

Call for Evidence: Review of the Role of Incineration in the Waste Hierarchy

December 2021

Foreword

I have been asked by the Scottish Government to review the role of incineration in the waste hierarchy in Scotland, with priority given to consideration of national capacity requirements for incineration given the Scottish Government's ambitious targets for waste reduction. I have also been asked to consider how emissions from existing incinerators can be reduced and residual heat may be reused; and consider the societal impacts of residual waste treatment, including health and community impacts.



In order to carry out this task, I am supported by a small team drawn from Scottish Government and SEPA. In addition, we will be commissioning additional work from others. However, it is vital that all those with an interest in this matter have the opportunity to share their evidence with us so that my report – due to be provided to Scottish Ministers by Easter 2022 – is as well-founded as possible. We are therefore issuing this Call for Evidence and would welcome contributions as set out in this document. We are also planning to organise several events in January as part of the process, which will give stakeholders a further opportunity to provide evidence.

Please do therefore have a look at the questions set out below and provide any evidence you may have on any of the questions we pose. Please can your evidence reach us no later than 21 February 2022?

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Abbreviations

BMW	Biodegradable Municipal Waste
C&I	Commercial and Industrial
C&D	Construction and Demolition
CXC	ClimateXChange
HH	Household
MBT	Mechanical Biological Treatment
RDF	Refuse Derived Fuel

1. Introduction

1.1 Overview

The Scottish Government has committed to reviewing the role of incineration in the waste hierarchy in Scotland, to ensure that how residual waste is managed in Scotland aligns with Scotland's carbon reduction ambitions.

On 30 September, the Minister for Green Skills, Circular Economy and Biodiversity set out Scottish Government's intention to appoint an independent chair to undertake the work, and for it to prioritise consideration of national capacity requirements for incineration¹. Dr Colin Church subsequently agreed to take on this task and the review team has started its work under his leadership.

The Review is in the context of Scotland's waste management ambitions and its progress towards meeting them. This Call is therefore seeking evidence on five broad topics:

1. Given Scotland's ambitions and current progress towards these, what capacity is required to manage residual waste in Scotland?
2. What are the options for managing residual waste?
3. What are the economic, environmental and social trade-offs of those residual waste management options?
4. How do we decide where capacity should be located, and in what form?
5. What can be done to improve existing residual waste treatment facilities in terms of carbon performance and societal impact?

The Review will consider these topics in the context of the treatment of household (HH) and commercial and industrial (C&I) waste streams.

The Review will consider options for residual waste treatment beyond incineration, including, but not limited to, landfill, mechanical biological treatment (MBT), and biostabilisation. In this Call for Evidence, the following definitions apply:

- **Incineration** – the thermal treatment of waste with or without the recovery of energy, including advanced thermal treatment processes such as pyrolysis, gasification or plasma methods.
- **Mechanical biological treatment (MBT)** – a group of solid waste management systems, typically used for the pre-treatment of waste, that

¹ [Written question and answer: S6W-03436 | Scottish Parliament Website](#)

combines a sorting facility with a form of biological treatment such as composting or anaerobic digestion. Unless specified, MBT is used in this Call to specifically mean processes that produce a high calorific fuel called Refuse Derived Fuel (RDF), which can be used in cement kilns or power plants.

- **Biostabilisation** – A specific form of MBT which seeks to reduce the biodegradability of mixed wastes for the purpose of landfilling the stabilised waste.
- **Landfilling** - the deposition of the waste onto or into land.
- **Residual waste** – the material left that cannot be reused or recycled and thus must be disposed of safely.
- **Household (HH) waste** – waste generated by households. This includes waste collected through kerbside collections, household collections such as bulky waste collections, waste deposited by householders at household waste recycling centres and recycling points/ bring banks.
- **Municipal waste** - waste from households as well as other waste which because of its nature or composition is similar to waste from households.
- **Biodegradable waste** - any waste capable of undergoing anaerobic or aerobic decomposition such as food, garden waste, paper and cardboard
- **Biodegradable Municipal Waste** - municipal waste that is also biodegradable.
- **Commercial & Industrial (C&I) waste** – waste from commercial and industrial sources. Includes waste from business and industrial premises in Scotland, but excludes waste from the construction and demolition industry.
- **Construction & Demolition (C&D) waste** - waste from the construction and demolition industry.

The Review will not include:

- the incineration of biomass for energy.
- consideration of high-temperature incineration for the treatment of some healthcare and hazardous wastes.
- construction and demolition (C&D) waste streams.
- an in-depth review of health impacts of residual waste treatment.

The Review is seeking to give stakeholders the opportunity to contribute their evidence and views, both through this Call for Evidence and during stakeholder events taking place on 18, 26, and 27 January 2022. Please contact incineration-review@gov.scot for more information on attending these events.

1.2 What does the Call for Evidence cover?

The priority for the Review is an assessment of national capacity requirements (Topic 1) as Scotland moves towards its waste reduction, recycling and circular economy ambitions.

This Call for Evidence seeks your views and evidence on Topics 1-5 and prioritises Topics 1-4 in line with the task we have been set. We intend to also commission separate work to review the options to improve the performance of the existing incineration infrastructure in Scotland (Topic 5). This may take longer than the current Review deadline, in which case we will be limited in what we can say on Topic 5 in our report. However, the Review team will consider all evidence received on this and ensure the evidence is shared with the Scottish Government to inform the separate piece of work.

1.3 How is the Call for Evidence structured?

[Section 3](#) presents a series of questions about you, which will help to contextualise your response to the Call for Evidence.

[Section 4](#) Sets out the policy landscape, including the Scottish Government's targets and ambitions, and provides an overview of waste management in Scotland.

[Section 5](#) Considers the question of what capacity is required to manage residual waste in Scotland, given Scotland's ambitions and current progress towards these (Topic 1).

[Section 6](#) Considers the possible options for managing residual waste in Scotland (Topic 2).

[Section 7](#) Considers the potential economic, environmental and social tradeoffs of the potential residual waste management options in Scotland (Topic 3).

[Section 8](#) Looks at what considerations should be examined in determining where residual waste management capacity should be located (Topic 4).

Section 9 invites any comments on what can be done to improve existing residual waste treatment facilities in terms of carbon performance and societal impact residual waste management in Scotland (Topic 5).

1.4 How to respond to the Call for Evidence

The deadline for responses to this Call for Evidence is 21 February 2022. If you would like to respond but will not be able to do so in the timeframe, please contact incineration-review@gov.scot to discuss.

The best way to respond to this Call for Evidence is through CitizenSpace, which can be accessed at the following link from Monday 20 December:
<https://consult.gov.scot/environment-forestry/incineration-review-call-for-evidence>.

Alternatively, you can also to send your response by email to: incineration-review@gov.scot.

Representation by mail and requests for free of charge paper copies and alternative formats of this document can be sent to:

Incineration Review
C/O Zero Waste Team,
Scottish Government,
3H South, Victoria Quay,
Edinburgh, EH6 6QQ

Any questions about the Call for Evidence can also be sent to incineration-review@gov.scot.

This document can also be accessed from the [website](#).

All responses will be acknowledged, but it will not be possible to give substantive replies to individual representations. We intend to publish a summary of evidence alongside the final report. This may involve publishing your response in full, or as part of a summary of responses.

The most useful contributions to the Review will be evidence that addresses the questions posed, so please do try to focus your contributions on that. This Call for Evidence will inform the Review's report to Scottish Ministers in 2022.

2. Processing of data

This section sets out how the Review team will use your personal data for the purposes of the Call for Evidence and explains your rights under the General Data Protection Regulation (UK-GDPR) and the Data Protection Act 2018 (DPA).

2.1 Purpose - why do we need your information?

The Review team has been commissioned by the Zero Waste Unit in Scottish Government to review the role of incineration in the waste hierarchy in Scotland. We will use the information you provide through the Call for Evidence to gather evidence and opinions from members of the public and representatives of organisations and companies, about the role of incineration in the waste hierarchy in Scotland, an issue of significant public interest.

2.2 Data categories – What data are we collecting?

Personal data

We will process the following information about you, if you volunteer it:

- name
- address
- email address
- phone number
- job title and employer (where applicable), ,
- your opinions and data/information related to questions in the Call for Evidence.

Special category data

The Call for Evidence does not request any Special Category Data. However, it is also possible that Special Category Data (such as information on health conditions) relating to the respondent (you) or a third party, may be volunteered as part of the response to the Call for Evidence.

Any of the categories of special category data may be processed if such data is volunteered as part of the Call for Evidence.

2.3 Processing and legal basis

For the purposes of the UK-GDPR, we will process the information that you include in your correspondence. The personal information collected may relate to you, other members of the public, parliamentarians, and representatives of organisations or companies who respond to this Call for Evidence.

