“Impact Assessment on Options Reviewing Targets in the Waste Framework Directive, Landfill Directive and Packaging and Packaging Waste Directive” Final Report

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EXECUTIVE SUMMARY

E.1.0 Introduction

The 'Targets Review Project' was commissioned by DG Environment of the European Commission. The project reviewed issues with, and possible changes to, the key targets in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive (Table E -1).

This project was delivered by Eunomia Research & Consulting (Eunomia) with support from Öko-Institut, the Copenhagen Resource Institute (CRI), ARGUS, and Satsuma Media. It was delivered under Eunomia's contract with the European Commission on *"Technological, Socio-Economic and Cost-Benefit Assessments Related to the Implementation and Further Development of EU Waste Legislation"*.

The basis for the review of the targets was twofold: first, the review was triggered by the review clauses set out in the Directives; and second, the aim was to bring the targets into line with the Commission's ambitions for promoting resource efficiency, and reducing greenhouse gas emissions associated with waste management. The review clauses in the Directives are as follows:

- Article 11(4) of the Waste Framework Directive requires that by 31st December 2014, the Commission shall examine the measures and targets set out in Article 11(2) with a view to, if necessary, reinforcing the targets and considering the setting of targets for other waste streams.
- Under the Landfill Directive, by 16th July 2014, the Council is required to re-examine the 2016 target under Article 5(2)(c) of the Directive, on the basis of a report from the Commission on the practical experience gained by Member States in the pursuance of the targets laid down in Articles 5(2)(a) and (b).
- Article 6(5) of the Packaging Directive stipulates that no later than 31st December 2007, the European Parliament and the Council shall, on a proposal from the Commission, fix targets for the third five-year phase 2009 until 2014, based on the practical experience gained in the Member States, and that this process shall be repeated every five years. However, in its December 2006 implementation report on the Directive to Council and Parliament, the Commission expressed the view that it was premature to propose new recycling and recovery targets at a stage when the previous set of targets had only recently been transposed into national legislation and when the latest implementation deadline for those targets (for Member States that joined the EU in 2004) was as late as 2015. In the report, the Commission therefore took the view that the targets should remain valid beyond 2008. However, given the requirement in article 6(5) to review targets *"every five years"*, these are now due for review in 2014.

Table E - 1: Directives and Associated Targets to be Reviewed

Directive	Targets
Waste Framework Directive **Article 11(2)**	a) by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight. b) by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight.
Landfill Directive **Article 5(2)**	a) by 16 July 2006, biodegradable municipal waste going to landfills must be reduced to 75 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available; b) by 16 July 2009, biodegradable municipal waste going to landfills must be reduced to 50 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available; c) (c) by 16 July 2016, biodegradable waste going to landfills must be reduced to 35% of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data are available.
Packaging Directive **Article 6(1)**	a) no later than 30 June 2001 between 50 % as a minimum and 65 % as a maximum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery; b) no later than 31 December 2008 60 % as a minimum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery; c) no later than 30 June 2001 between 25 % as a minimum and 45 % as a maximum by weight of the totality of packaging materials contained in packaging waste will be recycled with a minimum of 15 % by weight for each packaging material; d) no later than 31 December 2008 between 55 % as a minimum and 80 % as a maximum by weight of packaging waste will be recycled; e) no later than 31 December 2008 the following minimum recycling targets for materials contained in packaging waste will be attained: (i) 60 % by weight for glass; (ii) 60 % by weight for paper and board; (iii) 50 % by weight for metals; (iv) 22,5 % by weight for plastics, counting exclusively material that is recycled back into plastics; (v) 15 % by weight for wood.

This study also covers a number of related issues – for example, issues surrounding the quality of waste statistics – that are not specifically related to the targets currently set out in the above mentioned Directives. The following points of interest were highlighted by DG Environment in the Terms of Reference for this study and have been examined within this project:

1. The reference made in the Roadmap on Resource Efficiency to the necessity to avoid incineration of 'recyclable waste';
2. The emergence of over-capacity in incineration in some Member States;
3. The possibility for setting targets or bans for the incineration of some types of waste;
4. The possibility for setting bans for the landfilling of some types of waste (in line with the aspirational objective set out in the Roadmap to a Resource Efficient Europe);

5. The feasibility of, and opportunities for, setting waste prevention and reuse targets;
6. The possibility of setting targets for other waste streams, principally industrial and commercial waste;
7. The overlaps and inconsistencies between current targets;
8. The comparability of approaches and of data used to report on the achievement of targets; and
9. The gulf between different parts of the European Union in terms of current performance.

These points were raised as being of concern and have therefore also been reflected within the considerations and analyses undertaken as part of this project.

E.2.0 Approach Taken

The project adopted a five step approach which is similar to that outlined in the Impact Assessment Guidelines:

1. Identify the problem;
2. Define the objectives;
3. Develop main policy options;
4. Analyse the impacts of the options; and
5. Compare the options.

The first step was to identify the scope and nature of the problems associated with the targets in the above three directives. An important component of any Impact Assessment is to have a clear understanding of the objectives which underpin the work and provide a clear framework for the consideration of new policy agendas and the analysis of the options. A brief summary of how the policy options were developed and selected for final analysis is outlined below. In addition, the key findings and results of the study are summarised below, following the logic of the five step approach outlined above.

E.3.0 Problem Context

A detailed review was undertaken to understand and contextualise some of the key problems associated with the targets in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive. The problems associated with the targets can broadly be summarised into three categories:

- **Issues with respect to definitions and reporting** – in each of the Directives there are issues associated with poor definitions and ambiguities which allow for a variety of interpretations by Member States. These variations lead to significant variability in the reporting undertaken by Member States and further exacerbate differences in the relative performance of Member States. In addition, regarding the 50% recycling/preparation for reuse target set in the Waste Framework Directive which covers waste from *"households and possibly from other origins as far as these waste streams are similar to waste from households",*[1] Member

[1] For the sake of simplicity the 50% recycling/preparation for reuse target in the Waste Framework Directive is referred to here as the '50% recycling target'.

States are allowed to report against the target using one of four different calculation methods, which demand quite different levels of performance depending on the method chosen.[2] Issues such as these were identified as part of this work and helped to contextualise the proposals which were put forward as suggested changes.

- **Unequal performance across Member States** – for each of the targets, notwithstanding the issues of performance reporting highlighted above, there remains notable variation in the level of performance of different Member States.
- **Lack of coherence with broader EU policy on resource efficiency** – through a number of documents (see section below) the European Commission has set in place clear ambitions to improve resource efficiency across the Union. There was a significant call from many stakeholders to extend the existing targets and/or develop new targets which would allow for these broader objectives to be implemented and would help to ensure that, as far as possible, waste was being driven up the waste hierarchy.

The identification of a number of more specific issues through deliberation and through consultation with key stakeholders allowed a long list of potential solutions to be drawn up alongside each issue. The initial phase of the project involved compiling a comprehensive list of the key issues and identifying policy options which could be used to address these solutions. This list was used as the basis for a public consultation on the European Waste Management Targets which was held between 4th June and 10th September 2013.[3] Consultees were also asked to identify additional solutions that had not already been identified.

E.4.0 Objectives of the Review

In recent years the Commission has published a number of Communications which give a clear picture of the direction in which the Europe Union hopes to travel in terms of improving resource efficiency and securing access to resources. These Communications have ambitious aspirations and the intention was that the revision of the targets in the three Directives would help to set a concrete framework for achieving some of these aspirations. The key communications are:

1. The Resource Efficiency Roadmap, including 2020 aspirational targets; [4]
2. The 7th Environmental Action Programme;[5]
3. The Raw Materials Initiative highlighting the importance of recycling to ensure safe access to raw materials;[6] and

[2] See: Commission Decision of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council (notified under document C(2011) 8165) (2011/753/EU)

[3] European Commission (2014) *Consultation on the Review of the European Waste Management Targets*, http://ec.europa.eu/environment/consultations/waste_targets_en.htm

[4] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[5] Decision of the European Parliament and of the Council (2013) *Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet"*, November 2013, http://ec.europa.eu/environment/newprg/

4. The Report on the Thematic Strategy on Waste Prevention and Recycling summarising progress thus far, remaining challenges and proposals for the future.[7]

The first two documents above were identified as setting the context for the review of targets. The basis of this work was therefore intended to be closely aligned with these documents and, as far as is possible, aimed at ensuring that as a whole Europe is encouraged to improve resource efficiency and reduce the environmental impact of its waste management practices.

E.5.0 Development of Main Policy Options

The review of targets was informed by a formal public consultation and a detailed analysis of a long list of policy options which had been drawn up alongside a list of issues that had been identified in the early stages of the project. Stakeholders were asked to rank various policy options and identify additional solutions which could possibly be used to address the key issues. Detailed analysis of these options and the consultation responses allowed a number of front-running policy options to be identified for further scrutiny of their likely financial, environmental, and social costs and benefits. The final list of target related policy options which were analysed using a cost benefit approach are summarised in Table E-2.

[6] Communication from the Commission to the European Parliament and the Council (2012) *The Raw Materials Initiative — Meeting Our Critical Needs for Growth and Jobs in Europe*, COM(2008) 699 final, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:en:PDF

[7] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2011) *Report on the Thematic Strategy on the Prevention and Recycling of Waste*, SEC(2011) 70 final, http://ec.europa.eu/environment/waste/strategy.htm

Table E - 2: Summary of Modelled Scenarios

Option Number	Description of Option		Target Year			Comments
			2020	2025	2030	
Option 1.0	Business as usual		-	-	-	This is Baseline 1 as outlined in Section 3.4 of the main report. This Baseline presents an objective view of likely future waste management based upon realistic expectations for the performance and delivery of future waste management systems.
Option 2.0	Full implementation of existing targets		50%	-	-	This scenario assumes full implementation of the existing targets. This includes the current 50% recycling/preparation for reuse target in the Waste Framework Directive, performance against which can be measured by one of four methods.
Option 3.1.a	60% MSW recycling/preparation for reuse target by 2030		50%	50%	60%	Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods.[1] These Options assumed that Member States will use their chosen method for the existing 2020 target. For the 2025 and 2030 targets these Options assume that calculation Method 4 is used by all Member States (i.e. % MSW recycled).
Option 3.1.b	65% MSW recycling/preparation for reuse target by 2030		50%	-	65%	
Option 3.1 .c	70% MSW recycling/preparation for reuse target by 2030		50%	60%	70%	
Option 3.2.a	Increased packaging targets without split target for metals	Plastics	45%	60%	60%	This Option assumes separate targets for each type of packaging material listed here, other than for metals for which a combined target was modelled.
		Metal	80%	90%	90%	
		Glass	70%	80%	90%	
		Paper/Card	85%	90%	90%	
		Wood	50%	65%	80%	
Option 3.2.b	Increased packaging targets with split targets for metals	Plastics	45%	60%	60%	This Option is identical to Option 3.2.a other than for considering separate targets for ferrous and non-ferrous metals.
		Non-ferrous metal	85%	90%	90%	
		Ferrous metal	70%	80%	90%	
		Glass	70%	80%	90%	
		Paper/Card	85%	90%	90%	
		Wood	50%	65%	80%	
Option 3.3	Limiting the landfilling of MSW residual waste to 5%		-	-	5% of MSW to landfill	This Option assumes that landfilling is restricted to 5% of MSW generated in 2030.

Option Number	Description of Option	Target Year			Comments
		2020	2025	2030	
Option 3.4.a	Combination of Options 3.1.c, 3.2.b, and 3.3	as above	as above	as above	This is a combined scenario that looks at the overall impact of introducing a 70% MSW recycling and preparation for reuse target in 2030 alongside a 5% landfill ban in 2030. In addition to this, it also assumes that packaging recycling rates are increased as shown under Option 3.2.b above.
Option 3.4.b	Combination of Options 3.1.b, 3.2.b, and 3.3 with different deadlines for some Member States	as above, but with different timings for Group 1 and Group 2 countries	as above, but with different timings for Group 1 and Group 2 countries	as above	The different deadlines assumed in this Option are as follows: Group 1 and 2 Member States (see Table 7-4 in Section 7.8 of the main report) are obliged to meet the 2020 recycling/preparation for reuse target using Method 4 only, whereas Group 3 countries would be given until 2025. All countries would be obliged to meet the 60% recycling/preparation for reuse target by Method 4 in 2025 and 70% recycling/preparation for reuse in 2030. In terms of the landfill ban in this Option Group 1 countries are required to meet the 5% target by 2020, whereas Group 2 and 3 countries have until 2030 to achieve the target.
Option 3.4.c	Combination of Options 3.1.b, 3.2.b, in addition to limiting the landfilling of all waste sent to Category B landfills to 5% of total arisings by 2030.[2]	as above	as above	as above, but including ban on waste going to Category B landfills	This Option simply scales the benefits for a combined scenario by prorating Option 3.4.a to the totality of wastes landfilled at Category B landfills in 2011.

Notes:

1. *Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF.*
2. *Council Decision of 2003/33/EC refers to B1a, B1b, B2, and B3 landfills. Category B landfills are those that are licensed to accept non-hazardous waste and it is these landfills which form the focus of this analysis. See Commission Decision of 19th December 2002, Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Pursuant to Article 16 of and Annex II to Directive 1999/31/EC, Decision 2003/33/EC, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003D0033&from=EN.*

E.6.0 Analysis and Comparison of the Options

A cost-benefit approach was taken and the European Reference Model on Municipal Waste Management was used for this purpose, with a number of adaptions and additions to the model being made to allow non-municipal waste streams to be analysed.[8] All of the policy Options which were analysed were compared against a scenario under which full implementation of the existing legislation was assumed. Apart from measures taken to improve implementation, such as improved statistics, promotion of economic instruments, improvement of the functioning of the extended producer responsibility schemes, and other measures that may be required to meet existing targets, no additional changes in the legislation were included in the full implementation scenario.

By comparing the costs against the full implementation scenario it was possible to identify the additional costs and benefits associated with implementing the changes proposed by each of the policy Options included in Table E-2. The impacts from 2014 to 2030 of each Option for the key indicators is summarised in Table E-3. It is important to note that in terms of the Net Present Value (NPV) costs presented in the table below, negative values represent a benefit to society (a discount rate of 4% per annum was used across all 28 Member States). In financial terms negative values mean a direct saving relative to the full implementation scenario, whilst in terms of environmental externalities negative values reflect reduced damage costs relative to full implementation.

The results presented in Table E-3 indicate that the greatest net benefit is delivered by Option 3.4.c in which the net social costs amounts to a NPV of -€28.97 billion in 2013 real term prices. This Option effectively combines the 70% recycling/preparation for reuse target for MSW (Option 3.1.c), with increased targets for the recycling of packaging waste (Option 3.2.a) and measures to limit landfilling at Category B landfills to 5% by 2030. Overall this Option performs better than Options 3.4.a and 3.4.b which only consider applying a landfill ban to MSW. The inclusion of all waste sent to Category B landfills obviously brings with it additional environmental benefits and this is reflected in the lower environmental costs of this Option (NPV of -€18.27 billion).

Options 3.4.a and 3.4.b combine the 70% recycling/preparation for reuse target for MSW (Option 3.1.c), with increased targets for the recycling of packaging waste (Option 3.2.a) and measures to limit landfilling of MSW to 5% by 2030 (Option 3.3). There is considerable overlap between higher recycling targets for MSW and for packaging waste. As would be expected this gives some additional net benefit relative to the Options which examine the 70% recycling/preparation for reuse target, the packaging waste recycling targets, and landfill ban in isolation.

[8] Eunomia Research & Consulting and Copenhagen Resource Institute (2014) *Development of a Modelling Tool on Waste Generation and Management*, Report for the European Environment Agency and DG Environment at the European Commission, February 2014, www.wastemodel.eu

Table E - 3: Comparing the Costs of the Options[1]

Option Number[2]	Financial Costs	External Costs	Net Social Costs	Employment[4]	GHG Reduction	
	NPV 2014-2030, € Billion 2013 Real Term Prices[3]			1,000 FTEs in 2030	Million Tonnes $CO_{2\ eq}$ in 2030	Million Tonnes $CO_{2\ eq}$, 2014-2030
Option 3.1.a	-€3.73	-€3.96	-€7.69	79	-23	-107
Option 3.1.b	-€6.91	-€6.61	-€13.52	103	-32	-166
Option 3.1.c	-€8.41	-€8.49	-€16.91	138	-39	-214
Option 3.2.a	-€11.20	-€8.45	-€19.66	108	-20	-183
Option 3.2.b	-€13.48	-€10.05	-€23.53	108	-24	-250
Option 3.3	€5.64	-€0.65	€4.99	46	-13	-49
Option 3.4.a	-€12.65	-€13.00	-€25.65	178	-44	-308
Option 3.4.b	-€13.62	-€13.58	-€27.20	178	-44	-320
Option 3.4.c	-€10.70	-€18.27	-€28.97	-	-62	-443

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against a scenario of full implementation (Option 2).*
2. *The details of each Option are summarised in Table 7-5 in Section 7.8.*
3. *Net social costs = financial costs + external costs.*
4. *Employment figures represent direct employment only (no multiplier effects have been included)*

In terms of job creation, Options 3.4.a and 3.4.b are very promising with an estimated 178 thousand jobs likely to be created by 2030, with most of these jobs being created in the recycling industry (these jobs may not necessarily be confined to Europe and will largely depend on the amount of material that is reprocessed within the Union). Due to the nature of the modelling required for Option 3.4.c it was not possible to calculate employment impacts by Member State; however, the diversion of non-MSW away from Category B landfills will help to generate additional jobs in the recycling sector which would mean that employment under this Option would be in excess of 178 thousand by 2030.

The net social costs of Option 3.4.b are slightly higher than that of Option 3.4.a as the timings applied in this Option assume that Group 1 and 2 Member States (see Table 7-4) are obliged to meet the 2020 recycling target using Method 4 only, whereas Group 3 countries would be given until 2025. All countries would be obliged to meet the 60% recycling/preparation for reuse target by Method 4 in 2025 and 70% recycling/preparation for reuse in 2030. In terms of the landfill ban in this Option Group 1 countries are required to meet the 5% target by 2020, whereas Group 2 and 3 countries have until 2030 to achieve the target. Given that the environmental benefits are realised earlier on, the NPV of this Option shows a greater overall social benefit.

From this analysis it would appear that there is a very strong case for going for a combination of policy measures that includes:

1. The 70% MSW recycling/preparation for reuse target (Option 3.1.c);
2. The packaging recycling targets (Option 3.1.a or 3.2.b); and
3. Limiting the amount of residual waste landfilled at Category B landfills to 5% by 2030.

It should be noted that limiting the amount of waste landfilled, on its own, does not necessarily deliver net social benefits. However, the measure features strongly in both the Roadmap to a Resource Efficient Europe and the 7th EAP (see Section 5.0 of the main report).

Although both Options 3.4.a and 3.4.b provide very attractive opportunities and, relative to full implementation, result in significant financial savings and environmental benefits, it would be difficult to enforce the ban on sending only MSW to Category B landfills. Extending the ban to all non-hazardous waste sent to such landfills would be both environmentally beneficial and easier to monitor/enforce (it is very difficult to identify the source of materials once they have been bulked and delivered to landfill).

Option 3.4.c is in clear alignment with the objectives underpinning this review, which have been framed by the Roadmap to a Resource Efficient Europe and the 7th EAP.[9,10] In this regard, this Option would appear to encapsulate much of the ambitions set out in these documents to improve resource efficiency and employment opportunities within the European Union.

E.7.0 Recommendations

It is clear from the analyses of the front-running Options carried out in the above sections, that there are significant financial and environmental benefits to be gained from the combination of the following three proposed targets:

- 70% MSW recycling/preparation for reuse of MSW by 2030;[11]
- Ambitious recycling targets for packaging materials; and
- A ban on landfilling which will limit the amount of residual waste going to Category B landfills.

Given the clear benefits associated with this package of targets it is recommended that the Commission give serious consideration to Option 3.4.c.

During the course of the project a number of interesting and relevant policy options were investigated and considered by the project team. However, not all of these were included as part of the package of Options shown in Table E-2, either because they did not lend themselves to detailed analysis of the type undertaken here, or because they were related to non-target measures that are essential for supporting the implementation and monitoring of the targets outlined above. Below is a summary of the recommendations that have emerged as a part of this work:

- **Recommendations arising from the analysis of the front-running policy Options:**

[9] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[10] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

[11] The setting of an ambitious recycling target means that there is little need for targets focused on individual waste streams. At recycling rates of 70% all of the key materials will have to be captured from the municipal waste stream, with the remaining 30% being comprised of marginal materials.

1. Instead of extending the Landfill Directive in its current form, replace the diversion target for biodegradable municipal waste with a progressive reduction in landfilling of all wastes, as set out in the Options above;
2. The maximum limit of 80% recycling in the Packaging Directive should be removed.
3. Given the intention to increase recycling targets, both the overall recycling target, and the target for 'recovery' in the Packaging Directive should be removed.
4. Regarding the Article 11(2)(b) Waste Framework Directive target on C&D waste, there is deemed to be a need to provide a clear definition of recycling and material recovery / backfilling, and how these should be calculated for the C&D waste stream.

- **Measures to support the targets:**
  5. Establish a legal obligation for reporting on 'municipal waste' based upon a single unambiguous definition of the term, to be used by all Member States.
  6. Monitoring and validation of the reports submitted by Member States needs to be enhanced so that the consistency and reliability of data is assured.
  7. The definitions for key terms such as 'municipal waste', 'reuse', 'recycling' and 'composting' should be set out clearly in the Waste Framework Directive, with all other Directives cross-referencing to these definitions (so as to avoid inconsistencies across definitions used in different Directives).
  8. Enhance the quality of data, and the monitoring of the movement of wastes, possibly through an obligation to introduce centralized registers on national or regional level such that waste generators, waste collectors and waste treatment facilities have to report data to an e-data system.
  9. Introduce economic implementation mechanisms for Member States moving too slowly to meeting legally binding targets (e.g. pay-as-you throw schemes for collection and treatment of household and municipal waste).
  10. Member States not fulfilling binding targets or moving too slowly in fulfilling should be obliged to develop criteria for municipalities (competent authorities) to implement services of a minimum standard to enable sorting of a range of waste materials for recycling and composting / anaerobic digestion.
  11. Develop EU guidance on the proper implementation of the waste hierarchy with focus on the EU binding targets and an obligation for Member States to develop a national guidance on the same items.

- **Additional recommendations:**
  12. In the future the following matters might usefully be reported on, with a view to the development of targets at a subsequent stage:
      - The level of packaging reuse;
      - With appropriate boundaries, the level of reuse, and preparation for reuse, of items such as (W)EEE, furniture and textiles; and
      - Generation and management of food waste, preferably by sector.
  13. The sorting of wastes should be made mandatory at C&D sites above a certain threshold, to be determined, with special attention being given to hazardous waste.

14. Introduce requirements on businesses to sort a range of waste materials for recycling and composting / anaerobic digestion.
15. Member States are strongly encouraged to set waste prevention targets in their own Waste Prevention Plans.
16. The targets under the Packaging Directive should allow for some recognition of reuse in the calculation of the recycling target. This might be possible in future once data is available regarding packaging reuse.
17. (Preparation for) reuse targets should be considered as part of existing extended producer responsibility legislation (e.g. Directives covering WEEE and ELVs), or potentially as part of new Directives to cover materials such as furniture, textiles and toys. Member States are strongly encouraged to set such targets in their own Waste Prevention Plans.

Contents

1.0 Introduction

The 'Targets Review Project' was commissioned by DG Environment of the European Commission. The project was aimed at identifying the issues associated with, and proposing possible solutions to, the targets in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive. The basis for the review of the targets was twofold: on the one hand, it was to respond to the review clauses set out in the Directives; and, on the other, to bring these targets in line with the Commission's ambitions of promoting resource efficiency and reducing greenhouse gas emissions associated with waste management.

This project was delivered by Eunomia Research & Consulting (Eunomia) with support from Öko-Institut, the Copenhagen Resource Institute (CRI), ARGUS, and Satsuma Media. It was delivered under Eunomia's contract with the European Commission on *"Technological, Socio-Economic and Cost-Benefit Assessments Related to the Implementation and Further Development of EU Waste Legislation"*.

This document is the Final Report which presents the full details of the review process and analyses that were undertaken in order to assist the Commission with the development of its Impact Assessment which was used to justify the revision of the targets in the above Directives. **Section 2.0** of the report provides details on the project background and introduces the reasons for undertaking the review of targets, it highlights how this has been framed by the broader aspirations and longer-term visions set out in documents such as the Roadmap to a Resource Efficient Europe and the Commission's 7th Environmental Action Programme (7th EAP).[12,13]

The methodological approach taken to the study is described in detail in **Section 3.0**. This is followed by a detailed discussion in **Section 4.0** on the current waste management performance of Member States. This includes an analysis of some of the key issues associated with the targets in the above mentioned Directives and the problems associated with reporting accurately against them.

The review of targets was undertaken within the context of an ambitious resource efficiency framework and a number of aspirational targets for 2020 which have been set out in the Roadmap to a Resource Efficient Europe. As such, the objectives upon which this review has been based have, at least to some extent, already been articulated. These aspirations and the implications of implementing these changes in different types of countries are discussed in **Section 5.0**.

This project consisted of two key phases of work:

- Phase 1 – in which a long list of issues and potential solutions associated with the targets in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive were identified. The full range of proposed solutions was systematically reviewed to come up with a short list of potential policy options which were taken forward for detailed analysis in Phase 2.

