance

A breakdown of the recycling performance achieved for the baseline and baseline in 2030 is outlined in Table 14 and **Error! Reference source not found.**. There is increased material collected for recycling in Baseline 2030, as this is based on the current service projected ahead to 2030 and therefore considers

household growth and associated waste growth. It is assumed that EPR and DRS are fully implemented in this option and as such the impacts are also applied here, however the impact of household growth (and subsequent waste growth) outweighs the reduction in both recycling and residual waste streams that is anticipated as a result of DRS and EPR implementation.

Based on an estimated capture of 85% obligated material, a DRS is estimated to reduce the tonnage of 'targeted' plastic bottles by an average of 16% and 'targeted' metal cans by an average of 25% from the material presented by each borough. This equates to an average reduction in total recycling yields of 2%. It is also estimated to reduce the amount of total residual waste by c.1%. However, when combined with the impacts of EPR, which incentivises the design of recyclable packaging, it is assumed that there will be a slight overall increase in recycling, driven by more materials moving from the residual waste stream to the recycling (namely, paper and card and steel cans) which offsets the loss of some single use plastic drinks bottles and some aluminium cans from the kerbside to the DRS.

Baseline 2030, which models the waste collection service in 2030[60], results in an increased recycling performance of 33%. In this option, the current service is modelled with the addition of a separate food waste collection for all properties (where not already provided) and the collection of plastic film. This results in a proportion of these materials being diverted from the residual stream and therefore recycling performance increasing. Although this option uses a commingled system, which typically increases participation from residents due to the ease of the system, it is expected that all housing growth up to 2030 will be from flats/estates properties only, which restricts the performance of this option (see Section 5.9 for more information on issues faced by flats and estates).

Table 14: Breakdown of the tonnage and recycling performance (Baseline and Baseline 2030)

	Baseline	**Baseline 2030**
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections, DRS/EPR, simpler recycling*
Dry recycling	117,132	121,358
Garden waste	39,537	41,120
Food waste	23,766	44,191
Residual waste	412,404	417,611
Total	**592,838**	**624,280**
North London Recycling Rate	**30.4%**	**33.0%**

[60] All alternative options will perform worse in 2030, versus the 2020/21 models (unless there are further changes) because the housing increase between now and 2030 is anticipated to all be from flatted properties which have a lower potential for high recycling rates. Therefore Baseline 2030 is not comparable to Options 2 & 3.

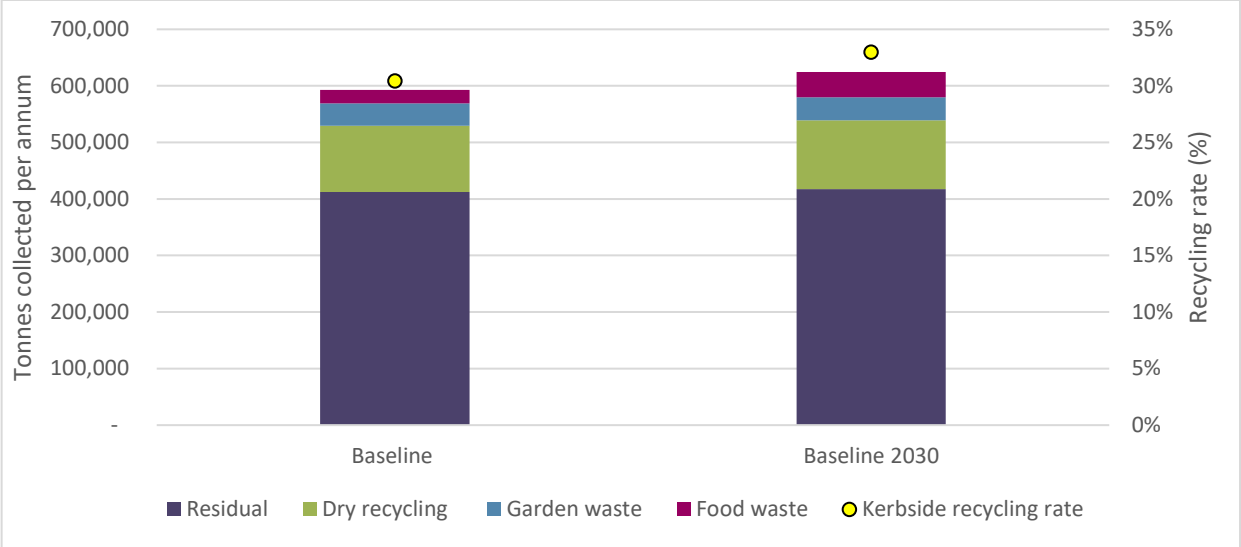


Figure 9: Breakdown of the tonnage and recycling performance (Baseline and Baseline 2030)

NB. The left axis (stacked column) refers to the total tonnes collected in each option, by material stream, whilst the right axis (yellow dot) refers to the recycling rate of each option.

A breakdown of the recycling performance achieved for the Baseline, Option 2 and Option 3 are shown in Table 15 and **Error! Reference source not found.**. Options 2 and 3 also consider the impacts of EPR / DRS and lead to a drop in the overall tonnage collected. For all boroughs, recycling performance increases above the baseline in both of the alternative options, which corresponds to improved results for north London ranging from 32.8% (Option 3) to 33.5% (Option 2).

Table 15: Breakdown of the tonnage and recycling performance (Baseline, Option 2 and Option 3)

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections, DRS/EPR, simpler recycling (21/22)*	*Weekly multi stream + separate food waste collections, DRS/EPR, simpler recycling (21/22)*
Dry recycling	117,132	119,934	115,936
Garden waste	39,537	39,899	39,899
Food waste	23,766	36,442	36,442
Residual waste	412,404	387,546	391,544
Total	**592,838**	**583,821**	**583,821**
North London Recycling Rate	**30.4%**	**33.5%**	**32.8%**

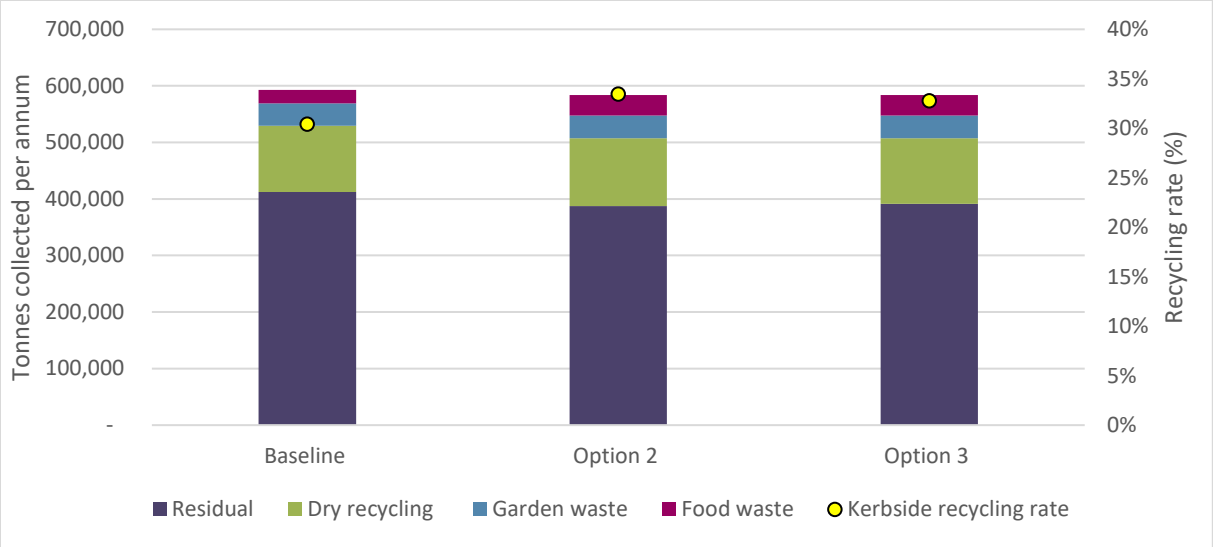


Figure 10: Breakdown of the tonnage and recycling performance (Baseline, Option 2 and Option 3)

NB. The left axis (stacked column) refers to the total tonnes collected in each option, by material stream, whilst the right axis (yellow dot) refers to the recycling rate of each option.

The best performer is Option 2, where all boroughs move to an alternate weekly twin stream recycling collection (fibres collected week 1, dry recycling (plastic, metals and glass) collected week 2). As well as this, a separate food waste collection (where not already provided) is introduced and plastic film is collected for recycling, both of which help to divert recyclable material from the residual waste stream.

Option 3 has the lowest performance of the alternative options, where a weekly multi-stream dry recycling collection is introduced (plus collection of plastic film) alongside a separate weekly food waste collection for all property types (where not already in place). It is expected that recycling rates do not reach the higher levels due to increased requirements of residents to separate their dry recycling into three boxes. This can lower the yield from the service. The reason it offers an improvement over the baseline of 2.4% is primarily because of the added plastic film and additional food waste collections.

It must be noted that the recycling performance derived from this modelling exercise represents the material collected from **street-level, flats and FLASH properties only**. It is anticipated that the overall council recycling rate would be moderated by other tonnages (e.g. bulky waste, RRCs, commercial waste) which are not included within the KAT modelling.

5.2 Cost

5.2.1 Collection Cost

Table 16 illustrates the total annualised collection costs of the baseline and baseline in 2030, which includes the vehicles, containers, staffing, running, standing and overheads costs (but excludes the gate fees for recycling). This means that any capital costs, such as bins and vehicles are included and depreciated over the assumed service lifetime. However, this means that it is not reflective of the differential capital investment required to implement a new system.

Table 16: Total annualised collection costs (Baseline and Baseline 2030)

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Total annualised gross collection cost	£57,849,000	£67,579,000
Difference from Baseline	-	*+£9,730,000*

The annualised collection costs can be broken down by vehicle operating costs, containers, vehicles and overheads. The collection costs modelling results for the baseline in 2030 and how it compares to the baseline is shown in Figure 11.