The legal basis for processing this data is 'public task' (Data Protection Act 2018 Article 6 (1) (e)). The processing of the data is necessary for the performance of a task carried out in the public interest. For the purpose of this Call for Evidence, the task is inviting evidence on a departmental policies or proposals or obtaining opinion data in order to develop recommendations for good effective government policies.

Where special category data is volunteered by you and it is not relevant to the review and of substantial public interest, we will delete this data within 1 month of the closing date of the Call for Evidence. Where special data is processed, the legal basis for processing it is the processing is necessary for reasons of substantial public interest for the exercise of a function of the Crown, a Minister of the Crown, or a government department. In this case, this function is consulting on departmental policies or proposals, or obtaining opinion data, to develop good effective policies.

2.4 How we keep your information secure

Information held by the Scottish Government and its representatives is managed effectively by secure systems on secure servers.

Your information will not be shared outside the UK.

2.5 Who we share your responses with

The personal data you send us can be viewed by authorised people in the Scottish government, supplier organisations, agencies and public bodies. This may include a supplier who can assist in reviewing and summarising the evidence gathered.

Information provided in response to this Call for Evidence may be published or disclosed in accordance with the access to information regimes. These are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 2018 (DPA) and the Environmental Information Regulations 2004 (EIR).

If you want the information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals with, amongst other things, obligations of confidence.

It would, therefore, be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding.

Where information about respondents is not published, it may be shared with officials within other public bodies and our contractors involved in this Call for Evidence process to assist us in developing the policies to which it relates.

2.6 How long we will hold your data (Retention)

Personal information in responses to call for evidences will generally be published and therefore retained indefinitely as a historic record under the Public Records Act 1958.

Personal information in responses that is not published will be retained for three calendar years after the Call for Evidence has concluded.

2.7 Your rights

You have the right to:

- access to any [personal data](#) we hold about you, by making a [Subject Access Request \(SAR\)](#).
- request that any inaccuracies in your personal data are rectified without delay.
- request that your personal data are erased if there is no longer a justification for them to be processed.
- in certain circumstances (for example, where accuracy is contested), request that the processing of your personal data is restricted.
- object to the processing of your personal data where it is processed for direct marketing purposes.

- data portability, which allows your data to be copied or transferred from one IT environment to another.

Find out more about your rights on the [Information Commissioner's site](#).

In some circumstances we may not be able to comply with your request. This is because some of these rights are conditional and can only be applied in certain circumstances and/or where there is no compelling reason to continue to process your personal data.

2.8 How to submit a Data Subject Access Request (DSAR)

To request access to personal data that Scottish Government holds about you, contact: dpa@gov.scot.

2.9 Complaints about the use of personal data

If you have any concerns about the use of your personal data, please contact us via this mailbox: DataProtectionOfficer@gov.scot

If we are unable to address your concerns to your satisfaction, you can make a complaint to the Information Commissioner, the UK's independent regulator for data protection. The Information Commissioner can be contacted at:

Information Commissioner's Office,
Wycliffe House,
Water Lane,
Wilmslow,
Cheshire,
SK9 5AF
Telephone: 0303 123 1113
Email: casework@ico.org.uk

Any complaint to the Information Commissioner is without prejudice to your right to seek redress through the courts.

2.10 Contact details

The data controller for any personal data collected as part of this call for evidence is Scottish Government, the contact details for which are: incineration-review@gov.scot.

The contact details for Scottish Government's Data Protection Team are: dpa@gov.scot.

3. About you

Providing data about yourself helps to contextualise your response to the Call for Evidence and will support the Review in drawing accurate conclusions from all of the evidence submitted.

When replying to the Call for Evidence, please ensure that you answer the following questions:

Q1. What is your name?

Q2. What is your email address?

Q3. Which category in the following list best describes you?

- i. Business that operates one or more incineration facilities in Scotland
- ii. Business that operates one or more incineration facilities outside of Scotland
- iii. Business that operations other (non-incineration) residual waste treatment facilities in Scotland
- iv. Business that operations other (non-incineration) residual waste treatment facilities outside of Scotland
- v. Business that does not operate a residual waste treatment site but produce waste that ultimately is treated at one
- vi. Professional body, trade organisation or governing body
- vii. Environmental group
- viii. Local government
- ix. Community group
- x. Academic or research
- xi. Individual
- xii. Other (please state)

Q4. If you are replying on behalf of a business or representative organisation, please provide the name of the organisation/sector you represent, where your business is located, and an approximate size/number of staff (where applicable).

Q5. If you are an organisation, please be aware that your response may be published with your organisation's name. If you are responding as an individual, please indicate if you give permission for your response to be published, without your name or email address, as part of the review. If there are elements of your response which would wish to remain confidential, please make this absolutely clear

within your answer. You can make this clear by writing 'confidential' at the start of your response.

Q6 . Does the Review Team have permission to contact you about your response?

4. Policy landscape and background to waste management in Scotland

Targets and ambitions

The Scottish Government has set out a range of waste reduction and recycling targets². By 2025, Scotland aims to:

- reduce total waste arising in Scotland by 15% against 2011 levels
- reduce food waste by 33% against 2013 levels
- recycle 70% of the remaining waste
- send no more than 5% of remaining waste to landfill
- end the practice of landfilling biodegradable municipal waste (BMW) in Scotland by 2025.

In addition, the Scottish Government has agreed to extend the ban on landfilling BMW to include biodegradable non-municipal waste, subject to appropriate consultation and work to provide assurance around some specific waste streams³.

The Climate Change Plan³ sets out an ambition to reduce greenhouse gas emissions from the waste sector (excluding emissions from incineration for energy from waste) from around 1.9 million tonnes of carbon dioxide equivalent (MtCO_{2e}) to 1.2MtCO_{2e} per year by 2025, and to 0.8 MtCO_{2e} per year by 2030.

Where is Scotland now?

Waste Arisings

The latest official statistics that are available⁴ suggest that around 11.45 Mt of waste were generated in Scotland in 2018. Of this, 2.4 Mt is household (HH) and 3.2 Mt is commercial and industrial (C&I) wastes, with most of the rest being construction & demolition (C&D) waste. This is a reduction of 4.2% since 2011 (Figure 1). While there has been a general reduction in HH (7% between 2011 and 2018) and C&I waste (22% between 2011 and 2018), the amount of C&D waste generated fluctuates year on year, but has recently risen in line with economic activity.

² [Managing waste - gov.scot \(www.gov.scot\)](https://www.gov.scot)

³ [Update to the Climate Change Plan](#)

⁴ [Waste data reporting | Scottish Environment Protection Agency \(SEPA\)](#) (Waste from All Sources 2018, Household Waste Statistics 2020, Waste Landfilled 2020, Waste Incinerated 2020)

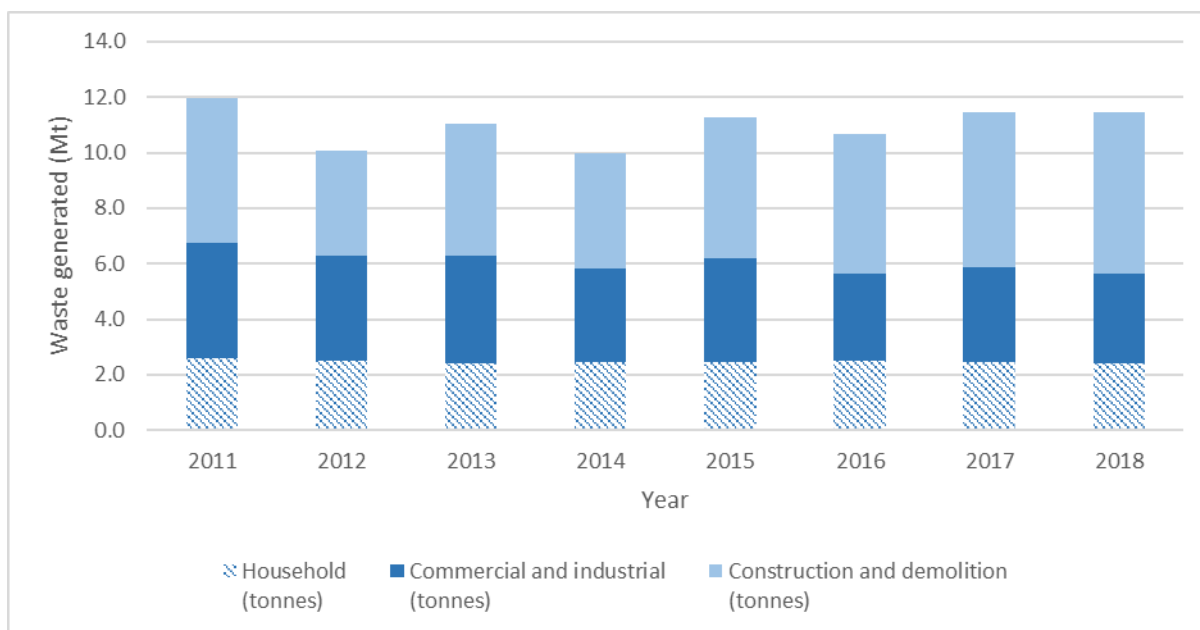


Figure 1. Waste generated in Scotland by category

Recycling

In 2018, Scotland recycled 60.7% of waste from all sources, around 7.07 Mt of the waste produced. This was an increase of 1.1 percentage points from the 59.6% recycled in 2017⁵. For 2020, the HH waste recycling rate was 42.0% a decrease of 2.9 percentage points from the 44.9% rate achieved in 2019⁶.