[12] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[13] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

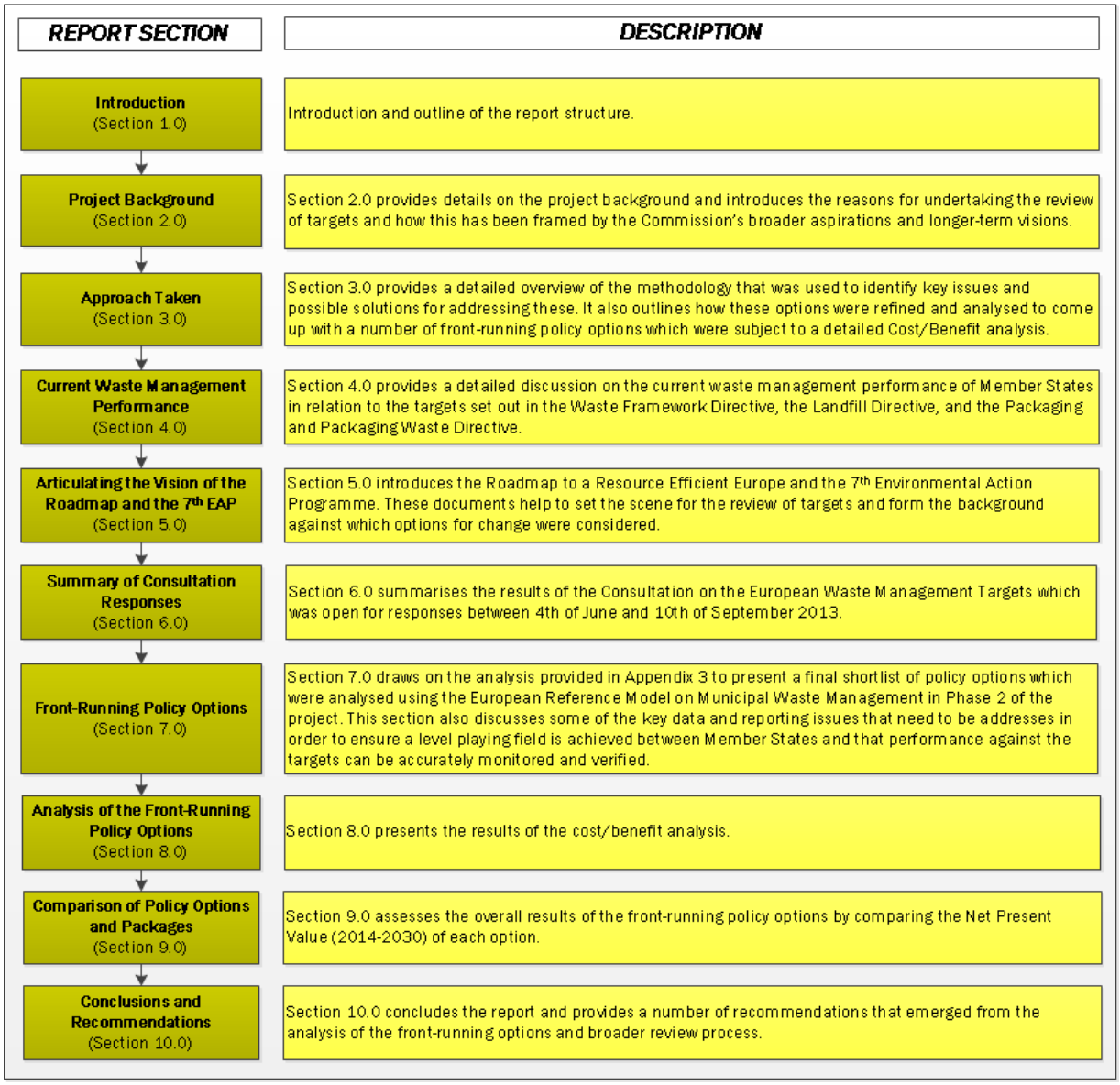
- Phase 2 - of the project adopted a cost-benefit approach to analyse the impacts of the front-running policy options identified in Phase 1.

As part of the Phase 1 work a formal public consultation was held between the 4th June and 10th September 2013.[14] The results of this consultation are summarised in **Section 6.0** and helped to shape the choice of policy options which were chosen for inclusion in the detailed cost-benefit analysis. The final list of policy options which were taken forward for analysis in Phase 2 are introduced and discussed in **Section 7.0.** This is followed by **Section 8.0** which provides an overview of some of the important principles which must underpin any review of targets – for example, a common definition of municipal waste and improved reporting of data. **Section 8.0** presents the results of these analyses and discusses the economic, social, and environmental implications of the various scenarios which were modelled. This is followed by **Section 9.0** which compares the results of the different scenarios to come up with a final recommendation as to which is the most favourable option. The final section of the report, **Section 10.0**, concludes by providing a number of succinct recommendations. A number of Appendices accompany the main report and give additional information regarding various aspects of the work undertaken.

A summary of the report structure is presented in Figure 1-1 below.

[14] European Commission (2014) *Consultation on the Review of the European Waste Management Targets*, http://ec.europa.eu/environment/consultations/waste_targets_en.htm

Figure 1-1: Overview of the Report Structure



2.0 Project Background

In its 2011 Communication on the implementation of the Thematic Strategy on the Prevention and Recycling of Waste, the Commission identified a list of actions and priorities to both improve the implementation of existing legislation and to move towards a more ambitious waste management policy. This includes continuing efforts to modernise, simplify and ensure the consistency of the waste legislation and the review of main targets included in key waste Directives.[15]

2.1 Reviewing the Targets under the Relevant Directives

In terms of reviewing the specific targets in each of the Directive, Article 11(4) of the Waste Framework Directive requires that by 31st December 2014, the Commission shall examine the measures and targets set out in Article 11(2) with a view to, if necessary, reinforcing the targets and considering the setting of targets for other waste streams. The Article requires that the Commission sends a report, accompanied by a proposal if appropriate, to the European Parliament and the Council, and that the report should take into account the relevant environmental, economic and social impacts of setting the targets.

Article 9 of the Waste Framework Directive stipulates that by the end of 2014, and following a consultation of stakeholders, the Commission shall submit to the European Parliament and the Council a report accompanied, if appropriate, by proposals for measures covering the setting of waste prevention and decoupling objectives for 2020, based on best available practices including, if necessary, a revision of the indicators related to prevention.

Under the Landfill Directive, by 16th July 2014, the Council is required to re-examine the 2016 target under Article 5(2)(c) of the Directive, on the basis of a report from the Commission on the practical experience gained by Member States in the pursuance of the targets laid down in Articles 5(2)(a) and (b) (see Table 2-1). This may be accompanied, if appropriate, by a proposal with a view of confirming or amending this target in order to ensure a high level of environmental protection.

Article 6(5) of the Packaging Directive stipulates that no later than 31st December 2007, the European Parliament and the Council shall, on a proposal from the Commission, fix targets for the third five-year phase 2009 until 2014, based on the practical experience gained in the Member States, and that this process shall be repeated every five years. However, in its December 2006 implementation report on the Directive to Council and Parliament, the Commission expressed the view that it was premature to propose new recycling and recovery targets at a stage when the previous set of targets had only recently been transposed into national legislation, and when the latest implementation deadline for those targets (for Member States that joined the EU in 2004) was as late as 2015. In the report, the Commission therefore took the view that the targets should remain valid beyond 2008. However, given the requirement in article 6(5) to review targets *"every five years"*, these are now due for review in 2014.

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[15] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2011) Report on the Thematic Strategy on the Prevention and Recycling of Waste, SEC(2011) 70 final, http://ec.europa.eu/environment/waste/strategy.htm

The relevant targets under each of the aforementioned Directives are set out in Table 2-1.

Table 2-1: Directives and Associated Targets to be Reviewed

Directive	Targets
Waste Framework Directive **Article 11(2)**	a) by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight. b) by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight.
Landfill Directive **Article 5(2)**	a) by 16 July 2006, biodegradable municipal waste going to landfills must be reduced to 75 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available; b) by 16 July 2009, biodegradable municipal waste going to landfills must be reduced to 50 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available; c) (c) by 16 July 2016, biodegradable waste going to landfills must be reduced to 35% of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data are available.
Packaging Directive **Article 6(1)**	a) no later than 30 June 2001 between 50 % as a minimum and 65 % as a maximum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery; b) no later than 31 December 2008 60 % as a minimum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery; c) no later than 30 June 2001 between 25 % as a minimum and 45 % as a maximum by weight of the totality of packaging materials contained in packaging waste will be recycled with a minimum of 15 % by weight for each packaging material; d) no later than 31 December 2008 between 55 % as a minimum and 80 % as a maximum by weight of packaging waste will be recycled; e) no later than 31 December 2008 the following minimum recycling targets for materials contained in packaging waste will be attained: (i) 60 % by weight for glass; (ii) 60 % by weight for paper and board; (iii) 50 % by weight for metals; (iv) 22,5 % by weight for plastics, counting exclusively material that is recycled back into plastics; (v) 15 % by weight for wood.

This project aimed to thoroughly review the current targets under these three Directives. The primary intention of this work was to:

- Lead to better application, clarification and simplification of the existing targets;
- Consider the case for the reinforcement of the existing targets and/or to the introduction of new targets (in line with the Roadmap to a Resource Efficient Europe);
- Consider possibilities in respect of waste prevention and further reductions in landfilling; and
- Consider the need for additional recycling targets over the medium to longer term.

At the same time, the review was intended to investigate possible overlaps in targets and, if necessary, identify options to improve clarity and consistency. In addition to this the review considered a number of related issues which are discussed below.

2.2 Consideration of Related Issues and New Targets

In recent years the Commission has published a number of Communications which give a clear picture of the direction in which Europe hopes to travel in terms of improving resource efficiency and securing access to resources. These Communications have ambitious aspirations and the intention was that the revision of the targets in the Waste Framework Directive, Landfill Directive, and Packaging Waste Directive would help to set a concrete framework for achieving some of these aspirations. The key communications are:

1. The Resource Efficiency Roadmap, including 2020 aspirational targets; [16]
2. The 7th Environmental Action Programme;[17]
3. The Raw Materials Initiative, highlighting the importance of recycling to ensure safe access to raw materials;[18] and
4. The Report on the Thematic Strategy on Waste Prevention and Recycling summarising progress thus far, remaining challenges, and proposals for the future.[19]

The first two documents above were identified as setting the context for the review of targets. The basis of this work was, therefore, intended to be closely aligned with these documents and, as far as is possible, aimed at ensuring that as a whole, Europe is encouraged to improve resource efficiency and reduce the environmental impact of its waste management practices. The aspirations and visions set out in the aforementioned documents are discussed in more detail in Section 5.0.

Also of relevance to this work was the *ex-post* evaluation (also referred to as the "fitness checks") of five EU Directives that deal with separate waste streams: namely, sewage sludge, PCBs/PCTs, packaging waste, end-of-life vehicles, and batteries (this work was carried out in parallel to this project).[20] In addition, the Green Paper on Plastic Waste was published early in 2013, with a public consultation on the paper closing on the 7th June 2013.[21] Another important piece of work which overlapped with this project was the

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[16] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

[17] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

[18] Communication from the Commission to the European Parliament and the Council (2012) *The Raw Materials Initiative — Meeting Our Critical Needs for Growth and Jobs in Europe*, COM(2008) 699 final, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:en:PDF

[19] Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions (2011) *Report on the Thematic Strategy on the Prevention and Recycling of Waste*, SEC(2011) 70 final, http://ec.europa.eu/environment/waste/strategy.htm

[20] European Commission (2013) *Review of Waste Policy and Legislation*, Date Accessed: September 2013, Available at: http://ec.europa.eu/environment/waste/target_review.htm

[21] *Ibid.*

Commission's work on the *Sustainability of the Food System* (a public consultation on the subject was held between the 9th June and 1st October 2013).[22]

This study also covers a number of related issues – for example, issues surrounding the quality of waste statistics – that are related to the way in which performance against the targets currently set out in the Waste Framework Directive, the Landfill Directive, and the Packaging Waste Directive are reported.

The following points of interest were highlighted by DG Environment in the Terms of Reference for this study and have been examined within this project:

1. The reference made in the Roadmap on Resource Efficiency to the necessity to avoid incineration of 'recyclable waste';
2. The emergence of over-capacity in incineration in some Member States;
3. The possibility for setting targets or bans for the incineration of some types of waste;
4. The possibility for setting bans for the landfilling of some types of waste (in line with the aspirational objective set out in the Roadmap to a Resource Efficient Europe);
5. The feasibility of, and opportunities for, setting waste prevention and reuse targets;
6. The possibility of setting targets for other waste streams, principally industrial and commercial waste;
7. The overlaps and inconsistencies between current targets;
8. The comparability of approaches and of data used to report on the achievement of targets; and
9. The gulf between different parts of the European Union in terms of current performance.

These points were raised as being of concern and have also been reflected upon in the work undertaken as part of this project.

[22] European Commission (2013) *Consultation on the Sustainability of the Food System*, Date Accessed: September 2013, Available at: http://ec.europa.eu/environment/consultations/food_en.htm

3.0 Approach Taken

The approach adopted for this study was based around ensuring that the steps set out in the Commission's Impact Assessment Guidelines[23] were respected in order to allow the Commission to develop the Impact Assessment on the review of European waste management targets.

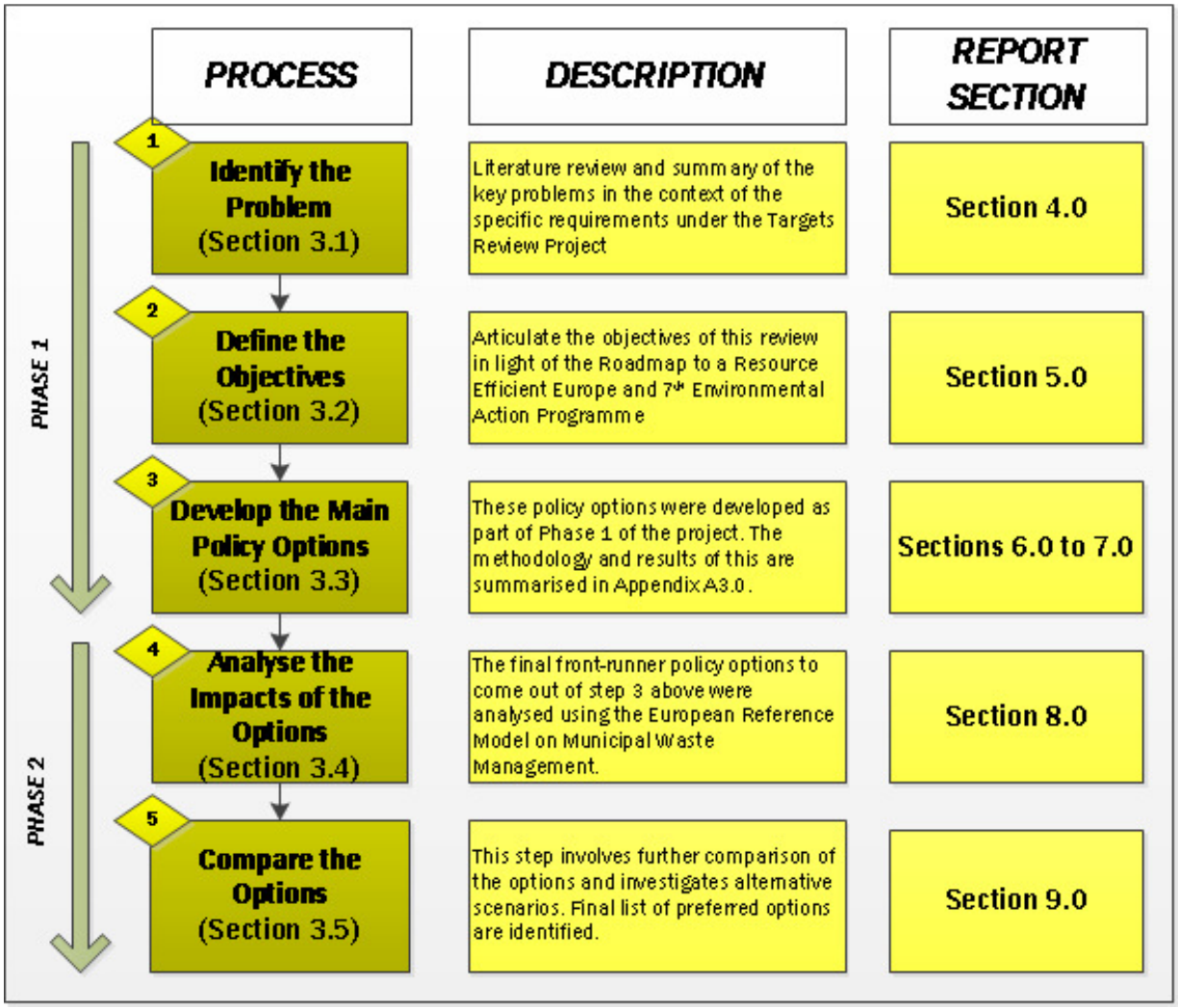
The Impact Assessment Guidelines set out a six step approach:

1. Identify the problem;
2. Define the objectives;
3. Develop main policy options;
4. Analyse the impacts of the options;
5. Compare the options; and
6. Outline methods for monitoring and evaluating the policy options.

We proposed using a similar format for this report to support the Commission's Impact Assessment. This process is summarised in Figure 3-1. From this figure it can be seen that there are only five steps. This is because the section on outlining the 'methods for monitoring and evaluation' is not strictly within scope of this work. We do, however, provide a detailed discussion, in Section 7.6 of this report, on some of the important principles that need to be considered when setting targets, including, for example, suggested changes to the definition of municipal waste and the way in which recycling rates are reported. This discussion should underpin any considerations being made by the Commission when they come to outlining their chosen methods for monitoring and evaluating any new targets that may be set. Not that our proposals do not necessarily imply a change in the approach to reporting recycling targets as defined in the existing Directives. Rather, they seek to ensure that the reporting of performance corresponds with what the Directives require to be reported as 'recycling'.

[23] European Commission (2009) *Impact Assessment Guidelines*, January 2009, http://ec.europa.eu/governance/impact/commission_guidelines/commission_guidelines_en.htm

Figure 3-1: Methodological Approach to the Study



3.1 Identifying the Problem

As an initial task the project team worked to identify all of the key issues associated with the targets in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive. This included a review of the issues surrounding the implementation, monitoring, and reporting of the targets outlined in Table 2-1. This review took the form of a literature review, and drew on a number of data sources as well as the extensive experience of the project team. In addition, a list of stakeholders was asked to provide additional feedback on potential issues associated with the targets.

3.2 Defining the Objectives

A clear definition of the objectives is always essential at the outset of any Impact Assessment as it allows for the policy options under consideration to be considered in light of a number of key criteria. A clear objective underpinning this work was the Commission's broader resource efficiency agenda. We therefore use Section 5.0 of the report to articulate the vision of the Roadmap to a Resource Efficient Europe and the 7th EAP.

3.3 Developing the Main Policy Options

Our approach to developing and identifying the main policy options was based around ensuring that the steps set out in the Commission's Impact Assessment Guidelines were respected.[24] In essence, there were ten stages to this particular phase of work:

1. Initial consideration of options;
2. Brainstorming of options;
3. Stakeholder interviews;
4. Development of web-based questionnaire (the full consultation document can be found in Appendix 1.0 and the results are presented in Appendix 2.0);
5. Consultants' initial appraisal of options;
6. Review of stakeholder responses;
7. Reconciliation of outcomes from 5) and 6);
8. Initial recommendations;
9. Discussion with Steering Group; and
10. Final recommendations.

These ten stages are summarised diagrammatically in Figure 3-2. The full methodology for this section of the report is described in Appendix 3.0. This Appendix also describes the outcome of stages 1 to 8. It will be noticed from Figure 3-2 that the project team, as part of stage 8, made a number of initial recommendations about those policy options which should be investigated in more detail. Section 7.0 of this report presents the final recommendations that were made after consultation with the Steering Group (stage 9) to come up with a final list of 'front-running' policy options (stage 10).

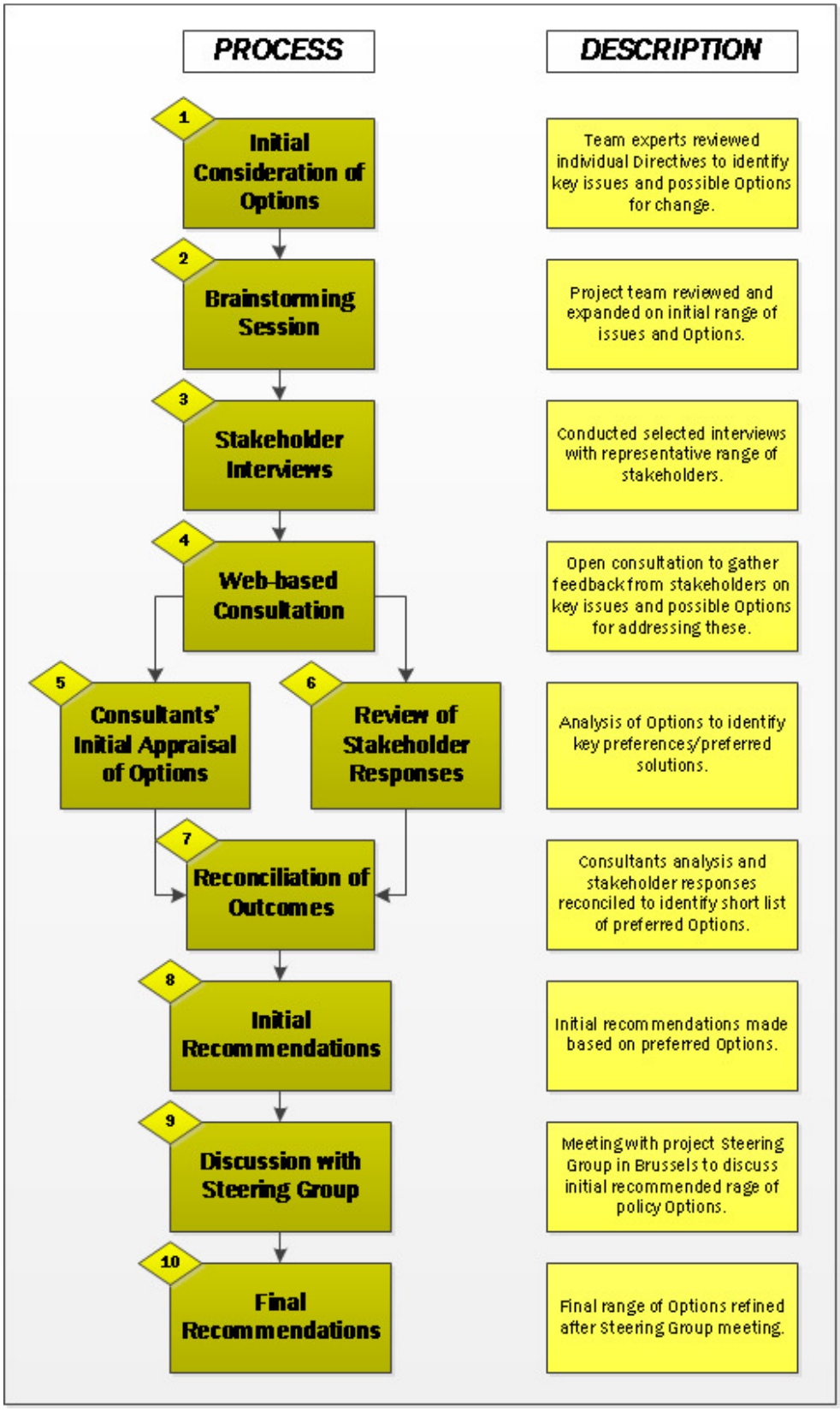
The following DG's participated in the Impact Assessment Steering Group: ENTR, CLIMA, JRC, and ESTAT. The Steering Group held five meetings between March 2013 and January 2014. The Steering Group was also invited to a presentation which outlined the main features of the model used for the preparation of the Impact Assessment in October 2013.

The final front-running options were then considered as part of a detailed cost benefit analysis to determine the impacts of various scenarios. These scenarios were developed in consultation with the Commission and were analysed, for the most part, using the European Reference Model on Municipal Waste Management.[25] Some additional analysis was necessary regarding the targets under the Packaging Directive and this is described in Appendix 4.0.

[24] European Commission (2009) *Impact Assessment Guidelines*, January 2009, SEC(2009) 92 http://ec.europa.eu/governance/impact/commission_guidelines/commission_guidelines_en.htm

[25] Eunomia Research & Consulting and Copenhagen Resource Institute (2014) *Development of a Modelling Tool on Waste Generation and Management*, Report for the European Environment Agency and DG Environment at the European Commission, www.wastemodel.eu

Figure 3-2: Methodological Approach Used to Identify the Main Policy Options



3.4 Analysing the Impacts of the Options

With regard to analysing the impacts of the options, economic, social and environmental impacts were considered. For this purpose the project team drew on Tables 1 to 3 in Section 8 of the Impact Assessment Guidelines for guidance.[26] The Impact Assessment Guidelines highlight potential tools for use in assessing policies, these being cost-benefit analysis, cost effectiveness analysis and multicriteria analysis. For the purposes of this work we have adopted a cost-benefit approach to assess the impact of the front-running policy options (Section 3.3).

The Impact Assessment Guidelines are clear that it is not the case that detailed analysis of all impacts are required. The Guidance notes that the analysis:

> *"…should also avoid unnecessary effort that would not lead to further insights or alter the conclusions or their robustness. The concept of '**proportionate level of analysis**' for an Impact Assessment relates to the appropriate level of detail of analysis which is necessary for the different steps of Impact Assessment.*
>
> *The 'proportionate level of analysis' is not only about the depth and scope of the analysis or the drafting of the Impact Assessment report. It refers to the whole Impact Assessment process – data collection efforts and stakeholder consultation, the level of ambition of the objectives, options and delivery mechanisms, the type of impacts to be examined, and the arrangements for monitoring and evaluation".*

The approach adopted as part of this work was to ensure coverage of the main impacts, and to cover these in a manner that gives some confidence to the insights which are gained from the results which emerge from the analysis.