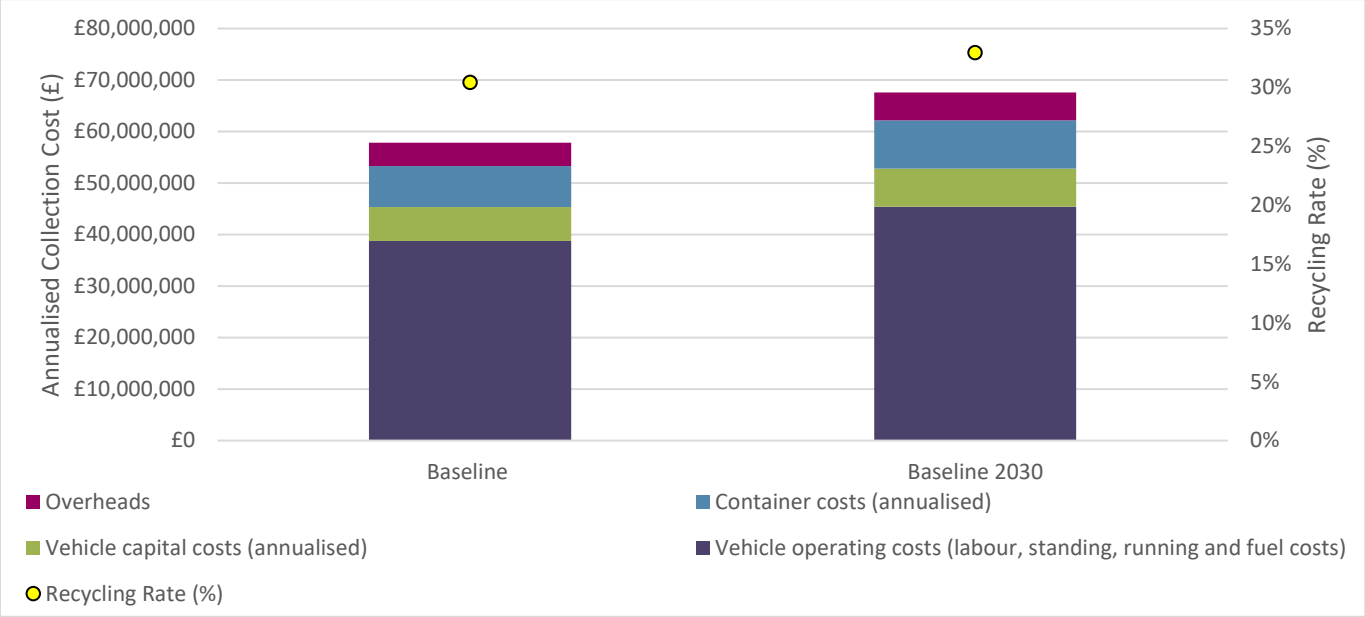


Figure 11: Annualised collection costs, broken down by cost element (Baseline and Baseline 2030)

Baseline 2030[61] is more expensive than the current service due to housing growth and increased resource requirements to operate the service. There is also the introduction of a separate food waste collections, a new service for Barnet, and an expanded service for many of the other boroughs across their flatted properties. This assumption is consistent across all alternative options.

Table 17 shows the total annualised collection costs of Option 2 and Option 3 in comparison to the Baseline. The breakdown of these cost elements are illustrated in Figure 12.

Table 17: Total annualised collection costs (Baseline, Option 2 and Option 3)

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*

[61] Which uses consistent costs with the other options in the model (not inflated)

Total annualised gross collection cost	£57,849,000	£69,567,000	£67,717,000
Difference from Baseline	-	*+£11,719,000*	*+£9,868,000*

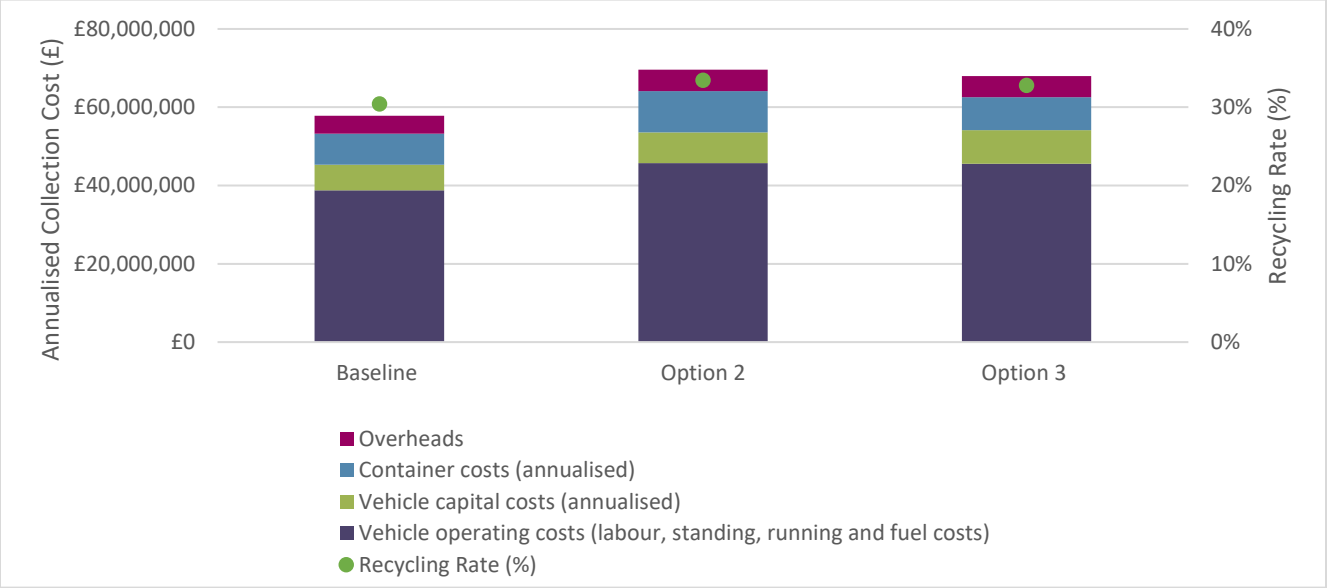


Figure 12: Annualised collection costs, broken down by cost element (Baseline, Option 2 and Option 3)

NB. The left axis (stacked column) refers to the annualised collection costs of each option, broken down by cost element, whilst the right axis (yellow dot) represents the recycling rate for each option.

The results show that each of the alternative options have an increased annualised collection cost higher than the current baseline service and that these costs are primarily driven by vehicle operating costs (which includes labour, vehicle running costs, vehicle standing costs and labour).

The twin-stream collection option (Option 2) results in the highest annualised gross collection cost of all the alternative options, due to a higher number of containers and vehicles being required for this collection system.

The multi-stream collection option (Option 3) results in the second highest annualised gross collection cost of the options modelled. It is worth noting that it has been assumed that food waste will be co-collected with the dry recycling on a multi-compartmentalised vehicle, such as a Romaquip. Should individual boroughs choose to operate dedicated 7.5t food waste vehicles, that would increase the annualised operating costs of operating this service due to the additional resource (vehicles, crew, fuel etc) that would be required to operate a dedicated food waste fleet.

As mentioned, these results present the collection costs only, this is prior to the treatment and disposal costs and any potential revenue from the on sale of material has been applied.

5.2.2 Whole System Cost

The whole system costs of the baseline and alternative options for NLWA and its constituent boroughs are presented in Table 18 and **Error! Reference source not found.**, respectively. These figures include the collection cost modelling results, as discussed in Section 5.2.1, as well as any revenues received by

the councils (e.g. income associated with charged garden waste collections) and the notional treatment and disposal costs of managing the collected waste. This analysis is focused on the collected waste and recycling streams across north London and does not include any additional waste streams including bulky waste, commercial waste, RRCs, street cleansings or others.

The whole system cost modelling results are derived using standard UK industry figures on the following:

- Gate fees for processing facilities
- Material prices for any separately collected material that can be sold for recycling
- Haulage costs where waste streams are transferred for onward processing.

The assumptions applied are provided in Appendix A.

This approach provides NLWA and its constituent boroughs with a basis to compare the indicative whole systems costs and performance of each of the alternative collection options against the current service (Baseline). **However, as mentioned any true whole system cost implications would be subject to a business case analysis to consider the impact on the Waste Levy mechanism which is in place for NLWA and the Boroughs.**

As shown in Table 18, Baseline 2030 incur additional costs to NLWA and the north London boroughs in comparison to the baseline costing £111.2m per annum. The baseline results in the lowest overall whole system cost of all the options modelled at just under £100m.

Table 18: Total annualised whole system cost (Baseline and Baseline 2030)

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Total Whole System Cost	£99,628,000	£111,240,000

Figure 13 provides a breakdown of the whole system cost for the baseline and Baseline 2030 by the different cost elements which contribute to operating and managing the collected waste and recycling. Collection costs are the most significant cost element of the total cost incurred followed by the residual waste treatment costs which is driven by the higher population and tonnage of waste anticipated in 2030.

