MUNICIPAL RECYCLING POTENTIAL IN NORTHERN IRELAND

This study summarises research undertaken to estimate the potential to achieve a Municipal recycling rate of 65%

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About WRAP

WRAP is not-for-profit, working with governments, businesses and citizens to create a world in which we use resources sustainably. Our experts generate the evidence-based solutions we need to protect the environment, build stronger economies and support more sustainable societies. Our impact spans the entire lifecycle of the food we eat, the clothes we wear and the products we buy, from production to consumption and beyond.

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Front cover photography: Northern Ireland Bottom-up survey 2019 © WRAP

Executive summary

The adoption of the Circular Economy Package (CEP) across the UK will require greater ambition in managing resources and increasing recycling performance. WRAP previously supported DAERA on analyses of household recycling designed to understand potential increases in household recycling and also helped deliver a range of support initiatives on the ground in Northern Ireland to improve recycling performance. The broader scope of municipal waste following the revisions to the Waste Framework Directive instigated by the adoption of CEP now means that the arisings from a wider range of businesses and public sector organisations are to be included in future recycling targets.

The aim of this research was to answer whether Northern Ireland could achieve the 65% municipal waste recycling rate. The outputs will support DAERA's policy development on this aspect. The supplementary objectives were to consider:

- The cost to the different sectors now included within the definition
- Where contributions are needed to help meet the target
- The recycling potential from each sector
- The optimum approach to achieve high recycling but also relieve the cost burden on sectors and sub-sectors now in scope?

Methodology

WRAP undertook a wide-ranging analysis which included the collection of Northern Ireland-specific data and the development of new modelling approaches to calculate performance from broader sectors now in scope. Under the broader CEP definition, the analysis focussed on arisings from Northern Ireland household collections (HH) and waste originating from non-household municipal sectors (NHM).

The component parts of the Northern Ireland CEP analysis were:

1. NHM business survey – data gathering on sample Northern Ireland business waste profiles to understand the waste and recycling service profiles and bin configurations in place currently.
2. NHM cost survey – gathering of representative waste and recycling service charges to NHM businesses.
3. NHM analysis – a bottom-up analysis focussing on the collected local data sets to make accurate waste provision behaviour assumptions at sub-sector level

4. NHM analysis – a top-down analysis focussing on nationally reported business waste data at business sector level identifying sectors and arisings in scope of the new definition.
5. HH analysis – an analysis of scenarios to increase Local Authority household waste recycling. This work re-visited an earlier WRAP gap study designed to understand how household recycling could progress to meet 50% by 2020 and beyond.

In delivering the objectives WRAP aligned the analysis approach to previous research for UK funders to ensure consistency in approach. In this way we could adapt existing peer reviewed methodologies used in combination with new Northern Ireland local data to ensure high quality robust and relevant outputs. WRAP used industry experts from its call off contracts to both gather data and also peer review the methodologies and datasets to ensure we could be confident with the assumptions and approach.

Key findings

The key findings are for the two large sectors that generate municipal arisings in line with the revised municipal waste definition; Non-household municipal (NHM) and Household (HH).

For NHM sectors:

- A wide range of private and public sectors were identified as generating municipal waste and would in future be obligated within the revised definition. These sectors include retail and wholesale, hospitality, food manufacturing, health centres and hospitals, schools and further education, offices and similar non-food producing outlets. Around 56,000 businesses appear to be generating waste as defined.
- Around 780,000 tonnes are estimated to be generated each year from the obligated NHM sectors.
- A high recycling rate is achievable for the majority of NHM business types addressed in this analysis.
- Nationally, there could be marginal costs savings in transitioning from current practice to high recycling services. Small and micro-businesses are more likely to see a cost increase under current service pricing options.
- There are UK data limitations for business waste in the absence of reporting standards. Despite this issue, the two-way modelling approach undertaken gives confidence to similar trends revealed for each set of results.

- NHM sector recycling rates appear variable for each sub-sector with an average rate of 40%. Some large businesses are already at high or maximum recycling with the majority of small business either recycling small quantities of waste or none.
- The survey data shows that there is a wide range of waste and recycling service prices offered to NHM businesses.
- Some businesses will be limited to increasing waste collection container/recycling provision due to restricted space for storage of containers and restricted access for collection vehicles.
- Removing the known data limitations in reporting and increasing clarity on capture rates will help improve recycling forecasts over time.

For HH Local Authority collections:

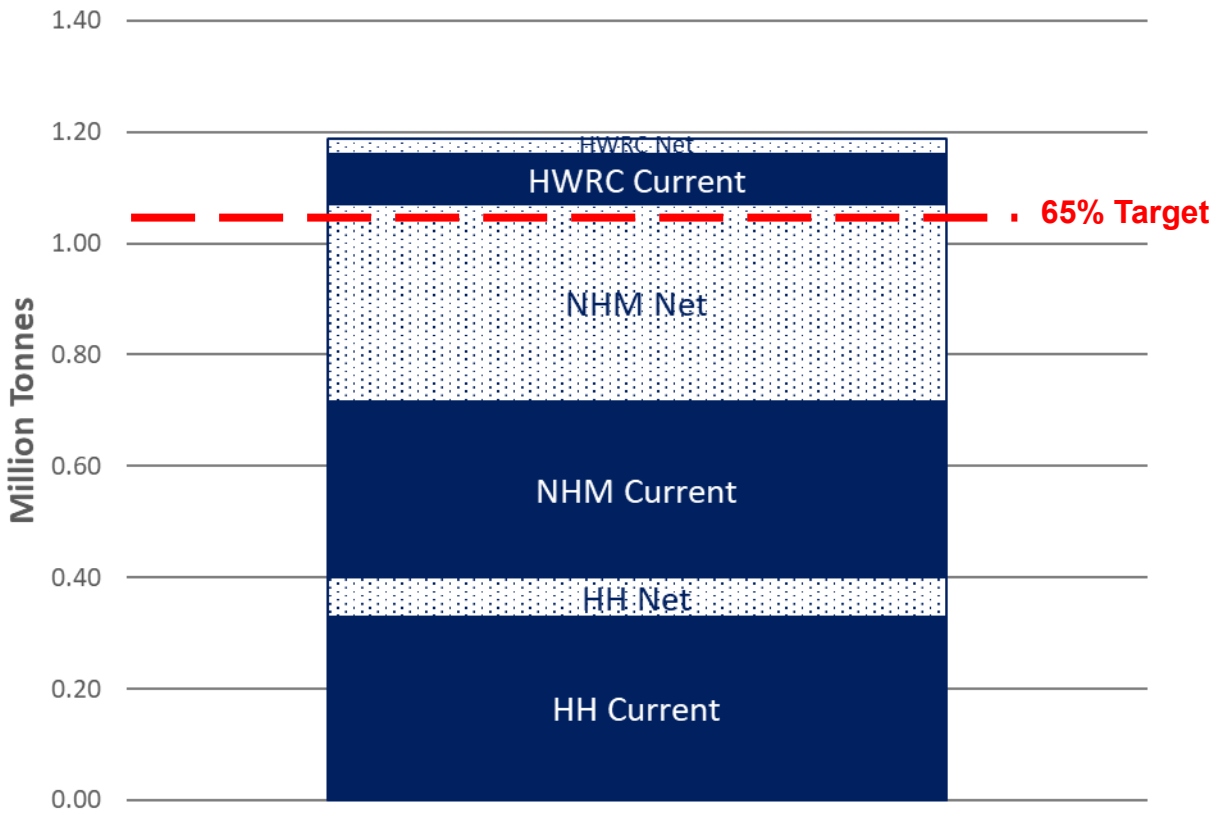
- The current waste arisings from households (based on the waste from households definition) are 838,500 tonnes in 2017/18.
- HH recycling rates have increased in recent years but there remains potential to increase recycling by around 110,000 tonnes.
- HH performance gains would come from new kerbside collection schemes and improvements to household waste recycling centres (HHWRCs).
- Potentially a further 28,000 tonnes could be recycled following improvements to HHWRCs.
- Restrictions in residual waste collection provision and new weekly food waste collections offer the greatest potential increase in HH recycling performance.
- Movement towards more segregated collections systems are likely to help reduce on-going service delivery costs especially when collecting a broad range of materials and may protect against rising processing costs.
- Residual waste arisings from households appear high compared to the UK average. Addressing the high arisings will be key to further improvements in recycling rates. High frequency recycling and restricted residual waste collections are likely to reduce these arisings and overall service delivery costs.

Conclusions

The combined analysis from HH and NHM sectors shows that it is possible to achieve and surpass a municipal recycling rate of 65% in Northern Ireland well before the target date of 2035. Recycling rates will be dependent on high capture of the prevalent, readily recyclable materials found in the

waste arisings of the sectors in scope.Improvements in the recycling rate will require contributions from all Local Authority household collections, improvements at HHWRCs and significant improvements from across the newly obligated NHM sectors.

The chart below shows the current collected recycling in Northern Ireland and indicates where potential new net gains could be made adopting the top-down scenarios outlined within the report. There are several permutations where different contributions support meeting the 65% targets and further work is required to test the cross-sector potential gains and responses to policies designed to increase material diversion.



Whilst improvements are needed across the range of sectors it appears that, based on the best available data, the NHM sectors are the most influential in achieving a national Northern Ireland municipal recycling rate.

The optimum approach to achieving a 65% municipal recycling rate seems to be to balance contributions fairly across all sectors according to waste profile potential and relative cost burden faced. In practice this will mean setting higher ambition in recycling from NHM businesses and the public sector organisations and more realistic targets for Local Authority collections. For Local Authorities the performance potential is variable and so contributions from each Council needs to be tailored to represent their potential relative to each council's operating context.

The individual sector and sub-sector contributions to the recycling rate will vary according to a wide of factors including future waste composition and arisings changes, the impact of a revised calculation method as well as the impact of policy drivers. As an indication the average scenarios would suggest a balance of approximately 58% recycling from Local Authority collections and 73% from non-household sources as an optimum means of meeting the overall rate of 65%. It is possible to increase performance from either sub-sector but further investment and more impactful policy drivers would be required to drive diversion from residual waste further.

Maximising the potential from all the sectors affected by the CEP target will require the development and implementation of new policy measures. These will be designed to drive change, maximise material capture and alleviate cost burden generated in the transition and maintenance of new high recycling service profiles.

The report concludes with a series of suggested recommendations. These recommendations centre on improvements needed for improving forecast estimates and the need to develop new policy measures that drive the specific cross sector changes to achieve a 65% municipal recycling rate.

A number of recommendations are made addressing requirements to improve recycling and waste arising forecasts and to develop new policy measures. These will drive specific cross-sector changes to achieve a minimum recycling rate.

Note on Covid 19. Since March 2020, the Covid-19 virus has resulted in significant changes in the operations of businesses and other organisations, including an increase in the number of people working from home. These changes have and will continue to impact waste arisings and composition for the foreseeable future. Long term impacts on recycling and waste arisings and operations are unknown and it will take a while to properly understand data to determine the cross sector impacts. This study was based on the best available historical data and evidence and WRAP intends to update the CEP analysis in 2020 with the most up to date scheme figures. At the same point WRAP will undertake an initial review of the impacts of Covid on the sectors affected in this study to identify any early trends in results and implications on resource management for the next few years.

Contents

Glossary

CEP	Circular Economy Package
NHM	Non-Household Municipal as defined under CEP (typically these arisings originate from businesses and the public sector but is defined later in the report)
HH	Household
LA	Local Authority
WMC	Waste Management Company
HHWRC	Household Waste Recycling Centre

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1.0 Introduction

In December 2017 the UK agreed to adopt the Circular Economy Package (CEP) proposals with the finalised version published in the Official Journal of the European Union in summer 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2018:150:FULL&from=EN

UK nations are currently considering transition of the various articles into law with each country developing or updating their waste strategies to help deliver the range of ambitions set out within.

As well as proposals on Extended Producer Responsibility to fund the life cycle costs of valuable resources, there are new directives to recover key materials such as batteries and textiles and measures to limit landfill disposal. The CEP also sets ambitious new recycling targets on a wider definition than was the case in earlier directives. Previous UK waste strategies have prioritised waste management from households whereas CEP now broadens the scope of arisings and subsequently the obligations to all sectors generating municipal waste that is similar in profile to household waste. The municipal recycling rate target is to achieve 65% by 2035 with interim targets of 55% by 2025 and 60% by 2030.

The aim of this study was to support DAERA in answering the question whether Northern Ireland could achieve the 65% municipal recycling target. In developing the analysis approach the supplementary objectives emerged which were to consider;

- What would be the cost to the different sectors now included within the definition?
- The optimal contributions needed from to meet the target?
- What is the recycling potential from each sector?
- What might be the optimum approach to achieve high recycling but also relieve cost burden on sub-sectors affected?

The component parts of the analysis were:

1. NHM business survey – data gathering on sample Northern Ireland business waste profiles to understand service profiles and configurations in place currently.
2. NHM cost survey – gathering of representative waste and recycling service charges to NHM businesses
3. NHM analysis (1) – a bottom-up analysis focussing on the collected local data sets to make accurate waste provision assumptions at sub-sector level

4. NHM analysis (2) – a top-down analysis focussing on nationally reported business waste data at business sector level to understand cost and performance implications identifying sectors and arisings in scope of the new definition.
5. HH analysis – an analysis of scenarios to increase Local Authority household waste recycling. This work re-visited an earlier WRAP gap study designed to understand how household recycling could progress to meet 50% by 2020 and beyond.

WRAP undertook the analysis using in-house resources and using approaches similar to previous national studies for other Government funders. Industry experts from WRAP's call off contractor framework were used to help peer review these methodologies and gather datasets necessary for the analysis. A high level of quality assurance was built into the analysis to provide confidence to DAERA in the assumptions and the general research method employed to deliver accurate and relevant outputs. The report summarises the key outputs at a high level with a range of further outputs available should further analysis or extrapolation of results for different audience be required.

