

<b>Title:</b> Consistent municipal recycling collections in England <b>IA No:</b> <b>RPC Reference No:</b> RPC-DEFRA-4341 (2) <b>Lead department or agency:</b> Department for Environment, Food and Rural Affairs (Defra) <b>Other departments or agencies:</b>	<b>Impact Assessment (IA)</b>
	<b>Date:</b>
	<b>Stage:</b> Consultation
	<b>Source of intervention:</b> Domestic
	<b>Type of measure:</b> Primary and Secondary legislation
<b>Contact for enquiries:</b> Raminta Brazinskaite, Matthew Harrington	
<b>Summary: Intervention and Options</b>	<b>RPC Opinion:</b> Green

**Cost of Preferred (or more likely) Option 3 (2019 prices, 2020 present value)**

Total Net Present Value	Business Net Present Value	Net cost to business per year (EANDCB in 2019 prices)	One-In, Three-Out	Business Impact Target Status
£ 2,766.3m	£ 4,743.8m	-£444.9m	Not in scope	Qualifying provision

**What is the problem under consideration? Why is government intervention necessary?** Waste generation produces negative environmental externalities. It emits greenhouse gases when sent to treatment such as incineration or landfill. When waste cannot be prevented, recycling reduces the environmental costs of products/materials being disposed of. It also generates value by providing raw materials for manufacturing. However, current measures for household collection of recyclable materials, such as landfill tax or dry recycling separation, are proving insufficient to increase recycling beyond the current level of 45% and reduce the amount of residual waste produced. Loose requirements on local authority waste collections have led to a variety of different collection systems and materials collected, leading to different recycling performance and experience across England. This limits potential recycling and the environmental and economic benefits that could be achieved. For non-household municipal waste (NHM), businesses usually pay for waste collections on a per lift or bin basis. Consequently, introducing additional recycling bins may not lead to reduced waste costs (especially without a high rate of business participation). Government intervention is required to enable a consistent range of waste materials to be collected from households and businesses to overcome these barriers to achieve high recycling.

**What are the policy objectives and the intended effects?** To deliver a consistent range of dry materials for collection from all households, as well as weekly separate food waste collection and free garden waste collection. For the NHM sector the objective is for all businesses to separate dry recyclable material and food waste from residual waste for recycling. This will ensure that businesses present waste separately for recycling. These measures will increase both (i) the quantity of materials collected, and (ii) the quality of recyclate produced due to improved material segregation. For householders, the proposed changes will expand the range of materials collected and help them make the right decisions on what can be recycled, reducing contamination. Decreased contamination will boost reprocessors' confidence in the quality of recyclate being collected, increasing demand for secondary materials. These changes will ensure that minimal waste goes to landfill, and more food waste and garden waste is composted or sent for anaerobic digestion. For the non-household sector changes will increase quantity and quality of materials collected for recycling.

**What policy options have been considered, including any alternatives to regulation? Please justify preferred option**

The Environment Bill requires the collection of 6 recyclable waste streams from households (food waste, plastics, metal, glass, paper and card and garden waste). The Bill also requires these streams (except garden waste) to be collected from non-domestic premises and other premises producing household like waste. The Bill requires these materials to be collected separately except where this is not practicable for technical or economic reasons or there is no significant environmental benefit. We expect there to be a variety of different arrangements for the collection of material according to circumstances. The impacts of different requirements for household and non-household waste and recycling collections were considered and then combined for the whole municipal sector:

**Baseline (i.e. do-nothing):** do not implement consistent municipal recycling collections in England. Only introduce an “all-in” Deposit Return Scheme (DRS) for drinks containers in England, Wales and Northern Ireland (as set out in the DRS IA).

**Option 1M:** (i) Household sector - collection of recyclable materials through multi-stream collection systems; separate weekly food waste; and free garden waste. (ii) NHM sector - requiring collection of dry mixed recyclables (DMR), separate glass and separate food waste. Micro businesses exempt from separating their waste streams.

**Option 2M:** (i) Household sector – as Option 1M. (ii) NHM sector - requiring collection of dry mixed recyclables (DMR); separate glass and separate food waste. Micro businesses phased from 2025 onwards.

**Option 3M:** (i) Household sector - collection of recyclable materials through ‘optimised’ collection systems (Local Authorities use the least cost option for their recycling collections (between multi-stream, twin-stream and commingled collection services); separate weekly food waste; and free garden waste. This means that some Local Authorities rely on one of the exceptions (that it is not economically or technically practicable or there is no significant environmental benefit) and are unable to collect all the recyclable waste streams separately from each other, taking into account any statutory guidance.

(ii) NHM sector - requiring collection of dry mixed recyclables (DMR), separate glass and separate food waste. Micro businesses exempt from separating their waste into the required waste streams. This is our preferred option based on the highest NPV.

**Option 4M:** (i): Household sector – as Option 3M. (ii) NHM sector - requiring collection of dry mixed recyclables (DMR), separate glass and separate food waste. Micro businesses phased from 2025 onwards.

Non-regulatory options were considered, e.g. voluntary frameworks and guidance, educational/communication schemes, businesses support via specific grants and tools. They were disregarded given that these options are already in place, but have not achieved the intended policy objectives. Local Authorities are already able to decide on a local basis what and how materials should be collected from households for recycling. This has led to a large variety of service collection profiles and current legislative or fiscal drivers are unlikely to change this (i.e. they proved to be insufficient to increase current levels of recycling which plateaued over the last 5 years or so). WRAP and other bodies do work with local authorities to improve recycling. WRAP, for example, worked with the waste sector to develop a voluntary Consistency Framework, but this has not been taken up by the majority of Local Authorities because of other funding pressures and an absence of legal drivers. For businesses, a range of voluntary initiatives have operated but there have been no drivers for the sector to actively recycle waste and costs of the change, without rationalisation of waste services, can inhibit the transition. Government has committed to meet a 65% municipal recycling rate by 2035.

**Will the policy be reviewed?** It will be reviewed. **If applicable, set review date:** 5 years post implementation

Does implementation go beyond minimum EU requirements?		No		
Are any of these organisations in scope?	<b>Micro</b> No	<b>Small</b> Yes	<b>Medium</b> Yes	<b>Large</b> Yes
What is the CO <sub>2</sub> equivalent change in greenhouse gas emissions? (Million tonnes CO <sub>2</sub> equivalent)		<b>Traded:</b> -17.5		<b>Non-traded:</b> -36.4

***I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.***

Signed by the responsible  
SELECT SIGNATORY:

..... Date: .....

# Summary: Analysis & Evidence

# Policy Option 1M

## Description:

### FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2023	Time Period Years 13	Net Benefit (Present Value (PV)) (£m)		
			Low: -£1,606.0	High: £8,442.5	Best Estimate: £2,745.9

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£911.8	8	£301.6	<b>£3,836.4</b>
High	£911.8		£1,083.8	<b>£12,056.0</b>
Best Estimate	£911.8		£668.2	<b>£7,704.1</b>

#### Description and scale of key monetised costs by 'main affected groups'

Local Authorities (LA's) see £1,220m net increase in their costs over the total appraisal period. Of which £829m are transition costs as a result of investment needs in new vehicles, containers and wider transition costs; and LAs lose income from a garden waste charging scheme of £ 1,318m. This is a transfer to households as they generate savings from removed garden waste charges. NHM Sector sees increase in waste management costs by £351m. Government loses £5,972m in reduced landfill tax receipts. This is a transfer in savings to LAs (i.e. £467m) and businesses (i.e.£5,505m) as they forgo the cost associated with disposing of waste to landfill sites. The household (HH) and NHM policy support costs are £18m and £143m, respectively. **All values are discounted.**

#### Other key non-monetised costs by 'main affected groups'

Familiarisation costs to households and businesses as a result of new regulation are not accounted for. Nor are the ongoing costs to households and businesses of sorting waste for new collection requirements. Wider impacts on the recycling and waste industry have not been monetised either. We will seek any additional evidence on these items in the consultation.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	0	£1,030.5	<b>£10,450.0</b>
High	£0		£1,216.2	<b>£12,278.9</b>
Best Estimate	£0		£1,030.5	<b>£10,450.0</b>

#### Description and scale of key monetised benefits by 'main affected groups'

Households' savings from removed garden waste charging are estimated at £1,318m over the total appraisal period. This is a transfer from LAs to households. There is a saving to the NHM sector of £5,505m due to reduced landfill tax receipts. Carbon savings (traded and non-traded) are estimated at £3,627m. These savings are net of emissions associated with an increase in recycling activity. **All values are discounted.**

#### Other key non-monetised benefits by 'main affected groups'

The recycling industry benefits from an increased supply of higher quality and quantity of materials. However, this has not been monetised at this stage. Avoiding wider environment costs, such as landfill aftercare costs, have not been included. Reduced pressure on residual waste infrastructure has not been quantified. A net impact on jobs have not been quantified either. We will seek any additional evidence on these items in the consultation.

#### Key assumptions/sensitivities/risks

For the household sector, the uptake in recycling is estimated based on WRAP's modelling. The modelling reflects different collection schemes, rurality, deprivation levels and other ONS categories. The high/low sensitivities do not assume any change in recycling quantity from their best estimates. They only account for different material price and gate fee assumptions.

For the NHM sector, we assume that 80% out of the total tonnage that could be further recycled (i.e. capture rate) is presented by businesses in all scenarios. This capture rate is based on the evidence from the household sector and is assumed constant across all the scenarios. The NHM 'presented' baseline recycling rate is assumed to be 49% as a best estimate, 44% as a low estimate (implying higher benefits) and 54% as a high estimate (implying lower benefits).

Discount rate (%)

3.5%

### BUSINESS ASSESSMENT (Option 1)

<b>Direct impact on business (Equivalent Annual) £m:</b> Costs: £33.0      Benefits: £516.3      Net: -£483.3	<b>Score for Business Impact Target (qualifying provisions only) £m:</b> -£2,179.5
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# Summary: Analysis & Evidence

# Policy Option 2M

## Description:

### FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2023	Time Period Years 13	Net Benefit (Present Value (PV)) (£m)		
			Low: -£4,016.7	High: £6,816.9	Best Estimate: £491.2

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£911.8	8	£747.5	<b>£8,350.2</b>
High	£911.8		£1,560.6	<b>£16,881.7</b>
Best Estimate	£911.8		£1,129.6	<b>£12,373.8</b>

**Description and scale of key monetised costs by 'main affected groups'**

As per Option 1M LAs see £1,220m net increase in their costs. Of which £829m are transition costs as a result of investment needs in new vehicles, containers and wider transition costs; and LAs lose income from a garden waste charging scheme of £ 1,318m. This is a transfer to households as they generate savings from removed garden waste charges. The NHM sector sees increase in waste management costs of £3,276m. Government loses £7,448m in reduced landfill tax receipts. This is a transfer in savings to LAs (i.e. £467m) and businesses (i.e. £6,881m) as they forgo the cost associated with disposing of waste to landfill sites. The HH and NHM policy support costs are £18m and £412m, respectively. All values are discounted.

**Other key non-monetised costs by 'main affected groups':**

Familiarisation costs to households and businesses as a result of new regulation are not accounted for. Nor are the ongoing costs to households and businesses of sorting waste for new collection requirements. Wider impacts on the recycling and waste industry have not been monetised either. We will seek any additional evidence on these items in the consultation.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	8	£1,273.7	<b>£12,865.0</b>
High	£0		£1,508.1	<b>£15,167.1</b>
Best Estimate	£0		£1,273.7	<b>£12,865.0</b>

Households' savings from removed garden waste charging are estimated at £1,318m over the total appraisal period. This is a transfer from LAs to households. There is a saving to the NHM sector of £6,881m due to reduced landfill tax spending. Carbon savings (traded and non-traded) are estimated at £4,566.3m. These savings are net of emissions associated with an increase in recycling activity. All values are discounted.

**Other key non-monetised benefits by 'main affected groups'**

The recycling industry benefits from an increased supply of higher quality and quantity of materials. However, this has not been monetised at this stage. Avoiding wider environment costs, such as landfill aftercare costs, have not been included. Reduced pressure on residual waste infrastructure has not been quantified. A net impact on jobs have not been quantified either. We will seek any additional evidence on these items in the consultation.

<b>Key assumptions/sensitivities/risks</b>	<b>Discount rate (%)</b>	3.5%
<p>For the household sector, the uptake in recycling is estimated based on WRAP's modelling. The modelling reflects different collection schemes, rurality, deprivation levels and other ONS categories. The high/low sensitivities do not assume any change in recycling yields from best estimates. They only account for different material price and gate fee assumptions.</p> <p>For the NHM sector, we assume that 80% out of the total tonnage that could be further recycled is presented by businesses in all scenarios. This capture rate is based on the evidence from the household sector and is assumed constant across all the scenarios. The NHM 'presented' baseline recycling rate is assumed to be 49% as a best estimate, 44% as a low estimate (implying higher benefits) and 54% as a high estimate (implying lower benefits).</p>		

### BUSINESS ASSESSMENT (Option 2)

<b>Direct impact on business (Equivalent Annual) £m:</b>	<b>Score for Business Impact Target (qualifying provisions only) £m:</b>
Costs: £307.2   Benefits: £654.7   Net: -£347.5	-£1,566.9

# Summary: Analysis & Evidence

# Policy Option 3M

## Description:

### FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2023	Time Period Years 13	Net Benefit (Present Value (PV)) (£m)		
			Low: -£1070.2	High: £8953.2	Best Estimate: £3,067.0

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£794.4	8	£287.1	<b>£3,580.0</b>
High	£794.4		£1,062.0	<b>£11,724.7</b>
Best Estimate	£794.4		£666.6	<b>£7,587.4</b>

**Description and scale of key monetised costs by 'main affected groups'**

LAs see £931m net increase in their costs. Of which £726m are transition costs as a result of investment needs in new vehicles, containers and wider transition costs; and LAs lose income from a garden waste charging scheme of £1,318m. This is a transfer to households as they generate savings from removed garden waste charges. NHM sector sees increase in waste management costs of £351m. Government loses £6,143m in reduced landfill tax receipts. This is a transfer in savings to LAs (i.e. £532m) and businesses (i.e. £5,611m) as they forgo the cost associated with disposing of waste to landfill sites. The HH and NHM policy support costs are £19m and £143m, respectively. All values are discounted.

**Other key non-monetised costs by 'main affected groups':**

Familiarisation costs to households and businesses as a result of new regulation are not accounted for. Nor are the ongoing costs to households and businesses of sorting waste for new collection requirements. Wider impacts on the recycling and waste industry have not been monetised either. We will seek any additional evidence on these items in the consultation.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	0	£1,051.0	<b>£10,654.4</b>
High	£0		£1,241.7	<b>£12,533.2</b>
Best Estimate	£0		£1,051.0	<b>£10,654.4</b>

**Description and scale of key monetised benefits by 'main affected groups'**

Households' savings from removed garden waste charging are estimated at £1,318m over the total appraisal period. This is a transfer from LAs to households. There is a saving to the NHM sector of £5,611m due to reduced landfill tax payments. Carbon savings (traded and non-traded) are estimated at £3,725.8m. These savings are net of emissions associated with an increase in recycling activity. All values are discounted.

**Other key non-monetised benefits by 'main affected groups'**

The recycling industry benefits from an increased supply of higher quality and quantity of materials. However, this has not been monetised at this stage. Avoiding wider environment costs, such as landfill aftercare costs, have not been included. Reduced pressure on residual waste infrastructure has not been quantified. A net impact on jobs have not been quantified either. We will seek any additional evidence on these items in the consultation.

<b>Key assumptions/sensitivities/risks</b>	<b>Discount rate (%)</b>	3.5%
<p>For the household sector, the uptake in recycling is estimated based on WRAP's modelling. The modelling reflects different collection schemes, rurality, deprivation levels and other ONS categories. The high/low sensitivities do not assume any change in recycling yields from best estimates. They only account for different material price and gate fee assumptions.</p> <p>For the NHM sector, we assume that 80% out of the total tonnage that could be further recycled is presented by businesses in all scenarios. This capture rate is based on the evidence from the household sector and is assumed constant across all the scenarios. The NHM 'presented' baseline recycling rate is assumed to be 49% as a best estimate, 44% as a low estimate (implying higher benefits) and 54% as a high estimate (implying lower benefits).</p>		

### BUSINESS ASSESSMENT (Option 3)

<b>Direct impact on business (Equivalent Annual) £m:</b>	<b>Score for Business Impact Target (qualifying provisions only) £m:</b>
Costs: £33.0   Benefits: £526.2   Net: -£493.2	-£2,224.4

# Summary: Analysis & Evidence

# Policy Option 4M

## Description:

### FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2023	Time Period Years 13	Net Benefit (Present Value (PV)) (£m)		
			Low: -£3,484.4	High: £7,322.4	Best Estimate: £808.8

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£794.4	8	£733.0	<b>£8,093.8</b>
High	£794.4		£1,538.8	<b>£16,550.4</b>
Best Estimate	£794.4		£1,128.0	<b>£12,257.2</b>

**Description and scale of key monetised costs by 'main affected groups'**

As per Option 3M, LAs see £931m net increase in their costs. Of which £726m are transition costs as a result of investment needs in new vehicles, containers and wider transition costs; and LAs lose income from a garden waste charging scheme of £ 1,318m. This is a transfer to households as they generate savings from removed garden waste charges. The NHM sector sees increase in waste management costs of £3,276m. Government loses £7,619m in reduced landfill tax receipts. This is a transfer in savings to LAs (i.e. 532m) and businesses (i.e. £7,087m) as they forgo the cost associated with disposing of waste to landfill sites. The HH and NHM policy support costs are £19m and £412m, respectively. All values are discounted.

**Other key non-monetised costs by 'main affected groups':**

Familiarisation costs to households and businesses as a result of new regulation are not accounted for. Nor are the ongoing costs to households and businesses of sorting waste for new collection requirements. Wider impacts on the recycling and waste industry have not been monetised either. We will seek any additional evidence on these items in the consultation.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	0	£1,293.7	<b>£13,066.0</b>
High	£0		£1,533.0	<b>£15,416.3</b>
Best Estimate	£0		£1,293.7	<b>£13,066.0</b>

**Description and scale of key monetised benefits by 'main affected groups'**

Households' savings from removed garden waste charging are estimated at £1,318m over the total appraisal period. This is a transfer from LAs to households. There is a saving to the NHM sector of £7,087m due to reduced landfill tax payments. Carbon savings (traded and non-traded) are estimated at £4,661.3m. These savings are net of emissions associated with an increase in recycling activity. All values are discounted.

**Other key non-monetised benefits by 'main affected groups'**

The recycling industry benefits from an increased supply of higher quality and quantity of materials. However, this has not been monetised at this stage. Avoiding wider environment costs, such as landfill aftercare costs, have not been included. Reduced pressure on residual waste infrastructure has not been quantified. A net impact on jobs have not been quantified either. We will seek any additional evidence on these items in the consultation.

<b>Key assumptions/sensitivities/risks</b>	<b>Discount rate (%)</b>	3.5%
<p>For the household sector, the uptake in recycling is estimated based on WRAP's modelling. The modelling reflects different collection schemes, rurality, deprivation levels and other ONS categories. The high/low sensitivities do not assume any change in recycling yields from best estimates. They only account for different material price and gate fee assumptions.</p> <p>For the NHM sector, we assume that 80% out of the total tonnage that could be further recycled is presented by businesses in all scenarios. This capture rate is based on the evidence from the household sector and is assumed constant across all the scenarios. The NHM 'presented' baseline recycling rate is assumed to be 49% as a best estimate, 44% as a low estimate (implying higher benefits) and 54% as a high estimate (implying lower benefits).</p>		

### BUSINESS ASSESSMENT (Option 4)

<b>Direct impact on business (Equivalent Annual) £m:</b>	<b>Score for Business Impact Target (qualifying provisions only) £m:</b>	
Costs: £307.2	Benefits: £664.6	Net: -£357.4
		-£1,611.7

## Glossary

**Municipal waste:** household waste and household-like waste produced on non-household premises.

**Municipal sector:** includes households and non-household municipal sector (NHM)

**Non-household municipal sector (NHM):** businesses and public sector organisations that produce household-like waste.

### Waste collection system definitions:

- Dry recycling/recyclables: Paper, cardboard packaging, plastic packaging, glass packaging, metal packaging etc.
- Multi-stream collection: Dry recycling materials are presented for collection by the household in three separate containers.
- Two-stream collection (also known as twin-stream): Dry recycling materials are presented for collection in two separate containers, for example fibres (paper and cardboard) in one and other dry materials in another.
- Mixed dry recyclables collection: Dry recycling materials are presented together in one bin. This also called co-mingling.
- Optimised collection: dry collection system with the lowest cost at a Local Authority level. Local Authorities use the least cost option for their recycling collections (between multi-stream, two-stream or mixed (i.e. commingled) collection). This means that some Local Authorities will rely on one of the exceptions applying because they are unable to collect all the recyclable waste streams separately from each other, taking into account any statutory guidance.
- Separate food waste collections: Food waste is collected in a separate container, on its own, as opposed to mixed garden and food waste collections.
- Separate free garden waste collections: For households, garden waste is collected separately from other waste materials and is not directly charged for.
- Capture rate: is the quantity of target material 'captured' divided by the total quantity of the material available for waste collection. Capture rate is a non-specific waste stream term.
- Recycling rate:
  - *Presented* recycling rate: the amount of recycle presented for recycling at kerbside level i.e. the amount of waste physically put in the bin by the householder or firm as a proportion of the total amount of waste available for collection.
  - *Actual* recycling rate: the proportion of recycle that arrives for treatment at the disposal sites, sorted and split from any contamination that may make the recyclable material untreatable, as a proportion of total amount of waste available for collection.

Low-rise and flatted properties: For households, properties that are usually three stories or less whose waste is collected at kerbside. Flatted properties are those usually higher than three stories. Their waste may be collected at kerbside but also there may be recycling facilities with shared bins within the building complex. The reason for the distinction is that it is usually easier to collect waste from low-rise properties and residents tend to use recycling bins more than in flatted properties. This is because the recycling facilities in the flatted properties are more complex, there may be inadequate space at the point of collection to separate recyclables, etc.

## Executive Summary

This is an impact assessment to support the second consultation on consistency in household and business recycling collections in England. We first consulted on the policy and published the summary of consultation responses in 2019<sup>1</sup>. Since then we have worked to refine the economic analysis to incorporate more detailed policy proposals as well as new evidence where applicable.

The scope of this impact assessment (IA) is as in our first IA<sup>2</sup>. It covers municipal waste, which is comprised of household waste and businesses and public sector organisations that generate household-like waste. In this IA non household premises affected are referred to as municipal businesses or the non-household municipal sector (NHM). Despite being grouped together as the municipal sector, waste collections for households and municipal businesses are very different and will be addressed separately throughout the IA. For example, the NHM sector is overall more complex than the household sector given its diversity and no ‘middle-man’ to manage waste collections between the businesses and the waste collectors (as a Local Authority does for households).

The legal requirements being consulted on are to require local authorities, businesses and public sector organisations that generate household-like waste to collect and present a consistent set of recyclable waste streams for collection as set out in the Bill. The aim is to increase the overall quantity and quality of recycling collected by providing minimum service standards. This is because current requirements and policy on recycling are proving insufficient to increase recycling beyond the current level of 45% for households (this rate has not changed for the past 5 years) and 49%<sup>3</sup> for businesses. They have led to different waste collection services (including different material collected for recycling) and performance across England.

Following our consultation in 2019, we are legislating in the Environment Bill to introduce a core set of recyclable waste streams (plastics, metal, glass, paper and card, food waste and garden waste) to be **separately** collected for recycling from households across England. The Bill also requires arrangements to be made for similar recyclable waste streams (except garden waste) to be presented and separately collected from non-domestic premises that produce household-like waste, this includes from schools and hospitals, as well as from producers of industrial and commercial waste, which is similar in nature and composition to household waste (“relevant waste”). Together these areas of waste make up what is referred to in this IA as municipal waste.

The recyclable waste streams must be collected separately from each other except where this is not technically or economically practicable or there is no significant environmental benefit from collecting separately. It is likely that whilst some will arrange for the collection of recyclable waste streams separately, there will be many that will have to rely on the exceptions that allow them to collect some waste streams together for technical or economic reasons. As such, the policy options – presented and analysed in this IA - are based on the most likely collection arrangements to operate across households and non-household premises taking into account these exceptions.

Overall, changing collection systems can unlock significant environmental and financial benefits and increase the quantity and quality of materials collected for recycling and reprocessing into secondary raw materials. There are significant barriers limiting further uptake such as insufficient pricing of environmental externalities, behavioural barriers at the point of materials’ collection or fragile secondary materials markets<sup>4</sup> preventing these benefits being realised. Through

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<sup>1</sup> <https://www.gov.uk/government/consultations/waste-and-recycling-making-recycling-collections-consistent-in-england/outcome/consistency-in-recycling-collections-in-england-executive-summary-and-government-response#government-response-to-consultation-on-consistency-in-household-and-business-recycling>

<sup>2</sup> [https://consult.defra.gov.uk/environmental-quality/consultation-on-consistency-in-household-and-busin/supporting\\_documents/recycleconsistencyconsultia.pdf](https://consult.defra.gov.uk/environmental-quality/consultation-on-consistency-in-household-and-busin/supporting_documents/recycleconsistencyconsultia.pdf)

<sup>3</sup> Presentational recycling rates from WRAP analysis

<sup>4</sup> There are a number of proposals – set out in our Resource and Waste Strategy - to help stimulate supply and demand for secondary materials. This is because it is often cheaper to use virgin raw materials than recycled, despite their higher environmental impact:



mandating increased standardisation of materials collected for recycling across England, we expect to improve waste collection services and performance (i.e. this is because current approach to recycling is fragmented and inconsistent across England). We also expect via communications/better labelling to improve business and residential understanding of what can be recycled, leading to high recycling rates by both sectors as well as lower contamination and better compliance with our requirements. Table 1 summarises our high-level theory of change for consistent recycling collections.

**Table 1: High level theory of change for consistent recycling collections**

Issue	Activity	Expected behaviour changes	Outcome	Environmental, economic or social benefit
<p><b>The HH sector:</b> currently local authorities make their own decisions about which materials they collect for recycling, depending on local factors and the ability to sell these materials on to recycling companies. Some materials are widely collected currently (e.g. paper &amp; card collected by c.100% of LAs in England), however others are less widely collected (e.g. 35% of LAs have a separate food waste collection; 78% collect plastic pots tubs and trays for recycling). This creates fragmented and inconsistent approach to recycling across England; and households have very different experiences of recycling depending on where they live.</p>	<p>A core set of materials<sup>5</sup> to be collected from households by all local authorities.</p>	<p>All households recycle the same set of materials and experience the same level of service.</p>	<p>Improved participation and standardisation of materials in recycling so increased amounts of waste are recycled</p>	<p>Reduced landfill and incineration and their associated carbon emissions</p>
	<p>We will continue to work with WRAP to develop good practice on communications for householders alongside the implementation of recycling consistency reforms.</p> <p>Working with EPR reforms on a universal recycling label for packaging will reduce confusion for householders on what can and can't be recycled.</p>	<p>Via better labelling householders are less confused about which materials to recycle so are able to put more recyclables into the recycling collection rather than the residual.</p>	<p>Improved capture rates so increased amounts of waste are recycled</p> <p>Less contamination of recycling streams so recyclate is more valuable (higher quality) and less time and money is spent removing contaminants</p>	<p>Reduced emissions as a result of reduced production from virgin materials</p> <p>Increased revenue for the recycling industry (non-monetised in this IA)</p>
	<p>Mandate the separate collection of food waste for households</p>	<p>Households currently without separate collections can recycle food waste</p>	<p>Improved capture rates so increased amounts of food waste are recycled</p>	
	<p>Mandate the free collection of garden waste for households</p>	<p>Households that currently do not pay for their garden waste collection are now able to recycle their</p>	<p>Improved capture rates so increased amounts of garden waste are recycled</p>	

<sup>5</sup> Paper and card, metal, plastics (pots, tubs and trays), glass

		garden waste instead of putting it to the residual or disposing of it elsewhere.		
<p><b>The NHM sector:</b> there are no drivers for businesses to actively recycle waste and costs of the change, without rationalisation of waste services, can inhibit the transition. This is because businesses usually pay for waste collections on a per-lift or bin basis. Consequently, introducing additional recycling bins may not lead to reduced waste costs.</p>	<p>Requirement for businesses to present recycling and food waste separately from residual waste for collection.</p> <p>We will continue to work with WRAP on developing communications messages for businesses and other organisations.</p> <p>Working with EPR reforms on a universal recycling label for packaging will reduce confusion on what can and can't be recycled in the NHM sector.</p>	<p>Business owners and managers recycle materials that would otherwise been landfilled or incinerated.</p>	<p>Improved capture rates so increased amounts of material from non-household municipal sources are recycled</p>	

Source: Defra and WRAP methodologies

The analysis builds on the options analysed in the first impact assessment. It covers different options and collection systems for local authorities and businesses that would meet proposed policy requirements and compares their costs and benefits:

- For the household sector, we have included the multi-stream collection (i.e. the preferred option in the first impact assessment) and an 'optimised' collection. Both options include separate food waste and free garden waste collections.
- The "optimised collection" option is a new option in which Local Authorities use a collection system (between multi-stream, two-stream or commingled collection services) based on the lowest cost to them over period 2023/24 to 35/36. Given our stakeholder engagement, it was felt that we needed to have an option to reflect that some collection systems may not be best suited to particular areas, and a one-size fits all requirement would present delivery challenges. This option means that Local Authorities rely on one of the exceptions (that is not economically or technically practicable or there is no significant environmental benefit) to collect some recyclable waste streams together. This option also recognises that there needs to be flexibility in the systems used to collect waste across England. However, these systems would still need to meet minimum required standards.
- The NHM sector has two options based on the preferred option from the previous impact assessment. The preferred businesses option had all businesses separate waste to mixed dry recyclables, have separate glass waste collections and separate food waste collections. In this impact assessment, we use this option as the most likely scenario (on the assumption that the majority of businesses will rely on one of the exceptions from the

requirement to collect the recyclable waste streams separately from each other) and assume all municipal business follow this from 2023, except micro businesses. They are included from 2025. We also consider an option in which micro business are fully excluded from this requirement.