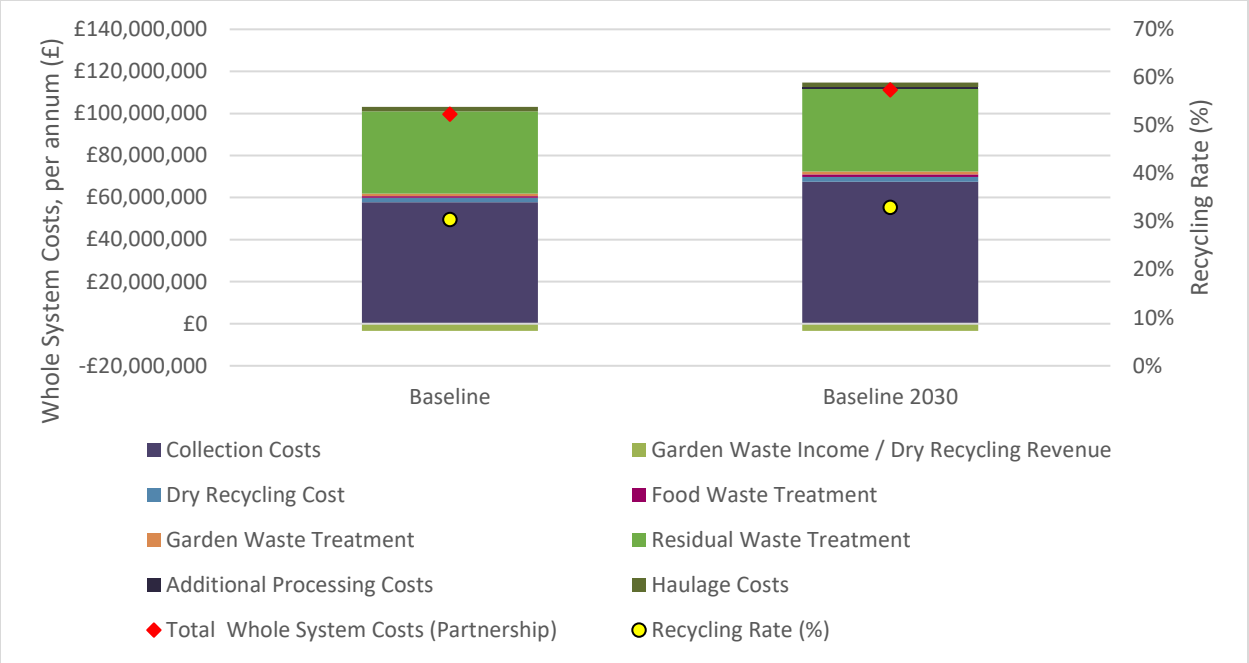


Figure 13: Breakdown of whole system costs by cost indicator (Baseline and Baseline 2030)

NB. The left axis (stacked) column provides the breakdown of the whole system costs. The total whole system cost to NLWA and its constituent boroughs is represented by the red diamond. The right axis (yellow dot) refers to the recycling rate of each option.

Table 19 illustrates the whole system costs of operating the two alternative collection options in comparison to the baseline. Option 2 (alternate weekly twin stream dry recycling) incurs an increase in whole system costs, estimated to cost in the region of £105m per annum. Option 3 (weekly multi-stream dry recycling) is slightly more expensive than the baseline but is largely comparable (c.£700K additional costs).

Table 19: Total annualised whole system cost (Baseline, Option 2 and Option 3)

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Total Whole System Cost	£99,628,000	£104,953,000	£100,315,000

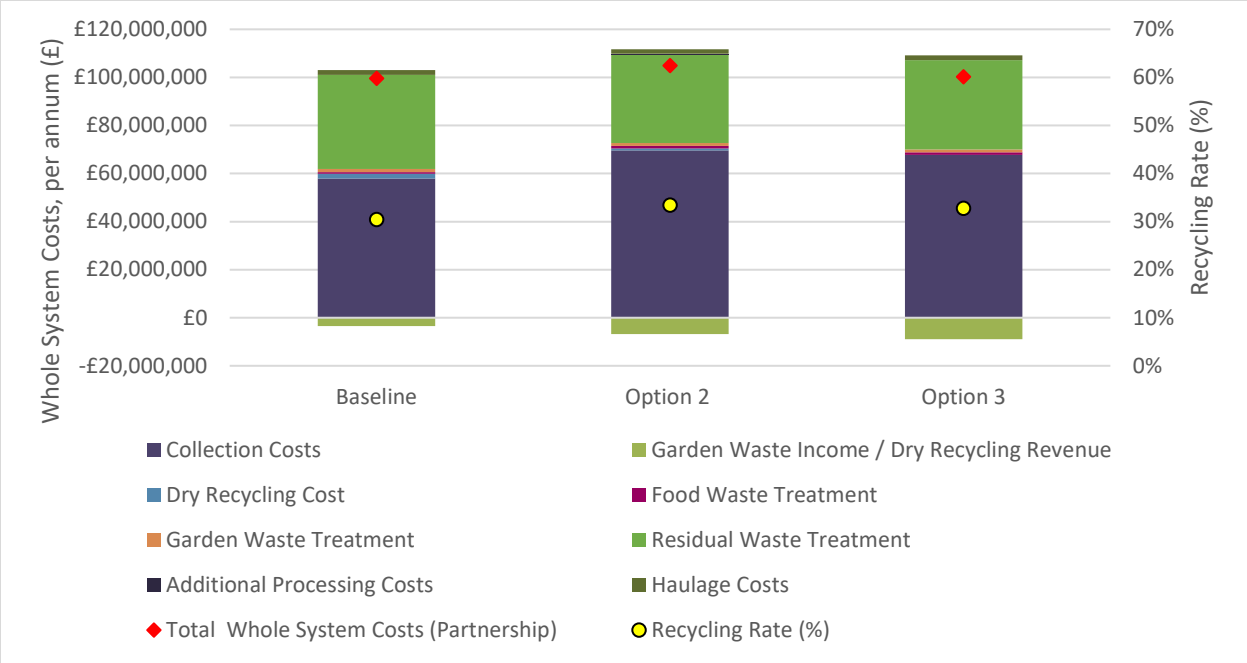


Figure 14: Breakdown of whole system costs by cost indicator (Baseline, Option 2 and Option 3)

NB. The left axis (stacked) column provides the breakdown of the whole system costs. The total whole system cost to NLWA and its constituent boroughs is represented by the red diamond. The right axis (yellow dot) refers to the recycling rate of each option.

In both alternative collection options residual waste treatment costs are lower than that of the baseline. This is in part due to increased food waste diversion through wider separate food waste collections which has a lower processing cost when sent for anaerobic digestion than for disposal via the EfW. There are also reduced residual waste treatment costs as a consequence of the introduction of plastic film within the dry recycling service and the impacts of implementing DRS and EPR. Baseline 2030 incurs higher residual waste costs than the baseline, due to anticipated household growth leading to an increase in generated waste.

In both Option 2 and Option 3 there are revenues received for the sale of separately collected dry recycling streams. In Option 2 (twin-stream), as the fibres are collected separately from the remaining dry recycling, it is assumed that the fibres fraction (paper and card) would be suitable for on-sale as is the case for all dry recycling collected in Option 3 as material is sorted at the kerbside via three recycling boxes and sorted onto the compartmentalised recycling vehicles, resulting in higher quality, sorted material streams that do not need further processing (i.e. via a Materials Recycling Facility (MRF)). The revenue helps to somewhat offset the additional collection costs in each option.

As mentioned, over half of the boroughs currently charge for their garden waste collection. Revenues from garden waste subscription fees have been accounted for within the whole systems cost modelling, however in reality, this revenue would sit with the constituent borough in which the charged collection service is in operation.

The tables below outline the annualised cost per 1% increase in recycling rate. The results of Baseline 2030 suggest that north London could improve their recycling rate by 2030, however this will be at a

cost of c.£4.5m per percentage point increase. Providing a restriction on the residual waste could be one method of driving higher levels of recycling performance.

Table 20: Combined annualised whole system cost per 1% increase in recycling rate for the baseline and Baseline 2030

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Average recycling performance	30.4%	33.0%
Cost per 1% increase in recycling rate	-	[£4,553,725][62]

Although Option 3 results in the lowest recycling rate of the alternative collection options (32.8%), due to the whole system costs being comparable to the baseline, this results in this option being the most cost effective in terms of cost per recycling performance improvement.

Table 21: Combined annualised whole system cost per 1% increase in recycling rate for the Baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Average recycling performance	30.4%	33.5%	32.8%
Cost per 1% increase in recycling rate	-	£1,751,645	£289,873

5.3 Carbon

This section details the results of the carbon emission modelling carried out via the EPS tool (Section 4.4.3) for all the options considered.

Table 22 illustrates the carbon performance of the baseline 2030 against the current service. Baseline 2030 is considerably worse performing than the others, which is a consequence of the energy mix in 2030 that is projected to make incineration a lot less 'appealing' in carbon terms, as more green sources of energy are anticipated to be added to the grid and the energy mix gets cleaner. Transport in this option has a lower carbon impact, as according to the pledges from all boroughs, the collection vehicle fleet is projected to be fully electric or zero / low emission by 2030. Electric HGV's emit c. 58% less carbon and as such, this has a significant impact on transportation emissions.[63] Overall this implies that the carbon performance of the service is likely to reduce unless there are step changes like carbon capture and storage.

Table 22: Carbon assessment for the baseline and baseline 2030

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Total t CO_2-eq	-40,365	-14,513

[62] Note that Baseline 2030 is not directly comparable due to the larger amount of waste projected as needing to be managed in 2030, and the population increase anticipated to be living in flats.

[63] https://assets.publishing.service.gov.uk/media/5b968e5940f0b67896977b4f/transport-energy-model.pdf

Table Key	Worst performing		Best performing

Table 23 illustrates how the carbon performance of the two alternative collection systems (Option 2 and Option 3) compare against the current service. Options 2 and 3 add additional tonnage to organics (particularly food waste) collections and treatment and plastic film. These have beneficial impacts on treatment and disposal impacts. However, they also come with significant additional transport implications where organics are collected separately. As such, the transport impacts for separately collected organics increase. The benefits of the separate collection of organics, reduced residual treatment via EfW and the additional food waste tonnage are countered by the transport-related emissions generated in Options 2 and 3. Furthermore, there is a lower recycling yield from Options 2 and 3 compared to the baseline (single bin) service which also reduces carbon benefits of these alternative options, and finally, the loss of a significant proportion of aluminium to the DRS scheme reduces the carbon benefit of Baseline 2030 and Options 2 and 3[64]. As such, the carbon assessment results between the baseline, Option 2 and 3 are very similar with the baseline yielding the least amount of emissions.

Table 23: Carbon assessment for the baseline, Option 2 and Option 3

	Baseline	**Option 2**	**Option 3**
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Total t CO_2-eq	-40,365	-37,370	-34,717

Table Key	Worst performing		Best performing

5.4 Operational Flexibility

This criterion reflects on how well the boroughs could deliver the service, based on the resources required to deliver each option and the flexibility which is offered in terms of vehicle requirements.