Northern Ireland's household recycling rate has improved steadily over the last decade from nearly 38% in 2010 to over 46% in 2017 based on the UK waste from households definition (WFHH). The performance based on the Northern Ireland Waste Management Strategy KPI method of calculation shows even greater improvement and reached 50% in 2018/19.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/784263/UK_Statistics_on_Waste_statistical_notice_March_2019_rev_FINAL.pdf

In order to review performance on the ability to meet the future targets the analysis looks specifically at the definitions of municipal waste set out in the CEP. Further explanation of the definitions and sub-sectors included is outlined in the respective HH and NHM sections.

Note on Covid 19. Since March 2020, the Covid-19 virus has resulted in significant changes in the operations of businesses and other organisations, including an increase in the number of people working from home. These changes have and will continue to impact waste arisings and composition for the foreseeable future. Long term impacts on recycling and waste arisings and operations are unknown and it will take a while to properly understand data to determine the cross-sector impacts. This study was based on the best available historical data and evidence and WRAP intends to update the CEP analysis in 2020 with the most up to date scheme figures. At the same point WRAP will undertake an initial review of the impacts of Covid on the sectors affected in this study to identify any early trends in results and implications on resource management for the next few years.

2.0 Defining sectors generating municipal waste

The adoption of the Circular Economy Package (EU Directive 2018/815/EC) necessitated changes to the Waste Framework Directive (2008/98/EC) to describe municipal waste and identifyetermine the waste streams in scope of the new proposals. Broadly speaking "municipal waste" covers household waste and waste similar in nature and composition to household waste. It is neutral in terms of who produces, collects or manages the waste streams, e.g. regardless of whether collections are delivered by the public or private sector. The definition is to be used to measure progress against recycling performance and targets. The full definition is set out in the following European Commission publication and is expected to be transposed to UK law in 2020.

https://ec.europa.eu/eurostat/documents/342366/351811/Municipal+Waste+guidance/bd38a449-7d30-44b6-a39f-8a20a9e67af2

The full scope of municipal waste is determined by application of the List of Waste codes set out in the supporting annex. For Local Authority household waste collections the obligation is clear in terms of the majority of collected waste arisings being in scope of the definition and targets. However, which non-household (NHM) sectors should be included is less clear and requires scrutiny in order to determine the quantities of arisings, the recycling potential and the subsequent costs of recovery from these organisations. In general terms the most appropriate method of calculating Northern Ireland NHM Municipal Waste fraction is to determine the amount of waste arisings under List of Waste codes (LoW) Chapter 20 with some additional LoW Chapter 15 waste, as well as exports defined of a similar nature.
http://ec.europa.eu/environment/waste/framework/list.htm

A recognition of business profiles, their numbers and sizes are important when apportioning nationally recorded data into the segmented businesses. Unfortunately, there are no accurate data sets apportioning all NHM arisings into the individual businesses at a national level. By reviewing previous approaches taken to estimate the cost impact of business recycling in UK regulatory impact assessments it was possible to create a methodology that is transparent, robust and clearly defines the NHM sub-sectors to include, along with business size categorisation. The method has been peer reviewed by Government funders and external Industry contractors, employed in UK evidence for dialogue with the European Commission and

in the development of analysis for England's recent national Resources and Waste Strategy; https://www.gov.uk/government/publications/resources-and-waste-strategy-for-england

Using this method and reviewing Standard Industrial Classifications (SIC), WRAP established the NHM Sectors that should be included in this project. https://www.gov.uk/government/publications/standard-industrial-classification-of-economic-activities-sic

These sectors are:

- (Food) Manufacturing
- Wholesale & Retail
- Hospitality
- Health
- Education
- Transport & Storage
- Offices & Other Services

By collating the Office National Statistics Inter-departmental Business Register (IDBR) local unit data for Northern Ireland, it was possible to extract the number of local units under each SIC code. https://www.ons.gov.uk/aboutus/whatwedo/paidservices/interdepartmentalbusinessregisteridbr

IDBR data is then segmented into the codes for Standard Industrial Classification of Economic Activities (SIC codes) plus a split by local unit size, to enable the creation of a table of market share by both business sector and business size. Figure 1. below is a visual representation of businesses in Northern Ireland that would be expected to fall under the WFD CEP definition. The list includes a range of expected commercial sectors such as hospitality and retail as well as public sector organisations such as education and the health sector. In total, there are 55,523 units in Northern Ireland that are classed as Municipal businesses.

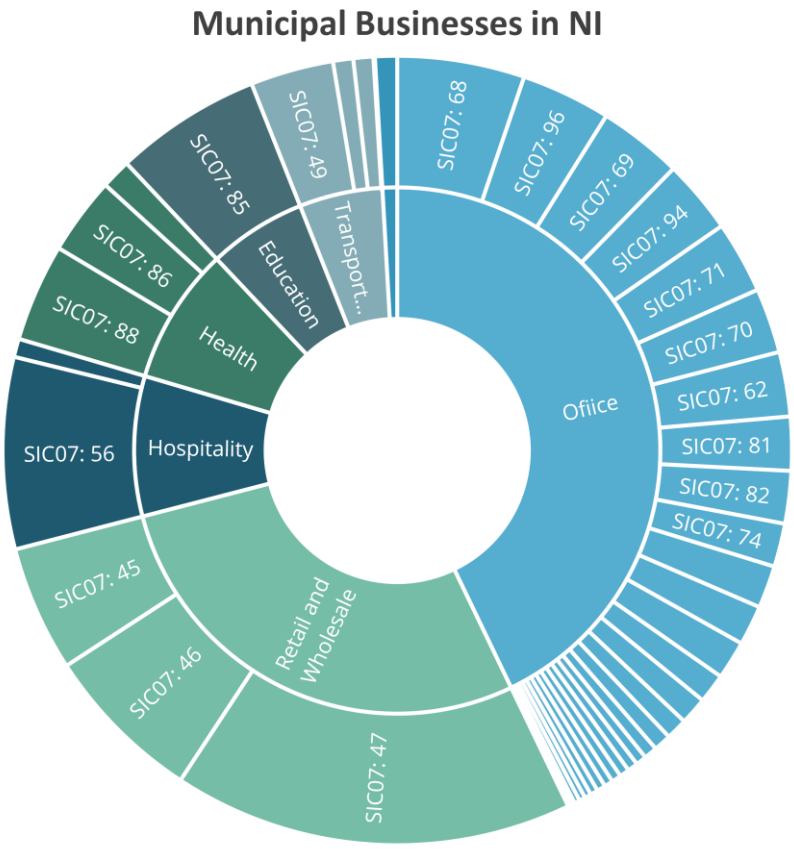

Figure 1: Northern Ireland businesses that are obligated under WFD CEP definition

A full list of SIC apportioned businesses that fall under WDF CEP definition can be found in Appendix 1. *Please note: Appendix 1 lists Municipal businesses to the nearest count of 5. The CEP NHM analysis was performed on actual counts, but due to its sensitivity it cannot be published.*

Businesses sizes to be used in the municipal analysis are categorised as below:

- Micro: 0-9 employee's
- Small: 10-49 employee's
- Medium: 50-249 employee's
- Large: 250+ employee's

This categorisation was adopted as it seemed suitable for this project and was consistent with previous CEP analysis work for UK Government.

Local Authority waste arisings are regularly recorded in Waste Data Flow and audited by a contractor to allow analysis of national, regional and individual Local Authority scheme statistics; https://www.wastedataflow.org/ At present no electronic reporting system for business or public

sector data exists which could provide the necessary data to support the analysis. In order to help develop confidence in the arisings assumptions and the subsequent cost calculations directly related to sub-sector arisings two approaches have been used to make assumptions on recycling rates and review the overall cost burden to businesses. These are a Top-down approach which models nationally recorded waste data to NHM Municipal business Sector level and secondly, a Bottom-up approach which models data gathered from businesses to make accurate waste stream provision behaviour assumptions at Sub-sector level. Both approaches are complex and involve data manipulation and alignment before new scenario modelling designed to increase recycling can be undertaken.

Given the absence of localised data the two methods assume that NHM businesses in scope of a revised definition can increase recycling from their starting position. The analysis does not account for localised physical or contractual factors preventing changes in service profile onto high recycling scenarios. In comparison to LA HH collection services WRAP research suggests that business collection contracts are relatively short term, typically of up to 2 years or less, with the majority on one year or rolling contracts. On this basis the anticipation is that, as long as changes are set at a realistic point in the future, the NHM businesses are likely to be able to secure a contract that enables the transition to a high recycling collection scenario.

2.1 Top-Down Approach

The formula below shows the calculation process WRAP used to obtain the high level estimate of NHM Municipal Arisings for Northern Ireland. The data gathering included sourcing data from the Environment Agency's Waste Data Interrogator (WDI), Northern Ireland Environment Agency who helped derive a NI specific version and also a review of reporting of licensed waste management facilities.

$$\sum EA\ WDI\ Ch.20\ and\ Ch.15\ Input\ permitted\ facilities - \sum EA\ WDI\ Ch.20\ and\ Ch.15\ Transfer\ Facility\ Output\ permitted\ facilites + \sum Exports - \sum Total\ collected\ waste\ from\ Households$$

2.1.1 NHM Sector Waste Generation

NHM businesses comprise commercial businesses, public sector and some larger industrial premises known to be generating "household similar waste streams". There are existing data sets which can apportion waste arisings in Commercial and Industrial Sectors as a whole, but none specifically for NHM sectors. To apportion waste generation to NHM sectors, a calculation of the Industry/Commercial split is required. This was achieved by replicating the methodology used in the England CEP analysis for Defra by using Eurostat and European Waste Catalogue code data applying a factor to calculate all waste apportioned to Industry (typically Food Manufacturing), and all waste apportioned to Commercial (all other sectors). By using a combination of Defra's established Industrial apportionment method and recent Northern Ireland Municipal studies further allocation of waste generation to each sector sitting under Commercial was able to provide tonnes of arisings per sub-sector for Northern Ireland. The Industrial apportionment information can be found at:
(https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/778779/CommercialandIndustrial_WasteArisings_Methodology_Revisions_Feb_2018_Oct_2018_rev2_update.pdf)

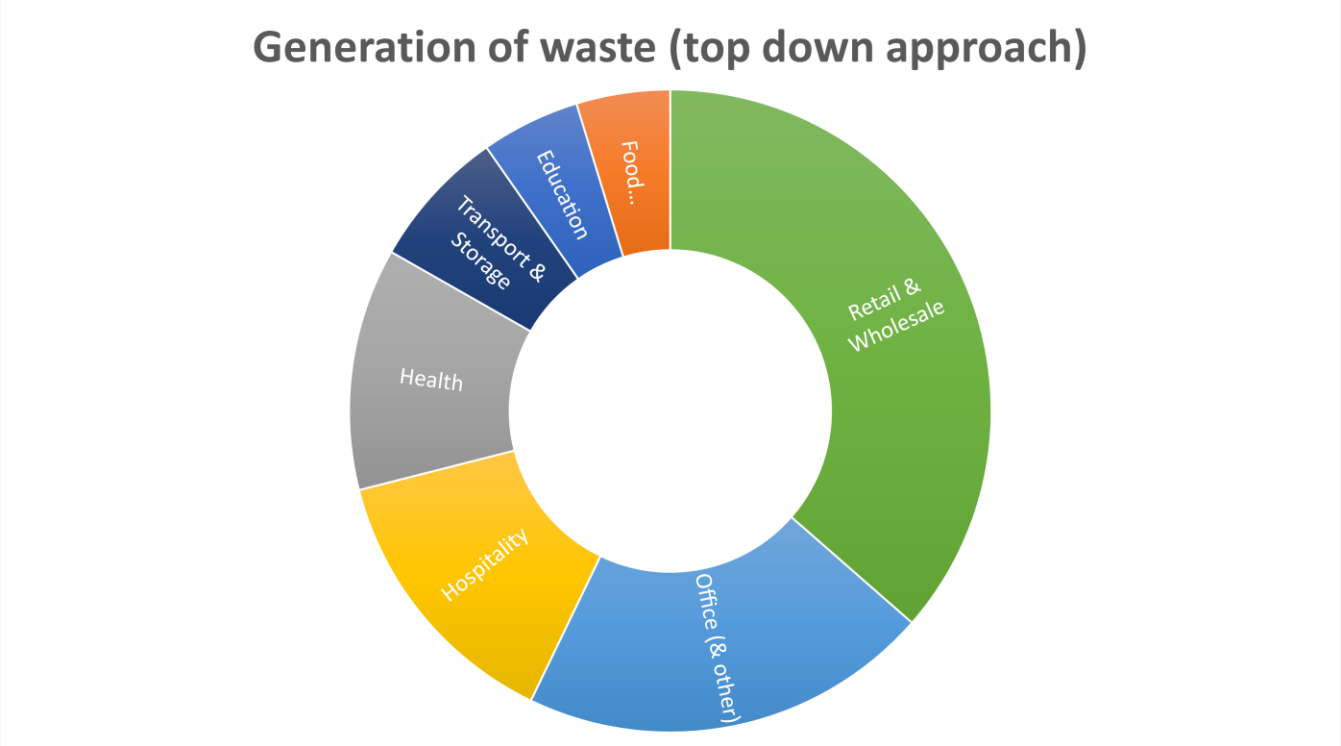

Figure 2: Generation of sub-sector tonnes from NHM sector

The tonnes from these sectors are broken down further into business sizes;

Table 1.NHM tonnes by business size

Total Tonnes of Sectors by business size				
Sectors	**Micro**	**Small**	**Medium**	**Large**
Hotels & Catering	51,080	40,153	14,470	1,785
Health	16,092	38,955	19,254	20,015
Retail & Wholesale	101,983	103,730	48,422	27,744
Education	457	14,726	17,889	5,428
Office (& other)	43,597	46,073	36,239	34,218
Food Manufacturing	476	4,100	4,566	27,406
Transport & Storage	12,318	16,955	23,285	2,063

2.1.2 Modelling data

In order to analyse the performance under new recycling scenarios and the cost of delivering the change there are two phases of modelling. The first phase takes the tonnes of each sub-sector and calculates the market share and waste generation per size and number of business. The second phase focuses on calculating the recycling rate and cost by streamlining tonnes per annum (tpa) per business type/size into material types. Each material type is then converted into volume using specific Industry established bulk densities and cost by converting tonnes into volume and material stream with an associated collection charge.