In respect of targets related to municipal waste the European Reference Model on Municipal Waste Management was used for analysing the front-running policy options. DG Environment of the European Commission, working with the European Environment Agency, commissioned Eunomia and the Copenhagen Resource Institute (CRI) to develop this model which covers all 28 EU Member States. This model has been used, firstly, to develop scenarios which aid understanding of the gap between likely waste management performance in specific Member States and the targets for recycling, recovery and landfill diversion under existing legislation. In addition, it can be used to quantify the impact of different scenarios in respect of impacts on the environment, including (but not limited to) greenhouse gas emissions, job creation, financial costs (under either social or private metrics) and external costs.

The European Reference Model on Municipal Waste Management was developed in parallel to this study by Eunomia and CRI. It is built as a spreadsheet tool in Microsoft Excel 2010 and is populated with national waste management data for all Member States. At its core sits the mass flow modelling, where data on waste arisings, recycling, and residual waste treatment are recorded for each Member State. The model is able to make projections on waste generation and management in all Member States and at EU level –for the period 2010 to 2035. A schematic of the overall model is depicted in Figure 3-3.

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[26] European Commission (2009) *Impact Assessment Guidelines*, January 2009, http://ec.europa.eu/governance/impact/commission_guidelines/commission_guidelines_en.htm

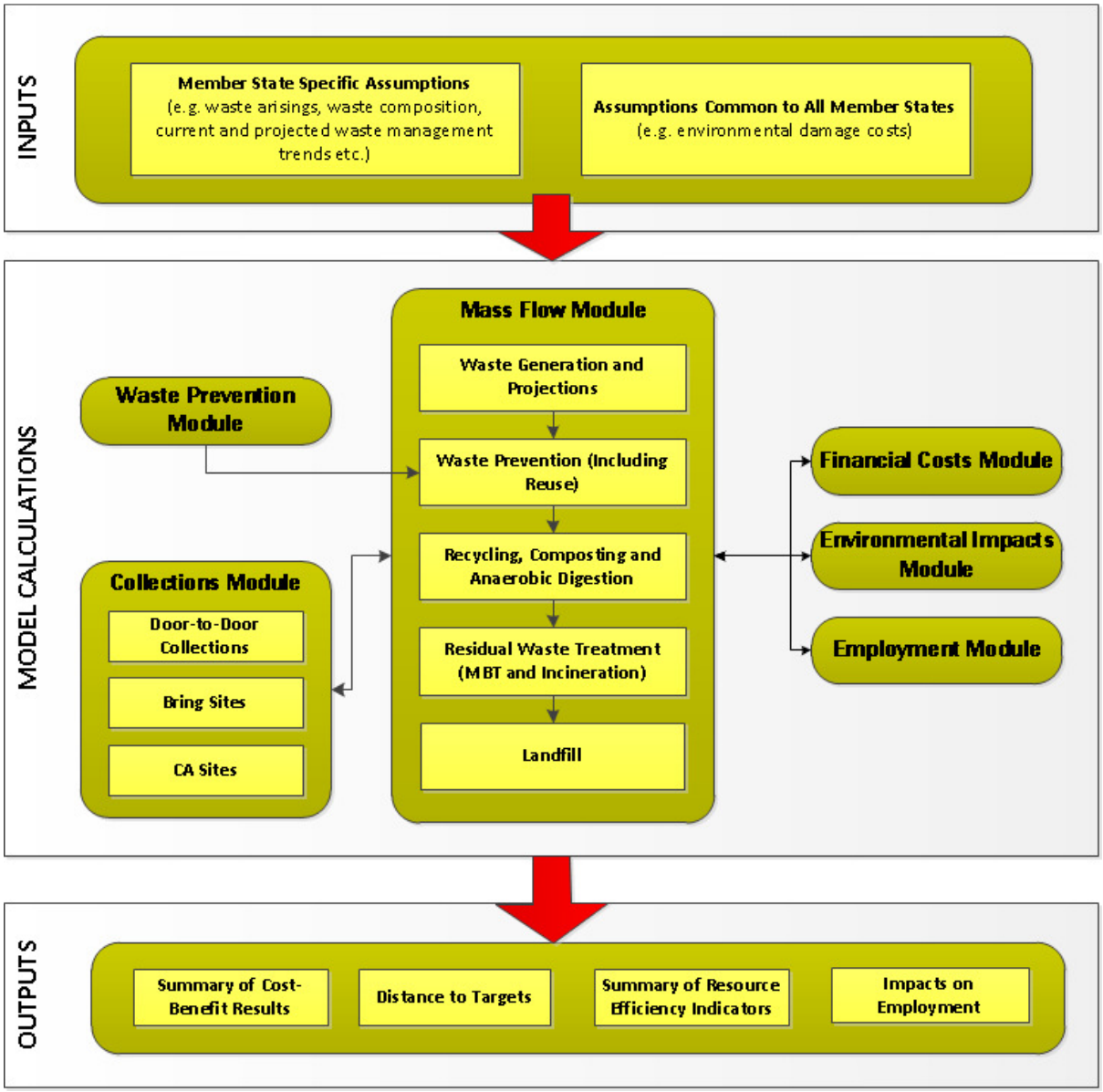
The model incorporates two baselines against which changes in waste policies that affect municipal waste can be assessed. The two baselines were developed in consultation with Member States and can be described as follows:

1. Baseline 1 presents the likely outlook based on current information. This Baseline presents an objective view of likely future waste management based upon realistic expectations for the performance and delivery of future waste management systems. For certain Member States it is likely to be a more moderated and objective version of the second baseline scenario; and
2. Baseline 2 reflects the stated intentions of Member States and takes these at face value (understandably, in most cases the stated intention is that Member States plan to achieve the targets, thus this baseline is close to the full implementation scenario discussed below).

In addition, the model includes a full implementation scenario. This scenario assumes that all relevant waste targets have been achieved by Member States. The above baselines are descried in more detail in the documentation which accompanies this model.[27] This documentation clearly summarises the key assumptions and data sources which have been used to calculate the financial and environmental impacts of the policy options considered as part of this project. A summary of the model and the key assumptions is provided in Appendix 4.0.

[27] Eunomia Research & Consulting and Copenhagen Resource Institute (2014) *Development of a Modelling Tool on Waste Generation and Management*, Report for the European Environment Agency and DG Environment at the European Commission, February 2014, www.wastemodel.eu

Figure 3-3: Overview of the European Reference Model on Municipal Waste Management



It is important to note upfront that there are a number of uncertainties associated with the model. The modelling, which forms the basis for most of the analysis of policy options presented in Section 8.0, is complex and incorporates a range of assumptions and variables which can be expected to influence the outcome of the assessment. In the experience of the modelling team, and reflecting the nature of the model developed, the main uncertainties are set out below insofar as they affect the financial and the external costs:

- **Financial costs associated with collection:**
  - The model has, necessarily, to simplify somewhat the complexity of the situation which actually exists in Member States. In each country, there are, and are likely to be in future, a range of different collection systems in place. The model simplifies reality by modelling a narrow range of systems. However, although the range is narrowed, the general tendencies are expected to be a reasonable reflection of the relative costs of systems

delivering varying recycling rates. It should also be noted that in the modelling systems are ordered on the basis of a reasonably efficient system of collection. There are good reasons to believe that there are considerable efficiencies to be gained from improving service performance;

- The model makes assumptions which determine the number of households which can be served by a given vehicle. These are likely to vary from place to place. The model seeks to deal with this through setting different parameters for urban, suburban and rural households;
- The costs are modelled in real terms. They are essentially deemed to remain constant across time in real terms. The time horizon for the assessment is, however, considerable. Over such a period, the index of some input parameters to the collection model, such as labour costs, might not be the same as the general rate of price increases. As such, the costs might not remain constant in real terms over the time period considered. This is, however, believed to be the most reasonable assumption to make in the circumstances (projecting, for example, the rate of increase in real wages would appear to be rather speculative);
- The value of materials being captured for recycling is deemed to remain constant in real terms. Following a period in history (roughly spanning the period 1950-2000) over which real prices for commodities have experienced a decline, the last decade has seen that decline completely reversed owing to increased global demand, notably from China. Many commentators believe prices may continue to rise in real terms, but there are, equally reasons why prices, not least in real terms, may decline. As such, the assumption regarding constant prices in real terms seems a reasonable one;
- For each country, where municipal waste is concerned, the model uses data from Member States regarding the composition of their municipal waste. The composition data is, in the model team's view, of variable quality. Because of the variation in composition from one country to another, the revenue generated from the capture of recyclables varies across countries (affecting net costs). Some countries' assumptions regarding what is, or is not, municipal waste also affect the reported composition of waste; and
- Quite apart from current waste composition, the modelling effectively has to consider waste composition over the period to 2035. Relatively little is known about exactly how waste composition will change in future. What seems certain, however, is that it *will* change. It is to be hoped that those changes that do occur will increase the extent to which materials can be easily recycled. What cannot be known, however, is how such changes will affect the costs of collecting and processing materials, and the revenues generated from selling the materials collected. The assumption of constant composition is, on the one hand, unlikely to reflect reality, but on the other, it is felt that no reasonable alternative assumption exists;

➢ **Financial costs associated with treatment:**

- The costs of treatment are assumed to remain constant in real terms. For some treatments, as well as taking into account the sale of some materials (see above for a discussion) the net costs take into account the sales of energy. The revenue derived from the sales of energy are assumed to be constant in real terms. This implies constant real terms prices for energy. Energy prices could, of course, follow a different path;

- The costs are influenced by assumptions regarding capital costs, assumed to be constant across countries, and the costs of other inputs to the process. Labour costs have been adapted to Member State situations. There is variation in unit capital costs of facilities, but the model assumes a single figure for a given treatment type. This seems reasonable given that the high level, strategic nature of the model means that assumptions regarding the size of specific facilities cannot meaningfully be made; and
- The way in which capital costs are financed will affect the costs for different facilities. In different Member States, there are different patterns of financing and ownership of waste management facilities. Some facilities are funded by municipalities, others are financed using public / private partnerships. These situations lead to variations in the costs of capital, and this affects the costs of operating facilities. The model effectively assumes a single figure for the real cost of capital.

➢ **Environmental externalities:**

- The overall figures for externalities reflect the inclusion and exclusion of various effects in the model. We believe that the main externalities of well operated facilities are captured by the model, but even so, some externalities are not captured by the model (see Section 4.1.5.1 in Appendix 4.0).
- The model assumes different damage costs for the air pollutants with these adapted for each Member State. These are based on the best evidence available, but clearly, uncertainties exist (not least in respect of how mortality is valued);
- The model assumes a profile for the damages associated with GHG emissions. The debate concerning how best to value damages associated with GHGs continues apace. There are clearly alternative assumptions that could be made in this regard;
- Some characteristics of key processes influence emissions, and hence, externalities. Key amongst these are:
    1. The modelling of the extent to which biodegradable material degrades in landfill;
    2. The capture of methane generated by landfills for energy generation and flaring (and crucially, the amount of methane escaping to the atmosphere);
    3. For technologies generating energy, such as incineration, the nature of the energy source which is assumed to be avoided, at the margin, when new facilities are introduced; and
    4. The modelled GHG emissions from facilities relate back to waste composition. If composition is not well known, then the emissions will be similarly poorly understood (and as noted above, composition is likely to change in future).

It will be clear from the above that the model is complex, and that the results are likely to vary with the nature of assumptions made. That having been said, considerable efforts have been made to ensure assumptions are reasonable, and the modelling is based on the best information available. The model has been subject to peer review.

3.5 Comparing the Options

Upon completion of the analyses the project team in consultation with the Commission decided on the most preferred options which should be considered for implementation. The discussion surrounding the comparison of the options is presented in Section 9.0.

4.0 Current Waste Management Performance

An oft-repeated observation from consultees with whom we spoke in the one-to-one discussions was that waste data was generally not comparable, and that there were problems both with how terms were defined, or interpreted, and, as a result, with the way in which performance against specific targets was being reported. The way in which definitions are applied also varies across countries.

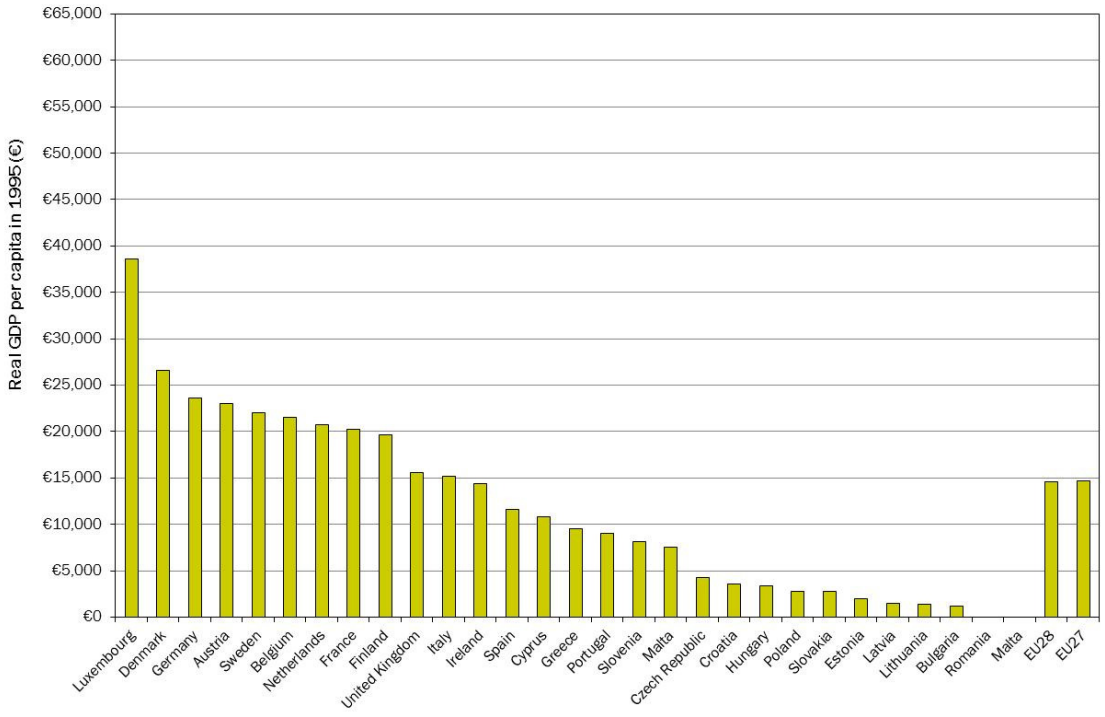
Some of these issues are taken up in more detail below, but in general, it is a matter that needs to be borne in mind when exploring current performance. As will become clear, matters of definition, interpretation and reporting make it difficult to be confident that the statistics allow for an accurate comparative analysis of the performance of the different Member States. That having been said, the extent of variation in performance clearly indicates that there is a wide gulf between the performance of the different countries.

This variation reflects a variety of differences across the Member States. Fundamentally, and notwithstanding the ongoing attempts to decouple waste generation from economic growth, waste generation is likely to be related, in some way, to consumption expenditure. Consumption expenditure is, in turn, a major component of GDP.

Prior to the accession of ten new Member States in 2004 the per capita income levels of the EU member states were relatively uniform, with most states being at a similar level of economic development. At that time, a uniform target had a similar impact for most states. However, the Member States that have acceded since then have brought a much greater heterogeneity to the levels of per capita income across the Union. This increase in heterogeneity is highlighted in Figure 4-1 and Figure 4-2 which show the relative GDP levels per capita of each current EU member in 1995 and 2012, respectively.

GDP, expressed in euros, is not necessarily the best indicator of consumption expenditure. Actual individual consumption (AIC) includes all goods and services actually consumed by households, and encompasses consumer goods and services purchased directly by households, as well as services provided by non-profit organisations and the government for individual consumption (e.g. health and education services). In international comparisons, the term is usually preferred over the narrower concept of household consumption, because the latter is influenced by the extent to which non-profit institutions and general government act as service providers. At the same time, AIC per capita is usually highly correlated with GDP per capita, because AIC is, in practice, the biggest expenditure component of GDP. Eurostat supplies information on AIC adjusted to account for differences in the purchasing power of local currencies relative to each other (prices are not uniform across the EU). The data are shown graphically for 2012 in Figure 4-3. This highlights the fact that consumption expenditure varies by a factor of 2.5 across the Member States. Ten Member States have per capita consumption levels above the EU28 average.

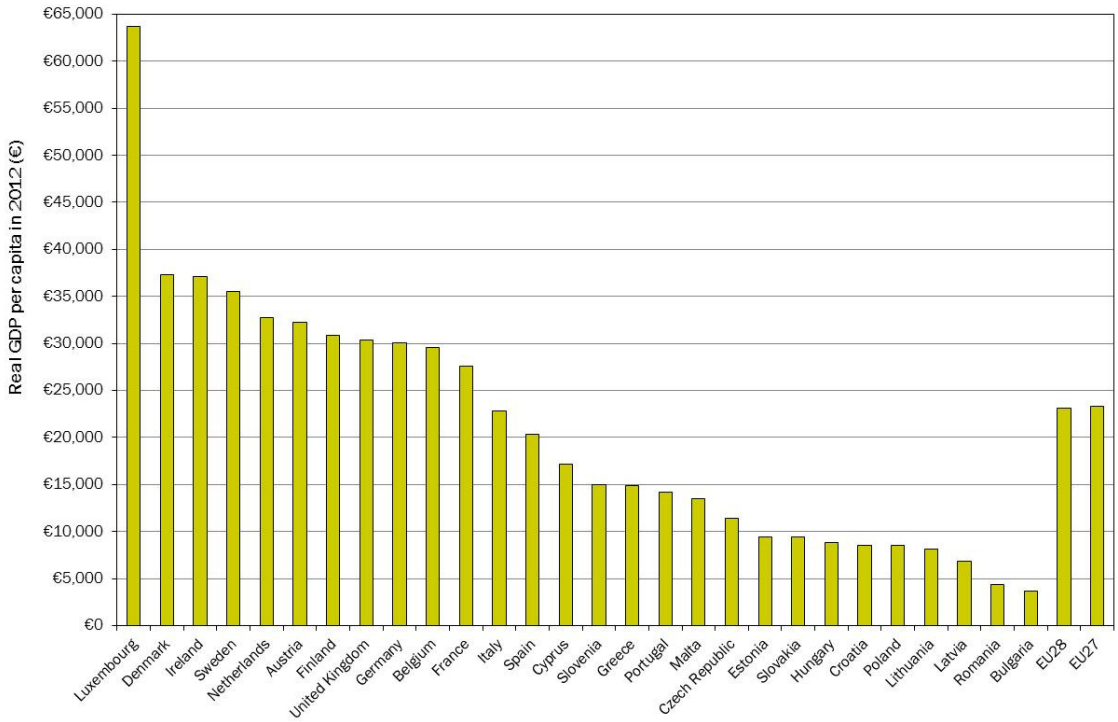
Figure 4-1: The Range in Real GDP per Capita in 1995



Note: No data was available for Romania and Malta.

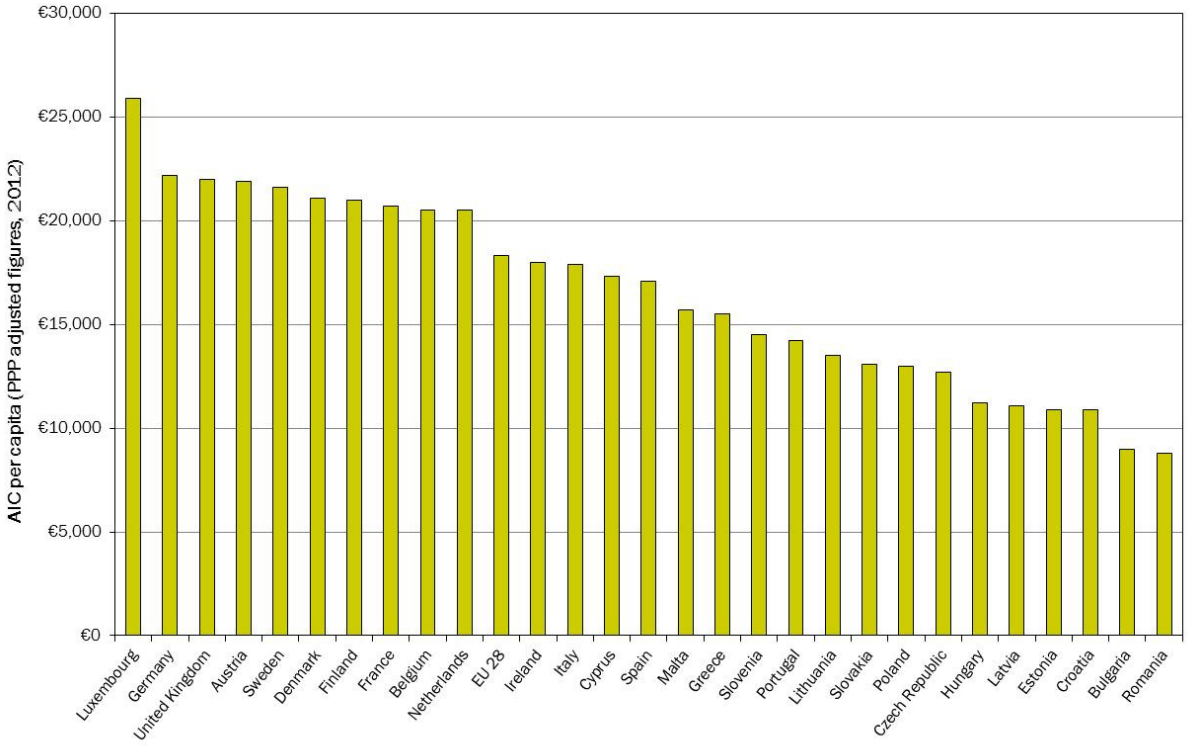
Source: Eurostat

Figure 4-2: The Range in Real GDP per Capita in 2012



Source: Eurostat.

Figure 4-3: Actual Individual Consumption (AIC) in 2012 (per Capita, Adjusted for Purchasing Power)



Source: Eurostat.

As an indicator of the distance separating the upper and lower levels of the range, at an annual growth rate of 3%, it would take 31 years for countries such as Romania and Bulgaria to achieve the AIC levels of the UK and Germany (or 19 years at 5% growth). Interestingly, if one looks back 20 or 30 years at the countries / regions with the highest per capita figures for AIC currently, then recycling rates were very different to those being achieved today. For example:

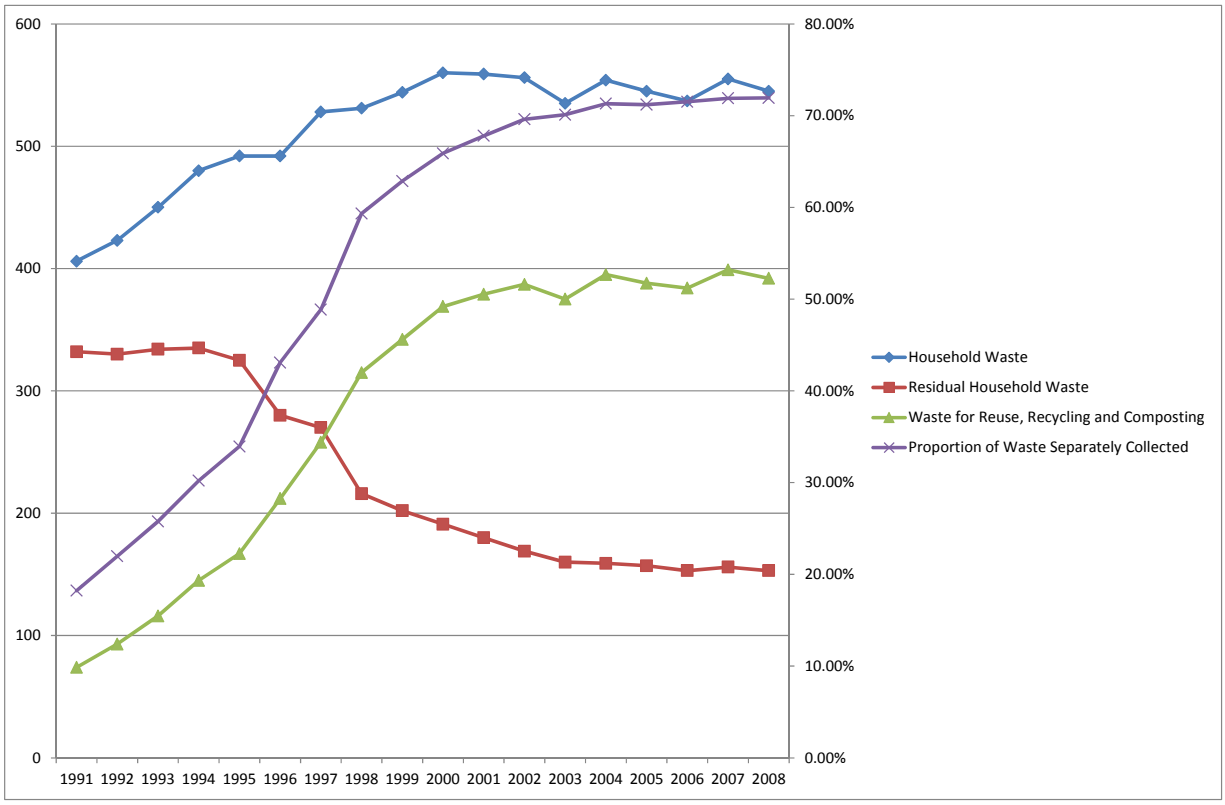
1. Household waste recycling in Germany was 13% in 1990[28] whereas by 2011, waste recycled and composted had reached 57%;[29]
2. Household waste separated for recycling in Flanders was 18% in 1991, whereas by 2002, it had reached 69% (see Figure 4-4) and by 2010, separately collected waste (for recycling and composting) had reached 71.4%; and

[28] Institute for Energy and Environmental Research (2006) *Study on Household Waste*, Federal Environment Agency (Umweltbundesamt, UBA), cited in Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) (2006) Waste Management in Germany: A Driving Force for Jobs and Innovation, July 2006, http://cleaner-production.de/fileadmin/assets/pdfs/_73_Engl.__broschuere_abw_deutschland_01.pdf