Table 24: Operational flexibility for the baseline and Baseline 2030

	Baseline	**Baseline 2030**
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Operational Flexibility		

Table Key	Worst performing		Best performing

The baseline is the highest scoring option against this criterion, as typically, the boroughs collect most

[64] This is not to say that the carbon benefits will not arise, but that they will be recorded elsewhere by the operators of the Deposit Return Scheme.

waste streams (dry recycling, garden waste and residual waste) using standard Refuse Collection Vehicles (RCVs), with some notable variances. Therefore, this provides flexibility in operating the service as vehicles can be used across the different waste streams where required, for example, should vehicles require maintenance or waste tonnages fluctuate. However, food waste is generally collected using dedicated food waste vehicles, meaning that these vehicles cannot be used to service other collections, and vice-versa. Baseline 2030 utilises the same vehicles as the baseline, and so also provide the same level of operational flexibility.

Table 25: Operational Flexibility for the baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Operational Flexibility			

Table Key	Worst performing		Best performing

Table 25 shows the operational flexibility of Option 2 and Option 3 in comparison to the baseline. Similar to the Baseline 2030 option, Option 2 utilises the same vehicles as the baseline, and so scores jointly as the best performing against this criterion.

Option 3 sees the introduction of a multi-stream system for the collection of dry recycling, with food waste being collected alongside this. This is serviced by compartmentalised vehicles (e.g. Romaquip), which have designated sections on the vehicle for the different recyclate streams (e.g. glass, fibres, food waste etc.). These vehicles are designed solely for this collection type, and therefore could not be used to collect other waste streams. However, garden waste and residual waste continues to be collected using RCVs, so some level of operational flexibility is provided amongst these collections.

It should be noted that the addition of any new materials (i.e. plastic film) which is likely required to be separated at a MRF, would require a new contractual arrangement and appropriate partnership discussions.

Furthermore, multi-compartmentalised vehicles require additional sorting at the vehicle during rounds by crew to further separate dry recycling materials into their compartments on the vehicle. This can add significantly to loading times, which may pose significant congestion impacts, particularly in more urban areas of the boroughs. For diesel fuelled vehicles this would have detrimental impacts on emissions and local area quality.

5.5 Public Acceptability

The public acceptability criterion considers how acceptable each option is anticipated to be to householders, based on the level of change in comparison with the current service and the number of containers required.

The results of the evaluation of Baseline 2030 against the baseline are illustrated in Table 26. With the additional collection of extra materials where they are not already collected (e.g. food, plastic film), the

baseline in 2030 is the highest scoring option against this criterion. The frequency and type of waste collection remains the same, and residents receive collection of a wider variety of materials. In boroughs where food waste is not already collected, there is slightly more responsibility on the householder to separate out their food waste and store the corresponding containers; however, considering the additional collection being proposed, it is likely that this option will still be highly acceptable.

The baseline scores slightly lower because although no change is required of residents, they do not have access to the collection of the full range of recyclables.

Table 26: Public acceptability for the baseline and Baseline 2030

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Public Acceptability		

Table Key	Worst performing		Best performing

Table 27 illustrates how the alternative collection system options (Option 2 and Option 3) compare to the baseline service against this evaluation criterion.

Table 27: Public acceptability for baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Public Acceptability			

Table Key	Worst performing		Best performing

Option 2 receives the same score as the baseline (and Baseline 2030) because although all householders have access to the collection of additional materials (e.g. food, plastic film), some changes are required of residents. In this option, a twin-stream dry recycling collection is introduced, meaning that residents need to separate their paper and card from the rest of their recycling; this process also involves an additional container with which residents would have to accommodate space. It is understood that in many borough areas, the space and location placement for wheeled bins (both internally and externally) is limited and as such may not be considered an acceptable option. These two recyclate streams (dry mixed recycling and paper / card) are collected on alternate weeks, meaning that the full range of recycling is collected once a fortnight, which is a decrease in frequency for those households currently receiving weekly collections, and therefore may not be most acceptable. The impact on flatted properties, flats above shops and estates will be bespoke to particular settings and the ability to handle additional containers (inside and/or outside) to facilitate a two stream dry recycling collection. We have assumed for the purposes of modelling that these will not be able in general to switch and so would maintain a single stream commingled collection.

The worst performing option against this criterion is Option 3, with the most significant change being a move from a commingled to multi-stream dry recycling service. Within this option, there is an expectation for residents to separate their dry recycling into three separate boxes, which is not highly acceptable as this requires more time and effort, as well as a requirement to store additional containers. However, this option does see frequent collections for recycling (weekly) and additional materials are collected where not already (e.g. plastic film, food). The impact on flatted properties, flats above shops and estates will be bespoke to particular settings and the ability to handle additional containers (inside and/or outside) to facilitate a multi stream dry recycling collection. We have assumed for the purposes of modelling that these will not be able in general to switch and so would maintain a single stream commingled collection.

5.6 Alignment with National Policy Direction

As regards alignment with National Policy, the options have been scored based on their anticipated alignment with the Resources and Waste Strategy for England. Although some aspects are still under consultation, following the release of Simpler Recycling proposals in October 2023[65], it is current understanding that authorities will be required to collect residual waste fortnightly (as a minimum) and collect a consistent set of materials for dry recycling (paper and card, plastic bottles, PTT, plastic film, carton, metals and glass). Each borough is already broadly compliant with this set of materials, however it will require the introduction of plastic film collections (to be implemented by 2027), which has been assumed in all alternative options. Furthermore, every borough will be required to collect food waste weekly from all properties.

Table 28 illustrates how the baseline in 2030 compares to the baseline, whilst Table 29 shows how the two alternative dry recycling collection systems (Option 2 and Option 3) compare to the current service.

In terms of compliance, the baseline is the lowest scoring option. This is because although there are frequent collections of all waste streams (maximum fortnightly), none of the boroughs currently collect plastic film and not all collect food waste, both of which are required under Simpler Recycling proposals.

Baseline 2030 and Options 2 and 3 are all anticipated to be fully compliant with national policy, and therefore receive the highest scoring. Collections of residual waste are in place either weekly or fortnightly, separate weekly food waste collections are provided and residents can recycle additional materials such as plastic film.

Table 28: Compliance with national policy direction for the baseline and Baseline 2030

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Compliance with National Policy Direction		

Table Key	Worst performing		Best performing

[65] https://www.gov.uk/government/consultations/consistency-in-household-and-business-recycling-in-england/outcome/government-response

Table 29: Compliance with national policy direction for baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Compliance with National Policy Direction			

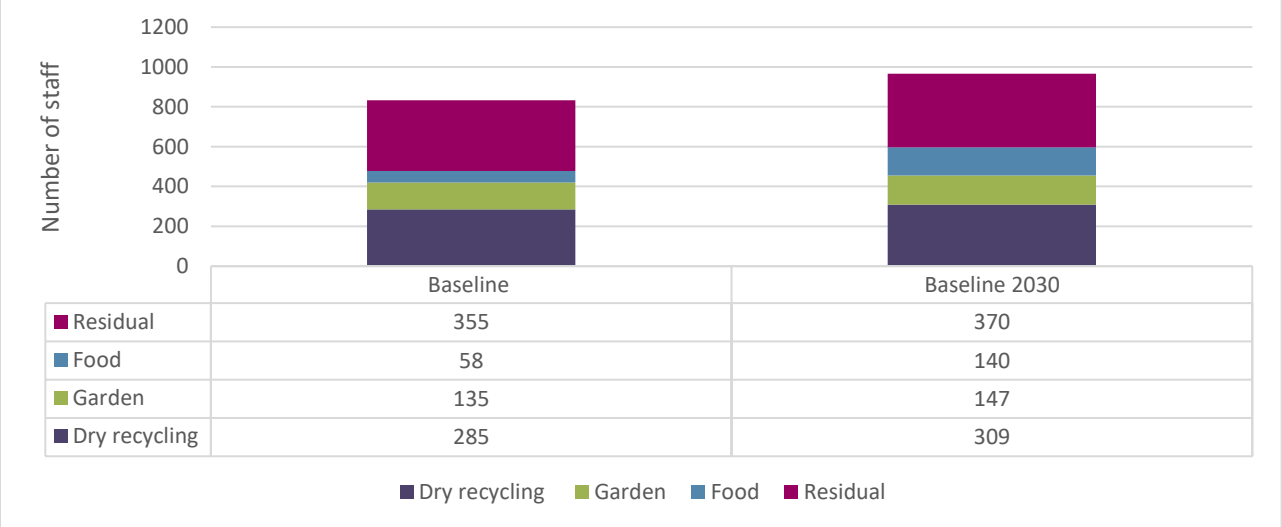
Table Key	Worst performing		Best performing

5.7 Social Value

With both job creation and the range of materials residents can recycle considered, the evaluation for this criterion is outlined in Figure 15 for the Baseline 2030 and for Options 2 and 3 in Figure 16, respectively.

Option 3 receives the highest score as the most jobs are created, and residents are provided with access to an improved range of materials for recycling. Baseline 2030 and option 2 also allow residents to recycle more materials, however the level of job creation is reduced slightly, and therefore these options receive a lower score. Due to the lowest level of job creation and some residents not being able to recycle food waste and plastic film, the baseline is scored the lowest.