These key data sets included are:

- Tonnes arising
- Sector and Sub-Sector waste generation
- Sector and Sub-Sector waste composition
- Collection costs (price per lift per container and stream)
- Bulk density
- Container fill capacities
- Waste composition
- Business profile data

The majority of the key data sets were transferrable from the England model to the Northern Ireland model. However, three data sets were specifically re-worked to be representative of Northern Ireland. The three data sets are tonnes arising, collection costs and business profile data. Working with DAERA and NIEA, WRAP obtained government data on Tonnes arisings and business profile data. For the collection costs, WRAP commissioned desk-based research to establish Northern Ireland representative cost data on the most frequently used waste containers.

The flow diagram below shows the basic process modelling process from entering the overall NHM waste arisings figure, to calculating cost and recycling rate assumptions.

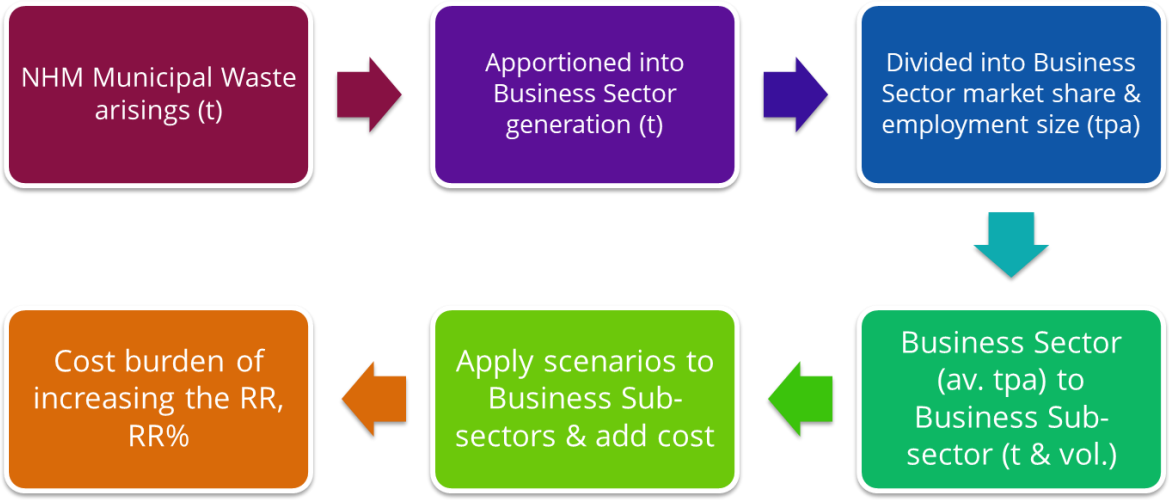

Figure 3 Flow diagram of Top-Down approach

2.2 Bottom -Up Approach

Even when businesses are apportioned out, in the absence of localised business reporting it is difficult for cost and performance assumptions to be calculated. An alternative approach developed to provide confidence in the overall estimates is a Bottom-up analysis using sampled data from representative NHM sector businesses.

The Bottom-up method involved gathering actual waste provision profile data from 319 business sites across Northern Ireland to develop a baseline that informs the average capacity for NHM businesses to adopt new recycling scenarios.

An experienced contractor was commissioned to representatively sample data from micro-, small, medium and large sized sub-sector NHM businesses. The sectors sampled included:

- Retail & Wholesale
- Hotels & Catering
- Health
- Education
- Transport & Storage
- Food Manufacture
- Offices (inc. 'Other Services') Note that offices is a broad SIC category that includes a wide range of premises.

The waste service provision data per business that was collected included:

- Waste/recycling container types per collection waste stream
- Number of containers per collection waste stream
- Frequency of collection per collection waste stream
- How full the container was
- Service provider type

Additionally, any behaviours that would affect a collection scheme were recorded in the face to face surveys. These included whether the business disposed of waste in the household collection system at home or took waste to HHWRC, or had an internal business disposal system that didn't involve a Local Authority or private waste management contractor.

Photographs were taken of the waste provision set up for each business to provide a visual representation. Below is a selection of some photographs of waste provision taken from visited business sites.

Figure 4: Surveys of NHM sector waste service profiles in Northern Ireland

The sampled on-site data was then modelled to create a realistic baseline of what services businesses are procuring for waste and recycling and the container typically provided.

In addition to the site surveys it was important to understand the typical service costs the NHM sector businesses are charged. The service charges are used in the NHM analysis to calculate the baseline costs businesses incur for the service profiles they are known to have and to calculate the future costs should they change that would result if recycling activity was increased. These higher rate scenarios were modelled.

The typical service cost is predominantly charged on a price per empty container which reflects the service collection costs, container capital, associated marketing, scheme set up and management, any bulking and haulage, the material treatment and/or net sales and profit margin. The survey secured data for the 11 LAs and from 7 private waste management companies operating in Northern Ireland. Factors such as the geographical location of serviced businesses, the contract terms and profit margin all play a part in the variability of the costs.

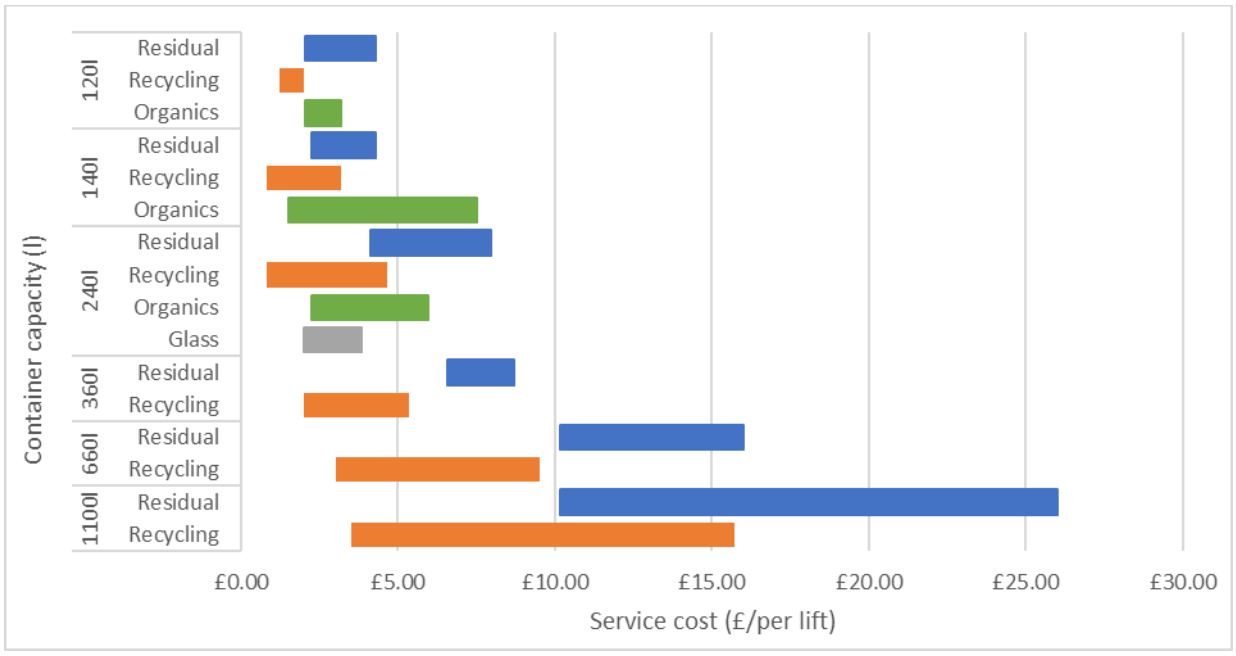

Figure 5: Lift pricing survey results for LA-managed commercial waste services in Northern Ireland

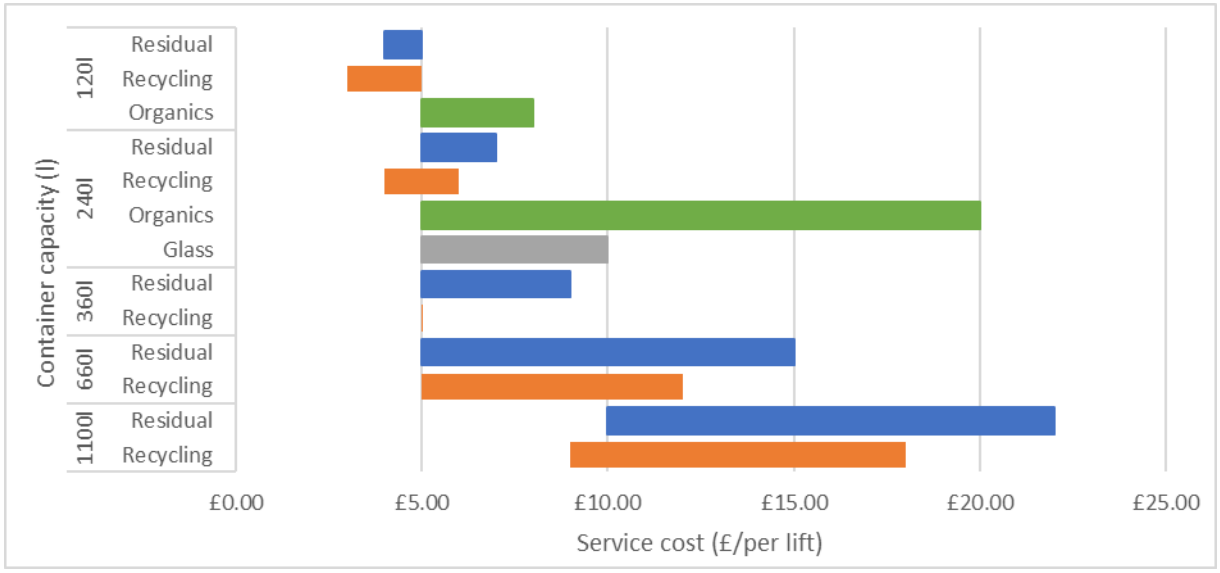

Figure 6: Lift pricing survey results for private sector managed commercial waste services in Northern Ireland

It was not the objective of this research to scrutinise the pricing across providers and all results are anonymised and data treated confidentially. The average pricing per empty container relative to the capacity and material stream was combined in the analysis to provide indicative baseline and future scenario cost profiles for each NHM sector.

Similar to the Top-down approach, the Bottom-up assumptions have recycling rates generated by tonnes and costs generated by volume. The assumptions are calculated on one of 3 core variants:

1. Business as usual; "BAU" is a representation of the most frequently used waste provision scenario of a specific sub-sector business type and size. It provides data on the most commonly used container type and quantity along with collection frequencies for waste streams identified in the most frequently used waste provision scenario.

2. Maximum Business as usual; "MaxBAU" is a representation of any additional waste stream data that is evidenced from on-site data collected from businesses, but not included in the most frequently used waste provision scenario. This variant does not reduce the residual container size even though an additional recycling container may have been added. With BAU and MaxBAU we can calculate and make assumptions on current recycling rates, increased recycling rates and cost implication.

3.Optimised; The "optimised" variant is when the residual container is able to reduce in size if sufficient recycling has been diverted from the residual stream dependent on the scenario. Although this is not fully reflective of actual behaviour and capability of the business, it does suggest what could be achieved at high levels of recyclable materials capture within the business.

It is important to note that no robust UK data currently exists that can inform the actual capture rates of recyclable materials that should be entering the designated containers versus the residual stream. As such the "optimised" estimates in the analysis of NHM recycling based on what is currently available in the waste stream are clearly optimistic. However, over time the impact of Extended Producer Responsibility measures will be to decrease the non-recyclable fraction of waste which correspondingly may help address the high capture rate.

The initial analysis of how Municipal businesses are recycling with current waste provisions (BAU), indicates a Recycling Rate of 40%. Further analysis will provide more data points and update the baseline estimates and help refine the assumptions.

3.0 Findings from NHM analyses

3.1 Overall NHM Findings

In the absence of clear NHM sector reporting it was felt important that both Top-down and Bottom-up approaches were needed to make the most realistic assumptions of increasing the recycling rate to 65% and above and the cost implications of this.

The same patterns are emerging in both methodologies. These findings include a similar baseline NHM recycling rate, similar levels of high recycling performance that could be achieved. Although overall there is a low or limited cost burden, there is clear evidence that the micro- and smaller businesses would pay proportionately more to use high recycling service options.

3.2 Top-Down Findings

The Top-down approach emphasises the reported tonnages. From the calculations it is possible to start to infer a recycling rate by sector, based on the waste composition profiles their arisings are based on in the analysis. All sectors tend to have high theoretical recycling rates when the full range of services is included in the scenario. This is because, compared to household waste derived from LA collections, the NHM waste profiles tend to be predominantly made up of packaging and food waste. In particular, the addition and use of food waste collections to all NHM businesses in the scenarios sectors presents the largest potential increase in recycling performance. Table 1 describes the make-up of each scenario.

Table 2: NHM scenarios and descriptions

Scenario	Description	Presented Scenario
Scenario 1	All waste is classed as Residual	Baseline
Scenario 2	Residual & DMR (excluding glass)	Low
Scenario 3G	Residual, DMR & separate Glass	Moderate
Scenario 3F	Residual, DMR & separate Food	Moderate
Scenario 4	Residual, DMR, separate Glass & separate Food	High

The chart below details the indicative recycling rates through the 4 scenarios which increase recycling provision. The results show that all sectors can achieve high levels of recycling

performance. The performance levels for NHM sectors are very high compared to household recycling because the waste composition profiles for each sub-sector contains much bigger proportions of recyclables and food waste and low quantities of non-recyclable waste. In particular, the step change in performance appears when all businesses that generate food waste are maximising the capture of this prevalent material.