The previous IA assumed the phased approach to all businesses, starting with the most cost-effective sectors and not requiring small and micro businesses to start making changes until 2029 and 2032, respectively. Based on consultation responses and internal discussions with WRAP this approach has been removed. This is to increase businesses recycling and associated benefits.

Given the options analysis presented in this impact assessment, the collection systems that yielded the highest Net Present Value (NPV, net benefit to society), and therefore our recommended option is:

- For households: collection of recyclable materials through 'optimised' collection systems; separate weekly food waste; and free garden waste.
- For municipal businesses: collection of dry mixed recyclables (DMR), separate glass and separate food waste. Micro businesses exempt.
- The NPV (2023-2035) of these two options combined is £3,067.0m

The appraisal period covers the period from 2023 to 2035, i.e. 13 years. This is to help measure our progress against meeting a 65% target of municipal waste by weight to be recycled by 2035<sup>6</sup>.

This IA includes the following analysis to account for uncertainty in Local Authority and businesses-related costs:

- Given that some gate fees and material revenue are subject to variation, we have tested how central values change if gate fees and material revenue increase or decrease by 10%<sup>7</sup>.
- Besides the above, we have not adjusted Local Authority capital and costs for optimism bias or additional sensitivity analysis. Typically, operational costs dominate the overall proportion of gross collection costs that Local Authorities incur in delivery of services. Operational costs are comprised of the labour, fuel, insurance, management, local overhead costs. The highest proportion of the operational costs (c.70%) relates to staff salaries and associated costs (pension, holiday cover) and their supervision. The capital for vehicles tends to be annualised and represent around 15-20% of the overall scheme gross costs (varying slightly according to vehicle design and geography). With pay sector pay freezes over the past decade, WRAP has not seen significant changes in Local Authority operating costs given that there is a high proportion related to salaries<sup>8</sup>. Fuel and vehicle capital have increased related to factors such as production (energy costs) but these prices are monitored and updated regularly in WRAP's modelling.
- A change in businesses costs are most sensitive to the current set up of waste collections. As such, we have tested different profiles for the baseline to estimate the impact on changes in businesses costs.
- In their NHM analysis, WRAP has assumed that businesses can achieve 100% capture rate, given appropriate level of businesses support. This is because of their available data on capture rates for business waste. Whilst this may seem unrealistic, the rate is assumed

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<sup>6</sup> As set out in our Resource and Waste Strategy for England:  
[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/765914/resources-waste-strategy-dec-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf)

<sup>7</sup> This variation in gate fee is within historical norms.

<sup>8</sup> The costs to Local Authorities account for the changes associated with the number of FTEs required for different collection schemes, but the unit cost stays the same.

this high on the basis of specific policy drivers (including consistency in collections) that improve waste compositions so that waste is becoming increasingly recyclable. That said, we still felt it was a very optimistic assumption and therefore assumed that only 80% out of the total tonnage that could be further recycled is presented by businesses in all scenarios. This has been based on the existing capture rate observed in the household sector. The actual capture rate will also depend on available support and guidance for businesses. The associated policy costs have been included in our NPV calculations.

- We will be seeking stakeholder views on how to improve our approach to accounting for uncertainty in Local Authority and businesses-related costs.

## Summary of key changes made to this IA following the 2019 consultation

Further to our updated list of policy options and responses to our consultation, we have made the following changes in this impact assessment:

- The analysis includes the effect of a deposit return scheme (DRS) for drinks containers as part of its baseline. We have estimated the DRS effect based on the 'All-In' DRS, which is presented as a preferred option in the second consultation DRS impact assessment. Although the DRS is planned to be implemented at the same time as consistent recycling, the scheme has a significantly shorter transitional period<sup>9</sup> i.e. it could take up to eight years for all Local Authorities to transition and comply with proposed recycling regulations. The scheme will affect both household and non-household waste collections:
  - Both household options are adjusted to include the DRS impact on Local Authorities. We have modelled the changes in waste management costs due to the DRS in both the baseline and policy-related options. The net change in costs due to the DRS has been included in the overall NPV calculations. This is because this change in Local Authority waste management costs will be absorbed by the EPR scheme; and the EPR impact assessment builds on the preferred option of this IA. This then means that the IA on EPR includes both DRS and consistency policies as part of its baseline.
  - Opposite to the HH sector, the DRS net effect for the NHM sector has not been included in the overall NPV calculations. It is used here for illustration purposes only. This is because it is assumed that the Deposit Management Organisation (DMO)<sup>10</sup> will bear the actual cost of it.
- We have estimated that the proposed options will have higher greenhouse gas positive impacts compared to the previous IA. This is mainly driven by a higher estimate of total NHM waste arisings; a different profile for business transitions (i.e. most businesses transition to new collection by 2026); and changes to the warming potential of methane which has been updated from 25x CO<sub>2</sub> to 28x CO<sub>2</sub>, in line with IPCC AR5 recommendation<sup>11</sup>.

Updated policy costs for both the Household and Non-household municipal sectors. This is to be in line with the updated policy options.

- HH specific changes:
  - As per previous impact assessment, we have used WRAP's Routemap collection model to present different household recycling scenarios. The model has been updated to include:

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<sup>9</sup> The DRS analysis assumes that an 85% return rate is achieved by the first two years of the policy.

<sup>10</sup> The proposal is for DMO to be an independent, not-for-profit, industry/trade association-led organisation to manage the implementation and day-to-day running of the scheme.

<sup>11</sup> [https://archive.ipcc.ch/pdf/assessment-report/ar5/syr/AR5\\_SYR\\_FINAL\\_All\\_Topics.pdf](https://archive.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_All_Topics.pdf) , p87, Table 1

- Latest Local Authorities collection scheme data. We are now using 2017/18 year data compared to 2016/17.
- Latest Waste Data Flow tonnage data (i.e. 2017/18) compared to 2015/16.
- Localised gate fees and treatment costs. This is to reflect variation in gate fees across different Local Authorities.
- Updated bulking data to only apply to Local Authorities that actually bulk their waste.
- Incorporated individual Local Authority garden waste charges where available. In the absence of this data, an average estimate is used.
- Updated average garden waste costs (for those Local Authorities where no cost data is available, and to apply to new charged schemes).
- Updated costs associated with multi-stream collections. The latest data suggest an increase in costs associated with multi-stream vehicles.
- Updated dry collection contamination rates.
  - Updated in-house collections dates of change to correspond to collection vehicle renewal dates. This impacts when Local Authorities transition in our HH model.
- NHM specific changes:
  - We have updated the baseline cost estimates for the NHM sector based on WRAP's analysis, using the bottom-up business survey. This helped to create two high-level profiles of the current waste collections that businesses tend to use: (i) a representative of all waste collections; and (ii) the most frequently used waste collection. Both profiles were developed by business size and at sector level.
  - The above means that our central cost estimates for the baseline has been estimated as a mid-point between these two profiles. Meanwhile, the individual profiles have been used in our sensitivity analysis.
  - We have updated our assumptions concerning business transition. It is assumed that all businesses transition by 2026<sup>12</sup>. The previous IA assumed a longer period of transition. This is to increase businesses recycling and associated benefits. WRAP has updated their estimates on the NHM waste arisings. This was mainly driven by better data reporting.
  - We are committed to exploring cost mitigation measures for micro and small businesses. 2019 Consultation responses did not indicate a preferred option(s) concerning exemptions or special considerations. We are giving further consideration to options that can reduce costs and support increased recycling for businesses and are engaging with industry and other key stakeholders further on these options.

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<sup>12</sup>Given that we are consulting on transition dates, including a start date and a date by which consistent collections will be required, for both the household and NHM sectors, we have assumed a more conservative transition period in this analysis. This will be updated for the final IA in line with a final government response to this consultation.

## **The structure of the IA**

The IA has the following structure:

**Section 1:** Problem under consideration

**Section 2:** Rationale for Intervention

**Section 3:** Policy objective

**Section 4:** Summary of options considered

**Section 5:** Detailed description of household and non-household municipal options considered (including do-nothing)

**Section 6:** Costs and benefits of collections system options for the municipal, household and non-household sectors

**Section 7:** Small and Micro sized Business Assessment

**Section 8:** Monitoring & Evaluation

## **Annexes**

**Annex A:** Key Assumptions and data used

**Annex B:** Greenhouse gas emissions impact

**Annex C:** Non-monetised costs and benefits

**Annex D:** Sensitivity Analysis – waste management costs

**Annex E:** Free versus charged garden waste

**Annex F:** Quality assurance

**Annex G:** Covid-19 considerations

# Section 1: Problem under consideration

## Household waste collections

English household recycling rates have been static at around 44-45% since 2015<sup>13</sup> with only a small number of Local Authorities expanding services to add new materials to be collected such as food waste or pots, tubs and trays. Some have also introduced charges for previously-free services such as garden waste collection. Local authorities' budget provisions have reduced and, together with the slowing impact of current incentives, this has led to a lack of investment in new recycling services.

Landfill tax has been one of the drivers for local authorities to divert household waste from landfill and towards energy recovery or recycling<sup>14</sup>. In 2010 there was also a new requirement for all Local Authorities to collect at least one type of recycling. Together with the improvements in recycling and energy recovery plants, local authorities have seen a 72% reduction by weight of collected waste sent to landfill since 2010/11<sup>15</sup>. This has incentivised local authorities to provide recycling services for most dry materials. However, these regulatory drivers are not sufficient for expanding certain collections (e.g. such as separate food waste collections) and the benefits of expanding recycling services to include certain types of plastics are limited because the value of those materials on secondary markets does not outweigh the costs of collection.

Current targets for recycling are weight-based but Government has said it may review its approach to weight-based targets and alternatives such as carbon based<sup>16</sup>. These options are not considered as part of this impact assessment, but government has said that it will work with local authorities to identify a range of non-binding performance indicators for recycling. Further, Defra has also published proposals for environmental targets using powers in the Environment Bill. This includes targets for resource efficiency and waste reduction<sup>17</sup>.

## Dry recycling collections

In 2017 the Conservative manifesto included a commitment to encourage 'comprehensive rubbish and recycling collections'<sup>18</sup>. Currently, there is limited consistency over the materials local authorities collect for recycling, with only 70% collecting the six widely recycled materials including paper, card, plastic bottles, glass, cans and PTTs (i.e. plastic pots, tubs and trays)<sup>19</sup>. This reduces the quantity of material collected overall and undermines public confidence and participation in recycling because householders are confused about what can and can't be recycled – 40% of the public think recycling rules should be simplified<sup>20</sup>.

WRAP surveys show that over four in five UK households (82%) add one or more items to their recycling collection that is not accepted locally. Furthermore, just over half of UK households (51%) put at least one item in the general rubbish that could be collected in the kerbside recycling<sup>21</sup>. As a result, householders either recycle fewer items than they are able to or

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<sup>13</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/918853/201819\\_Stats\\_Notice\\_FINAL\\_accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918853/201819_Stats_Notice_FINAL_accessible.pdf)

<sup>14</sup> UK Parliament website (2014) <https://publications.parliament.uk/pa/cm201415/cmselect/cmenvfru/241/24105.htm>

<sup>15</sup> Our Waste, Our Resources: A Strategy for England, 2018:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/765914/resources-waste-strategy-dec-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf)

<sup>16</sup> As per footnote 14

<sup>17</sup> <https://www.gov.uk/government/publications/environment-bill-2020/august-2020-environment-bill-environmental-targets#part-b-an-overview-of-the-scope-of-targets>

<sup>18</sup> <https://www.letsrecycle.com/news/latest-news/packaging-litter-feature-conservative-manifesto/>

<sup>19</sup> WRAP LA Recycling Portal

<sup>20</sup> <https://www.confused.com/recycling-confusion>

<sup>21</sup> <https://wrap.org.uk/resources/report/recycling-tracker-survey-2020-behaviours-attitudes-and-awareness-around-recycling>

contaminate recycling bins with items that are not collected locally for recycling or items that cannot be recycled (e.g. soiled packaging). Such contamination can reduce the quality and value of materials recycled and can even lead to whole loads being rejected at reprocessing or sorting centres. This in turn reduces the amount of material made available to producers to be recycled into new products and also makes it harder for the UK to match the 65% of municipal waste recycling ambition by 2035 (set out in the Resources and Waste Strategy<sup>22</sup>), or for packaging producers to achieve targets and obligations to recycle a set proportion of the packaging they place on the UK market.

China's ban on the import of certain types of recycling<sup>23</sup> has reinforced the need for us to improve the quality of what is recycled and to increase the separation of dry materials for recycling so that there is less cross contamination (e.g. between glass and paper) and of recyclable and non-recyclable materials. This impact of this ban could be associated with the increase in MRF site gate fee price for fully mixed recyclables over the past five years, as well as, fast scheme changes into 2 stream recyclable collections where comingled collections are being separated by key materials to improve quality and meet new specifications.

High profile media coverage such as The Blue Planet means that there is high public demand to tackle the problem of waste in more effective ways and to recycle more materials, especially plastics. Similarly, the latest YouGov survey results show that the British public want more to be done to encourage recycling in the UK<sup>24</sup>. The survey identifies that the biggest issues keeping British people from recycling more are a lack of local facilities, councils not collecting certain types of items from the kerbside and confusing rules.

The quality of dry recycling has also failed to improve in recent years, with Materials Recovery Facilities (MRFs) reporting a target material percentage of 84.4% towards the last quarter of 2019, a fall from 90.6% since the last quarter of 2014, with a notable rise in non-recyclable material received<sup>25</sup>. This is influenced by both collection services run by Local Authorities as well as products being placed on market by producers. More composite or difficult to recycle products placed on the market cannot be controlled by local authorities or waste management companies running the MRFs.

## Food waste collections

Using WRAP's analysis for households, hospitality and food service, food manufacture, retail and wholesale sectors in 2018 we estimate around 9.5 million tonnes of food waste (i.e. post farm gate<sup>26</sup>) is produced every year. This has an estimated sale value of over £19 billion a year and is associated with more than 25 million tonnes of GHG emissions<sup>27</sup>. The detrimental impacts of food waste on the environment are significant. Food waste that is sent to landfill generates methane from landfill (i.e. a powerful greenhouse gas 28 times more powerful than CO<sub>2</sub><sup>28</sup>). The government has made a commitment in its Clean Growth Strategy<sup>29</sup> to work towards no food waste entering landfill by 2030.

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<sup>22</sup> Our Waste, Our Resources: A Strategy for England, 2018: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/765914/resources-waste-strategy-dec-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/765914/resources-waste-strategy-dec-2018.pdf)

<sup>23</sup> China's ban on foreign waste imports 'is opportunity', <https://www.bbc.co.uk/news/uk-politics-41816491>

<sup>24</sup> <https://yougov.co.uk/topics/science/articles-reports/2019/11/04/britons-say-more-needs-be-done-encourage-recycling>

<sup>25</sup> <https://wrap.org.uk/resources/guide/dry-recyclables-improving-quality-cutting-contamination>

<sup>26</sup> Post –farm gate includes all food waste from processors, manufacturers, retailers and from households. This figure is taken from the UK progress against Courtauld 2025 targets and Sustainable Development Goal 12.3, WRAP, 2020.

<sup>27</sup> Based on lifecycle emissions (e.g. including production, packaging, transport, waste management). Further detail can be found here: <https://wrap.org.uk/resources/report/uk-progress-against-courtauld-2025-targets-and-un-sustainable-development-goal-123>

<sup>28</sup> over 100 years, IPCC AR5 Synthesis Report

<sup>29</sup> The Clean Growth Strategy, Leading the way to a low carbon future. <https://assets.publishing.service.gov.uk/government/clean-growth-strategy-correction-april-2018.pdf>



Currently 51% of local authorities collect food waste separately from residual waste (either, food mixed with garden waste, or separate collection of food waste) but only 35% of these collect this waste separately from other biodegradable waste and on a weekly basis, with remaining authorities collecting food waste mixed with garden waste (Table 2). Collecting food waste mixed with garden waste is less efficient than weekly separate collection. It leads to lower amounts of food waste being collected and less efficient treatment through in-vessel composting compared to anaerobic digestion, which produces energy and organic soil improver or fertiliser. If all local authorities provided at least kerbside properties with a household food waste collection this would increase the amount of food waste collected by an estimated 1.4 million tonnes by 2035.

**Table 2: Percentage of English Local Authorities collecting selected materials for recycling**

% of English LA's collecting	Beverage cartons	Cardboard	Foil	Glass	Metal (Cans and tins)	Mixed plastic film	Paper	Plastic Bottles	Plastic Pots, Tubs and Trays	Separate food waste
2017/18	66%	99%	74%	89%	100%	20%	100%	99%	77%	35%

Source: WRAP Local Authorities portal

### Garden Waste Collections

Providing all kerbside garden properties with a free garden waste collection would help to increase recycling rates further and would also ensure this material is sent to industrial composting rather than sometimes discarded in the residual waste bins. Charging for garden waste is likely to reduce the number of households using the service, therefore potentially increasing levels of garden waste in residual waste. Where this is sent to landfill, this generates greenhouse gas emissions as well as leachate, an acidic liquid which needs to be extracted and treated. Further, there is also evidence that home composting of garden waste is often less efficient than a dedicated collection and composting service.

Around 65% of local authorities charged for garden waste collections in 2018/19<sup>30</sup> and this results in significantly lower participation than a free service (Annex E).

Overall, national household recycling rates have stagnated over the past five years with few drivers to help local authorities increase recycling or address the waste hierarchy and the provision of free garden waste can contribute largely to increases in recycling rates<sup>31</sup>.

### Business waste collections

The Waste (Circular Economy) (Amendment) Regulations 2020 introduce a definition of municipal waste, which is waste collected from households and waste collected from other sources, where such waste is similar in nature and composition to waste from households

Given the size of the non-household municipal (NHM) sector (around 2 million business and public administration units<sup>32</sup>), it potentially makes a significant contribution to the overall municipal waste recycling targets. The various sub-sectors in business have not historically had direct policy measures to drive their recycling performance apart from the price they pay for the collection of waste. Business waste and recycling services tend to be a very small proportion of overall

<sup>30</sup> WRAP's LA Recycling Portal

<sup>31</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/918853/201819\\_Stats\\_Notice\\_FINAL\\_accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918853/201819_Stats_Notice_FINAL_accessible.pdf)

<sup>32</sup> <https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/bulletins/ukbusinessactivitysizeandlocation/2019>

business turnover<sup>33</sup> and so efficiency gains in diverting more waste to recycling may yield comparatively few savings at site level and provide limited financial incentive to separate waste.

The Waste Circular Economy (Amendments) Regulations 2020 require waste collectors to collect paper, metal plastic or glass separately unless one of a list of conditions is met. This includes separate collection entailing disproportionate economic costs whilst taking into account the costs of adverse environmental and health impacts of mixed waste collection and treatment, the potential for efficiency improvements in waste collection and treatment, revenues from sales of secondary raw materials as well as the application of the polluter-pays principle and extended producer responsibility. Generally, waste collection services are offered on a per bin or per lift basis and businesses would pay a higher cost for having additional bins for recycling, unless they produce enough waste that it reduces the number of size refuse waste bins needed.

Currently, there is a substantial variation in the non-household sector's performance in recycling, both across sub-sectors and business sizes, and data quality is significantly poorer compared to the household sector. We estimate levels of recycling from businesses – that produce municipal waste – to be at around 49%<sup>34</sup>. However, there is potential to increase these rates through introducing requirements for greater separation, especially of dry materials and food waste.

Our analysis indicates that these requirements of introducing separate food waste and separate dry recycling collection could increase recycling to as much as 87%<sup>35</sup> under a full capture of remaining recyclates. This is a theoretical potential that could only be achieved under substantial changes to the way the NHM waste sector operates. These changes could, for example, include measures to ensure more municipal businesses have access to recycling collection services at reasonable cost. This could be achieved through businesses working together to procure services or local authorities or other bodies, such as facilities managers, controlling waste procurement over a group of premises in a single building or shopping centre (also known as zoning) to realise economies of scale and to increase recycling provision. This has not been included in this IA, but we continue to work with WRAP on this area (i.e. cost reduction measures for the NHM sector).

## Section 2: Rationale for Intervention

Waste generation is a source of negative environmental externalities as it can emit greenhouse gases when sent to treatment such as incineration or landfill. Another problem for municipal solid waste (MSW) landfills is leachate generation which could cause significant threat to surface water and groundwater. When waste cannot be prevented, recycling can minimise these environmental costs of products/materials being disposed of and create value by providing valuable materials for manufacturing.

Current measures and requirements for household collection of recyclable materials, such as landfill tax or dry recycling separation, are proving insufficient to increase recycling beyond the current level of 45% and reduce the amount of residual waste produced. Loose requirements on local authority waste collections have led to a variety of different collection systems and materials collected, leading to different performance across the country. This limits potential for recycling and lowering the environmental and economic benefits that otherwise could be achieved. This also means different experiences of recycling depending on where people live.

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<sup>33</sup> <https://www.cips.org/knowledge/categories-and-commodities/facilities/waste-management/how-to-develop-a-waste-management-and-disposal-strategy/>

<sup>34</sup> Estimated 'presented' recycling rate, i.e. based on WRAP's analysis

<sup>35</sup> Assuming that all municipal businesses are within the scope of policy requirements (including micro businesses). In assessing options in this IA, we have assumed that businesses achieve a lower capture rate of 80%. Highest achievable recycle rate at this capture is 70%.

For NHM sector, businesses usually pay for waste collections on a per-lift or bin basis. Consequently, introducing additional recycling bins may not lead to reduced waste costs. Government intervention is therefore needed to require a consistent range of waste materials to be collected from households and from businesses. This will enable current measures such as landfill tax to be most effective at driving waste up the waste hierarchy<sup>36</sup> (i.e. towards reuse or recycling).

## Behavioural barriers

Overall, the case for change in the municipal sector is undermined if the overall business case from higher recycling is marginal from a private perspective, upfront costs are high and future savings are uncertain because they depend on assumptions of higher recycling rates (i.e. economies of scale) and secondary material prices (which in return depend on quality of recyclates). In addition, waste and recycling services have not typically been a priority area for businesses or Local Authorities in recent years. Business waste services represent a small proportional cost to overall turnover for most operators<sup>37</sup> which means few incentives to improve, even though changes could lead to savings over time. Further, current waste service arrangements in the commercial sector do not drive economies of scale or incentivise recycling over residual waste. That said, the economies of scale to reduce costs to the NHM sector could be achieved by mandating consistent collections.

## Household sector

Local Authorities provide collections of recyclable material based on their own decisions and compliance with existing legislation. The Environmental Protection Act 1990 requires waste collection authorities (WCAs) to make arrangements for the collection of at least two types of recyclable waste together or individually separated from the rest of the household waste. There are also further requirements on Local Authorities set out in the Waste (England and Wales) Regulations 2011 and subsequent amendments. The current legislation means that WCAs do not all collect the same range of materials. There is no consistency in respect of what waste streams are collected and also what materials are collected as part of those waste streams. Whilst this helps to account for local circumstances, this creates fragmented and inconsistent approach to recycling across England.

The new consistency measures build on existing requirements set out in legislation. Section 45A of the Environmental Protection Act (EPA) 1990 currently requires local authorities to make arrangements for the collection of at least two types of recyclable waste together or individually separated from the rest of the household waste. The current legislation means that local authorities do not all collect the same range of materials. There is no consistency in respect of what waste streams are collected and also what materials are collected as part of those waste streams. As a result, householders are having very different experiences of recycling depending on where they live. People that want to recycle are often held back by their local services and there is no option for clear packaging labelling because of the wide range of approaches. There is also some confusion on what can and cannot be recycled (e.g. uncertainty about what can/cannot be recycled was identified as one of the most frequently cited barriers) evidence shows that this can create confusion to householders over the type of materials collected and the way they should be presented for the collection<sup>38, 39</sup>.

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36 The “waste hierarchy” ranks waste management options according to what is best for the environment.

37 <https://www.cips.org/knowledge/categories-and-commodities/facilities/waste-management/how-to-develop-a-waste-management-and-disposal-strategy/>

38 <https://www.bbc.co.uk/news/science-environment-45496884>

39 <https://wrap.org.uk/sites/default/files/2020-10/WRAP-Recycling%20Tracker%20Report%202020.pdf> 40 Q40,41 and 42 in consultation responses [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/819467/epr-consult-sum-resp.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819467/epr-consult-sum-resp.pdf) 40 Q40,41 and 42 in consultation responses

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/819467/epr-consult-sum-resp.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819467/epr-consult-sum-resp.pdf)

In addition to the EPA 1990 requirements on local authorities specifically, the Waste (England and Wales) Regulations 2011 (“the 2011 Regulations”) set out the duty on establishments or undertakings (including local authorities) that collect waste paper, metal, plastic or glass. Regulation 13(2) states that those organisations must ensure those waste streams are collected separately. Regulation 13(3) states that local authorities must, when making arrangements (e.g. outsourcing) for the collection of waste paper, metal, plastic or glass, ensure those arrangements are by way of separate collection. However, the duties in Regulation 13(2) and 13(3) do not apply if one of the conditions set out in Regulation 13(4) apply. In other words, there are circumstances under which local authorities do not have to collect the recyclable waste streams separately from residual waste.

Requiring the same set of materials to be collected consistently and separately from residual waste across England, alongside specific communications, would improve waste collection services and performance. Further, the proposed introduction of mandatory labelling through the extended producer responsibility (EPR) scheme, where government requires producers to include appropriate labelling on their packaging was agreed with strongly for at consultation stage<sup>40</sup>. This would also improve household participation and recycling. Impacts associated with labelling are assessed as part of the EPR IA.

Although our analysis suggests that certain collection schemes might result in cost savings for Local Authorities, some authorities may see the change as a risk increasing their cost burden in the short-term (i.e. to cover the costs of transitioning to a new collection system)<sup>41</sup>. This is because the savings depend on an uncertain income from selling separately collected materials, reduction in gate fees’ payments, compared with what the LA is used to paying at the moment. Significant risk aversion due to clear upfront costs but uncertain long-term savings may thus be a cause of them not making the change themselves. Another possible factor is political preference to collection schemes requiring fewer bins, which reduces the Local Authorities cost savings potential in the long-term.

Consistent collections would help achieve wider system efficiencies and reduce risks associated with investments in new collection systems.

## **Non-household municipal sector**

With respect to businesses and public sector organisations generating household-like waste (i.e. non-household municipal sector (NHM)), the main behavioural and cost barriers are particularly pertinent to small- and micro-sized businesses. These are understood as the following:

- waste and recycling sits low on business agenda’s<sup>42</sup>
- there is lack of clarity of responsibilities between businesses and waste management companies and possible split incentives<sup>43</sup>;
- there is little knowledge and skills in waste management of how through re-configuring their collection provisions, the overall waste management costs can be reduced. This is a particular issue concerning small and micro businesses;
- possible space issues especially for micro businesses; high turnover of staff etc.<sup>44</sup>

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40 Q40,41 and 42 in consultation responses

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/819467/epr-consult-sum-resp.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819467/epr-consult-sum-resp.pdf)

41 Based on discussions with LAs

42 Based on WRAP’s research and engagement with the sector

43 For example, charging on a per lift basis regardless of whether the bins are full or not can possibly make the use of recycling services more expensive, if simply added next to the refuse waste collections.

44 [https://archive.wrap.org.uk/sites/files/wrap/SME\\_Recycling\\_-\\_Summary\\_Report.pdf](https://archive.wrap.org.uk/sites/files/wrap/SME_Recycling_-_Summary_Report.pdf)

Businesses typically pay for the collection and subsequent processing of material in their waste and recycling collection containers on a regular schedule under a contract with a waste management company or for a minority of businesses, through a local authority waste provider. Recycling collection charges per 'bin-empty' are lower than for residual bins due to the higher value of the material and their lower disposal costs compared to refuse. However, diverting some recyclable waste from the refuse bin still, almost certainly, means that a refuse container is required despite it becoming less full. The need for a range of recyclable containers to collect the extra material streams will increase cost to businesses unless all of the waste from the refuse bin can be removed and that service suspended or reduced in frequency e.g. three-weekly collections instead two-weekly.

For larger businesses, reducing the number of refuse containers and using savings to pay for more recycling is possible. A key issue for very small businesses is that re-configuring the container mix is more difficult when there are limited containers to start with and adding in extra recycling bins at current market prices may increase overall costs. Also, the majority of the charges for commercial collections relate to the operational delivery cost (e.g. labour) and not the treatment of the material.

The waste composition profiles for the diverse NHM sectors all show much larger proportions of recyclable waste than for household waste<sup>45</sup>. This is primarily due to businesses purchasing packaged goods from their supply chain, food waste generated in preparation and post-consumer waste. As such, the recycling potential from NHM sectors is significantly greater than from household sector which contains greater proportions of non-recyclable waste.

Under new regulation businesses would be required to segregate their core waste into up to four streams (residual, dry-mixed recyclables, food waste and glass) depending on the types of waste the businesses generate. Without the intervention of legislation, there appears limited options to incentivise businesses in the separation of key recyclables which are important to meet future national targets.