Landfill: All Waste

The total amount of waste disposed of to landfill has generally decreased steadily since 2007. In 2020, Scotland sent 2.6 Mt to landfill, a reduction of 390,000 tonnes (13%) from 2019 and a reduction of over 4.4 Mt (63%) from 2005⁷. There was a modest (2.8%, 21,000 tonnes) reduction in HH and similar wastes landfilled in 2020 compared with 2019, partly due to a decrease in the amount of this waste material category available for disposal and partly due to a change in the management of these wastes over the last few years⁷.

Landfill: Biodegradable Municipal Waste⁸

The amount of biodegradable municipal waste (BMW) disposed of in landfill has also followed a decreasing trend (Figure 2). In 2020, the amount of BMW disposed to

⁵ [waste-from-all-sources-summary-document-and-commentary-text-2018.pdf \(sepa.org.uk\)](https://sepa.org.uk/waste-from-all-sources-summary-document-and-commentary-text-2018.pdf)

⁶ [2020-household-statistics-commentary-final-v2b-002.pdf \(sepa.org.uk\)](https://sepa.org.uk/2020-household-statistics-commentary-final-v2b-002.pdf)

⁷ [2020-waste-landfilled-in-scotland-release.pdf \(sepa.org.uk\)](https://sepa.org.uk/2020-waste-landfilled-in-scotland-release.pdf)

⁸ Note the BMW landfilled calculated to report against the EU target is calculated differently to the BMW landfilled in Section 4 Topic 1: Capacity Analysis. For details see [zero_waste_plan_recycling_guidance1.pdf \(wastedataflow.org\)](https://wastedataflow.org/zero_waste_plan_recycling_guidance1.pdf)

landfill was 691,000 tonnes. This is a reduction of 8,000 tonnes (1.1%) from 2019 and 1.3 Mt from 2005, exceeding the EU target to landfill less than 1.26 Mt BMW by 2020⁷.

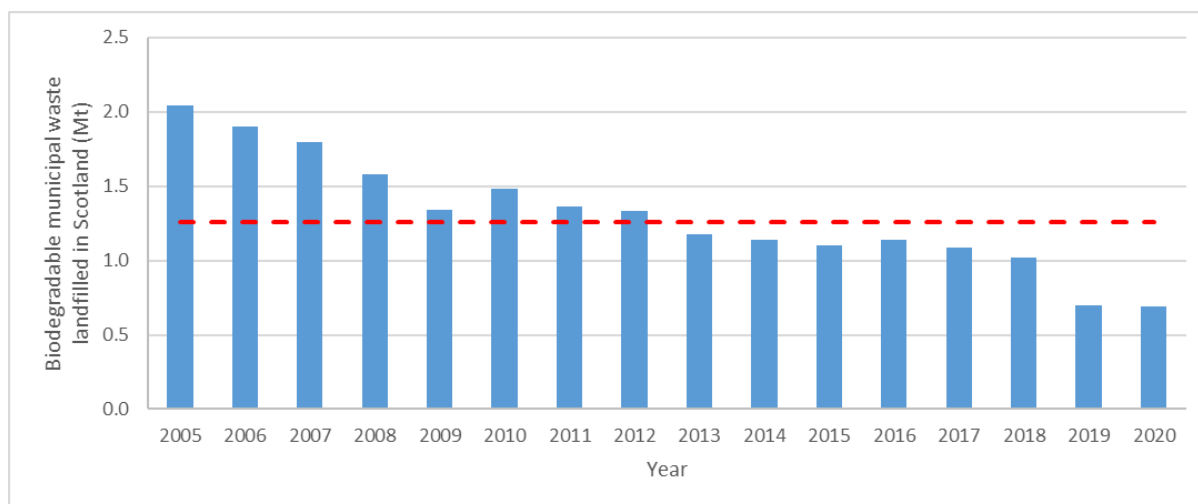


Figure 2. Biodegradable municipal waste (BMW) landfilled in Scotland since 2005. The red dashed line shows the 2020 EU target for Scotland to landfill less than 1.26 Mt of BMW.

Incineration

The total quantity of waste incinerated in Scotland in 2020 was 1.26 Mt, an increase of 0.38 Mt (3.1%) from 2019, consistent with the longer term trend of an increase of 0.86 Mt (208%) from 2011. There was a 6.0% (20,000 tonnes) increase of HH and similar wastes incinerated in 2020. At least one municipal incineration site has reported an increase in these wastes being due to an increase in municipal waste arising from the COVID-19 pandemic.

Carbon emissions

Carbon emissions from waste management (excluding from incineration) declined significantly from 6.1 MtCO_{2e} per year in 1995 to 1.4 MtCO_{2e} per year in 2013, and have remained relatively stable in recent years, with a value of 1.5 MtCO_{2e} in 2019.

The carbon impact⁹ of HH waste in 2020 was 5.8 MtCO_{2e}, an increase of 179 ktCO_{2e} (3.2%) from 2019, and a reduction of 0.92 MtCO_{2e} from 2011¹⁰.

⁹ The carbon impact is a measure of the whole-life carbon impacts of waste, from resource extraction and manufacturing emissions, right through to waste management emissions.

¹⁰ [2020-household-statistics-commentary-final-v2b-002.pdf \(sepa.org.uk\)](https://sepa.org.uk/2020-household-statistics-commentary-final-v2b-002.pdf)

Summary

- The HH and C&I waste generated has generally been declining.
- Scotland's recycling rate in 2018 was 42.0% for HH waste and 60.7% for all waste.
- The amount of waste disposed of to landfill has generally decreased steadily since 2009, including BMW.
- There has been an increasing trend in waste incinerated since 2011.
- The carbon impact of HH wastes has generally decreased since 2011.

5. Topic 1: Capacity Analysis

In light of the ban on sending biodegradable municipal waste (BMW) to landfill, by 2025, Scottish Government, through ClimateXChange (CXC)¹¹, commissioned work to assess the residual waste capacity required to treat Scotland's residual waste.

The work also considers the impact of extending the ban on landfilling biodegradable waste to C&I waste streams in light of Scottish Government's commitment to extend the ban to biodegradable non-municipal waste streams¹².

This work is due to be published by CXC during the course of the Review and our analysis will be updated accordingly. In the meantime, we are presenting a draft version of the initial analysis here to give an indication of the current evidence to help identify gaps where additional data from stakeholders could add value to the analysis. It should not therefore be taken as the final version and figures and estimates cannot be used or reproduced as such.

A full methodology is available in Annex 1. Briefly, the most recent Waste from All Sources data available (2018)¹³ is used to consider three scenarios:

- A baseline scenario, where the waste produced fluctuates only with economic activity and the proportion of household (HH) and commercial and industrial (C&I) waste recycled remain at 2018 levels.
- An 'approaching targets' scenario where the amount of HH and C&I waste produced reduces by 7.5% of 2011 levels, and 59% of each waste stream is recycled. This scenario is similar to the scenario considered by the Waste Markets Study in 2019¹⁴.
- An 'achieves targets' scenario, where the amount of HH and C&I waste produced reduces by 15%, and the recycling rates achieve 70%¹⁵.

Each scenario is split into two showing the waste considered to be captured by the BMW ban (Scenarios 1a, 2a, 3a), and the waste captured under the extended ban (Scenarios 1b, 2b, 3b). Scenarios 1a, 2a, and 3a are shown below (5.1), and the extended ban scenarios are summarised below (5.2).

¹¹ [ClimateXChange | Scotland's Centre of Expertise on Climate Change](#)

¹² [Securing a green recovery on a path to net zero: climate change plan 2018–2032 - update - gov.scot \(www.gov.scot\)](#)

¹³ [Waste data for Scotland | Scottish Environment Protection Agency \(SEPA\)](#)

¹⁴ Scotland may still achieve the targets under this scenario depending on the generation and recycling of C&D waste

¹⁵ Scotland may fall short or exceed the targets under this scenario depending on the generation and recycling of C&D waste.

