Number: WG37657

Welsh Government

Regulatory Impact Assessment

Regulatory Impact of Options to Increase Business Recycling in Wales

Statutory Instruments under Part IV of the Environment (Wales) Act 2016 and the Waste (Wales) Measure 2010

Date of issue: 23 September 2019

Mae'r ddogfen yma hefyd ar gael yn Gymraeg.

This document is also available in Welsh.

Contents

1.0 Introduction

1.1 The Environment (Wales) Act 2016 amends the Environmental Protection Act 1990 to provide the Welsh Ministers with the powers to:

- Require businesses to present their wastes separately for collection
- Require waste collectors such as waste management companies to collect specified materials by way of separate collection.

1.2 The Act also amends the Waste (Wales) Measure 2010 in order to confer the power to ban specified waste materials from incineration. The Act also bans the disposal of food waste to public sewer from business premises in Wales, subject to a commencement order.

1.3 The Waste (Wales) Measure 2010 (the Measure) provides the Welsh Ministers with the power to ban specified waste materials from landfill.

1.4 It is the intention of the Welsh Government to bring forward regulations under the above provisions and to commence the ban on the disposal of food waste to sewer. The Welsh Government will thus require:

- business waste producers (including the public sector) to present their wastes separately for collection
- separate collection of business wastes (including public sector wastes)

and:

- ban specified materials to landfill
- ban specified materials to incineration
- ban the disposal of commercial food waste to sewer

1.5 The purpose of making the regulations is to create a framework to drive up levels of high quality recycling, food waste treatment and energy recovery and reduce disposal to landfill by business, to end the incineration of specified recyclable materials, provide additional jobs and investment in the waste supply chain and in doing so, help protect human health, the environment and natural resources.

1.6 This will make a major contribution to ‘green growth’ in Wales which is a crucial aspect of Taking Wales Forward, sustainable development and a low carbon circular economy.

1.7 It is predicted the increased recycling from the introduction of regulations will lead to significant savings to the Welsh economy and increased employment and investment in the sector.

1.8 The waste management sector is a significant economic sector. The Office for National Statistics report ‘UK environmental goods and services sector (EGSS): 2010 to 2015’ estimates waste management activities in the UK

accounted for output of £14.2 billion, gross value added of £5.5 billion and 101,000 FTE jobs in 2015.

1.9 The 2013 WRAP/Ellen MacArthur Foundation report 'Wales and the Circular Economy: Favourable system conditions and economic opportunities' identifies potential savings to the Welsh economy of over £2 billion a year by it adopting a circular economy approach for three specific business sectors.

1.10 The 2015 WRAP/Green Alliance report 'Employment and the circular economy: Job creation in a more resource efficient Britain' identifies the potential for up to 30,000 jobs to be created in Wales through moving toward a circular economy.

1.11 The regulations will drive the development of waste collection services, with many businesses predicted to make savings by modelling undertaken for this RIA.

1.12 The regulations are critical to green economic growth and the Circular Economy in Wales. Without them there will be no framework to drive change in the waste recycling sector and deliver the jobs, investment and resource security the sector can provide.

1.13 Bringing forward regulations under the above powers also supports key Welsh Government goals, including:

- The resource efficiency commitments in Programme for Government (Taking Wales Forward), the National Strategy (Prosperity for All) and A Low Carbon Wales
- The Economic Action Plan goals for sustainable economic growth.
- The Well-being of Future Generations (Wales) Act 2015, in particular regarding the aims of a prosperous, resilient and globally responsible Wales.
- Towards Zero Waste, the waste strategy for Wales.
- The Carbon budget and targets set under Part 2 of the Environment (Wales) act 2016.
- The Natural Resources Policy for Wales, in particular the aims of increasing resource efficiency and moving towards a more circular economy.
- Wales' commitment to the United Nations Sustainable Development Goals, for example goal 12 'Ensure sustainable consumption and production patterns' and its associated targets'.

1.14 The costs and benefits for each of the options set out in this RIA have been assessed relative to a baseline "business as usual" scenario that reflects the current situation including landfill disposals tax and current legislative requirements.

1.15 The RIA has been informed by work primarily undertaken by independent consultants Eunomia Research and Consulting Ltd on behalf of the Welsh Government. The work included an assessment of the potential costs and

benefits of implementing the legislative proposals and the potential impacts on impacted stakeholders in the public and the private sectos.

1.16 The RIA builds on previous work carried out in the development of the provisions of Part IV of the Environment (Wales) Act 2016 ("the Act"). The options are constructed around the previous preferred option detailed in the Explanatory Memorandum for the Act[1] and passed by the National Assembly for Wales.

1.17 The analysis presents a best estimate of costs and benefits for each option based on the currently available information.

[1] http://www.senedd.assembly.wales/documents/s48090/Revised%20Explanatory%20Memorandum.pdf

2.0 Options Analysis

2.1 For the purpose of this Regulatory Impact Assessment, the impact of three options has been assessed against a baseline scenario (Option 1). The analysis presents a best estimate of costs and benefits based upon the currently available information.

2.2 For the purpose of modelling, the appraisal period covers ten years (2020 to 2029), with the options commencing in 2020. Where modelling for an individual year is presented for illustrative purposes, 2025 is presented as a typical year, as by this point transitional costs of implementing the policy have been incurred.

2.3 The HM Treasury central discount rate of 3.5% has been used to calculate the net present value (NPV) figures within the modelling.

2.4 The details of this modelling, including the assumptions underpinning the modelling are contained in the report "Regulatory Impact of Statutory Instruments - Part 4 Environment (Wales) Act 2016 and Articles 9-11 Waste (Wales) Measures 2010" – Eunomia Research and Consulting"[2].

2.5 Figures are presented in the Eunomia report as unrounded, but for presentation purposes are rounded in this RIA. Unless otherwise stated, cost figures have been rounded to the nearest £100,000, recycling tonnages are rounded to the nearest 100,000 tonnes and CO_2 and NO_2 emissions are rounded to the nearest 1,000 tonnes. Some of the totals in the tables may not sum due to the rounding.

2.6 The preferred option of the Welsh Government is Option 3 (below).

Option 1: Do nothing: Rely on existing mechanisms

2.7 Option 1 is the baseline against which we assess costs and benefits. It includes extant legislative requirements (for example, the requirements of the Waste (England and Wales) Regulations 2011 (as amended)) and the landfill tax.

Option 2: Low Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

2.8 The option requires the occupiers of business premises (including the public sector) to present specified recyclable wastes for collection.

2.9 The specified materials are: Food, paper, card, plastic, metal, glass, small waste electrical and electronic equipment (WEEE) and textiles.

[2] *Eunomia Research and Consulting (2019) Regulatory Impact of Statutory Instruments (May 2019)*

2.10 Under this option the materials could be presented co-mingled, in the following streams:

- food produced by premises producing more than 5kg/week;
- paper, card, glass, metal, plastic;
- WEEE;
- textiles.

2.11 Those that collect these waste materials (for example, waste management companies and Local Authorities) would be required as a minimum to collect materials in the following streams, provided that this met with the minimum requirements of the European Union Waste Framework Directive (2008/98/EC) and transposed in the Waste (England and Wales) Regulations 2011 (as amended).

- food collected from premises producing more than 5kg/week;
- paper, card, glass, metal, plastic;
- WEEE;
- textiles.

2.12 The disposal of food waste to sewer from business premises in Wales would be prohibited.

2.13 The incineration of recyclable loads of the specified materials would be banned.

2.14 The landfilling of recyclable loads of the specified materials would be banned. In addition to the above materials, wood waste would be banned from landfill in Wales.

Option 3: Moderate Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

2.15 The option requires the occupiers of business premises (including the public sector) to present specified recyclable wastes for collection.

2.16 The specified materials are: Food, paper, card, plastic, metal, glass, small waste electrical and electronic equipment (WEEE) and textiles.

2.17 Under this option most of the materials would need to be presented separately, however some could be presented together, as shown below:

- food produced by premises producing more than 5kg/week;
- paper, card;
- glass;
- metal, plastic;
- WEEE;
- textiles.

2.18 Those that collect these waste materials (for example, waste management companies and Local Authorities) would be required as a minimum to collect materials in the following streams:

- food collected from premises producing more than 5kg/week;
- paper, card;
- glass;
- metal, plastic;
- WEEE;
- textiles.

2.19 The disposal of food waste to sewer from business premises in Wales would be prohibited.

2.20 The incineration of recyclable loads of the specified materials would be banned.

2.21 The landfilling of recyclable loads of the specified materials would be banned. In addition to the above materials, wood waste would be banned from landfill in Wales.

Option 4: High Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

2.22 The option requires the occupiers of business premises (including the public sector) to present specified recyclable wastes for collection.

2.23 The specified materials are: Food, paper, card, plastic, metal, glass, small waste electrical and electronic equipment (WEEE) and textiles.

2.24 Under this option all of the dry recyclables would be presented separately, as shown below:

- food produced by premises producing more than 5kg/week;
- paper;
- card;
- glass;
- metal;
- plastic;
- WEEE;
- textiles.

2.25 Those that collect these waste materials (for example, waste management companies and Local Authorities) would be required as a minimum to collect materials in the following streams:

- food collected from premises producing more than 5kg/week;
- paper;
- card;
- glass;
- metal;

- plastic;
- WEEE;
- textiles.

2.26 The disposal of food waste to sewer from business premises in Wales would be prohibited.

2.27 The incineration of recyclable loads of the specified materials would be banned.

2.28 The landfilling of recyclable loads of the specified materials would be banned. In addition to the above materials, wood waste would be banned from landfill in Wales.

3.0 Summary and Preferred Option

3.1 A summary of the high level and environmental costs and benefits of each of the options, along with a summary table (Table 1), is presented below. These costs, along with the costs and benefits to the main actors, are discussed in detail in Section 4.

3.2 A summary of the Welsh Government's considerations regarding potential exemptions from the requirements is also discussed below. A fuller analysis of these considerations is provided in the appendix to this report.

Option 1

3.3 The overall cost of this option is modelled to be £2,118 million NPV over 10 years, which is the baseline against which Options 2, 3 and 4 are measured. It is estimated to result in emissions of 411,000 tonnes CO_2 equivalent and the production of 4.4 million tonnes of recyclate. As this option proposes no change, there are no additional financial costs associated with it, though there will be ongoing costs and benefits not realised. The costs and benefits of this option are shown against the other options in the Table 1, below.

3.4 In terms of overall costs this option delivers significantly lower savings than Option 2 or Option 3 (the Welsh Government's preferred option).

3.5 Failure to act will mean that businesses and the public sector are not provided with a quality recycling service - potentially recyclable materials will continue to be sent to landfill or incineration facilities. There will be no consequent decrease in dependence on primary material resources and or improvement to resource security.

3.6 It is the worst performing of all the options environmentally and carries considerable risk to the sustainability of our businesses and natural resources.

Option 2

3.7 The overall cost of this option is modelled to be £1,713.8 million NPV over 10 years, which represents a net benefit of £404.2 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 2.8 million tonnes CO_2 equivalent and an additional 3.7 million tonnes of recyclate. The costs and benefits of this option are shown against the other options in the Table 1, below.

3.8 Environmentally, it outperforms option 1 due to the higher levels of recycling and reduced residual disposal costs. Despite providing an increase in recycling tonnage, it is unlikely to provide the high quality, high value recycling resulting from the preferred option (Option 3, below). This is due to the lower quality, more contaminated material resulting from co-mingled collections. As this material would be of lower quality it would realise a lower material price. The extent of benefits realised in terms of the economy and the environment would thus be smaller.

3.9 There is also a higher risk of non-compliance with the requirements of the EU Waste Framework Directive and Circular Economy Package for separate collection and high quality recycling.

3.10 The lower quality material resulting from co-mingled collections leads to a smaller decrease in dependence on primary material resources and the improvement to resource security than would be achieved with options 3 or 4.

Option 3

3.11 This is the preferred option of the Welsh Government.

3.12 The overall cost of this option is modelled to be £1,665.5 million NPV over 10 years, which represents a net benefit of £452.5 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 3.2 million tonnes CO_2 equivalent and an additional 3.8 million tonnes of recyclate. The costs and benefits of this option are shown against the other options in the Table 1, below.

3.13 This option is the best option in terms of both high level costs and environmentally. Though it is predicted that Option 2 would produce a similar amount of recycled material, Option 3 is predicted to produce higher quality materials, requiring less processing and realising higher material values. This is because keeping the materials separate results in a less contaminated material than that resulting from co-mingled collections such as required by option 2. The extent of benefits realised in terms of the economy and the environment are thus be higher.

3.14 As the option requires separate collection of materials and is likely to provide high quality, high value recycling there is a low risk of non-compliance with the requirements of the EU Waste Framework Directive.

Option 4

3.15 The overall cost of this option is modelled to be £2,294.4 million NPV over 10 years, which represents a net cost of £176.4 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 2.8 million tonnes CO_2 equivalent and an additional 3.7 million tonnes of recyclate. The costs and benefits of this option are shown against the other options in the Table 1, below.

3.16 The option has highest overall costs of the options (including option 1) in the main because of higher transitional costs for business waste producers and the waste management sector and higher administrative and waste collection costs.

3.17 This option is likely to provide high quality, high value recycling. This is because keeping the materials separate results in a less contaminated material than that resulting from co-mingled collections such as required by

Option 2. There is thus a low risk of non-compliance with the requirements of the EU Waste Framework Directive.