It is important to note that whilst the increase in waste management costs for the NHM sector appears large, the costs are relatively small at individual site level given the two million businesses included in the NHM sector. Waste management and recycling costs remain a very small proportion of overall turnover<sup>46</sup>. The importance of legislation is to force the business case which otherwise would be unlikely to happen without large scale participation across the numerous and diverse NHM sectors.

High participation in recycling services could improve the economies of scale in waste collection. For waste-generating businesses to see cost savings, there needs to be several businesses adopting a preferred collection regime. This is because of the cost overhead involved for a collection vehicle to get to a business' site. Similarly, waste management companies would need to see changes in their waste management costs in order to pass some of these savings on to affected businesses through higher revenues for separated material or savings in landfill tax. It is thus possible that a co-ordination issue has prevented the realisation of these benefits.

The charges for container collections in this analysis use current market prices which are a reflection of current low levels of participation and separation of recyclable material. A key benefit of intervention through legislation would be that the higher presentation rates of recyclable materials reduce the charges to businesses. Charges would reduce from improvements in the efficiency of collection, making better use of collection assets and increased revenue from the capture of more recyclable materials. However, given the complexity in charging and the range

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45 <https://wrap.org.uk/content/quantifying-composition-municipal-waste>

46 <https://www.cips.org/knowledge/categories-and-commodities/facilities/waste-management/how-to-develop-a-waste-management-and-disposal-strategy/>

of NHM business, a future reduction in container charges has not been assumed in this assessment.

Further, WRAP undertook a workshop with SME (small- to medium-sized enterprise) business representatives on behalf of Defra to review and better understand current barriers to improving current recycling in the non-household municipal sector, and any appropriate mitigation measures that can be taken in an effort to reduce current charges to businesses. The 2019 consultation document<sup>47</sup> produced after discussions with stakeholder's show that there is increased interest in the possibilities of a range of options for businesses, including waste collection authorities combining household and business collections. This could, for example, reduce costs for SME's producing small quantities of waste situated within residential areas where it would make sense to consider joint collection opportunities. This would support a standardised approach to waste collection through consistency in materials being collected by households and businesses alike, where each user pays a smaller proportion of the cost of the service as waste disposal journeys are more efficient. We continue to explore combined household and business collections, alongside other options that will reduce the collection costs for SME's, and work with industry on developing these options further.

## **Environmental externalities**

The municipal sector is not fully accounting for the environmental impacts of the resources it uses and waste it generates when making decisions on recycling and waste disposal. Despite incentives being aligned to the waste hierarchy, with landfill being subject to landfill tax as it represents the worst option environmentally for most materials, there is still a significant amount of waste that ends up in landfill and incineration. In fact, the total amount of residual waste (sent to landfill or incineration) generated by Local Authorities has remained stable over recent years<sup>48</sup>. These environmental impacts range from the impact on natural resource depletion, greenhouse gas emissions, and wider ecosystem impacts associated with the production of raw materials when compared to the use of secondary, recycled, materials. This should also reflect the environmental impacts of waste management activities when comparing recycling to refuse waste treatment options (energy from waste (EfW) incineration or landfilling). Generally, recycling activities are less carbon intensive compared to the refuse waste treatment options, especially given that they help avoid suboptimal extraction of virgin materials and associated carbon emissions<sup>49</sup>. Further, there are known long-term environmental issues and high management costs associated with landfill aftercare treatments.

## **System-wide failures**

Suboptimal levels of recycling have wider, system-wide implications. First, recycling activities are generally less capital and infrastructure intensive when compared to residual waste treatment. As recognised by the National Infrastructure Commission, the higher recycling performance generally leads to lower pressures on residual waste infrastructure<sup>50</sup>.

A fragmented approach to recycling currently undermines the development of viable and resilient secondary markets for materials and goods in the UK. The contamination of materials for recycling was identified as one of the key barriers in relation to plastics, paper and cardboard, metals and glass in a recent WRAP research<sup>51</sup>. There is particular concern about the impact of co-mingled kerbside collections of dry recyclates on paper quality, the ability to separate colour glass and

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<sup>47</sup> [https://consult.defra.gov.uk/environmental-quality/consultation-on-consistency-in-household-and-busin/supporting\\_documents/recycleconsistencyconsultdoc.pdf](https://consult.defra.gov.uk/environmental-quality/consultation-on-consistency-in-household-and-busin/supporting_documents/recycleconsistencyconsultdoc.pdf)

<sup>48</sup> <https://www.gov.uk/government/statistical-data-sets/env18-local-authority-collected-waste-annual-results-tables>

<sup>49</sup> As demonstrated in our calculations on carbon savings presented as part of this IA.

<sup>50</sup> National Infrastructure Commission, 2018, National Infrastructure Assessment.

<sup>51</sup> Anthesis, 2018, Characterising Supply and Demand within secondary material and goods markets.

more generally challenges for all materials around the recycling infrastructure in the UK and how this can create wider issues further down the supply chain. The different preferences at Local Authorities collection kerbside (with a variety of collection systems and materials often collected co-mingled leading to cross contamination) and the NHM side (low recycling levels and material separation) against supply chain preference (calls for separating glass and paper and other fibres) shows that there are split incentives between those presenting and collecting materials on one hand and preferences down the supply chain.

Finally, the UK secondary material markets have recently been under pressure due to closures in foreign markets receiving UK exported waste. This is because of increasing contamination of waste leading to poor quality of presented recyclates, leading to a high dependency on export markets<sup>52</sup>. There is a need to strengthen domestic reprocessing capabilities and to develop a sustainable end market for recycled goods.

### **Section 3: Policy objective**

The provisions in the Environment Bill will require all local authorities in England to separately collect 4 dry recyclable waste streams – metal, plastic, paper and card and glass. These recyclable waste streams are currently being collected by 76% of England's LA's<sup>53</sup>. Expansion to all local authorities would increase the amount of dry materials collected. This measure together with clearer labelling of recyclable packaging, would also reduce confusion among households over what can and can't be recycled. This would help to reduce contamination of non-recyclable items in recycled materials, providing a higher quality recyclates for reprocessors and secondary materials markets. Evidence from nationally collected data from MRFs shows much higher levels of contamination for whole mixed material streams when compared to part-mix or separate streams<sup>54</sup>.

The Bill also requires waste collection authorities to collect food waste separately on a weekly basis. This can then be sent to anaerobic digestion sites where it generates biofuel and digestate, a nutrient-rich fertiliser, rather than landfill, where it releases methane and contributes to the generation of leachates. The UK committed to working towards sending no food waste to landfill by 2030 through its 2017 Clean Growth Strategy and the Resource and Waste Strategy, published in 2018.

We are also consulting on free garden waste collections. Introducing free garden waste collections could help to increase England's recycling rate by approximately 6 percentage points<sup>55</sup>, contributing significantly by diverting garden waste from residual bins (seen where households may not choose to participate in charged garden waste services), and moving them into the separate garden waste collection, improving the quantity and quality of garden waste. This would move garden waste treatment further up the waste hierarchy, towards composting and away from residual waste and support the movement towards a more circular economy. The Resource and Waste Strategy also pledges to work towards zero biodegradable waste to landfill by 2030, which would reduce greenhouse gas emissions and align with the priorities of the Committee on Climate Change (CCC).

The new measures will ensure that there are a consistent set of 6 recyclable waste streams collected by all local authorities and that the materials included in a particular waste stream are also consistent. As a result, householders will know what to recycle whether they are at their house or visiting elsewhere. There will also be clear conditions set out in the legislation including

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<sup>52</sup> WRAP's Plastic Market Situation Report, 2019, <https://www.wrap.org.uk/plastics-market-situation-report-2019>

<sup>53</sup> WRAP Local Authorities portal

<sup>54</sup> <https://wrap.org.uk/resources/tool/materials-facility-mrf-reporting-portal><sup>55</sup> Defra and WRAP modelling.

<sup>55</sup> Defra and WRAP modelling.

that the recyclable waste must be collected for recycling and composting. This is in order to increase confidence in the recycling system that materials put out for recycling will actually be recycled.

Furthermore, there will be no exception from the requirement to collect the recyclable household waste from residual waste. The exceptions are only from the requirement to collect recyclable household waste stream in each waste stream separately. In addition to this, there is a requirement to collection food waste once a week to ensure that all householders are experiencing the same level of service. The Government recognises that these new duties will impose additional costs on local Government, and it will follow the new burdens guidance to ensure the costs of new statutory duties for local authorities are covered.

The provisions in the Environment Bill will also require non-domestic premises that produce household waste and also premises that produce household like or relevant waste to arrange for the separate collection of the four dry recyclable waste streams and separate food waste. Greater consistency in the range of materials presented will enable increased economies of scale in service provision (e.g. reducing the costs of food waste collections) and reduced charges to businesses. The increased quantity and quality of materials will ensure more viable and resilient secondary markets. These measures would impose some additional costs on businesses but there would be scope to reduce these costs by measures to share collection services across businesses or districts<sup>56</sup>. This could reduce collection overheads for individual businesses.

The new requirements on businesses and non-domestic premises will largely mirror the requirements on local authorities collecting household waste, although there is an additional requirement on any party to the arrangements presenting the waste to do so in accordance with the arrangements<sup>57</sup>. In view of the fact this is a larger change, there are wider exemption making powers in respect of these requirements and it is possible to exempt certain businesses, such as micro firms, from these requirements entirely or in respect of a particular waste stream, for example, food waste.

We will issue statutory guidance to ensure minimum standards are met in the design and delivery of these new collections in order to achieve high levels of performance. This means that there will be a specified range of collection profiles that meet that criteria.<sup>58</sup> The standards will also ensure consumers have access to frequent quality services which enable high levels of satisfaction and participation.

This policy dovetails with reforms to packaging Extended Producer Responsibility (EPR) and the introduction of a Deposit Return Scheme (DRS) for drinks containers:

- Reforms to the UK-wide packaging producer responsibility system will see producers bearing much greater costs for collection and disposal of packaging placed on the market than at present. This additional financial obligation will be used to support both local authorities and businesses to reduce costs of collecting packaging. In turn, the increased quantity and quality of recycling collected will help producers to meet packaging obligations to demonstrate that packaging placed on the market is properly recycled.
- In addition to placing the cost of managing packaging waste on producers, proposals for EPR include a mandatory UK-wide labelling scheme for packaging in which producers would label their packaging as 'Recyclable' or 'Not Recyclable.'

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<sup>56</sup> We continue to work with WRAP on potential cost reduction measures for businesses.

<sup>57</sup> There will be no requirement to collect garden waste, although this could be added as an additional waste stream in due course.

<sup>58</sup> In this IA, we assume this includes multi-stream, twin-stream and co-mingled collections.



- The proposed materials to be included in scope of a DRS in England, Wales and Northern Ireland are: PET bottles, steel and aluminium cans and glass bottles. This is based on a preferred option, i.e. 'All-in' DRS.

For modelling purposes, we have assumed that implementation of changes to adopt consistent dry collections, separate food waste collection and free garden waste collection would begin from April 2023 and would continue for several years as local authorities renegotiated contracts and adopted additional collection arrangements.

## Section 4: Summary of options considered

The options considered in this analysis are informed by our first consultation and associated impact assessment<sup>59</sup>. They include well established collection scheme design principles and peer reviewed industry assumptions. Each option is underpinned by best practice for both household and NHM sectors and this impact assessment focuses on the combined effects.

Based on the analysis of costs and benefits, the following four municipal options are presented in the overall NPV calculations (Table 5)<sup>60</sup>. These were selected from a list of 12 scenarios when combining four household and three NHM options.

### Household Sector Options

*1hh*: Consistent weekly collection of dry recyclables under multi-stream systems for low-rise properties. Collection of dry recyclables at flatted properties. Fortnightly residual collections, separate weekly food waste and free fortnightly garden waste collections are covered under this policy option.

*2hh*: Consistent collection of dry recyclables under collection systems with the lowest cost at a Local Authority level for low rise properties. Collection of core dry recyclables at flatted properties. Fortnightly residual collections, separate weekly food waste and free fortnightly garden waste collections are covered under this policy option.

For modelling purposes, we have assumed fortnightly residual waste collections (in both options) unless LAs provide a less frequent service. In reality, some LAs are likely to continue to provide weekly collections.

### Non-Household Municipal Options

*1nhm*: Businesses separate waste to residual, mixed dry recyclables, separate glass waste collections and separate food waste collections. Micro-sized firms, those who employ less than 10, are exempt in this policy option to mitigate against cost pressure.

*2nhm*: Businesses separate waste to residual, mixed dry recyclables, separate glass waste collections and separate food waste collections. Micro businesses are included and phased into the policy in the year 2025/26, two years after implementation to allow time for businesses to account for new provisions.

<sup>59</sup> <https://www.gov.uk/government/consultations/waste-and-recycling-making-recycling-collections-consistent-in-england/outcome/consistency-in-recycling-collections-in-england-executive-summary-and-government-response#government-response-to-consultation-on-consistency-in-household-and-business-recycling>

<sup>60</sup> Given that we are consulting on transition dates, including a start date and a date by which consistent collections will be required, for both the household and NHM sectors, we have assumed a more conservative transition period in this analysis. This will be updated for the final IA in line with a final government response to this consultation.

**Combinations of municipal (M) sector options considered for household and non-household municipal waste.**

Sectors	Non-Household Municipal (NHM) Sector		
	1nhm	2nhm	
Household Sector	1hh	1M	2M
	2hh	3M	4M

**Disregarded options from the main analysis**

**We have disregarded the following options for the household sector:**

- Consistent weekly collection of dry-mixed recyclables (all main DMR materials) under **twin-stream systems for low-rise properties**<sup>61</sup>. This option has been replaced with the “optimised option” which allows local authorities to have a twin-stream collection system if it is the most cost-effective collection (i.e. given local circumstances and having regard to any statutory guidance). Given our stakeholder engagement, it was felt that we needed to have an option to reflect that some collection systems may not be best suited to particular areas, and a one-size fits all requirement would present delivery challenges. The “optimised option” recognises that there needs to be flexibility in the systems used to collect waste across England.
- Consistent weekly collection of dry-mixed recyclables under **current collection systems for low-rise properties**<sup>62</sup>. This option has been replaced with the “optimised option” to account for the lowest cost option available at a local authority level (i.e. given local circumstances and having regard to any statutory guidance). We have disregarded this option based on the arguments set out in the above paragraph.
- **Charged garden waste scenario.** We have modelled all the household options (i.e. both selected as the main policy options and selected as disregarded options) to understand the impact of all local authorities introducing a charge for their garden waste collection. This is because of an increasing number of local authorities introducing a charge, which could be accelerated further once all local authorities introduce separate food waste collections<sup>63</sup>. We have disregarded all these options because they produce a worse NPV compared to those that have free garden waste associated with them. Further detail is provided in Annex E.

**We have disregarded the following options for the non-household municipal sector:**

- No exemptions, phasing or de minimis (i.e. all businesses are within scope). This means that all businesses separate waste to residual, mixed dry recyclables, separate glass waste collections and separate food waste collections. This option has been disregarded because it disproportionately affects micro businesses compared to other size businesses.
- We explored a de minimis threshold for businesses to be exempt from food waste separation if they produce less than 5kg of food waste per week. WRAP’s analysis has found that most businesses produce this amount of food waste and therefore they would not be exempt from this requirement. Most consultation responses agreed that

<sup>61</sup> Including collection of key dry recyclables at flatted properties; fortnightly residual collections; separate weekly food waste and free fortnightly garden waste collections.

<sup>62</sup> As per above – Including collection of key dry recyclables at flatted properties; fortnightly residual collections; separate weekly food waste and free fortnightly garden waste collections.

<sup>63</sup> This is because some local authorities are currently providing a mixed food and garden waste collection.

businesses that produce sufficient quantities of food waste should separate it from residual waste for collection and recycling. Furthermore, this option would present difficulties to enforce weight-based compliance. As such, we have not presented this as an option in this impact assessment.

- The previous IA assumed that different size businesses would be phased in at different periods. Based on consultation responses, it is felt that different cost mitigation measures are needed, especially for micro and small businesses. As such, we are doing some further work on this with WRAP and are also seeking further stakeholder views.

### Non-regulatory options:

Non-regulatory options were considered as part of a long-list of possible approaches, but disregarded due to the following reasons:

- There are various non-regulatory approaches. They include voluntary educational schemes and campaigns, frameworks and guidance, businesses support via specific grants and tools. These approaches have already been used in the sector. Although they have encouraged some individual organisation or individual LA action, they have not led to a systematic change to deliver against the policy objectives set out in this consultation IA. For this reason, we have disregarded these approaches from the short-list of options for quantitative appraisal.
- **Educational schemes and campaigns:** Recycle Now<sup>64</sup> is the national recycling campaign for England and Northern Ireland, which aims to motivate more people, to recycle more things, more often. WRAP work with and alongside brands, retailers, waste management companies, local authorities and Government to bring about real sustainable change. Recycle Now works at the forefront of consumer insights on recycling behaviours. Through the delivery of key campaign moments, ongoing citizen interaction, partnerships and Recycle Week, the annual recycling awareness week, Recycle Now works to educate and inspire citizens to modify their behaviour in recycling. The campaign is about 20 years old, e.g. the first Recycle Week was back in 2003<sup>65</sup>. It is a successful campaign, but it does not deliver against the policy objectives proposed in this consultation IA. This is because this campaign needs to be accompanied with consistent waste collections which would then enable people to recycle the same material across the country.
- **National framework and guidance:** Local Authorities are currently able to decide on a local basis what and how materials should be collected from households for recycling. This has led to a large variety of service collection profiles and current legislative or fiscal drivers are unlikely to change this (i.e. they proved to be insufficient to increase current levels of recycling which plateaued over the last 5 years or so)<sup>66</sup>. As such, WRAP and other bodies have been working very closely with local authorities to improve recycling<sup>67</sup>. WRAP, for example, worked with the waste sector to develop a voluntary 'Consistency Framework'<sup>68</sup>. The framework sets out a 5-point action plan, including specific actions on Local Authorities to improve their services with the support from WRAP. However, this has not been taken up by the majority of Local Authorities because of other funding pressures and an absence of legal drivers. Evidence of limited impact is shown in Figure 1, of very little change in overall household recycling rates since 2012. The Framework has been in place since 2016. It is therefore clear that further legislation is required in order to increase recycling rates and it is not sufficient to rely on local authorities to keep improving recycling rates on a voluntary basis.

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<sup>64</sup> <https://wrap.org.uk/taking-action/citizen-behaviour-change/recycle-now>

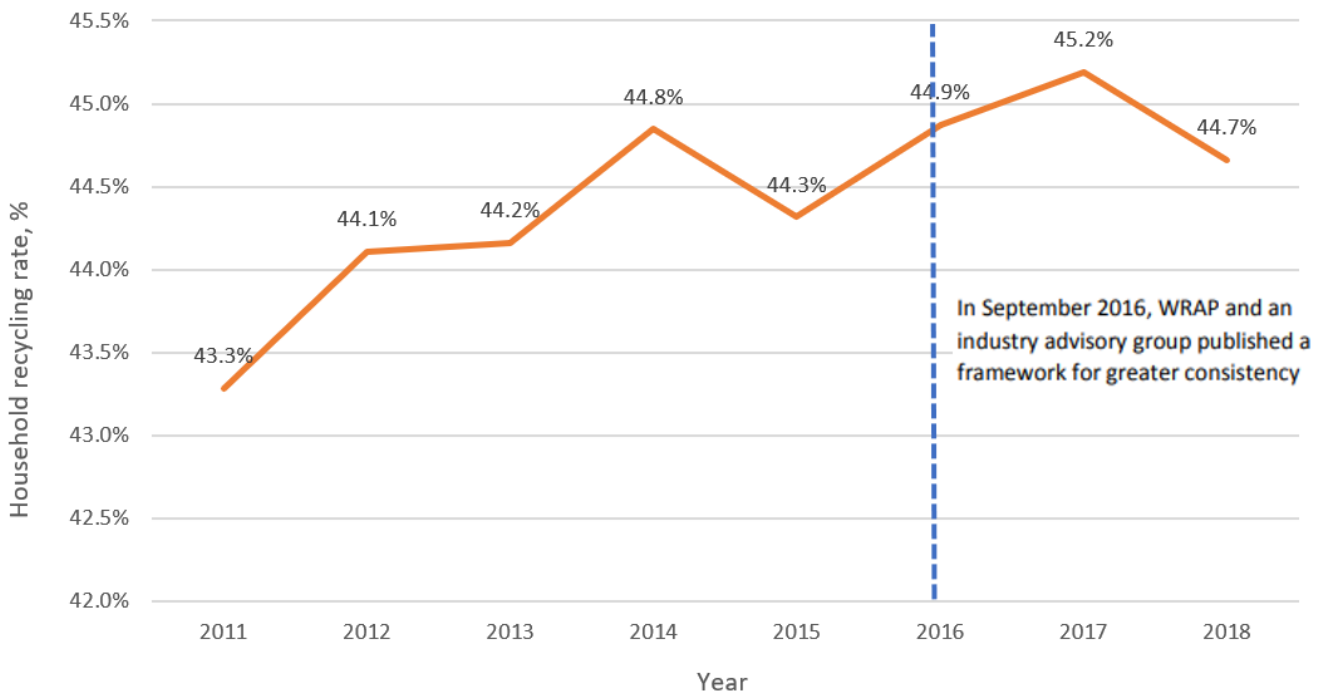
<sup>65</sup> Based on WRAP

<sup>66</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/918853/201819\\_Stats\\_Notice\\_FINAL\\_accessible.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918853/201819_Stats_Notice_FINAL_accessible.pdf)

<sup>67</sup> <https://wrap.org.uk/sectors/local-authorities>

<sup>68</sup> <https://www.wrap.org.uk/collections-and-reprocessing/consistency>

**Figure 1. Household recycling rates in England since 2011 with a timestamp of when the Consistency Framework was introduced.**



Source: UK Statistics on waste<sup>69</sup>, released annually.

- Businesses support, including tool and grants:** For businesses, a range of voluntary initiatives operate (e.g. the business recycling and waste services commitment and recycle at work campaigns)<sup>70,71</sup>. This also includes publicly funded capital grants to help improve recycling<sup>72</sup> and a small number of Business Improvement Districts that have brought individual businesses together to agree more comprehensive waste collection services at lower prices for example by agreeing a contract with a single waste management company<sup>73</sup>. Despite this, it remains the exception and requires collective action to identify financial savings as well as increase recycling. In addition, there have been no drivers (e.g. business residual waste and recycling services tend to be a very small proportion of overall business turnover<sup>74</sup>, further see Figure 2. below) and so efficiency gains in diverting more waste to recycling may yield comparatively low savings at site level and provide limited financial incentive to separate waste without the presence of regulatory requirements.
- There are no requirements at all on those producing the waste to segregate recyclable waste or make arrangements for recycling collections. Simply relying on businesses to do the right thing has not worked and, as such, business recycling rates are much lower than household recycling rates. This is reinforced by the current estimated recycling rate of 43% in the NHM sector.

<sup>69</sup> <https://www.gov.uk/government/statistical-data-sets/env23-uk-waste-data-and-management>

<sup>70</sup> <https://www.recyclenow.com/recycle/recycle-work-1>

<sup>71</sup> <https://wrap.org.uk/resources/guide/business-recycling-and-waste-services-commitment#download-file>

<sup>72</sup> <https://wrap.org.uk/media-centre/press-releases/wrap-launches-new-ps1-million-grant-increase-business-waste-recycling>

<sup>73</sup> <https://www.teamlondonbridge.co.uk/recycling>; <https://betterbankside.co.uk/what-we-do/recycling/>

<sup>74</sup> <https://www.cips.org/knowledge/categories-and-commodities/facilities/waste-management/how-to-develop-a-waste-management-and-disposal-strategy/>

**Figure 2. Baseline costs of waste service provision as a proportion of average turnover, given per sector and firm size**

	<b>Micro</b>	<b>Small</b>	<b>Medium</b>	<b>Large</b>
<b>Hospitality</b>	1.47%	0.60%	0.29%	0.04%
<b>Retail &amp; Wholesale</b>	0.42%	0.09%	0.04%	0.01%
<b>Health</b>	1.10%	0.40%	0.22%	0.09%
<b>Education</b>	0.49%	0.56%	0.23%	0.18%
<b>Transport &amp; Storage</b>	0.61%	0.21%	0.13%	0.00%
<b>Food Manufacturing</b>	0.27%	0.19%	0.29%	0.06%
<b>Offices &amp; other Services</b>	0.18%	0.09%	0.03%	0.01%

Source: WRAP costing of baseline waste provision and turnover taken from ONS<sup>75</sup>

- In our 2019 initial consultation, we asked whether businesses, public bodies and other organisations that produce municipal waste should be required to separate dry recyclable material from residual waste so that it can be collected and recycled. The majority of responses (95%) agreed with this proposal<sup>76</sup>. We have also asked whether there are alternatives to legislative measures that would be effective in increasing business recycling. There were a number of comments, however, most of them were about additional incentives and/or businesses to support the proposed legislative measures. Several comments also suggested that commercial collections should meet the same consistency aims as household waste and recycling services, as this would enable common messaging to reflect recycling options at home and work. Concerning segregation of food waste for businesses, a large majority of respondents agreed that businesses that produce sufficient quantities of food waste should be required to separate for recycling.

Other:

- Landfill tax has been one of the drivers for local authorities to divert household waste from landfill and towards energy recovery or recycling<sup>77</sup>. It helped move standard rated waste to landfill from being a cheap form of waste disposal to the most expensive, which reflects its position at the bottom of the waste hierarchy.
- HM Treasury are responsible for tax policy. HM Treasury regularly reviews Landfill Tax as part of normal budget procedure and works with Defra to assess policy impacts alongside other interventions, including those proposed in this impact assessment.

## **Section 5: Detailed description of household and non-household municipal options considered (including do-nothing)**

The options presented in this IA have been designed in line with the requirements of the Bill to separately collect recyclable waste streams and taking account of the technical economic and environmental exceptions that allow certain waste streams to be collected together.

<sup>75</sup> Turnover taken from ONS IDBR Business Data, organised by employment size band.

<sup>76</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/819780/consistent-recycling-consult-part2.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/819780/consistent-recycling-consult-part2.pdf)

<sup>77</sup> UK Parliament website (2014) <https://publications.parliament.uk/pa/cm201415/cmselect/cmenvfru/241/24105.htm>

These options have been assessed based on a combined output from three technical models:

- WRAP's Routemap collection model to estimate impacts concerning the HH sector;
- WRAP's NHM model to estimate impacts concerning the NHM sector; and
- Defra's in-house model, called FoWST (i.e. Fates of Waste Simulation Tool) to estimate impacts across the municipal sector. The model estimates the mass flow balance across the municipal sector in order to estimate the amount of tonnages treated by different methods and associated GHG emissions. It also helps estimate impacts on overall landfill tax payments.

All these models rely on a large set of assumptions and data which are summarised in Annex A. Quality assurance of these models is explained in Annex F.

## Household sector and baseline scenario

The household sector comprises of the waste collected at kerbside (door to door collections) for low-rise household properties, waste collected from flatted properties (i.e. high-rise properties), bring sites for waste, bulky waste and waste presented at Household Waste Recycling Centres (HWRCs). The analysis on this sector has focussed on the first two categories. Bring sites<sup>78</sup>, areas where LA's or third parties provide containers for the public to deposit recyclable material, and Household Waste Recycling Centres are not included for reasons of data quality, particularly around cost, and their performance is assumed to continue at current levels.

The baseline scenario assumes that Local Authorities make no changes with respect to the offered dry recycling collection systems, separate food waste collections, free garden waste collections or any changes in the frequency of refuse waste collections. This scenario assumes that Local Authorities provide waste management services as observed in 2017/18 WasteDataFlow data and Local Authority Recycling Scheme Updater (LARSU)<sup>79</sup> and make no change in the period of 2017-2035. The baseline is used as the starting point for each scenario.

The 2017/18 year data<sup>80</sup> on local authorities show:

- Local Authorities use the following dry kerbside collection schemes for low rise properties: 66 with multi-stream collections, 172 with co-mingled collection, 120 with two stream collections and 3 with single material collection.
- 89% collect glass, 100% metal cans and tins, 100% paper, 99% plastic bottles, 99% collect cardboard packaging. Overall, 70% of Local Authorities collect all five widely recycled materials and PTTs (plastic pots, tubs and trays).
- 35% (113) of Local Authorities provide separate food waste collections.
- 58% of Local Authorities charge for the collection of garden waste.
- 2% of households have their refuse collected more than weekly, 29% on weekly, 67% on fortnightly and 2% on three-weekly basis.

The current coverage of recycling and service profiles from high rise flats varies considerably across Local Authorities. The known coverage varies from flats having only a residual waste collection to full segregation of dry materials and food waste. Baseline assumes no change from the current service provisions.

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<sup>78</sup> WRAP research on LA Bring Sites 2018

<sup>79</sup> <https://larsu.wrap.org.uk/>

<sup>80</sup> Data from WRAP's Local Authority portal: <https://laportal.wrap.org.uk/>

Consequently, the household sector recycling rate stood at 45% in 2017/18 and is expected to remain unchanged by 2035/36 as we assume that collection systems do not change over time. Waste arisings grow in-line with household projections with an assumed fixed recycling yield<sup>81</sup> per household each year.

For the baseline scenario we use the results from WRAP's Routemap collection model to provide the net service costs<sup>82</sup> of waste management for both low-rise and high-rise properties. These costs are estimated to be around £2.35 billion in 2017/18, rising to around £2.58bn by 2035 as results of projected growth in the number of householders from 23.6 million to 26 million of households in 2035<sup>83</sup>. The largest proportion (52%) of the overall costs are annual operating and communications costs (including staff costs), followed by annual bulking costs of dry recycling and treatment costs of food waste and residual waste (40%, covering the cost of sending waste to relevant facilities for waste treatment and paying associated gate fees), annualised capital costs for vehicle and containers replacement (bins). This 'net' estimate also accounts for any revenues received through selling separately collected dry recyclates directly to reprocessors (e.g. paper to paper mills).