[29] EUWID (2013) *Slight Increase in Germany's Household Waste Generation in 2011*, Date Published: 18 January 2013, Available at: www.euwid-recycling.com/news/policy/single/Artikel/slight-increase-in-germanys-household-waste-generation-in-2011.html

3. Recycling and composting of separately collected waste from households and similar establishments in Austria was 15% in 1989, whereas by 2000, it had reached 50%, and by 2009, stood at 50.4%, with an additional 2.4% of waste being separately collected as WEEE and household hazardous waste (see Figure 4-5).[30]

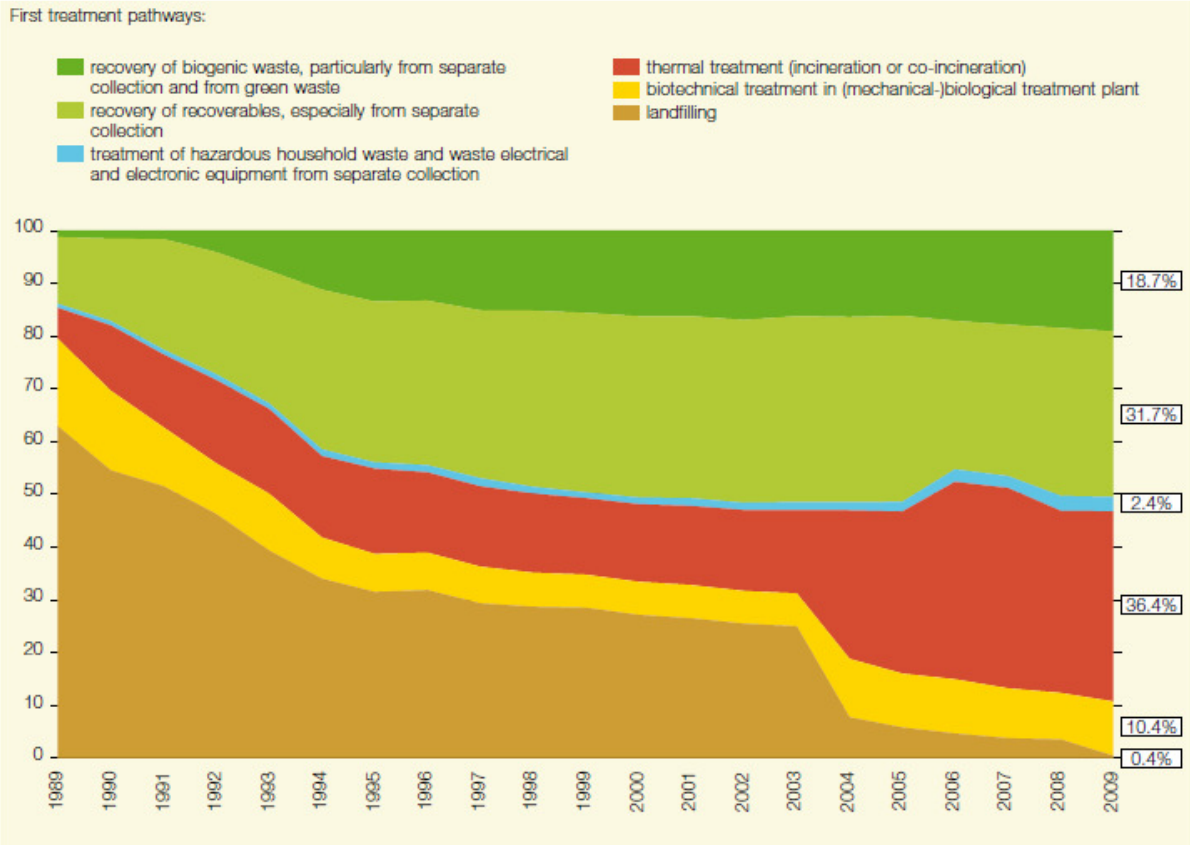
Figure 4-4: Evolution of Household Waste Recycling in Flanders



Source: Vlaco, www.vlaco.be

[30] See Federal Waste Management Plan (2011) *Volume 1, Lebensministerium*, www.bundesabfallwirtschaftsplan.at/dms/bawp/BAWP_Band_1_EN.pdf

Figure 4-5: Waste from Households and Similar Establishments (Quantity Generated, Recovery and Disposal between 1989 and 2009, by mass)



Source: German Federal Waste Management Plan (2011) Volume 1, Lebensministerium, www.bundesabfallwirtschaftsplan.at/dms/bawp/BAWP_Band_1_EN.pdf

These figures indicate that at a time when the countries now in the vanguard of recycling had incomes comparable with those of the less economically developed Member States, their recycling rates for household waste were generally between 10% and 20%. Encouragingly, the results from the leading countries indicate that the pace at which change can take place is relatively swift. In the space of a decade, Austria, Germany and Flanders had moved from relatively low recycling rates to figures in excess of 50%.

With these matters in mind, we now turn to consider the existing levels of performance as reported by Member States to Eurostat. In each case, we take a critical look at the definitions used and the guidance on reporting of performance.

4.1 Landfill Directive

4.1.1 Issues in Respect of Definitions and Reporting

The Landfill Directive 1999/31/EC stipulates in Article 5 that national strategies shall be established to ensure that the amount of 'biodegradable municipal waste' does not exceed the limit given in Article 5(2).

The Landfill Directive provides the following definitions for the relevant terms:

- *"'Biodegradable waste' means any waste that is capable of undergoing anaerobic or aerobic decomposition, such as food and garden waste, and paper and paperboard";*[31] and
- *"'Municipal solid waste'* means *waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households*".[32]

It is easy to see why these definitions would lead to a lack of comparability in the reporting as to what constitutes 'biodegradable municipal waste'. Regarding municipal waste, for example, even if 'waste from households' was understood in the same way across countries, the latitude in interpretation afforded by the clause "*other waste which, because of its nature or composition, is similar to waste from households*" is significant. The phrase is also ambiguous: how 'different' does the composition of waste need to be from that of household waste before it is considered no longer 'similar'? If targets are to be set, the domain of application of the target has to be clear, and in this case, it is not.

In principle it would be possible to refer to the OECD definition of municipal waste, but this is also not without its problems. The strength and weakness of the application of the OECD definition are described in Section 4.3.1.2.

As regards what is termed 'biodegradable', the definition might benefit from being explicit about the list of materials to be included within the definition. The definition does, at least, mention the main materials which will contribute to the category. In terms of reporting on performance against the targets in the Landfill Directive, Article 15, outlines the reporting obligations:

> *"At intervals of three years Member States shall send to the Commission a report on the implementation of this Directive, paying particular attention to the national strategies to be set up in pursuance of Article 5. The report shall be drawn up on the basis of a questionnaire or outline drafted by the Commission in accordance with the procedure laid down in Article 6 of Directive 91/692/EEC(11) The questionnaire or outline shall be sent to Member States six months before the start of the period covered by the report. The report shall be sent to the Commission within nine months of the end of the three-year period covered by it. The Commission shall publish a Community report on the implementation of this Directive within nine months of receiving the reports from the Member States".*

The questionnaire to which Member States need to respond (as per Article 6 of Directive 91/692/EEC(11)) was set out in a Commission Decision in 2000.[33] The questionnaire includes the following questions:

> *"4. (a) Has the national strategy for the reduction of biodegradable waste going to landfills pursuant to Article 5(1) been developed and notified to the Commission?*
>
> *If no, please state the reasons why.*

---

[31] Article 2(m)

[32] Article 2(b)

[33] Commission Decision of 17 November 2000 concerning a questionnaire for Member States reports on the implementation of Directive 1999/31/EC on the landfill of waste, (notified under document number C(2000) 3318), OJEU 25.11.2000

(b) Give an indication of which wastes are classified at national level as biodegradable waste and which wastes as biodegradable municipal waste.

(c) Indicate the experiences made with the practical application of the strategy.

(d) Indicate the amount of biodegradable municipal waste (in tonnes, if possible broken down in waste streams) produced in 1995 (respectively the latest year before 1995 for which standardised Eurostat data is available).

(e) Indicate the amount of biodegradable municipal waste and other biodegradable waste (both in tonnes, if possible broken down in waste streams) going to landfills for each year of the reporting period.

(f) Which adaptations of the strategy are envisaged?"

As far as we are aware, no explicit guidance exists as to how the information reported at point e) should be derived. Whilst it might be possible to know how much waste is landfilled, and in a given country, the amount of municipal waste landfilled, the quantity of biodegradable waste being landfilled is not so easily known. Indeed, as discussed in Section 4.3.1.2 below, Member States' definition of 'municipal waste' can vary quite significantly),

Given the following limitations it seems only reasonable to suggest that the reported performance of Member States should be interpreted with caution:

- The lack of a clear definition of 'municipal waste' in the Directive;
- The lack of a clear definition of what should be considered as biodegradable (though this seems less likely to be the cause of major variation); and
- The lack of a clear method (or range of acceptable methods) that would be considered acceptable for the reporting of progress under the Landfill Directive.

Member States have some freedom to choose how to measure movement towards their targets. In principle, in order to monitor performance against the Directive, then unless the implementing mechanism was an effective ban on landfilling of waste, or of waste which was biodegradable / had the potential to biodegrade, some mechanism for measuring or estimating the following would be required:

- *Either* a direct measurement of biodegradable waste going to landfill:
  - The quantity of waste landfilled; and
  - A measure of its biodegradable content, in which case the sampling regime for the measuring of biodegradable content would have to be capable of picking up differences in the waste generation habits, and the recycling services provided, in different parts of the country. The Irish approach comes close to this one, with different 'biodegradable contents' being assigned to the residual waste that is collected as part of each waste collection system.
- *Or* and an indirect measure of waste going to landfill:
  - A measure of the composition of the total waste stream (so that the biodegradable component could be identified);
  - A measure of the biodegradable content of materials diverted from landfill through separate collection for recycling and composting, net of any rejects from (for example) sorting facilities;
  - A means to estimate the amount of biodegradable material being dealt with through means other than landfill; and

- So that by subtraction, the amount of biodegradable waste landfilled could be known. This is more akin to the approach used in the UK.

In principle, one of these two methods – the one, a direct measurement of biodegradable waste being landfilled, the other, an indirect measure – would be required in countries where no ban is in place. In practice, the quality of the approaches used in the different Member States, in terms of accurately monitoring biodegradable municipal waste being landfilled, appears to be rather variable.

That having been said, this is perhaps unsurprising. It is challenging to monitor, at a national level, the biodegradable composition of waste being landfilled, suggesting the desirability of setting targets related to something which is less challenging to monitor in future.

4.1.2 Member State Performance

The relevant targets under Article 5(2) of the Landfill Directive are:

a) *"by 16 July 2006, biodegradable municipal waste going to landfills must be reduced to 75 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available;*
b) *by 16 July 2009, biodegradable municipal waste going to landfills must be reduced to 50 % of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data is available; and*
c) *by 16 July 2016, biodegradable waste going to landfills must be reduced to 35% of the total amount (by weight) of biodegradable municipal waste produced in 1995 or the latest year before 1995 for which standardised Eurostat data are available".*

Note that some Member States have been allowed an additional four years to comply with these targets in cases where they were landfilling more than 80% of their waste in 1995.

A recent EEA report notes:

> *"Twelve countries have been given a four-year derogation, however, meaning that they must meet their targets by 2010, 2013 and 2020. Furthermore, Ireland has been given a four-year derogation for the 2006 and 2009 targets, meaning that it must meet them in 2010 and 2013. Portugal has been given a four-year derogation for the 2009 and 2016 targets and must meet them in 2013 and 2020. Slovenia has a four-year derogation for the 2016 target and has to meet it by 2020. Croatia must meet the targets by 2013, 2016 and 2020".*[34]

The same EEA report sought to estimate the performance of different Member States, based on what EU Member States have reported to the European Commission. Performance against the targets, as reported in the document, is shown in Figure 4-6 for

[34] European Environment Agency (2013) *Managing Municipal Waste – A Review of Achievements in 32 European Countries*, EEA Report No 2 / 2013, www.eea.europa.eu/publications/managing-municipal-solid-waste/download

countries without such derogations, and those eligible for derogations. The Figure shows that of those countries without derogations, only Italy appears to have failed to meet the 2009 target. Of those countries with derogations, Cyprus, Czech Republic, Greece, Latvia, Lithuania, Malta, Poland and Portugal are shown to be landfilling more than the Directive allows (Croatia has a derogation from the first target to 2013). It should be noted, however, that for the last five of these countries the performance against the target has been based on an estimate.

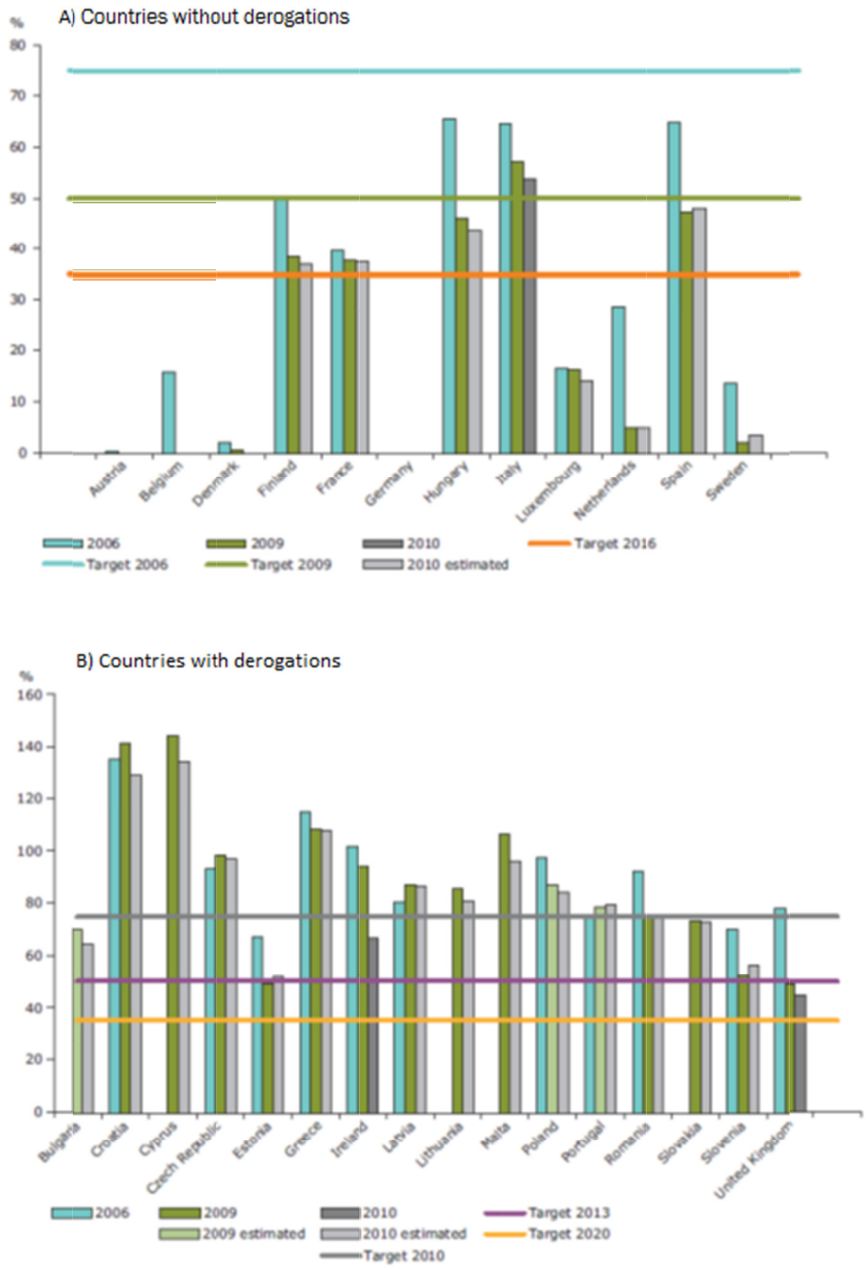
The report noted that some Member States had not yet reported for 2009, but that some countries provided data for 2009 and 2010 to the EEA for the purpose of this analysis. The ETC/SCP estimated, therefore, the missing biodegradable municipal waste data for 2009 by subtracting the increase in the amount of municipal waste composted or digested from 2008 to 2009 from the amounts of biodegradable municipal waste landfilled in 2008. The amount of landfilled biodegradable municipal waste for 2010 was calculated in a similar way from 2009 data. The report noted:

> *"This calculation methodology did not address improvements in diverting other biodegradable waste from landfill, such as paper or textiles, or diversion from landfill to incineration. As such, these data are only rough estimates".*

It will become clear below, in discussions regarding the definition of municipal waste, that some countries' figures will also be affected by what they include or exclude under the definition 'municipal waste' (some countries, for example, are likely to be excluding the municipal packaging which is being collected because they refer to the EWC codes as the basis for reporting data on municipal waste).

In addition to these points, for several countries, waste generation is likely to have fallen between 2008 and 2010 as a result of the financial downturn which took hold in many countries in 2008. As such, the total amount of biodegradable waste generated may well have fallen during this period. In Ireland, for example, where the 2010 figures are not estimates, but based on the calculations of the Irish Environmental Protection Agency, municipal waste fell from 3.10 to 2.58 million tonnes between 2008 and 2010. The change in municipal waste landfilled over the same period – of around 400,000 tonnes – was a result of an increase in recovery of the order 100,000 tonnes, and a drop in waste generated of close to 300,000 tonnes. In other words, the majority of the change from 2008 to 2010 was associated with a reduction in the waste generated, not an increase in the amount of municipal waste recovered.

Figure 4-6: Percentage of Biodegradable Municipal Waste Landfilled in 2006, 2009 and 2010 Compared with the Amount Generated in 1995



Notes: Graph A) 2010 data estimated for all countries but Italy. Graph B) 2009 data are estimated for Bulgaria, Poland and Portugal. The 2010 data are estimated for all countries but Ireland and the United Kingdom. Diverting derogations: Ireland: derogation only for the 2006 and 2009 targets, to be met by 2010 and 2013. Portugal: derogation only for the 2009 and 2016 targets, to be met in 2013 and 2020. Slovenia: derogation only for the 2016 target, to be met by 2020. Croatia must meet the targets by 2013, 2016, and 2020.

Source: European Environment Agency (2013) Managing Municipal Waste – A Review of Achievements in 32 European Countries, EEA Report No 2 / 2013, www.eea.europa.eu/publications/managing-municipal-solid-waste/download

According to Eurostat data, the drop in waste quantity between the latest year for which data was available (2008 or 2009) in the above figure, and 2010 was:

- 14.5% for Bulgaria;
- 6.5% for Croatia;
- 2.9% for Cyprus;
- -0.7% (i.e. an increase) for Czech Republic;
- 10.2% for Estonia;
- -14.3% (i.e. an increase) for Greece;
- 9.7% (i.e. an increase) for Latvia;
- -3.9% (i.e. an increase) for Lithuania;
- 7.1% for Malta;
- 1.3% for Poland;
- 0.3% for Portugal;
- -0.8% (an increase) for Romania;
- -3.7% (an increase) for Slovakia;
- 6.1% for Slovenia;
- 6.5% for Hungary; and
- 1.8% for Spain.

With the exception, therefore, of:

- Greece, for which the figure seems anomalous (given that the economy was already in decline in the 2009-2010 period);
- Lithuania and Slovakia, for both of whom the year 2010 saw some recovery following the drop in economic activity between 2008 and 2009; and
- Czech Republic and Romania, for which the changes were marginal,

the remaining countries in the above list will probably be doing somewhat better against the Landfill Directive targets relative to the position shown above as a result of the drop in waste generation, linked to the economic downturn following the onset of the banking crisis in 2007/2008. This is before the additional consideration of additional treatment of waste through incineration or MBT. Regarding incineration, the Czech Republic reported a 125kt increase between 2009 and 2010. Figures for the change in waste treated through MBT are not available from Eurostat.

Generally, of course, the Figures might not be entirely accurate, still less, comparable, for reasons already discussed (and discussed further in Section 4.3.1.2 below). Detailed scrutiny of the approach of each country to reporting their performance under the Landfill Directive is not presented here. What is clear, however, is that there is a very wide range of performance, both against the targets, and in absolute terms.

This largely reflects the range of approaches taken to the design of waste policy in the different countries. Given that the target of the Directive is the landfilling of biodegradable municipal waste, then it stands to reason that countries that have progressed furthest are likely to have been those who take measures to:

- Encourage prevention of biodegradable municipal wastes (though, in practice, the prominence of such measures may have been limited to efforts to encourage home composting, and to the effects of household charging for biowaste);
- Encourage / mandate sorting of biodegradable fractions of municipal waste through use of ordinances / regulations, with a view to ensuring they are recycled / composted / digested. This amounts to a ‘positive re-direction’ of the biodegradable fractions;

- Discourage landfilling of biodegradable fractions of municipal waste. Since it is difficult to discourage landfilling of 'biodegradable fractions' when the majority of landfilled municipal waste will be 'mixed' in nature, then this might be considered difficult to do without more generally discouraging landfilling of municipal waste, or of all waste. hence, the key measures in this regard have been:
  - Landfill taxes;
  - Landfill restrictions and bans, these being split into two types:
    - Those which allow landfilling of waste subject to it having been biologically pre-treated to reduce its fermentability; and
    - Those which make no allowance for landfilling of biologically treated waste (focusing, for example, on the total organic carbon content of the waste as the basis for it being considered acceptable for landfilling).

  The United Kingdom has been somewhat exceptional in resorting to a system of landfill allowances as the basis for regulating the landfilling of municipal waste.

It remains the case that those countries that have made least progress in respect of meeting Landfill Directive targets are, by and large, those which have done least to pursue the policies mentioned above. At the other end of the spectrum, one sees countries such as Belgium, the Netherlands and Austria, where mandates / ordinances have been used along with taxes and bans. These countries have achieved relatively high rates of recycling of biodegradable waste whilst effectively phasing out landfilling. Germany is in a similar position, though it has not resorted to use of a landfill tax. Denmark and Sweden have also effectively eliminated landfilling, but the recycling of biowastes is not so well developed as in the aforementioned countries. Denmark moved earlier to promote incineration of residual waste, whilst in Sweden, measures to encourage segregation of biowaste emerged shortly after the ban on landfilling of combustible waste was introduced.

Countries which have more or less eliminated landfilling of untreated waste are:

- Austria;
- Belgium;
- Denmark;
- Germany;
- Netherlands;
- Sweden; as well as
- Norway and Switzerland.

Each of these countries has enacted some form of landfill ban or restriction, and they are readily identifiable in Figure 4-6 since the biodegradable waste landfilled is either at, or close to, 0% (Austria, Belgium, Denmark, Germany, Netherlands, Sweden). In these countries, the extent to which biodegradable waste is recycled, or treated through incineration / MBT, is largely determined by the relevant policies in respect of recycling:

the stronger the drive for recycling by the time the bans had entered into force, the greater the share of recycling, relative to incineration / MBT, tends to be.[35]

4.2 Packaging and Packaging Waste Directive

4.2.1 Issues in Respect of Definitions and Reporting

Following the introduction of the Packaging and Packaging Waste Directive 1994/62/EC Member States were required to report data according to the structure set out in Annex III of the Directive. The reporting requirements in force until 2003 were summarised as follows:

1. *"For primary, secondary and tertiary packaging:*
    a. *Quantities, for each broad category of material, of packaging consumed within the country (produced + imported – exported) (Table 1);*
    b. *Quantities reused (Table 2).*
2. *For each of the household and non-household packaging waste streams:*
    a. *Quantities for each broad category of material, recovered and disposed of within the country (produced + imported – exported) (Table 3);*
    b. *Quantities recycled and quantities recovered for each broad category of material (Table 4)."*

However, Member States found collection and reporting of the required data difficult, and in 2005, a further amendment to the Directive was implemented by Commission Decision 2005/270.[36] This simplified the reporting requirements and made some elements voluntary (see Figure 4-7). Since 2008 Eurostat has been in charge of collecting, validating and publishing Member State data, and has also issued additional guidance on how to report on packaging and packaging waste.

[35] Eunomia Research & Consulting (2012) *Landfill Bans: Feasibility Research, Appendices to Main Report to WRAP*, November 2012, http://www.wrap.org.uk/sites/files/wrap/Appendices%20-%20Landfill%20Bans%20Feasibility%20Research.pdf.