3.18 However, in terms of environmental costs, though benefitting from lower recycling processing costs and onward transport costs than Option 3, it is estimated to be outperformed by Option 3, in the main due to higher collection costs of collecting additional material streams.

3.19 As the option requires separate collection of materials and is likely to provide high quality, high value recycling there is a low risk of non-compliance with the requirements of the EU Waste Framework Directive.

Table 1: Summary of Options – Main Impacts

	Option 1	Option 2		Option 3		Option 4	
	Impact	Impact	Relative to Option 1	Impact	Relative to Option 1	Impact	Relative to Option 1
CO_2 (tonnes)	0.4m	-2.4m	-2.8m	-2.8m	-3.2m	-2.4m	-2.8m
NO_2 (tonnes)	2,500	-3,000	-5,500	-5,300	-7,800	-4,100	-6,600
Recycling (tonnes)	4.4m	8.1m	3.7m	8.2m	3.8m	8.0m	3.6m
Environmental NPV	£180.1m	-£0.8m	-£180.9m	-£43.4m	-£223.5m	-£28.0m	-£208.1m
Total cost[1]	**£2,118.0m**	**£1,713.8m**	**£-404.2m**	**£1,665.5m**	**-£452.5m**	**£2,294.4m**	**£176.4m**

1. Excludes landfill disposals tax

Exemptions

3.20 The Welsh Government has considered exemptions from the requirements in three areas:

- A de minimis threshold for business waste producers, below which the requirement to present waste for collection would not apply;
- An exemption to the requirement to present waste separately for business waste producers in rural areas;
- An exemption for the ban on the disposal of food waste to sewer for waste treated by specified treatment technologies.

An analysis of these is provided in the appendix to this report.

De minimis threshold for business waste producers

3.21 It is estimated that the exemption of businesses with 0-4 employees would exempt 60% of businesses and result in a reduction in overall financial and administrative costs for all options. However it would adversely impact on the environmental benefits of the policy. The Welsh Government is thus of the view introducing such an exemption is not desirable.

3.22 The exemption for businesses producing less than 5kg of food waste/week, though difficult to quantity in terms of impact, has been successfully introduced in Scotland and Northern Ireland and is in the view of the Welsh

Government appropriate for businesses who produce small amounts of such waste and that may have to pay a disproportionate amount for its collection.

3.23 The Welsh Government therefore proposes to exempt businesses producing less than 5kg of food waste/week from the requirement to present food waste separately for collection.

3.24 Collectors of waste (for example, waste management companies and Local Authorities) would be exempt from the requirement to collect food waste by means of separate collection from such premises.

Exemption to the requirement to present waste separately for business waste producers in rural areas

3.25 Eunomia's modelling estimates that for the preferred option (Option 3), the introduction of the policy would not incur significantly higher costs for rural businesses than non-rural. On the other hand, exempting businesses from the requirement would result in a reduction in environmental benefits. On the basis of this, the Welsh Government is of the view that, for the preferred option (option 3) it is not appropriate to provide for an exemption to the requirement to sort for businesses in rural areas.

Exemption for the ban on the disposal of food waste to sewer for waste treated by specified treatment technologies

3.26 It is the policy of the Welsh Government to divert food waste from the residual (black bag) waste stream or other forms of disposal to anaerobic digestion for the recovery of energy and nutrients (via the production of high quality fertiliser). The overall environmental impacts of exempting food waste treated by individual technologies are therefore the primary factors the Welsh Government has considered when assessing the appropriateness of such exemptions. However, other factors have also been assessed, for example broader societal and financial impacts for different levels of market penetration, and costs to businesses where possible.

3.27 On this basis the modelling carried out by Eunomia, which took into account previous work undertaken in this area, did not provide a justification to exempt food waste treated by any of the technologies assessed from the ban on the disposal of food waste to sewer.

3.28 The Welsh Government does not therefore intend to introduce an exemption for food waste treated by any technologies prior to its disposal to sewer.

4.0 Costs and Benefits

4.1 As noted in Section 1, above, the analysis is primarily based on modelling carried out by Eunomia Consulting and Research Ltd[2] on behalf of the Welsh Government. The modelling, assumed, for each option, that the policy is fully enacted by 2020 following making of the statutory instruments in 2019.

4.2 The costs for each option are presented below.

Option 1: Do Nothing: Rely on existing mechanisms

Introduction

4.3 As this option proposes no change, there are no additional financial costs associated with it (though there will be ongoing costs and benefits not realised).

4.4 The overall cost of this option is modelled to be £2,118 million NPV over 10 years, and is the baseline against which Options 2, 3 and 4 are measured. It is estimated to result in emissions of 411,000 tonnes CO_2 equivalent and the production of 4.4 million tonnes of recyclate.

Environmental Costs

4.5 For the analysis, a range of environmental costs were modelled, including:

- Emissions of greenhouse gases (expressed as CO_2 equivalent)
- Levels of NO_2 pollution
- Tonnes Recycling
- Monetised environmental impacts

The costs are shown below:

Table 2: Option 1 - Environmental Impacts, 10 Year 2020 to 2029

	Option 1 Impacts
Tonnes CO_2	411,000
Tonnes NO_2	2,500
Tonnes recycling	4,400,000
Monetised Environmental NPV	£180,100,000

4.6 The costs show relying on existing mechanisms would result in the emission of 411, 000 tonnes of greenhouse gas emissions and 2,500 tonnes of NO_2, and the production of 4.4 Mtonnes of recycling over 10 years. The monetised environmental cost is estimated to be £180.1 million over 10 years.

Landfill Tax

4.7 The modelling estimates a landfill disposal tax revenue of £830.8million NPV over 10 years as a result of the landfilling of recyclable materials covered by the regulations under this option.

Table 3: Option 1 - Landfill Tax, 10 Year NPV 2020 to 2029

	Option 1 Costs
Landfill Disposals Tax	£830,800

Recyclate Quality

4.8 Analysis carried out by Eunomia shows that this option has the least likelihood of providing high quality recyclate, a key requirement of the EU Waste Framework Directive. This is due to the cross contamination of material streams and the subsequent difficulty in separating them out in a material recycling facility. High quality recyclate has a higher market value and is more likely to be used in manufacturing processes, thus producing greater environmental benefits.

Jobs

4.9 The modelling predicts this option will sustain an average of 2,306 jobs in the waste management sector from 2020-29.

Costs to the Main Sectors

4.10 The costs to the different sectors are presented below and summarised in Table 5.

Costs and Benefits to Waste Management Businesses

4.11 Though there are no additional costs to waste management businesses in this option, there are ongoing costs and unrealised benefits. These include:

- Infrastructure transition costs
- On-going administrative costs
- Costs of Waste Collection (Residual and recycling/recovery)
- Disposal/Processing of residual waste
- Materials Revenue
- Landfill tax

Table 4: Option 1 – Breakdown of Financial Costs to Waste Management Businesses

	Financial costs to waste management businesses, £m (2020 to 2029 NPV)
Infrastructure Transitional costs	£0
On-going administrative costs	£0
Waste collections (recycling & residual)	£710.8
Residual waste processing/disposal	£1,351.0

Materials revenue (net of processing)	-£168.6
Landfill tax	£830.8
NET FINANCIAL COST	**£2,724.0**

4.12 In a properly functioning competitive market these costs will be passed on to the customer (business waste producers). Thus these costs will apply in part to waste producers rather than the waste industry.

Costs to Waste Producers

4.13 As noted above, in a properly functioning market, the costs (and savings) accruing to waste management businesses are passed to their customers in the form of charges to remove waste, subject to competition between service providers. Thus, the costs above would be expected to be incurred by waste producers.

4.14 Producers of food waste disposing of food waste to sewer will also incur the capital and operating costs of food waste treatment technologies such as maceration.

4.15 The costs consist of:

- Annualised Capital Cost
- Electricity
- Water use
- Sewerage Charge
- Maintenance

4.16 The costs are estimated, for all users, to be £6.7 million NPV over ten years. The costs to waste producers disposing of food waste to sewer are discussed in more detail in Option 2, below.

Sewerage Authorities

4.17 As under this option food waste will continue to be discharged to sewer. There will therefore be costs incurred by the sewerage authorities.

4.18 Under this option, 10 year NPV costs of £38 million are estimated to fall to the sewerage authorities. The costs result from the modelled cost of treatment of macerated food waste within the sewerage system, taking into account the energy generation benefit from anaerobic digestion of sewage sludge and the additional treatment costs of specifically treating the food waste.

4.19 The costs relate to:

- Sewer pumping
- AD costs – both the additional costs of the equipment and benefits from additional electricity generation
- Secondary sewage treatment

4.20 It is widely assumed that a high proportion of sewer blockages result from, or are significantly contributed to, by macerated food waste in the sewerage

system. The costs of dealing with blockages and their consequences has therefore been modelled, but has not been included in the central case due to the difficulty in attributing this type of incident solely to food waste.

4.21 The cost is estimated to be £3.2 million per year, equating to an estimated £238/tonne of food waste. These costs are not passed on specifically to the businesses using the units and would be expected to be spread across all water customers. The costs can be attributed to use of macerators only, as the other two food waste treatment technologies modelled (enzymic digesters and dewatering systems) produce a discharge more similar to normal sewage discharge, not anticipated to cause issues of this nature.

Welsh Government

4.22 No additional costs accrue to Welsh Government under this option.

Natural Resources Wales

4.23 No additional costs accrue to Welsh Government under this option.

Local Authorities

4.24 No additional costs accrue to Local Authorities under this option.

Option 1: Summary Table – 10 Year NPV

4.25 Table 5, below, summarises the costs and benefits to the main sectors of the implementation of Option 1, profiled from 2020 to 2029. Avoided Landfill Tax is a transfer payment and is therefore excluded from the 'Net Cost' calculation.

Option 1: Summary Table - 10 Year NPV (rounded to nearest £100,000)

	Costs (£m)
Financial costs	
Welsh Government	
Transitional costs	£0
NRW	
Transitional costs	£0
On-going administrative costs	£0
Local Authority	
Transitional costs	£0
On-going administrative costs	£0
All Waste Producers	
Transitional costs	£0
On-going administrative costs	£0
Opex / capex (food to sewer)	£6.7
Waste Management Businesses**	
Infrastructure Transitional costs	£0
On-going administrative costs	£0
Waste collections (recycling & residual)	£710.8
Residual waste processing/disposal	£1,351.0
Materials revenue (net of processing)	-£168.6
Landfill tax	£830.8
Sewerage Authorities	
Water treatment costs	£38.0
Monetised Environmental Costs	
All environmental costs	£180.1

Total Cost	£2,948.8
Total Cost (ex LFT)*	£2,118.0

Total Welsh Government	£0
Total NRW	£0
Total Local Authority	£0
Total All Waste Producers	£6.7
Total Waste Management Businesses**	£2,724.0
Total Sewerage Authorities	£38.0

*This calculation excludes taxes, as taxes function simply as transfers between different entities rather than as a net overall cost – an increase in the total landfill disposals tax paid is a cost to Welsh businesses, but is an income to the Welsh government and thus neutral within the overall costs and benefits of the system.

**Costs in this table attributed in this table to waste management companies are in practice expected to be passed to waste producers. However, for the purposes of this table they are attributed to waste management businesses.

Option 2: Low Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

Introduction

4.26 The overall cost of this option is modelled to be £1,713.8 million NPV over 10 years, which represents a net benefit of £404.2 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 2.8 million tonnes CO_2 equivalent and an additional 3.7 million tonnes of recyclate.

4.27 Though this option will lead to some increase in recycling, it is unlikely to provide the high quality, high value recycling resulting from the preferred option (Option 3, below). This is due to the lower quality, more contaminated material resulting from co-mingled collections. There is also a higher risk of non-compliance with the requirements of the EU Waste Framework Directive.

4.28 Modelling carried out for the Welsh Government estimates that though relative to Option 3 (below) a similar amount of recycled material would be produced, as this material would be of lower quality it would realise lower material costs. The extent of benefits realised in terms of the economy and the environment would thus be smaller.

Environmental Impacts

4.29 For the analysis, a range of environmental impacts were modelled, including:

- Emissions of greenhouse gases (expressed as CO_2 equivalent)
- Levels of NO_2 pollution
- Tonnes Recycling
- Monetised environmental impacts

4.30 The calculation of monetised environmental benefits is detailed in the supporting Eunomia study.

4.31 The impacts are shown below:

Table 6: Option 2, Environmental Impacts, 10 Year 2020 to 2029

	Option 2 Impacts	Impacts relative to Option 1 (Baseline)
Tonnes CO_2	-2,388,000	-2,799,000
Tonnes NO_2	-3,000	-5,500
Tonnes recycling	8,100,000	3,700,000
Monetised Environmental NPV	-£0.8m	-£180.9m

4.32 The implementation of this option would result in environmental benefits above the baseline (Option 1), giving a reduction in greenhouse gas emissions of 2.8Mtonnes CO_2 and 5,000 tonnes of NO_2, and an increase of

3.7Mtonnes of recycling over 10 years. The monetised environmental benefits above the baseline are estimated to be £180.9million over 10 years.

4.33 The benefits are due to the modelled switch of recyclable material from the residual waste stream to the recycling waste stream. Reductions in CO_2 and NO_2 emissions are predicted from the increase in recycled materials and decrease in residual waste disposal (and in the case of CO_2) residual waste processing. The reductions are observed despite increased emissions from recyclate processing and onward transport costs (and in the case of NO_2) recyclate collection.