We also adjust these estimates to include the DRS effect. Based on WRAP's modelling, we estimate an average increase of £8m to annual net service costs for the local authorities from 2023 onwards. This is based on the materials removed by the DRS from kerbside collections. Although the tonnage associated with DRS materials do not affect the overall collection costs, they do affect bulking, treatment and disposal costs. There are some savings associated with residual waste disposal and dry material bulking. They are offset by increased costs incurred from the remaining material going to material recovery facilities (MRFs) and lost revenue from DRS materials being removed. The former is driven by an estimated increase in MRF gate fees. WRAP has modelled a cost increase from c. £15 per tonne to £50 per tonne once DRS materials are removed from kerbside. The latter effect has been estimated based on the tonnes of DRS materials removed and associated lost revenue for each material.

Further detail on WRAP's Routemap collection model can be found in Annex A.

### **Option 1hh – Multi-stream dry recycling collections, separate food waste and free garden waste collections**

This household collection scenario assumes the following:

- At low-rise household properties, all Local Authorities collect on a weekly basis a set of dry materials (plastic bottles, metal cans, paper, cardboard packaging, glass packaging and plastic pots, tubs and tubes) for recycling through a multi-stream collection. This means a provision of three separate containers for (i) plastic packaging and metal packaging and cartons, (ii) glass and cardboard (separated out by crews into different compartments on the vehicle), (iii) and paper. Using 2017/18 data, this means that all 345 collection schemes now operate through using a multi-stream for dry recycling (compared to 66 schemes in 2017/18).
- At low-rise household properties, all Local Authorities provide weekly collections of separate food waste.
- At low-rise household properties, all Local Authorities provide free collections of garden waste on the currently operated frequencies.

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<sup>81</sup> Yields represent material collected from the kerbside and therefore include contamination. The contamination rates are then applied per each collection system to derive the recycling tonnage net of contamination. See the 'Key household scenario assumptions' section in Annex A for more details.

<sup>82</sup> Overall cost for all English local authorities of running their waste collection systems, net of revenue they generate such as the sale of separately collected dry recyclable material.

<sup>83</sup> Population growth projections – <https://www.gov.uk/government/statistical-data-sets/live-tables-on-household-projections>

- At low-rise household properties, all Local Authorities, except those that had already introduced a less frequent collections, provide fortnightly collections of refuse waste. This means that 98% of households are on refuse collection every two weeks. This has been modelled to minimise costs of transitioning to new collection systems and increase recycling yields.
- At high-rise properties, local authorities introduce comprehensive collections of the dry materials. No changes are assumed with respect to dry scheme, food waste or refuse waste collections.

### **Option 2hh – Optimised dry recycling collections, separate food waste collections and free garden waste collections**

This household collection scenario assumes the following:

- At low-rise household properties, all Local Authorities collect on a weekly basis a set of dry materials (plastic bottles, metal cans, paper, cardboard packaging, glass packaging and plastic pots, tubs and tubes) for recycling through the collection systems with the lowest cost to them. This means that 221 Local Authorities use multi-stream, 48 co-mingled dry recycling and 44 two separate stream collections. Compared to the baseline data, there are 200 Local Authorities that change and 113 Local Authorities that stay the same, i.e. continue to use their current collection system<sup>84</sup>.
- At low-rise household properties, all Local Authorities provide weekly collections of separate food waste.
- At low-rise household properties, all Local Authorities provide free collections of garden waste on the currently operated frequencies.
- At low-rise household properties, all Local Authorities, except those that had already introduced a less frequent collections, provide fortnightly collections of refuse waste. This means that 98% of households are on refuse collection every two weeks. This has been modelled to minimise costs of transitioning to new collection systems and increase recycling yields.
- At high-rise properties, Local Authorities introduce comprehensive collections of the dry materials. No changes are assumed with respect to dry scheme, food waste or refuse waste collections.

In the modelling we have assumed that dry recycling system capacity for low-rise properties is equivalent to at least 140 litres per week; food recycling capacity is 23 litres per week; and residual waste capacity is around 120 litres per week<sup>85</sup>. The analysis assumes the industry follows best practice in selecting their waste containers, vehicles and crew profiles.

Both household options are adjusted to include the DRS impact on Local Authorities. We have modelled the changes in waste management costs due to the DRS in both the baseline and policy-related options. The net change in costs due to the DRS has been included in the overall NPV calculations. This is because this change in Local Authority waste management costs will be absorbed by the EPR scheme; and the EPR impact assessment builds on the preferred option of this IA.

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<sup>84</sup> Based on WRAP's modelling

<sup>85</sup> The scheme profiles and associated container capacities come from data reported in LARSU (<https://larsu.wrap.org.uk/>) and are built into the core model. LARSU is the data input tool used by Local Authorities



## Non-household municipal (NHM) sector options

### Non-household municipal (NHM) sector and baseline scenario

WRAP created industry waste estimates for approximately 2.1 million private businesses and public sector entities. This was based on 2018 data from ONS for the Inter-Departmental Businesses Register (IDBR), using local unit counts. The sector scope of NHM businesses included is defined by a close examination of European Waste chapter codes and their mapping onto data sources such as Environmental Agency's Waste Data Interrogator (WDI) and Incineration data<sup>86</sup>, Defra RDF, Defra Household data, Defra C&I study, EuroStat<sup>87</sup>, related-waste compositions and previous similar studies. This mapping allows us to determine which firms are producing household-similar waste per the Circular Economy Package (CEP) definition<sup>88</sup>. From the data on business counts, 83.4% are micro businesses, 13.4% are small, 2.8% are medium and 0.4% are large businesses (Table 3 below).

Following the CEP definition of Municipal Waste, the NHM sector includes seven core sectors: Hospitality, Retail and Wholesale, Health, Education, Transport and Storage, Food Manufacturing and Office and other Services<sup>89</sup>. Defra commissioned WRAP to map the national NHM data returns onto the individual business profiles. This research estimates the NHM sector produced 26.9 million tonnes of waste<sup>90</sup> in 2018. All NHM data, including this total waste arisings figure is a median-averaged figure comprised of four estimated sensitivities that WRAP have developed.

Although granular data and assumptions have been applied to calculate high-level sector breakdown, it will not show the exact data for individual businesses and this *cannot* be calculated with the data available. The methodology on these four sensitivities can be found in more detail in the 'Key NHM Scenario Assumptions' section (i.e. see Annex A).

**Table 3: Number of businesses/public units, counts by employment band size, England, 2018**

Sector	Micro	Small	Medium	Large	Total
Hospitality	113,395	47,970	4,805	250	<b>166,420</b>
Retail & Wholesale	352,050	71,925	9,490	1,475	<b>434,940</b>
Health	90,365	42,785	8,900	935	<b>142,985</b>
Education	31,820	18,410	11,850	770	<b>62,850</b>
Transport & Storage	96,220	10,805	3,695	750	<b>111,470</b>
Food Manufacturing	4,855	1,780	730	330	<b>7,695</b>
Offices & other Services	1,114,140	96,615	21,060	4,775	<b>1,236,590</b>
<b>Total</b>	<b>1,802,845</b>	<b>290,290</b>	<b>60,530</b>	<b>9,285</b>	<b>2,162,950</b>

Source: WRAP Business count based on the IDBR register from the Office for National Statistics (ONS)

The highest contribution of waste arisings comes from the Retail and Wholesale sector, accounting for 35.2% of total NHM waste arisings, with Office and other Services second (19.0%) and Hospitality third (12%)<sup>91</sup>. Table 4, below, shows how the generation of waste is split by employment size band and sector type.

<sup>86</sup> <https://data.gov.uk/dataset/312ace0a-ff0a-4f6f-a7ea-f757164cc488/waste-data-interrogator-2018>

<sup>87</sup> <https://ec.europa.eu/eurostat/web/environment/overview>

<sup>88</sup> <https://ec.europa.eu/eurostat/documents/342366/351806/Municipal-waste-statistics-guidance.pdf>

<sup>89</sup> It is important to note that only a small proportion of food manufacturers are included within the NHM definition. This is because (especially with medium and large Food Manufacturers), they may have a significant proportion of their waste collected by a non-standard business kerbside collection service, more so than other Sectors. Examples of alternative disposal routes may be animal feed or food re-distribution.

<sup>90</sup> Indicative estimate

<sup>91</sup> In the previous Impact Assessment, Office and other Services produced the lowest contribution of all the sectors. The second contributor was Education and the third was Hotels and Catering.

**Table 4: NHM waste arisings in tonnes, baseline year, by sector and business size**

	Micro	Small	Medium	Large	Total
Hospitality	1,805,383	1,284,735	531,087	63,636	<b>3,684,841</b>
Retail & Wholesale	3,443,730	3,301,851	1,724,790	924,562	<b>9,394,932</b>
Health	479,012	1,055,793	552,304	710,217	<b>2,797,325</b>
Education	29,558	943,359	1,219,425	350,117	<b>2,542,459</b>
Transport & Storage	429,530	591,206	813,015	72,902	<b>1,906,654</b>
Food Manufacturing	10,339	33,978	646,495	813,914	<b>1,504,727</b>
Office and other services	1,393,698	1,395,211	1,212,402	1,084,775	<b>5,086,085</b>
<b>Total</b>	<b>7,591,251</b>	<b>8,606,132</b>	<b>6,699,518</b>	<b>4,020,122</b>	<b>26,917,023</b>

Source: WRAP's analysis

Table 4 shows that small businesses generate the largest share of waste arisings, followed by micro, then medium and finally large businesses. The table also shows that the sector type also affects how much waste is produced alongside businesses size.

The NHM sector is overall more complex than the household sector given its diversity and no 'middleman' to manage waste collections between the businesses and the waste collectors (as a Local Authority does for households). In 2017 and 2018 WRAP have undertaken large scale surveys of waste container profiles from the NHM sector to help understand the baseline profiles for the businesses in scope and found that:

- Businesses and public sector units are predominantly charged by pick up and pay per volume<sup>92</sup> of an ordered container.
- The costs are not officially reported because they are commercially sensitive. They vary according to contract terms which are often very short-term and influenced by the take up of a range of other services, as well as national or regional contract terms.
- The type of collection for the NHM sector can vary from sack pick-ups, 120 litre wheeled bins, up to 1280 litre wheeled bins and can provide collections of general refuse, mixed dry recycling with and without glass, separate paper and cardboard packaging, mixed plastics, mixed glass and food waste<sup>93</sup>. Waste management companies collecting waste from businesses tend to favour the customer (business) in using 1100l waste bins for general waste. This is largely because the collection vehicles are suited to lifting this type of bin, convenient for the customers' use and it is cost efficient for the waste management company in terms of operations.
- There are instances of larger containers being used and further specialist collections for key materials from NHM businesses, but these tend to be in the minority.

In addition, in 2019 WRAP have also commissioned surveys of national pricing for NHM collections for a range of materials and considered variations across the country. Using the surveys mentioned above provides a useful indication of what services are being used and the relative costs of provision.

Whilst charges for recycling services are lower than for residual waste, ordering more containers and services often results in more costs to the NHM sector businesses. Reducing or avoiding cost

<sup>92</sup> A flat rate is charged per pick up of a container, irrespective of its weight or how full it is.

<sup>93</sup> Container and material types are known to vary even further for broader commercial and industrial waste streams but these are not in scope since they would not follow the standard municipal waste definition.

increase is possible where businesses and public sector units decide to cost-optimize their collections through measures such as reduced size for refuse containers, decreased frequency of collections or shared waste service provisions. All these measures are considered in increased recycling scenarios and are described in more detail in the 'Key NHM sector assumptions' section in Annex A. From WRAP's survey of NHM businesses, it appears that part of the NHM sector is already implementing these measures, although to varying degrees. However, there are still businesses that do not have a recycling collection at all. They only have a residual collection or a very small recycling collection and there is lack of rationalisation. Factors such as coordination failure among businesses due to lack of information on support options available to them to minimise costs, may be a considerable contributing factor. For example, businesses (i.e. operating in the same work-space area) may have little to no knowledge of the amount of cost savings they could make if they made use of the shared service provision or collectively reduced the size of their refuse containers etc. Another factor limiting the optimisation approach has been the relatively low savings that might be achieved relative to the overall turnover and the perceived challenge in realising small savings.

### **Baseline scenario for the NHM sector**

There is currently no robust data reporting requirement, of similar quality to the Waste Data Flow used on the household side, which could be used for the NHM sector analysis. We have asked WRAP to develop the evidence for the baseline of the NHM sector on which this IA could build. The IA develops the baseline scenario on a number of assumptions described below.

Like in the household sector, the NHM baseline scenario assumes that the sector makes no change to their current use of waste collection systems or collection frequency. We assume that the presented recycling rate for the NHM baseline is between 44% and 54%, with a central estimate of 49%, or 11.6-14.5 million tonnes of waste currently recycled. This range was estimated based on WRAP's bottom-up analysis<sup>94</sup> whereby a representative sample of NHM businesses were visited and their waste provision recorded. From this data, WRAP calculated:

- the 54% baseline which is representative of the most frequently used waste provision profiles by business size per sector level; and
- the 44% baseline which is representative of all waste provision profiles used by business size per sector level.

Next, we assume that, out of this recycled tonnage, overall, around 80% are dry mixed recyclates (DMR) and 20% represent separate food waste collections sent for recycling. This split is based on an average of the individual sub-sector waste composition estimates for the overall sector. We estimate the following split for the total 26.9Mt of waste arisings:

- 18.69Mt could be collected as dry material recyclates (including glass)
- 4.66Mt represent total food waste available for recycling
- 3.56Mt are currently non-recyclable materials<sup>95</sup>.

The three baseline estimates (44%, 49% and 54% recycling rates<sup>96</sup>) are run against the low, best and high estimate of NHM scenarios as a sensitivity of options to baseline recycling rate. In each of the baseline scenarios, we assume the recycling rate remains unchanged from year to year over the period covered across all business sizes.

WRAP has estimated the NHM waste management costs to be around £3.8 billion per year for the 44% and £3.4 billion per year for the 54% baseline. This means that our central estimate is

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<sup>94</sup> This is an actual sub-sector profiling of waste generation per material and type of business.

<sup>95</sup> Whilst averages are shown for illustration the analysis uses individual sub-sector waste compositions and calculates tonnage for each.

Source: WRAP's analysis

<sup>96</sup> Presented recycling rates, i.e. represents the amount of waste that gets initially recycled by businesses.

£3.6 billion per year. WRAP has also estimated these costs to include the DRS scheme. The scheme increases the 44% baseline costs by £285m per year and the 54% baseline costs by £219m per year. The central estimate for the 49% baseline is £246m per year. We use these DRS costs to estimate the net DRS effect as a transfer cost from the NHM sector to the Deposit Management Organisation (DMO).

Finally, the three baseline recycling rates (i.e. 44%, 49% and 54%)<sup>97</sup> represent the amount that gets initially recycled by business and are used to estimate NHM waste management costs in the baseline (as explained above). An actual recycling rate for the NHM baseline is slightly lower than the presented rates above. This is because the actual rate is based on the end destination of business waste streams. We estimate this rate to be approx. 43%<sup>98</sup>. This rate is used to estimate GHGs emissions in the baseline.

The following options have been considered against the baseline:

### **Option 1nhm: Dry mixed recyclables (DMR), separate glass and food collections, micro-sized businesses exempt from policy**

The waste composition profiles of the NHM sub-sectors all show that businesses have much higher proportions of potentially recyclable waste than is prevalent in the household waste stream. With legislative measures to compel businesses to separate their waste, the potential of increased recycling rate is significant compared to the baseline. This scenario depicts the whole NHM sector (except micro businesses) collecting consistently dry mixed recyclables: paper, cardboard packaging, plastic bottles, plastic pots, tubs and trays (PTTs), metal packaging and, separately, glass packaging. It also requires having separate food waste collections. Under our best estimate, this policy option would produce a 77% presented recycle rate for the NHM sector by 2035.

### **Option 2nhm: Dry mixed recyclables (DMR), separate glass and food collections, micro-sized businesses phased into the policy from 2025 onwards (i.e. two years after implementation of the policy)**

This option assumes the same collection of the recyclable materials, all dry mixed recyclables, separate glass and separate food waste as in Option 1nhm, but rather than micro-sized firms being exempt, they are phased in later to allow additional time to change their arrangements for waste collection. This option allows micro-firms to contribute to the increased recycling rate and improves the overall performance against policy objectives. Under this option, we expect to see an NHM presented recycling rate of 87% by 2035. This option provides a better recycling rate than option 1nhm, owing to the capture of the micro business waste.

## **Municipal scenario descriptions**

Combining the household and non-household recycling scenarios we have developed four municipal sector options:

*Household 1hh:* Consistent weekly collection of dry-mixed recyclables under multi-stream systems for low-rise properties. Collection of core dry-mixed recyclables at flatted properties. Fortnightly residual, separate weekly food waste and free fortnightly garden waste collections.

*Household 2hh:* Consistent weekly collection of dry-mixed recyclables under collection systems with the lowest cost at a local authority level for low-rise properties. Collection of core dry-mixed recyclables at flatted properties. Fortnightly residual, separate weekly food waste and free fortnightly garden waste collections.

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<sup>97</sup> A proportion of this is assumed to be dry recyclables and separate food waste recycling.

<sup>98</sup> Estimated by WRAP

*Non-household municipal 1nhm:* Businesses separate waste to residual, dry-mixed recyclables, separate glass and separate food waste collections. Micro-sized firms, those who employ less than 10 employees, are exempt in this policy option.

*Non-household municipal 2nhm:* Businesses separate waste to residual, dry-mixed recyclables, separate glass and separate food waste collections. Micro businesses are phased into the policy in the year 2025/26, two years after implementation to allow additional time for transition.

**Option 1M** – Option 1hh and Option 1nhm

**Option 2M** – Option 1hh and Option 2nhm

**Option 3M** – Option 2hh and Option 1nhm

**Option 4M** – Option 2hh and Option 2nhm

## **Section 6: Costs and benefits of collections system options for the municipal, household and non-household sectors**

The four municipal sector options deliver very similar costs and benefits. The key difference is the scale of effect (as summarised in Table 5).

We identify the following benefits associated with the presented options:

- **Municipal recycling rate:** the combination of ambitious household and NHM scenarios achieves an increase in the recycling rate from 44.0% to 60-65% by 2035<sup>99</sup>. This excludes the contribution of metals recovered and recycled from incinerated bottom ash.
- **Savings to households from removed garden waste charging:** all household scenarios assume Local Authorities provide free garden waste collections. Local Authorities face the costs of this service while households see a reduction in costs of the free service of up to £156m per year from not being directly charged for the service. This is to incentivise households to collect and take out garden waste from residual collections to prevent it from going to landfill. Given that all options include free garden waste collections, we estimate that all options deliver the same saving of £1,318m to households (i.e. discounted and estimated over the total appraisal period). This is based on outputs from WRAP's Routemap collection module.
- **GHG emissions savings:** All municipal scenarios achieve a substantial reduction in GHGs emissions. Across the appraisal period, these savings are £3.63bn for Option 1M, £4.56bn for Option 2M, £3.73bn for Options 3M and finally £4.66bn for Option 4M (all discounted). Estimated using Defra's in-house model.
- **NHM landfill tax saving<sup>100</sup>:** We have estimated £5,505-5,611m reduction for Option 1nhm and £6,981-7,087m for Option 2. Using our internal model, we estimate the amount of tonnages treated by different methods, including landfill. We then provide a breakdown of landfill tonnage diverted from households and businesses (i.e. HH landfill tax is included in LA waste management costs).
- We assume that these NHM landfill tax savings are realised by waste management companies. We also assume that these companies do not pass any of that saving back to the affected municipal businesses.

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<sup>99</sup> Rounded to the nearest whole number

<sup>100</sup> As explained in the key municipal-wide sector assumptions section, the landfill tax value is assumed to be flat and at the 2019 level of £91.35 per tonne of waste sent to landfill. Whilst the landfill tax has previously risen in line with the growth in the Retail Price Index, a constant rate has been assumed for the modelling purposes as all other prices have been kept constant.

- This is because businesses tend to pay for waste collection on a per lift or bin basis (i.e. not by quantity of waste); and most of these charges for commercial collections relate to the operational delivery cost (e.g. labour) and not the treatment of the material, which varies per collection event. As such, WRAP has assumed that lift prices stay constant.
- Similarly, most businesses will not be able to significantly reduce their refuse collections. Diverting some recyclable waste from the refuse bin still, almost certainly, means that a refuse container is required despite it becoming less full. Only large businesses can make some savings (as demonstrated by our analysis on NHM waste management costs (see below)).
- We will explore this further via consultation, i.e. to what extent waste management companies can pass some of these savings on to affected businesses.
- We would also like stakeholder views on our assumption concerning constant lift prices for businesses as well as overall NHM tonnages and recycling rates.

We identify the following benefits associated with the presented options:

- **LA waste management costs (including landfill tax saving):** there is a net increase in costs for 1hh and 2hh options. This is mainly driven by the change in garden waste provision to a free collection in all local authorities, resulting in lost revenue from no longer being able to charge for this service. 1hh option means that Local Authorities see £1,220m net increase in their costs over the total appraisal period. 2hh increases Local Authorities net costs by £931m. Please note that these net costs include LA-specific reductions in landfill tax payments. Estimated based on WRAP's Routemap collection model.
- **NHM waste management costs (excluding landfill tax saving):** across all policy options and business size, waste management costs are expected to increase for the business sector over the period 2023-35. Large businesses are estimated to experience some savings in their overall waste management costs (e.g. this is because they can further reduce their frequency of residual waste collections or number of associated bins). Medium and small firms are estimated to experience an increase in their costs (e.g. they might require some additional recycling bins), but not as large as micro businesses. They see the largest net cost increase under 2nhm option (see the 'Small and Micro Business sized Assessment section'). These net cost increases are attributed to the necessary change in waste provision mainly across micro-sized firms. Most of these businesses currently have a waste provision that collects 100% to residual waste. In our analysis we assume that some micro and small businesses would make use of the shared provision<sup>101</sup>, although only a few may be doing so at present. These costs were estimated based on WRAP's NHM model.
- **Municipal sector support costs to government:** they are estimated by WRAP to be c. £161-431m to support both Local Authorities and NHM businesses over the overall appraisal period. These include national communication campaigns, random site visits, mailing and design costs and other policy support activities essential for effective transition to higher recycling. Further detail can be found in Annex A.
- **Landfill tax impact on government:** All municipal scenarios are estimated to see a substantial reduction in landfill tax bill by 2035. The modelling results show that all scenarios see only 8-12% of municipal solid waste (MSW) sent to landfill by 2035, compared to 27% in baseline (see Annex B). This means that government will lose £5,972

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<sup>101</sup> Please see NHM waste management costs methodology, page 59, for further details on shared business waste provisions.

in reduced landfill tax receipts in 1M Option, £7,448m in 2M Option, £6,143m in 3M and £7,619m in 4M Option. This is based on our in-house model.

- Given data limitations associated with the NHM sector and a high degree of uncertainty about future waste arising more widely, there is a risk that we may have significantly overestimated potential savings associated with the landfill tax. However, the landfill tax represents a transfer of money between government and businesses and does not affect the overall NPVs. This will be investigated further once we complete our externally commissioned research on future waste arisings<sup>102</sup>. HM Treasury continues to keep tax policy under review, and any changes to this are announced as part of the Budget process.

#### **Net present value:**

- Option 1M sees net societal savings estimated at £2.75bn over the total appraisal period 2023-35. This is the second-best option and its NPV is very close to Option 3M (i.e. the preferred option). The key difference is that this option has a slightly higher cost to Local Authorities compared to 3M.
- Option 2M achieves the lowest NPV of £0.49bn. This is because this option includes micro businesses who experience a significant increase in their waste management costs. This option also has a slightly higher net cost to LA compared to 3M and 4M.
- Option 3M delivers the highest NPV of £3.07bn due to the lowest net cost increase to Local Authorities, the net waste management saving to the NHM sector (once adjusted for the reduction in landfill tax payments).
- Option 4M achieves the NPV of £0.81bn. This option includes micro businesses.

#### **Non-monetised costs and benefits:**

- See Annex C on the implication of these scenarios with respect to recycling and waste infrastructure needs; familiarisation costs, wider economic benefits; landfill aftercare costs, international GHGs emissions savings and household and business inconvenience and disamenity costs.
- We were not able to estimate the additional GHG savings associated with higher quality recycle that is more likely to be produced under multi-stream collections. We are unable to do this as the data quality of Waste Data Flow (WDF), limits details of the end destinations of materials (limited descriptions, missing/incomplete responses, limited auditing). Until better auditing and completions are made, it is very difficult to identify the treatment process associated, in-turn the GHG benefit from the material flow.

Table 5 below summarises the net costs and savings for each municipal scenario. Table shows the profile of costs and savings to the municipal sector over the period of 2023-2035 for Option 1M-4M. All results are shown with constant prices and discounted. They have been estimated applying an annual discount rate of 3.5% per year<sup>103</sup>. The analysis follows the Green Book and Aqua Book principles throughout<sup>104</sup>.

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<sup>102</sup> <https://bidstats.uk/tenders/2020/W38/735183088>

<sup>103</sup> HM Treasury, 2018, The Green Book – central government guidance on appraisal and evaluation.

<sup>104</sup> HM Treasury, 2015, The Aqua Book: guidance on producing quality analysis for government.

**Table 5: Summary of impacts of considered policy options, £ millions, discounted.**

<b>Change over 2023-2035 (against baseline)</b>	<b>Option 1M</b>	<b>Option 2M</b>	<b>Option 3M</b>	<b>Option 4M</b>
Municipal recycling rate* achieved (Baseline rate 44.0%)	60.0%	64.2%	60.5%	64.7%
Savings to households from removed garden waste charging	£ 1,318	£ 1,318	£ 1,318	£ 1,318
GHGs emissions savings (traded and non-traded)	£ 3,627	£ 4,566	£ 3,726	£ 4,661
NHM landfill tax saving	£5,505	£6,981	£5,611	£7,087
<b>Social benefits (total)</b>	<b>£ 10,450</b>	<b>£ 12,865</b>	<b>£ 10,655</b>	<b>£ 13,066</b>
Additional Local Authorities net service costs (+)/savings (-) from changes in dry recycling, food waste and free garden waste collections for all HHs	<b>£1,220:</b> £ 829 transition costs,  -£679 savings on ongoing costs**,  -£248 DRS net effect; and  £ 1,318 lost income from garden waste charging	<b>£1,220:</b> £ 829 transition costs,  -£ 679 savings on ongoing costs**,  -£248 DRS net effect; and  £ 1,318 lost income from garden waste charging	<b>£931:</b> £ 726 transition costs,  -£ 939 savings on ongoing costs**,  -£174 DRS net effect; and  £ 1,318 lost income from garden waste charging	<b>£931:</b> £ 726 transition costs,  -£ 939 savings on ongoing costs**,  -£174m DRS net effect; and  £ 1,318 lost income from garden waste charging
Net waste management costs to NHM businesses under increased recycling collections	£ 351	£ 3,276	£ 351	£ 3,276
NHM net DRS effect adjustment***	-£ 19	£ 1,641	-£ 19	£ 1,641
Policy costs to apply best practices in recycling collections	£ 161	£ 430	£ 162	£ 431
Reduction in government landfill tax receipts (benefits to municipal sector included in LA and NHM rows) <sup>105</sup>	£ 5,972	£ 7,448	£ 6,143	£ 7,619
<b>Social costs (total)</b>	<b>£ 7,713</b>	<b>£ 11,970</b>	<b>£ 7,596</b>	<b>£ 11,854</b>
<b>Net present value<sup>106</sup></b>	<b>£ 2,746</b>	<b>£ 491</b>	<b>£ 3,067</b>	<b>£ 809</b>

Source: Defra analysis

\*Municipal recycle rate is adjusted to include improvement in recycling due to Deposit Return Scheme (DRS) and the effect is estimated to enhance municipal recycling rate by 1-2%.

\*\*Savings on ongoing costs are composed of changes in: (i) annual bulking and treatment costs; (ii) annual operating and comms; (iii) DRS effect.

<sup>105</sup> As explained in the key municipal-wide sector assumptions section, the landfill tax value is assumed to be flat and at the 2019 level of £91.35 per tonne of waste sent to landfill. Whilst the landfill tax has previously risen in line with the growth in the Retail Price Index, a constant rate has been assumed for the modelling purposes as all other prices have been kept constant.

<sup>106</sup> The net present value calculation removes the garden waste charges and landfill tax changes from the overall societal costs or savings as these are transfers between relevant parties (garden waste charging – costs to LAs, savings to householders; landfill tax changes – loss to Government, saving to municipal sector).



\*\*\* The DRS net effect is presented here for illustration purposes only – illustrating how taking out dry recyclable material (chosen materials from DRS scheme) from kerbside collection will affect the recycling collection costs. It is considered as a transfer effect with a full cost being absorbed by the Deposit Management Organisation, the scheme administrator for the Deposit Return Scheme – please see Annex A for more details on NHM DRS analysis.

In our consultation, which is published alongside this IA, we are asking stakeholder views on our impact assessment assumptions and identified impacts (including both monetised and unmonetised). If you have any additional evidence on these costs and benefits, we would appreciate it via your response to our consultation.

We also plan to run specific discussions with industry experts to improve our evidence to inform the final IA.