[36] Commission Decision of 22 March 2005 Establishing the Formats Relating to the Database System Pursuant to Directive 94/62/EC of the European Parliament and of the Council on packaging and Packaging Waste (Notified Under Document Number C(2005) 854) (Text with EEA relevance) (2005/270/EC)

Figure 4-7: Table 1 from 2005 Commission Decision

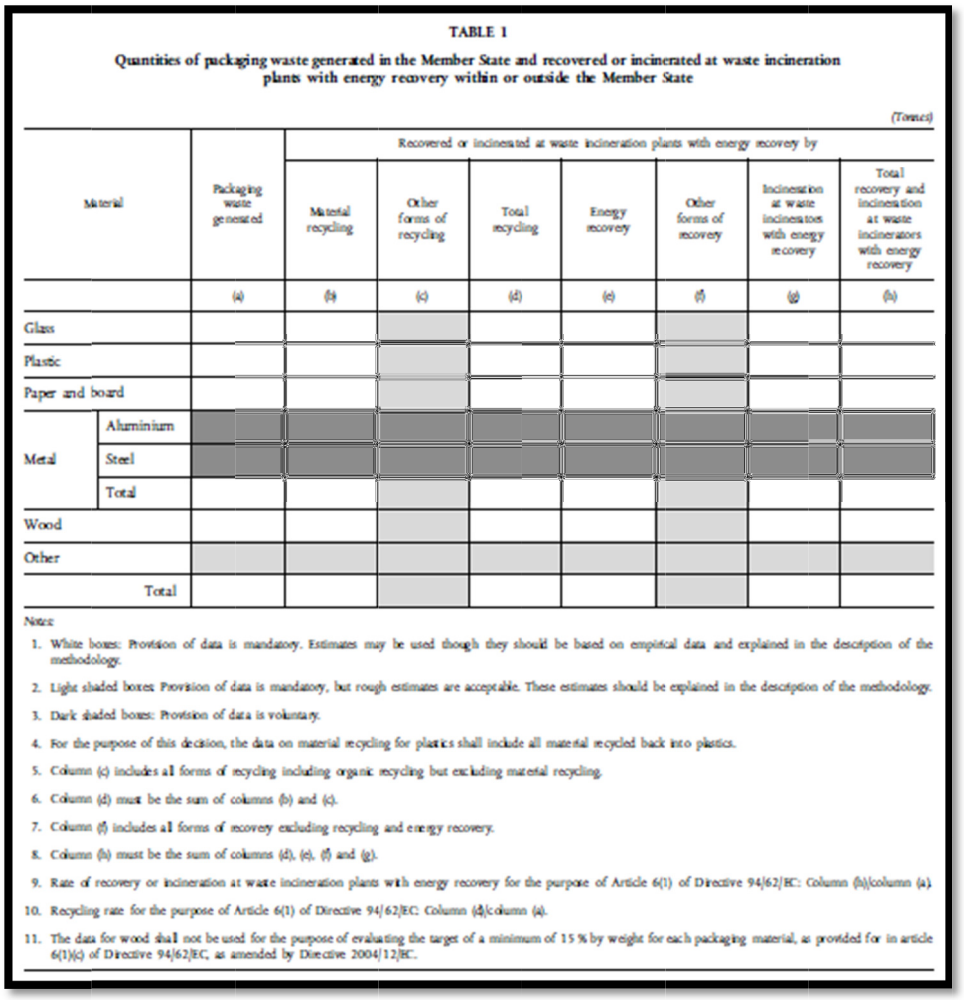


TABLE 1

Quantities of packaging waste generated in the Member State and recovered or incinerated at waste incineration plants with energy recovery within or outside the Member State

(Tonnes)

Material		Packaging waste generated	Recovered or incinerated at waste incineration plants with energy recovery by						
			Material recycling	Other forms of recycling	Total recycling	Energy recovery	Other forms of recovery	Incineration at waste incinerators with energy recovery	Total recovery and incineration at waste incinerators with energy recovery
		(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
Glass									
Plastic									
Paper and board									
Metal	Aluminium								
	Steel								
	Total								
Wood									
Other									
Total									

Notes:

1. White boxes: Provision of data is mandatory. Estimates may be used though they should be based on empirical data and explained in the description of the methodology.
2. Light shaded boxes: Provision of data is mandatory, but rough estimates are acceptable. These estimates should be explained in the description of the methodology.
3. Dark shaded boxes: Provision of data is voluntary.
4. For the purpose of this decision, the data on material recycling for plastics shall include all material recycled back into plastics.
5. Column (c) includes all forms of recycling including organic recycling but excluding material recycling.
6. Column (d) must be the sum of columns (b) and (c).
7. Column (f) includes all forms of recovery excluding recycling and energy recovery.
8. Column (h) must be the sum of columns (d), (e), (f) and (g).
9. Rate of recovery or incineration at waste incineration plants with energy recovery for the purpose of Article 6(1) of Directive 94/62/EC: Column (h)/column (a).
10. Recycling rate for the purpose of Article 6(1) of Directive 94/62/EC: Column (d)/column (a).
11. The data for wood shall not be used for the purpose of evaluating the target of a minimum of 15 % by weight for each packaging material, as provided for in article 6(1)(c) of Directive 94/62/EC, as amended by Directive 2004/12/EC.

Article 7 in the Commission Decision 2005/270 stipulated that:

> "*Member States shall send, together with the completed tables, an appropriate description of how the data have been compiled. The description shall also give an explanation of any estimates used.*"

Before 2008, data collection was performed by DG Environment. In 2008, Eurostat took over the task of data collection and validation on packaging and packaging waste (in the context of Environmental Data Centre on Waste). In 2009, Eurostat issued a guidance document called *How to Report on Packaging and Packaging Waste According to Commission Decision 2005/270/EC* which is, with minor adjustments (rev. 2011), still applicable.[37]

[37] Eurostat (2011) *How to Report on Packaging and Packaging Waste According to Commission Decision 2005/270/EC,* February 2011, http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/Guidance_document_on_packaging_waste_16022011.pdf

This guidance recommends the following outline / issues to be addressed to comply with the requirements of Article 7:

- Description of the source of information (e.g. census / national statistics / reporting obligations of business or certified business units / agencies / associations / surveys of waste composition/ specific related implications of national laws and relevant regulations);
- Description of the quality of sources / completeness (coverage rate);
- Description of any mandatory information that is missing;
- What measures are to be taken in future to fill the gap in future?
- Description of the validation process (How was the validity of the data established?);
- Description of estimations / calculations conducted; and
- Description of changes relative to the previous data delivered.

The reports submitted by the Member States to Eurostat are not publicly available, and thus it is not possible to provide a critical commentary on the scope of waste considered by Member States, the methods used for data collection, and the comparability of the data. However, it is known that methodological reports are of variable depth and quality. Some countries provide in-depth reports with very detailed descriptions of how the raw data have been derived and managed, whilst others provide very limited descriptions of their procedures and methodologies.

In summary, it is clear that there is currently no consistent reporting methodology at the European level. Given that this is currently accepted in the Directive at present it is unlikely that Member States, who are free to derive their own methods for reporting recycling rates, will gravitate towards a common method of reporting.

4.2.1.1 What is 'Recycled'?

In principle, the definition of recycling provided in the Packaging Waste Directive is clear enough. The Directive defines recycling as follows:

> *"...recycling' shall mean the reprocessing in a production process of the waste materials for the original purpose or for other purposes including organic recycling but excluding energy recovery".*[38]

Counting the amount of waste entering a sorting facility as 'recycled' is clearly not appropriate as, according to the above definition, only the material reprocessed should be considered as having been recycled. In such cases, losses, and residues sent for disposal or treatment as residual waste would need to be deducted.

Eurostat requires that data be provided on the amount of packaging waste generated, recycled and recovered (in addition to other data on imports and exports etc.). The 2005 Commission Decision defines 'recycling rate' as:

> *"'recycling rate' for the purposes of Article 6(1) of Directive 94/62/EC means the total quantity of recycled packaging waste, divided by the total quantity of generated packaging waste".*

[38] Article 3(7)

In principle, this definition is clear enough: it suggests that recycling should be measured as what is 'reprocessed', though there is no definition of 'reprocessing'. There is some ambiguity in respect of whether the quantity that is recycled should be considered as:

- The amount of material which is used in a reprocessing process; or
- The amount of material which is actually made from the material used in the reprocessing process.

The Commission Decision on the rules for calculating recycling rates under the Packaging and Packaging Waste Directive appears to lean towards the former in Article 3(4), which reads:

> *"The weight of recovered or recycled packaging waste shall be the input of packaging waste to an effective recovery or recycling process".*

Unfortunately, the Decision introduces some uncertainty in terms of the point at which this is measured. Article 3(4) continues:

> *"If the output of a sorting plant is sent to effective recycling or recovery processes without significant losses, it is acceptable to consider this output to be the weight of recovered or recycled packaging waste".*

The question here might be, "When are losses deemed to be significant?" As packaging recycling develops, the range of materials being collected also increases, and even after sorting, these frequently contain 'non-target materials'. Whilst the sophistication of sorting facilities is increasing, the loss rates even following sorting at these facilities can be quite high, and certainly not insignificant (most notably, for mixed plastic streams).[39]

Article 5 of Commission Decision 2005/270/EC also seeks to provide some general guidance on the potential for over-reporting of packaging recycling:

> *"The weight of recovered or recycled packaging waste shall, as far as is practical, exclude non-packaging materials collected together with the packaging waste.*
>
> *Corrections shall be made to the data relating to the weight of recovered or recycled packaging waste, if non-packaging materials in the waste sent to an effective recovery or recycling process risk leading to substantial over- or underestimates of packaging recovery or recycling rates.*
>
> *No corrections shall be made in the case of small amounts of non-packaging materials, or for such contamination as can regularly be found in packaging waste.*
>
> *Significant corrections shall be reported in the descriptions regarding the data compilation, provided for in the fourth paragraph of Article 7".*

Once again, it will be appreciated that the wording used here uses descriptive terms and therefore, in many respects, is far from clear. For example, what does a Member State need to demonstrate in order to prove that there was a risk of substantial over- or under-reporting of recycling rates; or, indeed, how widely might one extend the interpretation in

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[39] See for example: Waste & Resources Action Programme (2009) *Commercial Scale Mixed Plastics Recycling,* June 2009, www.wrap.org.uk/sites/files/wrap/Commercial%20Scale%20Mixed%20Plastics%20Recycling%2019%206%20FINAL%20FINAL%20VERSION.pdf

the third clause above, concerning *"small amounts of non-packaging materials"* and *"such contamination as can regularly be found in packaging waste"*. These ambiguities seem to allow for considerable leeway in the reporting of data, and have the potential to undermine the intent of the Directive.

It should also be noted that even though the Decision itself allows, with the afore-mentioned qualifications, Member States to report the output from recycling plants as 'recycling', evidence suggests that some countries report, as being recycled, what is *collected for* recycling. As a result, they include also those materials that may be rejected from the sorting process itself within the amount counted as having been recycled. Work undertaken on behalf of APEAL, for example, has indicated that the point at which Member States report the quantity of steel recycled varies across countries, and includes the following approaches:

- Material collected for recycling;
- Output from sorting plants;
- Materials sent from scrap dealers to reprocessors; and
- Materials received at smelting plants.

If this approach is replicated across materials, then it might be expected that losses are almost certainly not 'insignificant', though this depends on the approach taken to collect the materials.[40]

The significance of this has to be considered in the context that the quality of collected packaging waste is not always especially high. Member States will not always know the extent to which non-target impurities are present, but reprocessors are acutely aware of this issue, not least because of the ramifications for their business models, and for their competitiveness, especially in those countries where the cost of disposal or treatment of rejects is high. In such cases, the tendency will be for lower quality material to find its way to countries – within and outside the EU – where the costs of dealing with rejects is low. If the EU itself is to retain greater value in terms of the materials which it recovers, the prospects for doing so will be somewhat enhanced if the collection systems in place deliver high quality material. Allowing Member States the latitude to report on material recycled under existing targets without taking a major interest in the presence of non-target materials will tend to allow lower quality collection and sorting systems to persist (Member States will continue to report quantities of material post sorting, or even, pre-sorting, including a – typically unknown – quantity of non-target materials/contraries, rather than the quantity which is actually recycled).

Article 5 of the Communication also addresses the question of the influence that higher moisture contents have on increasing the weights of material recycled. It notes:

> *"The weight of recovered or recycled packaging waste shall be measured using a natural humidity rate of the packaging waste comparable to the humidity of equivalent packaging put on the market.*
>
> *Corrections shall be made to measured data relating to the weight of recovered or recycled packaging waste, if the humidity rate of that packaging waste*

[40] Eunomia Research & Consulting (2013) *Overview of 2011 Steel and Aluminium Consumer Packaging Statistics*, Report for Metal Packing Europe, December 2013, www.alueurope.eu/wp-content/uploads/2011/08/MPE-External-statement-on-2011-metal-packaging-recycling-statistics-final18Dec13.pdf

regularly and significantly differs from that of packaging placed on the market and if this factor risks leading to substantial over- or underestimates of packaging recovery or recycling rates".

It goes on to note, however, that:

"Those corrections shall be limited to exceptional cases, caused by specific climatic or other conditions".

This seems a reasonable interpretation given that the previous clauses would imply – if taken literally – frequent measurements of the moisture content of loads, which is likely to prove costly. Indeed, this is another argument against allowing for reporting on quantities of waste as collected since those marketing paper to recyclers are unlikely to have an interest in selling loads which have an unusually high moisture content (since the price they receive will be lowered as a result).

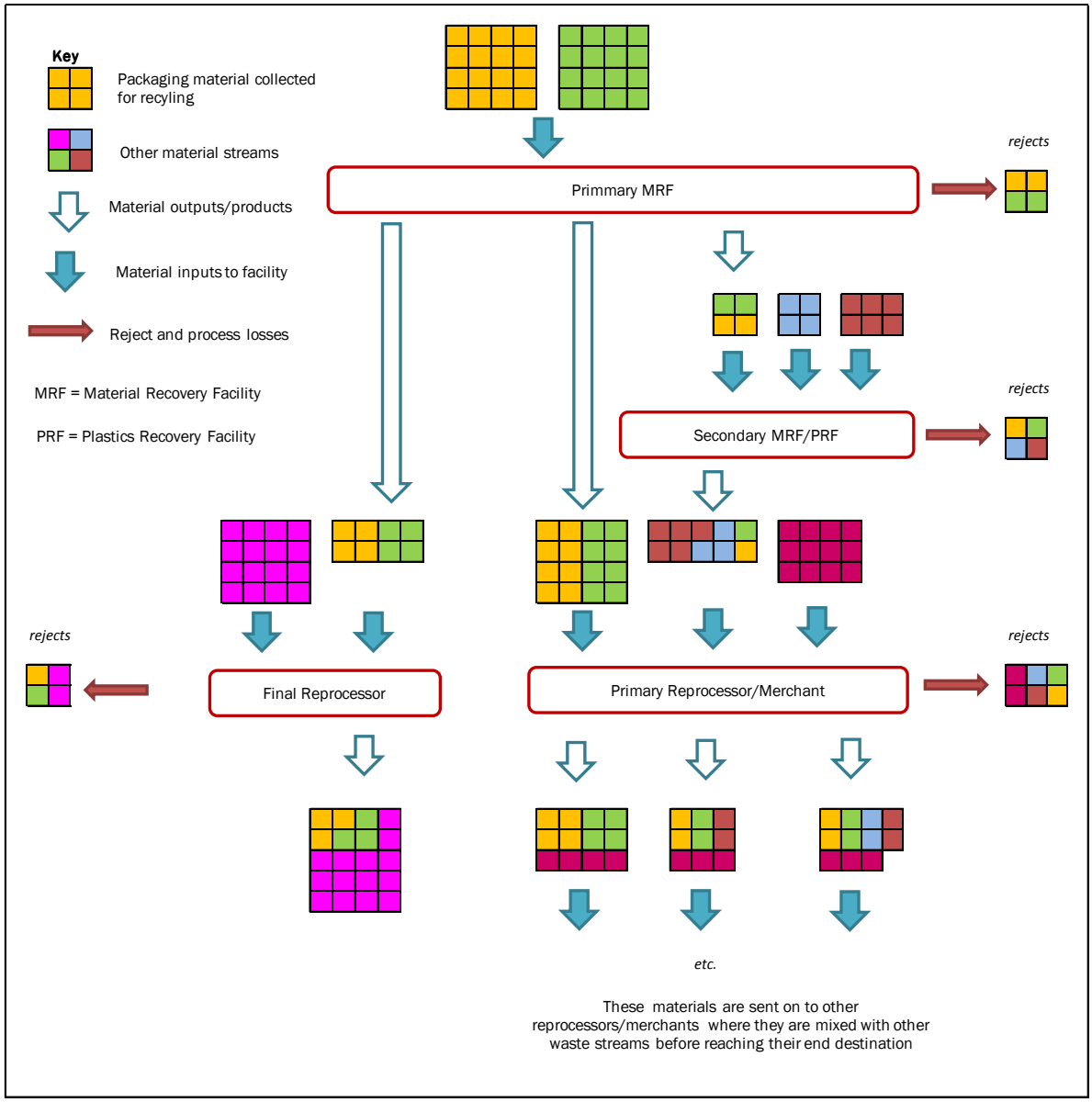
Regarding exports, Article 4(1) states:

"Packaging waste exported out of the Community shall be counted as recovered or recycled only if there is sound evidence that the recovery and/or recycling took place under conditions that are broadly equivalent to those prescribed by the Community legislation on the matter".

In principle, and in accordance with the definition of recycling, Member States ought to ensure that losses are traced through the system, including those losses which occur outside the country of origin, including outside the EU. The quality of exported material is clearly not always such as to allow one to be confident that the quantity or packaging waste 'exported for recycling' will actually be 'recycled' in accordance with the terms of the Directive. Significant losses could occur along the line, notwithstanding the efforts to ensure that only waste that is free of contaminants / contraries is exported for recycling.

In more market oriented systems, material which has been collected for / sorted for recycling often moves through the hands of different organisations, and may be exported, re-exported, etc. Material collected for recycling may go through several sorting stages, with plastics sorted for recycling sometimes being sent to specific facilities for further sorting into the specific plastic polymers. Tracing the losses through the system for each load is therefore very challenging. An example of these challenges is shown graphically in Figure 4-8 below.

Figure 4-8: Hypothetical Example of the Mixing and Movement of Waste Materials Sent for Recycling



Source: Adapted from Eunomia Research & Consulting (2011) Survey of Welsh Local Authorities: Reporting of End Destinations in WasteDataFlow, Report for Welsh Local Government Association, June 2011, www.wlga.gov.uk/download.php?id=4317&l=1

4.2.1.2 Packaging Placed on the Market

Many Member States seek to understand the amount of waste which arises as packaging through reference to the amount of packaging placed on the market in a given year. This is consistent with Commission Decision 2005/270 Article 2(2), which states:

> *"For the purposes of this Decision, packaging waste generated in a particular Member State from reusable packaging may be deemed to be equal to the amount of reusable packaging placed on the market within that Member State in the same year".*

Strictly speaking, of course, what is placed on the market in a given country does not necessarily arise as waste in that country in that year for a variety of reasons, including:

1. People may store some items of packaging (for example, cardboard boxes); and
2. People may purchase a packaged item in one country and take it to another.

In most cases, this is unlikely to be of great significance: the flows of material from one country to another are unlikely to be a significant proportion of the packaging waste stream. The main exception is where differential taxes generate significant price differentials for packaged goods, notably, where alcohol excise duties vary across borders. In such situations, the amount of packaged product which moves across borders is:

- Likely to be significant; and
- Likely to display a single direction of travel (so that the flow is in one direction is not 'cancelled out' by the flow in the opposite direction).

Hence, there is likely to be a need to try to account for such flows where the excise duty differentials suggest that they may be large.[41] A good example is Estonia, where much of the material placed on the market leaves the country, and where, as a result, reported recycling rates may be lower than they should be. This is because the amount of packaging which is placed on the market is much higher than the amount of packaging which actually arises as waste within the country. The recycling rate ought to be calculated on the basis not of what is placed on the market, but on the basis of what is in the waste stream. Where these two are likely to differ, some form of adjustment is necessary to correct for the recycling rate.

4.2.1.3 Reuse

There is a separate issue in respect of reusable packaging which does not seem to favour such systems in terms of the performance data. Article 3(2) of Commission Decision 2005/270 notes:

> *"Reusable packaging shall be considered to be placed on the market when it is made available for the first time, together with the goods it is intended to contain, protect, handle, deliver or present.*
>
> *Reusable packaging shall not be considered packaging waste when it is sent back for reuse. Reusable packaging shall not be considered to be placed on the market as packaging when it has been reused with a good and is made available again.*
>
> *Reusable packaging discarded at the end of its useful life shall be considered packaging waste.*
>
> *For the purposes of this Decision, packaging waste generated in a particular Member State from reusable packaging may be deemed to be equal to the amount of reusable packaging placed on the market within that Member State in the same year".*

The main point regarding this approach is that reuse of packaging does not count towards a recycling target. Indeed, it might be appreciated that if reuse of packaging tends to occur in respect of those materials / uses which are also straightforward to

[41] Eunomia Research & Consulting et al. (2011) *Options and Feasibility of a European Refund System for Metal Beverage Cans*, Report for the DG Environment at the European Commission, November 2011, http://ec.europa.eu/environment/waste/packaging/cans/intro.htm

recycle, then the more a Member State does to encourage reuse, as opposed to recycling, the more difficult it would be to achieve a given recycling rate. Effectively, the reused packaging material is removed from the numerator and the denominator of the calculation of 'recycling rate'. To the extent that the same (or similar) material has been 100% 'captured for reuse', and could have been 100% (or close) 'captured for recycling', a given recycling rate becomes harder to achieve. Member States are effectively penalised for encouraging reuse, despite this being consistent with Article 1 and Article 5 of the Directive.

4.2.1.4 Consistency of Definitions

We note also that the wording for the definition of 'recycling' in the Packaging Directive does not match exactly with the wording used in the Waste Framework Directive. To remove such inconsistencies, a simple reference in the Packaging Directive to the definition in the Waste Framework Directive would improve coherence. The same applies to the wording of the template given in the Commission Decision on reporting packaging and packaging waste. To the extent that recovery targets remain, then the same applies in respect of the definitions of recovery and disposal operations (i.e. a cross-reference to the definitions in the Framework Directive would make sense).

It should be noted that the difference in definitions is unlikely, to our knowledge, to cause significant problems in respect of reporting. Rather, this would make sure that all definitions are aligned in future, with the key definitions related back to those which are set out in the Waste Framework Directive.

4.2.1.5 Summary

It is clear that Member States use different methodologies to report their data, and that the level of confidence one can have in the data that is reported is likely to vary. Furthermore, the comparability of the data is not helped by virtue of the treatment of reusable packaging, and the fact that Member States may take into account, to varying degrees, the losses which occur along the way from the collection of waste to the reprocessing of the collected material. This means that cross country comparison on the basis of the reported data is likely to suffer some significant shortcomings.

4.2.2 Member State Performance

As a reminder, the key targets contained in Article 6(1) of the Packaging and Packaging Waste Directive are currently:

- Article 6(1)b: no later than 31 December 2008 60 % as a minimum by weight of packaging waste will be recovered or incinerated at waste incineration plants with energy recovery;
- Article 6(1)d: no later than 31 December 2008 between 55 % as a minimum and 80 % as a maximum by weight of packaging waste will be recycled;
- Article 6(1)e: no later than 31 December 2008 the following minimum recycling targets for materials contained in packaging waste will be attained:
  - (i) 60 % by weight for glass;
  - (ii) 60 % by weight for paper and board;
  - (iii) 50 % by weight for metals;
  - (iv) 22.5 % by weight for plastics, counting exclusively material that is recycled back into plastics;

(v) 15 % by weight for wood.

It's worth noting that the 12 new Member States have derogations from the dates set out here, giving them more time to comply (the relevant years are between 2012 and 2015) as displayed in Table 4-1. In addition to the above, Article 9 of the Directive sets out *essential requirements* to promote the fitness for purpose of packaging, as well as its reusability and recoverability (notably, its recyclability). No specific targets are set, however, in Article 9.

Figure 4-9 below shows the proportion of packaging waste recycled in each Member State in 2011 and shows how the different Member States fared against the 2008 overall recycling target of 55% for all packaging materials. From this it can be seen that there is considerable variation in the reported recycling rate across the various countries. It should be noted, however, that all countries who reported a recycling rate below 55%, with the exception of Sweden, are entitled to a derogation, and so would not have had to meet the target in 2008 (see Table 4-1 for derogations).

Table 4-1: Targets and the Years in which the Targets must be Achieved

	RECOVERY			RECYCLING			
Article in Packaging Directive	§6(1)(a)			§6(1)(c)			
	Overall target: 50-65%			**Plastics: min. 15%**			
Malta	end of 2009			end of 2009			
Bulgaria	end of 2011			end of 2009			
Romania	end of 2011			end of 2011			
	RECOVERY	**RECYCLING**					
Article in Packaging Directive	§6(1)(b)	§6(1)(d)	§6(1)(e)(i)	§6(1)(e)(ii)	§6(1)(e)(iii)	§6(1)(e)(iv)	§6(1)(e)(v)
	Overall: 60%	**Overall: 55-80%**	**Glass: min. 60%**	**Paper and board: min. 60%**	**Metals: min. 50%**	**Plastics: min. 22.5%**	**Wood: min. 15%**
Belgium, Denmark, Germany, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Finland, Sweden, United Kingdom	**End of 2008**						
Greece, Ireland, Portugal	**End of 2011**						
Czech Republic, Estonia, Cyprus, Lithuania, Hungary, Slovenia, Slovakia	End of 2012						
Malta	**end of 2013**						
Poland	**end of 2014**						
Latvia	**end of 2015**						
Bulgaria	**2014**	**2014**	**2013**	**2008**	**2008**	**2013**	**2008**
Romania	**2013**	**2013**	**2013**	**2008**	**2008**	**2013**	**2011**
The data for wood shall not be used for the purpose of evaluating the target of a minimum of 15% by weight for each packaging material, as provided for in article 6(1)(c) of Directive 94/62/EC, as amended by Directive 2004/12/EC.							

Source: Eurostat.

Figure 4-9: Reported Performance of Member States, Recycling of Packaging Waste (%, 2011 Data)

Source: Eurostat.

4.2.3 Material Specific Analysis - Recycling

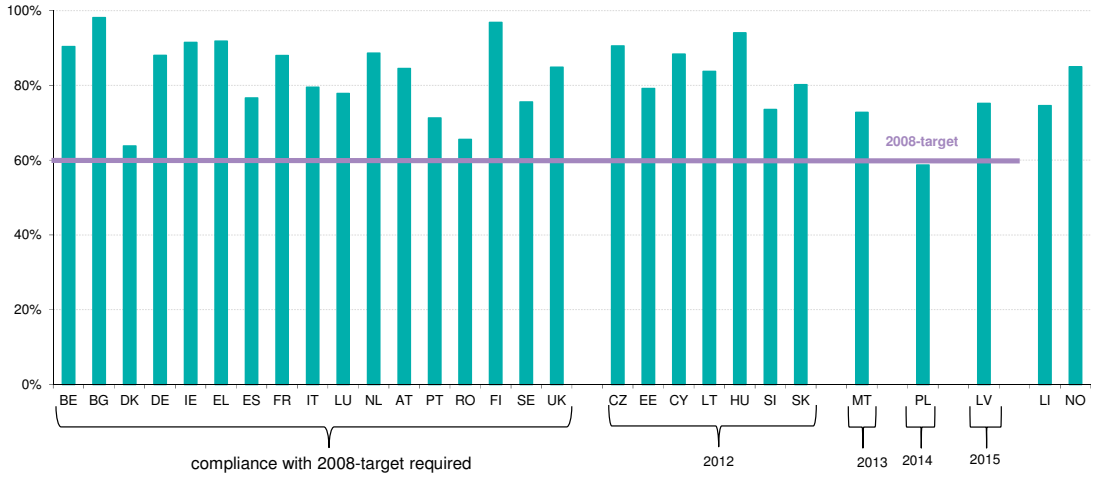
Some material specific analysis of recycling rates for the specific packaging materials is given in Table 4-2. This shows that plastic is the material for which most countries appear to be already meeting the current target of 22.5%. Twenty-four countries are also already meeting the targets for paper/cardboard, metals, and wood. Glass is the material for which the smallest number of countries are currently meeting or exceeding the existing target of 60%.