All scenarios assume that:

- the market for refuse derived fuel (RDF) will continue and around 0.4 Mt of material will be processed through this route and treated outside of Scotland.
- the facilities producing RDF are producing this to export this waste out of Scotland.
- all biodegradable waste captured under each ban (see Annex 1) will be diverted away from landfill.
- no hazardous waste is incinerated in facilities accepting municipal and C&I waste.
- incineration facilities operate at 95% of their permitted capacity, and all those in the pipeline are built and become operational by 2025.

5.1 BMW capacity analysis results

Baseline Scenarios

Baseline scenario 1a assumes that Scotland continues with 'business as usual' including the BMW landfill ban, and the results are shown in Figure 3. In 2025, the total waste quantities are estimated to increase to approximately 2.63 Mt and 2.37 Mt for the materials included within the scope of the landfill ban. This is due to the increase in waste growth and stagnation of recycling rates as outlined within the scenario assumptions.

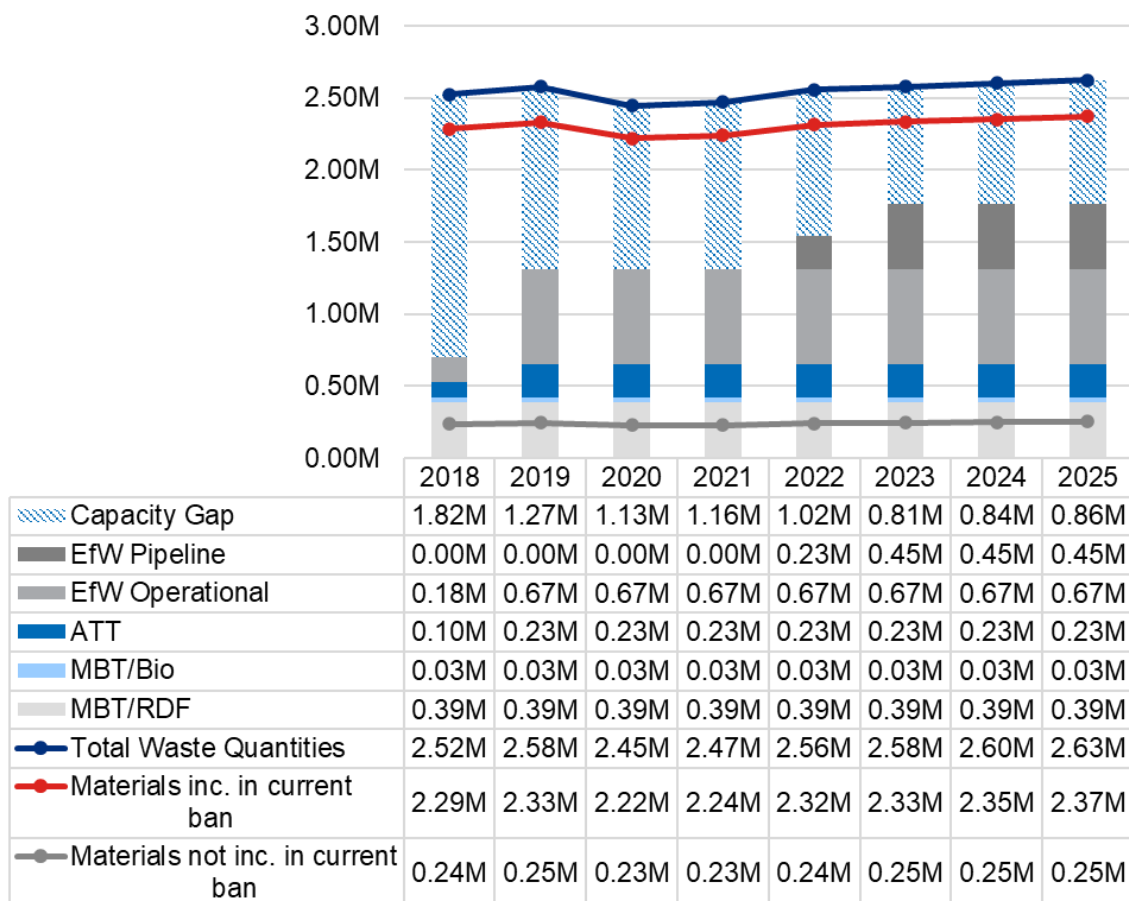


Figure 3. Baseline Scenario 1a – ban on sending biodegradable municipal waste to landfill by 2025

Under this scenario, the results indicate that a capacity gap will be evident when the landfill ban is due to be implemented in 2025. This capacity gap equates to approximately 0.60 Mt for the materials included within the current BMW ban. This capacity gap is still evident in 2025 despite pipeline infrastructure due to become operational and phased in from 2022.

Approaching targets scenario

The *approaching targets scenarios* assume Scotland progresses around half-way towards the targets (when compared to the *baseline scenario*). The overall waste reduction and recycling targets could be met depending on the amount of construction and demolition (C&D) waste generated and recycled.

Scenario 2a (Figure 4) shows the results of applying these assumptions alongside a ban on landfilling BMW by 2025. The waste quantities after 2018 are projected to decrease to approximately 2.15 Mt for the total waste quantities and approximately 1.90 Mt for the materials under the scope of the current BMW landfill ban.

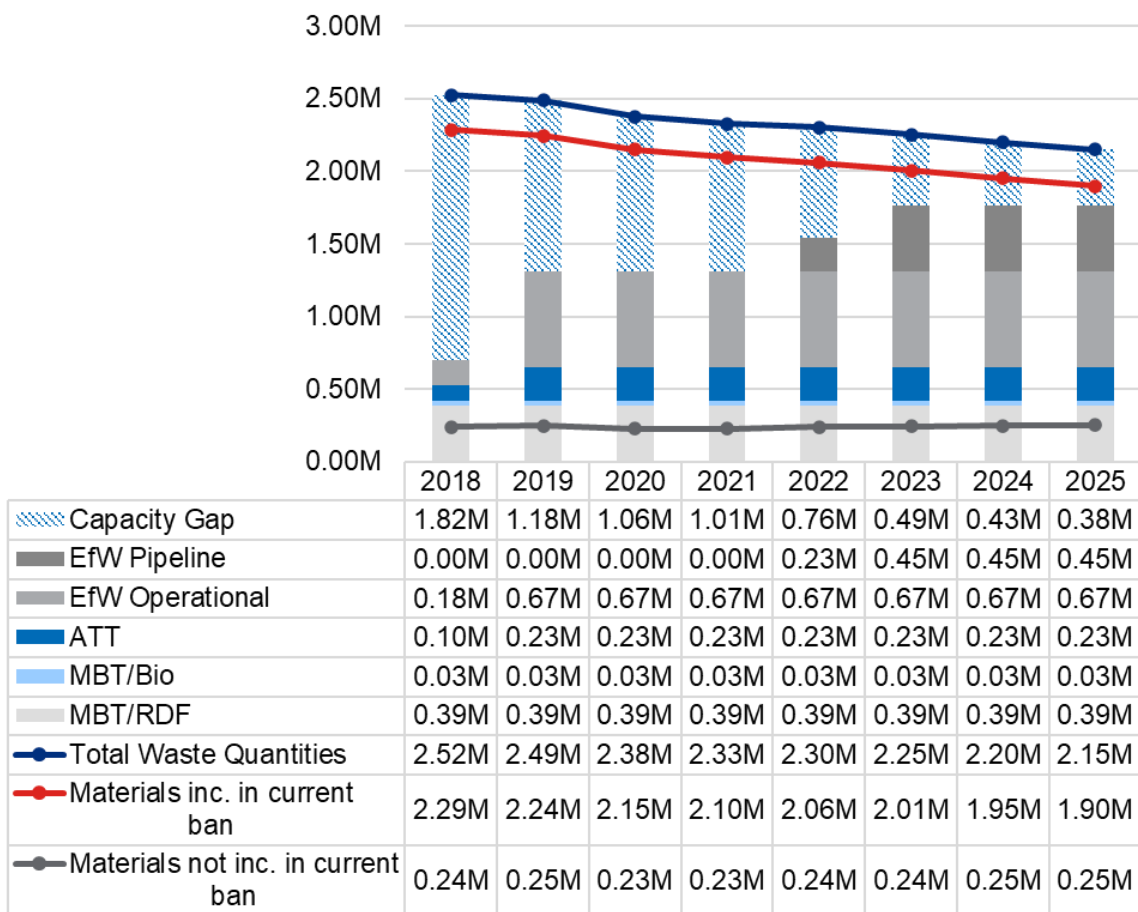


Figure 4. Approaching targets scenario 2a - biodegradable municipal waste banned from landfill by 2025

Under this scenario, a capacity gap is estimated for 2025 when the BMW landfill ban is due to be implemented. The capacity gap is approximately 0.13 Mt for the materials within the scope of the current BMW ban.