### Municipal sector

The tables below provide yearly estimates of modelled economic costs and benefits for the four municipal options considered. These costs and benefits are all relative to the current baseline.

**Figures presented are all undiscounted unless otherwise stated.**

Concerning the costs of free garden waste collections, these are the costs to local authorities due to eliminating garden waste collection charges to households. In our NPV calculations, they represent a transfer of money between local authorities and households.

**Table 6: Modelled costs and benefits of municipal Option 1M, £ millions, 2023 to 2035**

	Benefits			Costs					Total net costs (-) / savings (+)	Net present value costs (-) / savings (+)
	HH's: savings from free garden waste	Green-house gas emission savings	NHM: landfill tax savings	NHM: net service cost	LA's: net service cost (incl. landfill tax savings)	HH: Policy Cost	NHM: Policy cost	Municipal landfill tax revenue losses		
2023	£ 50	£ 13	£ 73	£ -	£ 250	£ 2	£ 15	£ 89	<b>-£ 220</b>	<b>-£ 220</b>
2024	£ 65	£ 61	£ 248	£ 14	£ 112	£ 2	£ 15	£ 271	<b>-£ 38</b>	<b>-£ 37</b>
2025	£ 88	£ 128	£ 409	£ 27	£ 105	£ 2	£ 15	£ 438	<b>£ 38</b>	<b>£ 36</b>
2026	£ 115	£ 210	£ 574	£ 40	£ 157	£ 2	£ 15	£ 610	<b>£ 75</b>	<b>£ 67</b>
2027	£ 128	£ 265	£ 600	£ 40	£ 121	£ 2	£ 15	£ 645	<b>£ 170</b>	<b>£ 148</b>
2028	£ 138	£ 316	£ 614	£ 40	£ 108	£ 2	£ 15	£ 664	<b>£ 240</b>	<b>£ 202</b>
2029	£ 145	£ 363	£ 623	£ 40	£ 95	£ 1	£ 15	£ 676	<b>£ 304</b>	<b>£ 247</b>
2030	£ 154	£ 406	£ 631	£ 40	£ 98	£ 1	£ 15	£ 686	<b>£ 351</b>	<b>£ 276</b>
2031	£ 154	£ 472	£ 634	£ 40	£ 75	£ 1	£ 11	£ 691	<b>£ 442</b>	<b>£ 336</b>
2032	£ 155	£ 538	£ 634	£ 40	£ 75	£ 1	£ 11	£ 691	<b>£ 509</b>	<b>£ 373</b>
2033	£ 156	£ 605	£ 634	£ 40	£ 77	£ 1	£ 11	£ 691	<b>£ 575</b>	<b>£ 408</b>
2034	£ 156	£ 674	£ 634	£ 40	£ 78	£ 1	£ 11	£ 691	<b>£ 643</b>	<b>£ 440</b>
2035	£ 157	£ 742	£ 634	£ 40	£ 79	£ 1	£ 11	£ 691	<b>£ 710</b>	<b>£ 470</b>
<b>Total</b>	<b>£1,661</b>	<b>£ 4,793</b>	<b>£ 6,942</b>	<b>£ 444</b>	<b>£1,429</b>	<b>£ 21</b>	<b>£ 172</b>	<b>£ 7,533</b>	<b>£ 3,798</b>	<b>£ 2,746</b>

Source: Defra analysis

**Table 7: Modelled costs and benefits of municipal Option 2M, £ millions, 2023 to 2035**

	Benefits			Costs					Total net costs (-) / savings (+)	Net present value costs (-) / savings (+)
	HH's: savings from free garden waste	Green-house gas emission savings	NHM: landfill tax savings	NHM: net service cost	LA's: net service cost (incl. landfill tax savings)	HH: Policy Cost	NHM: Policy cost	Municipal landfill tax revenue losses		
2023	£ 50	£ 13	£ 73	£ -	£ 250	£ 2	£ 15	£ 89	-£ 220	-£ 220
2024	£ 65	£ 61	£ 248	£ 14	£ 112	£ 2	£ 46	£ 271	-£ 69	-£ 67
2025	£ 88	£ 128	£ 409	£ 27	£ 105	£ 2	£ 46	£ 438	£ 7	£ 7
2026	£ 115	£ 258	£ 764	£ 417	£ 157	£ 2	£ 46	£ 800	-£ 285	-£ 257
2027	£ 128	£ 333	£ 790	£ 417	£ 121	£ 2	£ 46	£ 835	-£ 170	-£ 148
2028	£ 138	£ 400	£ 804	£ 417	£ 108	£ 2	£ 46	£ 854	-£ 84	-£ 71
2029	£ 145	£ 461	£ 813	£ 417	£ 95	£ 1	£ 46	£ 866	-£ 5	-£ 4
2030	£ 154	£ 518	£ 821	£ 417	£ 98	£ 1	£ 46	£ 876	£ 55	£ 43
2031	£ 154	£ 603	£ 824	£ 417	£ 75	£ 1	£ 33	£ 881	£ 174	£ 132
2032	£ 155	£ 688	£ 824	£ 417	£ 75	£ 1	£ 33	£ 881	£ 260	£ 190
2033	£ 156	£ 775	£ 824	£ 417	£ 77	£ 1	£ 33	£ 881	£ 345	£ 245
2034	£ 156	£ 863	£ 824	£ 417	£ 78	£ 1	£ 33	£ 881	£ 433	£ 297
2035	£ 157	£ 951	£ 824	£ 417	£ 79	£ 1	£ 33	£ 881	£ 520	£ 344
<b>Total</b>	<b>£ 1,661</b>	<b>£ 6,053</b>	<b>£ 8,844</b>	<b>£ 4,211</b>	<b>£ 1,429</b>	<b>£ 21</b>	<b>£ 501</b>	<b>£ 9,435</b>	<b>£ 961</b>	<b>£ 491</b>

Source: Defra analysis

**Table 8: Modelled costs and benefits of municipal Option 3M, £ millions, 2023 to 2035**

	Benefits			Costs					Total net costs (-) / savings (+)	Net present value costs (-) / savings (+)
	HH's: savings from free garden waste	Green-house gas emission savings	NHM: landfill tax savings	NHM: net service cost	LA's: net service cost (incl. landfill tax savings)	HH: Policy Cost	NHM: Policy cost	Municipal landfill tax revenue losses		
2023	£ 50	£ 14	£ 76	£ -	£ 227	£ 2	£ 15	£ 94	-£ 199	-£ 199
2024	£ 65	£ 64	£ 254	£ 14	£ 95	£ 2	£ 15	£ 281	-£ 22	-£ 22
2025	£ 88	£ 131	£ 415	£ 27	£ 86	£ 2	£ 15	£ 449	£ 55	£ 51
2026	£ 115	£ 214	£ 581	£ 40	£ 127	£ 2	£ 15	£ 623	£ 104	£ 93
2027	£ 128	£ 272	£ 610	£ 40	£ 89	£ 2	£ 15	£ 661	£ 202	£ 176
2028	£ 138	£ 324	£ 626	£ 40	£ 77	£ 2	£ 15	£ 682	£ 271	£ 229
2029	£ 145	£ 372	£ 636	£ 40	£ 67	£ 1	£ 15	£ 695	£ 334	£ 272
2030	£ 154	£ 417	£ 643	£ 40	£ 64	£ 1	£ 15	£ 706	£ 388	£ 305
2031	£ 154	£ 485	£ 647	£ 40	£ 47	£ 1	£ 11	£ 711	£ 476	£ 361
2032	£ 155	£ 553	£ 647	£ 40	£ 47	£ 1	£ 11	£ 712	£ 545	£ 400
2033	£ 156	£ 623	£ 647	£ 40	£ 48	£ 1	£ 11	£ 712	£ 613	£ 435
2034	£ 156	£ 693	£ 647	£ 40	£ 49	£ 1	£ 11	£ 712	£ 683	£ 468
2035	£ 157	£ 763	£ 647	£ 40	£ 50	£ 1	£ 11	£ 712	£ 753	£ 498
<b>Total</b>	<b>£ 1,661</b>	<b>£ 4,924</b>	<b>£ 7,077</b>	<b>£ 444</b>	<b>£ 1,072</b>	<b>£ 23</b>	<b>£ 72</b>	<b>£ 7,750</b>	<b>£ 4,202</b>	<b>£ 3,067</b>

Source: Defra analysis

**Table 9: Modelled costs and benefits of municipal Option 4M, £ millions, 2023 to 2035**

	Benefits			Costs					Total net costs (-) / savings (+)	Net present value costs (-) / savings (+)
	HH's: savings from free garden waste	Green-house gas emission savings	NHM: landfill tax savings	NHM: net service cost	LA's: net service cost (incl. landfill tax savings)	HH: Policy Cost	NHM: Policy cost	Municipal landfill tax revenue losses		
2023	£ 50	£ 14	£ 76	£ -	£ 227	£ 2	£ 15	£ 94	-£ 199	-£ 199
2024	£ 65	£ 64	£ 254	£ 14	£ 95	£ 2	£ 46	£ 281	-£ 53	-£ 52
2025	£ 88	£ 131	£ 415	£ 27	£ 86	£ 2	£ 46	£ 449	£ 24	£ 23
2026	£115	£ 262	£ 771	£ 417	£ 127	£ 2	£ 46	£ 813	-£ 256	-£ 231
2027	£ 128	£ 339	£ 800	£ 417	£ 89	£ 2	£ 46	£ 851	-£ 138	-£ 120
2028	£ 138	£ 407	£ 816	£ 417	£ 77	£ 2	£ 46	£ 872	-£ 53	-£ 44
2029	£ 145	£ 470	£ 826	£ 417	£ 67	£ 1	£ 46	£ 885	£ 25	£ 20
2030	£ 154	£ 529	£ 833	£ 417	£ 64	£ 1	£ 46	£ 896	£ 92	£ 72
2031	£ 154	£ 615	£ 837	£ 417	£ 47	£ 1	£ 33	£ 902	£ 207	£ 157
2032	£ 155	£ 703	£ 838	£ 417	£ 47	£ 1	£ 33	£ 902	£ 295	£ 216
2033	£ 156	£ 791	£ 837	£ 417	£ 48	£ 1	£ 33	£ 902	£ 383	£ 271
2034	£ 156	£ 882	£ 837	£ 417	£ 49	£ 1	£ 33	£ 902	£ 472	£ 324
2035	£ 157	£ 972	£ 837	£ 417	£ 50	£ 1	£ 33	£ 902	£ 562	£ 372
<b>Total</b>	<b>£ 1,661</b>	<b>£ 6,179</b>	<b>£ 8,978</b>	<b>£ 4,211</b>	<b>£ 1,072</b>	<b>£ 23</b>	<b>£501</b>	<b>£ 9,651</b>	<b>£ 1,360</b>	<b>£ 809</b>

Source: Defra analysis

### Household sector

This presents the detailed costs and savings across the two household scenarios. Note that all the values are undiscounted unless otherwise stated.

By implementing Options 1hh and 2hh, householders are expected to increase the level of material separation to relevant waste streams. Each option has different participation rates and is based on the evidence from Local Authorities already operating proposed collection systems<sup>107</sup>. For example, Option 1hh (multi-stream, dry recycling collections) achieves a slightly lower overall tonnage of recycling. This is due to vehicle capacity from further separated waste streams and in-turn a lower recycle rate when compared to Option 2hh. But these multi-stream collections deliver a higher material quality that is then reflected in material revenues received by Local Authorities. Mixed dry collections (e.g. with commingled collections) are becoming increasing associated with higher levels of recycling contamination, shown in evidence from falling material capture of commingled schemes over the past five years<sup>108</sup>.

Further, both household scenarios have been modelled to include a Deposit Return Scheme (DRS) effect. The DRS effect has been included in both the baseline and the policy option that can be seen in Tables 10 and 12. This adjustment is made to account for the associated changes to:

- MRF gate fees (i.e. increases in price per tonne in entrance charges to waste collection authorities)
- residual disposal savings (i.e. reduced as DRS tonnes are removed from residual waste);
- dry bulking cost savings (i.e. DRS tonnes removed so fewer tonnes on which to pay for bulking); and
- lost material revenue (i.e. that Local Authorities would have received for secondary market value, but is now captured under the DRS scheme).

<sup>107</sup> <https://laportal.wrap.org.uk/>, used to reflect the individual waste collection systems per LA and their different participation rates.

<sup>108</sup> Based on WRAP's expertise

See Annex A for underpinning modelling assumptions related to household scenarios and Deposit Return Scheme.

**Household Option 1hh – Consistent weekly collection of dry-mixed recyclables under multi-stream systems for low-rise properties. Collection of key dry recyclables at flatted high-rise properties. Fortnightly residual collections, separate weekly food waste and free fortnightly garden waste collections are covered under this policy option.**

In 2023/24, the WRAP model assumes that around 43% of Local Authorities would be able to switch to a new service within the year of implementation, with all the remaining 57% transitioned to the new collection system by 2030/31. The majority of LA collections (60%) are operated by in-house services which are able to move into new services more quickly than contracted services. A smaller number of the out-sourced services are also available to change given the timing of their contract renewal dates in line with the scenario.

In terms of net collection costs of improved dry recycling and separate food waste, this option burdens Local Authorities with higher transition costs compared to Option 2hh as it expects a complete transition to a multi-stream collection, which is currently the second most frequent collection behind commingled single-stream DMR collections. This option implies transition costs of around £912m in the period of 2023/24-2030/31. These costs mainly include capital spent on additional containers and vehicles (mainly dry recycling, food waste and garden waste).

As for ongoing cost, Local Authorities would see their annual operating and communications costs increasing from £76m in 2023/24 to £233m by 2035, or an average increase of £191m per year over the period of 2023-2035 when compared to the baseline. Regarding the ongoing savings, the model estimates bulking and waste treatment costs (net of revenue for separately collected materials and garden waste charge) to fall by £62m in 2023/24 and £187m by 2035, or average savings of £152m per year.

In addition, Option 1hh assumes, as well as all other household options, that Local Authorities would introduce a free garden waste recycling collections. This has two main implications on the Local Authorities costs:

- Local Authorities would lose the income received from households. WRAP estimate this to be £1,661m over the period of 2023-2035. Householders would see savings of the same value, £1,661m, over the same period as a result of removed charging for garden waste collections.
- Local Authority data indicates that free garden waste collection systems are more efficient in raising households' recycling participation. In particular, free collections can achieve up to 80-90% participation rate in households with garden waste when compared to estimated 35% only under charged services<sup>109</sup>. We estimate an increase in the household recycling rate to be around 3% to 4%, compared to the baseline (which assumes 65% of Local Authorities charging for their garden waste collection).

Taking into account the loss of garden waste charging income, and the provision of increased separation and collection of garden waste, this scenario estimates a 4% increase in Local Authority waste management costs (£1,429m) over the period of 2023-2035. Table 10 shows the modelled costs for the period of 2023-2035<sup>110</sup>.

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<sup>109</sup> See key household scenario assumptions for more evidence on garden waste.

<sup>110</sup> These cost results also reflect the change at high-rise properties, but these are currently reported only as part of the overall LA waste management costs.

**Table 10: Modelled costs (+) and savings (-), of household Option 1hh, £ millions, 2023 to 2035**

	Container Capital costs	Wider transition costs	Annualised Vehicle	Annual Operating and Comms	Annual Bulk and Treatment (including lost income from garden waste charges)	Income from charged garden (presented for clarity only)	DRS effect	Total service cost (+) / saving (-)	Total present value cost (+) / saving (-)
2023	£ 171	£ 45	£ 21	£ 76	-£ 62	-£ 50	-£ 2	£ 250	£ 250
2024	£ 50	£ 10	£ 35	£ 128	-£ 96	-£ 65	-£ 15	£ 112	£ 108
2025	£ 35	£ 7	£ 39	£ 140	-£ 100	-£ 88	-£ 17	£ 105	£ 98
2026	£ 66	£ 17	£ 45	£ 155	-£ 113	-£ 115	-£ 14	£ 157	£ 141
2027	£ 40	£ 8	£ 55	£ 189	-£ 149	-£ 128	-£ 21	£ 121	£ 106
2028	£ 25	£ 6	£ 60	£ 207	-£ 165	-£ 138	-£ 26	£ 108	£ 91
2029	£ 15	£ 3	£ 63	£ 217	-£ 176	-£ 145	-£ 27	£ 95	£ 77
2030	£ 18	£ 4	£ 65	£ 223	-£ 182	-£ 154	-£ 30	£ 98	£ 77
2031	£ 1	£ -	£ 66	£ 228	-£ 188	-£ 154	-£ 33	£ 75	£ 57
2032	£ 0	£ -	£ 67	£ 230	-£ 189	-£ 155	-£ 33	£ 75	£ 55
2033	£ 0	£ -	£ 67	£ 231	-£ 188	-£ 156	-£ 33	£ 77	£ 54
2034	£ 0	£ -	£ 67	£ 232	-£ 188	-£ 156	-£ 34	£ 78	£ 53
2035	£ 0	£ -	£ 68	£ 233	-£ 187	-£ 157	-£ 34	£ 79	£ 52
<b>Total</b>	<b>£422</b>	<b>£101</b>	<b>£719</b>	<b>£2,487</b>	<b>-£1,982</b>	<b>-£1,661</b>	<b>-£318</b>	<b>£ 1,429</b>	<b>£ 1,220</b>

Source: WRAP modelling

Table 11 then shows the breakdown of transition costs for dry recycling, food waste and garden waste collection changes, avoided capital and vehicles costs associated with mixed garden waste collections and residual waste collections, as well as wider transition costs. Transition costs are only modelled until 2030 because these are, by definition, temporary. They consist of additional vehicles, containers and wider costs to enable the transition to a new collection system or a new waste contracts. When all Local Authorities have moved to the new collection system there are no longer any transition costs. The total discounted transition costs are estimated to be £829m (i.e. for the overall transition period).

**Table 11: Modelled transition costs (+) and savings (-) of household Option 1hh, £ millions**

	Dry recycling collection	Separate Food waste	Garden only collection	Mixed food and garden waste	Residual waste collection	Wider transition costs	Total transition costs	Total transition costs (discounted)
2023	£ 127	£ 16	£ 58	-£ 2	-£ 2	£ 45	£ 241	£ 241
2024	£ 56	£ 13	£ 25	-£ 4	-£ 4	£ 10	£ 96	£ 92
2025	£ 51	£ 6	£ 28	-£ 5	-£ 5	£ 7	£ 83	£ 77
2026	£ 81	£ 7	£ 35	-£ 6	-£ 5	£ 17	£ 129	£ 117
2027	£ 72	£ 11	£ 27	-£ 7	-£ 7	£ 8	£ 103	£ 90
2028	£ 68	£ 8	£ 25	-£ 7	-£ 8	£ 6	£ 91	£ 77
2029	£ 66	£ 6	£ 22	-£ 8	-£ 9	£ 3	£ 81	£ 66
2030	£ 70	£ 6	£ 26	-£ 8	-£ 9	£ 4	£ 87	£ 68
<b>Total</b>	<b>£ 590</b>	<b>£ 74</b>	<b>£ 246</b>	<b>-£ 48</b>	<b>-£ 50</b>	<b>£ 101</b>	<b>£ 912</b>	<b>£ 829</b>

Source: WRAP modelling, Defra assumptions on the length of transition period

In this Option the HH recycling rate is estimated to increase by 10.6% points to around 55.3% by 2035.

**Household Option 2hh – Consistent collection of dry recyclables under collections systems with the lowest cost at a local authority level for low rise properties. Collection of key dry recyclables at flatted high-rise properties. Fortnightly residual collections, separate weekly food waste and free fortnightly garden waste collections are covered under this policy option.**

The Local Authority's ability to switch to new collection systems is as described under Option 1hh.

The modelling of the optimised cost scenario, including fortnightly residual, dry recycling and weekly separate food waste and free garden waste collections implies the lowest transition costs when compared to other household options. In particular, it estimates the transition costs to be £794m over the period of 2023-2030:

- Those Local Authorities that do not currently operate their least cost collection system would change to a new scheme with the lowest cost to them that allows them to collect waste streams separately. This would require the Local Authorities to invest in new containers and vehicles once out of contract. Further investment would be needed for separate food waste and garden waste collection if Local Authorities do not provide them. We estimate that this will require a further investment of £700m in new container capital and further vehicle spend in the period to 2030.
- The wider transition costs<sup>111</sup> are estimated to be around £94m.

In terms of the ongoing net costs and net savings, the optimised cost scenario estimates the following:

- The model estimates that Local Authority's will save on average £127m per year on the annual bulking and treatment costs net of the recycled material and garden waste revenue. This level of ongoing savings is lower than in Option 1hh. This is because Option 1hh expects Local Authorities to receive higher material revenue through the higher quality recyclates (less contaminated and better sorted) associated with multi-stream collections.

The introduction of free garden waste would have the same implications as described in Option 1hh: Local Authorities would lose the income from garden waste charging of £1,661m, and experience the same increase in household recycling rate of 3% to 4%. Householders would see savings of the same value, £1,661m, over the same period as a result of removed charging for garden waste collections. Overall, this scenario estimates 1.7% increase in net service costs to Local Authorities (£1,072m, undiscounted) over the period of 2023-2035 with the initial transition costs of £794m. The household recycling rate is 56.3% by 2035.

Table 12 shows the modelled costs for the period of 2023-2035. Table 13 then shows the transition costs for dry recycling, food waste and garden waste collection changes, avoided capital and vehicles costs associated with mixed garden waste collections and residual waste collections, as well as wider transition costs. Transition costs are only modelled until 2030 because these are, by definition, temporary. They consist of additional vehicles, containers and wider costs to enable the transition to a new collection system or a new waste contracts. When all Local Authorities have moved to the new collection system there are no longer any transition costs.

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<sup>111</sup> For each scenario, these include the costs of project management, re-routing of vehicles, roll out communication costs, depot hire for containers, engagement staff costs, call centre costs and delivery costs of new containers.

**Table 12: Modelled costs (+) and savings (-) of household Option 2hh, £ millions, 2023 to 2035**

	Container Capital costs	Wider transition costs	Annualised Vehicle	Annual Operating and Comms	Annual Bulk and Treatment (including lost income from garden waste charges)	Income from charged garden (presented for clarity only)	DRS effect	Total service cost (+) / saving (-)	Total present value cost (+) / saving (-)
2023	£ 163	£ 42	£ 17	£ 60	-£ 52	-£ 50	-£ 4	£ 227	£ 227
2024	£ 50	£ 10	£ 29	£ 101	-£ 84	-£ 65	-£ 11	£ 95	£ 91
2025	£ 33	£ 7	£ 32	£ 113	-£ 83	-£ 88	-£ 15	£ 86	£ 81
2026	£ 59	£ 16	£ 35	£ 119	-£ 92	-£ 115	-£ 11	£ 127	£ 114
2027	£ 35	£ 8	£ 43	£ 143	-£ 124	-£ 128	-£ 16	£ 89	£ 78
2028	£ 23	£ 5	£ 47	£ 157	-£ 137	-£ 138	-£ 18	£ 77	£ 65
2029	£ 15	£ 3	£ 49	£ 165	-£ 147	-£ 145	-£ 18	£ 67	£ 54
2030	£ 14	£ 3	£ 51	£ 168	-£ 152	-£ 154	-£ 20	£ 64	£ 50
2031	£ 2	£ -	£ 52	£ 172	-£ 157	-£ 154	-£ 21	£ 47	£ 35
2032	£ 1	£ -	£ 52	£ 173	-£ 158	-£ 155	-£ 21	£ 47	£ 34
2033	£ 1	£ -	£ 52	£ 174	-£ 157	-£ 156	-£ 22	£ 48	£ 34
2034	£ 1	£ -	£ 53	£ 174	-£ 157	-£ 156	-£ 22	£ 49	£ 34
2035	£ 1	£ -	£ 53	£ 175	-£ 156	-£ 157	-£ 22	£ 50	£ 33
<b>Total</b>	<b>£397</b>	<b>£ 94</b>	<b>£ 565</b>	<b>£ 1,894</b>	<b>-£ 1,657</b>	<b>-£ 1,661</b>	<b>-£220</b>	<b>£1,072</b>	<b>£ 931</b>

Source: WRAP modelling

**Table 13: Modelled transition costs (+) and savings (-) of household Option 2hh, £ millions, 2023 to 2029**

	Dry recycling collection	Separate Food waste	Garden only collection	Mixed food and garden waste	Residual waste collection	Wider transition costs	Total transition costs	Total transition costs (discounted)
2023	£ 103	£ 27	£ 58	-£ 2	-£ 2	£ 42.2	£ 225	£ 225
2024	£ 40	£ 21	£ 25	-£ 4	-£ 3	£ 9.8	£ 89	£ 86
2025	£ 34	£ 11	£ 28	-£ 5	-£ 4	£ 6.9	£ 72	£ 67
2026	£ 57	£ 13	£ 35	-£ 6	-£ 4	£ 16.1	£ 111	£ 100
2027	£ 45	£ 20	£ 27	-£ 7	-£ 6	£ 7.8	£ 86	£ 75
2028	£ 43	£ 17	£ 25	-£ 7	-£ 7	£ 5.4	£ 76	£ 64
2029	£ 42	£ 15	£ 22	-£ 8	-£ 8	£ 3.3	£ 67	£ 55
2030	£ 42	£ 14	£ 26	-£ 8	-£ 8	£ 2.9	£ 68	£ 53
<b>Total</b>	<b>£ 406</b>	<b>£ 138</b>	<b>£ 246</b>	<b>-£ 48</b>	<b>-£ 42</b>	<b>£ 94</b>	<b>£ 794</b>	<b>£ 726</b>

Source: WRAP modelling, Defra assumptions on the length of transition period

As for landfill tax and GHG emission impacts for the household policy options, these are reported for the overall municipal sector as the infrastructure for both household and non-household municipal waste is linked. Thus, policy option net present savings account for municipal wide impacts with respect to GHG emissions and landfill waste reductions.

## Non-household municipal sector

Waste management costs to businesses are relatively small. According to the Chartered institute of Procurement and Supply (CIPS), they account for around 4% to 5% of total business turnover, potentially up to 10%. Bearing this in mind, the following modelled scenarios describe the net costs or savings per business size and sub-sector.

Recycling rates presented in this section are the rates as presented by businesses unless otherwise stated. These rates are based on the amount recycled by businesses and are usually higher than the actual rate which is based on the end destination of waste streams.

**Option 1nhm – Businesses separate waste to residual, mixed dry recyclables, separate glass waste collections and separate food waste collections. Micro-sized firms, those who employ less than 10, are exempt in this policy option in an attempt to mitigate cost pressure.**

This option estimates the net costs and savings across the NHM sector (excluding micro businesses) if all businesses were to separate their waste arisings to mixed dry materials, glass, food waste and residual waste.

All businesses start making improvements the year after implementation year, i.e. from 2024 onwards. This is to reflect that all businesses are likely to focus on transitional activities in 2023. Transitional actions include communication, training staff, ending and updating waste management contracts, buying new bins, changes to waste collection vehicles etc. We estimate businesses to take approximately 4 years to fully transition to new collection systems, i.e. we assume that all affected businesses fully comply with regulations by 2026<sup>112</sup>. This transition period was based on the need for business support to be offered to the majority of businesses, and basing it off a reasonable size support package (see Annex A for more detail), the amount of time to properly allocate these changes is felt to be conservative.

Using WRAP cost estimates, this scenario implies the following costs per business sizes:

- Large businesses face baseline waste management costs of £338m per year. These waste management costs are estimated to decrease by £4m to £334m per year in 2026. It is based on achieving 60.4% actual recycling rate, including having food waste and glass presented in separate containers; and having refuse collections optimised accordingly. Optimisation costs are modelled using the cheapest container option for that waste stream and volume of waste.
- Medium sized businesses and public sector organisations also achieve 60.4% actual recycling rate. Unlike large businesses, the costs are expected to increase from £612m per year to £632m per year, or £20m per year cost increase by 2026.
- Under the baseline or 'do-nothing' option, small sized businesses are estimated to spend £960m per year on their waste management. Their costs are expected to increase by £25m per year by 2026. This is based on cost optimisation and use of shared service provision (see details on this in the 'Key non-household municipal sector assumptions' section in Annex A). This equates to c. £86 increase in waste management cost per small business per year.

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<sup>112</sup>Based on WRAP's modelling



- Finally, micro businesses see no changes compared to their baseline waste management costs of £1.732bn per year. In Option 1nhm, micro-sized firms are exempt. Though, this means their material is not captured and will not be able to increase policy option recycle rate.

Overall, this policy option increases waste management costs for the sector from £3.64bn to £3.68bn per year. The overall recycling rate increases from 43.0% to 60.4%. Over the period, NHM waste management costs grow by 1.1%. Table 14 provides more detail on the path of waste management costs and recycling rates.

**Table 14: Option 1nhm, micro-sized firms exempt from all recycling policy, costs and recycling rate over the appraised period, £ millions undiscounted**

Option 1nhm: DMR, separate food and glass	2018	2025	2028	2031	2035
Waste management costs, £m	£ 3,644	£ 3,671	£ 3,684	£ 3,684	£ 3,684
Waste management costs, net to baseline, £m	£ -	£ 27	£ 40	£ 40	£ 40
Business support policy costs	£ 0m	£ 14.8	£14.8	£ 14.8	£ 10.6
DRS net effect*	£ 247	£ 246	£ 244	£ 244	£ 244
Recycling rate	43.0%	53.3%	60.4%	60.4%	60.4%

Source: Defra analysis of WRAP data.

\* The DRS net effect is presented here for illustration purposes only. It is considered as a transfer effect with a full cost being absorbed by the DMO<sup>113</sup>.