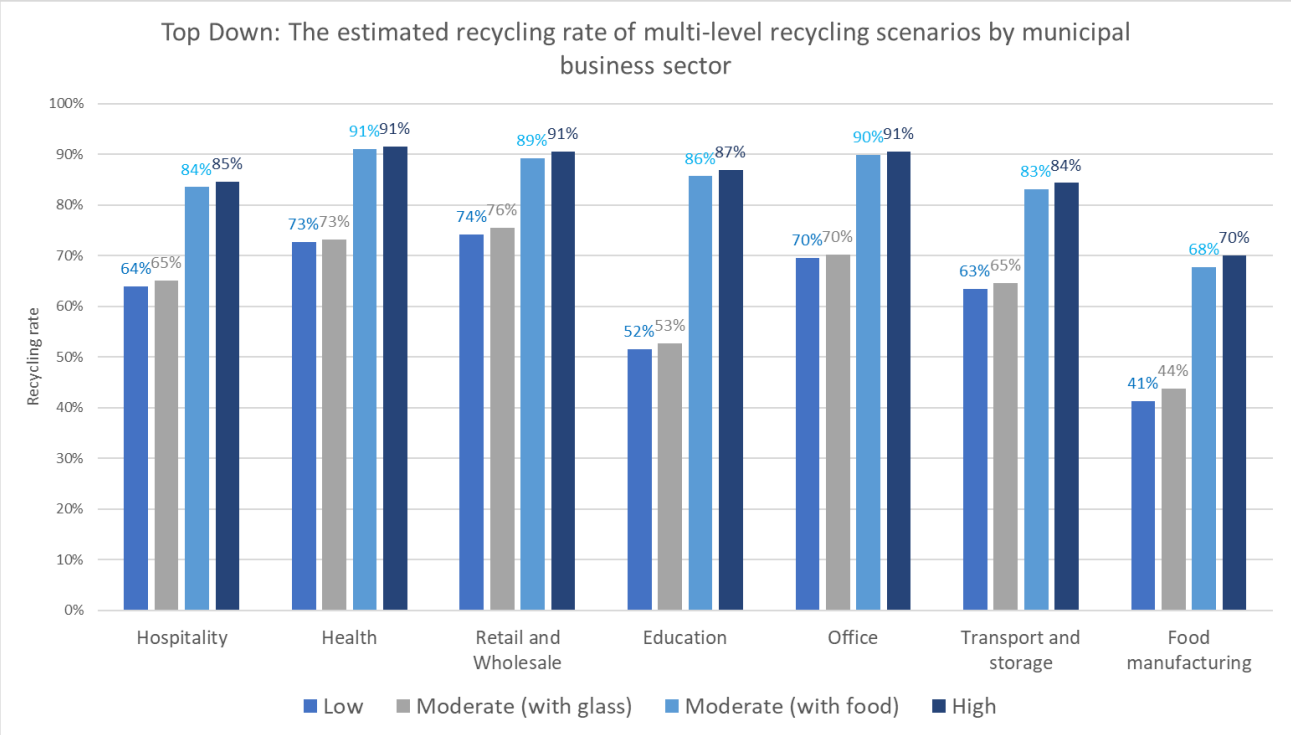

Figure 7: Modelled recycling rates by NHM sector considering low to high scenarios

Because there is no actual reported baseline for each sector to refer to in terms of costs, scenarios are shown ranging in different levels of recycling and waste service provision. The costs are presented as deviating if businesses were only using a residual waste service.

The scenarios show all NHM businesses as having one of four services:

1. Dry mixed recyclables (DMR) and a residual waste service.
2. Dry mixed recyclables (DMR), separate glass collection for those businesses generating large quantities, and a residual waste service.
3. Dry mixed recyclables (DMR), a food waste collection to all and a residual waste service.
4. Dry mixed recyclables (DMR), a food waste collection to all, separate glass collection and a residual waste service.

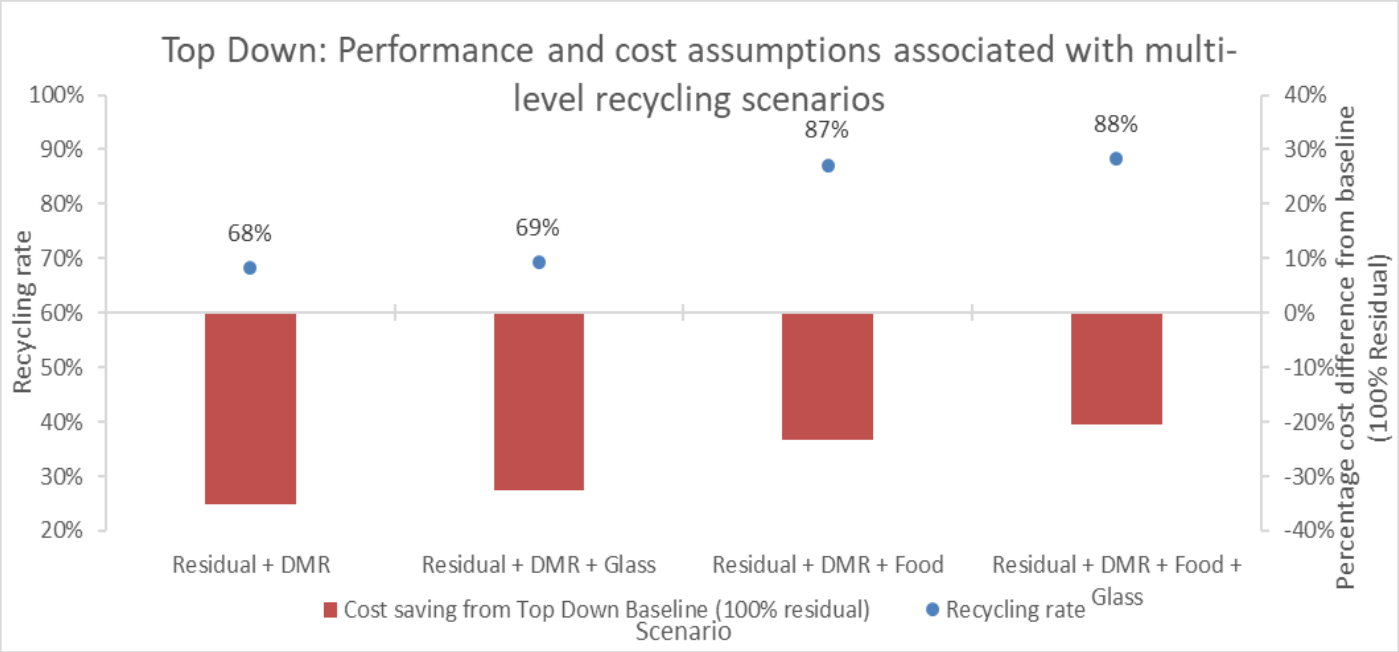

Figure 8: Chart to show performance and cost assumptions per waste provision scenarios

The results show that it is clear that large financial savings of between 20% and 30% can be made nationally by transitioning to using high recycling collection scenarios from a base of no or limited recycling. The actual business savings will depend on where the individual business sits at present and the difference to the on-going cost of the new scenario. The individual baseline position is currently unknown due to non-reporting limitations and unlikely to be addressed until a version of reporting similar to Waste Data Flow is introduced.

The scenarios typically show that as the volume of recyclables is transposed from the residual waste container in to the recyclate container then, in theory, businesses could save money when the level of diversion is sufficient to allow reductions in residual containment. As the recycling service profiles increase for each business the savings diminish relative to the ability to make savings from spare capacity.

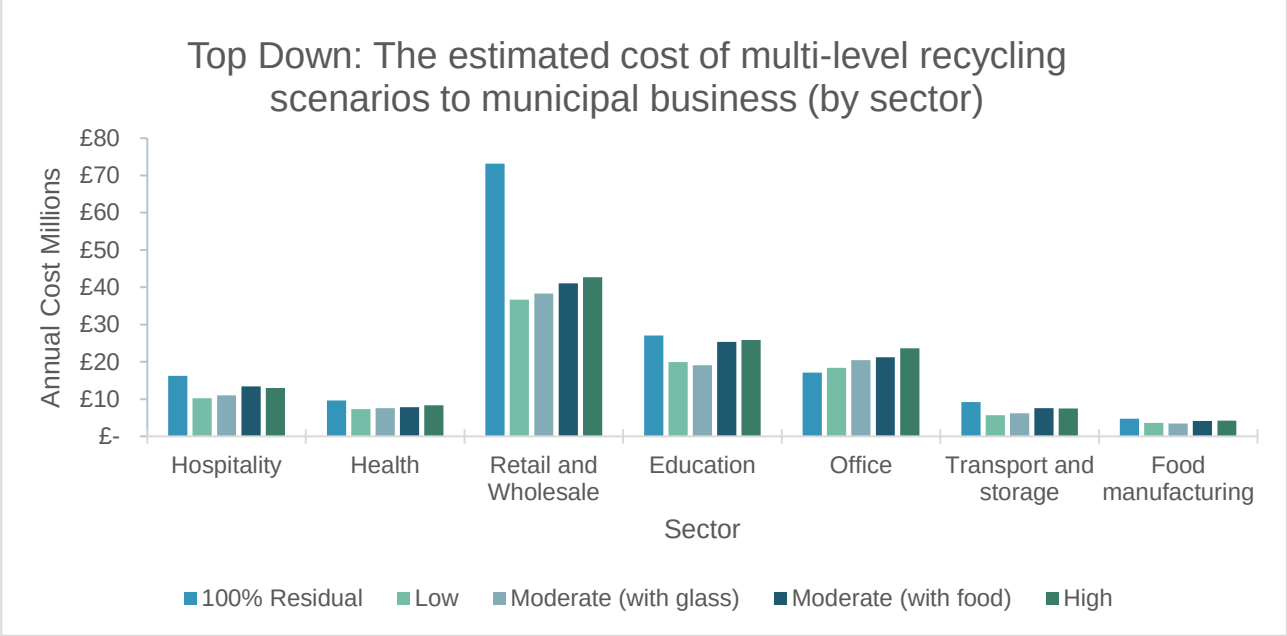

Figure 9: Chart to show estimated cost to business per scenario

The survey in section 2.2 clearly showed that in Northern Ireland the cost per lift of recycling is cheaper than the cost per lift of a same sized residual waste container. This is typically due to the lower gate fee for mixed DMR stream compared to residual waste gate fees. On this basis the analysis shows that Retail and Wholesale, Hospitality and Transport & Storage would pay less if they used the optimum segregation collection and Health, Education and Food Manufacturing show to be cost neutral. The office (SIC) business units are the key sector that have to pay more for higher recycling based on current market rates for recycling and waste services. The reason for the range of costs is linked to the size of the business and the type and scale of waste materials they are generating.

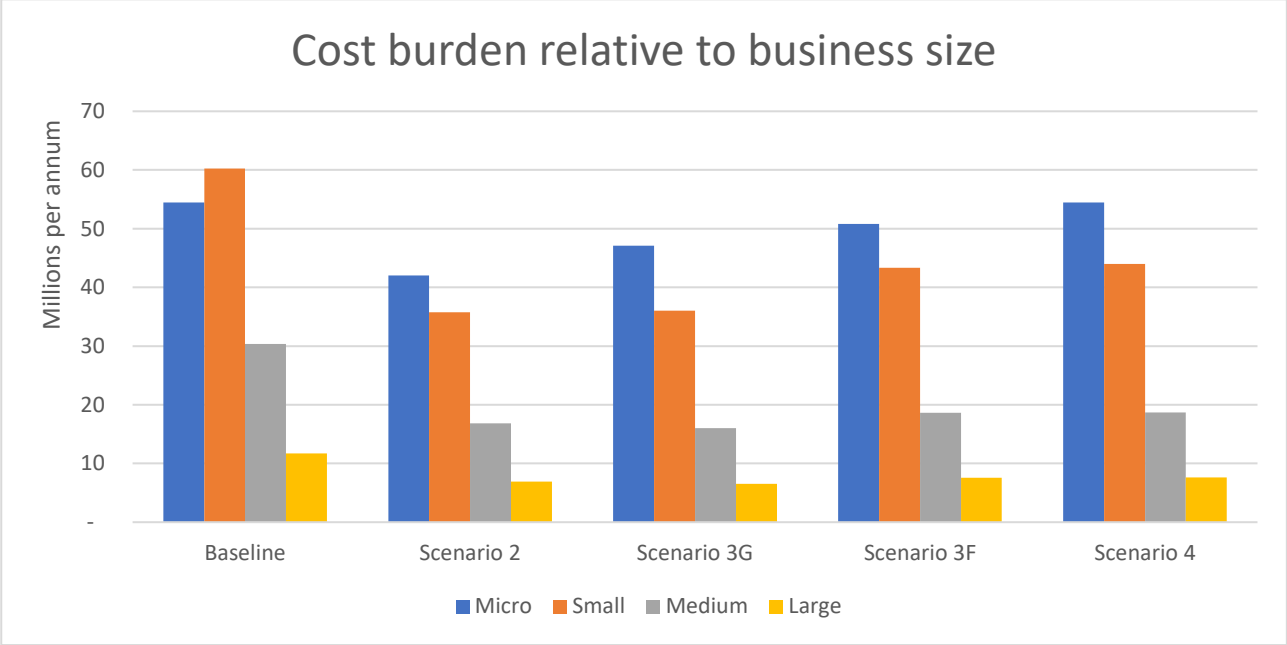

Figure 10: Cost burden to NHM sector by business size

It is clear that micro- and small businesses look to have the biggest cost burden if they increase their recycling, moving from 100% to residual to an optimum segregated collection. This is mainly due to the smaller sized businesses changing from one or limited containers for their current waste management services to the additional cost to provide further containers for additional recycling. There are significantly more micro- and small units for the office sector in Northern Ireland. [Then?]