Landfill Tax

4.34 The modelling estimates a reduction in landfill disposal tax revenue of £246.4 million NPV over 10 years as a result of diversion of material from landfill as a result of the implementation of this option.

Table 7: Option 2, Landfill Tax, 10 Year NPV 2020 to 2029

	Option 2 Costs	Costs relative to Option 1 (Baseline)
Landfill Disposals Tax	£584.4m	-£246.4m

Recyclate Quality

4.35 Analysis carried out by Eunomia shows that, other than Option 1, this option has the least likelihood of providing high quality recyclate, a key requirement of the EU Waste Framework Directive.

4.36 Presenting recyclable waste materials together for collection means that the materials have to be subsequently separated, which results in cross contamination by the different material types. This lower quality material has a lower market price. This option therefore produces lower material revenues than Options 3 and 4, resulting in higher waste collection costs to business waste producers.

Employment

4.37 The modelling predicted Option 2 would sustain an average of 2,340 jobs in the waste management sector during the period 2020-29, 34 jobs more than would be sustained in the baseline (Option1). The cost impacts of Option 2 are predicted to be too small to have any direct impact on jobs.

4.38 To consider the Well-being and Future Generations Act further, both GVA per hour worked and percentage of businesses which are innovation driven were considered. Eunomia report that previous work[3] has shown that although the data does not provide an indication of the GVA per hour worked, it does

[3] Eunomia (2016) A Resourceful Future – Expanding the UK Economy, Final Report for Suez, September 2016

predict that GVA is expected to increase as overall levels of recycling increase.

Costs to the Main Sectors

4.39 The costs to the different sectors are presented below and summarised in table 20.

Costs to Business Waste Producers

4.39 In addition to commercial and industrial premises, the term business waste producers includes public sector institutions and charities. Waste services are provided in a competitive market, with the costs of waste management being incurred primarily by waste producers. The scale of costs or cost savings to the producers depends in part on factors such as market competition and innovation to drive down costs to customers, awareness of the business waste producers to the services available and their response to increased costs of residual waste collection. Where the policy measures envisaged would result in additional costs to waste management companies in the first instance, it should be anticipated that these will effectively be recharged to waste producers subject to competition between service providers.

4.40 The waste management sector involves private sector collectors and treatment providers, and local authority waste collectors. The modelling has assumed that the changes resulting from the policy interventions will not result in a change to the way that the waste market allocates costs. Thus, for the purposes of estimating the costs to businesses for this section, it has been assumed that all costs or cost savings to waste management businesses will be passed to their customers (ultimately waste producers).

4.41 For the purpose of modelling, business waste producers may thus incur costs in two areas:

- Transitional costs related to changes in practice
- Ongoing costs or savings related to the collection of their waste materials passed on by the waste management sector.

4.42 Transitional costs are expected to be incurred in the following areas:

- Training and Awareness
- Modifying internal procedures and guidance
- Implementing a new bin system
- Organising a new collection system

4.43 Eunomia assumed that that bin systems are regularly reviewed, and therefore after the second year of the assessment period, any updates to the bins and their collection systems would not be additional to what would have occurred otherwise (i.e. within the baseline).

4.44 It has also been assumed that the effort required by employees to sort their waste into the separate co-mingled and food bins would be negligible and that

the time this action requires would not be significant enough to result in an additional cost.

4.45 The transitional costs of this option on waste producers is presented below, these transitional costs are incurred in the first two-years.

Table 8 – Option 2: Forecast Transitional Costs for Waste Producers (Co-mingled)

Activity	Year 1 (£)	Year 2 (£)	10 Year Total (NPV £)
Attending Seminars	10,000	0	10,000
New Guidelines	700,000	0	700,00
Organising New Bin System	0	1,200,000	1,200,000
Organising New Collection System	0	3,600,000	3,500,000
Total (£)	**700,000**	**4,800,000**	**5,400,000**

4.46 To estimate the overall costs or cost savings to businesses, Eunomia has taken into account the combined net costs of the option. These consist of the costs or savings to waste management businesses (as detailed in paragraphs 4.65 to 4.74) and the transitional costs to waste producers, applied to a typical business waste producer, based on size of business (number of employees). The results are shown in table 9.

Table 9: Option 2 - Weekly Financial and Transitional Cost Impact per business of recyclate collection - 2025 (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 2	£5.37	£1.24	-£4.82	-£15.75	-£21.93	-£77.41	-£485.18

4.47 Option 2 gives rise to savings above the baseline on overall waste management costs for the larger businesses (over 10 employees) and a small additional cost to smaller businesses. This pattern arises because the administrative costs incurred by businesses of different sizes are similar; but large businesses make bigger savings due to benefiting from reduced waste management costs over a greater quantity of waste.

4.48 Option 2 is more costly than the preferred option (Option 3) for businesses with 9 employees or less, with larger businesses making lower savings than Option 3. This is because, though waste producers incur lower administration under Option 2, the overall savings to waste management businesses of this option (as described below), expected to be passed on to the waste producer, are not as great as those resulting from Option 3.

4.49 In order to examine whether businesses producing large amounts of food waste might be impacted, the modelling also examined the impact on businesses in the accommodation and food services sector. The results are shown in table 10, below:

Table 10: Option 2 - Weekly Financial and Administrative Cost Impact per Local Unit of recyclate collection - Accommodation and Food Service Activities only – 2025 (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 2	-£76.70	-£48.06	-£97.01	-£174.48	-£226.25	-£223.57	-£1,513.67

4.50 The relatively large amount of waste produced by businesses in this sector means that the savings that are able to be realised are potentially greater than for businesses in general. As a result the waste management costs associated with all businesses fall under this option.

4.51 The savings for this option are lower than those resulting from the preferred option (Option 3). The lower savings for the 5-9 size band reflects the data on waste generation, which shows businesses of this size producing less waste per local unit than those in the 0-4 range.

Costs to Businesses Disposing of Food Waste to Sewer

4.52 Food waste is typically treated prior to being discharged to sewer. There are a number of different technologies used to carry out treatment. The Welsh Government is not at this time intending to exempt food waste treated by any of these technologies from the ban on the disposal of food waste to sewer. The impacts of these technologies are considered individually in the Appendix to this document.

4.53 As food waste is required to be presented separately for collection in options 2, 3 and 4, the costs and savings to businesses currently disposing of food waste to sewer are the same for each of the options.

4.54 There is little data available with regard to the current use of the different treatment technologies. The sectors where the technologies are most prevalent are, as would be expected, those which include a number of food producing businesses or public-sector organisations:

- Accommodation and food service activities (i.e. restaurants, hotels)
- Education (i.e. schools, colleges and universities)
- Human health and social work activities (i.e. hospitals)

4.55 Following discussion with industry, Eunomia confirmed that relatively little data was available on the prevalence of the technologies in the hospitality sector as a whole. Estimates given by stakeholders to Eunomia in respect of

penetration suggested that they were used in between a third to three quarters of food businesses. However, feedback from Environmental Health Officers - who inspect the majority of these premises - indicated that the units are rarely encountered in their inspections, suggesting relatively low levels of penetration under current market conditions. Feedback from public sector bodies indicates that there is variety of treatments in use and no consistent pattern of service delivery for food waste treatment.

4.56 An overview of food waste treatment in Health Boards across Wales suggests that around a third of food waste produced by hospitals is disposed of to sewer. Furthermore, in anticipation of the introduction of legislation under Part 4 of the Act, it appears that some organisations are choosing to introduce food waste collections, rather than investing in food waste to sewer units which are at risk of being banned.

4.57 Under the ban, businesses using currently these technologies will be required to cease using the practice and present their food waste separately for collection. The most likely waste management route for this food waste is anaerobic digestion (AD). This is therefore the route used as a comparison to evaluate the costs of switching from the current practice.

4.58 Table 11 shows the financial costs per tonne of food waste to waste producers currently disposing of food waste to sewer of introducing the food waste to sewer ban; the table shows the breakdown of results for each technology option. Related to this, table 12 shows the annual cost per business for larger businesses treating 46 tonnes of food waste per year.

4.59 These results suggest there will be a net financial cost to the larger food waste producing businesses arising from the ban of food waste disposed to sewer. Data on the capex and opex for the FWD units suggests that the net cost to businesses arising from the use of these units is lower than the cost of food waste collections. The financial cost increase to larger businesses using these technologies of switching from disposal to sewer to a food waste collection service is modelled as between £17 and £64 per tonne, depending on the treatment technology used. Eunomia took a relatively conservative approach in respect of calculating the financial costs to business of source segregated food waste collection schemes. Actual costs may therefore be lower than those shown. Furthermore, smaller businesses using these methods for treating their waste will see their costs decrease if they switch to a separate food waste collection system, as is discussed subsequently in this section.

Table 11: Food Waste to Sewer Ban – Financial Results to Larger Waste Producers

	£ per tonne of food waste			
	Macerator	De-waterer	Enzyme Digester	Waste AD
Annualised Capital Cost – FWD	£2.47	£23.08	£28.33	
Electricity FWD	£6.00	£0.37		

Water FWD	£24.00	£7.92		
Combined Opex (Water/ Electricity)			£13.77	
Sewerage Charge	£24.00	£7.39		
Maintenance	£0.00	£28.00	£28.49	
AD Treatment Costs		£36.11		£35.65
AD Transport Costs		£0.00		£84.70
Total	**£56.47**	**£102.86**	**£70.60**	**£120.35**

Table 12: Financial Cost per Business per Year – Larger Businesses

	£ per business per year			
	Macerator	De-waterer	Enzyme Digester	Waste AD
Impact per Business per Year	£2,576.40	£4,693.18	£3,221.02	£5,491.07
Notes: Based on businesses producing 46 tonnes a year of food waste				

4.60 Costs are anticipated to be higher for the de-waterer and the enzyme digester than for the macerators due to the higher capital cost and maintenance charges, although there are some cost savings in respect of water use in comparison to the use of macerators. The extent to which maintenance costs may be incurred was unclear, particularly for the de-waterers, where no direct feedback from unit users was available.

4.61 As was indicated above, there is some uncertainty regarding the amount of food waste that may be treated annually by businesses using these units. Eunomia's assumptions have been developed following discussion with industry, taking into account the maximum capacity of these units. Given the capital cost of investing in these units, take-up is anticipated to be greatest in the larger businesses. Smaller businesses using these units may see their costs decrease as a result of the switch to source segregated food waste collections. In this respect, Table 13 shows the annual costs for businesses producing 20 tonnes of waste a year; at this point, the waste to AD option is the cheapest for businesses.

Table 13: Financial Cost per Business per Year – Smaller Businesses

	£ per business per year			
	Macerator	De-waterer	Enzyme Digester	Waste AD
Impact per Business per Year	£2,423.10	£2,866.46	£2,869.17	£2,416.07
Notes: Based on businesses producing 20 tonnes a year of food waste				

4.62 Leading on from this, Table 14 shows the thresholds – defined here in terms of the amount of food waste generated in tonnes per year – where the total cost of switching from disposal to sewer to a separate food waste collection is equivalent to that of each of the food waste to sewer technologies. The threshold varies for each of the technologies (dewatering being the most expensive, and the macerator being the cheapest). From this, it can be seen that businesses producing 20 tonnes a year and using a macerator will see no increase in cost as a result of the ban. For those using de-waterers (which have higher costs), the impact will be cost-neutral for businesses producing 29 tonnes per year.

4.63 Thus, businesses producing less than these food waste tonnages will see a saving.

Table 14: Waste Generation – Thresholds for Cost Savings

	Macerator	De-waterer	Enzyme digester
Threshold for cost neutrality – tonnes per year of food waste generated	20	29	24

4.64 Based on data from StatsWales, Eunomia have estimated that the businesses within the size band of 20 – 49 employees have a turnover of £2.25 million – further suggesting that for these businesses, the *additional cost* of taking up a food waste collection (in comparison to the use of a macerator) would equate to around 0.1% of annual turnover.

Costs and Benefits to Waste Management Businesses

4.65 The waste management industry includes waste collection companies, operators of intermediate storage and treatment facilities such as waste transfer stations and end stage recovery and disposal facilities such as energy from waste facilities and landfill sites.

4.66 Local Authorities also have a duty (under the Environmental Protection Act 1990) to collect commercial waste on request. However, this is operated on a full cost recovery basis and thus there are predicted to be no costs arising to Local Authorities in this area.

4.67 The waste management industry is expected to experience an overall benefit from this option, it will be expected to experience some costs.

4.68 Costs include:

- Infrastructure costs
- On-going administrative costs
- Costs of Waste Collection (Residual and recycling/recovery)

The benefits include:

- Disposal/Processing of residual waste

- Materials Revenue
- Landfill tax

4.69 In a properly functioning, competitive market the costs and costs savings would be expected to be passed on to the customer (business waste producers). Thus the net costs and benefits will be accrued by waste producers rather than the waste industry. The net costs described below are thus attributed to waste producers for the purpose of calculating waste producer costs and savings in paragraphs 4.39 to 4.51 above.