There is significant variation not only across business sizes but also across sub-sectors. WRAP has estimated the following net costs or savings, and recycling rates per sub-sector against the baseline (see Table 15). The recycling rate performance varies across the diverse sectors included in the NHM analysis according to their waste composition and business size.

**Table 15: Option 1nhm net to baseline cost (+) or saving (-) across total appraisal period, against baseline in £ millions and achieved recycling rate<sup>114</sup>.**

Sector	Micro	Small	Medium	Large	Total	Total (discounted)	Recycle rate (Change in percentage points)
Hospitality	£ -	£ 154	£ 8	£ 1	£ 163	£ 129	54.4% (+16%)
Health	£ -	-£ 22	-£ 39	£ 6	-£ 54.5	-£ 43.2	62.4% (+21%)
Retail & Wholesale	£ -	-£ 229	£ 31	£ 53	-£ 145	-£ 115	60% (+22%)
Education	£ -	£ 217	£ 326	£ 24	£ 567	£ 449	61.6% (+28%)
Office (& other)	£ -	£ 114	-£ 100	-£115	-£ 101	-£ 80	59.2% (+22%)
Transport & Storage	£ -	£ 59	£ 12	-£ 1	£ 69	£ 55	64.8% (+19%)
Food Manufacturing	£ -	-£ 20	-£ 19	-£ 16	-£ 55.1	-£43.6	69.6% (+22%)
Total	£ -	£ 273	£ 219	-£ 49	£ 444	£ 351	

Source: Defra calculations based on WRAP analysis

<sup>113</sup> Further detail can be found in Annex A, under NHM DRS analysis.

<sup>114</sup> Note that these costs are only applicable once the relevant business sizes transition to recycling scenario. See the 'Key NHM scenario assumptions' for more detail.

**2nhm: Businesses separate waste to residual, mixed dry recyclables, separate glass waste collections and separate food waste collections. Micro businesses are phased into the policy finishing in years 2025/26, two years after implementation to allow time for businesses to account for new provisions**

Similar to Option 1nhm, this scenario assumes that businesses and public sector will be employing separate glass collections, separate food waste collections, all material DMR services and residual together. This option is differentiated by its inclusion of micro-sized firms, who are phased into the scheme two years after implementation. This is to allow additional time for transition.

We assume the same transitional period as per Option 1nhm for all but micro businesses. Micro business start making improvements from only 2024 onwards with an expectation all micro businesses will have transitions by 2026. This also means that this option has higher costs than Option 1nhm as a result of bringing in micro businesses. Large, medium and small firms experience the same changes in waste management costs as in Option 1nhm.

As per Option 1nhm, for large businesses, the baseline costs of £338m decrease by £4m, or to £334m per year. For medium businesses, we estimate their waste management costs to increase from £612m to £632m per year by 2026. With respect to small businesses, the scenario estimates the costs of DMR, food and glass to result in net cost rise of £25m per year, increasing their overall waste management costs from £0.960bn to £0.985bn. Finally, the scenario expects a net increase in waste management costs to micro businesses. These are estimated to increase from £1.73bn per year to £2.11bn per year, or £377m increase in costs per annum as a result of new regulations.

Overall, this scenario estimates the NHM waste management costs to increase from £3.64bn to £4.06bn per year from 2026 onwards. There is a significant variation across sub-sectors and business sizes, with increased costs affecting sub-sectors and firm-sizes unevenly when compared to baseline. Tables 16 and 17 provide more detail on Option 2nhm net costs and achieved recycling rates.

**Table 16: Option 2nhm, micro-sized firms phased in from 2025, costs and recycling rate over the appraised period, £ millions undiscounted**

Option 2nhm: DMR, separate food and glass	2018	2025	2028	2031	2035
Waste management costs, £m	£ 3,644	£ 3,671	£ 4,061	£ 4,061	£ 4,061
Waste management costs, net to baseline, £m	£ -	£ 27	£ 417	£ 417	£ 417
Business support policy costs	-	£ 14.8	£ 45.7	£ 45.7	£ 33.2
DRS net effect*	£ 247	£ 246	£ 458	£ 458	£ 458
Recycling rate	43.0%	53.3%	69.5%	69.5%	69.5%

Source: Defra analysis of WRAP data

\* The DRS net effect is presented here for illustration purposes only. It is considered as a transfer effect with a full cost being absorbed by the DMO.

**Table 17: Option 2nhm net to baseline cost (+) or saving (-) across total appraisal period, against baseline in £ millions and achieved recycling rate<sup>115</sup>.**

Sector	Micro	Small	Medium	Large	Total	Total (discounted)	Recycle rate (Change in percentage points)
Hospitality	£ 239	£ 154	£ 8	£ 1	£ 401	£ 314	70.4% (+33%)
Health	-£ 139	-£ 22	-£ 39	£ 6	-£ 194	-£ 151	67.2% (+25%)
Retail & Wholesale	-£ 1,741	-£ 229	£ 31	£ 53	-£ 1,886	-£ 1,467	72.8% (+35%)
Education	£ 99	£ 217	£ 326	£ 24	£ 667	£ 526	62.4% (+28%)
Office (& other)	£ 5,063	£114	-£ 100	-£ 115	£ 4,962	£ 3,851	67.2% (+30%)
Transport & Storage	£ 235	£ 59	£ 12	-£ 1	£ 305	£ 237	70.4% (+25%)
Food Manufacturing	£ 11	-£ 20	-£ 19	-£ 16	-£ 44	-£ 35	69.6% (+22%)
<b>Total</b>	<b>£ 3,767</b>	<b>£ 273</b>	<b>£ 219</b>	<b>-£ 49</b>	<b>£ 4,211</b>	<b>£ 3,276</b>	

Source: Defra analysis of WRAP data

## Section 7: Small and Micro sized Business Assessment

In terms of the demographic of businesses in England, micro and small firms make up the majority of the business count, representing 96.8% of total firms respectively (according to the 2018 Business Count by Standard Industry Classification (SIC) class by employment size-band<sup>116</sup>). The 2018 business data suggests of the 2.16 million firms, 2.06 million of them are categorized in the micro or small definition because of their labour force being lower than 50 people per firm.

Relative to the total waste arising's for the 2018 NHM sector, small businesses contribute 32% (8.5 million tonnes) and micro 28% (7.4 million tonnes) of all NHM waste. Given they represent 96.8% total businesses, they produce 60% of the total sector waste<sup>117</sup>. The sub-sector attributed to producing the most amount of waste in these micro and small firms, is the Retail and Wholesale sub-sector. They are estimated to produce 3.4 million and 3.3 million tonnes per year respectively<sup>118</sup>. Retail and Wholesale also produce the most waste arisings tonnes for large and medium firms per sub-sector.

Figure 3, below, presents the micro businesses population against estimated waste arisings for each of the main NHM sub-sectors.

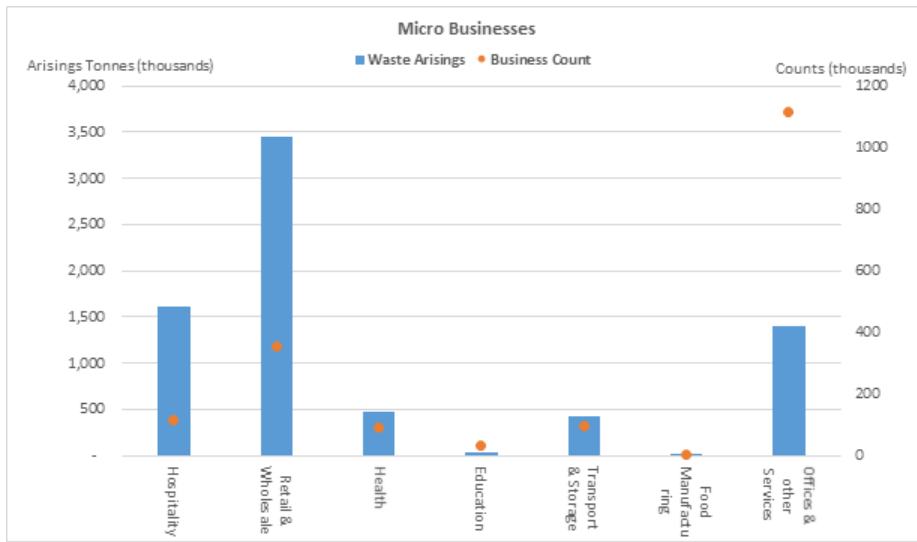
<sup>115</sup> Note that these costs are only applicable once the relevant business sizes transition to recycling scenario. See the 'Key NHM scenario assumptions' for more detail.

<sup>116</sup> <https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation> - Using Table 4 from the 2018 data.

<sup>117</sup> The total estimated NHM waste arisings is 26,522,968 tonnes based on 2018 WRAP NHM Baseline data.

<sup>118</sup> WRAP modelling.

**Figure 3. Micro business counts, and total waste arisings, England 2018**

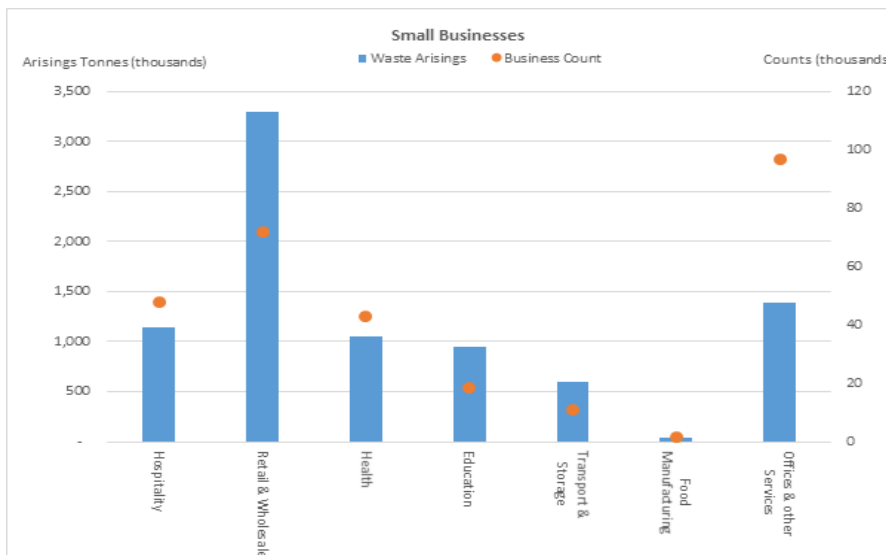


Source: Based on WRAP analysis of the NHM sector<sup>119</sup>

Figure 3 shows that although the largest waste arisings are produced by the Retail and Wholesale sub-sector, the largest business count belongs to the Office and other sub-sector who produced the third highest total waste arisings<sup>120</sup>.

Figure 4, below, shows small business count against estimated waste arisings per sub-sector. Figure 4 also shows how small firms echo micro firms in their trends. Office and other still count for the majority of the businesses per sub-sector but Retail and Wholesale still produce the highest total waste arisings per year<sup>121</sup>.

**Figure 4: Small business firm count, and total waste arisings, England 2018**



Source: Based on WRAP analysis of the NHM sector<sup>122</sup>

<sup>119</sup> Waste arisings are based on WRAP estimates. Business counts are based on 2018 data from the interdepartmental business register published by the ONS. Due to scaling issues, business counts for Food Manufacturing are close to zero. Micro food manufacturers are estimated at around 4,855.

<sup>120</sup> This differs to the last IA evidence base, where Transport and Storage had the highest micro business count but Retail and Wholesale still produced the most waste arisings.

<sup>121</sup> Furthermore, compared to the last IA evidence base, there has too been a reduction in the number of Transport and Storage firms but their waste arisings total has stayed reasonably similar.

<sup>122</sup> As per the micro-business count and arisings, scaling issues put Food and Manufacturing close to zero in business count. These are estimated at 1,780.

From WRAP's own 2017/18 NHM Business Survey, the current most frequently employed waste collection service for micro-sized firms represents 100% to residual collection with little focus on recyclables, and for small firms, residual collection with dry-mixed recyclables (DMR) collected. Compared with medium and large sized firms who are currently running the majority of collection systems that include residual, DMR, food waste and separate glass, small- and micro-sized businesses are the firms most likely to see the biggest change in waste collection behaviour to achieve the desired policy outcome in recycling rate. The change in waste management costs associated with the change in waste provision can be seen in Tables 18 and 19 below, broken down per policy option, and per sub-sector. Note, WRAP's analysis represents a median of four sensitivities<sup>123</sup> therefore costs should be considered as indicative when split down to a more granular level.

The NHM policy options are based on all business separating waste to mixed dry recyclables, separate glass waste collections and separate food waste collections from 2023 onwards, except for micro businesses for Option 1nhm.

For micro businesses, Option 1nhm would lead to no changes in cost due to these businesses being exempt from the policy in an attempt to mitigate costs associated with the increase in waste provision. Currently, one-person businesses may not produce sufficient recycling waste to justify separate collection and are likely to dispose their household-like waste in with their current household services, albeit illicitly. Option 2nhm represents policy where instead of exemption, micro-sized firms are phased in later in the appraisal period (2025-26) than other sized businesses. This is to allow more time for these businesses to prepare for the necessary waste provision changes, such as procuring new service providers, setting up the in-house systems, communicating with staff and then optimising waste provision. Direct business support has shown that larger businesses, particularly with multiple sites, can change their service much quicker due to centralised drivers such as single point procurement and typically more space per site. Including micro-firms in the policy improves the outcome and overall objective of the policy so exemptions should be carefully considered.

Table 18, below, shows no changes to waste management costs under Option 1nhm for micro firms. Under Option 2nhm, only two sub-sectors are showing cost savings, Retail and Wholesale and Health, whereas all other sectors are showing expected cost increases. Most notably, the largest increase can be seen in the Office and other sub-sector, explained because Office and other services subsector represents over half (61%) of all micro-sized businesses, thereby the associated cost to change all waste provisions is relatively more expensive than the other sub-sectors. When looking at the indicative per year per firm cost, Office and other is no longer notably larger than the other sectors. Note also, under Option 2nhm micro businesses are expected to only start separating their waste in 2025 thus these costs or savings are not realised in the years before and will continue their current baseline recycle rate performance.

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<sup>123</sup> Please see Annex A for full description of these four sensitivities and their involvement in methodology.

**Table 18: Scenario net appraisal (2023-35) cost (+) or saving (-) relative to baseline, micro businesses only, in pounds.**

<b>Micro Businesses, £</b>				
	<b>Option 1nhm: Net appraisal cost per sector, £m</b>	Option 1nhm: Indicative net cost per year, per firm	<b>Option 2nhm: Net appraisal cost per sector, £m</b>	Option 2nhm: Indicative net cost per year, per firm
<b>Hospitality</b>	£ -	£ -	£ 239	£ 162
<b>Retail &amp; Wholesale</b>	£ -	£ -	-£ 1,741	-£ 380
<b>Health</b>	£ -	£ -	-£ 139	-£ 118
<b>Education</b>	£ -	£ -	£ 99	£ 240
<b>Transport &amp; Storage</b>	£ -	£ -	£ 235	£ 188
<b>Food Manufacturing</b>	£ -	£ -	£ 11.2	£179
<b>Offices &amp; other Services</b>	£ -	£ -	£ 5,063	£ 350
<b>All</b>	<b>£ -</b>	<b>£ -</b>	<b>£3,767</b>	<b>£ 160.7</b>

Source: Defra estimates based on WRAP's NHM Modelling

Concerning small businesses, we have decided not to model exempting small businesses. This is because the cost increase to businesses are smaller compared to micro businesses. Similarly, exempting small businesses from this policy would significantly affect the intended benefits of policy.

For small businesses, there is no general trend in waste management costs across sectors, independent of scenario chosen, as both policy options lead to the same changes in waste provision for all small firms. Small businesses, unlike micro, will be expected to change their collection services along with medium and large sized firms when the policy is implemented in 2023. Table 19 shows the associated changes in net costs for small businesses, with the three largest increases in yearly waste management costs seen for Education, Transport and Storage and Hospitality sectors respectively.

**Table 19: Scenario net appraisal (2023-35) cost (+) or saving (-) relative to baseline, small businesses only, in pounds.**

<b>Small Businesses</b>				
	<b>Option 1nhm – Net appraisal cost per sector, £m</b>	Option 1nhm - Indicative net cost per year, per firm	<b>Option 2nhm – Net appraisal cost per sector, £m</b>	Option 2nhm - Indicative net cost per year, per firm
<b>Hospitality</b>	£ 154	£ 247	£ 154	£ 247
<b>Retail &amp; Wholesale</b>	-£ 229	-£ 244	-£ 229	-£ 244
<b>Health</b>	-£ 22	-£ 39	-£ 22	-£ 39
<b>Education</b>	£ 217	£ 905	£ 217	£ 905
<b>Transport &amp; Storage</b>	£ 59	£ 419	£ 59	£ 419
<b>Food Manufacturing</b>	-£ 20	-£ 881	-£ 20	-£ 881
<b>Offices &amp; other Services</b>	£ 114	£ 91	£ 112	£ 91
<b>All</b>	<b>£ 273</b>	<b>£72.4</b>	<b>£ 273</b>	<b>£72.4</b>

Source: Defra estimates based on WRAP's NHM Modelling

Across the two business sizes, it is already clear that due to diversions away from current waste provision systems, that micro- and small-sized firms will face the highest burden of the increases in management costs. In terms of total value, the highest net cost increase per sector belongs to Office and other. This, again, is likely due to being the most populated sector by business count (representing 58% of total small and micro firms) as well as currently providing the most basic waste provision, 100% to residual, meaning a larger change in waste provision to supply DMR, food waste and separate glass collections.

Further, for micro- and small-sized firms, there exists varying outcomes in costs and savings per sub-sector from the change in service provision. These differences in savings are driven by the recyclable qualities, greater or lesser recycling potential, of waste that the subsector produces. In addition to the baseline potential, WRAP research of container profiles in-situ for each sector suggests different business types and sizes were sorting into more or less recyclable collection streams at present. Generally, the less recycling in-situ at present, then the greater the savings in moving to high recycling scenario. There exists diminishing returns where businesses already have some recycling provision in place.

These cost estimates do account for some shared waste provision for micro, and to a lesser extent smaller businesses, but modelled around only up to two firms sharing (there is some evidence of more than two firms sharing bins, but lack of available data means it is difficult to quantify shared waste provisions). See Annex A – ‘NHM scenario assumptions’ for more detail.

Responses to our consultation suggested that both small and micro businesses want “to do the right thing”. As such, we are continuing to investigate further options that could reduce the cost burden to small and micro businesses. Together with WRAP, we have already started some work on the Commercial Waste Zoning (i.e. already popular in some American cities) and how the scheme can improve the cost forecasts that we see above. The principle of zoning is to divide cities or regions into zones where waste management contractors bid to provide services for all municipal-like waste. This concept consolidates collection rounds and service providers to a single supplier, there-by alleviating some costs to businesses. This should reduce vehicle movement and in-turn reduce pollution, reduce costs, increase recycling and generally improve service quality. In the final impact assessment, we plan to present our quantitative analysis on zoning to see how much it could be expected to alleviate costs by. Our initial analysis suggests that these costs could be reduced by around 20%.

## Section 8: Monitoring & Evaluation

Consistency is one of the major waste reforms introduced as part of the Resources and Waste Strategy (RWS) for England. In August 2020 Defra published *The Evaluation Plan*<sup>124</sup> which establishes how policies implemented under the RWS will be evaluated to provide a full picture of impact. The purpose of this Plan is to clearly and transparently set out the provisions for evaluating the impact of the policies described in the RWS. It explains how Defra will monitor and report on progress of the Strategy in achieving change by identifying the extent to which policy initiatives are working and how much of the observed impacts are due to the Strategy, rather than external factors.

Given that the Strategy contains close to 100 commitments, five have been identified for specific evaluation. This includes consistency. The proposed scope and extent of the evaluation of this policy measure is presented in Chapter 4.

The evaluation will be designed to address the following questions:

- Outcomes: What difference (if any) did the measures make?
- Mechanisms, Contexts and Attribution: Why did observed changes occur?
- How were the activities delivered, and what can we learn?
- Economic evaluation: Did the benefits justify the costs?

As well as the Evaluation Plan Defra has committed to publishing an annual Monitoring Progress Report, the first of which was published in August 2020<sup>125</sup>. This includes the regular collection of quantitative data (e.g. the amount of waste recycled) that provides an indication of progress towards achieving the Strategy's goals.

Finally, the new regulations will also be subject to a statutory Post Implementation Review (PIR) five years after they come into force. This is anticipated to be in 2028 or 2029.

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<sup>124</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/907161/resources-and-waste-strategy-evaluation-plan.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/907161/resources-and-waste-strategy-evaluation-plan.pdf)

<sup>125</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/907029/resources-and-waste-strategy-monitoring-progress.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/907029/resources-and-waste-strategy-monitoring-progress.pdf)



# Annex A: Key Assumptions and data used

## Household scenarios assumptions

The following section describes the key assumptions driving the performance, costs and savings in household recycling scenarios (i.e. both low- and high-rise properties are included in the options analysis). It is not within the scope of the IA to provide a full modelling approach and description here since the summaries can be located in self-contained studies referenced.

### Household recycling scenarios modelling approach

The household sector analysis is undertaken from a bottom-up approach, which considers the known baseline profiles of each collection authority in England. The data used to build the individual baselines is derived from WRAP's local authority data on the LA Portal<sup>126</sup> which is derived from the national scheme audit undertaken and with performance data benchmarks processed from Waste Data Flow<sup>127</sup>.

The overall net service costs of waste and recycling can be split into a number of key elements including the collection costs, material revenue from recyclates (e.g. under separate collection of dry material streams), required sorting costs (e.g. gate fees paid by Local Authorities to process commingled dry recycling through material recycling facility operations) and treatment and disposal costs (from food waste to garden waste or refuse waste).

However, when scaling and comparing costs across Local Authorities, the comparison is difficult due to different local circumstances<sup>128</sup>, different services included in cost estimates, no formal reporting method and so on. Thus, WRAP developed a national cost modelling approach (Indicative Cost and Performance study (ICPv2)) to establish standardised costs to enable fairer comparison between collection systems. The modelling approach was endorsed and assured by an Industry representative group when used in the national Consistency Framework.<sup>129</sup>

Given the number of Local Authorities, it would be too complex to calculate the national cost based on the actual local costs for each Local Authority. As such, WRAP developed the national indicative cost and performance assessments (ICP) on known average baselines for different areas. For further technical details and full assessment of the methodology please refer to WRAP ICP2 – Online Tool Modelling Assumptions Technical Annex.

The ICP2 modelling approach uses the Kerbside Analysis Tool (KAT) to generate a series of baseline models from which the new standardised costs can be generated. KAT uses actual scheme collection timings collected from over 130 hours of filming a wide range of collection services. The tool shows how different waste flows are linked in a way that enables to achieve significant collection savings in refuse collection and disposal activity via high recycling scenarios. KAT is typically used for individual LA support projects. It is used to produce a bespoke and transparent kerbside analysis to account for aspects such as service profile, operational efficiency and recycling performance.

Previous WRAP research looking at variables affecting recycling rates showed that the level of economic deprivation and rural nature of the area are two important contextual factors that have a significant impact on kerbside recycling performance and collection service efficiency<sup>130</sup>.

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<sup>126</sup> <https://laportal.wrap.org.uk/>

<sup>127</sup> <http://www.wastedataflow.org/>

<sup>128</sup> Such as different property types and travel distances through conurbations and onto treatment end-destinations.

<sup>129</sup> <https://www.wrap.org.uk/collections-and-reprocessing/consistency>

<sup>130</sup> <https://www.wrap.org.uk/collections-and-reprocessing/collections-and-sorting/kerbside-collections/reports/factors-influencing-recycling-performance>

The KAT baselines are set up for six different rurality groups (combinations of deprivation and geography) from data covering the majority of England Councils. The baselines account for typical operational conditions with respect to average staff time or average pick rates achieved when servicing properties in a range of areas. The results of the ICP for each LA then feed into WRAP's Routemap model to generate results for the Impact Assessment.

The presented household recycling scenarios were prepared using WRAP's Routemap model. The model was originally built for the cost and performance analysis of 2020 household recycling target and subsequently refined for the national Consistency Framework. It applies a number of assumptions on waste and recycling collection scenarios on top of ICPs results, including:

- Waste arisings: latest tonnages information from Waste Data Flow, waste from household recycling rate calculations or Local Authority Recycling Scheme Updater.
- Effect of changes to waste arisings: the initial recycling 'yield' projections account for anticipated increases in the number of households in each LA, but an uplift is applied based on the ratio of projected arisings to projected households.
- General assumptions: levels of contamination, food waste and garden waste arisings assumptions.
- Assumptions by Local Authorities: with respect to household numbers, material yields (e.g. kg/hh collected under separate food waste services), gate fees, contextual information on the level of rurality and deprivation, transition costs and Local Authorities waste management contract end dates. WRAP's LA analysis is based on data from 2017/18. The baseline collection regimes for each authority are assumed to be those in place in 2017/18, and thus do not reflect changes made since 2017/18. The baseline year has been decided on the basis of the availability of waste data flow tonnage that have been processed into usable benchmarks by the time of the analysis starting.
- Cost assumptions: with respect to dry recycling collection costs, residual waste collection costs, separate food waste collection costs or garden waste collection costs, container delivery cost etc.
- Contract assumptions: takes into account when Local Authorities might be able to adopt a new service profile. It depends on their contract end and renewal dates. Authorities are assumed to change collection system no sooner than 2023. In particular, where an authority's waste management contract is due for renewal sooner than 2023/24, the analysis assumes that contracts can be continued on a rolling basis until 2023, i.e. when the change is made. Any extra costs incurred from this are not reflected in the analysis.
- Vehicle renewal schedules: for services operating in-house managed collections the timing of service change is influenced by how Local Authorities might renew their relevant fleet. The assumptions for vehicle renewal were determined by an extensive national survey in 2019 with findings showing a range of batch or whole fleet procurement depending on LA's size and local preferences.
- Transition rate assumptions: the rate at which Local Authorities can implement new services profiles and roll them across their areas. This depends on area size and complexity of the new profile. The transition costs include a wide range of diverse requirements in mobilising services such as re-routing, project management, container delivery and call-centre management. The analysis does not account for any effects resulting from large-scale adoption of certain collection methods, e.g. the spike in demand for certain types of truck. Defra and WRAP have been developing Strategy Implementation Plans to help address procurement and capacity issues.

- In general, the projections from Routemap are based upon observed data in authorities where a particular collection regime has been introduced. It may be that certain local factors, not accounted for in the modelling, will affect the yields and prices in ways not reflected in these cases. As such the Impact Assessment modelling objectives are to understand the average differences in scheme types and their associated performance delivery to help refine a way forward with national policy proposals. It is not the objective that the IA costs would be directly used to inform funding payments. It is recognised that further refinement and local data improvements would be needed to devise actual funding arrangements.

The spreadsheets producing WRAP's analysis has been peer reviewed both internally and externally. The assumptions on costs and performance of collection systems are updated annually<sup>131</sup> and undertake peer review<sup>132</sup> to ensure they are fit for application in the models. The outputs from the model runs were also subject to an analytical review (i.e. sense checking) by Defra staff. The main sources of uncertainty are the complexity of the interlinked models and reliance on indicative costs specifically for high density housing such as flats and Household Waste Recycling Centres. Further work is underway to improve estimates in these areas in the absence of formal report frameworks.

### Price assumptions

As for price assumptions, all modelling is done based on current prices that do not change over the years. Material incomes are accounted for in sorting costs (i.e. these are net of income received for sold material) as well as in direct payments in scenarios where materials are collected separately (i.e. for fibres in twin-stream scenarios and separately collected materials in multi-stream scenarios). The material income is based on the average prices as reported in WRAP's Material Pricing Reports (2019/20 values).

Regarding the treatment and disposal costs, Routemap uses localised gate fee costs, where these are known. They are based on both Gate Fees surveys (from between 2018/19 and 2019/20) and local 1:1 Council studies across various waste and recycling facilities in England. Where data cannot be sourced the regional average is used. This data is provided as commercially sensitive and is locked into the model with limited staff access to protect the integrity of the Councils supplying the information. In addition, bulking and haulage costs are added relative to the scheme profile where required.<sup>133</sup> Haulage costs are also considered in the materials pricing where appropriate<sup>134</sup>.

We have undertaken some high-level price sensitivity analysis to reflect uncertainty associated with different gate fees and material prices. The low estimates assume low material revenue prices, leading to higher gate fee payments from Local Authorities to treatment operators, and vice versa for high scenario (Table 20). When generating low and high scenarios, we compared baseline with high material prices and low gate fees to scenarios with low materials prices and high gate fees to derive the overall low estimate (i.e. worst-case scenario) and baseline with low material prices and high gates fees to scenarios with high material prices and low gate fees (i.e. best-case scenario).

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<sup>131</sup> Through the published statistics at [portal.wrap.org.uk](http://portal.wrap.org.uk)

<sup>132</sup> There are several peer reviews of the assumptions and modelling used using experts with skills in diverse areas of analysis and industry knowledge. This also includes using external expert contractors to gather assumptions and/or to sense check that data are appropriate to use in the modelling.

<sup>133</sup> For example for LAs who might need to haul food waste to an anaerobic digestion facility cross country, or to manage the transfer of segregated dry-recyclables into bulk containers at a local depot

<sup>134</sup> Such as Ex-works costs rather if delivered directly through the reproprocessors' gate.