From previous studies and Industry experience the cost increases tend to be that these businesses generally having a smaller unit size. As such they do not produce enough quantities of the key recyclables to make sufficient savings to significantly reduce the residual waste capacity needed. As such these businesses, on the current price per lift market rates, can end up paying for more recycling and waste management services overall.

The costs to small businesses may also be high due to their starting point. For example, the waste container profile survey found the 1100 litre euro bin was found to be the most frequently used container size of business waste, which may be too big for the waste they individually generate. The bottom-up approach shows that some small business owners share bins to address this problem or have a smaller container. Some small businesses may be exempt from this top-down assumption. We will be able to evaluate better small businesses when we increase small business site data obtained through the bottom-up approach.

3.3 Bottom-up Findings

The Bottom-up approach focusses on the data by business sub-sector and emphasises the use of the survey data collected. It provides a more realistic baseline of what is being collected from business sites and the waste service provisions employed for this. It also provides insights on the actual business behaviours that can influence the cost burden if the recycling rate was increased.

The surveying approach identified a range of means of waste provision used for and recycling other than a LA/WMC collection scheme. It showed that for the smaller businesses and especially micro-businesses, a significant amount of waste is either taken home and put in household waste streams, or taken to the HHWRC or local recycling bring banks. This means that some NHM arisings are entering the household waste stream and some businesses are not paying for the commercial collection. The implication for recycling performance is that the current household recycling rate is being negatively affected by the ingress of commercial/NHM waste

It was also recognised that some businesses shared containers and cost as they did not generate enough arisings individually to warrant a container commonly used in waste collection schemes. There are uncertainties regarding whether the sharing of containers was legitimate but probing this issue further was outside the scope of the survey.

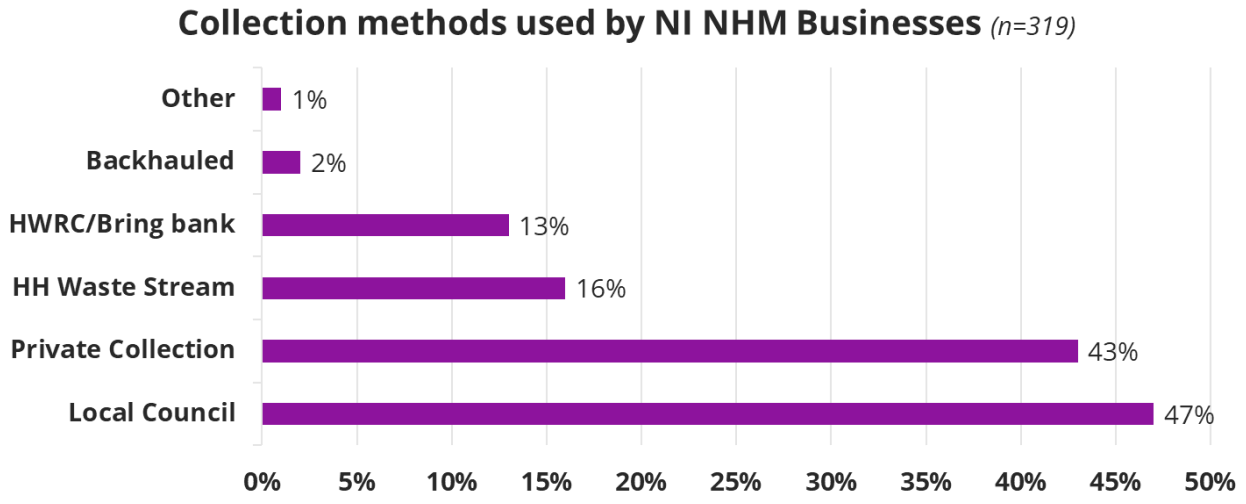

Figure 11: Reported use of collection methods for waste and recycling in Northern Ireland

Table 3: share of waste and recycling collection containers by businesses

Overall, only 8% of businesses have a shared waste provision				
	Micro	Small	Medium	Large
BAU*	13%	2%	0%	0%

**BAU = Business As Usual (current)*

For larger businesses, it is suggested that it is common to have disposal methods such as back-hauling of food and DMR, which again excludes these arisings from a LA/WMC commercial collection scheme. This means that although arisings may be captured on a national level they may have little relevance to the business site, and may cost the business less than a LA/WMC commercial collection scheme. For food producing businesses, efforts to reduce or re-distribute may also affect the overall quantity available for recycling.

The modelling assumptions presume that businesses can theoretically change container profiles and at this level of analysis we cannot yet build in localised limitations that premises may face in this transition. It became apparent in the surveying that space may be a barrier to some businesses if they are asked to increase the numbers of containers they have to recycle more. In some places space to house waste and recycling containers is limited, as well as access for collection vehicles lifting the containers. Equally, the transitioning of services on a national or regional scale will also provide opportunities to reduce costs and identify more efficient solutions through economies of scale in collection charges and/or joint procurement.

4.0 HH analysis

Recycling rates across the UK are calculated and often presented in slightly different ways to align with objectives in the different national Strategies. The Northern Ireland household recycling rate on the KPI a2 calculation has shown steady progress to meet 50% in 2018/19 which equated to over 990,000 tonnes of waste and recyclate arisings.
https://www.wastedataflow.org/documents/guidancenotes/NorthernIreland/OtherGuidanceNotes/WfHrecyclingguidanceNI_v2.pdf

Future transposition of the Circular Economy Package will probably require the recycling calculation method to be harmonised across the UK and the European Union Member States, which will be aligned with adoption of CEP. As well as the transition to report on the wider municipal definition of household similar waste, the calculation will also determine which materials can be counted and the point at which recycling can be classified. Further dialogue is being undertaken across the UK on the implications of the definition. It is expected there will be closer alignment to the standard "waste from households" calculation method (WFHH) than the individual Northern Ireland Waste Management Strategy-related definitions. The WFHH definition excludes noticeable contributions from a number of waste streams including street sweepings, on-the-go recycling and parks and grounds. The current WFHH calculation definition is lower in overall arisings at 838,546 tonnes with a recycling rate of 46.3%. In order that the results from the NHM section can be combined to review the overall ability to meet the CEP 65% target the household analysis is presented on the standard WFHH definition.

Despite the transition to a combined municipal definition,WRAP believes it will be important to retain monitoring and recording of a household recycling rate in order to understand the relative contribution from this sector to the overall municipal target. Therefore, this section covers the analysis of household recycling potential to increase and contribute to the municipal recycling target. Overall, more waste is generated from households than from businesses and public sector organisations and institutions obligated within the CEP municipal definition; 838, 546 tonnes from HH sources compared to 773,480 tonnes from NHM. Therefore, the achievement of a 65% recycling rate target requires the recycling of 1,047,817 tonnes of recyclate across Northern Ireland, based on the financial year 2017/18.

4.1 2016 50% HH gap study findings

In 2016 WRAP worked closely with DAERA and Northern Ireland Local Authorities to undertake a gap study of how household recycling could progress to 50% and beyond by 2020. The analysis considered the impact of different waste and recycling collection scenarios on the recycling rate for Northern Ireland from both kerbside and household waste recycling centres (HHWRCs).

CEP analysis Northern Ireland

To ensure cross-Northern Ireland participation in the study a workshop with all NI Local Authorities was convened in Templepatrick in 2016 to help consider a wide range of potential scenarios that could drive recycling performance. The scenarios that Northern Ireland LAs wanted to consider in the analysis included adding missing dry materials to schemes, increasing the frequency of food waste collections, improvements at HHWRCs, restricting residual waste either by frequency or by volume, and national or regional communications campaigns. A representative group was formed of key stakeholders representing Local Authority interests to help with filtering of the scenarios, agreeing key assumptions and ensuring that the analysis was fit for purpose. A wide range of assumptions from Northern Ireland and UK studies and published evidence was used in the analysis.

The analysis tasks involved:

- Collecting baseline data from each Local Authority on their service costs and operational service delivery.
- Agreeing a range of scenarios with the representative group.
- Identifying appropriate modelling assumptions to use for Northern Ireland.
- Agreeing a range of scheme roll-out constraints (contracts, number of flats, other key barriers).
- Developing a modelling approach that met the requirements of DAERA and Northern Ireland LAs.
- Undertaking analysis with projections over time.
- Showing the breakdown of costs for the key scenarios.
- Combining scenarios to review the overall potential to achieve the national recycling targets.

The key conclusions of the 2016 analysis were that:

- It appeared possible to meet 50% recycling rate from kerbside scenarios. The maximum performance achieved was 50.8%.
- Due to limited contractual constraints in Northern Ireland compared to other nations it appeared possible to meet 50% in 2020 assuming all Northern Ireland LAs started with major scheme changes in 2018/19 financial year.
- The groups of scenarios which meet 50% all include further restrictions of residual waste either by frequency (3 weekly collections) or by constraining volume (replacing current residual containers with restricted volume bins).
- The lower cost high performance scenarios included weekly food waste and restricted residual waste.
- The 3-weekly residual scenarios were lower in cost due to the operational savings in reduced service frequency.

- The least cost scenarios all included multi-stream collection profiles with savings coming from co-collection of separate food waste alongside the dry recyclables.
- Separate food waste collections increased the recycling rate by over 6% compared to 2% addition from mixed garden and food waste collections.
- HHWRC scenarios added over 3% and would support kerbside performance to increases beyond 50%.
- The maximum rate from combined scenarios showed it was theoretically possible to achieve approximately 55% assuming the optimum component parts of scenarios could be combined and delivered effectively.
- Scenarios including flats, adding in missing dry materials at kerbside, communications added minimal increase to the recycling rate.
- The use of Northern Ireland specific data (lower than UK performance generally) appeared to be reducing the potential recycling rates that could be achieved.

4.2 Updated HH analysis

The objective of the study was to update the 2016 analysis and further understand the potential contribution to a municipal recycling rate from Northern Ireland LA household sources. Since the gap study recycling in Northern Ireland has steadily progressed from 42.4% in 2015/16 to 47.1% in 2017/18 based on the WFHH definition. The main reasons for this appear to be investment in LA collection schemes, particularly the promotion of food waste capture, and decline in household residual arisings.

Previous statistical analyses of UK recycling performance had noted that Northern Ireland was not achieving comparable recycling yields from similar schemes. Over the last 3 years dry recyclable yields have started to increase in line with UK captures. A key assumption in the original gap study was to incorporate a Northern Ireland factor to prevent over-projection of performance which may have slightly depressed the original forecast rate.

A key consideration in the updated analysis was to ensure that good quality assurance principles were maintained in line with work undertaken for Government in line with the AQUA book guidance; https://www.gov.uk/government/publications/the-aqua-book-guidance-on-producing-quality-analysis-for-government

Given the short timescales for the analysis between December 2018 and March 2019, it was not possible to reconvene the representative group or organise a cross—Northern Ireland workshop to discuss new scenarios and assumptions. In order to maintain quality controls, it was agreed that the analytical methods adhere to the original modelling approach since the method and use of national and UK data seta sets had previously been agreed and therefore quality standards would

be maintained. The annual performance data and any schemes changes would be updated but the core assumptions would remain.
The original gap study undertook a desktop review of recycling potential from HHWRC in Northern Ireland to help inform the additional contribution to the overall HH recycling rate. The study considered the addition of missing materials and implementation of new policies to increase capture at each site and minimise trade waste ingress. A 2018 study commissioned by WRAP undertook site assessments to further explore the potential contributions. The summary of these studies is shown at the end of this section.

Based on the points above the steps in the updated 2019 HH analysis were to:

1. Review the scheme changes made by Northern Ireland LAs and incorporate these into a new baseline model.
2. Update LA recycling performance using the latest statistics available.
3. Consider whether to replace the Northern Ireland sourced that was reducing the potential uplifts achievable.
4. Review the previous scenarios and agree to reduce the number by eliminating low impact options.
5. Arrange and undertake a peer review of approach and assumptions.
6. Run the kerbside scenario analysis.
7. Incorporate the HHWRC analysis.

4.3 Overview of HH modelling approach

The Northern Ireland HH scenarios are analysed using a modelling approach WRAP originally developed for the Consistency Framework in England http://www.wrap.org.uk/collections-and-reprocessing/consistency. The modelling approach (Routemap) was peer reviewed throughout the project development to ensure that the analysis followed good practice and the risk of error in calculations was minimised. A consultancy experienced in analytical techniques including statistics, modelling, simulation and testing of spread sheet tools was employed to peer review the structure of the model with verification of input data tasked to external Industry specialists. The modelling suite is updated annually using the latest information and reviewed internally for comparison to the previous year. A version of the Routemap model was created for Northern Ireland using scheme and performance data specific to the Northern Ireland

The scheme profiles for dry recycling, residual, food and garden waste collections, are provided by the Northern Ireland LAs into the WRAP Local Authority Recycling Scheme Updater (LARSU http://larsu.wrap.org.uk/). The scheme baselines are developed with the nationally reported Waste

Data Flow (WDF) tonnages from 2017/18 http://www.wastedataflow.org/ The 2017/18 year was selected as the year for the HH analysis partly because audited WDF was available and partly due to the need to compare to scheme performance from WRAP's audited Local Authority Recycling Scheme Updater information for the same year. http://larsu.wrap.org.uk/

The collection scheme data was analysed to extract details for both low-rise and high-rise collections in order to model performance and costs for each local authority as accurately as possible. It would naturally be expected that the performance and cost of collecting from high-rise properties varies quite considerably from that of low-rise. Hence it was important that the model differentiated between low-rise and high-rise, especially in areas with a higher proportion of flatted properties such as in Belfast City Council.