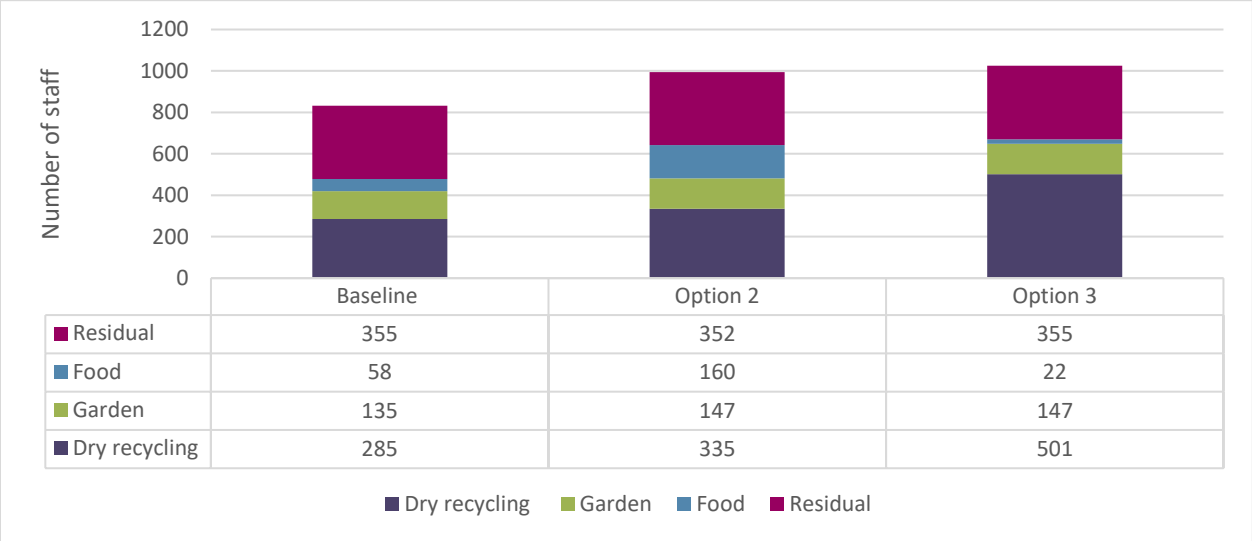
In terms of staffing requirements, all alternative options provide some level of job creation. This is largely due to the introduction of a food waste collection for all property types across all boroughs, with extra staff (drivers and loaders) required to operate the additional vehicles associated with this. Baseline 2030 is estimated to require an additional 133 jobs than the current service.



	Baseline	Baseline 2030
Residual	355	370
Food	58	140
Garden	135	147
Dry recycling	285	309

Figure 15: Crew requirements for the baseline and Baseline 2030

Option 3 has the biggest uplift in terms of staff requirements compared to the baseline, with an additional 192 jobs created. This can be linked to the introduction of a multi-stream collection of dry recycling and food waste, which is serviced by Romaquip vehicles for most properties. Due to the lower utilisation of this vehicle type, it results in a higher number of these vehicles being required, and therefore more staff. Option 2 also results in increased staff requirements, with 161 additional jobs created.



	Baseline	Option 2	Option 3
Residual	355	352	355
Food	58	160	22
Garden	135	147	147
Dry recycling	285	335	501

Figure 16: Crew requirements for the baseline, Option 2 and Option 3

As well as job creation, the range of materials that residents can recycle has also been considered as part of this criteria. The baseline provides the lowest level of access, as a food waste collection is not provided to all property types, and the range of materials that residents can recycle is restricted as plastic film is not collected. In all alternative options, these gaps are addressed and residents are able to recycle a larger number of materials.

The evaluation for this criterion is outlined in Table 30 and Table 31 below. Option 3 receives the highest score as the most jobs are created, and residents are provided with access to an improved range of materials for recycling. Baseline 2030 and option 2 also allow residents to recycle more materials, however the level of job creation is reduced slightly, and therefore these options receive a lower score. Due to the lowest level of job creation and some residents not being able to recycle food waste and plastic film, the baseline is scored the lowest.

Table 30: Social value for the baseline and Baseline 2030

	Baseline	**Baseline 2030**
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Social Value		

Table Key	Worst performing		Best performing

Table 31: Social value for the baseline, Option 2 and Option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Social Value			
Table Key	Worst performing		Best performing

5.8 Deliverability

This criterion considers how deliverable each option is, in terms of changing to a new service and consideration of any additional vehicle requirements and associated service management.

The breakdown of vehicle requirements for Baseline 2030 compared to the current service is shown in Figure 17, and demonstrate that additional vehicles are required in each of the alternative options. Notably, there is a large increase in the number of 7.5t food waste vehicles required, as a food waste collection is rolled out to all households.

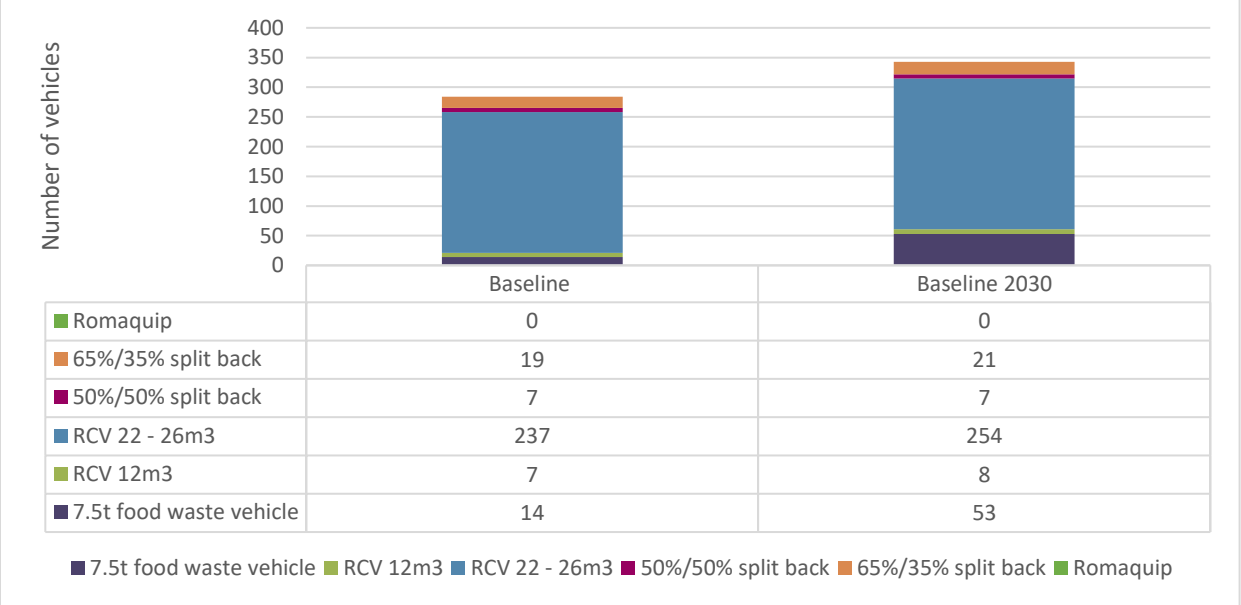
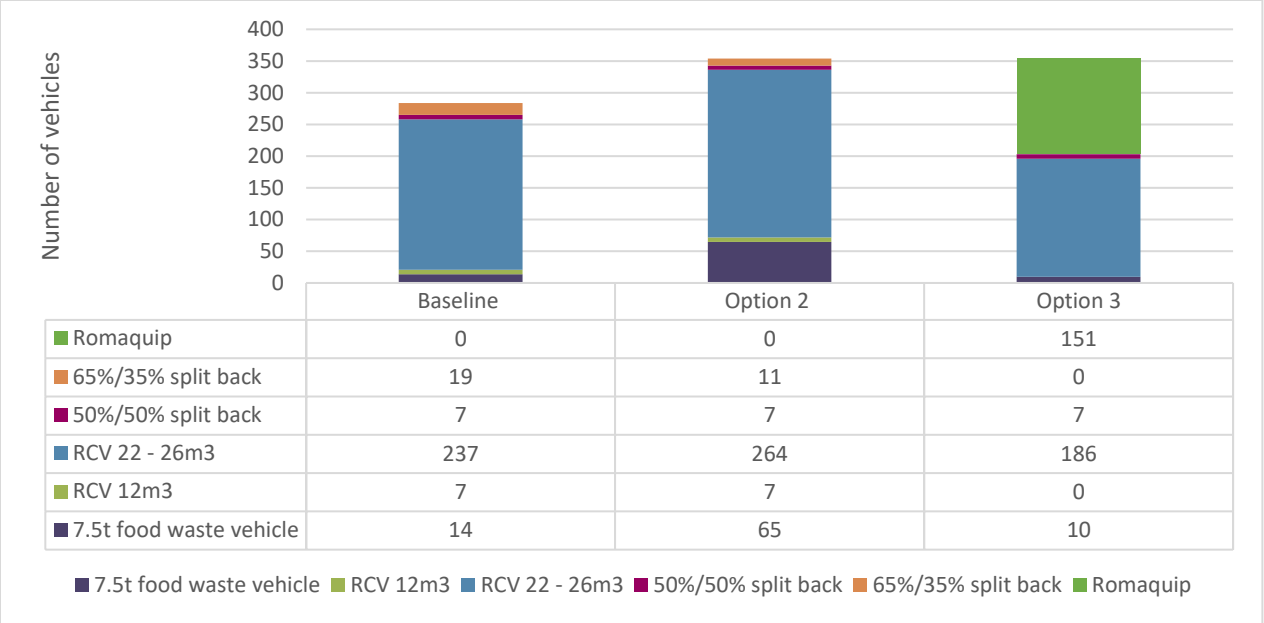


Figure 17: Vehicle requirements for the baseline and baseline 2030

The vehicle requirements for Options 2 and 3 are shown in Figure 18 below. Options 2 and 3 have the biggest uplift in vehicle requirements, with 355 additional vehicles being required across north London. At present, dry recycling is generally collected in RCVs (some local nuances), but the number required in Option 3 decreases, as dry recycling is modelled as collected on Romaquip vehicles. The number of food waste vehicles required also decreases, as it is assumed that in most cases, this will also be collected on the Romaquip vehicles.



	Baseline	Option 2	Option 3
Romaquip	0	0	151
65%/35% split back	19	11	0
50%/50% split back	7	7	7
RCV 22 - 26m3	237	264	186
RCV 12m3	7	7	0
7.5t food waste vehicle	14	65	10

Figure 18: Vehicle requirements for the baseline, option 2 and option 3

Furthermore, the requirement for additional vehicles and resource (crew) will require additional depot space for parking and vehicle maintenance, which may present challenges for some boroughs which are constrained for space. Boroughs will also need to consider the procurement implications of any such service change and factor in lead in times for the manufacture and delivery of any new vehicles or containers required. Lead times vary according to the market at the time but a period of at least 12 month should be factored into the procurement programme for any new vehicles. This has been reflected in the scoring provided.