Achieving targets scenarios

The *achieving targets scenarios* assume Scotland achieves its policy targets. These policy targets are applied to HH and C&I waste only (i.e. excluding construction and demolition waste) for this analysis. The results of these assumptions applied alongside a ban on BMW (Figure 5) are shown below. The total waste quantities show a decrease to approximately 1.53 Mt in 2025 within this scenario. This is as a result of achieving the waste reduction targets and increased recycling as outlined within this scenario. For the materials within the scope of the BMW ban, this decreases to approximately 1.28 Mt in 2025.

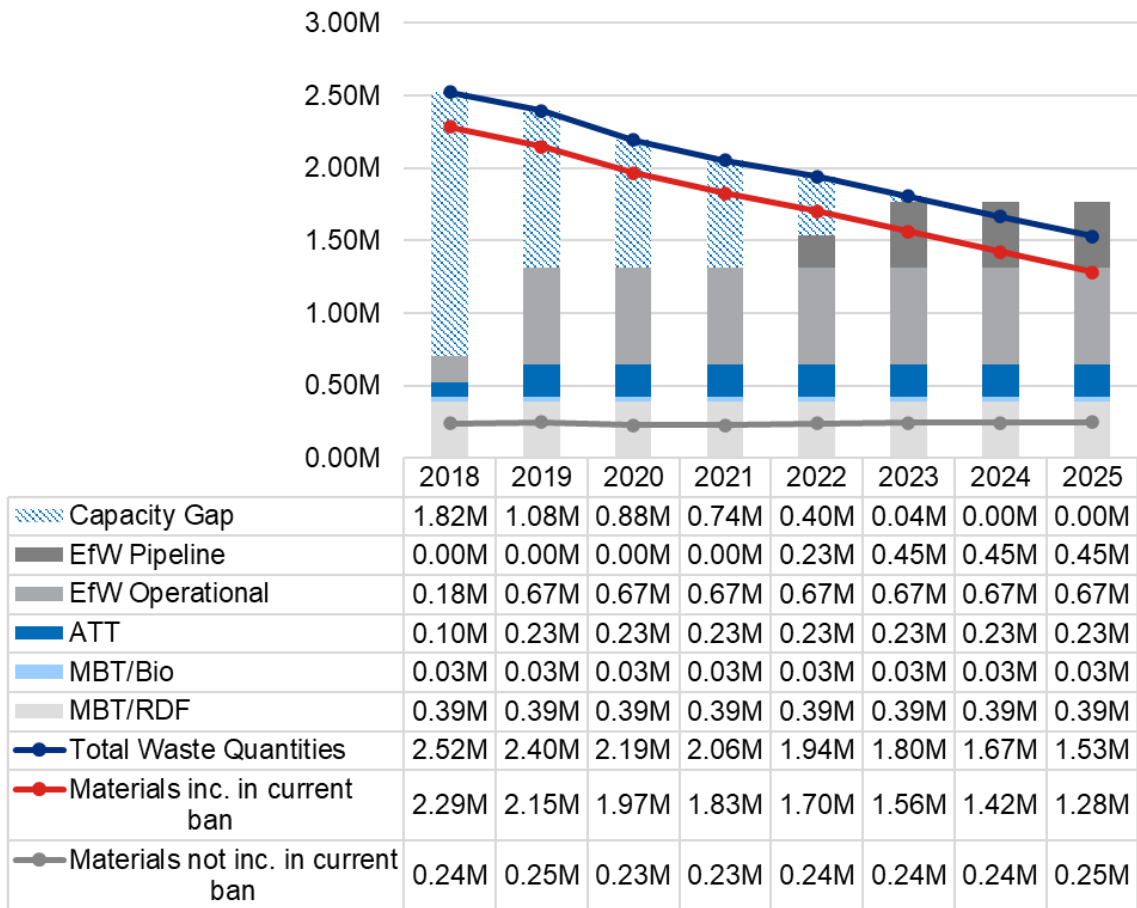


Figure 5 Achieving targets scenario 2a, biodegradable municipal waste banned from landfill by 2025

Figure 5 suggests that there could be an excess capacity of around 0.49 Mt from 2024 onwards. Therefore, under this scenario where all policy targets are achieved, the results indicate that there would be sufficient treatment capacity to meet the waste captured under the ban, assuming all pipeline treatment infrastructure (see Annex 1) becomes and remains operational.

Summary and questions

Table 1 provides a summary of the potential differences in infrastructure capacity and residual waste.

Table 1. Summary of capacity gap for the biodegradable municipal waste to landfill ban in 2025

2025 Capacity Gap Summary	Baseline	Approaching Targets	Achieving Targets
Total waste quantities	0.86 Mt	0.38 Mt	-0.23 Mt
Materials within scope of the ban	0.61 Mt	0.13 Mt	-0.48 Mt

However, there remains a number of uncertainties in the analysis which additional evidence and information could help clarify.

Q7 How much capacity do you think we need to build given the current waste produced, managed and disposed of in Scotland, as well as Scotland's waste and recycling targets? What evidence do you have to support this?

Q8 It is suggested that the development of incineration capacity could lead to a 'lock-in' effect which will prevent waste from moving further up the hierarchy to be reused or recycled. What evidence do you have about these valid concerns? How do we prevent this lock-in effect, if it is a real risk?

5.2 Extending the ban capacity analysis

The analysis also considers the impact of expanding the ban to include biodegradable C&I waste streams. In general, there is only a small impact of including C&I waste streams, with an increase of around 0.04 Mt of waste captured under the ban in 2025 for all scenarios. For the baseline, approaching targets and achieving targets scenario, the capacity gap would become 0.66 Mt, 0.18 Mt, and -0.43 Mt in 2025.

C&D waste has not been included in this analysis to date. However, if Scottish Government do extend the ban to include non-municipal sources some C&D wastes are likely to be captured by that ban, particularly processing fines and sorting residues. There is a high level of uncertainty around the composition of sorting residues, such as the biodegradability, particularly from C&D sources. The Review

would therefore welcome additional information on the composition of mixed sources of C&D waste that could be captured by the extended ban.

We are aware of a range of potential data gaps and sources of uncertainty in the data and modelling approach. These include:

- Compositional analyses, particularly of mixed waste streams such as sorting residuals.
- Data on C&I waste streams.
- The suitability of waste streams to be diverted from landfill – for example, landfill may represent the best environmental outcome for some biodegradable non-municipal waste streams.

Q9 Are you aware of any evidence or data that could be used to improve the capacity analysis? It would be particularly helpful if you could provide us with data on:

- HH and C&I waste composition.
- C&I waste arisings, recycling and treatment.
- The potential developments of future RDF export markets.
- composition and biodegradability of sorting residues from HH, C&I and C&D waste.

6. Topic 2: Management Options

In Scotland, the residual waste treatment options currently consist of:

- 45 operational and 224 closed landfill sites.
- Six incineration facilities which are permitted to accept municipal waste, with three in construction.

Several reports have suggested alternative residual waste treatment routes include:

- MBT (as a pre-treatment to incineration in Scotland or to export).
- Biostabilisation (as a pre-treatment to landfill).

In July 2021, Zero Waste Scotland published a report, the Climate Change Impacts of Burning Municipal Waste in Scotland¹⁶. This suggested that incinerating municipal waste in Scotland resulted in 27% fewer emissions than landfilling the same waste. The report also included a hypothetical scenario which suggested that biostabilisation of waste could result in lower emissions.

However, there are gaps in our knowledge about the feasibility of biostabilisation in Scotland. Zero Waste Scotland has commissioned research on this, but we would particularly welcome robust evidence around:

- case studies of biostabilisation working well
- the levels of biodegradability of the biostabilised waste
- whether it is possible for biostabilised waste to achieve the (low) levels of biodegradability necessary to allow landfilling of this waste post 2025.¹⁷

In addition, there is a range of incineration technologies which may provide alternatives to traditional 'mass burn' technologies, and alternative outputs (e.g. syn gas, hydrogen) from these technologies which could reduce the carbon impacts of incineration.

Q10 What treatment options for residual waste should Scotland consider?

We are mindful that some rural and island communities may face particular challenges in treating the residual waste they produce. These challenges may arise due to the location of residual waste treatment options, as well as the small volumes of waste, relative to urban areas, that are generated in rural areas. We are therefore interested in evidence of emerging technologies or approaches which could work on a small scale to support such communities.