Performance levels for future scenarios are derived from the UK benchmarking and analysis of scheme types undertaken by WRAP and presented on the Local Authority Portal (http://laportal.wrap.org.uk/). The performance levels are aligned to factors known to affect recycling performance such as scheme design variables and contextual factors, such as relative deprivation and housing type recognised in established research; http://www.wrap.org.uk/collections-and-reprocessing/collections-and-sorting/kerbside-collections/reports/factors-influencing-recycling-performance. In this way performance forecasts for new scenarios are in line with established schemes from across the UK relative to local circumstances and the effects of scheme design. Where data sets are limited and not possible to derive from national case studies for example, with regards to kerbside dry recycling yields, the model assumes that high-rise perform at 50% of the Northern Ireland LAs low-rise properties.

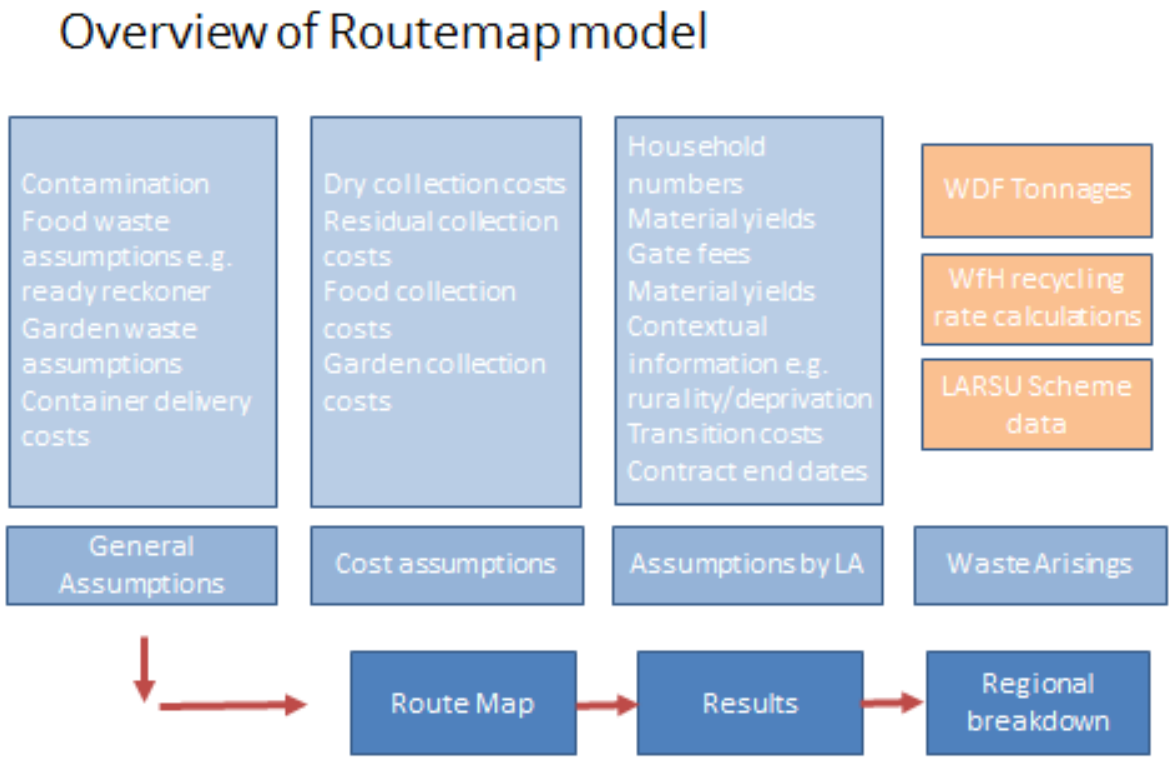

Figure 12: High level summary of data included in Household collection model

The modelling incorporates the potential scenario change according to when the Council can implement the change and includes assumptions regarding the pace of transition. The analysis accounts for population and housing stock changes and UK waste arisings projections. The model only looks at kerbside collection scenarios with tonnages for all other waste streams (such as HHWRC and bring sites) added separately in individual modules. In order to account for expected changes in waste streams over time, the model applies a percentage difference relative to the projected population change over time.

Local Authority collection and service costs are not formally reported at the granular level needed to undertake a comparative analysis of detailed scenarios. DAERA and the earlier representative group acknowledged the differing approaches to accounting between Councils as well as challenges in collecting and validating data from all Northern Ireland LAs. Given the project timescale available it was agreed that indicative costs derived from WRAP's Kerbside Costing Tool could be used in the analysis where particular costs are attributed to collection scheme types relative to the local geography and deprivation for specific Authority 'types'. The model calculates the expected indicative collection costs of each individual service based on the rurality of the LA, whether the collection is to high-rise or low-rise properties, the collection type, frequency and materials included (where relevant). There are currently almost 6,000 different collection cost codes in the Routemap model created from the underlying models behind WRAP's kerbside costing

tool. The large range of cost models derived are designed to reflect the wide diversity of ruralities and service configurations. Further details of the general costing approach can be found at: http://laportal.wrap.org.uk/ICPToolHome.aspx

The kerbside costs generated were compared to actual LA costs submitted by Northern Ireland LAs in the 2016 study and via a review of recent LA reports undertaken by WRAP. The majority of operational costs were found to be close in value to the standard cost unit values with minor adjustments made to update for vehicle capital prices. The costs are provided for six typical rurality groupings assigned to each Northern Ireland LA to reflect local geography and deprivation with the individual yields being able to be tailored to each LA.

Where applicable the Materials Recycling Facility gate fee, bulking, treatment, disposal and material revenues have also been tailored to the specific costs provided by the individual local authorities during the analysis carried out in 2016/17. Default values are obtained from the Materials Pricing Report and Gate fees report in the absence of localised values.

http://www.wrap.org.uk/content/gate-fees-report-2018-comparing-costs-waste-treatment-options

http://www.wrap.org.uk/content/materials-pricing-report

The modelling also accounts for transitional costs in changing services between the baseline (what is currently happening on the ground) and fully implementing the new scenarios. Transitional costs are accrued during the period of change such as the cost of re-routing, project manager support, container storage and delivery, additional call centre staff and communications. Transitional costs are standard unit prices derived from WRAP's extensive working with implementation of schemes across the UK. During the 2016/17 analysis some LAs provided specific localised costs and these have been incorporated into this updated modelling.

In order to generate the most accurate data available the modelling is done at the LA level and scaled up to generate results at a Northern Ireland level. Given the thousands of data points and many assumptions used in the analysis, many drawn from commercially sensitive sources it is not possible to list all assumption values publicly. Further detail and clarification can be available on request to DAERA.

The outputs are presented in terms of the WFHH definition but can also be interpreted via the national indicator KPIa2. It was agreed with DAERA that a reasonable start date for the majority of LA HH of schemes would be 2022/3 and that schemes would be fully implemented by 2025/6. The indicative costs of service delivery through collection and processing are broken down into their various components and presented over a stated time frame, to allow for the full mobilisation period.

4.4 Summary of scenarios in updated analysis approach

The range of scenarios in the original gap study were reviewed to see whether all scenarios were still relevant to be included. 28 core scenarios were used originally. It was agreed that scenarios that covered communications only, flats and two-stream glass separate could be removed on the basis of factors such as low performance, limited data quality, and in the case of two-stream collections it appeared more cost effective to keep the paper fibre stream separate. On this basis DAERA agreed to reduce the set of scenarios down to 21. The shortlisted scenarios are shown on the next page.

Table 4: Overview of HH scenarios

Scenario	Refuse	Dry	Food	Garden	Dry materials
BAU	No change	No change	No change	No change	All 6 materials
1b	3 weekly	No change	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
1c	3 weekly	No change	Weekly separate food	Free garden	All 6 materials
1d	3 weekly	Multi-stream	Weekly separate food	Free garden	All 6 materials
1e	3 weekly	Two-stream (paper/card sep)	Weekly separate food	Free garden	All 6 materials
1g	3 weekly	Multi-stream	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
1h	3 weekly	Two-stream (paper/card sep)	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
1j	Fortnightly	Multi-stream	No change	No change	All 6 materials
1k	Fortnightly	Two-stream (paper/card sep)	No change	No change	All 6 materials
1l	Fortnightly	No change	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
1m	Fortnightly	No change	Weekly separate food	Free garden	All 6 materials
1n	Fortnightly	Multi-stream	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
1o	Fortnightly	Multi-stream	Weekly separate food	Free garden	All 6 materials
1p	Fortnightly	Two-stream (paper/card sep)	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials

1q	Fortnightly	Two-stream (paper/card sep)	Weekly separate food	Free garden	All 6 materials
2b	Restricted (180 litres)	No change	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
2c	Restricted (180 litres)	No change	Weekly separate food	Free garden	All 6 materials
2d	Restricted (180 litres)	Multi-stream	Weekly separate food	Free garden	All 6 materials
2e	Restricted (180 litres)	Two-stream (paper/card sep)	Weekly separate food	Free garden	All 6 materials
2g	Restricted (180 litres)	Multi-stream	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
2h	Restricted (180 litres)	Two-stream (paper/card sep)	Fortnightly mixed food and garden	Fortnightly mixed food and garden	All 6 materials
3a	No change	No change	No change	No change	All 6 materials

4.5 Overview of HH kerbside analysis results

This section covers the analysis of scenarios designed to improve kerbside recycling. It is important to note that the scenarios modelled in the latest 2017/18 Northern Ireland Routemap model are not the same as those run previously for the earlier 50% analysis. The scenarios have similar profiles but use updated assumptions and combinations and are therefore not directly comparable. However, there are similar patterns to the earlier results since the key components of scenarios have similar influence on both recycling performance and the on-going service delivery costs.

The results were divided into the three key sets under which residual collections changes appear to be influencing the costs and performance. These sets are maintaining fortnightly residual, replacing residual containers for fortnightly collections and potentially switching to 3-weekly residual.

Overall, the trends show that the performance levels are uniformly higher than the original gap study. The maximum kerbside scenario appears to achieve close to 55% compared to around 51% in the original study. From reviewing the tonnage comparisons, the key reasons for the difference

appears to be the adoption of UK performance values and that Northern Ireland has progressed in national recycling performance since the original study was undertaken using 2015 data.

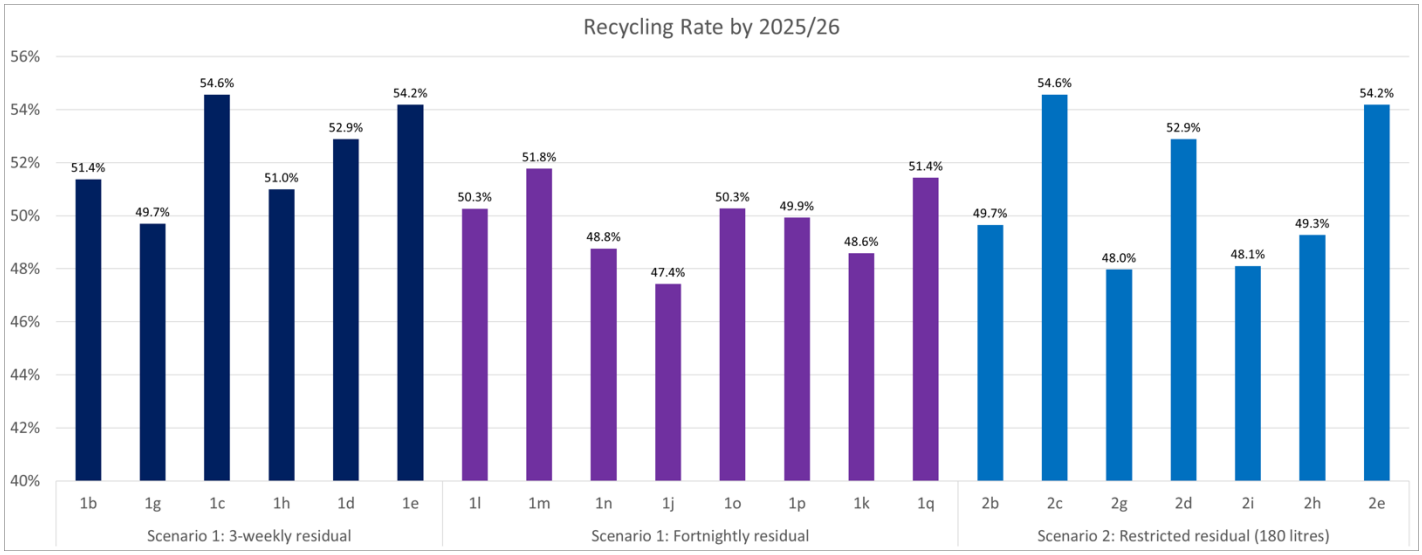

Figure 13: shows potential kerbside recycling rates (revised calculation method)

In terms of recycling performance, the latest results show that the highest performing scenarios are where LAs collect the 6 main dry recyclable materials as collected at present (paper, card, glass, cans, plastic bottles and pots, tubs & trays), with weekly separate food recycling, free garden waste collections and a restricted residual waste collection service. The type of residual restriction (whether smaller capacity residual containers or less frequent residual collections) does not have an impact on performance but does impact cost differences. Scenarios 1 c and 2c achieve a WFHH recycling rate of 54.9% in 2025/26. The two-stream dry recycling collections, separating out paper and card perform slightly lower at 54.2% (scenario 2e). The difference in recycling performance between these scenarios is related to the currently reported additional dry materials in co-mingled collections and subject to the current contamination rate reported in WDF. Further review of contamination rates, especially in the wake of the proposed CEP endpoint calculation change is required to determine the future impact on capture of dry recyclables under co-mingled collection systems.

The high performing scenarios around and above 53% all feature weekly separate food waste collections. The fortnightly mixed garden and food collections peak at around 51% when under the influence of either 3-weekly residual waste or restricted residual volume.