**Table 20: Applied costs per treatment of dry and organic recyclates and savings per material sold**

Sensitivity scenario	Gate fees	Material revenue
	Dry gate fees, food and organics gate fees, residual disposal (EfW and landfill gate fees, landfill tax) £/tonne	All key materials £/tonne
Low (i.e. worst case)	+10%	-10%
High (i.e. best case)	-10%	+10%

### **Dry recycling and separate food waste collections at kerbside (low-rise properties)**

WRAP uses data from the WasteDataFlow to calculate the collected tonnages of dry recyclables for each LA and analyse these to calculate dry recycling yields per household for each target material. These yields depend on collection system type, collection frequency, rurality and levels of deprivation. When an authority is assumed to move from one collection system to another (e.g. to multi-stream) the waste yield per household will change based on the above factors.

These yields represent material collected from the kerbsides and thus include a certain amount of non-target materials, or certain level of contamination. Reporting of inputs and rejects from MRFs shows reasonable variation and inconsistency between data sets such as Waste Data flow and the MF Portal and so standardised contamination rates are applied. A contamination rate is then applied to the tonnage collected and varies by collection approach with the following assumptions applied in the household model:

- Co-mingled mixed dry recyclables collections: 13.5%
- Two-stream dry recyclables: 9.5%.
- Multi-stream dry recycling collections: 4%<sup>135</sup>.

All household scenarios assume Local Authorities to adopt separate food waste weekly collections at kerbside. While there are other options for collecting food waste, such as mixed food and garden waste collections, WRAP evidence shows that separate weekly collections of food waste can capture nearly three times as much material per year compared to mixed food and garden waste collections. In addition, more food waste tends to be captured through weekly collections when residual collections are on a fortnightly basis (as assumed in all household scenarios). Summarised in the Consistency Framework supporting evidence<sup>136</sup> the estimated food waste yields are calculated on an established formula for each Local Authority area (including local deprivation and residual service profile).

All household scenarios assume an initial supply of free caddy liners would be offered and are accounted for as part of the transition and ongoing costs to Local Authorities. The liners are only supplied to participating households on an on-going basis to minimise wastage and are costed on the basis of compostable polymers so there might be savings made if a cheaper polyethylene versions are suitable at food waste treatment facilities. The start-up liner packs to all households equate to £0.5 per hh. Based on c.23.4m households in England, this equates to c.£12m start-up liner costs. The ongoing costs are around £1.5 per household (but could be £0.5 per household if PE bags are used instead) which means c.34m pa.

WRAP food waste trials<sup>137</sup> show that free caddy liners can result in significantly higher household participation. Without their provision to householders, WRAP estimate around 20% lower yield per household in Year 1, dropping to 50% of expected yield achieved under free caddy liners by

<sup>135</sup> WRAP's analysis (unpublished).

<sup>136</sup> Ibid

<sup>137</sup> WRAP (2016), Household food waste collections guide; WRAP (2009), Evaluation of the WRAP separate food waste collection trials.

Year 3. The recycling performance used in our IA scenarios assume free liner supply so deviating from this would significantly affect national capture and efficiency of separate food waste collections.

### **Dry recycling and separate food waste collections at high-rise properties (flats)**

The performance at flats is calculated in the same way as for kerbside properties. Based on WRAP reviews of urban schemes, flats are assumed to achieve collected dry yields equivalent to 50% of that achievable at kerbside properties. The frequency of the collection for both recycling and residual waste is unchanged. For food waste the typical capture rate is 0.5kg/hh served per week. The service profile assumed for flats are bring style collections. Given the huge diversity in the design of housing stock for flatted properties it is only possible to present service costs and performance values from observed and monitored services.

The 2011 Census offers a percentage of high-rise households defined as “*Flat, maisonette or apartment: Purpose-built block of flats or tenement*”<sup>138</sup>. However, the classification of high-rise may not match the local authority’s approach to service provision. Therefore, a methodology was derived to estimate the proportion of high-rise properties in the authority based on WRAP’s LARSU scheme data, using the Census figures where the scheme data was inconclusive.

### **Free garden waste collections**

In terms of the cost benefit between free and charged garden collections the key factors seem to be the quantity of garden waste that is remaining within residual stream, the level of take up in the charged collection and the level of collection efficiency that is achieved in the charged system.

WRAP’s analysis comes directly from Local Authority data. It uses a combination of national studies undertaken on Waste Data Flow and more recently targeting Councils who have changed their garden collections.

WRAP has undertaken several unpublished studies on garden waste collections performance. The most recent analysis showed that the introduction of charges to existing (previously free) garden waste collection was likely to result in the reduction in recycling yields by c.25% down from 144kg per household per year, to 106kg per household per year (+/- 26 kg within a 95% confidence interval<sup>139</sup>). In other words, the average subscription rate was 34%. Further studies indicated the level of subscription to be 25% (+/-5%) of possible users of garden waste collections.

In each case of the transition to charged garden collection the kerbside residual waste arisings appear to have increased, albeit to different degrees. This strongly suggests that residents are, in most cases, avoiding the charge and depositing some garden waste into residual streams. Increasing the amount of garden waste in residual waste increases disposal and collection costs to Local Authorities and increases environmental impacts compared to alternative treatment opportunities (e.g. garden waste composting).

As such, we assume that there is a 25% shift of garden waste to residual waste when charged garden waste is introduced; or a 25% increase in garden waste when free garden waste is introduced. This evidence comes from WRAP’s research in 2018 of councils who switched from free to charged garden schemes by looking at their localised data and not WDF.

The transfer of garden waste to household waste recycling centres, where residents are driving garden waste to bring facilities, appears minimal (around 5% switch of total tonnage from household kerbside to Household Waste Recycling Centres). In terms of home composting,

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<sup>138</sup> <http://www.ons.gov.uk/ons/rel/census/2011-census/key-statistics-and-quick-statistics-for-local-authorities-in-the-united-kingdom---part-3/rft-qs402uk.xls>

<sup>139</sup> Resource Futures for WRAP, 2017. Impact of garden waste charges, unpublished.

where garden waste could be diverted to if users do not want to pay a charge, there is limited evidence on how much of that activity takes place. Previous WRAP programmes on home composting and subsequent surveys have suggested that this activity may be near saturation and would require significant investment to re-start with diminishing returns in capture.

The analysis on garden waste subscriptions considers what each Local Authority currently charges households for the service. WRAP uses surveys to understand the actual local charge which has been included in the baseline modelling. Local Authorities charge over £120m per year through the garden waste charging subscription service. This is based on the assumption of an average charge of £43.8 per householder per year. There is a large variation in charging across England (£22-£97 per household per year for bin type services). There appears no strong relationship between the level of charge and take up rate or the corresponding tonnage collected. Finally, in both HH policy options, free garden waste is modelled fortnightly. In terms of equity impacts, the modelling is based on providing a free garden service of a 240-litre bin only. It is expected that properties with big gardens will need more than one bin. Local Authorities will still be able to charge for this extra service payment, ensuring some equity control. The data on the additional amount of properties who would/do obtain extra garden waste bins is inaccessible LA data and therefore difficult to include.

### HH policy support costs

WRAP has estimated that there would be some costs incurred to support LA-related transition (see Table 21). These costs would include the following activities:

- National Communications, development of non-binding performance indicators (NBPis) and transition support. It is assumed that most of work on this will be undertaken throughout the transition period and that it will cost c.1.4m pa. After that the costs associated with this activity will reduce to c£1m pa. The same costs will apply to both HH policy options.

Under the new requirements in the Environment Bill, the recyclable waste streams must be collected separately from each other, except in circumstances where it is not technically or economically practicable to collect two or more recyclable waste streams separately, or in circumstance where there is no significant environmental benefit. If a Local Authority or other waste collector is relying on one of these exceptions, they must complete a written assessment. Compliance will be assessed by Environment Agency. The policy requires to have separate collections, but this doesn't have to happen if it can be shown that one or more of three factors apply – technically, environmentally and economically practicable – so that there is a valid case for not collecting separately. It is assumed that the majority of written assessments and requests will be undertaken by 2028 once most of the new collection schemes rolled out. After 2028 resource requirements are reduced to 50% to maintain good practice information on centralised portal as well as maintaining the EA general awareness and raising random checks. For 1hh option, WRAP has estimated these costs to be £0.5m pa for the first 6 years and £0.4m pa for the remaining period. For 2hh option, WRAP has assumed more assessments would be required due to allowing different collection systems. On this basis the costs relating to "support to the assessment panel" have increased by 33% to address the additional workload throughout. This means £0.7m pa for the first 6 years and £0.5 for the remaining period.

**Table 21: Modelled policy costs of HH policy options, £ millions, 2023 to 2035, undiscounted**

HH policy option	Estimated policy costs
Option 1hh: Consistent weekly collection under multi-stream systems	£21m

Option 2hh: Consistent collection of dry recyclables under collection systems with the lowest cost at a local authority level	£23m
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Source: WRAP's analysis

## Key non-household municipal (NHM) sector assumptions

For the NHM scenarios, the following are the key WRAP assumptions that affect scenario costs and benefits. These are based on industry peer review<sup>140</sup>.

### NHM sector total waste arisings

The business classification used in the analysis follows the Standard Industrial Classification of economic activities at the 2-digit level and as such a wide range of businesses are included. For example, the office category in which a significant proportion are micro and small businesses includes estate agents, libraries, financial services, telecommunications centres as well as standard office complexes.

Given the uncertainty in data, WRAP have developed four key sensitivities on the total amount of waste in the NHM sector. This methodology used, among others, the data provided in the Environment Agency (EA) and resulted in four main estimates because the EA data is not conclusive in the sense of:

- In 2018 only 69% of permitted sites included site data in their returns. This could be for multiple reasons: they might have not processed any waste, they might have closed down, they have just opened, or simply did not include any site data.
- There is no flow of data within the EA WDI, and so it is difficult to know the true path of waste from one facility to another to an end destination. For instance, some waste is shown to go to a Facility, other waste is shown to go to a process (Recovery), and so it is difficult to depict if the Recovery tonnes are counted in a Recovery Site or if they are going to a recycling destination.

This means that four sensitivities were required when making assumptions on the EA WDI, so every eventuality is covered. These sensitivities include tonnes shown as gone to a Recovery process (and not), and a proxy extrapolating site data submission up to 84.5% to reflect different levels of the non-returns of data.

The four sensitivities are listed as:

- Without Recovery tonnes and 69% Returns
- With Recovery tonnes and 69% Returns
- Without Recovery tonnes and 84.5% Returns
- With Recovery tonnes and 84.5% Returns

These sensitivities were then each modelled by sector/sub-sector into waste collection scenarios and extrapolated to a national level to provide the NHM scenario results. For the purpose of this impact assessment, a median across the four sensitivities (i.e. 26.9Mt of waste) has been taken as our estimate across all scenarios and sensitivities.

We will be seeking stakeholder views on the NHM waste arisings via consultation and stakeholder related events. Similarly, we are currently undertaking an externally commissioned research to investigate future waste arisings that will be used to inform our final impact assessment.

<sup>140</sup> WRAP engages with waste management companies (i.e. service providers) and businesses receiving collections within the NHM sector to review and ensure that assumptions and approaches are reflective of real world situations. WRAP uses expert contractors procured via frameworks with skills and insights to gather Industry data and other perspectives on their application to the analysis. Outputs of the analysis are also sense checked with Industry, internal staff and contractors.

When estimating the DRS effect, we have adjusted NHM tonnages. We have removed the associated DRS tonnages from the hospitality sector<sup>141</sup> (i.e. the sector most likely to be affected by the DRS scheme).

## **NHM waste management costs methodology**

### *Applying costs to services*

Similar to the standardised costing approach for HH collections WRAP's NHM model uses Industry charge per container lift data for each service offered to a business. A 2019 Industry survey was used to update collection charges from a wider range of suppliers across the country. This data is then applied to the baseline and the container provision needed for future scenarios. The charges are derived from large scale surveys of commercial and Local Authority collectors and as such remain **commercially sensitive**. Industry reviews of SMEs and national retailers highlight contract prices that reflect minimal levels of discounting according to a range of factors such as duration, material ranges included, numbers of lifts per site, national or regional contracts.

However, given the range of contract differences and scale of businesses affected in the NHM analysis it is not possible to build in discount factors into the individual site analysis. As such the overall costs generated in the analysis are likely to be slightly overstated, particularly in the new scenarios when fully rolled out.

### *Shared waste provision*

WRAP's NHM model calculates for each of the four sensitivities the tonnes of waste generated per year per business sub-sector and size. It then applies estimated waste compositions to convert tonnes of waste into volume<sup>142</sup> and calculates the lowest collection costs from a range of different bin sizes per business. This means that:

- If it is cheaper for the business to have a larger bin but collected every other week, as each week the bin is less than half full, then this is selected.
- If two businesses were to share a larger bin (next size up as such) but have a weekly collection (because of double the amount of waste), then the price per business would remain the same as a fortnightly collection.

Alternatively, if the business was to have a smaller less expensive bin, but collected weekly, the price would only be marginally more than the fortnightly collection alternative with two businesses sharing the service.

The WRAP fieldwork carried out so far shows micro and, to a lesser extent, smaller businesses using a shared provision more often than medium and larger sized businesses. The surveys observed some businesses already operating shared services and employing other options to maintain low charges such as backhauling of their waste. Therefore, the baseline and future scenarios for micro businesses are likely to be overstated and offer opportunities to reduce on-going charges.

Thus, WRAP's modelled scenarios do account for some waste provision sharing with the smaller businesses, but only up to a shared provision between two businesses. This means that there could be more cost savings if more than two smaller businesses shared a waste provision. Due

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<sup>141</sup> DRS tonnage has been estimated using Placed on the Market (POM) data. The data mainly relates to the plastic, metal and glass beverage containers used in the hospitality sector. Although the POM data contains container data, the NHM waste compositions do not go down to the level of granularity. This means the reduction of waste has been taken out of all plastic, metal and glass materials and not just packaging materials.

<sup>142</sup> Given sector's use of the charge per pick-up rate for a service provided, tonnages of waste need to be converted to volume to account for the amount of space left per applied container.



to lack of available data on size and numbers of premises in shared office or retail facilities, it is difficult to quantify take up and cost of a shared waste provision provided by landlords or site managers.

### *Optimisation*

When expanding a waste provision from a residual only collection to a provision that includes additional bins for a recycling collection, two options are available to businesses:

- Non-optimisation of collection services: businesses keep the residual bin currently used and add extra bins to place the recyclates in. This means that the cost of a waste collection with additional recycling bins would increase significantly, because one, or some bins, are not efficiently sized to the volume of waste generated.
- Optimisation of collection services: businesses reduce the residual bin size in line with the amount of recyclable material diverted to the additional recycling bins.

When including recycling bins on top of residual waste collections, optimisation is key to keeping the costs down for the business. The additional recycling bins are not necessarily a separate bin for each recycling material. They can and are often bins that hold multiple recyclable materials (i.e. dry mixed recyclables which contain paper, card, plastics and metal).

Optimisation can be applied on two levels. The first is to reduce the residual bin size sufficient to the volume of residual waste that is left after the recyclable waste has been extracted and placed into recycling bins. The second is, on top of reducing the residual bin size sufficiently, to also have the most suitable recycling bin size appropriate to the volume of recyclate generated by the business.

This means that the cost of a waste provision with additional recycling bins would be less and, in some cases, cheaper than a residual only collection. This also may mean the waste management companies would need to adapt their collection vehicles to lift the various bin sizes. However, it is suggested some collection vehicles already have this capability.

### **NHM DRS analysis**

WRAP has interviewed seven different waste management companies (WMCs) asking for their view on potential cost impacts in relation to the DRS scheme<sup>143</sup>. Their view was that the scheme is very likely to increase the costs of collection of materials outside of the DRS scope. This is because the remaining material will be a less desirable product because of its lower value.

The views from WMCs did vary widely in the suggested cost increase to business charges. It was felt that the variation in charge increase was down to the individual business models operated, the proportion of DRS in the remaining container and its relative net processing cost. It is suggested that an overall cost increase up to 25% for NHM DMR and separate glass kerbside collections may happen because of the reduction in desirability of these streams. Although a higher cost impact was stated, most concluded impacts of up to 25%. As such, the NHM model has a 25% increase to DMR and separate glass kerbside collection prices to show this effect.

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<sup>143</sup> Interviews were conducted in March 2020.

The NHM Forecast has been calculated with reduced tonnes in the hospitality sector<sup>144</sup> and an increased cost to DMR and separate glass for all business sectors to show the effect the DRS scheme will have on the NHM kerbside collection.

Opposite to the HH sector, the DRS net effect for the NHM sector has not been included in the overall NPV calculations. It is used here for illustration purposes only. This is because it is assumed that the DMO will bear the actual cost of it.

## Sensitivity analysis

Our assumptions on the waste collection services included in the baseline affect the net impact of the NHM options considered with respect to waste management costs. The low baseline is representative of all waste collection services that are currently used by different businesses; the high baseline is based on the most frequently used waste provision by business size and sector level. The low baseline generally leads to higher potential savings in a given scenario.

For environmental savings, we use the 44% baseline recycling rate. This recycling rate has been estimated by WRAP (i.e. based on the end destination of NHM waste stream). We have also assumed that the NHM sector has a constant capture rate of 80%. The current data does not allow to extract information on the current capture rate. As such, this estimate has been based on the observed rates in the household sector. Given that the sector generates household like waste materials, we argue that this is a relatively sensible assumption.

Finally, as explained below, we realise that a high capture rate could only be achieved under targeted policy measures that support the transition of the sector to higher recycling performance and we account for these business support costs in our analysis.

## NHM policy support costs

We assume that business support costs would be needed in order to achieve such a significant change across the whole NHM sector. These are split to a number of activities:

- **Direct one-to-one business support.** This support covers the direct support provided to businesses in initial visits (cold, usually referring to ad-hoc meetings when officer or support staff are passing by, and warm visits, usually pre-planned) and includes a range of core activities to help with scheme set up and optimising container and system provision, procurement, communications and set up of internal separation systems. Allowance is made for follow up visits in successive years. The support is focussed on micro and small businesses given they represent most units and are most adversely affected by the Strategy proposals<sup>145</sup>.
  - **National guidance.** Activities to provide national guidance to delivery teams. It also includes monitoring NHM sector performance, creating and managing a plan for targeting businesses and providing support to optimise and alleviate costs to businesses. National Guidance is needed regardless of the number of businesses being targeted.
- Outreach and tools.** Includes national communications, regional outreach and roadshows to raise business awareness. Provided tools are for businesses to use directly. It is assumed that the majority of guidance and tools for businesses to use are generated in advance of 2030 but further reporting and maintenance will be required to ensure high participation.

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<sup>144</sup> DRS tonnage has been estimated using Placed on the Market (POM) data. The data mainly relates to the plastic, metal and glass beverage containers used in the hospitality sector. Although the POM data contains container data, the NHM waste compositions do not go down to the level of granularity. This means the reduction of waste has been taken out of all plastic, metal and glass materials and not just packaging materials.

<sup>145</sup> The evidence for this type of support comes from WRAP and their extensive surveys, focus groups and earlier responses to the RWS Consistency consultation.

**Table 22: Modelled policy costs of NHM policy options, £ millions, 2023 to 2035, undiscounted**

NHM policy option	Estimated policy costs
Option 1nhm: one-to-one businesses support provided for all small, medium and large businesses. It is assumed that small businesses will receive more of that support.	£172m
Option 2nhm: one-to-one businesses support provided for all businesses. Support for micro businesses is available from 2024 onwards.	£501m

Source: WRAP's analysis

Without the use of these support measures it is likely that the performance levels modelled in the analysis will not be achieved. The policy support cost categories follow clear Industry feedback in the 2019 Consultation and subsequent cross sector engagement in 2020.

### Key municipal-wide assumptions

The findings depend on the amount and composition of MSW arisings<sup>146</sup> in the future. For waste from households, these are based on a projected change in households numbers multiplied by associated waste arisings. NHM arisings projections are projected as a flat line for the period in question.

Defra's model estimates the mass flow balance across the municipal sector in order to estimate the amount of tonnages treated by different methods and associated GHGs emissions under different scenarios. This is a complex model with a number of key inputs influencing the modelling results. It is out of scope to present detailed assessment of the model here but we present here key assumptions on which our municipal-wide results (i.e. GHGs and landfill tax calculations) depend:

- To split landfill costs between Local Authorities and the NHM sector, we assume that local authorities send c. 28% ratio of their collected residual waste to landfill. The rest is assumed to be send to energy from waste (EfW) plants. This is based on 2017/18 WasteDataFlow data.
- We also assume that EfW capacity is fixed at 2017/18 levels. This is to be in line with the assumptions used in WRAP's modelling. We will aim to refine this assumption for the final Impact Assessment to reflect the latest data as well as to improve our landfill tax calculations<sup>147</sup>.
- Given that WRAP has modelled the tonnages that Local Authorities send to EfW, the remaining capacity is then allocated to the NHM sector. This assumption will need to be reviewed alongside the assumption concerning future EfW capacity. This is because historic data suggests that Local Authorities are sending an increasing proportion of their residual waste to EfW.
- This also potentially overestimates the amount of waste that the NHM sector diverts from landfill.

<sup>146</sup> We are only modelling waste from households and municipal businesses. This excludes litter and street sweepings that have some impact on capacity constraints.

<sup>147</sup> This assumption has a knock-on impact on the amount of waste assumed to be diverted from landfill.

- All scenarios assume that at least 5% of municipal solid waste is untreatable at the moment and in the future. This means that it needs to be sent to landfill and cannot be processed through EfW and MBT plants or recycling facilities in any of the scenarios.
- Waste composition for both HH and NHM sectors is assumed to be constant over time once adjusted for DRS tonnages. The exact changes are hard to predict, but there will almost certainly be shifts in the composition of waste arisings over time. These changes will, in particular, affect the greenhouse gas emissions and savings under different scenarios.
- There is no explicit modelling of the emergence of new infrastructure handling recycling (such as MRF and Anaerobic Digestion plants). Where there is an increase in demand for sorting of recyclates or anaerobic digestion, MRF and AD facilities are assumed to be built in order to meet that demand. The modelling does not explicitly account for any delays in building this infrastructure.
- Landfill GHG emissions are counted in the years that material biodegrades, not when it is deposited.
- Carbon factors for recycling/disposal of materials are unchanged from the 2019 IA and are held constant over time. The exception is the warming potential of methane, which is updated from 25x CO<sub>2</sub> to 28x CO<sub>2</sub>, in line with IPCC AR5 recommendation.
- The carbon intensity of grid electricity and heat are assumed to decline over time, but the profiles have not been updated since the 2019 IA.
- Refuse Dry Fuel is assumed to be produced at a constant rate and all is exported (so does not consume EfW capacity).

The landfill tax value is assumed to be flat and at the 2019/20 level of £91.35 per tonne of waste sent to landfill. Whilst the landfill tax has previously risen in line with the growth in the Retail Price Index I, a constant rate has been assumed for the modelling purposes as all other prices have been kept constant.

All municipal scenarios see a significant reduction in the amount of municipal waste sent to landfill. While we assume a constant gate fee costs per tonne of residual waste sent to landfill, this could lead to significant impacts on the economics of landfill management, through the reduction of gate fee receipts, and reduction of revenue from landfill gas combustion through reduced landfill gas generation. We do not reflect this dynamic, and its impact on prices, in the current modelling framework.

## Key environmental assumptions

### GHG emission savings

The greenhouse gas emissions analysis of recycling scenarios has been done using Defra's in-house model which estimates the net increase or decrease in carbon emissions across the following activities; Recycling and composting, Energy recovery and Landfill. We report GHGs emissions changes and split them in terms of whether they occur in sectors covered under the EU Emissions Trading Scheme<sup>148</sup> (ETS) ('traded emissions') or outside the EU ETS ('non-traded emissions'). In the case of waste, emissions from waste sent to landfill and incineration<sup>149</sup> are non-traded, and emissions from recycling and composting are traded.

<sup>148</sup> [https://ec.europa.eu/clima/policies/ets\\_en](https://ec.europa.eu/clima/policies/ets_en)

<sup>149</sup> Although incineration emissions are non-traded, the energy recovery component from incinerating municipal waste generates energy which offsets the need to produce that energy through existing UK power plants. That offset is counted as traded emissions savings.

The calculations are based on BEIS greenhouse gas conversion factors from 2017<sup>150</sup>. For each of the options' GHG emissions savings, we applied the carbon prices as presented in Table 23 over the appraised period.

**Table 23: Applied carbon prices, 2018 £/t CO<sub>2</sub>e (rounded)<sup>151</sup>**

Year	Traded carbon prices		Non-traded carbon prices	
	Central	High	Central	High
2023	34	56	73	109
2024	41	65	74	111
2025	47	74	75	113
2026	54	84	76	114
2027	61	93	77	116
2028	67	103	79	118
2029	74	112	80	120
2030	81	121	81	121
2031	88	132	88	132
2032	96	144	96	144
2033	103	155	103	155
2034	111	166	111	166
2035	118	178	118	178

Source: BEIS UK traded and non-traded carbon values for policy appraisal 2018; Table 3 from Data tables 1 to 19: supporting the toolkit and the guidance<sup>152</sup>.

## Annex B: Greenhouse gas emissions impact

This section presents the estimated GHG impacts from the four shortlisted municipal waste collection system options. As part of our consideration of environmental and wider impacts, we have only been able to monetise the GHG impact but discuss other areas in more detail under the non-monetised impacts section in Annex C.

### Greenhouse gas emissions impacts

The GHGs savings arise from diverting waste away from the residual waste stream (black bag waste) where it will be sent to landfill or energy from waste (EfW), having in many cases a negative environmental impact. In the case of landfill, biodegradable waste (food, garden, paper, etc.) can decompose anaerobically, generating methane, a potent GHG. For EfW, burning of fossil-based waste (plastic for example) releases CO<sub>2</sub> into the atmosphere. Despite the fact that both of these waste treatment methods usually recover energy, they remain for many materials a net GHG contributor.

In the case of waste, emissions from waste sent to landfill and incineration<sup>153</sup> are non-traded, and emissions from recycling and composting are traded. Non-traded sector emissions are those outside the European Union Emissions Trading System (EU ETS). Traded emissions are covered by the EU ETS.

<sup>150</sup> <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2017>

<sup>151</sup> These prices has been inflated to 2019 price level in the modelling used in this IA.

<sup>152</sup> <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

<sup>153</sup> Although incineration emissions are non-traded, the energy recovery component from incinerating municipal waste generates energy which offsets the need to produce that energy through existing UK power plants. That offset is counted as traded emissions savings.

This section presents the modelled impacts of household, NHM and municipal recycling scenarios on the amount of greenhouse gas emissions (GHGs) when compared to the baseline. Note that the separate household and NHM estimates do not add up to total municipal estimates. This is because changes in one sector have implications to the whole municipal sector's waste treatment.

Table 24 presents the GHGs emissions savings for household scenarios only while assuming no change in the NHM sector. As discussed above, these estimates should reflect the fact that:

- Increased household recycling activities (from around 45% in 2018 to around 55-6% by 2035) divert waste from energy from waste plants and landfill, thus reducing overall GHGs emissions in the sector.
- Reduced amount of household residual waste decreases the proportion of EfW capacity used by Local Authorities. This allows the NHM waste to utilise it and reduce the amount of waste sent to landfill.

Options 1hh (multi-stream) shows slightly lower GHG savings as a result of marginally lower overall recycling rate. There are additional GHG savings from having separate waste streams from one another though. Multi-stream collection produces higher quality recyclate that is more likely to find a market and thus be recycled. This has not been possible to monetise here.

**Table 24: Household recycling scenarios' GHGs emissions savings in million tonnes of CO<sub>2</sub>e**

In MtCO <sub>2</sub> e	2023-2035	5 <sup>th</sup> carbon budget (2028-2032)
Option 1hh	-1.6Mt traded, -11.9Mt non-traded	-0.7Mt traded, -5.5Mt non-traded
Option 2hh	-2.3Mt traded, -12.7Mt non-traded	-1Mt traded, -5.8Mt non-traded

Source: Defra analysis

These GHGs savings are then monetised using relevant traded and non-traded carbon prices over the period of 2023-2035. Note that these monetary savings are not discounted in Table 25. The range of savings is purely due to different carbon prices as no sensitivities were run with respect to the recycling capture rates achieved per household option.

**Table 25: Household GHG savings, £bn undiscounted central carbon prices (high carbon prices<sup>154</sup>)**

Household scenarios	2023-2035	5 <sup>th</sup> carbon budget
Option 1hh	-£1.26bn (-£1.89bn)	-£537.7m (-£806.9m)
Option 2hh	-£1.40bn (-£2.10bn)	-597m (-£896m)

Source: Defra analysis

Further, Table 26 presents the GHGs emissions savings associated with NHM options. Our modelling suggests that the NHM sector shows a substantial potential of GHGs emission reduction. This is significantly higher savings compared to the household sector, and reflects a number of factors, including:

- Slightly lower baseline recycling rate for the NHM sector when compared to household (43%<sup>155</sup> against 45%).

<sup>154</sup> The value placed on changes in greenhouse gas (GHG) emissions is currently under review, now the UK has increased its domestic and international ambitions. Accordingly, current central carbon values are likely to undervalue GHG emissions, though the scale of undervaluation is still unclear. The potential impact of placing a higher value on GHG emissions can be illustrated by using the existing high carbon values series, in addition to the prescribed central values. HMG is planning to review the carbon values during 2020.

<sup>155</sup> Actual recycling rate based on the end destination of waste streams.

- Higher proportion of NHM residual waste currently sent to landfill, thus allowing scope for higher emissions savings from diverting materials such as paper, cardboard and food waste to recycling.
- High level of recycling potential across all NHM options, ranging from 62% to 70% across the options with assumed 80% capture rate<sup>156</sup>.