Table 15: Option 2 – Breakdown of Financial Costs to Waste Management Businesses

	Financial costs to waste management businesses (2020 to 2029) (NPV £m)	Costs above Option 1 (Baseline) (NPV £m)
Infrastructure Transitional costs	£0	£0
On-going administrative costs	£92.5	£92.5
Waste collections (recycling & residual)	£788.2	£77.4
Residual waste processing/disposal	£1,018.3	-£332.7
Materials revenue (net of processing)	-£191.5	-£22.9
Landfill tax	£584.4	-£246.4
NET FINANCIAL COST	**£2,291.9**	**-£432.2**

Infrastructure Transitional Costs

4.70 The infrastructure transitional costs are the financial costs of upgrading and/or building new waste transfer stations under the options. As this option requires a low level of segregation it is not predicted that new infrastructure would be required.

Administrative Costs

4.71 The modelling shows ongoing administrative costs ranging between £238,000 in year 1 and £13 million in year 4, as a result of the requirement to collect the specified materials co-mingled as required by this option. Over the ten-year appraisal period, this totals approximately £92.5 million NPV. The majority (93%) of this cost is accounted for by the requirement for additional driving and loading staff, as shown in table 16. Just under 7% is accounted for by the requirements for operational changes such as updating collection routes and amending driver timetables.

Table 16: Administrative costs to waste management businesses – option 2 (rounded to nearest £1,000)

Activity	Year 1 (£)	Year 2 (£)	Years 3 – 10 (£)	10 Year Total (NPV £)
Waste Collection and Processing				

Attending Seminars	5,000	0		5,000
New Guidelines	219,000	0		219,000
Operational Changes	0	6,581,000		6,358,000
Additional Staff: Drivers and Loaders	0	4,335,000	98,937,626	85,915,000
Landfill and EfW				
Attending Meetings	1,000	1,000		1,000
New Guidelines	14,000	14,000		27,000
Total	**238,000**	**10,930,000**	**98,937,626**	**92,525,000**

4.72 In addition to these administrative costs, capital costs of £77 million NPV are estimated to be incurred to the waste management industry in the area of waste collection as an increased number of vehicles and containers will be required to deliver this option. However, this is predicted to be offset by:

- A decrease in the amount of residual waste processing and disposal costs from waste facilities is estimated to lead to a saving to the waste management sector of £333 million NPV over 10 years.
- An increase in the revenue received by the waste management industry from recycled material is estimated to lead to a saving of £23 million NPV over 10 years.
- A reduction in landfill disposal tax paid by waste management companies of £246million NPV over 10 years as a result of diversion of material from landfill from the implementation of this option.

4.73 The net impact is an estimated £432 million NPV saving to waste management businesses above the baseline over the ten-year appraisal period. However, as noted above, it is anticipated that competitive forces will result in waste management businesses passing at least some of these cost-savings onto waste producers.

4.74 Though collection costs and administration costs are lower for this option than for the preferred option (Option 3), the overall cost saving to waste management businesses is lower. This is primarily because of reduced revenue from the sale of recyclate caused by higher levels contamination from the co-mingling of recyclate streams.

Manufacturers and Supplies of Food Waste Disposal Technologies

4.75 The Welsh Government and Eunomia have met with manufacturers and suppliers of food waste disposal units and their representative bodies. From the meetings we understand that for the majority of these businesses, the supply of treatment units for the purposes of disposal to sewer in Wales represent a small part of the businesses output and we have not therefore

quantified this cost. While the actual cost is not known, discussions with the businesses concerned suggest that the cost is expected to be minimal.

Sewerage Authorities

4.76 Under this option there are no costs to the sewerage authorities, as there is no discharge of food waste to sewer from commercial premises in Wales. However, the authorities are estimated to save £44million in waste water treatment costs through the avoidance of treatment of food waste. This figure does not include the potential additional saving of £32.2million over 10 years from dealing with blockages and the consequent issues.

Welsh Government

4.77 The costs to the Welsh Government are presented below in table 17, below.

4.78 The modelling has costed for the Welsh Government to undertake the following tasks:

- Marketing
- Training.

Table 17: Option 2 – Breakdown of Financial Costs to Welsh Government (rounded to nearest £100)

	Financial costs to Welsh Government, (£) (2020 to 2029)
Marketing (requirement to sort)	250 000
Conducting training workshops & organising information campaigns (requirement to sort)	800
Marketing (ban to sewer)	50 000
Marketing and meetings (Landfill and incineration bans)	1,100
Total Cost	**301,900**

Natural Resources Wales

4.79 NRW is forecast to take on costs of £1.1million NPV over 10 years, as it will also undertake a number of actions regarding preparation and implementation activities for the requirements to present and collect waste separately, and for landfill and incineration bans. NRW provided information on the activities they expect to undertake to implement and regulate this policy, including staff grades, percentages of businesses to be inspected, and the forecast time required for each activity.

4.80 These activities include:

- Updating procedures, guidance and communications
- Supporting training workshops
- Inspections of waste producing businesses and waste carriers.
- Enforcement for non-compliance: In the case when an inspection has found a business to be non-complaint with regulation, assumed to be 10%

of inspected producer businesses and 5% of inspected carriers per year, a follow-up procedure is assumed to be carried out by NRW

- Variations of landfill and incineration permits
- Additional checks at landfill and EfW facilities
- Reporting to Welsh Government

4.81 The guidance updates, permit variations for incineration and landfill sites and all training activities are expected to occur within the first two years as an initial set-up cost. Once businesses have received the relevant information through these means, it is assumed that the inspections will take place in Year 2 onwards, to allow the affected businesses a transition period.

Table 18: Forecast Costs to NRW 2020-2029 (rounded to nearest £100)

Activity		Year 1 (£)	Year 2 (£)	Year 3 (£)	10 Year Total (NPV £)
	New procedures and communications work	3,800	0	0	3,800
	Government Workshop Support	1,800	0	0	1,800
	Organising inspections for producers	0	2,700	2,700	20,300
	Inspecting producers	0	93,500	95,600	767,200
Requirement to Sort and Separate Collection	Non-compliance follow-up for producers	0	9,300	9,600	76,700
	Organising inspections for waste carriers	0	900	900	6,800
	Inspecting waste carriers	0	18,900	18,900	144,100
	Non-compliance follow-up for waste carriers	0	1,900	1,900	14,400
	Reporting to Welsh Government	0	600	600	4,500
	Supporting meetings	600	600	0	1,200
Landfill and Incineration Bans	New procedures	400	400	0	900
	Permit Variations	18,900	18,900	0	37,100
	Additional Inspections	0	1,300	1,300	9,600
	Reporting to WG	0	300	300	2,300

Grand Total	**25,500**	**149,300**	**131,700**	**1,090,400**

Local Authorities

4.82 There are not expected to be any significant additional costs or benefits to Local Authorities in terms of waste collection to householders from this option (though some costs or benefits may be passed to local authorities from waste management companies) as Welsh local authorities must already meet the separate collection requirements of the Waste (England and Wales) Regulations (as amended) and already provide a separate food waste collection service. Local Authorities must also collect a high proportion of recyclable materials separately in order to meet the existing statutory recycling targets set under the provisions of the Waste (Wales) Measure 2010.

4.83 However, there should be no increase in costs with regard to local authority collection of business waste as this service is operated on a full cost recovery basis.

4.84 It is the intention of the Welsh Government that Local Authority environmental health teams will enforce the ban on the disposal of food waste to sewer from business premises. The costs arising from this include, and are shown in table 19, below:

- **Modifying procedures and guidance**.
- **Conducting inspections**: The frequency of inspections from environmental health officers will vary depending on the type of premises being inspected, with the frequency being dependent on the risks to public health posed by each business. While some very low risk businesses may not be inspected, a high-risk business premise could be inspected every 6 months. It has been assumed that 1% of food waste producing sites will receive an additional inspection that focusses on assessing the correct implementation the ban. Each inspection is assumed to be part of a pre-existing environmental health inspection carried out by one local authority inspector.

4.85 The training and guideline updates are expected to occur within the first year (2020) and inspections are expected to begin in year 2 once businesses have had time to update their procedures.

Table 19: Costs to Local Authorities for Food Waste to Sewer Ban 2020-2029 (rounded to nearest £100)

Actor	Activity	Year 1 (£)	Year 2 (£)	10 Year Total (NPV £)
Local Authorities	Updating Guidelines	500	0	500
	Inspections	0	47,000	385,900
Total Costs to Local Authorities (£)		**500**	**47,000**	**386,400**

4.86 Though certain incinerator or co-incinerator appliances could be regulated by local authorities, no such appliances are currently in operation in Wales. As such, restrictions on the incineration of materials are not expected to have an administrative impact on local authorities.

Summary Table – Option 2

4.87 Table 20, below, summarises the costs and benefits to the main sectors of the implementation of Option 2, profiled from 2020 to 2029. Avoided Landfill Tax is a transfer payment and is therefore excluded from the 'Net Cost' calculation.

Table 20: Option 2 Summary Table - 10 Year NPV (rounded to nearest £100,000)

	Costs (£m)	Costs compared to Baseline (Option1) (£m)
Financial costs		
Welsh Government		
Transitional costs	£0.3	£0.3
NRW		
Transitional costs	£0	0
On-going administrative costs	£1.1	£1.1
Local Authority		
Transitional costs	£0	£0
On-going administrative costs	£0.4	£0.4
All Waste Producers		
Transitional costs	£5.4	£5.4
On-going administrative costs	£0	0
Opex / capex (food to sewer)	£0	-£6.7
Waste Management Businesses**		
Infrastructure Transitional costs	£0	£0
On-going administrative costs	£92.5	£92.5
Waste collections (recycling & residual)	£788.2	£77.4
Residual waste processing/disposal	£1,018.3	-£332.7
Materials revenue (net of processing)	-£191.5	-£22.9
Landfill tax	£584.4	-£246.4
Sewerage Authorities		
Water treatment costs	£0	-£38.0
Monetised Environmental Costs		
All environmental costs	-£0.8	-£180.9

Total Cost	£2,298.2	-£650.6
Total Cost (ex LFT)*	£1,713.8	-£404.2

Total Welsh Government	£0.3	£0.3
Total NRW	£1.1	£1.1
Total Local Authority	£0.4	£0.4
Total All Waste Producers	£5.4	-£1.3
Total Waste Management Businesses	£2,291.9	-£432.2
Total Sewerage Authorities	£0	-£38.0

***** This calculation excludes taxes, as taxes function simply as transfers between different entities rather than as a net overall cost – an increase in the total landfill disposals tax paid is a cost to Welsh businesses, but is an income to the Welsh government and thus neutral within the overall costs and benefits of the system.

**Costs in this table attributed in this table to waste management companies are in practice expected to be passed to waste producers. However, for the purposes of this table they are attributed to waste management businesses.

Option 3: Medium Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

Introduction

4.88 The overall cost of this option is modelled to be £1,665.5 million NPV over 10 years, which represents a net benefit of £452.5 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 3.2 million tonnes CO_2 equivalent and an additional 3.8 million tonnes of recyclate.

4.89 This option is likely to provide high quality, high value recycling. This is because keeping the materials separate results in a less contaminated material than that resulting from co-mingled collections such as required by option 2. There is thus a lower risk of non-compliance with the requirements of the EU Waste Framework Directive.

4.90 Modelling carried out for the Welsh Government estimates that, though relative to Option 2 a similar amount of recycled material would be produced, as the material produced by this option is of higher quality it would realise higher material costs. The extent of benefits realised in terms of the economy and the environment are thus be higher.

Environmental Impacts

4.91 For the analysis, a range of environmental impacts were modelled, including:

- Emissions of greenhouse gases (expressed as CO_2 equivalent)
- Levels of NO_2 pollution
- Tonnes Recycling
- Monetised environmental impacts

4.92 The calculation of monetised environmental benefits is detailed in the supporting Eunomia study.

4.93 The costs are shown below:

Table 21: Option 3, Environmental Impacts, 10 Year 2020 to 2029

	Option 3 Impacts	Impacts above Option 1 (Baseline)
Tonnes CO_2	-2,767,000	-3,178,000
Tonnes NO_2	-5,000	-8,000
Tonnes recycling	8,2000,000	3,800,000
Monetised Environmental NPV	-£43,400,000	-£223,500,000

4.94 The implementation of this option would result in environmental benefits above the baseline (option 1), giving a reduction in greenhouse gas emissions

of 3.2Mtonnes and NO_2 of 8,000 tonnes, and an increase of 3.8Mtonnes of recycling over 10 years. The monetised environmental benefits above the baseline are estimated to be £223.5million over 10 years.

4.95 The benefits are due to the modelled switch of recyclable material from the residual waste stream to the recycling waste stream. Reductions in CO_2 and NO_2 emissions are mainly predicted from the increase in recycled materials, decrease in residual waste disposal (and in the case of CO_2) residual waste processing and reduction in onward transport costs. The reductions are observed despite increased emissions from recyclate processing and (in the case of NO_2) recyclate collection.

4.96 Though impacted by the increase in emissions from increased recyclate collection, this option outperforms Option 2 due to:

- Higher amount of recycled materials and associated carbon benefits
- Lower recycling processing costs due to reduced need to separate materials
- Lower levels of residual waste disposal
- Decreased onward transport

Landfill Tax

4.97 The modelling estimates a reduction in landfill disposal tax revenue of £231.4million NPV over 10 years as a result of diversion of material from landfill as a result of the implementation of this option.

Table 22: Option 3, Landfill Tax, 10 Year NPV 2020 to 2029

	Option 3 Costs	Costs above Option 1 (Baseline)
Landfill Disposals Tax	£599,500,000	-£231,400,000

Recyclate Quality

4.98 Analysis carried out by Eunomia shows that this option has a high likelihood of providing high quality recyclate, a key requirement of the EU Waste Framework Directive.