¹⁶ [The climate change impact of burning municipal waste in Scotland | Zero Waste Scotland](#)

¹⁷ The Landfill (Scotland) Regulations 2003 as amended by the Waste (Scotland) Regulations 2012

Q11 What emerging technologies are there for small scale residual waste treatment to support remote and island communities?

7. Topic 3: Economic, Environmental and Social Trade-offs

Identifying the appropriate options for the treatment of residual waste will require consideration of a range of trade-offs between several factors including feasibility, cost, environmental impact and societal impact.

7.1 Costs

While the costs of each residual waste treatment option are likely to vary significantly depending on individual circumstances, such as location, there are some general factors that influence the cost of treatment.

In general, residual waste treatment facilities operate on a gate fee model, where a weight-based fee is charged for waste received at a facility. Although there is a range of gate fees across treatment types, a recent report indicates that median gate fees in 2020 were around £93/tonne (range: £48 - £150) for energy from waste (UK figure) and £30/tonne (range: £10 - £93) for Scottish landfill sites¹⁸. Deposits at landfill sites in Scotland are also subject to Scottish Landfill Tax. Scottish Landfill tax is charged by weight based on two rates, a standard rate (£96.10/tonne) and a lower rate (£3.10/tonne) for less polluting materials (referred to as qualifying materials)¹⁹.

We are not aware of any recent estimates of gate fees for MBT facilities, although a 2017 report²⁰ notes that 'the 5 authorities with the most expensive total waste management cost per tonne of Residual Waste had primarily contracted an MBT based Residual Waste solution' and estimated gate fees were higher (£125 - £135/tonne) than previously reported²¹ (£88/tonne).

The Review would welcome Scotland-specific data on the costs associated with residual waste treatment, as well as the costs associated with other options that are not widely operational in Scotland, such as biostabilisation.

Q12 What data can you share with the Review on the costs of operating any options for managing residual waste in Scotland, especially costs based on real experience?

In addition to the costs of managing waste, there are wider costs associated with different waste treatment options. For example, the aftercare of landfills is necessary

¹⁸ [Gate Fees report 2020 | WRAP](#)

¹⁹ [Taxes: Scottish Landfill Tax - gov.scot \(www.gov.scot\)](#)

²⁰ [Tolvik-2017-Briefing-Report-Mechanical-Biological-Treatment.pdf](#)

²¹ [Gate Fees report 2017 | WRAP](#)

to mitigate the environmental impacts of sites after closure. In addition, there are other costs associated with closed landfills, for example, remediation costs associated with erosion of landfills near river banks. The Review, therefore, would welcome evidence and experiences on the wider costs that should be considered, particularly examples of where these costs have been realised.

Q13 What data can you share with the Review on the wider costs associated with options for managing residual waste in Scotland, especially where those costs have materialised?

7.2 Environmental impacts

The impact of residual waste treatment on the environment depends on the chosen technology and on how it is operated. The Review would welcome evidence around what these impacts are and, where possible, the quantification of these impacts. A Zero Waste Scotland report²² suggests that incinerating municipal waste in Scotland resulted in 27% fewer greenhouse gas (GHG) emissions than landfilling the same waste. Other, UK-level reports have supported this hierarchy, for example, a 2021 report noted that incineration (without pre-treatment) produces less GHG per tonne of waste treated today than landfill (without pre-treatment and biostabilisation)²³. Importantly, estimates of carbon impacts are particularly sensitive to changes in residual waste composition and the scope of the analysis (e.g. whether biogenic carbon is included or excluded from the analysis).

In addition, several reports^{22,23} have highlighted the potential of pre-treatment to remove recyclable materials, as a pre-cursor to landfill or incineration, as well as biostabilisation of waste as potential options to reduce the carbon impact of residual waste treatment.

Q14 Do you have any evidence that the Review should consider in comparing the carbon impacts of options for residual waste treatment? E.g. compositional analyses of waste streams, case studies, or reports on carbon impact.

There are other environmental risks from the treatment of municipal waste, such as emissions to air and water. Emissions from waste treatment sites are monitored and

²² [The climate change impact of burning municipal waste in Scotland | Zero Waste Scotland](#)

²³ [Greenhouse-Gas-and-Air-Quality-Impacts-of-Incineration-and-Landfill-v2.2-ozpmkl.pdf](#)

reported on by SEPA²⁴. In terms of environmental compliance, of the six sites accepting municipal waste for incineration in 2018 SEPA classified five as having 'Excellent' or 'Good' levels of compliance and one had 'Very poor' compliance²⁵. Of the 179 licenced landfill sites (both accepting waste and closed) in Scotland in 2018, 149 had 'Excellent' or 'Good' compliance, four were 'Broadly compliant and 26 were 'At risk', 'Poor' or 'Very Poor' levels of compliance.

Q15 What other aspects should the Review consider when assessing the environmental impacts of residual waste treatment options?

Q16 Do you have any evidence that the Review should consider in comparing the other (non-climate) environmental risks of options for residual waste treatment in Scotland?

7.3 Societal implications of residual waste treatment

The Review would like to consider the negative and positive implications for society arising from the choice of residual waste treatment.

For example, we understand that regulators receive a significant number of complaints about landfill sites and fewer about incineration facilities from the communities living near these sites. However, this may be due to the greater number of communities and people living close to landfill sites compared with incineration facilities. We would, therefore, particularly welcome any additional evidence on complaints, for example, evidence on the impacts on how people view their community, or the satisfaction that people get from their community, as well as noise and odour complaints related to residual waste treatment facilities.

Q17 Do you have evidence or experience of the community impacts (positive and negative) of different residual waste treatment options, e.g. landfilling compared to incineration, that you could share?

In terms of health, for modern incineration facilities, the evidence suggests that any potential adverse effects on health are likely to be very small.

In 2009, a review by Health Protection Scotland and SEPA noted that:

²⁴ For example, see [Scottish Pollution Release Inventory \(sepa.org.uk\)](https://sepa.org.uk/scottish-pollution-release-inventory)

²⁵ [Compliance Assessment Scheme - Assessment Reports \(sepa.org.uk\)](https://sepa.org.uk/compliance-assessment-scheme-assessment-reports)

- any risk to human health associated with newer incinerators, operated within the current regulations, which are based on a precautionary approach, is likely to be minimal and very difficult to detect.
- some recent (relative to the 2009 review) work suggested that there may have been an association between some airborne emissions from industrial, clinical and municipal waste incinerators in the past before more stringent regulatory requirements were implemented. However, this evidence is not completely conclusive and is inconsistent with other previous work.
- the magnitude of any health effects on residential populations living near incinerators in the past, if it occurred, is likely to have been very small.
- due to stricter legislative controls and improved technology, the levels of airborne emissions from individual incinerators should be lower now than in the past. Hence, any risk to the health of a local population living near an incinerator, associated with its emissions, should now be lower.

More recently, there have been several studies on the health impacts of incineration, from the Small Area Health Statistics Unit (SAHSU) at Imperial College London²⁶. Following the publication of the most recent study, which included data on an incineration facility in Scotland, Public Health England noted that its risk assessment remains that

*'modern, well run and regulated municipal waste incinerators are not a significant risk to public health. While it is not possible to rule out adverse health effects from these incinerators completely, any potential effect for people living close by is likely to be very small'*²⁷.

Public Health England note that its view is based on detailed assessment of the effects of air pollutants on health and on the fact that these incinerators make only a very small contribution to local concentrations of air pollutants²⁷.

However, one study suggests that there has not been enough time for adverse effects of modern incineration facilities to emerge²⁸.

²⁶ [Estimating Particulate Exposure from Modern Municipal Waste Incinerators in Great Britain | Environmental Science & Technology \(acs.org\)](#)
[Fetal growth, stillbirth, infant mortality and other birth outcomes near UK municipal waste incinerators: retrospective population based cohort and case-control study - ScienceDirect](#)

[Risk of congenital anomalies near municipal waste incinerators in England and Scotland: Retrospective population-based cohort study - ScienceDirect](#)

²⁷ [PHE statement on modern municipal waste incinerators \(MWIs\) study - GOV.UK \(www.gov.uk\)](#)

²⁸ [The health impacts of waste incineration: a systematic review - Tait - 2020 - Australian and New Zealand Journal of Public Health - Wiley Online Library](#)

In comparison to landfill, a recent systematic review²⁹ suggests that emissions from, and therefore health risks associated with, incineration facilities using RDF as a feedstock are lower than landfill.

Q18 Do you have evidence (reports, studies, data) that could help to inform consideration of the public health implications of different treatment options?