The baseline requires no change in service and therefore provides high deliverability regarding this aspect. Baseline 2030 expands the service delivered to residents, through collecting food waste from all households and collecting plastic film for recycling; this is considered a minor change as minimal changes to containers are required. Options 2 and 3 have more significant levels of change as new systems are introduced for the collection of dry recycling for the street-level properties, which also result in containers changes, with either an additional wheeled bin (Option 2, twin stream) or three boxes (Option 3, multi-stream). It is understood that space for containers presents a significant challenge to many London boroughs and some households (including street-level properties) will not be able to accommodate additional containers[66]. Therefore, both options are likely to be more challenging in terms of deliverability and as such rank the worst performing against this evaluation criterion.

Considering the discussion above, the scorings derived for each option are outlined in Table 32 and Table 33 below. Due to no service changes in the baseline, and therefore no changes to the number of vehicles required, this is highly deliverable and receives the highest score. Although Baseline 2030 only makes minor adjustments from the baseline, a significant number of additional vehicles are required

[66] The impact on flatted properties, flats above shops and estates will be bespoke to particular settings and the ability to handle additional containers (inside and/or outside) to facilitate a multi stream dry recycling collection. We have assumed for the purposes of modelling that these will not be able in general to switch and so would maintain a single stream commingled collection.

due to anticipated household growth, which can be more challenging in terms of deliverability. Options 2 and 3 receive the lowest score against this criterion, as additional vehicle and container requirements may negatively impact the level of deliverability for both of these options.

Table 32: Deliverability for the baseline and alternative options

	Baseline	Baseline 2030
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Deliverability		
Table Key	Worst performing	Best performing

Table 33: Deliverability for the baseline, option 2 and option 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Deliverability			
Table Key	Worst performing		Best performing

5.9 Improving Recycling for Flats, Estates and Flats above Shops (FLASH)

A significant proportion of north London residents reside in flats or flats above shops. Furthermore, looking ahead, the majority of future housing developments being built will be flats. Therefore, it is important that the design of any waste and recycling service and its operation considers the provision for flats and FLASH properties to ensures improved capture of material for recycling and reduced volumes of waste.

This section of the report looks at the specific issues and good practice relating to collection from flats and estates, highlighting the challenges and opportunities bespoke to different collection environments.

Table 34 below illustrates the proportion of street level properties against those which are flats and/or estates and flats above shops.[67] As shown, there is significant variation in the proportion of property types across the boroughs from c.20% in Waltham Forest to c.50% of all properties in Hackney. The number of flats in London presents a significant challenge when it comes to increasing recycling performance. Residents living in flats generally recycle less than those living in street-level properties, due to the additional barriers to access the services.

Table 34: Summary of property types across north London

Borough	Street level properties	Flats and Estates	Flats Above Shops (FLASH)
LB of Barnet	68.6%	29.4%	2.0%

[67] This is based on information provided by the boroughs for the baseline year 2021/22.

LB of Camden	51.9%	43.8%	4.3%
LB of Enfield	66.7%	31.0%	2.3%
LB of Hackney	44.5%	50.0%	5.5%
LB of Haringey	71.0%	22.0%	7.0%
LB of Islington	45.0%	45.0%	10.0%
LB of Waltham Forest	77.0%	20.0%	3.0%

It is well documented that people who live in flats (estates and FLASH) recycle less than those who live in houses. This is thought to be due to the waste / recycling storage capacity (internal and external) associated with communal living, communications and behaviour change aspects and the nature of collections. There are also less available routes to provide the required recycling knowledge to residents to increase engagement in recycling practices in this context. Some of the key issues that influence recycling performance are thought to include (but are not limited to); recycling behaviours in communal areas, difficulties with recycling processes, home storage issues and lack of internal space, lack of education and unappealing communal bin areas.

Much of the research conducted on recycling in flats and estates and FLASH shows that there are three mechanisms to ensuring engagement in recycling processes. Firstly, residents need to be ***motivated*** to recycle, have sufficient ***knowledge*** of recycling activity and finally, the process of recycling must be made as ***easy*** as possible.

5.9.1 Flats & Estates

Motivation

In order for residents in flats to be engaged in recycling it is essential for them to be sufficiently motivated to do so. Recycling in flats is often seen as an anonymous activity, therefore if residents do not see others recycling on a regular basis, then the activity does not become the 'norm'. Making recycling a more visible activity will provide opportunities for social norming. This could be achieved through actions such as encouraging discussion of recycling habits with fellow residents or placing bins in more prominent places.[68] It is also important for residents to be aware of how their actions fit into the wider recycling systems to increase their sense of collective recycling responsibility. This will also provide justification and meaning for their actions. Infrastructural changes are also critical for enhancing motivation. For example, making bin areas more accessible, aesthetically pleasing, providing frequent collections and regular cleaning routines to reduce odour can all have a positive impact. In addition, enhancing collections to include items such as electricals or textiles can all provide the motivation for recycling activity to occur.

Knowledge

Residents must also have sufficient knowledge of recycling systems in order to participate. If they do not have the knowledge or awareness of recycling practices, they will not be informed enough to understand the importance/benefits of recycling, or even how they can recycle locally. Knowledge can be disseminated in a variety of ways and can help residents to participate. Methods include clear

[68] https://relondon.gov.uk/wp-content/uploads/2021/02/Recycling-in-reality-report.pdf

information and recycling reminders from the council, educational programmes, strong signage, information on which type of waste goes where, and what can/cannot be recycled. It is also essential that the information provided is credible, and of high quality. Offering residents detailed feedback when they make mistakes, raising awareness of contamination and recycling quality and making information more succinct and easier to digest are also essential knowledge drivers for increasing recycling activity and improving performance.

Ease

A final component of encouraging best practice for recycling in flats is the ease of the process. In order for people to be engaged in recycling, taking recycling out must be an easy task. Residents only take out bins when they are full, overfull or when they can no longer be ignored. Residents who make trips to the bin purely for recycling purposes in flats are generally in the minority and are often living close to the communal bin areas.[68] Recycling is more likely to occur when people do not need to make special trips, and when it can be fit into existing activities i.e. going to the shop. In view of this, bin placement, in addition to increasing the number of bins is critical. Finally, storage of recycling in flats was found to be a significant issue due to lack of space. In some cases, help has been provided by councils to aid residents in flats with strategies to store recycling. In addition, for some residents, single use bags have been provided that can be used as a collection vessel and then be disposed of with recycling, making the process of collection as easy as possible.[69]

Best practice

In order to encourage residents to recycle more, a number of key actions are required to promote best practice. Key requirements include;

- clean and well maintained bins and communal bin areas,
- adequate waste collections,
- sufficient bin capacity,
- clear signs,
- convenient and careful selection of bin locations,
- broadening of household recycling materials,
- educational programmes (outlining collections and what can be recycled),
- in flat storage help and innovations.

Figure 19 provides an illustration of best practice in flats and estates.

[69] https://relondon.gov.uk/wp-content/uploads/2021/02/LWARB-Making-recycling-work-for-people-in-flats-full-report_200128-1.pdf

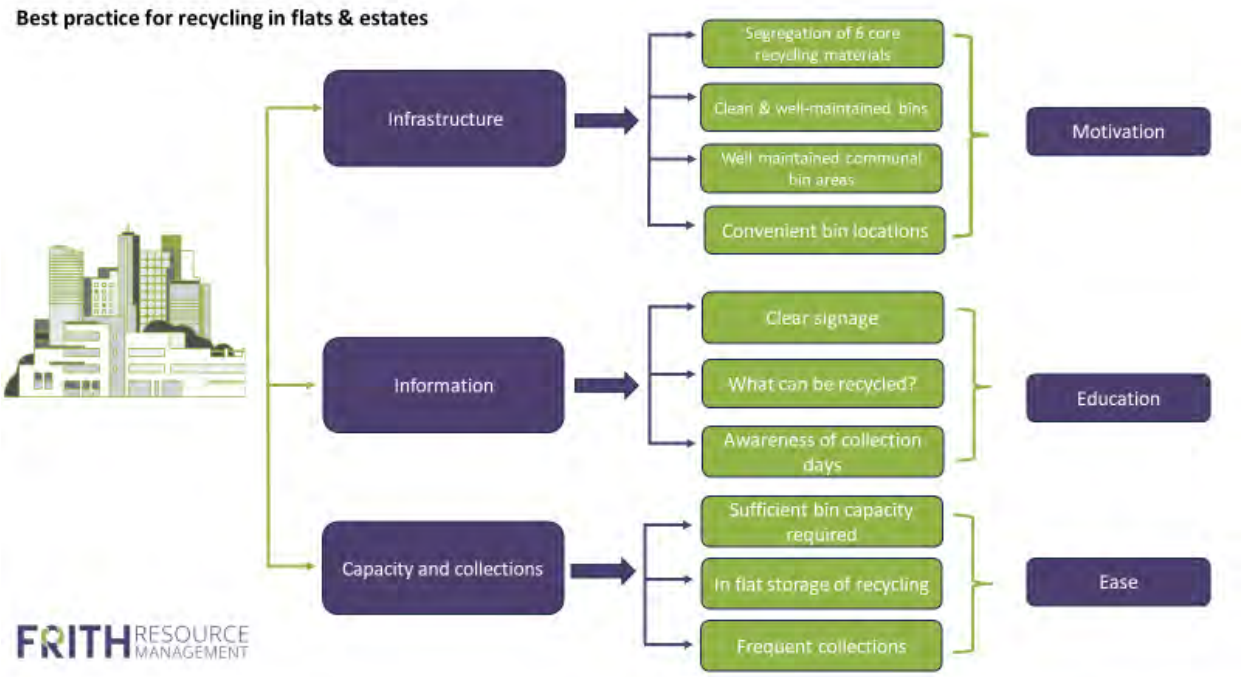


Figure 19: Best practice for recycling in flats and estates

5.9.2 Flats Above Shops (FLASH)

In contrast to purpose built flats where residents have dedicated communal bin areas and clear disposal instructions, recycling practices in FLASH are much more complex due to visible on street collections i.e. sacks presented on the street, restricted time-bands for collection, communication difficulties and relationships between tenants and owners. There is often a lack of clarity around recycling procedure and knowledge due to inadequate information channels that contribute to poor recycling performance. In addition, in flat storage can also a problem, similarly to estate flats.