Table 4-2: Analysis of Material Specific Recycling Rates, EU27

	Paper and Card	Glass	Metals	Plastics	Wood
Target	60.0%	60.0%	50.0%	22.5%	15.0%
Average	80.0%	65.9%	67.8%	34.5%	39.5%
Standard Deviation	12.6%	31.1%	19.1%	10.9%	23.3%
No. of Countries Exceeding Target	24	17	24	26	24

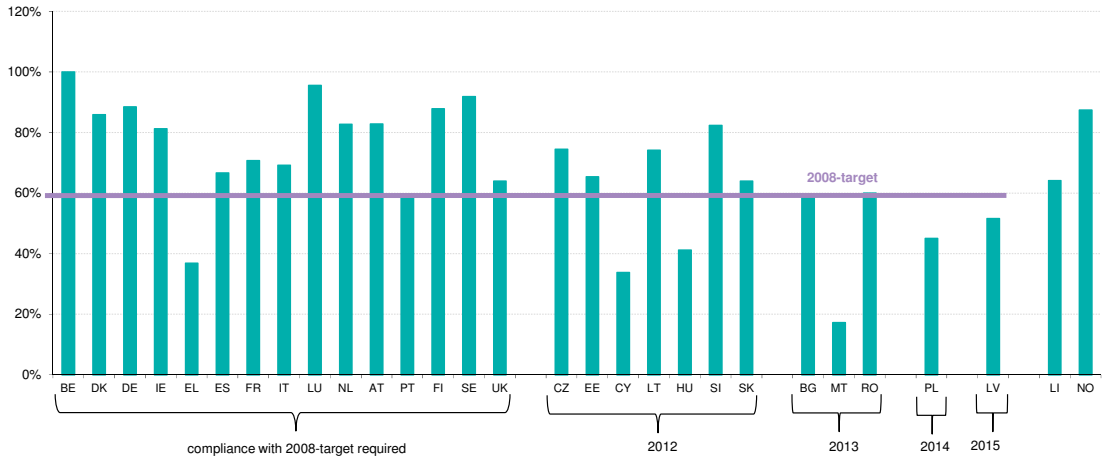
Figure 4-10 to Figure 4-14 below provide a detailed outline of the performance of each Member State against the material specific targets.

Figure 4-10: Paper and Cardboard Packaging (%, 2011 Data)



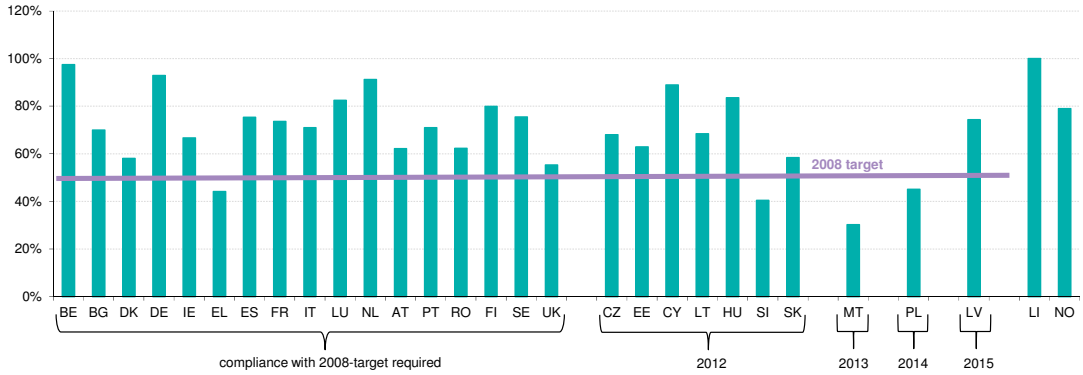
Note: the horizontal line indicates the target for 2008, the year of derogations for compliance is displayed accordingly.
Source: Eurostat.

Figure 4-11: Glass Packaging (%, 2011 Data)



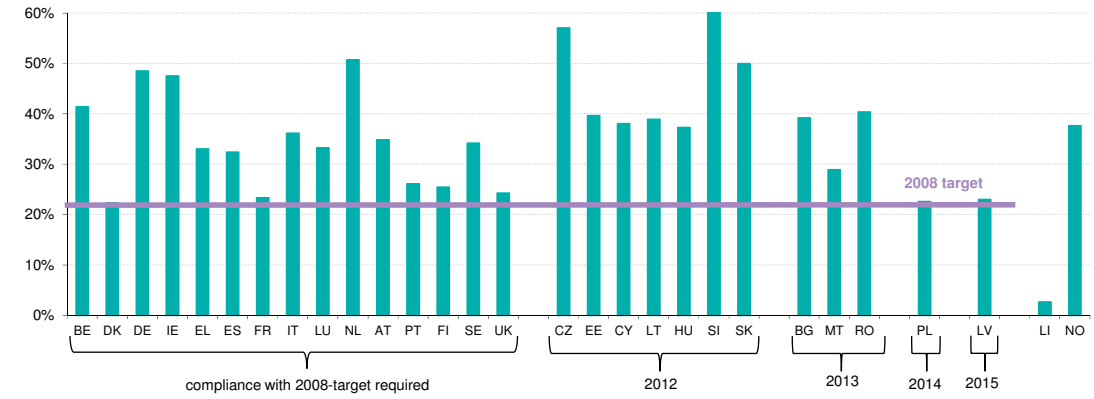
Note: the horizontal line indicates the target for 2008, the year of derogations for compliance is displayed accordingly.
Source: Eurostat.

Figure 4-12: Metal Packaging (%, 2011 Data)



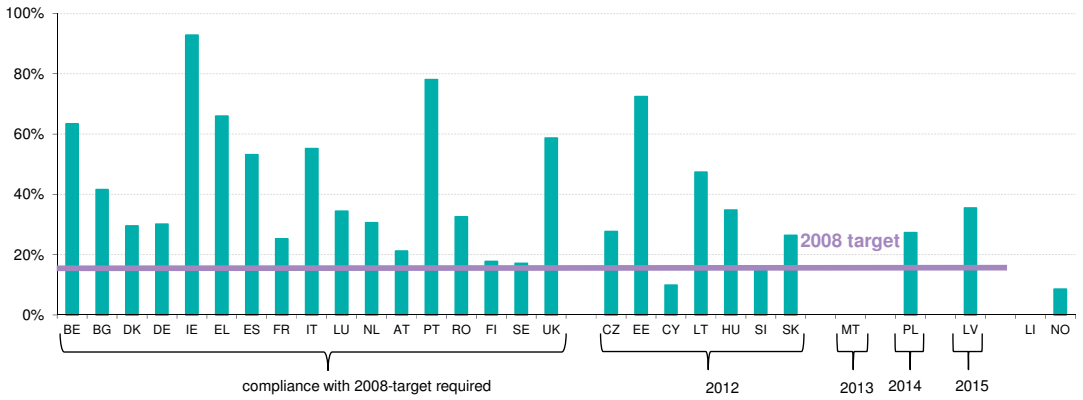
Note: the horizontal line indicates the target for 2008, the year of derogations for compliance is displayed accordingly.
Source: Eurostat.

Figure 4-13: Plastic Packaging (%, 2011 Data)



Note: the horizontal line indicates the target for 2008, the year of derogations for compliance is displayed accordingly.
Source: Eurostat.

Figure 4-14: Wood Packaging (%, 2011 Data)



Note: the horizontal line indicates the target for 2008, the year of derogations for compliance is displayed accordingly.
Source: Eurostat.

4.2.4 Recovery Targets

When the Packaging Directive was last revised, the previously large gulf between the recycling targets and the recovery targets was reduced. The 2008 recovery target is 60%, only 5% higher than the overall recycling target that has been set in the Directive.

Of the countries obligated to meet the recycling target of 55% in 2008, we noted above that only Sweden failed to meet this target, and then, only by a small margin. With the exception of Sweden and Finland, all of the countries obliged to meet the 2008 recovery target of 60% were achieving this target through recycling alone. In other words, they required no contribution from energy recovery to meet the target.

This raises the question as to what purpose, beyond that served by the recycling targets, the recovery target is intended to serve. Few producer responsibility schemes for packaging directly fund the development of energy recovery facilities. For most countries where packaging is sent for energy recovery, the recovery facilities exist for reasons other than for the purposes of meeting the packaging recovery targets (the recovery infrastructure tends to result from other policies, such as, landfill taxes, or landfill bans, or policies designed to meet the Landfill Directive). Finally, whilst energy recovery from paper and card packaging might contribute some renewable energy, the recovery of energy from plastics tends to give rise to significant contributions to climate change emissions, except in those cases where (as may be the case in cement kilns) the energy of the plastics replaces directly (or at a high level of substitutability) sources of energy that would otherwise be derived from carbon intense fuels, such as coal or petcoke.

It seems reasonable to question, therefore, what purpose the recovery target for packaging actually serves. Generally, packaging waste which is not recycled will, in any given country, be treated or disposed of using the residual waste infrastructure which is in place at the time. The extent to which packaging recovery targets have influenced the prevalence of energy recovery infrastructure is likely to have been negligible. The rationale for retaining such targets in future would appear to be extremely weak. Rather, the emphasis should be on increasing recycling and, as deemed appropriate, developing targets for prevention, including reuse.

4.3 Waste Framework Directive – Household and Other Waste

4.3.1 Issues in Respect of Definitions and Reporting

The target set out in Article 11(2)(a) of the Waste Framework Directive is as follows:

> *"…by 2020, the preparing for re-use and the recycling of waste materials such as at least paper, metal, plastic and glass from households and possibly from other origins as far as these waste streams are similar to waste from households, shall be increased to a minimum of overall 50 % by weight".*

The related Commission Decision on calculation methods provides four different methods for the calculation of the targets.[42] These are discussed below.

[42] Commission Decision of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council (notified under document C(2011) 8165) (2011/753/EU)

4.3.1.1 Four Methods for Report on Targets for 'Household Waste and Waste Similar to Household Waste'

In consultations with stakeholders, there was more or less universal condemnation of the decision to allow a choice from one of four different methods for demonstrating compliance with the targets under the Waste Framework Directive. Such a range of means to reach the targets defeats the objective of setting a given target since the measurement methods imply differing levels of performance.

This is quite easy to see if one compares, for example, the first and third methods outlined in the Commission Decision. These are:

- Method 1 – recycling rate (%) of waste paper, metal, plastic, and glass arising from households:

$$= \frac{\text{recycled amount of paper, metal, plastic, and glass household waste}}{\text{total generated amount of paper, metal, plastic, and glass household waste}}$$

- Method 3 – recycling rate (%) of all household waste:

$$= \frac{\text{recycled amount of household waste}}{\text{total household waste excluding certain waste categories}}$$

Table 4-3 presents an example calculation to demonstrate the least challenging approach, which appears to be Method 1. Column 1 of his table shows what the 'typical' proportion of paper/card, metal, plastic and glass may be in the household waste stream ('typically' these materials can add up to 48% of the total household waste stream). Column 2 shows the average European recycling rates for paper/card, metal, plastic and glass packaging. The packaging recycling rates obviously apply to household packaging, but also to commercial and transport packaging too.[43] Column 3 shows the proportion of packaging waste in the household waste stream that is recycled when the total packaging recycling rates shown in column 2 are achieved. This shows that the 50% target, as measured by Method 1, can be met relatively easily. Indeed, it would be possible, assuming the cited packaging recycling rates, to meet the target even if one of glass, plastics or metals contributed nothing to the overall rate.

[43] Although the rate for paper and card is likely to reflect the prevalence of card in commercial packaging, household paper and card also includes newsprint and magazines, which can be readily captured at high rates. An 80% capture rate is readily achievable. The rate for glass packaging are likely to reflect the performance for household packaging fairly closely, and the proportion of non-packaging glass in the household glass stream is low. Where plastics are concerned, household waste typically consists of bottles, films and other dense plastic, not all of which is packaging. Capture rates for bottles can be high, but the potential for recycling plastic films from households, some of which will be contaminated with food, is not as great as for the commercial stream where films are usually very clean. Non-bottle rigid plastics are being recycled to a growing extent. A capture rate of the order 35% is not excessive. For metals, the packaging rates may, in some countries, reflect high captures of industrial metal packaging, but this is increasingly unlikely to be the main driver of performance. Furthermore, household waste includes some non-packaging metal which can be effectively captured for recycling. Hence, captures of this order are not excessive in the household stream.

Table 4-3: Recycling Performance as Calculated under Method 1 Assuming European Average Recycling Rates for Packaging Materials

Material	Composition (% total household Waste) (1)	Average EU performance, Packaging Directive (2)	Contribution to Recycling (%total household Waste) (3)
Paper and card	20%	80.0%	16.0%
Glass	8%	67.8%	5.4%
Plastic	14%	34.5%	4.8%
Metal	6%	65.9%	4.0%
Total, as % total household Waste	48%	-	30.2%
Recycling rate calculated using Method 1[1]			62.9%

Note: 1. Method 1: $= \frac{recycled\ amount\ of\ paper,metal,plastic,and\ glass\ household\ waste}{total\ generated\ amount\ of\ paper,metal,plastic,and\ glass\ household\ waste}$

Another way of looking at this above discussion is shown in Table 4-4 which shows what the situation may be like in Member States which are only recycling packaging materials at the target levels (column 2). This shows that as long as countries are meeting the packaging targets and targeting non-packaging paper and card for recycling, as well as non-packaging metals, they are likely to be meeting the 50% recycling target according to calculation Method 1. As above, this assumes that the packaging recycling rates being reported are an accurate reflection of what is actually being recycled, which is not entirely clear at present (see Section 4.2).

Table 4-4: Recycling Performance as Calculated under Method 1 Assuming Packaging Recycling Targets are Met

Material	Composition (% total household Waste) (1)	Material Specific Targets, Packaging Directive	Contribution to Recycling (% total household Waste)
Paper and card	20%	60.0%	12.0%
Glass	8%	60.0%	4.8%
Plastic	14%	50.0%	7.0%
Metal	6%	22.5%	1.4%
Total, as % total household Waste	48%	-	25.2%
Recycling rate calculated using Method 1[1]			52.4%

Note: 1. Method 1: $= \frac{recycled\ amount\ of\ paper,metal,plastic,and\ glass\ household\ waste}{total\ generated\ amount\ of\ paper,metal,plastic,and\ glass\ household\ waste}$

To the extent that the materials covered by Method 1 may make up around half of the household waste stream, meeting a 50% target for these materials can be achieved at a household recycling rate of a quarter of household waste – around 25%. The composition of biowastes in the household waste stream varies depending on

socioeconomic conditions and the way in which household waste is collected (in particular, whether collections of garden waste are offered free of charge to households).[44] Food and garden waste, in combination, will typically constitute more than 30% of all household waste in any given country, with the precise proportion, and the split between food and garden, varying with the types of factors already discussed. Given its significance in the household waste stream, it would be difficult for a country to meet a 50% recycling rate for household waste without some focus on biowaste recycling. Given that such a focus still does not exist in many countries, it seems reasonable to state that whilst the target under Method 1 is likely to be met by a range of countries (or will be with limited changes to existing systems), Method 3 would require additional efforts to be made.

Method 2 of the Commission Decision allows for the calculation of the recycling rate (%) for household and similar waste to be calculated as follows:

$$= \frac{\begin{array}{c}\text{recycled amount of paper, metal, plastic, glass,} \\ \text{and other single waste streams from households or similar waste stream}\end{array}}{\begin{array}{c}\text{total generated amount of paper, metal, plastic, glass,} \\ \text{and other single waste streams from households or similar waste stream}\end{array}}$$

Method 4 of the Commission Decision proposes to "*rely on the statistical data on municipal waste reported annually to the Commission (Eurostat)*" and refers to the recycling rate (%) of municipal waste as being:

$$= \frac{\text{total municipal waste recycled}}{\text{total municipal waste generated}}$$

It needs to be mentioned in this context that the reporting on municipal waste to Eurostat has, thus far, been based on a 'gentlemen's agreement' and is, as a result, voluntary. The data reported to Eurostat clearly acquires some additional significance where Method 4 is chosen as the basis for reporting targets.

In short, the four calculation methods imply quite substantial differences in the levels of effort required to meet the 50% recycling /preparation for reuse target. The different methods effectively invite countries to choose a method which may allow them to meet the target with minimum effort or they may choose options for which they might have to make quite significant changes. The four methods under the Communication have effectively diminished any transformative potential of the recycling rate specified under the Directive.

Member States were required to report on their chosen calculation method as part of their Directive 2008/98/EC Implementation Reports, which were due to be submitted to the European Commission in September 2013. The state of play in respect of the chosen reporting methods were, as of December 2013, as summarised in Table 4-5 and Figure

[44] In lower income countries, food waste tends to be a higher proportion of the total waste (around 30% for lower income EU Member States), whereas it falls to around 20% in countries with higher per capita incomes. The garden waste element varies considerably: in suburban areas where households are offered free garden waste collections door-to-door, garden waste can rise to around 25% of household waste, and more (with other fractions correspondingly reduced). In the absence of free collections, the figure is typically less than 10%.

4-15. From this it can be seen that the majority of Member States have chosen Method 2, with around a quarter choosing Method 4, a smaller number choosing Method 3, and only one opting for Method 1. However, as can be seen from the Table, at the time of writing eight Member States were yet to report their approach.

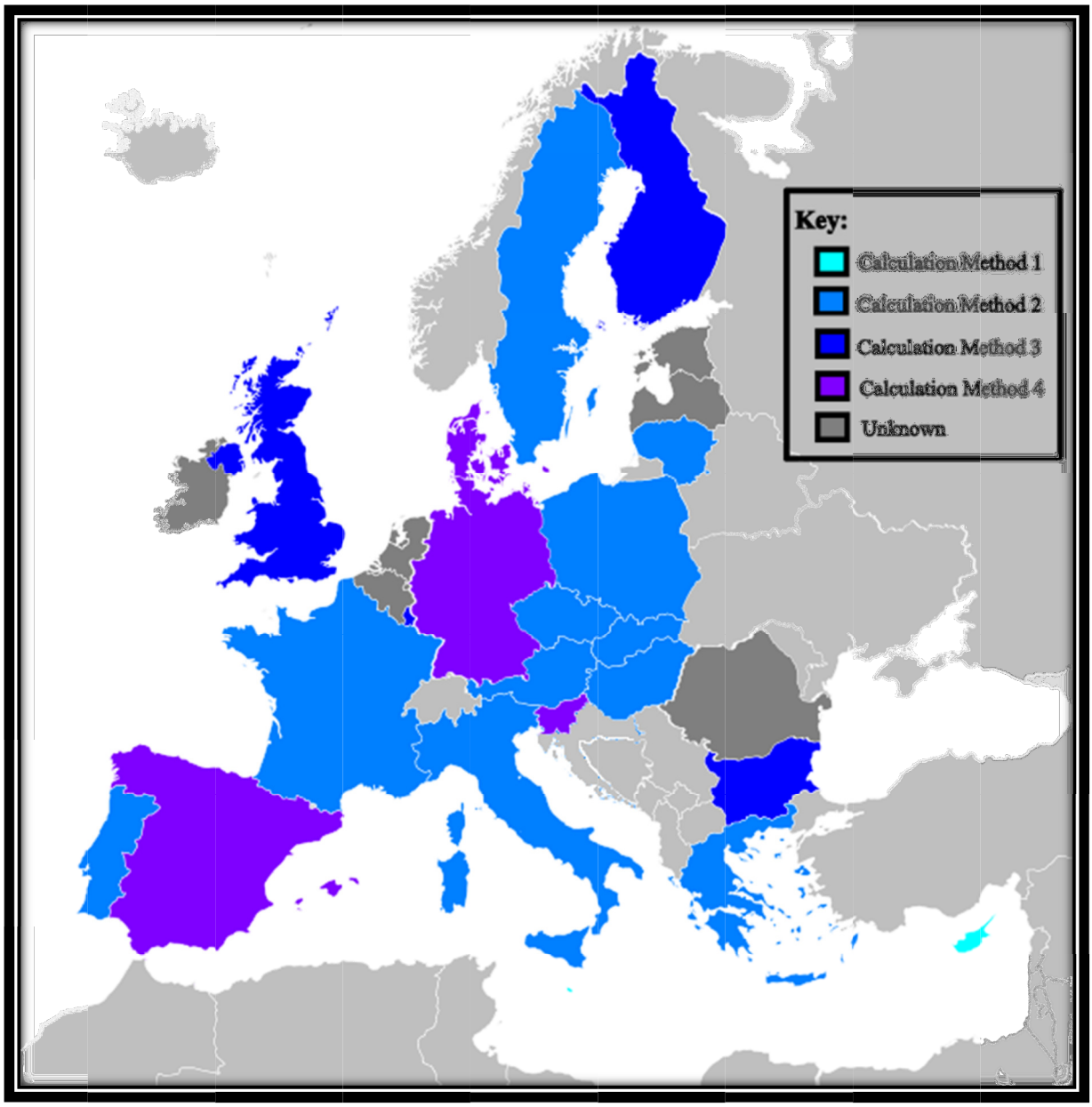
Table 4-5: Calculation Methods Chosen by Member States

Member State	Chosen Calculation Method
Austria	Method 2
Belgium	-
Bulgaria	Method 3
Croatia	-
Cyprus	Method 2
Czech Republic	Method 2
Denmark	Method 4
Estonia	-
Finland	Method 4
France	-
Germany	Method 4
Greece	Method 2
Hungary	Method 2
Ireland	-
Italy	Method 2
Latvia	-
Lithuania	Method 2
Luxembourg	Method 3
Malta	Method 1
Netherlands	-
Poland	Method 2
Portugal	Method 2
Romania	-
Slovakia	Method 2
Slovenia	Method 4
Spain	Method 4
Sweden	Method 2
United Kingdom	Method 3

Source: Member State Directive 2008/98/EC Implementation Reports.

Note: - = Member State had not reported on their chosen method at the time this information was obtained from the European Commission – the last update was received on 12th December 2013.

Figure 4-15: Graphical Display of Member States' Chosen Calculation Methods



Source: Member State Directive 2008/98/EC Implementation Reports submitted by November 2013.

We have already noted that the way in which Member States report on municipal waste varies significantly on account of the differences in the scope of wastes included within the reporting, and with regard to the way in which, as a result of the way in which they are required to report, the figures on generation and treatment may differ. Usefully, the Communication makes it clear that the denominator for the calculation should be the amount of waste generated, rather than the amount of waste treated (which has been used as the basis for reporting of statistics in several publications thus far).

4.3.1.2 Definition of Municipal Waste

A recent report by the EEA noted that the definition of 'municipal waste' used in different countries varies, *"reflecting diverse waste management practices"*.[45] In reality, however, the definition varies in part due to the wording of existing legislation and the reporting frameworks and not only to variations in waste management practices. Above, we noted the definition used in the Landfill Directive, which is:

> "*waste from households, as well as other waste which, because of its nature or composition, is similar to waste from households*".[46]

The Waste Framework Directive itself refers to a target, the measurement of which is set out under Article 1 of the Commission Decision which set out rules and calculation methods with respect to the Article 11 targets of the Waste Framework Directive. [47] Paragraph 3 defines 'municipal waste' as:

> *"household waste and similar waste".*

In turn, household waste is defined as:

> *"waste generated by households".*

and 'similar waste' is defined as:

> *"waste in nature and composition comparable to household waste, excluding production waste and waste from agriculture and forestry".*

This is closely aligned with, though not the same as, the definition in the Landfill Directive. As a result, it suffers from similar drawbacks to those discussed above.

Eurostat has issued Guidance on municipal waste data collection.[48] In discussing definitions, the Guidance notes, regarding the List of Waste:

> *"The primary aim of the list is not to be the basis for data collection. However it is widely used for this purpose as well".*

Even so, the Commission Decision on establishing rules and calculation methods makes reference, in Annexes I and II, to the List of Waste, presumably to facilitate understanding of what data is required to be collected.

The Guidance goes on to say:

> *"The waste list is structured in 20 chapters according to either the particular origin or other characteristics of the waste. Chapter 20 is dedicated to municipal*

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[45] EEA (2013) *Managing Municipal Solid Waste - A Review of Achievements in 32 European Countries*, EEA report. No 2 2013, February 2013, www.eea.europa.eu/publications/managing-municipal-solid-waste

[46] Council Directive 1999/31/EC of 26.4.1999 (OJ L 182, 16.7.199, p.1).

[47] Commission Decision of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council (notified under document C(2011) 8165) (2011/753/EU)

[48] Eurostat (2012) *Guidance on Municipal Waste Data Collection* – November 2012, Eurostat – Unit E3 – Environment and Forestry, http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/documents/Municipal_waste_statistics_guidance.pdf

wastes (household waste and similar commercial, industrial and institutional wastes) including separately collected fractions.

Chapter 20 contains a number of wastes separately collected. However, packaging waste is excluded in this chapter and classified under chapter 15. Several countries organising their data collection on the basis of the List of Waste are known to exclude packaging waste generated by households from municipal waste statistics because it is not classified under chapter 20 LoW. These countries underestimate their municipal waste generation, and their efforts in recycling of waste generated by households are not fully taken into account in the reporting on municipal waste".