4.99 This because keeping materials separately for collection (other than those that can be easily separated to high quality) minimises the levels of cross contamination of materials. This higher quality material has a higher market price.

4.100 The option is also predicted to produce a higher volume of recyclate than option 4, thus achieving slightly higher materials revenue.

Employment

4.101 The modelling predicted Option 3 would sustain an average of 2,367 jobs in the waste management sector during the period 2020-29, 61 jobs more than would be sustained in the baseline (Option1). The cost impacts of Option 3 are predicted to be too small to have any direct impact on jobs.

4.102 To consider the Well-being and Future Generations Act further, both GVA per hour worked and percentage of businesses which are innovation driven were considered. Eunomia report that previous work[3] has shown that although the data does not provide an indication of the GVA per hour worked, it does predict that GVA is expected to increase as overall levels of recycling increase.

Costs to the Main Sectors

4.103 The costs to the different sectors are presented below and summarised in table 28:

Costs to Business Waste Producers

4.104 As described in Option 2, above, business waste producers may incur costs in two areas – transitional costs related to changes in practice and ongoing costs (or savings) related to the collection of their waste materials from the waste management sector.

4.105 Transitional costs are expected to be incurred in the following areas:

- Training and Awareness
- Modifying internal procedures and guidance
- Implementing a new bin system
- Organising a new collection system

4.106 It is expected that more waste producers will to need update their guidelines and bin systems than with Option 2, as it will require different arrangements for a greater range of businesses than Option 2. However, It has been assumed that the time and effort required to sort waste into separate bins would not be significant enough to result in any additional costs. The total costs are shown in table 23 demonstrating an increased impact on waste producers under this option than Option 2.

Table 23 – Option 3: Forecast Administrative Costs for Waste Producers (Moderate Separation) (rounded to nearest £1,000)

Activity	Year 1 (£)	Year 2 (£)	10 Year Total (NPV £)
Attending training	14,000	0	14,014
New Guidelines	1,618,000	0	1,618,000
Organising New Bin System	0	2,903,000	2,529,000
Organising New Collection System	0	8,572,000	7,466,000
Total (£)	**1,632,000**	**11,475,000**	**11,627,000**

4.107 To estimate the overall costs or cost savings to businesses, Eunomia has taken into account the combined net costs of the option. These consist of the costs or savings to waste management businesses (as detailed in paragraphs 4.114 to 4.122) and the transitional costs to waste producers, applied to a typical business waste producer, based on size of business (number of employees). The results are shown in table 24.

Table 24: Option 3 - Weekly Financial and Administrative Cost Impact per business of recyclate collection (2025) (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 3	£8.37	£1.48	-£10.14	-£31.70	-£41.19	-£146.00	-£629.16

4.108 Option 3 gives rise to savings above the baseline on overall waste management costs for the larger businesses (over 10 employees) and a small additional cost to smaller businesses. This pattern arises because the administrative costs incurred by businesses of different sizes are similar; but large businesses make bigger savings due to benefiting from reduced waste management costs over a greater quantity of waste.

4.109 Option 3 provides the greatest savings of all the options for larger businesses between 10 and 250 employees and is marginally more costly than Option 2 for businesses with 9 employees or less. The option is more costly than option 2 to smaller businesses because the administrative costs (above) are proportionally higher for this option than the savings expected to be passed on to the businesses by their waste collector.

4.110 In order to examine whether businesses producing large amounts of food waste might be impacted, the modelling also examined the impact on accommodation and food services. The results are shown in table 25, below:

Table 25: Option 3 - Weekly Financial and Administrative Cost Impact per Local Unit of recyclate collection - Accommodation and Food Service Activities only (2025) (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 3	-£145.11	-£100.06	-£214.63	-£425.27	-£682.39	-£736.81	-£3,240.32

4.111 The relatively large amount of waste produced by businesses in this sector means that the savings that are able to be realised are potentially greater than for businesses in general. As a result the waste management costs associated with all businesses fall under this option.

4.112 The savings for this option are higher for all sizes of business than those of the other options. As with option 2, the lower savings for the 5-9 size band reflects the data on waste generation, which shows businesses of this size producing less waste per local unit than those in the 0-4 range.

Costs to Businesses Disposing of Food Waste to Sewer

4.113 The costs to businesses currently disposing of food waste to sewer are as presented for Option 2.

Costs and Benefits to Waste Management Businesses

4.114 As with Option 2, though the waste management industry is expected to experience an overall benefit from this option (see paragraph 4.120, below), it will be expected to experience some costs.

4.115 Costs include:

- Infrastructure costs
- On-going administrative costs
- Costs of Waste Collection (Residual and recycling/recovery)
- Disposal/Processing of residual waste
- Landfill tax

4.116 In a properly functioning, competitive market the costs and costs savings would be expected to be passed on to the customer (business waste producers). Thus the net costs and benefits will be accrued by waste producers rather than the waste industry. The net costs described below are thus attributed to waste producers for the purpose of calculating waste producer costs and savings in paragraphs 4.104 to 4.112 above.

Table 26: Option 3 – Breakdown of Financial Costs to Waste Management Businesses

	Financial costs to waste management businesses (2020 to 2029) (NPV £m)	Costs above Option 1 (Baseline) (NPV £m)
Infrastructure Transitional costs	£15.3	£15.3
On-going administrative costs	£196.2	£196.2
Waste collections (recycling & residual)	£915.0	£204.2
Residual waste processing/disposal	£1,009.7	-£341.4
Materials revenue (net of processing)	-£441.7	-£273.1
Landfill tax	£599.5	-£231.4
NET FINANCIAL COST	**£1,665.5**	**-£452.5**

Infrastructure Transitional Costs

4.117 The infrastructure transitional costs are the financial costs of upgrading and/or building new waste transfer stations under the options. As this option will require an increase in the number of streams collected by some waste management businesses, it is estimated that 59 transfer stations would require 2 new bays and 14 transfer stations would need to be replaced at a cost of £15.3m.

Administrative Costs

4.118 The modelling shows ongoing administrative costs ranging between £1.1million in Year 1 and £39.6million in Year 2, as a result of the requirement to collect the specified materials co-mingled as required by this option. Over the ten-year appraisal period, this totals approximately £196.2 million. The majority (84%) of this cost is accounted for by the requirement for additional driving and loading staff, as shown in table 27. 15% is accounted for by the requirements for operational changes such as updating collection routes and amending driver timetables.

Table 27: Option 3 - Administrative costs to waste management businesses – Option 3 (rounded to nearest £1,000)

Activity	Year 1 (£)	Year 2 (£)	Years 3 – 10 (£)	10 Year Total (NPV £)
Waste Collection and Processing				
Attending Seminars	9,000	0		9,000
New Guidelines	1,042,000	0		1,042000
Operational Changes	0	31,258,000		30,201,000
Additional Staff: Drivers and Loaders	0	8,320,000	189,908,675	164,911,000
Landfill and EfW				
Attending Meetings	1,000	1,000		1,000
New Guidelines	14,000	14,000		27,000
Total	**1,065,000**	**39,593,000**	**189,908,675**	**196,192,000**

4.119 In addition to the administrative costs, capital costs of £204 million NPV are estimated to be incurred to the waste management industry in the area of waste collection as an increased number of vehicles and containers will be required to deliver this option. However, this is predicted to be offset by:

- A decrease in the amount of residual waste processing and disposal costs from waste facilities is estimated to lead to a saving to the waste management sector £341million NPV over 10 years.
- An increase in the revenue received by the waste management industry from recycled material is estimated to lead to a saving of £273 million NPV over 10 years.
- A reduction in landfill disposal tax paid by waste management companies of £231million NPV over 10 years as a result of diversion of material from landfill from the implementation of this option.

4.120 The net impact is an estimated £452 million saving to waste management businesses over the ten-year appraisal period. However, as noted above, it is anticipated that competitive forces will result in waste management businesses passing at least some of these cost-savings onto waste producers.

4.121 Though the infrastructure, administration costs, waste collection and landfill tax costs are higher for this option than for option 2, they are offset by the higher material revenue resulting from the higher quality recyclate resulting from higher levels of source segregation. This results in a higher saving above the baseline than Option 2.

4.122 Option 3 is also predicted to provide lower costs or higher savings than Option 4 under all headings.

Manufacturers and Supplies of Food Waste Disposal Technologies

4.123 The impact on the manufacturers and suppliers of food waste disposal units is assumed to be the same as under Option 2.

Sewerage Authorities

4.124 As with Options 2 and 4, there are no costs to the sewerage authorities from this option, as there is no discharge of food waste to sewer from commercial premises in Wales. The savings are as presented for Option 2. The authorities are estimated to save £44m in waste water treatment costs through the avoidance of treatment of food waste. This figure does not include the potential addition saving of £32.2m over ten years from dealing with blockages and the consequent issues. These sums could otherwise be re-invested in water or sewerage infrastructure or services.

Welsh Government

4.125 The cost to the Welsh Government under this option is as presented for Option 2, with a total cost of £301,900NPV over 10 years.

Natural Resources Wales

4.126 The cost to NRW is assumed to be the same as detailed in Option 2, with a total cost of £1.1million NPV over 10 years.

Local Authorities

4.127 The cost to Local Authorities is as presented in Option 2, with a total cost of £386,400 NPV over 10 years associated with the duty to regulate the ban on the disposal of food waste to sewer.

Summary Table – Option 3

4.128 Table 28, below, summarises the costs and benefits to the main sectors of the implementation of Option 3, profiled from 2020 to 2029. Avoided Landfill Tax is a transfer payment and is therefore excluded from the 'Net Cost' calculation.

Table 28: Option 3 - Summary Table - 10 Year NPV (rounded to nearest £100,000)

	Costs (£m)	Costs compared to Baseline (Option1) (£m)
Financial costs		
Welsh Government		
Transitional costs	£0.3	£0.3
NRW		
Transitional costs	£0	£0
On-going administrative costs	£1.1	£1.1
Local Authority		
Transitional costs	£0	£0
On-going administrative costs	£0.4	£0.4
All Waste Producers		
Transitional costs	£12.7	£12.7
On-going administrative costs	£0	£0
Opex / capex (food to sewer)	£0	-£6.7
Waste Management Businesses**		
Infrastructure Transitional costs	£15.3	£15.3
On-going administrative costs	£196.2	£196.2
Waste collections (recycling & residual)	£915.0	£204.2
Residual waste processing/disposal	£1,009.6	-£341.4
Materials revenue (net of processing)	-£441.7	-£273.1
Landfill tax	£599.5	-£231.4
Sewerage Authorities		
Water treatment costs	£0	-£38.0
Monetised Environmental Costs		
All environmental costs	-£43.4	-£223.5

Total Cost	£2,265.0	-£683.8
Total Cost (ex LFT)*	£1,665.5	-£452.5

Total Welsh Government	£0.3	£0.3
Total NRW	£1.1	£1.1
Total Local Authority	£0.4	£0.4
Total All Waste Producers	£12.7	£6.0
Total Waste Management Businesses	£2,293.9	-£430.2
Total Sewerage Authorities	£0	-£38.0

***** This calculation excludes taxes, as taxes function simply as transfers between different entities rather than as a net overall cost – an increase in the total landfill disposals tax paid is a cost to Welsh businesses, but is an income to the Welsh government and thus neutral within the overall costs and benefits of the system.

**Costs in this table attributed in this table to waste management companies are in practice expected to be passed to waste producers. However, for the purposes of this table they are attributed to waste management businesses.

Option 4: High Level of Separation, Separate Collection, Ban on the Disposal of Food Waste to Sewer, Ban on Recyclable Materials to Incineration and Landfill

Introduction

4.129 The overall cost of this option is modelled to be £2,294 million NPV over 10 years, which represents a net cost of £176 million NPV over the baseline (Option 1). It is estimated to result in a reduction in emissions of 2.8 million tonnes CO_2 equivalent and an additional 3.7 million tonnes of recyclate.

4.130 The option has highest overall costs of the options (including option 1) in the main because of higher transitional costs for business waste producers and the waste management sector and higher administrative and waste collection costs.

4.131 This option is likely to provide high quality, high value recycling. This is because keeping the materials separate results in a less contaminated material than that resulting from co-mingled collections such as required by Option 2. There is thus a low risk of non-compliance with the requirements of the EU Waste Framework Directive.

4.132 However, in terms of environmental costs, though benefitting from lower recycling processing costs and onward transport costs than Option 3, it is estimated to be outperformed by Option 3 due to:

- Higher collection costs
- Lower amount of recycled materials and associated carbon benefits

Environmental Impacts

4.133 For the analysis, a range of environmental impacts were modelled, including:

- Emissions of greenhouse gases (expressed as CO_2 equivalent)
- Levels of NO_2 pollution
- Tonnes Recycling
- Monetised environmental impacts

4.134 The costs are shown below:

Table 29: Option 4, Environmental Impacts, 10 Year 2020 to 2029

	Option 4 Impacts	Impacts above Option 1 (Baseline)
Tonnes CO_2	-2,410,000	-2,821,000
Tonnes NO_2	-4,000	-7,000
Tonnes recycling	8,000,000	3,600,000
Monetised Environmental NPV	-£28,000,000	-£208,100,000

4.135 The implementation of this option would result in environmental benefits above the baseline (Option 1), giving a reduction in greenhouse gas emissions of 2.8Mtonnes and NO_2 of 7,000 tonnes, and an increase of 3.6M tonnes of recycling over 10 years. The monetised environmental benefits above the baseline are estimated to be £208.1million over 10 years.