²⁹ [The health impacts of waste-to-energy emissions: a systematic review of the literature - IOPscience](#)

8. Topic 4: Location Considerations

When deciding where to locate any necessary residual waste treatment capacity, it will be important to consider a range of factors such as population density, transport networks, energy supplies, etc. We are interested in understanding what you consider the main issues are that should be looked at in this context.

Q19 What are the main considerations in deciding where capacity should be located, and in what form?

9. Topic 5: Improving Existing Facilities

The Review will be considering, through a separate piece of work, what the potential options are to decarbonise the residual waste infrastructure that is already in place in Scotland. This includes incineration facilities that are operational or likely to be constructed by 2025, as well as operational and recently closed landfill sites. The Review would therefore welcome any evidence you may have to feed into that work.

Q20 Do you have evidence to support consideration of options to decarbonise the current residual waste treatment infrastructure in Scotland?

Q21 Do you have evidence of the main barriers and drivers of decarbonisation of this infrastructure?

10. ANNEX 1 – Methodology for the Capacity analysis

The modelling undertaken for this project was broken down into a four-stage approach which is outlined below, with further detail on each item provided within the following sections.

- Waste forecasting – examining how waste arisings may change in the future under different scenarios.
- Capacity gap modelling – examining how much waste is recycled and composted and, for the remaining waste quantities, how this compares to the available capacity of treatment infrastructure (current and planned).
- Carbon modelling – examining the impacts of the modelled scenarios with relation to their associated carbon footprints.
- Calorific value modelling – examining the calorific value of the remaining residual waste under the modelled scenarios.

The approach is similar to that used in the Waste Markets Study³⁰ undertaken in 2018, which used 2016-2017 waste data to forecast future waste arisings, recycling and residual waste quantities. Whereas the previous Waste Markets Study examined exports to energy from waste (EfW) facilities and landfills outside Scotland, this report focuses on Scotland managing all its waste within Scotland. Additionally, this report uses more recent data (2018 data) and does not examine the opportunities and costs related to exporting RDF.

10.1 Modelled Scenarios

Through discussion with the project steering group the following scenarios were modelled:

- **Scenario 1: Baseline** – where current performance would continue as ‘business as usual’.
- **Scenario 2: Approaching Targets** – where performance is improved beyond business as usual but only reaches half-way to the targets.
- **Scenario 3: Achieving Targets** – where all applicable waste performance targets are met.³¹

Each scenario was broken down further into two (i.e., Scenario 1a and 1b etc.) to allow for comparative analysis between the BMW ban and the extended biodegradable non-municipal waste bans under the different scenarios. outlines the details and key assumptions within each of these scenarios.

³⁰ [Scottish Government, Waste Markets Study, Full Report](#)

³¹ [Scottish Government, Managing Waste](#)

The Scottish Government's waste reduction and recycling targets encompass all three major waste sources (household, commercial and industrial (C&I), and construction and demolition (C&D)). This project focused only on Household and C&I waste due to two reasons:

- a) C&D waste is low in biodegradable content, which was the focus of this project.
- b) C&D waste historically has very high recycling rates compared with Household and C&I waste.

Therefore, the modelling has sought to reach overall recycling targets without "assistance" from C&D recycling contributing to the overall recycling rates. This means that if C&D recycling is included, Scenarios 2 and 3 would likely exceed the predictions in this report.

Table 2: Modelled scenario assumptions

	Baseline (Scenarios 1a and 1b)	Approaching Targets (Scenarios 2a and 2b)	Achieving Targets (Scenarios 3a and 3b)
Total waste arisings	No waste reduction, arisings follow the growth assumptions in Section 10.2	Reduction in total waste arisings by 7.5% (compared to 2011 levels) by 2025	Reduction in total arisings by 15% (compared to 2011 levels) by 2025
Food waste arisings	No food waste reduction target applied, follow the 'total arisings' trend	Reduction in food waste by 16.5% (compared to 2013 levels) by 2025	Reduction in food waste by 33% (compared to 2013 levels) by 2025
Recycling and Composting	Recycling rate remains at current level (48.6% across household and C&I)	Recycle 59% of remaining (household and C&I) waste by 2025	Recycle 70% of remaining (household and C&I) waste by 2025
Waste to landfill	Current proportion of waste to landfill (36.7%) continues	No more than 16-18% of remaining waste to landfill; diversion of all BMW from landfill (BMW landfill ban)	No more than 5% of remaining waste to landfill; diversion of all BMW from landfill (BMW landfill ban)

10.2 Waste Forecasting and Capacity Gap Analysis

Modelling Approach

For the waste forecasting and capacity gap modelling, Ricardo utilised an existing Residual Waste Model previously developed for the Scottish Government in 2015. This approach was undertaken as the model has already been verified and validated by the Scottish Government and provided trusted results.

The waste forecasting and capacity gap modelling approach is summarised in Figure 6: Waste forecasting and capacity gap modelling approach. The existing model was updated with the latest available data, which was for 2018, which is referred to as the 'baseline' year throughout this report. The relevant waste growth rates were then updated and applied to the baseline data.

Following the update to the baseline waste quantities and assumptions, a new component was added to the model to progress towards the waste targets outlined in scenarios 1 and 3. Additionally, facility capacity information (facility type, status, year of commissioning, throughput capacity etc.) was reviewed and updated.

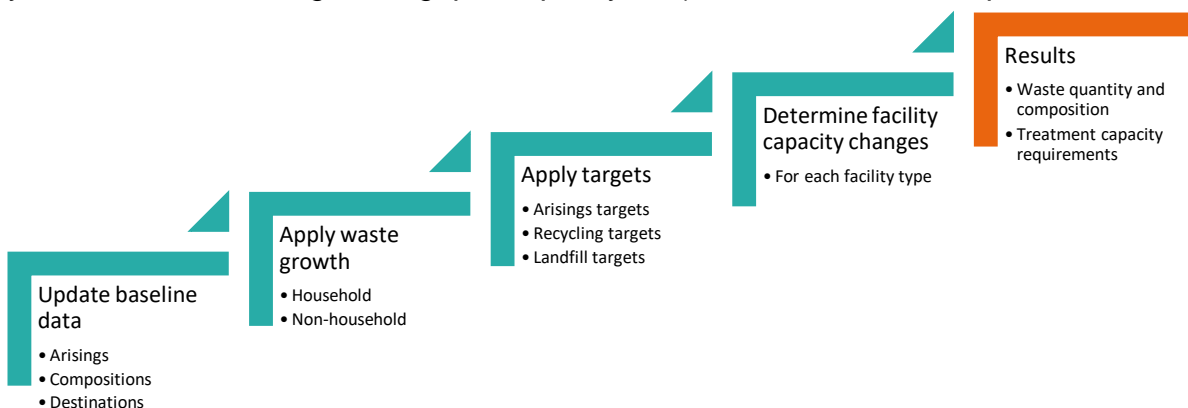


Figure 6: Waste forecasting and capacity gap modelling approach

10.3 Data and Assumptions

The existing Residual Waste Model relies upon numerous data sources and assumptions, which are detailed in the following sections.

Arisings, Composition and Destinations

The waste arisings and compositions are based upon 2018 data from the Scottish Environmental Protection Agency (SEPA)^{32,33}. The arisings data excludes hazardous waste, as advised by the project steering group. The waste destinations (i.e., how much of each material is recycled, landfilled etc.) was derived using SEPA data for household waste³³ and the Scottish Carbon Metric (SCM) data from Zero Waste Scotland for commercial and industrial waste³⁴.

The resulting baseline waste quantities for 2018 were applied consistently across all the modelled scenarios for the baseline year.

Waste Growth

The following growth assumptions were applied consistently to all scenarios:

- Household waste arisings - growth as per the Scottish Government population projections³⁵.
- Commercial and Industrial (C&I) waste arisings - growth as per estimated Scottish GDP growth³⁶.

Waste Reduction Targets

Scottish Government waste reduction targets have been based on 2013 data³⁷ for food waste targets and 2011 data for total waste arisings targets³⁸. Ricardo liaised closely with the steering group to confirm assumptions around particular material streams in the baseline data, in preparation for the scenario modelling, as follows:

1. **Food waste arisings reduction target:** SEPA indicated that the quantity of food waste in the published 2013 SEPA data (246k tonnes in the 'Animal and mixed food waste' material line) was too low. SEPA suggested that additional food waste could be contained within the 'Household and similar wastes' material line, which totalled 2.37M tonnes in the same year. SEPA proposed a re-allocation of this hidden food waste from the 'Household and similar wastes' material line to the 'Animal and mixed food waste', to the amount of

³² [SEPA, Waste Data for Scotland](#)

³³ [SEPA, Household Waste Data](#)

³⁴ [ZWS Scottish Carbon Metric 2018 Carbon Metric Factors 2018 and Carbon Metric Tonnages 2018](#)

³⁵ [Scottish Government Statistics, Population Projections \(2018 baseline\)](#)

³⁶ [Scottish Fiscal Commission, January 2021](#)

³⁷ Table 2 (waste from all sources), available [here](#).