This is something that has been observed, or suspected, in a number of countries, notably where countries report exceeding existing EU targets in respect of the Packaging Directive, but very low rates of recycling for municipal waste. Since there is a reasonable overlap between municipal waste and packaging waste (for example, virtually all glass packaging would fall under most interpretations of the definition of 'municipal waste'), and given the relatively high proportion of municipal waste accounted for by packaging fractions (according to composition studies), a reasonably high value for packaging recycling, and a very low value for municipal waste recycling, seems unlikely (albeit not impossible). Member States might be excused where they have made this mistake in the past to the extent that Chapter 20 in the List of Waste is entitled 'municipal waste'. That which is outside Chapter 20 might reasonably, therefore, have been considered to be *not* municipal waste.

In reality, it is understood that some countries are now revising their reporting on municipal waste recycling, it having become clear that they have been misreporting these figures in the past, because they neglected to include the recycling of packaging from municipal waste.

The traditional framework for European waste statistics until reference year 2003 had been the joint OECD/Eurostat questionnaire on waste (JQ) which mainly distinguished between waste from industrial sources (by groups of NACE divisions) and municipal waste. The Eurostat Guidance refers to the definition used in the JQ, which is as follows:

"Municipal waste includes household and similar wastes:

The definition also includes:

- *bulky waste (e.g. white goods, old furniture, mattresses); and*
- *garden waste, leaves, grass clippings, street sweepings, the content of litter containers, and market cleansing waste, if managed as waste.*

It includes waste originating from:

- *households,*
- *commerce and trade, small businesses, office buildings and institutions (schools, hospitals, government buildings).*

It also includes:

- *waste from selected municipal services, i.e. waste from park and garden maintenance, waste from street cleaning services (street sweepings, the content of litter containers, market cleansing waste), if managed as waste.*

It includes collected waste from these sources:

- *door-to-door through traditional collection (mixed household waste), and*

- *fractions collected separately for recovery operations (through door-to-door collection and/or through voluntary deposits).*

For the purpose of this questionnaire, municipal waste refers to waste defined as above, collected by or on behalf of municipalities.

The definition also includes waste from the same sources and similar in nature and composition which:

- *are collected directly by the private sector (business or private non-profit institutions) not on behalf of municipalities (mainly separate collection for recovery purposes),*
- *originate from rural areas not served by a regular waste service, even if they are disposed by the generator.*

The definition excludes:

- *waste from municipal sewage network and treatment,*
- *municipal construction and demolition waste".*

The Guidance recommends this definition on the basis that it fleshes out the definitions in the Landfill Directive and the Commission Decision of November 2011. However, it remains an opaque definition. Indeed, the recommended definition has broadened from covering:

"waste defined as above, collected by or on behalf of municipalities",

to include the vaguely defined:

"waste from the same sources and similar in nature and composition".

It is clear from the Eurostat Guidance that not all countries report the same waste stream coverage under the definition of municipal waste.

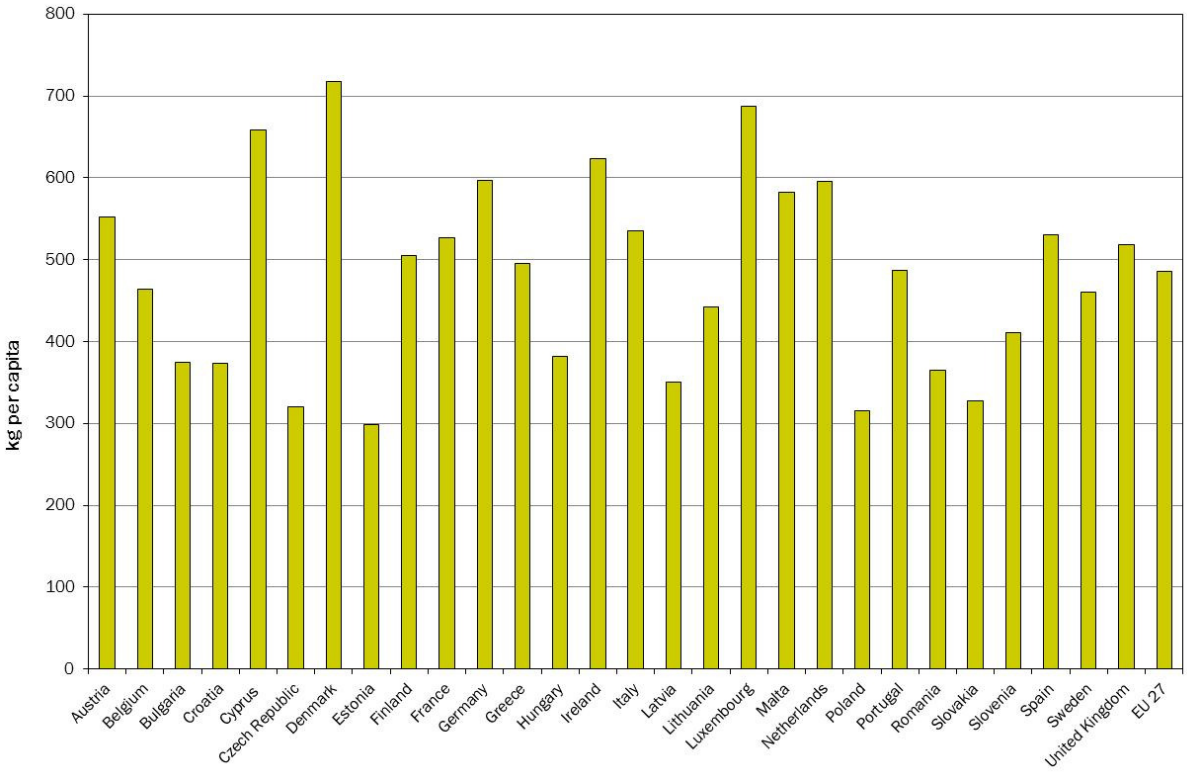
It remains the case, therefore, that the reporting of municipal waste data is likely to include a varying amount, across countries, of waste that is not from households. In some countries, it seems likely that the reporting will be restricted to the wastes collected by, or on behalf of, local authorities (a partial interpretation of the above definition). This might be in line with the definition, provided that all waste types and sources mentioned in the definition are covered by the collection system of the local authorities. Otherwise, it would be required to collect data from the private collectors, too, to the extent that they collected "waste from the same sources" which is "similar in nature and composition".

In others, and probably especially those countries which rely heavily on 'bring systems' for waste collection, the reported data will include material discarded by businesses in the vicinity, so that the quantity reported is likely to include a high proportion of waste from commercial enterprises. In several countries, as noted in the Eurostat Guidance, separately collected packaging is being omitted from the data, so that in calculating a recycling rate, there is no separately collected municipal waste packaging contributing either to the numerator or the denominator of a recycling rate estimate.

Given these difficulties, it seems likely that most attempts to explain the variation in municipal waste across countries through reference to, for example, economic characteristics, are likely to have limited success. The variation is just as (if not more) likely to have a more fundamental explanation – countries are simply reporting different things. In Figure 4-16 below, it would be easy to imagine that the variation in municipal solid waste per inhabitant was explained, to a considerable degree, by the variation in

the scope of the wastes collected and reported under the definition of municipal waste. For instance five countries with very similar Actual Individual Consumption levels in 2011 – Belgium, Finland, France, Netherlands and Denmark – reported radically different municipal waste per inhabitant in that year. The figures for municipal waste reported by these countries range from 464kg per inhabitant to 718 kg per inhabitant (see Figure 4-16), the latter being 55% greater than the former.

Figure 4-16: Municipal Waste Generated per Capita (2011 Data)



Source: Eurostat.

Such variability in the scope of wastes being reported in the data makes it extremely difficult to consider meaningful targets for waste prevention: the basis for setting targets in absolute quantities (e.g. kg per inhabitant) is shaky, whilst the potential for setting targets in terms of % changes is undermined by the fact that Member States seem free to report whatever scope of wastes they wish to under the definition (so that any observed 'prevention' might simply represent a narrowing in the scope of reporting over time).

In order to shed some light on differences in the scope of reporting on municipal waste, Eurostat conducted a methodological survey in 2011 asking the countries to indicate in a matrix the coverage of their data by waste categories (EWC-STAT code, being an aggregate of LoW codes) and economic activities (NACE codes + households). The matrix is equivalent to the reporting matrix on waste generation according to the Waste Statistics Regulation (WStatR). Member States were requested to indicate those cells which are included in their municipal waste figures, highlighting also whether they were fully or partly included in municipal waste.

For the 16 countries giving valid responses, Eurostat analysed the "included" or "partly included" cells. The result is shown in Table 4-6, where shadings illustrate the share of countries that marked the cell. The darker the shading of a cell, the more countries marked it as being included in municipal waste. The weighted average value (%) of the

degree to which the wastes represented by the cell were included in the reporting of municipal waste by different countries is also shown (not included=0, partly included = 0.5, fully included = 1) are shown in each cell.

In order to illustrate the importance of the marked cells in column 20 (households) in quantitative terms, the reported quantities reported for the EU 27 under the WStatR, averaged over the years 2004, 2006 and 2008, are displayed in the rightmost column as percentages of the total amounts. In addition, all waste categories which contain LoW keys belonging to Chapter 20 (municipal waste) or 1501 (Packaging) are marked in the right column of the Table.

The 16 participating countries filled in the questionnaires in quite different ways:

1. Four countries marked cells only in the columns “households” and “services”;
2. Three countries marked cells exclusively in “households”;
3. Others included all economic activities.

The following descriptions illustrate the greatest difference observed:

- One country marked only one cell as fully included (household and similar waste) and five others (mainly recyclables) as partly included[49], all from the source “households”.
- One country marked 29 EWC-STAT categories as being fully included from households and partly included from all other activities

The individual country sheets illustrated the considerable differences of the coverage of the national data on municipal waste, clearly indicating a complete absence of harmonisation in reporting.

The result over all valid questionnaires regarding the origin of municipal waste shows a clear focus on the source ‘households’. Indeed, given the definition which is supposed to be used for reporting purposes (see above), the limited extent to which wastes from ‘services’ are reported is quite striking. Even the category explicitly named ‘Household and similar waste’ (which is typically the unrecycled waste) is ‘fully’ or ‘partly’ included in the municipal waste data by, on average, only around half of the countries.

The item of most significant quantity is EWC-STAT 10.1 (household and similar waste), which contains LoW code 200301 (mixed municipal waste). The waste in this category generated by households is included in all countries’ municipal waste figures. At the EU27 level it also makes up by far the largest share of waste generated by households (68% in total). Clearly, in countries where little recycling of waste from households and service sector businesses is carried out beyond the recycling of packaging, then to the extent that some countries have been excluding the recycled packaging waste from their reporting, it would stand to reason that a very high proportion of ‘municipal waste’ would be of this nature.

[49] This indicates that these countries apparently focus on chapter 20, i.e. exclude the packaging collected from households, since the EWC-Stat items for the recyclables contain keys from chapter 20 and chapter 1501.

Table 4-6: Coverage of Municipal Waste by WStatR Categories - Share of Countries Indicating the cell as Being Included/Partly Included* in Municipal Waste 2008 (N=16)

waste	hazard	01 / A01_A02	02 / A03	03 / B	04 / C10-C12	05 / C13-C15	06 / C16	07 / C17_C18	08 / C19	09 / C20-C22	10 / C23	11 / C24_C25	12 / C26-C30	13 / C31-C33	14 / D	15 / E36_E37_E39	16 / E38	17 / F	18 / G-U_X_G4677	19 / G4677	20 / EP_HH	20 / EP_HH, share by EWC-Stat, EU27 2004 to 2008	LoW 20 1501
01.1 - Spent solvents	HAZ	6%		3%	6%	6%	6%	6%	3%	6%	3%	6%	6%	6%	3%	3%	6%	6%	16%	3%	44%	0,0%	X
01.2 - Acid, alkaline or saline waste	NHAZ																						
01.2 - Acid, alkaline or saline waste	HAZ			3%	6%	3%		3%		3%	3%	3%	3%	3%	3%	3%	3%	3%	16%	3%	38%	0,0%	X
01.3 - Used oils	HAZ	3%		3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	19%	3%	44%	0,0%	X
01.4 - Spent chemical catalysts	NHAZ																						
01.4 - Spent chemical catalysts	HAZ																						
02 - Chemical preparation wastes	NHAZ	3%			3%	3%	3%	3%	3%	3%	3%	3%	6%	3%	3%	3%	3%	3%	13%	3%	28%	0,0%	X
02 - Chemical preparation wastes	HAZ	9%		6%	6%	6%	6%	6%	3%	6%	6%	6%	9%	9%	9%	6%	9%	9%	19%	9%	56%	0,0%	X
03.1 - Chemical deposits and residues	NHAZ																						X
03.1 - Chemical deposits and residues	HAZ	3%		3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	9%	3%	19%	0,0%	
03.2 - Industrial effluent sludges	NHAZ																						
03.2 - Industrial effluent sludges	HAZ																						
05 - Health care and biological wastes	NHAZ					3%			3%	3%	3%	3%	3%	3%	3%		3%		19%		13%	0,0%	
05 - Health care and biological wastes	HAZ			3%	6%	3%			3%	6%			6%		3%	3%	3%	3%	19%	3%	13%	0,0%	
06 - Metallic wastes	NHAZ	9%	6%	6%	16%	16%	9%	16%	9%	16%	13%	16%	16%	16%	13%	9%	9%	9%	31%	9%	81%	1,5%	X
06 - Metallic wastes	HAZ																						
07.1 - Glass wastes	NHAZ	6%	3%	6%	16%	9%	6%	6%	9%	13%	13%	13%	16%	13%	13%	3%	9%	9%	28%	6%	78%	3,6%	X
07.1 - Glass wastes	HAZ																						
07.2 - Paper and cardboard wastes	NHAZ	6%	3%	6%	16%	16%	16%	13%	13%	16%	16%	16%	16%	16%	13%	13%	13%	13%	31%	9%	81%	7,8%	X
07.3 - Rubber wastes	NHAZ	6%		6%	6%	9%	6%	9%	6%	13%	9%	13%	6%	6%	6%	3%	6%	6%	13%	6%	34%	0,1%	
07.4 - Plastic wastes	NHAZ	9%	6%	6%	16%	13%	16%	13%	9%	16%	16%	16%	16%	16%	13%	9%	13%	13%	31%	9%	81%	0,9%	X
07.5 - Wood wastes	NHAZ	6%	3%	6%	16%	9%	16%	13%	6%	13%	13%	13%	16%	16%	13%	3%	9%	6%	22%	9%	63%	1,3%	X
07.5 - Wood wastes	HAZ	3%		3%	3%	3%	6%	3%	3%	6%	3%	6%	6%	6%	3%	3%	3%	3%	6%	3%	31%	0,0%	X
07.6 - Textile wastes	NHAZ	3%			9%	16%	9%	13%	6%	13%	6%	9%	13%	13%	6%		9%	9%	19%	9%	69%	0,3%	X
07.7 - Waste containing PCB	HAZ																						
08 (not 8.1, 8.41) - Discarded equipment (excluding discarded vehicles)	NHAZ	13%	9%	13%	16%	16%	13%	16%	13%	13%	13%	13%	13%	9%	13%	13%	13%	13%	25%	9%	66%	0,3%	X
08 (not 8.1, 8.41) - Discarded equipment (excluding discarded vehicles)	HAZ	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	13%	22%	9%	56%	0,2%	X
08.1 - Discarded vehicles	NHAZ																			3%	13%	0,0%	
08.1 - Discarded vehicles	HAZ																			3%	13%	0,6%	
08.41 - Batteries and accumulators wastes	NHAZ				6%	3%	3%	3%		3%	3%	3%	6%	3%	3%		3%		22%		47%	0,0%	X
08.41 - Batteries and accumulators wastes	HAZ	6%	3%	6%	9%	6%	9%	9%	6%	9%	13%	9%	13%	9%	9%	3%	9%	9%	28%	9%	56%	0,0%	X
09 (not 9.11, 9.3) - Animal and vegetal wastes	NHAZ	13%	9%	9%	16%	13%	16%	9%	9%	9%	13%	13%	13%	13%	13%	13%	13%	13%	41%	6%	81%	9,4%	X
09.11 - Animal waste of food preparation and products	NHAZ	6%	6%		6%					3%	3%	3%	3%		3%		3%		13%		9%	0,0%	
09.3 - Animal faeces, urine and manure	NHAZ																					0,0%	
10.1 - Household and similar wastes	NHAZ	19%	19%	28%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	31%	34%	28%	28%	53%	25%	100%	68,1%	X
10.2 - Mixed and undifferentiated materials	NHAZ	3%	3%	9%	16%	13%	16%	16%	9%	13%	13%	16%	16%	16%	13%	13%	9%	13%	31%	6%	56%	2,7%	X
10.2 - Mixed and undifferentiated materials	HAZ			3%	6%	3%		6%	6%	6%	6%	6%	6%	3%	6%		3%		16%	3%	19%	0,0%	
10.3 - Sorting residues	NHAZ	3%		3%	3%	3%	3%	3%		3%	3%	3%	3%	3%	3%	3%	3%	3%	6%	3%	9%	0,0%	
10.3 - Sorting residues	HAZ																						
11 (not 11.3) - Common sludges (excluding dredging spoils)	NHAZ	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	3%	31%	0,1%	X
11.3 - Dredging spoils	NHAZ																				13%	0,0%	
12.1 to 12.5 (not 12.4) - Mineral wastes	NHAZ	13%	9%	9%	13%	9%	9%	9%	9%	9%	13%	9%	9%	9%	13%	13%	13%	13%	22%	9%	56%	2,2%	X
12.1 to 12.5 (not 12.4) - Mineral wastes	HAZ	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	3%	31%	0,0%	(X)
12.4 - Combustion wastes	NHAZ			3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%		3%			0,0%	
12.4 - Combustion wastes	HAZ	3%		3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%		0,0%	
12.6 - Contaminated soils and polluted dredging spoils	HAZ																						
13 - Solidified, stabilised or vitrified wastes	NHAZ																						
13 - Solidified, stabilised or vitrified wastes	HAZ																						
total - Total Waste	NHAZ																					99,0%	
total - Total Waste	HAZ																					1,0%	
total - Total Waste	TOTAL																					100,0%	

Legend and Notes:

>20% to 40%

>40% to 60%

>60%

* : Entries are weighed (partly included = 0,5, fully included = 1)

Source: Unpublished weighted results of methodology questionnaire of Eurostat

Remarkably, this is the only type of waste which all the reporting Member States included all of in their reporting, even for household waste. The fact that some countries may be excluding recycled packaging waste from their reporting on municipal waste may mean that several of the material categories are excluded from reporting, which would tend to increase the share of household waste accounted for by LoW code 200301 (and EWC-STAT 10.1).

Some further issues with the way in which municipal waste is reported follow from Table 4-6, and the linkages with the EWC STAT codes and their equivalent EWC codes:

1. There are a number of wastes reported by some Member States for which there is no Chapter 20 code from the List of Waste, so from the List of Waste perspective, they should not be included as part of municipal waste:
    a. Health care and biological wastes are reported by some countries as municipal waste. Furthermore, some report this across a range of sectors, though presumably, such wastes are not produced in significant quantities by many sectors. There is no chapter 20 code (defining municipal waste) in the list of EWC codes under the relevant EWC STAT code for Healthcare and biological wastes;
    b. The same applies to rubber. The relevant category in EWC STAT encompasses no chapter 20 code. It includes only 'end of life tyres', suggesting that many Member States report end of life tyres from households, and to a lesser degree, other sectors, as part of municipal waste
    c. Similar comments apply to discarded vehicles, for which there is no 20 code, but which are reported by some Member States as part of municipal waste when generated by households, and a smaller number of Member States where they are generated by other sectors; and
    d. The following categories – 9.11 Animal waste of food preparation and products, 10.3 sorting residues and 12-1 to 12.5 (excl 12.4) Mineral wastes are all reported by some Member States despite the absence of any chapter 20 codes under these waste types.
2. On the other hand, there are some wastes which are likely to be separately collected in most, if not all, countries, and which have an associated Chapter 20 code from the List of Waste, but which are not reported as such by Member States. As long as such wastes are being separately collected, then all Member States should be reporting the following wastes:
    a. 08 discarded equipment. This category includes WEEE, and this is covered by a chapter 20 code. In principle, this should be reported by all Member States as long as some such wastes are collected separately. The same applies in respect of 08.41 – batteries and accumulators, and indeed, the same 'score' for reporting is given for both;
    b. 10.2 mixed and undifferentiated materials includes mixed packaging;
    c. Category 11, Common sludges excluding dredging spoils, includes 11.4 under which there are two 20 codes, waste from sewage cleaning, and septic tank sludge. Where households generate this waste, then Member States should report these wastes as municipal waste according to the List of Waste. That having been said, the definition used in the Joint Questionnaire for municipal waste excludes "*waste from municipal sewage network and treatment*"; and
    d. 12.6 Soils, which includes the 20 code, soil and stones.

Finally, there is nothing specific in the JQ which rules out any form of waste which is 'generated by households' other than those which are *explicitly* excluded from the definition. Since discarded passenger vehicles may reasonably be assumed to be a) wastes and b) originating from households, then it would appear that Member States should include it in their reporting.

4.3.1.3 Issues in Respect of Data on Generation and Treatment

In respect of how waste is treated, the latest Eurostat Guidance asks Member States to report only the waste quantities which are landfilled, incinerated, recycled or composted (including anaerobic digestion). It is known that many countries make use of a range of different processes to manage their waste, including others not included in the existing Guidance, such as mechanical biological treatment (MBT).

The Eurostat Guidance introduces a concept of pre-treatment as follows:

> *"Reporting on pre-treatment and secondary waste*
> *Where the pre-treatment operations MBT or sorting occurs, their outputs should be allocated to either of the following four treatment operations (see black and grey arrows in Figure 1). The amounts of these outputs may be based on estimation and / or modelling, but shall not contain process and water losses from pre-treatment, but only the secondary waste actually managed. For the four treatment operations incineration, landfill, recycling and composting, the direct (green arrows) and indirect (black and grey arrows) inputs shall be considered. Secondary wastes from the four existing treatment operations should not be reported".*

The term pre-treatment is also used in the Eurostat Manual on waste statistics.[50] In this document, it is stated that certain recovery and disposal operations (mainly preparatory treatments) are excluded from the scope of Annex II of the WStatR. Then it goes on to specify these operations under the heading:

> *"Exclusion of some recovery and disposal operations, pre-treatment".*

There is, however, no definition of 'pre-treatment' in either the Landfill Directive or the Waste Framework Directive. In a report of a Eurostat workshop in February 2012, some rationale for the use of the term is provided:[51]

> *"Sorting and MBT should be considered as pre-treatment operations, not as first treatment. Outputs from these operations should be assigned to the existing four treatment operations considered as first treatment operations".*

It is not clear why this distinction is made between 'treatment' (or 'first treatment') and 'pre-treatment'. Neither 'pre-treatment' nor the term 'first treatment' has any legal basis.

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[50] Eurostat (2013) *Manual on Waste Statistics – 2013 Edition*, Eurostat Methodologies and Working Papers, ISSN 197-0375, http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-RA-13-015

[51] Eurostat (2012) Municipal Waste – Methodological Issues and Report from the Workshop on 7/8 February 2012, Eurostat – Unit E3 – Environment and Forestry, Doc. WASTE WG 5.2 a (2012), http://circa.europa.eu/Public/irc/dsis/envirmeet/library?l=/statistics_29-30/methodology_workshoppdf/_EN_1.0_&a=d

In the Landfill Directive, Article 2 defines 'treatment' as follows:

> *"(h) 'treatment' means the physical, thermal, chemical or biological processes, including sorting, that change the characteristics of the waste in order to reduce its volume or hazardous nature, facilitate its handling or enhance recovery".*

This is a broad definition and it is easy to see why MBT and sorting processes would be covered by it. Indeed, Article 6 also indicates that:

> *"Member States shall take measures in order that:*
> *(a) only waste that has been subject to treatment is landfilled. This provision may not apply to inert waste for which treatment is not technically feasible, nor to any other waste for which such treatment does not contribute to the objectives of this Directive, as set out in Article 1, by reducing the quantity of the waste or the hazards to human health or the environment".*

It might be expected, therefore, that many Member States might include MBT as a form of treatment.

Treatment is also defined, albeit very differently, in Article 3 of the Waste Framework Directive:

> *"14. 'treatment' means recovery or disposal operations, including preparation prior to recovery or disposal".*

Annex II of the Waste Framework Directive includes the following definition of the recovery operation, R12:

> *"R 12 Exchange of waste for submission to any of the operations numbered R 1 to R 11".*

With the footnote definition suggesting:

> *"If there is no other R code appropriate, this can include preliminary operations prior to recovery including pre-processing such as, inter alia, dismantling, sorting, crushing, compacting, pelletising, drying, shredding, conditioning, repackaging, separating, blending or mixing prior to submission to any of the operations numbered R1 to R11".*

It seems clear that MBT or sorting processes would readily fall under this definition, and so would be classified as 'treatment'.