CEP analysis Northern Ireland

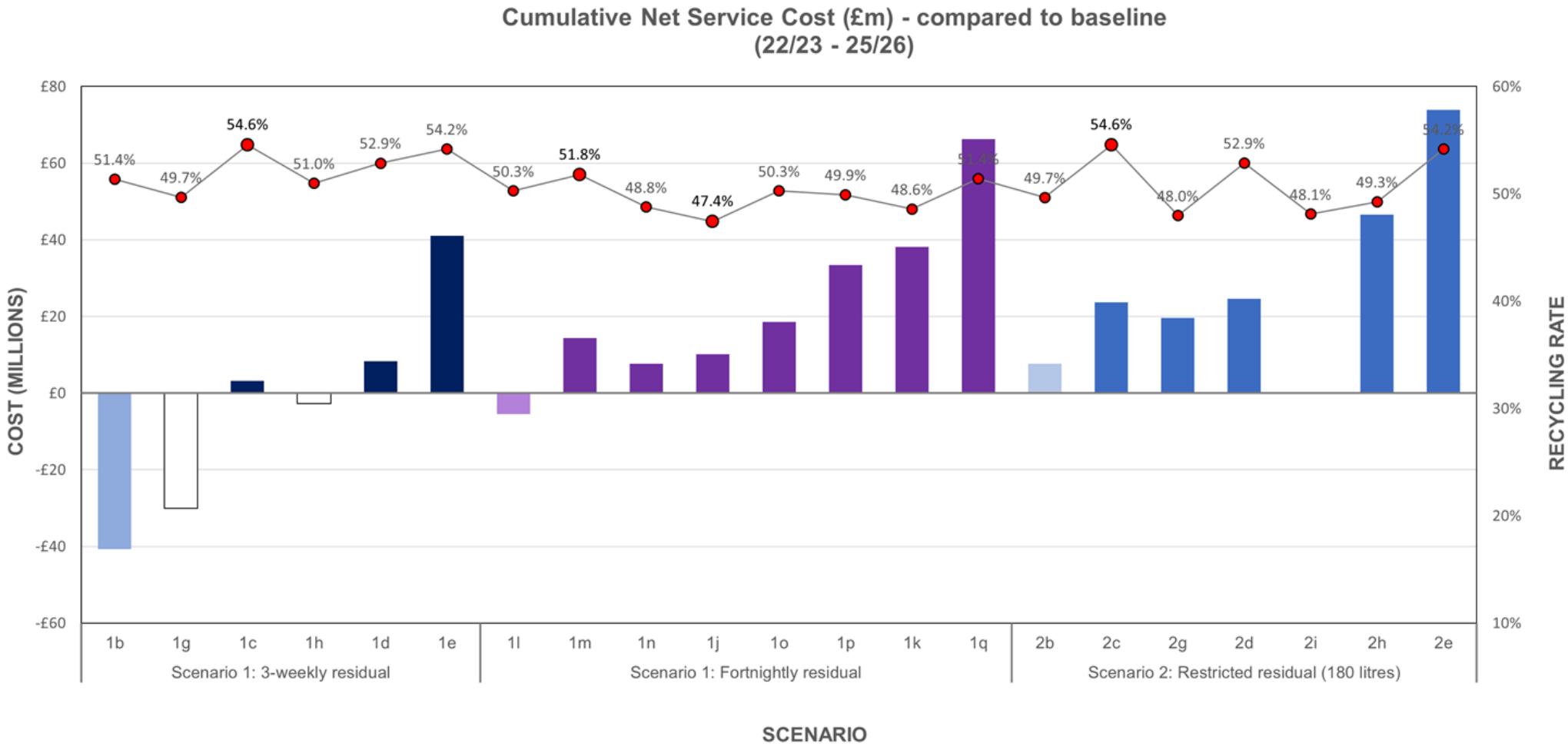

Figure 14: shows the range of scenarios aggregated by the common residual waste collection profile

The cumulative net service cost (2022/23-2025/26) for the range of scenarios shows a huge range in net costs ranging between -£41 million to a net cost of £74 million.

The higher performing scenarios 1c (3-weekly) and 2c (restricted capacity but fortnightly) differ by the frequency of residual with similar recycling capacity available to households each week. However, the 3 weekly scenario is a much lower cost at c£3 million above the baseline cost over the four-year time period compared to £24 million for the restricted volume. The operating costs for the 3-weekly collections are c50% less due to the reduced residual frequency and avoid the capital expenditure of replacement wheeled bins.

In a similar finding to the original gap study the lower overall system costs for the higher recycling scenarios tended to be with the multi-stream dry recycling collections. This is mainly due to the addition of food waste on the multi-compartment vehicles alleviating the need for a separate food collection fleet. However, the difference in reported material captured yields compared to co-mingled systems means that the multi-stream recycling performance appears lower.

Mixed garden and food waste is already known to be high performing compared to standard UK food capture rates given the recent investment in communications and restriction of food to the residual stream. The separate weekly food waste scenarios add around a further 3% to the recycling rate (comparing 1d to 1g, 1o to 1n, and 2d to2g.)

There are relatively few scenarios which show a cumulative net service cost saving but these tended to be lower performing scenarios with minimal recycling service change. For example, 1b which models 3 weekly residual collections with fortnightly mixed food and garden waste. This scenario is predicted to achieve a WFHH recycling rate of 51.4% by 2025/26 and the cost saving is mainly attributed to cost savings associated with less frequent residual collections.

The trends show that the high recycling scenarios (over 53% recycling) tend to face a net overall cost increase over the modelled timeframe. This is because the additional materials and frequencies designed to increase performance also increase operational costs. The exception to this rule relates specifically to the scenarios which move to 3-weekly residual but where all other services remain the same. As highlighted above, these scenarios improve material capture but less than the scenarios where weekly food waste is included.

The extent of the overall cost increase depends on the recycling scheme design and in particular the residual service restriction. As expected, the performance is higher for the restricted capacity residual bins compared to the current fortnightly collection cycle, although costs are similar. This is because whilst there are significant residual waste savings generated from a restriction in bin volume there is a significant capital investment in providing and delivering new smaller capacity containers (up to £16million).

A further consideration is that funding for packaging collections under Extended Producer Responsibility proposals could reduce the net costs of all the listed scenarios. The extent of reduction will be reviewed by WRAP under future iterations of this workstream.

The recycling performance of each LA varies according to their baseline service profile as a starting point, the contextual factors and barriers relevant to each LA, and which system they decide to adopt in the future. The maps below show the distribution of recycling performance for each Northern Ireland LA. It is clear that the urban conurbations of Belfast and Derry/Londonderry increase recycling performance, but given their local challenges associated with urban Authorities will reach a lower performance ceiling than many of the other Northern Ireland LAs. When supporting Northern Ireland LAs, the performance differences should be taken into account as well as investment for each area and whether KPIs or targets may be set in the future. Individual Northern Ireland LAs recycling performance values generate a national WFHH recycling rate of around 54.6% under scenario 2c.

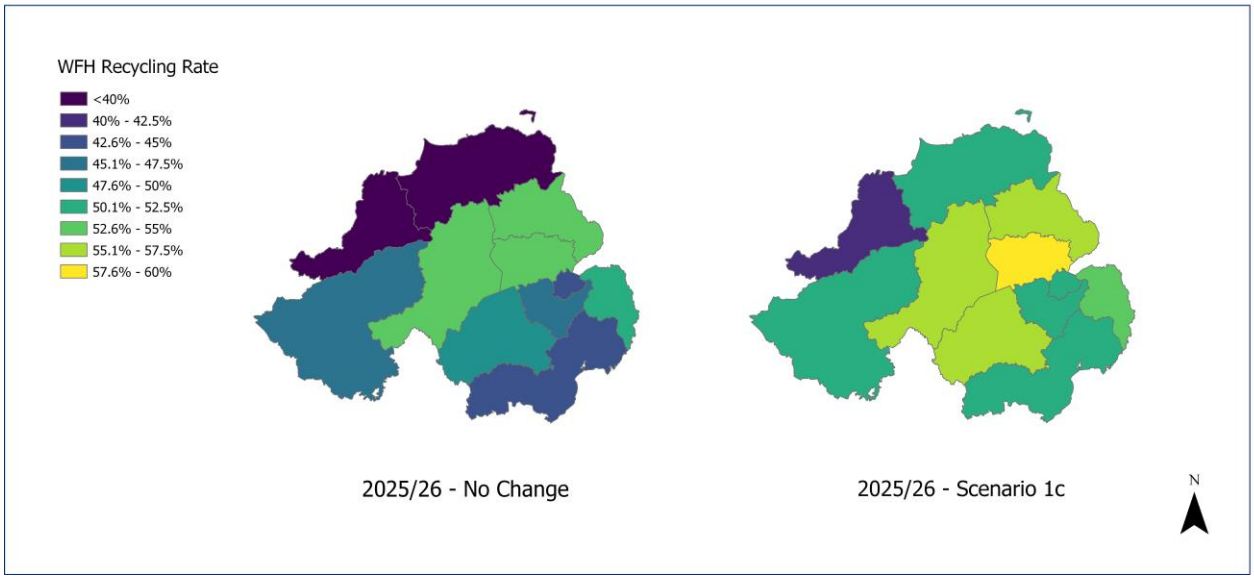

Figure 15: Scenario 1c: 3-weekly residual, dry no change, weekly separate food, free garden, all 6 materials. Overall: 54.6%

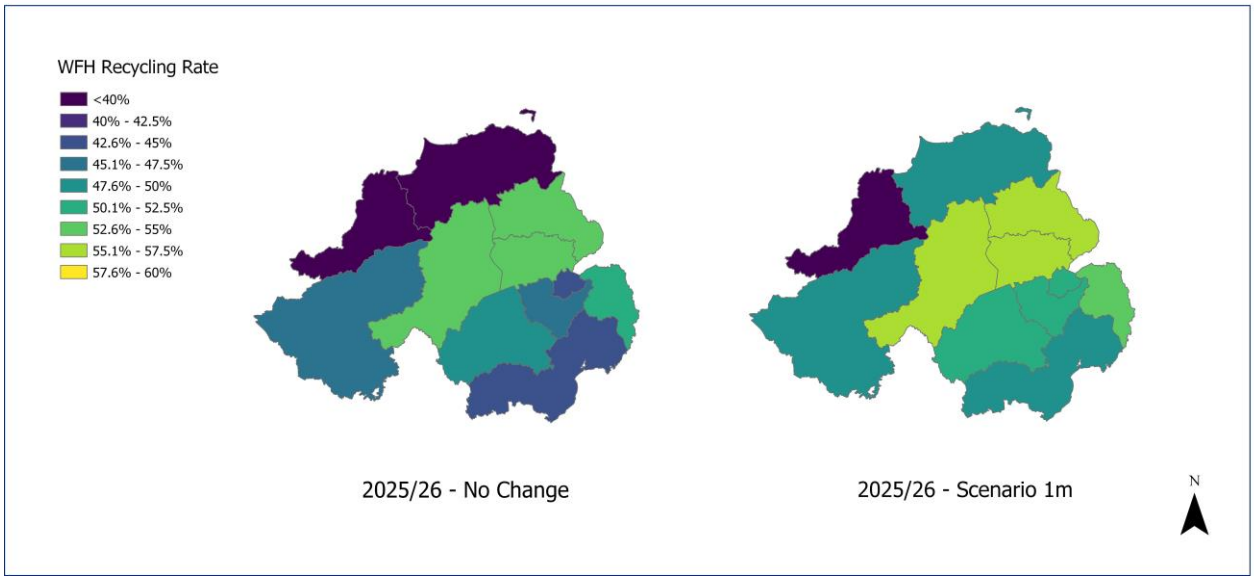

Figure 16: Scenario 1m: fortnightly residual, dry no change, weekly separate food, free garden, all 6 materials. Overall: 51.8%

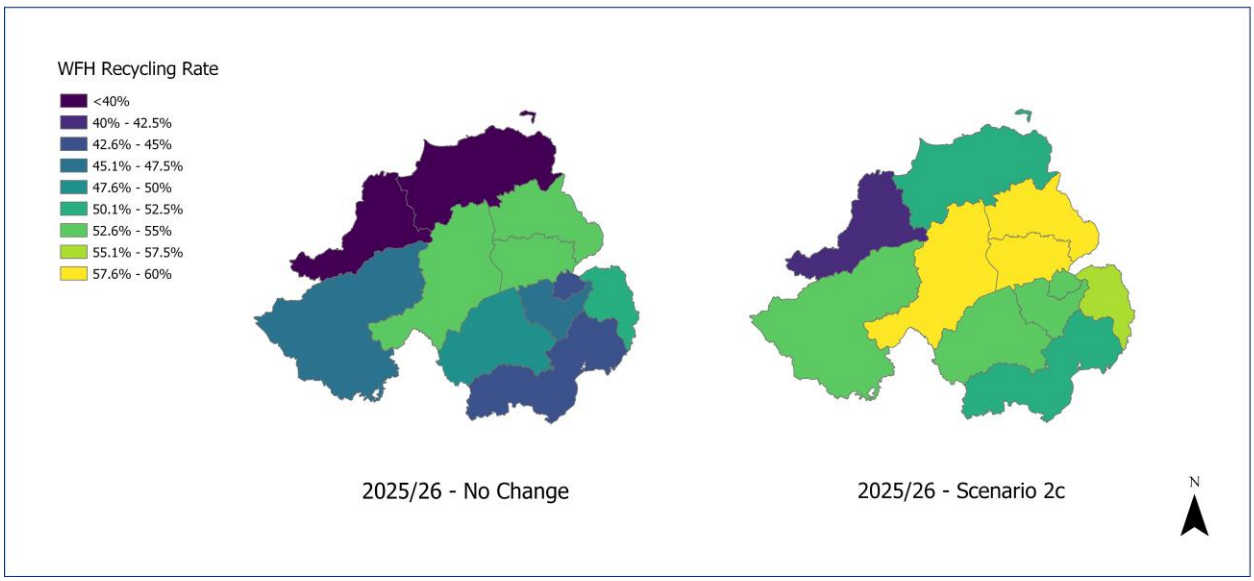

Figure 17: Scenario 2c: restricted residual (180 litres), dry no change, weekly separate food, free garden, all 6 materials. Overall: 54.6%

4.6 Household Waste Recycling Centre contributions

Approximately 21% of household waste arisings are collected and managed through a large network of 98 HHWRCs operated by LAs across the country. The 2016 gap study included a desktop review of the potential contribution from HHWRCs in each of the Northern Ireland LAs. The key focus was on adding materials known to be missing at sites and the implementation of measures to meet and greet or support site users and to restrict trade waste from entering the site. The calculations were based on good practice performance derived from UK performance and indicative costs provided. The optimum additional material estimated that could be collected and recycled per year following full implementation of all measures was 29,096 tonnes.