Motivation

Sufficiently motivating FLASH residents is much more difficult than in housing and purpose built complexes. Recycling behaviours of nearby residents are more visible in FLASH, therefore people tend to be driven by what other residents are doing. If the general consensus is to place all recycling in residual waste, then this activity will usually be followed by others, acting as a motivator for incorrect recycling practice. The visibility of street waste also poses difficulties for motivating residents to recycle effectively. If the street looks chaotic, then residents become disillusioned with what will happen to their recycling, resulting in disengagement[69]. In this case having a more structured approach to street collections could encourage positive recycling action and increase motivation.

Knowledge

Knowledge and information dissemination of recycling in FLASH is particularly difficult. Generally, FLASH have different waste collection systems compared to other types of residences. It is also more difficult to provide information to FLASH residents due to shared entrances and unreliable post-delivery. Due to

these factors, often residents fail to receive council communication on recycling meaning that collection days are missed and or residents are unaware of recycling procedures. FLASH residents usually rent their properties and rely on receiving information from landlords which may not be provided. This alongside a lack of street information can decrease motivation further as recycling activities become unclear. Investing in a wide array of accessible communication channels could have a significant and positive impact on recycling performance by ensuring residents are informed. In addition, providing visible feedback to residents on their recycling practices could also encourage participation by outlining what they are doing right and how they could improve.

Ease

Making recycling easier for FLASH is inherently challenging due to the nature of the required waste management processes. On-street pickup, restrictive time banding and recycling drop off methods mean that recycling correctly is often much more difficult in this context than in other forms of residence. Unfortunately, this could prove difficult to redesign, therefore enhancing current systems to make the recycling procedure easier would be the most effective option. An example of this might be providing collection bags for residents and or increasing information dissemination practices.[69]

Best practice

With a focus on motivation, increasing knowledge and ease, the following aspects of recycling in FLASH should be considered;

- provision of recycling receptacles/bags,
- clear and detailed information on what can and cannot be recycled,
- guidance on recycling pickups,
- increase in information channels,
- clean and well maintained streets on collection days (potential for new infrastructure),
- appropriate collection frequency
- increased resident communication to encourage the social norming of recycling.

Best practice for recycling in FLASH to increase recycling performance can be seen in Figure 20.

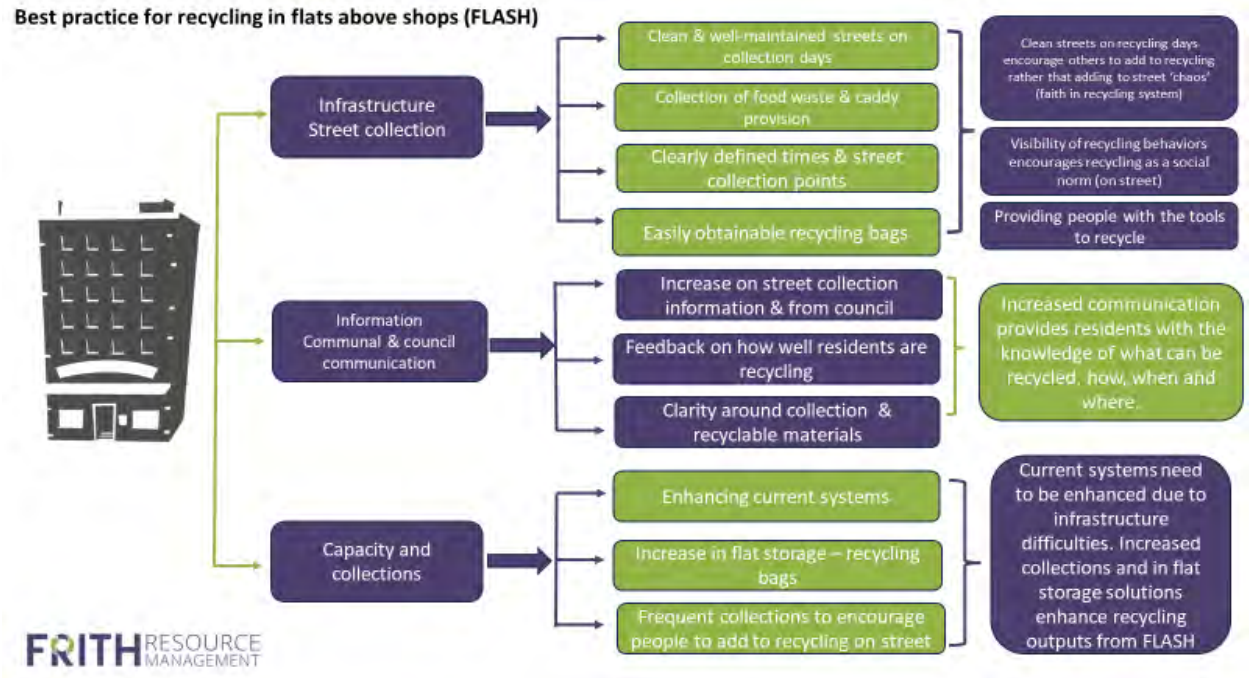


Figure 20: Best practice in flats above shops (FLASH)

A summary illustration on the key steps for improving recycling across both flats and FLASH can be seen in Figure 21.

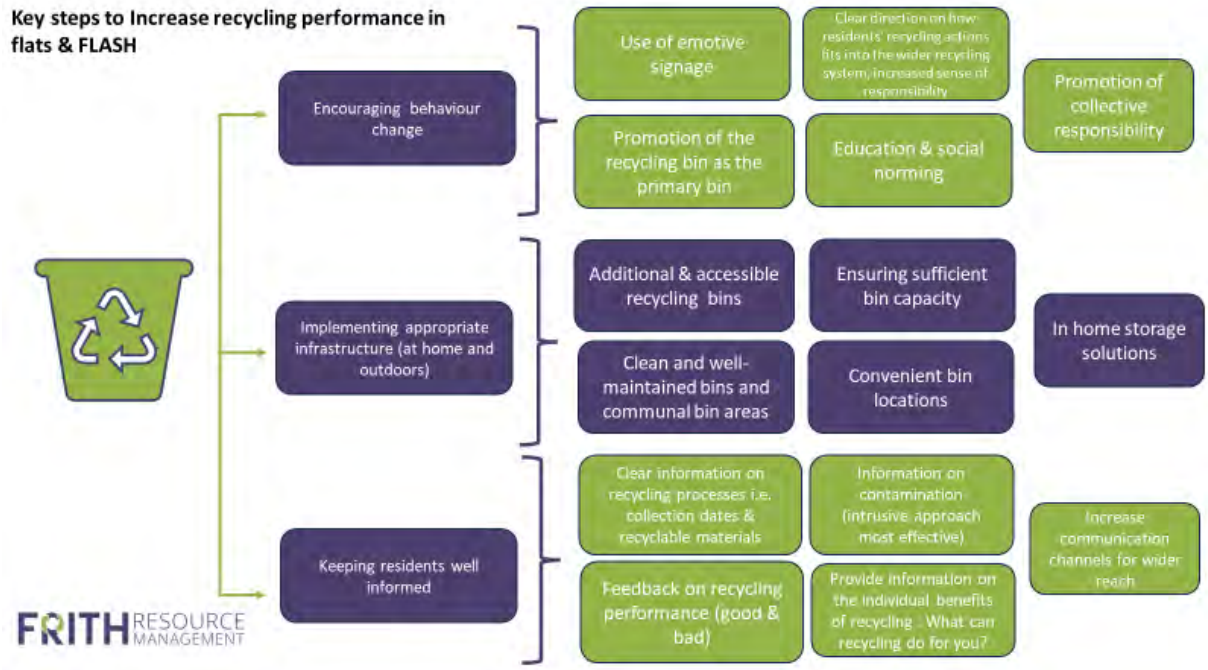


Figure 21: Key steps to increasing recycling performance in flats and FLASH

6 Summary

A Municipal Waste Management Strategy requires an Options Appraisal to prioritise between alternative collection options for the purposes of service delivery, procurement and planning. To compliment the collection Options Appraisal and in alignment with the principles of the waste hierarchy (see Figure 1), FRM has also undertaken an appraisal of options for addressing the first two principles of waste prevention and reuse, as well as recycling.

This Options Appraisal applies criteria agreed with NLWA and its constituent boroughs. These include quantitative assessments using industry standard models and assumptions; it also applies judgements on more qualitative criteria which have been discussed and presented in turn. This appraisal process informs the Joint Waste Strategy development process.

Regarding waste prevention, this is the most beneficial activity that NLWA and its constituent boroughs can undertake, as this reduces the demand for new products and preserves the use of resources. As recognised in the North London Waste Prevention Plan (Section 2.1), there are several steps which can be taken to encourage an uptake in such behaviours, including education for residents, working with businesses and the provision of opportunities for reuse and repair.

Once items are already in circulation, the useful life of such products can be prolonged through reuse and repair, which can enhance resource efficiency and improve the security of critical material supply. As discussed in Section 3, there are already many initiatives in place within north London for residents to engage with, however there is scope to increase the coverage of these, provide a wider range of opportunities and continue to raise awareness amongst all residents.

A summary of the baseline and Baseline 2030 options evaluation for recycling is provided in Table 35. The evaluation summary for Option 2 and Option in comparison to the baseline is presented in Table 36. The alternative options (Baseline 2030 and options 2 and 3) were selected to explore the collection cost implications and impacts upon performance of potential service changes (including disposal impacts, as agreed by NLWA and its constituent boroughs). Note, no weighting has been applied to the evaluation criteria agreed for this Options Appraisal.