4.136 The benefits are due to the modelled switch of recyclable material from the residual waste stream to the recycling waste stream. Reductions in CO_2 and NO_2 emissions are mainly predicted from the increase in recycled materials, decrease in residual waste disposal (and in the case of CO_2) residual waste and recyclate processing and reduction in onward transport costs. The reductions are observed despite increased emissions resulting from recyclate collection.

4.137 Though benefitting from lower recycling processing costs and onward transport costs than Option 3, it is outperformed by Option 3, in the main due to higher collection costs of collecting additional material streams. In addition Eunomia predict a lesser amount of recyclate estimated to be collected at the higher level of segregation as there would be a higher risk of non-compliance and therefore contamination, should a five stream dry recyclate system be introduced.

Landfill Tax

4.138 The modelling estimates a reduction in landfill disposal tax revenue of £163.3 million NPV over 10 years as a result of diversion of material from landfill as a result of the implementation of this option.

Table 30: Option 4, Landfill Tax, 10 Year NPV 2020 to 2029

	Option 4 Costs	Costs above Option 1 (Baseline)
Landfill Disposals Tax	£667,500,000	-163,300,000

Recyclate Quality

4.139 Analysis carried out by Eunomia shows that this option has a high likelihood of providing high quality recyclate, a key requirement of the EU Waste Framework Directive.

4.140 This because keeping materials separately for collection (other than those that can be easily separated to high quality) minimises the levels of cross contamination of materials. This higher quality material has a higher market price.

4.141 However, the option is also predicted to produce a lower volume of recyclate than Option 3, thus achieving slightly lower materials revenue.

Employment

4.142 The modelling predicted option 4 would sustain an average of 2,273 jobs in the waste management sector during the period 2020-29, 61 jobs more than would be sustained in the baseline (Option1). The cost impacts of Option 4 are predicted to be too small to have any direct impact on jobs.

4.143 To consider the Well-being and Future Generations Act further, both GVA per hour worked and percentage of businesses which are innovation driven were considered. Eunomia report that previous work[3] has shown that although the data does not provide an indication of the GVA per hour worked, to does predict that GVA is expected to increase as overall levels of recycling increase.

Costs to the Main Sectors

4.144 The costs to the different sectors are presented below and summarised in table 36.

Costs to Business Waste Producers

4.145 As described in Option 2 above, business waste producers may incur costs in two areas – transitional costs related to changes in practice and ongoing costs (or savings) related to the collection of their waste materials from the waste management sector.

4.146 Transitional costs are expected to be incurred in the following areas:

- Training and Awareness
- Modifying internal procedures and guidance
- Implementing a new bin system
- Organising a new collection system

4.147 Under this option there is a slight jump in the forecast costs for waste producers, especially in regards to organising new bin systems. It has been assumed that, although most businesses are likely to have some recycling, very few will currently have the five separate recycling bins for paper, card, glass, metals, and plastics. Although a similar assumption was made for Option 3, the key difference here is that it has also been assumed that, unlike the previous options, the necessary implementation time will be longer as the new bin system would be more complex and harder to implement.

4.148 However, similarly to the previous two options, it has been assumed that the time and effort required to sort waste into separate bins by the employees of waste producing businesses would not be significant enough to result in any additional administrative costs.

4.149 The forecast total costs to waste producers under the high separation policy is shown in Table 31.

Table 31: Option 4 - Administrative Costs for Waste Producers (rounded to nearest £1,000)

Activity	Year 1 (£)	Year 2 (£)	10 Year Total NPV (£)
Attending Seminars	19,000	0	19,000
New Guidelines	1,618,000	0	1,618,000
Organising New Bin System	0	5,807,000	5,610,000
Organising New Collection System	0	8,572,000	8,282,000
Total (£)	**1,636,000**	**14,379,000,**	**15,529,000**

4.150 To estimate the overall costs or cost savings to businesses, Eunomia has taken into account the combined net costs of the option. These consist of the costs or savings to waste management businesses (as detailed in paragraphs 4.157 to 4.165) and the transitional costs to waste producers, applied to a typical business waste producer, based on size of business (number of employees). The results are shown in table 32.

Table 32: Option 4 - Weekly Financial and Administrative Cost Impact per business of recyclate collection - 2025 (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 4	£20.95	£13.03	£2.73	-£15.28	-£25.64	-£127.43	-£785.98

4.151 Option 4 gives rise to savings on overall waste management costs for the larger businesses (over 20 employees) and is the most costly of all the options with 19 employees or less. This pattern arises because the administrative costs incurred by businesses of different sizes are similar; but large businesses make bigger savings due to benefiting from reduced waste management costs over a greater quantity of waste.

4.152 The option is the most costly than other options to smaller businesses because the administrative costs (above) are proportionally higher for this option than the savings expected to be passed on to the businesses by their waste collector.

4.153 In order to examine whether businesses producing large amounts of food waste might be impacted, the modelling also examined the impact on accommodation and food services. The results are shown in table 33.

Table 33: Option 4 - Weekly Financial and Administrative Cost Impact per Local Unit of recyclate collection - Accommodation and Food Service Activities only – 2025 (£)

Regulatory Scenario	Business Size Band (Employees)						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 4	-£128.28	-£84.31	-£203.94	-£407.67	-£659.10	-£712.11	-£4,047.68

4.154 The relatively large amount of waste produced by businesses in this sector means that the savings that are able to be realised are potentially greater than for businesses in general. As a result the waste management costs associated with all businesses fall under this option.

4.155 The savings for this option are lower than those resulting from the preferred option (Option 3) but higher than those predicted for Option 2. The lower savings for the 5-9 size band reflects the data on waste generation, which shows businesses of this size producing less waste per local unit than those in the 0-4 range.

Costs to Businesses Disposing of Food Waste to Sewer

4.156 The costs to businesses currently disposing of food waste to sewer are as presented for Option 2.

Costs and Benefits to Waste Management Businesses

4.157 The waste management industry includes waste collection companies, operators of intermediate storage and treatment facilities such as waste transfer stations and end stage recovery and disposal facilities such as energy from waste facilities and landfill sites.

4.158 Local Authorities also have a duty (under the Environment Protection Act 1990) to collect commercial waste on request. However, this is operated on a full cost recovery basis and thus there are no costs arising to Local Authorities.

4.159 As with Option 2, though the waste management industry is expected to experience an overall benefit from this option (see paragraph 521, below), it will be expected to experience some costs.

4.160 Costs include:

- Infrastructure costs
- On-going administrative costs
- Costs of Waste Collection (Residual and recycling/recovery)
- Disposal/Processing of residual waste
- Landfill tax

4.161 In a properly functioning, competitive market the costs and costs savings would be expected to be passed on to the customer (business waste producers). Thus the net costs and benefits will be accrued by waste producers rather than the waste industry. The net costs described below are thus attributed to waste producers for the purpose of calculating waste producer costs and savings in paragraphs 4.145 to 4.155 above.

Table 34: Option 4 – Breakdown of Financial Costs to Waste Management Businesses

	Financial costs to waste management businesses (2020 to 2029) (NPV £m)	Costs above Option 1 (Baseline) (NPV £m)
Infrastructure Transitional costs	37.2	37.2
On-going administrative costs	456.8	456.8
Waste collections (recycling & residual)	1,225.3	514.5
Residual waste processing/disposal	1,018.6	-332.4
Materials revenue (net of processing)	-432.8	-264.2
Landfill tax	667.5	-163.3
NET FINANCIAL COST	**2,294.4**	**176.4**

Infrastructure Transitional Costs

4.162 The infrastructure transitional costs are the financial costs of upgrading and/or building new waste transfer stations under the options. As this option will require an increase in the number of streams collected by some waste management businesses, it is estimated that 37 transfer stations would require 2 new bays and 36 transfer stations would need to be replaced at a cost of £37.2m.

Administrative Costs

4.163 The modelling shows ongoing administrative costs ranging between £1.1 million in year 1 and £64 million in year 4, as a result of the requirement to collect the specified materials co-mingled as required by this option. Over the ten-year appraisal period, this totals approximately £456.8million. The majority (93%) of this cost is accounted for by the requirement for additional driving and loading staff, as shown in table 35 below. 7% is accounted for by the requirements for operational changes such as updating collection routes and amending driver timetables.

Table 35: Administrative costs to waste management businesses – option 4 (rounded to nearest £1,000)

Activity	Year 1 (£)	Year 2 (£)	Years 3 – 10 (£)	10 Year Total (NPV £)
Waste Collection and Processing				

Attending Seminars	14,000	0		14,000
New Guidelines	1,097,000	0		1,097,000
Operational Changes	0	32,904,000		31,791,000
Additional Staff: Drivers and Loaders	0	21,388,000	488,163,738	423,907,000
Landfill and EfW				
Attending Meetings	1,000	1,000		1000
New Guidelines	14,000	14,000		27,000
Total	**1,125,000**	**54,305,000**	**488,163,738**	**456,837,000**

4.164 In addition to the administrative costs, capital costs of £514 million NPV are estimated to be incurred in the waste management industry in the area of waste collection as an increased number of vehicles and containers will be required to deliver this option. However, this is predicted to be offset by:

- A decrease in the amount of residual waste processing and disposal costs from waste facilities is estimated to lead to a saving to the waste management sector £332 million NPV over 10 years.
- An increase in the revenue received by the waste management industry from recycled material is estimated to lead to a saving of £264 million NPV over 10 years.
- A reduction in landfill disposal tax paid by waste management companies of £163million NPV over 10 years as a result of diversion of material from landfill from the implementation of this option.

4.165 The net impact is an estimated £176 million cost to waste management businesses over the ten-year appraisal period. However, as noted above, it is anticipated that competitive forces will result in waste management businesses passing at least some of this cost onto waste producers.

Sewerage Authorities

4.166 As with Options 3 and 4, there are no costs to the sewerage authorities from this option, as there is no discharge of food waste to sewer from commercial premises in Wales. The savings are as presented for Option 2. The authorities are estimated to save £44.0m in waste water treatment costs through the avoidance of treatment of food waste. This figure does not include the potential addition saving of £32.2m over ten years from dealing with blockages and the consequent issues. These sums could otherwise be re-invested in water or sewerage infrastructure or services.

Welsh Government

4.167 The costs to the Welsh Government under this option are as presented for Option 2, with a total cost of £301,900NPV over 10 years.

Natural Resources Wales

4.168 The costs to NRW is assumed to be the same as detailed in Option 2, with a total cost of £1.1million NPV over 10 years.

Local Authorities

4.169 The cost to Local Authorities is as presented in Option 2, with a total cost of £386,400 NPV over 10 years associated with the duty to regulate the ban on the disposal of food waste to sewer.

Summary Table – Option 4

4.170 Table 36, below, summarises the costs and benefits to the main sectors of the implementation of Option 4, profiled from 2020 to 2029. Avoided Landfill Tax is a transfer payment and is therefore excluded from the 'Net Cost' calculation.

Table 36: Option 4 - Summary Table - 10 Year NPV (rounded to nearest £100,000)

	Costs (NPV £m)	Costs compared to Baseline (Option1) (NPV £m)
Financial costs		
Welsh Government		
Transitional costs	£0.3	£0.3
NRW		
Transitional costs	£0	£0
On-going administrative costs	£1.1	£1.1
Local Authority		
Transitional costs	£0	£0
On-going administrative costs	£0.4	£0.4
All Waste Producers		
Transitional costs	£15.5	£15.5
On-going administrative costs	£0	£0
Opex / capex (food to sewer)	£0	-£6.7
Waste Management Businesses**		
Infrastructure Transitional costs	£37.2	£37.2
On-going administrative costs	£456.8	£456.8
Waste collections (recycling & residual)	£1,225.3	£514.5
Residual waste processing/disposal	£1,018.6	-£332.4
Materials revenue (net of processing)	-£432.8	-£264.2
Landfill tax	£667.5	-£163.3
Sewerage Authorities		
Water treatment costs	£0	-£38.0
Monetised Environmental Costs		
All environmental costs	-£28.0	-£208.1

Total Cost – Delete Row?	£2,961.9	£13.2
Total Cost (ex LFT)*	£2,294.4	£176.4

Total Welsh Government	£0.3	£0.3
Total NRW	£1.1	£1.1
Total Local Authority	£0.4	£0.4
Total All Waste Producers	£15.5	£8.8
Total Waste Management Businesses	£2,972,668,915	£248.6
Total Sewerage Authorities	£0	-£38.0

***** This calculation excludes taxes, as taxes function simply as transfers between different entities rather than as a net overall cost – an increase in the total landfill disposals tax paid is a cost to Welsh businesses, but is an income to the Welsh government and thus neutral within the overall costs and benefits of the system.

**Costs in this table attributed in this table to waste management companies are in practice expected to be passed to waste producers. However, for the purposes of this table they are attributed to waste management businesses.

A1.0 Appendix – Consideration of Exemptions

The Welsh Government has considered exemptions from the requirements in three areas:

- A de minimis threshold for business waste producers, below which the requirement to present waste for collection would not apply;
- An exemption to the requirement to present waste separately for business waste producers in rural areas;
- An exemption for the ban on the disposal of food waste to sewer for waste treated by specified treatment technologies.

A.1.1 An analysis of these is provided below.