In 2018 WRAP commissioned further research in this area in order to gain further insights on the recycling potential for HHWRCs. The follow up analysis (unpublished) included site assessments of 46 of the total 98 HHWRC sites across Northern Ireland.

The key recommendations included a series of interventions that could be implemented across the sites observed and extended to all centres. The key interventions would be:

- Improvements to trade waste controls
- Introduction of black bag restrictions
- Clarity of onsite signage, especially relating to the target materials
- Increase of different materials collected for re-use and recycling,
- Further public awareness raising; and
- Additional staff to aid site users

The site assessments and UK performance data were used to inform calculations on recycling potential. It appears likely that inert materials such as rubble will be excluded from the CEP recycling calculation and so results are shown to highlight current and future performance without these materials.

Table 5:

	Baseline performance 2016/17	Performance from interventions
Recycling (excluding inert) (Tonnes)	89,398	116,852
Total throughput (Tonnes)	175,699	173,429
Recycling Rate excluding inert	57.2%	76.1%
Recycling Rate including inert	60.2%	77.2%

Similar to the original study around 27,454 tonnes could be added to the national recycling performance depending on the range of interventions implemented.

A range of estimates were provided for the investment to achieve the performance levels outlined. These estimates included capital investment of £6.8m, ongoing revenue of £1.8m p.a., annualised capital plus revenue of £2.3m p.a. and material revenue costs of £1.2m p.a. The potential avoided disposal costs would be in the region of -£3.8m p.a. which could deliver around -£150k savings p.a. The values provided are indicative of the sites assessed and then scaled up across the remaining facilities. The overall costs are directly linked to the achievement of good practice performance benchmarks. The nature of the analyses do not properly allow for transfer of material between kerbside and HHWRC and the impacts that potential site closures or rationalisation may have.

If the potential interventions were successful, then a further 3.3% would be added to the national recycling rate. Overall, with the highest performing recycling scenarios Northern Ireland could in theory achieve a recycling rate of almost 58% on the WFHH calculation. Further improvements in the recycling rate could be achieved if reductions in residual waste arisings could be made.

5.0 Conclusions

The aim of this study was to support DAERA in answering the question whether Northern Ireland could achieve the 65% municipal recycling rate in line with the Circular Economy Package targets. The supplementary objectives were to consider;

- What would be the cost to the different sectors now included within the definition?
- Where contributions are needed from to meet the target?
- What is the recycling potential from each sector?
- What might be the optimum approach to achieve high recycling but also relieve the cost burden on sub-sectors affected?

Significant improvements have been made in Northern Ireland's household recycling rate in recent years. It is important to note that the changes to the municipal definition will mean that the HH recycling rate is expected to reduce by the exclusion of some categories of arisings. In this study the rates are based on the Waste from Households definition understood to be the most relevant definition. Any future tightening of the recycling rate definition in terms of the quality standards in reprocessing harmonisation could also mean that current reported household recycling rate performance will reduce. In particular, the CEP definition focuses on material reprocessed rather than outputs from sorting or treatment facilities.

The analysis for the NHM sector outlined that a range of businesses and public sector organisations are generating close to 775,000 tonnes of municipal waste per year. The recycling rate for the NHM sector via two research methods is around 40% which appears consistent with, although slightly higher than, NHM performance in England. In addition, the kerbside and household recycling centre recycling collections that are generating HH waste under the definition most closely aligned to the CEP calculations suggests (2017/18) around 47.1% of waste is recycled from nearly 840,000 tonnes.

From the calculations of NHM arisings and HH on a WFHH calculation basis, the overall municipal arisings generated in Northern Ireland from both HH and NHM appear to be 1,612,026 tonnes p.a. (838,547 HH and 773,480 NHM). A 65% threshold is therefore 1,047,817 tonnes. The 65% threshold will naturally vary as arisings shift according to factors such as waste prevention initiatives, residual restriction and housing growth, and will be affected by capture of recyclate and contamination.

The optimum contributions from each sub-sector (673,015 tpa from NHM, 476,475 tpa from HH kerbside and 116,852 tpa from HHWRCs) would clearly suggest that it is feasible to achieve and surpass the CEP 65% municipal recycling target. The actual contributions will depend on a range of

factors such as reliability of the base data, arisings growth and which scenarios can be implemented effectively.

The additional tonnes per sector clearly demonstrate that the largest growth is from the NHM sectors (363,623 from NHM, 81,572 from HH kerbside and 27,454 from HHWRCs). However, to achieve the combined 65% municipal recycling rate, significant contributions will be required from each of these sectors. High levels of capture will be needed to achieve the performance required for each of the sectors, either through amendments to existing legislation or the development of new policy instruments and sector support measures.

The report details the recycling rate each sector can achieve and the relative cost profile. The modelled scenarios show that it is possible to alleviate cost burden on Northern Ireland LAs and achieve high performance at very low cost. In order to significantly increase household recycling, food recycling will need to increase in participation and capture and further restrictions of residual waste capacity will be required. Whilst restricting residual waste may be a sensitive issue, there is strong UK evidence that high public satisfaction can be achieved through good scheme design and delivery of comprehensive resource management services. With these changes, the natural limits for household recycling appear to be around 58% by combining kerbside and HHWRC contributions, based on the WFHH definition. Beyond this level the improvements may be dependent on significantly increasing on-going investment, reductions in contamination and reductions in the amount of non-recyclable waste generated by consumers.

There appears to be significant growth potential from all NHM sectors with potential recycling rates of over 80%. The increase in recycling will be dependent on delivering a comprehensive range of recycling services to all NHM sectors along with new or updated policy measures that are enforced to drive participation and high capture. The finding that small and micro- businesses will potentially see cost increases in order to achieve high recycling is consistent with other analyses.

The NHM analysis used a high capture rate due to the absence of strong evidence on typical diversion rates and limited data on the levels of contamination that can be achieved. Clearly, further work is required to refine the capture estimates on a sub-sector and business profile basis. In order to help achieve high capture rates it will be important to develop initiatives that support businesses and the public sector to maximise diversion of recyclate from the residual stream. Disseminating good practice examples of lower cost material segregation in the public sector and Government Estates can help to provide leadership and re-enforce the merits of policy measures related to commercial waste.

Alleviating the cost burden to small businesses and to Local Authorities will be dependent on new support measures that encourage collections to be optimised and encourage service delivery options that increase recycling capacity over that of residual waste. There may be measures that consider greater collaborative procurement in business collections to reduce service costs and

charges. The roles of Local Authorities managing commercial waste collections, and business facing support in relation to these policy measures will also require consideration.

Given the step change in performance needed to contribute to a 65% municipal recycling target, new policy measures will be required that specifically incentivise the key influential scenarios to develop. This will require refinement of the current analysis to understand the individual cost burden for each Northern Ireland LA and the key NHM sectors, the specific performance levels that can be achieved and both the type and level of support required to achieve the optimum performance levels whilst alleviating costs. The design of the analysis in being bottom-up and looking at each sub-sector and individual LA could enable further refinement of any preferred policy scenarios under consideration. The development of the earlier CEP analysis in England was used to help inform cross-sector funding requirements for delivery of the national Strategy objectives and help identify the costs needed for policies such as for Extended Producer Responsibility.

The key recommendations from the Northern Ireland municipal analysis are that:

- There is an urgent need for improvements in data quality especially for NHM sectors in order to enable more accurate forecasting of performance and cost, as well as understanding the relative contributions needed from each sub-sector.
- New policy measures should be developed to drive the significant performance changes across each of the individual municipal sectors. The policy measures are required to maximise HH recycling and effectively double the recycling performance derived from NHM businesses and the wider public sector. Due to the CEP recycling rate definition change from the current Northern Ireland-reported method the policy measures may be required to be more ambitious in order to compensate for the likely drop in performance.
- New support measures should be developed to help alleviate the cost burden to small businesses from transitioning to high recycling scenarios.
- Support funding from Government should be considered to alleviate the cost burden in transitioning to high recycling, especially for Northern Ireland LAs at both kerbside and HHWRCs.
- The results of the analysis should be considered in terms of Extended Producer Responsibility and the impact of any changes or influences resulting from this on the future net service provision.
- The CEP analysis should be updated regularly to consider the impact of measures driving sub-sector change and ensure that investment can be targeted to generate to optimum performance returns.

Appendix 1: List of CEP Municipal Business with SIC codes

Industry	Micro (0 to 9)	Small (10 to 49)	Medium-sized (50 to 249)	Large (250+)	Total
Food Manufacturing	295	140	45	15	500
10 : Manufacture of food products	295	140	45	15	500
Retail & Wholesale	12,350	2,855	305	35	15,545
45 : Wholesale and retail trade and repair of motor vehicles and motorcycles	2,515	270	35	0	2,820
46 : Wholesale trade, except of motor vehicles and motorcycles	3,015	545	60	5	3,625
47 : Retail trade, except of motor vehicles and motorcycles	6,820	2,040	210	30	9,100
Transport & Storage	2,355	370	125	5	2,850
49 : Land transport and transport via pipelines	1,600	220	70	5	1,890
50 : Water transport	10	5	0	0	15
51 : Air transport	10	0	5	0	15
52 : Warehousing and support activities for transportation	335	100	25	0	460
53 : Postal and courier activities	400	45	25	0	470
Hospitality	3,330	1,275	145	0	4,750
55 : Accommodation	250	90	65	0	405
56 : Food and beverage service activities	3,080	1,185	80	0	4,345
Health	2,665	1,570	400	45	4,675
86 : Human health activities	1,065	550	120	40	1,775
87 : Residential care activities	140	370	180	0	685
88 : Social work activities without accommodation	1,460	650	100	5	2,215
Office (& other Services)	19,670	2,570	510	100	22,855
58 : Publishing activities	100	30	5	0	135

59 : Motion picture, video and television programme production, sound recording and music publishing activities	255	35	5	0	300
60 : Programming and broadcasting activities	20	5	0	0	25
61 : Telecommunications	135	30	10	0	175
62 : Computer programming, consultancy and related activities	1,285	110	40	5	1,445
63 : Information service activities	45	5	0	0	50
64 : Financial service activities, except insurance and pension funding	480	165	5	10	655
65 : Insurance, reinsurance and pension funding, except compulsory social security	115	5	5	0	130
66 : Activities auxiliary to financial services and insurance activities	810	85	20	0	915
68 : Real estate activities	2,285	120	10	0	2,420
69 : Legal and accounting activities	1,610	255	25	5	1,890
70 : Activities of head offices; management consultancy activities	1,335	95	20	0	1,450
71 : Architectural and engineering activities; technical testing and analysis	1,505	110	15	0	1,630
72 : Scientific research and development	70	15	5	0	90
73 : Advertising and market research	210	15	5	0	230
74 : Other professional, scientific and technical activities	755	30	0	0	785
75 : Veterinary activities	140	55	5	0	195
77 : Rental and leasing activities	530	65	5	0	595
78 : Employment activities	365	50	60	15	490
79 : Travel agency, tour operator and other reservation service and related activities	165	25	0	0	195
80 : Security and investigation activities	100	25	15	5	145

81 : Services to buildings and landscape activities	1,380	225	25	5	1,640
82 : Office administrative, office support and other business support activities	640	40	10	15	705
84 : Public administration and defence; compulsory social security	215	350	160	40	765
90 : Creative, arts and entertainment activities	210	15	5	0	230
91 : Libraries, archives, museums and other cultural activities	155	55	15	0	220
92 : Gambling and betting activities	350	50	0	0	400
93 : Sports activities and amusement and recreation activities	705	215	30	0	950
94 : Activities of membership organisations	1,485	175	10	0	1,670
95 : Repair of computers and personal and household goods	225	10	0	0	235
96 : Other personal service activities	1,990	105	0	0	2,095
Education	1,580	1,440	295	5	3,320
85 : Education	1,580	1,440	295	5	3,320

Table 5:

Industry	2-Digit SIC	Total
Food Manufacturing	SIC07: 10	502
Retail and Wholesale	SIC07: 45	2858
	SIC07: 46	3644
	SIC07: 47	9097
Transport and Storage	SIC07: 49	1893
	SIC07: 50	15
	SIC07: 51	19
	SIC07: 52	454
	SIC07: 53	459
Hospitality	SIC07: 55	415
	SIC07: 56	4360
Health	SIC07: 86	1761
	SIC07: 87	679
	SIC07: 88	2226
Education	SIC07: 85	3338
Office	SIC07: 58	137
	SIC07: 59	302
	SIC07: 60	24
	SIC07: 61	174
	SIC07: 62	1466
	SIC07: 63	52
	SIC07: 64	670
	SIC07: 65	124
	SIC07: 66	874
	SIC07: 68	2893
	SIC07: 69	1915
	SIC07: 70	1477
	SIC07: 71	1641
	SIC07: 72	87
	SIC07: 73	242
	SIC07: 74	987
	SIC07: 75	197
	SIC07: 77	625
	SIC07: 78	487
	SIC07: 79	194
	SIC07: 80	149
	SIC07: 81	1224
	SIC07: 82	1194
	SIC07: 84	909

	SIC07: 90	234
	SIC07: 91	221
	SIC07: 92	397
	SIC07: 93	967
	SIC07: 94	1681
	SIC07: 95	218
	SIC07: 96	2041
		55523

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