**Table 26: NHM scenarios' GHG emissions savings, in MtCO<sub>2e</sub>**

NHM scenarios	2023-2035	5 <sup>th</sup> carbon budget (2028-2032)
Option 1nhm	-14.9Mt traded, -25.4Mt non-traded	-6.7Mt traded, -12.2Mt non-traded
Option 2nhm	-20.6Mt traded, -33.9Mt non-traded	-9.6Mt traded, -16.5Mt non-traded

Source: Defra analysis

This means that monetary values for the GHGs emissions savings are also higher for the NHM sector. Table 27 shows the estimated savings for different NHM options.

**Table 27: NHM scenarios' GHGs savings, in £bn, undiscounted central carbon prices (high<sup>157</sup>)**

NHM scenarios	2023-2035	5 <sup>th</sup> carbon budget (2028 – 2032)
Option 1nhm	-£3.7bn (-£5.5bn)	-£1.6bn (-£2.4bn)
Option 2nhm	-£4.9bn (-£7.5bn)	-£2.2bn (-£3.3bn)

Source: Defra analysis

Finally, tables 28 and 29 in this section, present GHGs emissions savings with respect to municipal scenarios. Again, only central estimate is presented. Broken down into traded and non-traded emissions savings. Overall, the emission savings are on average between 25.3 MtCO<sub>2e</sub> to 33.2 MtCO<sub>2e</sub> over the period of the 5<sup>th</sup> carbon budget. In general, the highest savings are observed under Option 4M, but they are only marginally higher compared to Option 2M. There are wider environmental and economic benefits associated with greater waste and recycling separation that have not been monetised at this stage (see Annex C). Both Options 2M and 4M highlight the importance of including micro businesses in terms of carbon savings.

**Table 28: Municipal sector GHGs savings, in MtCO<sub>2e</sub>**

Municipal scenarios	2023-2035	5 <sup>th</sup> carbon budget (2028 – 2032)
Option 1M	-16.8Mt traded, -35.7Mt non-traded	-7.6Mt traded, -16.9Mt non-traded
Option 2M	-22.7Mt traded, -43.3Mt non-traded	-10.5Mt traded, -20.6Mt non-traded
Option 3M	-17.5Mt traded, -36.4Mt non-traded	-7.9Mt traded, -17.2Mt non-traded
Option 4M	-23.4Mt traded, -44.0Mt non-traded	-10.8Mt traded, -21.0Mt non-traded

Source: Defra analysis

<sup>156</sup> For the NHM sector, we assume that only 80% out of the total tonnage that could be further recycled (i.e. capture rate) is presented by businesses in all scenarios.

<sup>157</sup> As per footnote 154

As above, the monetary savings in Table 29 present a range of estimates in order to reflect the uncertainty with respect to future carbon prices. Household and NHM policy option recycling rates are unchanged across the range of estimates.

**Table 29: Municipal sector GHGs savings, in £bn, undiscounted central carbon prices (high<sup>158</sup>)**

Municipal scenarios	2023-2035	5 <sup>th</sup> carbon budget (2028 – 2032)
Option 1M	-£4.8bn (-£7.2bn)	-£2.1bn (-£3.1bn)
Option 2M	-£6.0bn (-£9.1bn)	-£2.7m (-£4.0bn)
Option 3M	-£4.9bn (-£7.4bn)	-£2.2bn (-£3.2bn)
Option 4M	-£6.2bn (-£9.3bn)	-£2.7bn (-£4.1bn)

Source: Defra analysis

The municipal recycling scenarios can also be presented in terms of their economic cost-effectiveness in carbon reduction<sup>159</sup>. This exercise sheds light on whether the municipal recycling policies would be a cost-effective way of reducing UK's GHGs emissions. Table 30 shows the results of this assessment. Given that cost-effectiveness indicators are lower than the relevant comparators, this suggests that emissions in all options are being abated cost-effectively.

**Table 30: Carbon cost-effectiveness of municipal scenarios, £/t of CO<sub>2</sub>e**

£/t of CO <sub>2</sub> e	Option 1M	Option 2M	Option 3M	Option 4M
Traded cost effectiveness	-99.8	42.6	-111.9	29.6
Traded costs comparator	63.7	64.2	63.7	64.2
<i>Cost-effective?</i>	Yes	Yes	Yes	Yes
Non-traded cost effectiveness	-5.3	60.4	-12.5	53.4
Non-traded costs comparator	71.7	71.8	71.7	71.8
<i>Cost-effective?</i>	Yes	Yes	Yes	Yes
All GHGs	16.8	61.7	12.2	57.2
All costs comparator	69.1	69.2	69.1	69.2
<i>Cost-effective?</i>	Yes	Yes	Yes	Yes

Source: Defra calculations based on BEIS (2018) Valuation of energy use and greenhouse gas.

## Annex C: Non-monetised costs and benefits

For each of the four municipal options, there are a number of additional costs and benefits to the municipal sector as a consequence of increasing the recycling performance that are challenging to monetise and are therefore not directly reflected in the modelling approach adopted in this assessment. These costs and benefits are set out below. In our consultation, which is published alongside this IA, we are asking stakeholder views on our impact assessment assumptions and identified impacts (including both monetised and unmonetised). If you have any additional

<sup>158</sup> As explained in footnote 154

<sup>159</sup> Based on the proposed methodology presented here:

[https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/794737/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal-2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/794737/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal-2018.pdf)



evidence on the non-monetised costs and benefits, which are presented in this section, we would appreciate it via your response to our consultation.

## Recycling and waste infrastructure implications

With improved recyclate separation, material quality collected for recycling is higher in each of the four scenarios relative to baseline. This reduces the amount of waste sent to energy from waste plants, landfill and other residual waste treatment facilities. Consequently, there would be less pressure on additional residual waste infrastructure across England<sup>160</sup>.

Similarly, household option 1hh of full roll-out of multi-stream would, on its own and in the short-run, likely have a negative economic impacts on some material reprocessing facilities (MRFs). Current kerbside collections see around 60% of dry recyclables collected as comingled material by Local Authorities. Under option 1hh, most dry recycling collections would be sorted at kerbside, and would require different sorting processes than MRFs after collection. Individual facilities may be able to adapt to accept kerbside-sorted material, instead of comingled material. But for some facilities these changes would not be economically feasible so the overall impact of multi-stream collections on sorting infrastructure is currently unclear.

All NHM scenarios assume significant increases in the collection of dry mixed materials that will need to be sorted by MRFs. Under all municipal options, this would more than offset the loss of supply of comingled dry recyclables to MRFs from household sector. To the extent that (a) MRFs cannot adapt to accept pre-sorted material and (b) the overall supply of dry recyclables extends (see Tables 31, 32, 33 and 34), there will likely be a requirement for new sorting / bulking facilities handling pre-sorted material.

**Table 31: Projected change to dry recycling tonnages under option 1M, in thousand tonnes**

	2025	2028	2031	2035
HH dry recycling	-131	-186	-218	-219
NHM dry recycling	+4,264	+6,835	+6,835	+6,835
MSW dry recycling	+4,132	+6,649	+6,616	+6,616

Source: Defra modelling

**Table 32: Projected change to dry recycling tonnages under option 2M, in thousand tonnes**

	2025	2028	2031	2035
HH dry recycling <sup>161</sup>	-131	-186	-218	-219
NHM dry recycling	+4,264	+10,556	+10,556	+10,556
MSW dry recycling	+4,133	+10,370	+10,338	+10,337

Source: Defra modelling

**Table 33: Projected change to dry recycling tonnages under option 3M, in thousand tonnes**

	2025	2028	2031	2035
HH dry recycling	-14	+14	+11	+11
NHM dry recycling	+4,264	+6,835	+6,835	+6,835
MSW dry recycling	+4,250	+6,849	+6,845	+6,846

<sup>160</sup> National Infrastructure Commission, 2018, National Infrastructure Assessment.

<sup>161</sup> Options 1M and 2M show lower household dry recycling tonnages in Option 1hh (multi-stream) than Option 2hh (optimised lowest cost for LA's) due to the lower number of tonnes collected associated with multi-stream waste collection services. The performance differences relate to the lower quantities of material reported in Waste Data Flow.

Source: Defra modelling

**Table 34: Projected change to dry recycling tonnages under option 4M, in thousand tonnes**

	2025	2028	2031	2035
HH dry recycling	-14	+14	+11	+11
NHM dry recycling	+4,264	+10,556	+10,556	+10,556
MSW dry recycling	+4,250	+10,570	+10,567	+10,567

Source: Defra modelling

The policies would also likely have an impact on residual waste treatment facilities. Table 35 shows the estimated tonnage entering residual treatment (mechanical and biological treatments, energy from waste plants and landfill) under each scenario. This projection is heavily dependent on the extent to which some waste is ‘untreatable’ by existing methods, as this is a factor which becomes increasingly important with higher recycling rates. Any reduction in waste going to treatment is also sensitive to the level of uncertainty in future recycling rates and future waste arisings. Table 35 shows estimated tonnages undergoing treatment under each option. Note that these projections are subject to significant uncertainty; in particular, the time profile is likely to have been distorted by the modelling approach (see ‘Key municipal-wide assumptions’ section in Annex A).

**Table 35: Projected residual treatment tonnages for the MSW sector under each option, in thousand tonnes (kT)**

	2025	2028	2031	2035	Total (2023-35)
Baseline	25,888	26,174	26,416	26,633	340,898
Option 1M	21,095	18,909	18,856	19,070	258,431
Option 2M	21,095	16,828	16,775	16,989	237,620
Option 3M	20,978	18,709	18,627	18,839	256,061
Option 4M	20,978	16,628	16,546	16,758	235,249

Source: Defra modelling

### Calorific value implications for energy from waste facilities

Additional recycling can change the composition of residual waste being sent for incineration. This can change the energy content of mixed residual waste, i.e. its calorific value (CV). Higher CVs imply a higher amount of heat being released during the combustion process. CV changes can have an impact on incineration plant throughputs, with higher CVs reducing the amount of waste a plant can burn and vice-versa. We have not modelled the impact of CV changes on throughput.

### Familiarisation and sorting costs

In increasing the recycling performance, associated costs to the public sector, households and businesses as a result of adopting new practices and changing behaviour have not been costed. For example, time costs of businesses familiarising themselves with the new practice of effectively separating their collection waste are not accounted for.

We are seeking stakeholder views on these costs in the consultation published alongside this document.

## **Wider economic benefits**

Compared to residual waste treatment, recycling is a more labour-intensive economic activity. All activities of bulking, sorting, processing and preparing for selling at secondary material markets require labour input. Hence, moving towards higher separation (i.e. multi-stream collections) would require additional staff, possibly increasing the net job creation in the sector<sup>162</sup>. However, in a changing sector, the net job creation is expected to be lower than the gross job creation. We have not accounted for any of these wider economic benefits in the analysis.

We plan to undertake some analysis for the final IA to summarise job creation opportunities as a result of our policy proposals.

## **Landfill aftercare costs**

Biodegradable waste in landfill breaks down anaerobically, leading to generation of methane emissions to atmosphere, and the generation of leachate, an acidic liquid which needs to be extracted and treated. Some evidence suggests that the timescales before these emissions fall below the level when they no longer need active collection and treatment are many times longer than originally thought. This could have subsequent consequences for the funding of the aftercare period, occurring once the revenue stream of gate fees and landfill gas combustion have ceased.

All municipal options will, depending on the quantity of biodegradable waste they divert from landfill, have a quantifiable effect on the landfill sector. They will reduce gas and leachate generation, reducing the landfill aftercare costs in the long run.

However, the reduced tonnages going to landfill will reduce revenue from gate fees while increasing costs associated with early closure and redesigned closing profiles. These increases, along with the reduction in revenue from landfill gas combustion would have a major effect on the financial provision for landfill aftercare and impact on renewable energy targets, of which landfill gas is a major component.

Savings would be made from the reduced maintenance cost, reduced greenhouse gas emissions, and the shortening of the aftercare period for future landfills, but it should be noted that this will have no benefit for current or historic landfills, and could exacerbate the issues due to diminishing revenues.

## **International GHGs emissions savings**

The estimates calculated in the Greenhouse gases emissions section reflect the contribution of municipal recycling policies with respect to the UK's territorial emissions only. A further reduction in international GHGs emissions would be observed as a result of reduced production from virgin materials.

## **Household and business inconvenience and disamenity costs**

The space taken by additional containers can present a disamenity for households and businesses. Further, the additional effort to separate waste into more streams can cause an inconvenience for households and businesses. We have not been able to monetise either of these, although they are likely to be highest under Option 2M given the additional household and business sorting required.

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<sup>162</sup> Green Alliance and WRAP, 2015, Employment and the circular economy – job creation in a more resource efficient Britain.

On the household side, WRAP undertook research asking respondents to rank a number of service features of a recycling system. The three key service features identified by respondents as being important are having a regular and reliable service, being clear on what can/cannot be recycled and sufficient capacity in the recycling container for all their materials. The aspect of not having to separate waste into multiple containers scored lower in importance<sup>163</sup>. Table 36 summarises research findings.

**Table 36: Percentage of householders ranking these factors as more and less important**

	Capacity/ Space	Not Having to Separate into Multiple Containers	Regular Service	Reliable Service	Containers returned to the same place	Area is Clean and Tidy	Clarity Over What Can/Can't be Recycled
More Important (1-3)	41%	26%	74%	65%	23%	27%	44%
Less Important (5-7)	41%	65%	15%	19%	63%	57%	40%

Source: WRAP (2015) Recycling Tracker Survey. Sample size: 1,771

Similarly, the 2020 survey<sup>164</sup> suggests that there are strong recycling motivations, e.g. 69% of survey respondents saying 'it's the right thing to do'. There has also been an increase in positive environmental outlooks, with a significant increase in the proportion agreeing with the statement 'I am prepared to make lifestyle compromises to benefit the environment' (64% in 2018 to 72% in 2020). In terms of barriers, over three quarters (77%) identify with at least one 'barrier' that leads to them sometimes putting items in the general rubbish rather than the recycling. The most frequently cited barrier (38%) is uncertainty about what can/can't be recycled; a lack of recycling capacity in their recycling bin/bag/box is 21%; and the council not collecting enough things for recycling (20%).

<sup>163</sup> WRAP (2015) Recycling Tracker Survey. Sample size: 1,771.

<sup>164</sup> <https://wrap.org.uk/sites/default/files/2020-10/WRAP-Recycling%20Tracker%20Report%202020.pdf>

## Annex D: Sensitivity Analysis – waste management costs

Table 37, below, shows the central, high (low cost, high benefit) and low (high cost, low benefit) sensitivity estimates for the modelled municipal scenarios. For the household sector, we have used variation in price associated with gate fees and material revenue. For the non-household municipal sector, the sensitivity analysis has been based on different cost profiles for the baseline. This is because this has the greatest impact on the change in costs to businesses as a result of the policies proposed in this IA. Table 37 includes the household DRS effect with all costs discounted, with the central scenario costs below in-line with policy impact summary table, Table 5.

**Table 37: Sensitivity analysis, for the municipal scenarios 1M-4M, on waste management costs only (with DRS effect in household net service costs, discounted (£m)).**

		Central	High	Low
<b>1M</b>	Household	£ 1,220	£ 1,432	£ 3,500
	Businesses	£ 351	£ 1,422	£ 2,088
	<b>Municipal waste</b>	<b>£ 1,571</b>	<b>£ 2,855</b>	<b>£ 5,587</b>
<b>2M</b>	Household	£ 1,220	£ 1,432	£ 3,500
	Businesses	£ 3,276	£ 2,981	£ 6,853
	<b>Municipal waste</b>	<b>£ 4,496</b>	<b>£ 1,549</b>	<b>£ 10,352</b>
<b>3M</b>	Household	£ 931	£ 1,624	£ 3,295
	Businesses	£ 351	£ 1,422	£ 2,088
	<b>Municipal waste</b>	<b>£ 1,282</b>	<b>£ 3,047</b>	<b>£ 5,383</b>
<b>4M</b>	Household	£ 931	£ 1,624	£ 3,295
	Businesses	£ 3,276	£ 2,981	£ 6,853
	<b>Municipal waste</b>	<b>£ 4,207</b>	<b>£ 1,357</b>	<b>£ 10,147</b>

Source: Defra analysis on WRAP's modelling

Table 38 presents a summary of results presented in this IA and from the Business Impact Target (BIT) Assessment Calculator<sup>165</sup>. This includes the equivalent annual net direct cost to businesses (EANDCB) which is used for the Business Impact Target (BIT). The key difference is that this IA uses 2023 as its present value base year whereas, the BIT calculator is based on 2020 present value.

**Table 38: The differences in IA central estimates and those calculated by the BIT assessment calculator, given in £ millions**

	IA – Central estimates		BIT calculator – Cost of Option		
	2019 prices, 2023 present value		2019 prices, 2020 present value		
	NPV	EANDCB <sup>166</sup>	NPV	EANDCB	BIT score
<b>1M</b>	£2,745.9	-£483.3	£2,476.7	-£435.9	-£2,179.5
<b>2M</b>	£491.2	-£347.5	£443.0	-£313.4	-£1,566.9
<b>3M</b>	£3,067.0	-£493.2	£3,067.0	-£444.9	-£222.4
<b>4M</b>	£808.8	-£357.4	£729.5	-£322.3	-£1,611.7

Source: Defra analysis

<sup>165</sup> <https://www.gov.uk/government/publications/business-impact-target-statutory-guidance>

<sup>166</sup> EANDCB for Impact Assessment central estimates also calculated using BIT calculator, but these use 2023 present value, not 2020.

## Annex E: Free versus charged garden waste

To illustrate the additional societal value of introducing free garden waste collections, we have run each HH option with both free and charged garden waste from 2023 (with everything else held constant). The comparison of the same option with and without free garden waste helps to illustrate the additional net societal value.

In this section we present the results of comparison, using the preferred municipal option (i.e. 3M):

- Table 39 (see page 65) shows the key monetised costs and benefits for the preferred option presented in this IA; and Table 40 (see page 66) shows the key monetised costs and benefits for the same option, except it assumes that all Local Authorities move to charged garden waste as they introduce separate food waste collections.
- We estimate a free garden service to produce the additional societal value of £691m over the total appraisal period (i.e. free and charged garden waste collection options have £3.07bn and £2.38bn NPVs, respectively).
- We estimate that free garden waste will deliver additional non-traded carbon savings of 1.4Mt in CB4 and 4.2Mt in CB5 (or 9.2 Mt over the overall appraisal period). In terms of traded carbon savings, it delivers 0.31Mt in CB4 and 0.51Mt in CB5 (or 1.10Mt over the total period).
- The option with free garden waste has a slightly lower BCR ratio of 1.4 compared to a charged one (which has a ratio of 1.6). This is because there are some additional CapEx and OpEx costs (as a result of additional garden waste tonnages).
- In terms of annual operating costs, compared to the charged garden scenario, there is an annual increase in Local Authority operational costs (approx. £200m annual increase after the transition period). This is mainly driven by lost revenue from no longer being able to charge for this service. Compared to the baseline, charged garden waste leads to an overall lower cost waste service whereas free garden waste leads to a marginally increased service cost once all Local Authorities have transitioned.
- In terms of equity impacts, the modelling is based on providing a free garden service of a 240-litre bin only. It is expected that properties with big gardens will need more than one bin. Local Authorities will still be able to charge for this extra service, ensuring some equity control.

**Table 39: Costs and benefits of 3M municipal option with free garden waste, (£m)**

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
Savings to householders due to removed garden waste charging	49.5	65.5	88.2	114.7	127.8	138.1	145.1	153.7	154.4	155.1	155.8	156.5	157.2	1,661.5
GHGs emissions savings	13.8	63.7	131.0	214.3	271.6	323.6	372.0	417.1	484.9	553.5	622.5	693.0	763.1	4,924.0
Net waste management saving to the NHM sector (i.e. including landfill tax)	75.6	240.6	387.9	540.9	569.4	585.6	595.3	603.0	606.6	607.1	607.0	606.9	606.8	6,633.1
<b>Social benefits (total)</b>	<b>138.9</b>	<b>369.8</b>	<b>607.1</b>	<b>869.9</b>	<b>968.8</b>	<b>1,047.3</b>	<b>1,112.4</b>	<b>1,173.8</b>	<b>1,245.9</b>	<b>1,315.7</b>	<b>1,385.3</b>	<b>1,456.4</b>	<b>1,527.1</b>	<b>13,218.6</b>
<b>Total social benefits (discounted)</b>	<b>138.9</b>	<b>357.3</b>	<b>566.7</b>	<b>784.6</b>	<b>844.2</b>	<b>881.8</b>	<b>904.9</b>	<b>922.6</b>	<b>946.1</b>	<b>965.3</b>	<b>982.1</b>	<b>997.5</b>	<b>1,010.6</b>	<b>10,302.8</b>
Net waste management costs to LAs	231.1	105.4	101.3	137.7	104.6	95.0	84.8	84.2	67.8	68.0	69.5	70.9	72.2	1,292.5
DRS net impact on LAs	-4.5	-10.8	-14.8	-11.0	-15.5	-17.8	-17.9	-20.3	-21.1	-21.4	-21.5	-21.7	-21.9	-220.3
DRS net impact on the NHM sector*	0.0	-0.4	-1.1	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-23.6
Policy support costs for both HH and NHM sectors	16.9	16.9	16.9	16.9	16.9	16.9	16.3	16.3	12.1	12.1	12.1	12.1	12.1	194.5
Reduction in government landfill tax receipts	94.3	280.8	448.5	622.7	660.7	681.8	695.0	706.1	711.5	712.3	712.2	712.1	712.0	7,749.9
<b>Social costs (total)</b>	<b>337.8</b>	<b>392.3</b>	<b>551.9</b>	<b>766.2</b>	<b>766.7</b>	<b>776.0</b>	<b>778.2</b>	<b>786.3</b>	<b>770.3</b>	<b>771.0</b>	<b>772.2</b>	<b>773.3</b>	<b>774.4</b>	<b>9,016.6</b>
<b>Total social costs (discounted)</b>	<b>337.8</b>	<b>379.0</b>	<b>515.2</b>	<b>691.1</b>	<b>668.1</b>	<b>653.4</b>	<b>633.1</b>	<b>618.0</b>	<b>585.0</b>	<b>565.7</b>	<b>547.5</b>	<b>529.7</b>	<b>512.5</b>	<b>7,236.0</b>
<b>Net social benefits (discounted)</b>	<b>-198.9</b>	<b>-21.7</b>	<b>51.5</b>	<b>93.5</b>	<b>176.1</b>	<b>228.4</b>	<b>271.8</b>	<b>304.6</b>	<b>361.1</b>	<b>399.6</b>	<b>434.6</b>	<b>467.8</b>	<b>498.1</b>	<b>3,067.0</b>

Source: Defra analysis

**Table 40: Costs and benefits of 3M municipal option with charged garden waste, (£m)**

	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	Total
GHGs emissions savings	6.3	47.3	106.3	181.1	227.1	267.4	304.3	338.4	389.6	441.6	494.0	547.3	600.6	3,951.5
Net waste management saving to the NHM sector (i.e. including landfill tax)	29.7	170.5	304.8	438.4	443.0	444.1	444.2	444.1	444.1	444.1	444.0	443.9	443.8	4,938.6
<b>Social benefits (total)</b>	<b>36.0</b>	<b>217.8</b>	<b>411.1</b>	<b>619.5</b>	<b>670.1</b>	<b>711.5</b>	<b>748.5</b>	<b>782.5</b>	<b>833.7</b>	<b>885.7</b>	<b>938.0</b>	<b>991.2</b>	<b>1,044.4</b>	<b>8,890.1</b>
<b>Total social benefits (discounted)</b>	<b>36.0</b>	<b>210.5</b>	<b>383.7</b>	<b>558.8</b>	<b>584.0</b>	<b>599.1</b>	<b>608.9</b>	<b>615.1</b>	<b>633.2</b>	<b>649.8</b>	<b>665.0</b>	<b>678.9</b>	<b>691.2</b>	<b>6,914.1</b>
Costs to householders due to all garden waste charging	67.1	77.2	80.2	106.8	116.9	123.6	127.7	131.0	131.6	132.2	132.7	133.3	133.9	1,522.6
Net waste management costs to LAs	85.7	-26.1	-51.9	-59.1	-95.3	-111.1	-123.5	-134.3	-143.1	-144.3	-144.7	-144.9	-145.2	-1,237.9
DRS net impact on LAs	-4.5	-10.8	-14.8	-11.0	-15.5	-17.8	-17.9	-20.3	-21.1	-21.4	-21.5	-21.7	-21.9	-220.3
DRS net impact on the NHM sector*	0.0	-0.4	-1.1	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-2.2	-23.6
Policy support costs for both HH and NHM sectors	16.9	16.9	16.9	16.9	16.9	16.9	16.3	16.3	12.1	12.1	12.1	12.1	12.1	194.5
Reduction in government landfill tax receipts	29.9	184.3	333.6	480.9	484.8	485.9	486.5	486.6	486.7	486.7	486.6	486.5	486.4	5,405.6
<b>Social costs (total)</b>	<b>195.2</b>	<b>241.4</b>	<b>364.1</b>	<b>534.5</b>	<b>507.8</b>	<b>497.6</b>	<b>489.0</b>	<b>479.2</b>	<b>466.1</b>	<b>465.2</b>	<b>465.3</b>	<b>465.3</b>	<b>465.3</b>	<b>5,636.0</b>
<b>Total social costs (discounted)</b>	<b>195.2</b>	<b>233.3</b>	<b>339.9</b>	<b>482.0</b>	<b>442.5</b>	<b>418.9</b>	<b>397.8</b>	<b>376.7</b>	<b>354.0</b>	<b>341.4</b>	<b>329.9</b>	<b>318.7</b>	<b>307.9</b>	<b>4,538.1</b>
<b>Net social benefits (discounted)</b>	<b>-159.2</b>	<b>-22.8</b>	<b>43.8</b>	<b>76.8</b>	<b>141.5</b>	<b>180.2</b>	<b>211.1</b>	<b>238.4</b>	<b>279.2</b>	<b>308.4</b>	<b>335.1</b>	<b>360.2</b>	<b>383.3</b>	<b>2,376.0</b>

Source: Defra analysis



## Annex F: Quality assurance

WRAP is responsible for quality assurance (QA) of their models as well as outputs. WRAP builds in QA into its workstreams following the Aqua book guidelines and with proportionality to the analysis and intended use of outputs. WRAP uses a range of experienced staff to perform the calculations and a buddy system to review modelling inputs and outputs. WRAP's approach also includes periodic external peer reviews where relevant. The external peer reviews come from a wide range of skilled contractors on WRAP's frameworks who undertake the reviews and also who engage directly with Industry to source and review assumptions. In addition to WRAP's QA Defra has reviewed the outputs from the model runs, although have been unable to separately QA the model due to commercial sensitivities. Defra will be reviewing quality assurance arrangements with WRAP for the final IA.

GHG estimates from waste collection and treatment have been estimated using Defra's Fates of Waste Simulation Tool (FoWST) model. This model has been built within Defra, using an older "WasteMan" model (used for the previous impact assessment) as a guide; FoWST is functionally similar to WasteMan but has been restructured to increase transparency of the assumptions and calculations. Calculations have been peer-reviewed for consistency with the Wasteman specification, and results have been sense-checked by multiple analysts. Calculations which are critical to the conclusions of this IA, including the GHG emissions from landfill and avoided emissions from recycling (both of which are significantly affected by the evaluated policies), have been subject to reperformance tests outside the model.

Most of the data and assumptions in FoWST are currently drawn from the older WasteMan model. Subject matter experts have been consulted on the sources of these assumptions and they have been documented. Numerical assumptions may be revised in the final Impact Assessment if updated data becomes available, but such changes are unlikely to change the overall conclusions presented here. Key assumptions and limitations of the model have been communicated in Annex A of this document.

## Annex G: Covid-19 considerations

The impact of Covid-19 has not been reflected in this IA. The initial findings by our Resources and Waste Covid-19 cell point to some changes in waste arisings based on LA survey results. Between April and September 2020<sup>167</sup>, Local Authorities were asked to reflect on any changes in waste arisings compared to a 'normal' period. Note, the survey did not ask for any raw data on actual changes in tonnages of waste arisings, instead it was thematic in its approach. As such, the survey results should be taken as indicative given that this survey was intended to show the broader picture. The overall picture for the local authority collected waste between April and September 2020 can be summarised by Table 41, below.

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<sup>167</sup>[https://www.adeptnet.org.uk/documents?field\\_document\\_cat\\_tid=43&keys=covid&field\\_document\\_date\\_value%5Bvalue%5D%5Bmonth%5D=&field\\_document\\_date\\_value%5Bvalue%5D%5Byear%5D=](https://www.adeptnet.org.uk/documents?field_document_cat_tid=43&keys=covid&field_document_date_value%5Bvalue%5D%5Bmonth%5D=&field_document_date_value%5Bvalue%5D%5Byear%5D=)

**Table 41: Table shows the initial waste arisings effects on LA collected waste due to the impacts of Covid-19**

<b>Higher than usual waste tonnages</b>	<b>Same levels</b>	<b>Lower than usual</b>	<b>Mixed results</b>
Residual waste	Clinical waste	Commercial waste	HWRCs
Recycling	Bulky waste		
Food waste	Street sweeping / litter		
Garden waste			
Bring banks			
Fly-tip clearance			

Source: Resources and Waste Covid-19 Cell

The above table suggests that commercial waste has decreased, while household waste and incidents of fly tipping clearance has increased. Covid-19, and in particular national restrictions has seen commercial waste significantly impacted through reduced tonnages collected and treated. However, as commercial waste activity tends to be closely linked with wider economic activity, we'd expect this to recover in line with an economic recovery. Despite this, it is too early to know whether this is a temporary or long-term change as Covid-19 restrictions get lifted. We will continue to monitor these trends through both follow-up LA surveys and industry as well as official statistics.