Consideration of de minimis provision to the requirement for businesses to present waste separately

A.1.2 The Welsh Government asked Eunomia to consider the impacts of applying a de minimis threshold to the requirements to separately present waste. Eunomia considered two scenarios:

- A de minimis to the separate presentation of all specified materials based on business size (number of employees);
- A de minimis to the separate presentation of food waste based on weight of food waste produced by the business, similar to that applied in Scotland and Northern Ireland.

De minimis based on business size

A.1.3 The impact of excluding all business local units with 0-4 employees from the separate presentation of specified recyclable materials was considered.

A.1.4 This would have the overall effect of exempting the 60% of businesses with fewer than five employees. These premises are responsible for 12% of commercial and industrial waste arisings.

High Level Costs

A.1.5 The high level costs are summarised in table 37, which shows the impact on the options of applying of implementing the regulatory options with a de minimis threshold of 5 employees.

Table 37: Impact of 0-4 Employee De minimis Exemption on Businesses – 10 Year NPV (2020-2029) (£M)

	Financial Cost	Monetised Environmental Cost	Additional Administrative Costs	Total
Option 2	-21.06	27.54	-3.22	2.26
Option 3	-62.13	33.61	-7.63	-36.15
Option 4	-266.05	25.36	-9.32	-250.01

A.1.6 The results show the impact that exempting these small businesses makes to the options. They predict a reduction in both financial costs and administrative costs for all the options compared with applying the policy to all businesses.

A.1.7 This is offset to a degree by an increase in the overall environmental costs of waste management for all the options, due to a decrease in the amount of recyclate produced by the exempted businesses (and therefore higher waste management costs). For options 3 and 4, the environmental cost is outweighed by the financial and administrative benefits and results in a increased whole system benefit.

A.1.8 For the preferred option, Option 3, the impact of the introducing the exemption is an increase in the whole system benefit of £36 million NPV over 10 years. However, this comes with a reduction in environmental benefits discussed below.

Environmental Costs and Benefits

A.1.9 Table 38 shows the environmental impacts to the policy options of an exemption for businesses employing 0-4 people. The exemption would result in a lower environmental benefit for each option, as less waste is recycled and commensurately smaller benefits are thus achieved. The exception to this is that applying the exemption to Option 4 would result in lower NO_2 emissions, due to a reduction in collection vehicle movements.

Table 38: Environmental Impacts 2021-2029

	Impact of exemption on policy options		
	Option 2	Option 3	Option 4
Tonnes CO_2	434,051	527,027	434,051
Tonnes NO_2	484	619	-116
Tonnes recycling	-474,730	-523,139	-483,447
Monetised Environmental Costs £ NPV	£26,538,780	£33,605,561	£25,361,185

A.1.10 For option 3, the preferred option, implementing the exemption would result in the reduction in benefits of 527 000 tonnes of CO_2 and 523 000 tonnes less recyclate over a 10 year period, with a reduction in monetised environmental benefits of £33 million NPV.

Costs to Business Waste Producers

A.1.11 As with non-rural waste producers in the main body of the RIA, the largest costs fall to smaller business waste producers (0-4m employees). Removing the requirement to source segregate the wastes from these businesses would result in the costs accruing to these businesses not being incurred.

Costs to Other Actors

A.1.12 Waste management businesses would be predicted to make savings, as the costs of collecting from smaller waste producers cost proportionately more than collecting from larger waste producers. However, the costs and savings to the waste industry are expected to be passed on to their customers (waste producers) depending on the competitveness of the market.

A.1.13 Cost impacts to other actors would be expected to be minimal and have not been included for the purpose of modelling.

Exemption to the requirement to separately present food waste to businesses producing <5kg of food waste

A.1.14 In Scotland[4] and Northern Ireland[5] a requirement to source-separate food waste has already been implemented. In both cases a de minimis threshold has been applied.

A.1.15 In Scotland, the requirement is limited to "food businesses", defined as "an undertaking, whether for profit or not, and whether public or private, carrying out any activity related to the processing, distribution, preparation or sale of food." For its first year, the requirement was limited to food businesses that produced in excess of 50kg of food waste per week; it then extended to businesses producing in excess of 5kg per week. Businesses in rural areas

[4] HM Government (2012) The Waste (Scotland) Regulations

[5] HM Government (2015) The Food Waste Regulations (Northern Ireland) 2015, 2015 No. 14

and food waste originating from international transport are exempted from the requirement.

A.1.16 In Northern Ireland, the requirement is also limited to food businesses (similarly defined), and applies only to businesses producing in excess of 5kg of food waste per week.

A.1.17 There is no detailed post-implementation data through which to analyse the impact of the de minimis threshold, or the policy more widely.

A.1.18 Interviews conducted for this study revealed some diversity of views regarding the value of the de minimis thresholds. One respondent thought that the majority of the boost in food waste collections in Scotland had occurred as a result of focusing on large, willing food waste producers; bringing in smaller producers who were less willing to comply had resulted in higher levels of contamination (principally packaging), which was problematic for AD plants and had taken time and effort to improve. Another said that the phased approach had been helpful in managing enforcement, and had provided time for food waste treatment capacity to develop; but that the 5kg de minimis risked making enforcement more difficult because it enabled some businesses to claim they produced very little waste, or disposed of it through redistribution. They added that it could usefully be dispensed with, as no food business would realistically produce so little food waste. It was also suggested that the rural exemption was unfortunately allowing some very large food businesses to avoid having a food waste collection, even when it was logistically feasible for them to receive one.

A.1.19 Although many non-food businesses will produce more than 5kg of food waste per week, respondents generally concurred with what they perceived to be the Scottish policy of focussing on businesses' major waste streams."

A.1.20 It was not possible to model the impact of this exemption on the policy as data on waste arisings at this level was not available, however, it is anticipated that exempting such businesses would impact a small proportion of the food waste stream while exempting the producers who may face disproportionately higher cost for the collection of a relatively low weight of food waste.

Consideration

A.1.21 It is estimated that the exemption of businesses with 0-4 employees would exempt 60% of businesses and result in a reduction in overall financial and administrative costs for all options. However it would adversely impact on the environmental benefits of the policy. The Welsh Government is thus of the view introducing such an exemption is not desirable.

A.1.22 The exemption for businesses producing less than 5kg of food waste, though difficult to quantity in terms of impact, has been successfully introduced in Scotland and Northern Ireland and is in the view of the Welsh Government

appropriate for businesses who produce small amounts of such waste and that may have to pay a disproportionate amount for its collection.

Conclusion

A.1.23 The Welsh Government therefore proposes to exempt businesses producing less than 5kg of food waste from the requirement to present food waste separately for collection.

Consideration of a Rural Exemption to the Provisions

A.1.24 Wales has large rural areas, where there are a larger number of small businesses and greater distances between towns. These factors are generally expected to give rise to greater waste management costs, which could be increased as a result of more materials being separately collected.

A.1.25 Eunomia has therefore modelled the impacts of the options on the costs and benefits of the options in rural areas, to assess the impact of the options in such areas. which might be multiplied as a result of more materials being separately collected. The areas covered are based on the Local Authority areas classified as rural.

A.1.26 Table 39 shows the net present value of the implementation of the options in these areas.

High Level Costs

A.1.27 Table 39 shows the contribution that applying the requirement to sort and separately collect business waste produced in rural areas makes to the options. Options 2 and 3 are predicted to result in financial and environmental benefits, though both will result in additional administrative costs to businesses as systems are changed. Both options 2 and 3 result in overall, whole system benefits. Though option 4 results in an environmental benefit it is outweighed by the financial and administrative costs and results in a whole system cost.

Table 39: Requirement to Sort – Costs above Baseline Rural Areas – 10 Year NPV (2020-2029) (£M)

	Financial Cost above baseline	Monetised Environmental Cost above baseline	Additional Administrative Costs	Total
Option 2	-£46.20	-£57.60	£36.20	-£67.60
Option 3	-£60.20	-£71.90	£76.50	-£55.50

Option 4	£102.90	-£64.90	£172.20	£210.10

A.1.28 The same figures also illustrate the costs and benefits of exempting the premises as the costs and benefits will not be incurred should premises in these local authority areas be exempted. Thus for Option 3 (the preferred option), such an exemption would result in an overall reduction in benefit of the policy of £55 Million NPV over 10 years.

Environmental Costs

A.1.29 Table 40 shows the environmental impacts to the policy options of an exemption for rural business premises. The exemption would result in a lower environmental benefit for each option, as less waste would be recycled and commensurately smaller benefits are thus achieved. For option 3, the preferred option, implementing the exemption would result in the emission of an additional 474 000 tonnes of CO_2 and 947 000 tonnes less recyclate over a 10 year period, with an increase of monetised environmental costs of £71 million NPV.

Table 40: Environmental Impacts 2021-2029

	Impact of exemption on policy options		
	Option 2	Option 3	Option 4
Tonnes CO_2	474,500	594,133	474,500
Tonnes NO_2	1,636	2,186	1,614
Tonnes recycling	-903,594	-947,650	-910,242
Monetised Environmental Costs £ NPV	57,095,319	71,393,493	64,435,023

Costs to Waste Producing Businesses

A.1.30 Eunomia also considered the costs to businesses in rural areas. As in the main body of this report, the cost to businesses are the sum of the administrative costs to the businesses resulting from the change in collection system added to the costs or savings to waste management companies which are assumed to be passed to the customer (the waste producer).

A.1.31 As with the costs across Wales, the costs in rural areas differ depending on the size of the business affected, as shown in Table 50. Again, the smallest businesses incur a cost. For larger businesses, the costs of managing their waste are expected to decrease. The different mix of business types (and therefore waste arisings) found in rural areas, with far fewer industrial premises, gives rise to different specific costs and savings for businesses than for the whole business population of Wales, but results follow broadly the

same pattern, in that smaller businesses are more likely to incur costs and larger businesses more likely to benefit from savings.

Table 50: Weekly Financial and Administrative Cost Impact per Rural Local Unit – 2025 (£)

Regulatory Scenario	Local Unit Size Band						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 2	£5.37	£1.24	-£4.82	-£15.75	-£21.93	-£77.41	-£485.18
Option 3	£8.37	£1.48	-£10.14	-£31.70	-£41.19	-£146.00	-£629.16
Option 4	£20.95	£13.03	£2.73	-£15.28	-£25.64	-£127.43	-£785.98

A.1.32 A key difference is that there are rather fewer larger business units in rural areas. Nevertheless, the aggregation of the small level of additional costs experienced by the large number of rural microbusinesses is offset by the savings achieved by larger businesses. The scale of the additional waste management costs per small business unit is relatively small, particularly for Option 2 and Option 3.

A.1.33 Table 51 shows the difference between the costs estimated to be experienced by businesses in rural Local Authority areas and the average costs or savings estimated to be experienced by businesses across all Local authority areas in Wales.

Table 51: Weekly Financial and Administrative Cost Impact per Business Unit – 2025 (£) - Difference between rural businesses and all Wales businesses

Regulatory Scenario	Local Unit Size Band						
	0-4	5-9	10-19	20-49	50-99	100-249	250+
Option 1 (Baseline)	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00	£0.00
Option 2	£0.95	£0.73	£0.90	£1.48	£2.47	-£15.94	-£177.09
Option 3	£0.97	£0.29	-£0.36	-£1.46	-£1.08	-£56.31	£45.25
Option 4	£2.55	£2.41	£2.23	£1.33	£2.56	-£51.41	-£524.96

A.1.34 For the preferred option (Option 3), the estimated difference in cost per business are not significantly higher or lower than for the average business costs across Wales, with the smallest businesses experiencing less than £1/week higher prices than those experienced by the average business.

Costs to Other Actors

A.1.35 Waste management businesses would be predicted to make savings, as the costs of collecting from smaller waste producers cost proportionately more than collecting from larger waste producers. However, the costs and savings to the waste industry are expected to be passed on to their customers (waste producers) subject to competition.

A.1.36 Cost impacts to other actors would be expected to be minimal and have not been included for the purpose of modelling.

Conclusion

A.1.37 Eunomia's modelling estimates that for the preferred option (Option 3), the introduction of the policy would not incur significantly higher costs for rural businesses than non-rural. On the other hand, exempting businesses from the requirement would result in a reduction in environmental benefits. On the basis of this, the Welsh Government is of the view that, for the preferred option (Option 3) it is not appropriate to provide for an exemption to the requirement to sort for businesses in rural areas.

Consideration of the exemption of food waste treated by different treatment technologies from the ban on the disposal of food waste to sewer

A.1.38 It is the policy of the Welsh Government to divert food waste from the residual (black bag) waste stream to anaerobic digestion for energy recovery and the production of high quality fertiliser. Policies are already in place to deliver this outcome for household waste. However, it was identified prior the Environment (Wales) Act 2016 that there were insufficient drivers in place for the business and public sector. Thus regulations to be brought under the Act will require businesses and the public sector to present food (and other recyclable materials) separately for collection and for the waste to be separately collected by the waste management companies and Local Authorities who collect the waste. The food waste will be banned from incineration and landfill, thus strongly influencing the switch to anaerobic digestion in line with Welsh Government policy.