³⁸ Table 1 (waste from all sources) and business waste by economic sector, available [here](#).

753k tonnes. This figure has been derived from the estimated 1 Mt of total food waste in 2013³⁹ minus the amount already in the 'Animal and mixed food waste' material line. This proportion⁴⁰ of 'hidden food waste' was used to determine the estimated total amount of food waste (identified and hidden) in 2018, in order to model the total food waste reduction to meet 2025 targets.

2. **Total waste arisings reduction target:** this has been calculated for all waste except food waste to avoid double counting the food waste reduction performance to meet the target summarised above. As such, food waste arising reductions were modelled first, followed by total waste arisings (minus food waste) reductions. For all four scenarios that are modelled to reach specific targets, it was found that applying the food waste reduction target on its own meant that the total waste arisings reduction target was met in its entirety. This is because of the high total waste arisings in 2011, (the year that the total waste arisings reduction target is based on), compared to the baseline year (2018) for this analysis. For this reason, the total waste arisings reduction target was not applied to any of the scenarios.

SEPA recommended that various commercial and industrial materials be re-allocated as household waste arisings. For this reason, the modelling examined total waste reduction targets, instead of separate targets for household waste and C&I waste.

Food waste arisings reduction targets are summarised in Table 3 and total waste arisings reduction targets are summarised in Table 4.

³⁹ Scottish Government, available [here](#).

⁴⁰ Hidden food waste made up an estimated 31.8% of the 'Household and similar wastes' material line in 2013. It was assumed that this proportion would be consistent over the time period examined.

Table 3: Food waste arisings reduction targets

	Approaching targets scenarios	Achieving targets Scenarios
Baseline food waste arisings (2018)	Total: 1.0M tonnes ⁴¹	Total: 1.0M tonnes ⁴²
Food waste target (2025)	Total: 835k tonnes ⁴³	Total: 670k tonnes ⁴⁴

Table 4: Total waste arisings reduction targets

	Approaching targets scenarios	Achieving targets Scenarios
Baseline total waste arisings (2018)	Total: 5.2M tonnes	Total: 5.2M tonnes
Total waste target (2025)	Total: 5.9M tonnes ⁴⁵	Total: 5.5M tonnes ⁴⁶

Recycling Targets

Scenario 1 examines the achievement of the recycling target (70% by 2025), and Scenario 3 examines achievement of ‘halfway to the recycling target’ (59% by 2025). The baseline recycling rate for household and C&I waste is 48.6% (2018), so in order to meet the targets of Scenarios 1 and 3, assumptions were required to determine which materials would be expected to have greater recycling rates in the future. SEPA provided guidance on material groups that were deemed to have a higher potential for recycling, and the recycling rates for these materials were increased in order to meet the overall targets. Based on this guidance from SEPA, it was assumed that the recycling rates of the following materials would increase in order to meet the overall targets:

⁴¹ 423k in the ‘Animal and mixed food waste’ material line, 605k in the ‘Household and similar wastes’ material line

⁴² 423k in the ‘Animal and mixed food waste’ material line, 605k in the ‘Household and similar wastes’ material line

⁴³ 17.5% lower than 2013 food waste arisings (1.0M tonnes)

⁴⁴ 33% lower than 2013 food waste arisings (1.0M tonnes)

⁴⁵ 7.5% lower than 2011 total arisings minus food waste (6.4M tonnes)

⁴⁶ 15% lower than 2011 total arisings minus food waste (6.4M tonnes)

- Household waste:
 - Household and similar wastes
- Commercial and Industrial waste:
 - Used oils
 - Chemical wastes
 - Plastic wastes
 - Wood wastes
 - Textile wastes
 - Animal faeces, urine and manure
 - Other mineral wastes.

Materials Included in the Bans

SEPA provided advice on the materials to be included in the current BMW landfill ban and the extended biodegradable non-municipal waste ban.

10.4 Infrastructure Landscape

Approach

In addition to quantifying potential future waste tonnages under the different scenarios, an equally important task is to establish the available infrastructure treatment capacity. When overlaid with the waste quantities this allows for analysis to determine whether a capacity gap exists, where there is insufficient treatment capacity, when the ban is due to be implemented or whether there is potential for there to be excess treatment capacity.

To identify suitable facilities, Ricardo utilised its own FALCON (Facilities, Arisings, Location, Contracts) database in addition to publicly available data and discussions with the steering group. To model the treatment capacity for each facility, the quantities of waste received at each facility were compared to the consented capacity, refined by intelligence known for each facility through the steering group. This was to enable Ricardo to model the true operational capacity of each facility. Whilst the total waste quantities a facility can accept will be consented through the planning and permitting process, the true throughput or processing capability of the facility may differ. This approach was therefore taken as a conservative approach to try and reflect the true operational capacity of the identified facilities.

Assumptions were also made relating to the lifespan of each facility from its' first operational date. These assumptions are outlined in Table 5.

Table 5 Assumed lifespan of treatment facilities by technology type

Technology Type	Estimated Lifespan (Years)
Advanced Thermal Treatment (ATT)	20
Energy from Waste (EfW)	40
Mechanical Biological Treatment (MBT)	30

Within the study period of interest, to 2025 no current operational facilities are expected to close based upon the lifespan assumptions in Table 5 Assumed lifespan of treatment facilities by technology type. However, consideration will need to be made to aging infrastructure which may need to be replaced to ensure that process efficiency and cost effectiveness is maintained, along with ensuring compliance with the latest regulatory requirements. Any alterations in facility size and capacity will need to be considered alongside new pipeline infrastructure potentially becoming available.

Operational Facilities

A total of 12 operational facilities were identified which are currently managing these waste types. The facilities are listed in Annex 2.

The total modelled capacity of these facilities is approximately 1.32 Mt.

Pipeline Facilities

Pipeline facilities within the development stage were also considered. Should these progress to completion and commercial operation, they could potentially change the infrastructure landscape.

Discussions were undertaken with the steering group to identify the facilities most likely to become operational by 2025. A total of 3 additional facilities were assumed to become operational by this date and these are outlined in Appendix 2. These would result in an approximately 0.45 Mt of additional treatment capacity. These facilities are 'relatively secure' in the pipeline as they are already within the stages of construction or commissioning at the time of writing. However, it is still possible for delays to occur during the later stages of project development which could still impact upon pipeline infrastructure becoming operational. The modelled capacity for

each facility was taken as 95% of the stated capacity for each facility, to factor in facilities ramping up to full operations and potentially becoming operational midway through the year. The modelled capacity was set at 50% for its first operational year, with 95% of the stated capacity modelled thereafter.

There are a number of other pipeline infrastructure projects within the earlier stages of development that have not yet reached key project milestones such as financial close or start of construction. Whilst the analysis has focussed upon 2025, there is still the potential for additional infrastructure to be developed after that date, should key project milestones be met to reach commercial operation. This is difficult to quantify as not all projects that are currently proposed, achieved planning and/or permit consent will make it through to commercial operation.

11. ANNEX 2 – Residual Waste Treatment Facilities in Scotland

Table 6. Operational residual waste treatment facilities in Scotland

Facility Name	Technology	Modelled Capacity (tpa)	Operational Year
Dunbar ERF	EfW	300,000	2019
DERL (Baldovie)	EfW	150,000	1994
Lerwick EfW	EfW	26,000	2000
Millerhill	EfW	189,500	2019
GRREC	ATT	123,000	2019
Levenseat	ATT	105,000	2018
Levenseat (Forth by Lanark)	MBT/RDF	250,000	2006
Eco Deco Dumfries	MBT/RDF	70,000	2006
Avondale	MBT/RDF	70,000	2005
Dalintongart Compost	MBT/Bio	10,000	2001
Moleigh, Kilmore	MBT/Bio	10,000	1998
Lingerton Compost	MBT/Bio	10,000	2001

Table 7 Pipeline incineration infrastructure and expected year that infrastructure will be operational

Facility Name	Technology	Modelled Capacity (tpa) ¹	Operational Year ¹
Dundee ERF	EfW	105,000	2022
Earlsgate Energy Centre	EfW	205,000	2022
Aberdeen Recycling & Energy Recovery	EfW	143,000	2022

¹ First operational year modelled at 50% capacity to factor in a ramp up of operations and facilities entering operations midway through the year.



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