Table 35: Summary of options evaluation for the baseline and Baseline 2050

	Baseline	**Baseline 2030**
	As per current service (21/22)	*Baseline in 2030 + separate food waste collections*
Recycling performance	30.4%	33.0%
Whole System Cost	£99,628,000	£111,240,000
Carbon (t CO2-eq)	-40,365	-14,513
Operational Flexibility		
Public Acceptability		
Alignment with National Policy Direction		
Social Value		
Deliverability		

Table Key	Worst performing		Best performing

Table 36: Summary of options evaluation for the baseline, Option 2 and 3

	Baseline	Option 2	Option 3
	As per current service (21/22)	*Alternate weekly twin stream + separate food waste collections (21/22)*	*Weekly multi stream + separate food waste collections (21/22)*
Recycling performance	30.4%	33.5%	32.8%
Whole System Cost	£99,628,000	£104,953,000	£100,315,000
Carbon (t CO2-eq)	-40,365	-37,370	-34,717
Operational Flexibility			
Public Acceptability			
Alignment with National Policy Direction			
Social Value			
Deliverability			

Table Key	Worst performing		Best performing

In terms of **recycling performance**, all options have an improved recycling rate (%) in comparison with the baseline. Performance ranges from 32.8% (Option 3) to 33.5% (Option 2). The introduction of plastic film within the recycling helps to improve performance and this is enhanced by the expanded roll out of separate food waste collections. In 2030 it is assumed that all the additional properties required will be flats / multi-occupancy meaning that recycling rates (all other aspects being equal) are reduced as there is generally lower recycling levels achieved from flats versus street level properties. Good practice on increasing recycling from flats is included in this report. Any of the alternative options (e.g. Options 2 and 3) would have a lower recycling rate in 2030, unless further changes are made.

Regarding **whole system costs**, all alternative options have an additional cost compared to be baseline. Option 3 (multi-stream) is most comparable to the baseline at c.£687K additional cost. Baseline 2030 results in the highest overall system costs of the options modelled. However, it is noted that Baseline 2030 is a projection of the current service modelled in 2030 and so is managing a larger tonnage of waste compared to the other options and therefore not directly comparable. Household and population growth has been factored in and for many of the boroughs, this will require additional resource (labour and vehicles) to service additional properties, in addition to the other service changes modelled (plastic film collections, wider food waste collections).

In terms of **carbon**, all the results show a negative figure (i.e. a net reduction of carbon), this is because of the offset of carbon emissions primarily from recycling of materials 'avoiding' emissions that would have occurred through virgin material extraction and processing. Due to the subtle differences in tonnage, there are relatively small differences recorded across the three comparable collections (Baseline, Option 2 & 3). Where additional/separate food waste collection & the Deposit Return Scheme (DRS) is introduced (Baseline 2030, options 2 and 3), additional carbon impacts associated with separate collection and diversion via DRS are also noted, the net effect being reducing the carbon performance to an extent. Full decarbonisation of the collection fleet across the boroughs by 2030 has beneficial

impacts on carbon emissions (Baseline 2030), however, due to an increased amount of cleaner energy projected in the national grid system by 2030, the incineration impacts are considerably higher in this option, substantially outweighing these benefits. Overall, the baseline yields the least amount of carbon emissions (most carbon avoided).

With regards to **operational flexibility** the baseline (current service) is the highest scoring, as typically, the boroughs collect most waste streams (dry recycling, garden waste and residual waste) using standard RCVs (with some notable exceptions). This provides the greatest level of flexibility in terms of operation as vehicles can be used across the different waste streams where required. Baseline 2030 and option 2 utilise the same vehicles as the baseline, and so also provide the same level of operational flexibility. Option 3 sees the introduction of a multi-stream system for the collection of dry recycling, with food waste being collected alongside this. This is serviced by compartmentalised vehicles (e.g. Romaquip), which have designated sections on the vehicle for the different recyclate streams (e.g. glass, fibres, food waste etc.). These vehicles are designed solely for this collection type, and therefore could not be used to collect other waste streams.

From a **public acceptability** perspective, Options 2 and 3 each require households to use an increased number of containers. In both options, residents will be required to separate material at the kerbside and present separately, either through a twin-stream option (where paper and card is separated from the remaining recycling streams) or multi-stream (where residents are required to separate material into three boxes [1] paper and card, [2] glass [3] plastic and metals). This may not always be considered acceptable by residents due to spatial constraints for storing containers (both internally and externally) and presenting bins at the kerbside. Baseline 2030, which models the baseline in 2030 with the addition of extra materials where they not already collected (e.g. food, plastic film), is the highest scoring option against this criterion. The frequency and type of waste collection remains the same, and residents receive collection of a wider variety of materials.

With regards to alignment with **national policy,** the options have been scored based on their alignment with the Resources and Waste Strategy for England. The baseline is the lowest scoring option in this regard, as although there are frequent collections of all waste streams, none of the boroughs currently collect plastic film, and not all collect food waste from all properties. Baseline 2030 and options 2 and 3 are all anticipated to be fully compliant with national policy, and therefore receive the highest scoring. Collections of residual waste are in place either weekly or fortnightly, separate weekly food waste collections are provided and residents can recycle additional materials such as plastic film.

The **social value** evaluation considers the job creation from each option and the range of materials collected from each household. All alternative options create additional employment opportunities and collect more materials through the introduction of plastic film collections and a wider food waste collection service. Option 3 receives the highest score as the most jobs are created, and residents are provided with access to an improved range of materials for recycling. Baseline 2030 and option 2 also allow residents to recycle more materials, however the level of job creation is reduced slightly, and therefore these options receive a lower score. Due to the lowest level of job creation and some residents not being able to recycle food waste and plastic film, the baseline is scored the lowest.

From a **deliverability** perspective, all alternative options will require some level of change to adapt to a new service. The baseline scores best against the criterion as this assumes business as usual (however this is unlikely to be viable in the future when considering national policy). Baseline 2030 may be

considered the most straightforward, as the only change made is the separate collection of food waste, requiring additional containers and vehicles. Furthermore, the requirement for additional vehicles and resource (crew) will require additional depot space for parking and vehicle maintenance, which may present challenges for a number of the boroughs which are constrained for space. Additional containers are required for separating dry recycling (and additional food waste collections for some boroughs). Storage and presentation space for containers is already a significant challenge for many London boroughs, and as such it is likely that many properties will not be able to accommodate additional containers associated with moving to a twin-stream or multi-stream collection. Furthermore, there are practicability considerations regarding additional sorting time at vehicles for multi-stream collections which may pose congestion and local air quality issues (from vehicles idling whilst material is sorted and loaded onto vehicles) This has been reflected in the scoring provided.

With the significant number of flats and FLASH in the boroughs, it is important to align options with best practice processes for these types of residences. In order for good practice to be implemented as noted in section 5.9, there are three key areas of importance to promote recycling with the view of enhancing performance in the long term. These areas include motivation, knowledge, and ease. As stated, residents should be sufficiently motivated to recycle, they should be equipped with all of the required knowledge to facilitate the recycling process, and it should be an easy task for them to complete. There are different complexities associated with both flats and estates and FLASH due to the nature of waste collection processes in these areas. However, adapting and aligning to a practical best practice approach i.e. improving infrastructure, enhancing knowledge, and increasing capacity, facilitates the promotion of recycling activity enhancements. The simpler the collection in terms of numbers / types of container required is more beneficial for Flats / Estates and Flats above shops, this therefore shows a preference for the Baseline and Baseline 2030 collection types as Options 2 and 3 will not be feasible in all areas.

Finally, the costs/savings and recycling figures estimated in this report are indicative and are based on a number of assumptions for modelling purposes only. They provide a reasonable guide to the magnitude of changes that might be expected and are subject to forthcoming legislation and future funding mechanisms. Therefore, they should not be used directly to justify specific cost of service change. They are modelled in comparison to NLWA and its constituent boroughs' estimated baseline costs and on an annualised basis. If NLWA and its constituent boroughs are minded to pursue any of the above changes, they are advised to undertake a more bespoke assessment of any particular option, potentially including re-routing and asset reallocation and the implications on the waste levy, in order to satisfy themselves that any improvements in recycling or efficiencies can be realised in practice.

Appendix A – Common Modelling Assumptions

When applying the nominal treatment and disposal costs, the median WRAP Gate Fee (£/t) has been applied for the appropriate treatment method. The MRF gate fee has been used for any co-collected dry recycling material (i.e. all dry recycling tonnage collected in the baseline and Baseline 2030. It has also been applied to the DMR fraction of the twin-stream option (Option 2)).

Source: WRAP Gate Fees Report 2021/22 Price excluding transport		UK £/tonne (2021/22)				
		Low	High	***Median***	*Mode*	*Mean*
MRF	Net	-£155	£135	**£18**	£25	£10
IVC	Mix food and green	£35	£80	**£55**	£54	£40
	Green	£20	£65	**£30**	£36	£30
AD	Food	£0	£75	**£30**	£32	£0
EFW	EFW	£20	£150	**£95**	£91	£90

Where material is separately collected (i.e. for the fibres fraction in Option 2 and all recycling streams in Option 3), it has been assumed that NLWA and its constituent boroughs could achieve 85% of the average material market value. A three-year average from Let's Recycle (2020-2023) has been used as the basis for this assumption. The income (£/t) is presented in the table below. Note that a negative number indicates a revenue (income) whereas a positive number indicates a cost.

Income per tonne (£/t)		
Modelled assumption: Assume achieve 85% of average LR price	**Average material price 3 year average 2020-2023**	**Material**
-£844.75	-£993.82	Cans: Aluminium: baled
-£145.56	-£171.25	Cans: Steel
-£12.97	-£15.26	Glass: Mixed
-£53.73	-£63.21	Paper: Mixed papers: domestic
-£95.05	-£111.82	Paper: News & Pams
-£92.50	-£108.82	KLS card
-£21.25	-£25.00	Non-corrugated card /cartons
-£32.17	-£37.85	Plastic film
-£122.37	-£143.96	Plastic bottles: Mixed bottles
-£32.76	-£38.54	Plastic: other dense

Additional Cost Assumptions:

- Haulage Fee: £8.50/tonne. The amount of material hauled at this rate is bespoke to each borough and based on information provided by NLWA as regards to transfer and haulage of waste and recycling.
- Plastic Film Processing - £5/tonne. A nominal additional processing fee has been applied in Baseline 2030 and option 2 to account for additional costs that may arise as a result of additional sorting and processing requirements for accepting plastic film at a MRF.