Along with food waste currently disposed of in the residual waste stream, it has been is estimated[6] that 19,000 tonnes of food waste is disposed of to sewer in the commercial sector based on the use in the Welsh hospitality sector and 2,000 tonnes in the public sector. It is the policy of the Welsh Government that this waste be sent to anaerobic digestion for the purposes of

[6] *Eunomia Research & Consulting (2013) Additional Policy Options Analysis for Welsh Government: Costs and Benefits of Extending Waste Framework Directive requirements, Waste Treatment Restrictions, Requirement to Sort and a Ban on the Disposal of Food Waste to Sewer (May 2013)* https://gweddill.gov.wales/docs/desh/publications/131021additional-waste-policy-options-en.pdf

energy generation and nutrient recovery (via the production of high quality fertiliser). For this reason the Welsh Government banned the disposal of food waste to sewer (subject to Commencement Order) in the Environment (Wales) Act 2016.

A.1.39 Food waste disposed to sewer would be normally expected to be treated prior to its disposal to prevent blockages, though regardless of this maceration is linked to fat build up and blockages within the sewerage network. There are three main treatment technologies used in this area:

- Macerator – the food waste is mixed with water and finely chopped and washed to sewer.
- Dewatering – the food waste is first macerated, then compacted to remove the liquids (the bulk of food being water). The liquid is disposed of to sewer, the dry fraction recovered or disposed of by other means (eg. anaerobic digestion, composting, combustion or landfill).
- Enzymic Digestor – the food waste is broken down by strong enzymes and the resulting "grey water" disposed of to sewer.

A.1.40 The technologies are mostly used by catering type establishments to dispose of with their food waste, including some public sector premises such as hospitals, prisons and schools for the same purpose.

A.1.41 During the development and passage of the Act the Welsh Government a number of manufacturers and suppliers of the above technologies expressed concerns regarding the ban.

A.1.42 The Welsh Government therefore required Eunomia to estimate the costs and benefits of exempting food waste treated by any the three technologies from the ban. In doing this, Eunomia considered previous work undertaken on the impacts of the different technologies.

Market Penetration of Technologies

A.1.43 There is very little published data available on the penetration of commercial food waste disposal (FWD) units by sector (or as a whole), therefore the assumptions used by Eunomia are based on information evidence provided by stakeholder interviews.

A.1.44 The sectors where FWD units are most prevalent are those which include a number of food producing businesses or public-sector organisations:

- Accommodation and food service activities (i.e. restaurants, hotels)
- Education (i.e. schools, colleges and universities)
- Human health and social work activities (i.e. hospitals)

Discussion with industry confirmed that relatively little data was available on the prevalence of the units in the hospitality sector as a whole. Estimates given by stakeholders to Eunomia in respect of FWD unit penetration suggested that between a third to three quarters of food businesses were using these units. However, feedback from Environmental Health Officers - who inspect the majority of these premises - has indicated that the units are rarely encountered in their inspections, suggesting relatively low levels of penetration. Feedback from public sector bodies indicates that there is variety of treatments in use and no consistent pattern of service delivery for food waste treatment.

A.1.45 An overview of food waste treatment in Health Boards across Wales suggests that around a third of food waste produced by hospitals is disposed of via a FWD unit. Furthermore, in anticipation of the Part 4 of the Environmental Act, it appears that some organisations are choosing to introduce food waste collections, rather than investing in food waste to sewer units which are at risk of being banned.

Modelling Work

A.1.46 Eunomia has liaised closely with the impacted companies to inform the consideration of the costs and benefits of a ban and to assess the case for exemptions. It has assessed each technology against the central case for separate presentation of food waste, followed by its collection and recovery at an anaerobic digestion facility. Eunomia has also considered previous work, including a piece of work funded by Mechline which assessed the case for exemptions from a ban.

A.1.47 Overall, the conclusions of the work submitted by Mechline are broadly similar to those that can be drawn from Eunomia's modelling. The main difference is that the contractor, Ricardo AEA made an assessment of practicability. The case is that some institutions, such as hospitals and prisons, do not wish to segregate food waste for collection due to perceived logistical constraints (such as convenience or simplicity for staff) or for security reasons (to restrict vehicle movements). Mechline have funded work to support this which concluded that the most practical system was the Mechline system (enzymic digestors), followed by maceration and dewatering (after which a liquid containing particles of food is discharged to sewer).

Case for Exempting the Technologies

A.1.48 Our central case for banning the disposal of food waste to sewer from business premises is that we require the food waste for the recovery of energy and nutrients (via the production of fertiliser) at anaerobic digestion facilities. The overall environmental impacts of exempting food waste treated by individual technologies are therefore the primary factors the Welsh Government has considered when assessing the appropriateness of such

exemptions. However, other factors have also been assessed, for example broader societal and financial impacts for different levels of market penetration, and costs to businesses where possible.

A.1.49 The case for and against exempting any of the food waste treated by any of the individual technologies is summarised below. A scenario in which food waste treated by each individual technology is exempted has been assessed against a central case or baseline scenario in which the disposal of commercial food waste to sewers is banned.

Food waste treated by macerator

A.1.50 Macerators are the most widespread of the three technologies. For the purpose of modelling, Eunomia assumed units being used in between 2404 and 7391 businesses and public sector premises, should the food waste treated by the technology be exempted from the ban. Though their market penetration is estimated to be low, it is higher than the other food waste treatment technologies and the overall impacts of exempting food waste treated by macerator are therefore proportionally larger than for food waste treated by the other technologies.

A.1.51 All food waste treated by a macerator only system would normally be disposed of to sewer.

Environmental Cost

A.1.52 Though there is some energy and nutrient recovery resulting from maceration (via sewage treatment) this is much lower than with the central case. There is therefore a net climate change cost to using the technology to treat food waste. Both the CO_2 and NO_2 arisings are higher and monetised environmental costs are also increased.

A.1.53 There is therefore a strong environmental case for not exempting food waste treated by macerators from the ban.

Financial Cost

A.1.54 There may be cost increases to any business currently using this technology producing greater than 20 tonnes of waste per year. Cost increases to these businesses of switching to the central case (separate food waste collection) are estimated to be around £60 /tonne. Smaller businesses will see savings from switching from the technology as the capital and maintenance costs of

the equipment become increasingly significant for treatment of lower tonnages of food waste.

A.1.55 The most significant financial costs associated with macerators relate to the cost to the water industry of treating the food waste via the sewage system, amounting to £301 per tonne of food waste, equivalent to £13k for each business using a macerator. These costs will ultimately be borne by all water service customers in Wales including householders.

A.1.56 A further potential financial impact is the cost of treating blockages arising as a result of food waste sent to the sewage system using macerators. The analysis suggests the cost to the water sector of treating these blockages is estimated at £189 per tonne of food waste.

A.1.57 If these cost savings are combined with the financial benefit arising from the reduced need to treat food waste via the water treatment system, the policy of banning food waste treated by macerators from disposal of food waste to sewer is estimated to result in a cost saving to the Welsh water industry of £8.3million in the central case. This figure does not include the potential additional saving of £32.2million over 10 years from dealing with blockages and the consequent issues.

Social Cost

A.1.58 The overall cost to society of exempting waste treated by a technology is equal to the monetised environmental costs plus the financial costs. It is estimated the social costs of exempting food waste treated using macerators from the ban at £32 million to £97 million over a ten year period, dependent on the level of market penetration.

Consideration

A.1.59 Considered against the central case for banning the disposal of food waste to sewer (energy generation and production of high quality fertiliser), there is no case to exempt food waste treated by maceration from the ban.

A.1.60 Though larger companies currently using this technology would experience potential cost increases they are unlikely to be significant. For example, Eunomia estimates businesses within the size band 20 to 49 employees would experience cost increases of 0.1% of annual turnover. Eunomia report that businesses are already moving away from this technology as they are aware the ban on disposal of food waste to sewer may impact them.

A.1.61 The costs to the water industry of exempting food waste treated by this technology would be high.

Conclusion

A.1.62 The Welsh Government is of the view that there is not a sufficient environmental case to exempt food waste treated in this manner from the ban.

Food waste treated by enzymic digester

A.1.63 As the market penetration is currently low, the overall impacts of exempting food waste treated by enzymic digester are therefore proportionally smaller than for food waste treated by maceration. For the purpose of modelling, Eunomia assumed units being used in between 60 and 185 businesses and public sector premises, should the food waste treated by the technology be exempted from the ban.

A.1.64 All food waste treated by an enzymic digester (other than non digestable items such as bones) would normally be disposed of to sewer.

Environmental Cost

A.1.65 Though there may be a small amount of energy and nutrient recovery resulting from enzymic digestion (via sewage treatment) this is much lower than with the central case. There is therefore a net climate change cost to using the technology to treat food waste. The monetised environmental costs of exemption are worse than the central case. The CO_2 and NO_2 arisings are also worse than the central case.

A.1.66 There is therefore no environmental case for exempting food waste treated by enzymic digestors from the ban.

Financial Cost

A.1.67 There may be cost increases to any business currently using this technology producing greater than 24 tonnes of waste per year. Cost increases to these businesses of switching to the central case are estimated to be around £50 /tonne. Smaller businesses will see savings from switching from the technology as the capital and maintenance costs of the equipment become increasingly significant for treatment of lower tonnages of food waste.

A.1.68 There are no anticipated additional costs to the water companies should food waste treated by this technology be exempted as the food waste is digested into a liquid prior to its disposal to sewer.

Social Cost

A.1.69 The overall cost to society of exempting food waste treated by a technology is equal to the monetised environmental costs plus the financial costs. Eunomia

has estimated the social costs of exempting food waste treated by enzyme digesters from the ban at between £164K and £494K over a ten year period, depending on the resultant level of market penetration. This because the financial costs to businesses of using separate collection systems are estimated as higher than the monetised environmental benefits.

Consideration

A.1.70 Considered against the central case for banning the disposal of food waste to sewer (energy generation and production of high quality fertiliser), there is no case to exempt food waste treated by enzyme digestion from the ban.

A.1.71 Though larger companies currently using this technology would experience potential cost increases they are unlikely to be significant. For example, Eunomia estimates businesses within the size band 20 to 49 employees would experience cost increases of 0.1% of annual turnover. Eunomia report that businesses are already moving away from this technology as they are aware the ban on disposal of food waste to sewer may impact them.

A.1.72 The overall social costs present a net cost if the food waste treated by the technology is not exempted. However, this cost is relatively low.

Conclusion

A.1.73 The Welsh Government is of the view that there is not a sufficient environmental case to exempt food waste treated in this manner from the ban.

Food waste treated by dewatering

A.1.74 As market penetration is currently low, the overall impacts of exempting food waste treated by dewaterer are therefore proportionally smaller than for food waste treated by maceration. For the purpose of modelling, Eunomia assumed units being used in between 541 and 1663 businesses and public sector premises, should the food waste treated by the technology be exempted from the ban.

A.1.75 The solid fraction after dewaterering is not sent to sewer and would be recovered at an AD plant or a separate composting unit also sold by the company (the liquid fraction would be disposed of to sewer). The waste management destination of the solid fraction has a significant impact on the environmental performance of the unit when compared against the Welsh Government's preferred option of separate collection and anaerobic digestion of food waste. This is because composting the solid output does not recover energy and may require energy input, thereby giving a worse CO_2 emissions outcome than if the material were sent to anaerobic digestion.

Environmental Cost

A.1.76 If the solid output were sent to AD, there would be a net climate change benefit over the central case. Both the CO_2 arisings and the monetised environment costs are better than in the central case, and some of the nutrients would also be recovered within the AD process. However, NO_2 arisings are worse than in the central case.

A.1.77 However, if the solid output were processed using an on-site composting unit and then spread on land, there would be net climate change cost compared to the central case, as no energy would be recovered from the waste. This cost would be increased if energy for heating the composting unit were required in colder weather. The nutrients in the solid fraction would also be recovered via the composting unit.

Financial Cost

A.1.78 There may be cost increases to any business currently using this technology producing greater than 29 tonnes of waste per year. Cost increases to these businesses of switching to the central case are estimated to be around £20 /tonne. Smaller businesses will see savings from switching from the technology as the capital and maintenance costs of the equipment become increasingly significant for treatment of lower tonnages of food waste.

A.1.79 There are no anticipated additional costs to the water companies should food waste treated by this technology be exempted as the food waste is digested into a liquid prior to its disposal to sewer, thus breaking down fats and other solids.

Social Cost

A.1.80 The overall cost to society of exempting food waste treated by a technology is equal to the monetised environmental costs plus the financial costs. Eunomia has estimated the social costs of exempting food waste treated using dewaterers from the ban at £614K to £10million over a ten year period, depending upon the destination of the solid output and the level of market penetration resulting from an exemption. This because the financial costs to businesses of using separate collection systems for both solid waste destinations modelled are estimated as higher than the monetised environmental benefits.

Consideration

A.1.81 Considered against the central case for banning the disposal of food waste to sewer (energy generation and production of high quality fertiliser), the grounds

for exempting food waste treated by dewaterering from the ban on disposal to sewer are dependent on the destination of the solid output of the process.

A.1.82 The overall social costs present a net cost if the food waste treated by the technology is not exempted. However, this cost is relatively low.

A.1.83 Though larger companies currently using this technology would experience potential cost increases they are unlikely to be significant. For example, Eunomia estimates businesses within the size band 20 to 49 employees would experience cost increases of 0.1% of annual turnover. Eunomia report that businesses are already moving away from this technology as they are aware the ban on disposal of food waste to sewer may impact them.

Conclusion

A.1.84 As it is not practical to mandate the waste management route for this material, the Welsh Government is of the view that there is not a sufficient environmental case to exempt food waste treated in this manner from the ban.