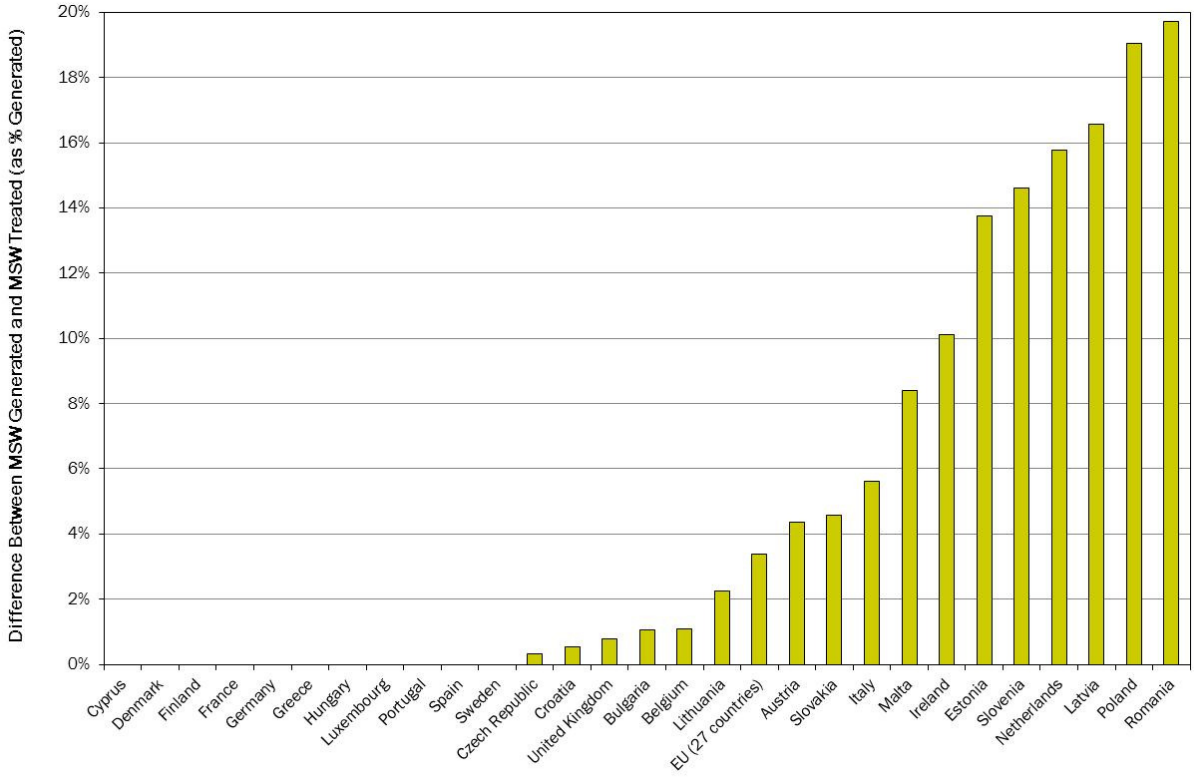
The introduction of a distinction between 'treatment' and 'pre-treatment', or 'first treatment' is not only lacking a substantive basis, but it seems to be seeking to draw a distinction between what are actually different forms of treatment.

This would not be of such concern if it were not for the fact that this opens up a clear gap between the reporting of municipal waste 'generated', and the quantity of municipal waste being 'treated', since MBT (and composting) processes are likely to lead to a loss in mass of the input material due to biodegradation processes and drying. This leads to a situation where the reporting of waste generated and waste treated are likely to be at variance, even where they are accurately reported in line with the Guidance. This makes it difficult to 'cross check' figures on waste generated and waste treated.

The current extent of this variance is indicated in Figure 4-17, which shows the percentage difference between reported municipal solid waste generated, and municipal solid waste treated (expressed as a percentage of that generated). In seven countries, the difference is more than 10%. On the other hand, some countries where MBT is known to be in place, and where mass losses would be expected to occur, report no

difference between the two figures (e.g. Germany and Spain), suggesting that they are overlaying their own interpretations on the data.

Figure 4-17: Difference between Municipal Solid Waste Generated and Treated (2011 Data)



Source: Eurostat.

Germany reports the input to the MBT under incineration, while Spain does not include it in their reporting at all. Other countries not reporting on MBT at all are Denmark, Czech Republic and Greece, which may be because no such facilities exist in these countries.

Italy, having previously reported inputs to its MBT facilities (approx. 9.3 million tonnes in 2010) under composting, retrospectively changed its reporting by referring to the outputs of these facilities. As a result, the composting rate fell from more than 30% to around 10%, and led to a gap of 6% between the amount of municipal solid waste generated and treated (Figure 4-17). This corresponds to a difference of 2 million tonnes or around 22% mass loss of the material that was inputted into MBT facilities (9.3 million tonnes in 2010).

For other countries the main reasons for the difference between waste generation and treatment have been documented by Eurostat:

- Estimates for the amount of waste generated by the population not served by municipal waste collection schemes are included in the figure on municipal waste generation for the following countries: Romania (74% of the population covered), Poland (81% of the population covered), Estonia (95% of the population covered), Ireland (not available), Bulgaria (99% of the population covered), Lithuania (99% of the population covered), and Croatia (96% of the population covered);
- Losses from MBT/sorting processes: Estonia (partly) and Malta (47% of the gap);

- Treatments not covered by the four available treatment operations were not reported: Netherlands (amounts sorted, mostly prior to incineration) and UK (MBT, "other alternative treatment technologies");
- Amounts temporary stored or exported are not included: Estonia (partly), Latvia, Lithuania (partly), Malta (53% of the gap).

For the remaining countries, the reason for the difference is not yet known. It is therefore unclear whether the gap between municipal waste generated and municipal waste treated is a result of 'correct reporting' – that is, accounting for mass losses at MBT facilities – or if other reasons apply.

Interestingly, the recycling rates for municipal waste which have been reported by Eurostat based on 2011 data appear to relate to the waste recycled and composted as a proportion of that which is reported as treated, rather than that which is generated. Since the existing Guidance dictates that countries should be reporting lower figures for treatment than for arisings (see Figure 4-17), the reported recycling rates have the potential to mislead. This is especially true in cases such as the Netherlands, where the gap between waste generated and waste treated is large. For the Netherlands, the combined recycling and composting rate amounts to 60% of what is treated, and is reported as the recycling rate by Eurostat. However, when calculated as a proportion of the waste generated, the figure is closer to 50%. This highlights the significance of the gap between 'generation' and 'treatment', and indeed, suggests that the basis for calculating and reporting the rates of recycling ought to be revised, or at least, accompanied by suitable caveats when published.

For the reporting on municipal waste, which was due in October 2013 for reference year 2012, Member States had to submit a new quality report. Member States are to explain in this quality report the reasons for the differences between figures for generation and treatment, which means that more information on this issue will become available in the near future. However, they are asked to do this only in respect of the influence of temporary storage. The quality report asks Member States to report how they assign quantities of so-called pre-treated waste (sorting plants and MBT facilities) to the different treatment options, but it makes no provision for reporting on mass losses in the system. As such, the information requested in quality reports is unlikely to correct some of the main issues relating the lack of a credible mass balance linking the generation and treatment of municipal waste.

The potential for using Method 4 in the Commission Decision on the rules for calculating recycling rates, as well as the publication, by the European Commission, of performance tables regarding municipal waste,[52] and the guidance and the process of harmonization with the OECD, appears to be triggering a closer look by Member States at municipal waste data, not least since they could be used for demonstrating compliance with the Article 11(a) target in the Waste Framework Directive.

Further improvements may be achieved now that Member States are required to report on performance under the WFD, but clearly, only those Member States that have chosen

[52] BiPRO, Arcadis and Enviroplan (2012) *Screening of Waste Management Performance of EU Member States*, Report for DG Environment of the European Commission, July 2012, http://ec.europa.eu/environment/waste/studies/pdf/Screening_report.pdf

Method 4 as their basis for reporting will be affected by any guidance in this regard (see Table 4-5). Examples of improvements made in recent years include:

- Spain, Malta, and France: exclusion of residues from recycling and composting figures and re-allocation to disposal;
- Cyprus and Denmark: identification of materials not covered by municipal waste definition, revision of the whole time series;
- Italy: improvement of composting figures by subtracting the amounts of waste associated with MBT;
- Lithuania and Bulgaria: inclusion of municipal packaging waste recycled in recycling figures;
- Croatia and Slovenia: inclusion of waste from services; and
- Luxembourg, Slovenia, and Hungary**:** better balancing and more realistic recycling rates by exclusion of imports and inclusion of exports for recycling).

4.3.1.4 Definition of Recycling

Article 3(17) of the Waste Framework Directive defines recycling as follows:

> *"recycling' means any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations".*

Commission Decision 2011/753/EU defines composting / digestion in Article 2(6) as:

> *"the aerobic or anaerobic treatment of biodegradable waste, …where that treatment generates compost or digestate which, following any further necessary reprocessing, is used as a recycled product, material or substance for land treatment resulting in benefit to agriculture or ecological improvement".*[53]

It seems entirely possible that, given the issues which have confronted the Packaging Directive in respect of reporting 'recycling', and given the added complications which are associated with definitions of composting / digestion (related to the issue of quality / end-of-waste standards), that these definitions might not be sufficient to ensure that the reporting of performance is as it should be. The definition of composting / digestion speaks of a treatment which generates compost or digestate which is "*used as a recycled product, material or substance*", a phrase which is loose, and likely to lead to the inclusion of various processes handling inputs, and generating outputs, of highly variable quality as long as some (undefined) "*benefit to agriculture or ecological improvement*" can be identified.

4.4 Waste Framework Directive – Construction and Demolition Waste

4.4.1 Issues in Respect of Definitions and Reporting

The target for non-hazardous construction and demolition (C&D) waste set out in Article 11(2)(b) of the Waste Framework Directive is:

[53] Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF

"by 2020, the preparing for re-use, recycling and other material recovery, including backfilling operations using waste to substitute other materials, of non-hazardous construction and demolition waste excluding naturally occurring material defined in category 17 05 04 in the list of waste shall be increased to a minimum of 70 % by weight".

Further relevant definitions concerning the recovery target are established in Article 1 of Commission Decision 2011/753/EU:

*"(4) '**construction and demolition waste**' means waste corresponding to the waste codes in Chapter 17 of the Annex to Commission Decision 2000/532/EC , excluding hazardous waste and naturally occurring material as defined in Category 17 05 04;*

*(5) **'material recovery'** means any recovery operation, excluding energy recovery and the reprocessing into materials which are to be used as fuel;*

*(6) **'backfilling'** means a recovery operation where suitable waste is used for reclamation purposes in excavated areas or for engineering purposes in landscaping and where the waste is a substitute for non-waste materials".*[54]

This means that the recovery target refers to all non-hazardous waste types listed in chapter 17 of the List of Wastes (2000/532/EC) except for:

- *"17 05 04 soil and stones other than those mentioned in 17 05 03* (excluded in the definition of the target)
- *17 05 06 dredging spoil other than those mentioned in 17 05 05* (excluded according to Decision 2011/753/EU, Annex III)".

4.4.1.1 Reporting Methods for Construction and Demolition Waste

The methods for the calculation of the C&D waste target are specified in Annex III of Commission Decision 2011/753/EU.[55] The recovery rate shall be calculated as follows:

$$= \frac{\text{materially recovered amount of construction and demolition waste}}{\text{total generated amount of construction and demoltion waste}}$$

Annex III allows two options for calculating the recovery rate:

1. The recovered amounts (numerator) are based on national data whereas the total amount generated (denominator) is reported according to the WStatR; and
2. Numerator and denominator are based on national data. In this case the countries shall submit a report explaining which materials are covered and how the data relate to the WStatR data.

It is important, in respect of the C&D waste stream, to understand that, for various reasons, it is very difficult to obtain accurate statistics. The sector, not least because of the equipment it routinely uses, lends itself to the recovery, or sham recovery, of wastes

[54] Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF

[55] *Ibid.*

through burying them on-site as part of ongoing developments.[56] Margins of error associated with statistics can be expected to be significant other than in the best regulated and monitored situations.

The WStatR was revised in 2010 with the aim being to match the definitions of the Waste Framework Directive and to make the data usable for the calculation of the recycling / recovery targets.

Figure 4-18 shows the C&D waste generation in 2010 by country determined on the basis of the WStatR data. The EU28 average amounted to 700 kg per inhabitant. The country data vary between 6 kg per inhabitant in Croatia and 1,986 kg per inhabitant in Malta.

The total amount of C&D waste generated is broken down into mineral C&D waste (EWC-Stat 12.1) and the aggregate 'recyclables', which covers metals (EWC-Stat 06), glass (07.1), plastics (07.4) and wood (07.5). The data show that the category 'mineral C&D waste' dominates the generation of C&D waste in all countries. The share of recyclables in the sector amounts to 8.2 % on average across the EU28, and varies from 0.3% in Latvia to 25.9% in Greece.

Concerning data quality, initial observations are:

- The low values in some countries (mainly in the 12 New Member States) point to a potential under-reporting of C&D waste data in these countries; and
- The direct use of the EWC-Stat classification for data collection may lead to misclassification of C&D waste which could result in an underestimation of generated amounts.

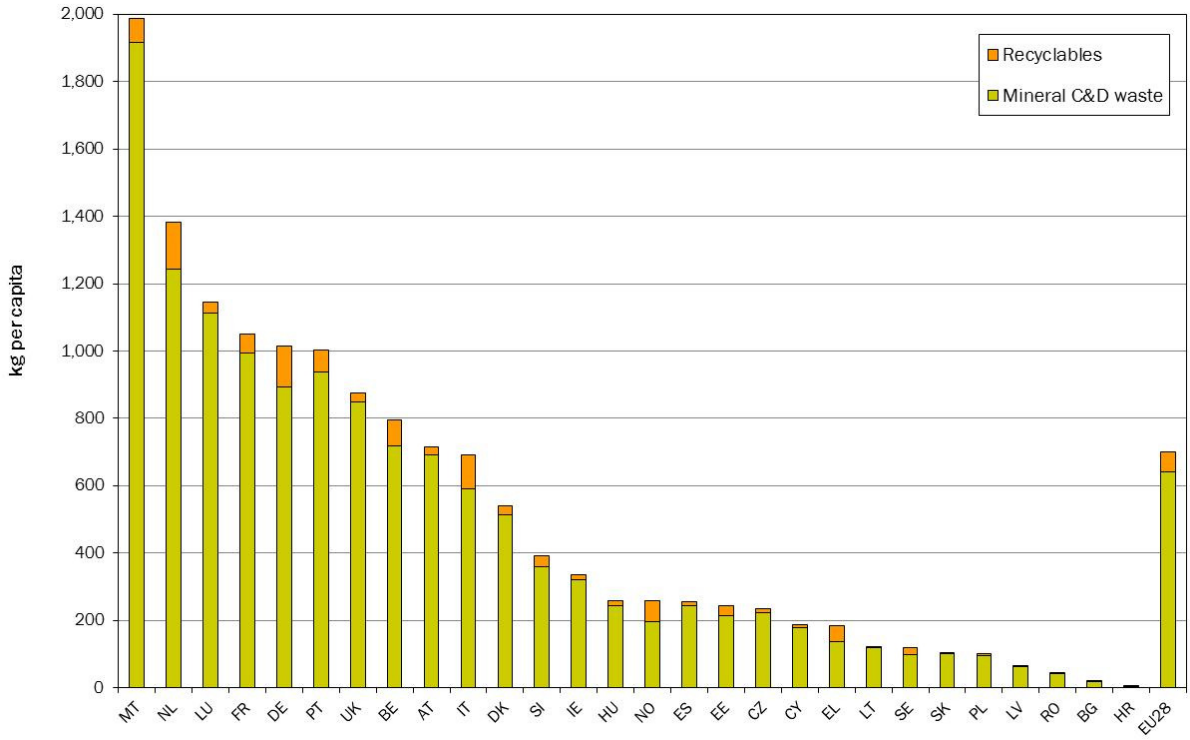
During the course of the WStatR revision in 2010, 'backfilling' was introduced as a treatment category in order to adapt the reporting formats to the definitions of the Waste Framework Directive and the requirements of the recycling and recovery targets for C&D waste. In spite of this adaptation, the amounts of C&D waste recovered as material (as opposed to energy) cannot be derived solely on the basis of WStatR data because of the following two limitations:

- The WStatR data on waste treatment do not relate directly to the wastes that are generated in the country, but may include the treatment of imported waste and exclude the treatment of exported waste. This is likely to be especially important in small countries, where the difference between generation and treatment of C&D waste can be considerable due to imports and exports of waste (see example of Estonia in Figure 4-20); and
- The recovery of C&D waste, other than mineral C&D waste (i.e. metals, glass, plastics, wood), cannot be determined as the WStatR data on treatment gives no information on the origin of the waste.

In spite of these limitations the WStatR data provide useful information on the treatment, in particular on the backfilling, of C&D waste (see Figure 4-19), and the data can be used for the approximation of the recovery rates achieved by the EU Member States in 2010 (see Figure 4-20).

[56] See ECOTEC (1999) Effects of Landfill Tax - Reduced Disposal of Inert Wastes to Landfill, Final Report for DETR.

Figure 4-18: Generation of C&D Waste According to the WStatR (2010 Data)



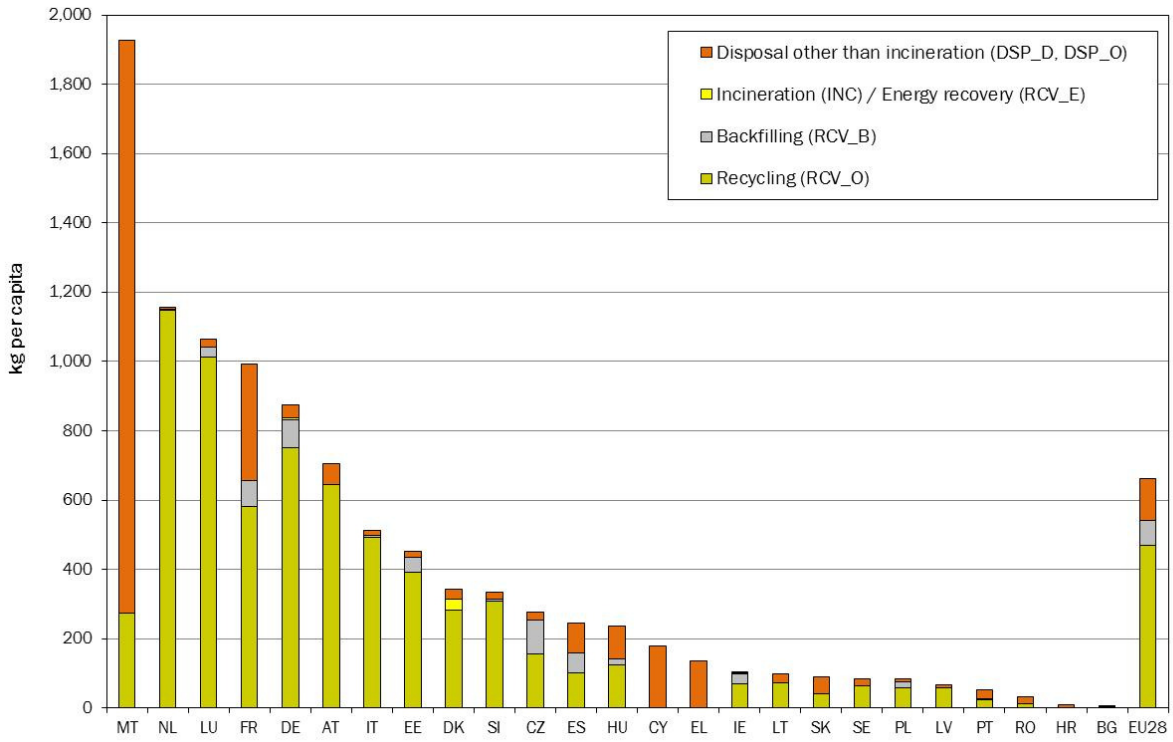
Source: Eurostat. Note: Finland is not included.

Figure 4-19 shows how the mineral C&D waste (EWC-Stat 12.1) is treated in the Member States. The data on backfilling were submitted for the reference year 2010 for the first time. Some countries have not been able to provide data on the amounts backfilled. The figures do, however, give an indication of the relevance of backfilling of C&D waste compared to other treatment operations.

In 2010, around 335 million tonnes of mineral C&D waste were treated in the EU28 of which 237 million tonnes (71%) were recycled, 36 million tonnes (11%) were backfilled, 61 million tonnes (18%) were landfilled and 0.8 million tonnes (0.2%) were for energy recovery. The treated amounts and the treatment mix vary considerable across countries as shown in Figure 4-19. Treatment by backfilling accounts for a significant share in the United Kingdom, France, Germany, Estonia, Czech Republic, Spain, Ireland, and Poland. As mentioned before, not all countries were able to report backfilling separately. Countries which failed to report backfilling include Belgium, Bulgaria, Denmark, Lithuania, Romania, Croatia, Latvia, Portugal, and Slovakia.

It has to be mentioned that the quality of the backfilling data suffers from the unclear definition of backfilling, and in particular, from the fact that backfilling cannot clearly be identified by the recovery codes (R-codes) defined in Annex II of the Waste Framework Directive. This lack of correspondence between the R-codes and the subject of the targets is problematic.

Figure 4-19: Treatment of Mineral Construction and Demolition Waste (EWC-Stat 12.1) by Country (2010 Data)



Source: Eurostat. Note: Belgium, Finland and UK are not included.

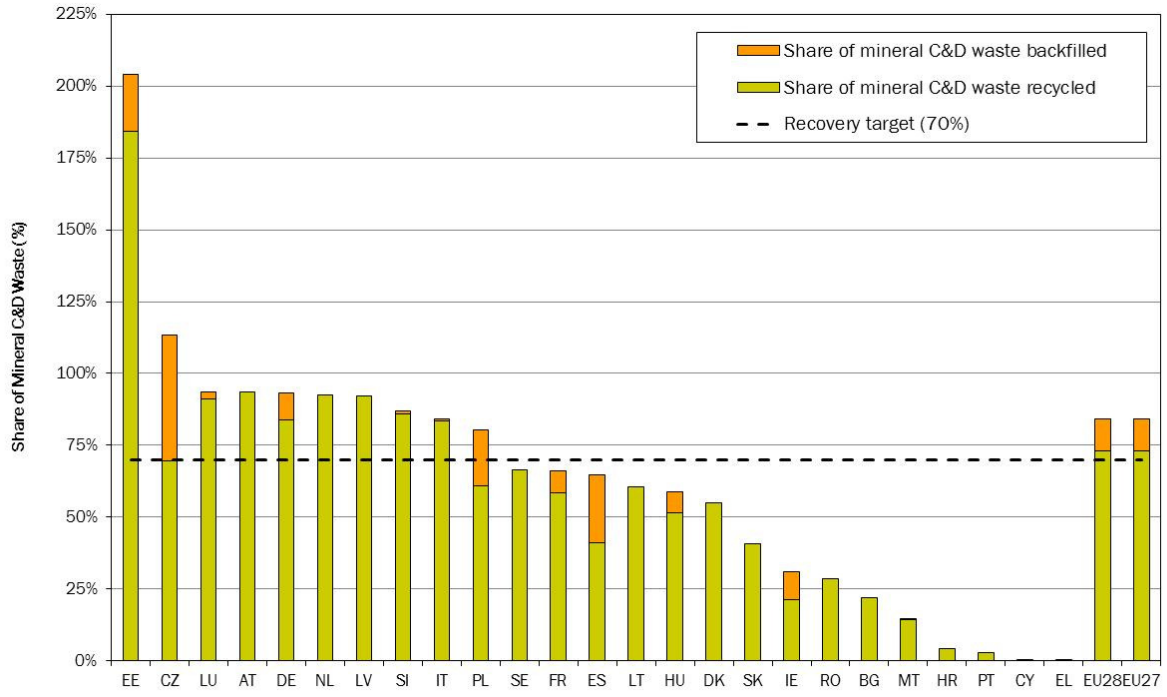
4.4.2 Member State Performance

Figure 4-20 shows approximate values for the material recovery rates based on the WStatR data. The data refer only to the waste category 'mineral C&D waste' (EWC-Stat 12.1) which, on average, makes up over 90% of the C&D waste generated (see Figure 4-18). Figure 4-20 shows the ratio between mineral C&D waste materially recovered (recycling + backfilling) within the country divided by the mineral C&D waste generated in the country. As mentioned in the previous section the ratio may be biased by imports and exports of waste for treatment.

The impact of imported waste is best reflected by the Estonian data, where in 2010, large amounts of mineral C&D waste from the Netherlands were imported and treated. As a result, the amount of mineral C&D waste treated was twice as high as the amount generated in the country. The recovery rate of more than 100% in the Czech Republic is also explained by imports of waste and by storage effects (i.e. recovery of waste that was generated in the previous year).

However, for most of the other countries the calculated ratio looks plausible. If this is the case, then ten Member States are likely to already be meeting the C&D waste recovery target. Other data sources suggest that two of the countries for which data are missing – the United Kingdom and Belgium – are also likely to be meeting the targets already. Six countries have a relatively short distance to travel given the available time. This would suggest that around two-thirds of Member States would have little difficulty in meeting this target by 2020.

Figure 4-20: Approximate Values for Recovery Rates for Mineral C&D Waste (EWC-Stat 12.1) by Country (2010 Data)



Source: Eurostat; Note: Belgium, Finland, UK are not included

The message is similar to that which can be gained from an earlier data gathering exercise carried out by the Umweltbundesamt on behalf of the JRC in the context of work on the end-of-waste criteria (see Table 4-7).

Table 4-7: Construction and Demolition Waste Arisings and Management

Member State / Region	Year	Arising (million tons)	% Reused or Recycled	% Incinerated or Landfilled
UK (England)	2005	89.6	80	20
Germany	2002	73	91	9
France	2004	47.9	25	n.s.
Italy	2004	46.5	n.s.	n.s.
Spain	2005	35	n.s.	n.s.
Netherlands	2005	25.8	95	3
Sweden	2006	11	n.s.	n.s.
UK (Scotland)	2003	10.8	96	4
Belgium (Flanders)	2006	9	92	n.s.
Czech rep.	2006	8.4	30	n.s.
Luxembourg	2005	7.8	46	54
Austria	2004	6.6	76	16
Denmark	2003	3.8	93	7
Portugal	1999	3	<5	>95
Estonia	2006	2.4	73	n.s.
Ireland	2005	2.3	43	57
Poland	2000	2.2	75	14
Belgium (Wallonia)	1995	2.1	74	17
Greece	1999	2	<5	>95
Finland	2004	1.6	54	46
Belgium (Brussels)	2000	1.2	59	22
Slovenia	2005	1.1	53	47
Lithuania	2006	0.6	n.s.	n.s.
Malta	2004	0.2	n.a.	n.a.
Bulgaria	n.a.	n.a.	n.a.	n.a.
Cyprus	n.a.	n.a.	n.a.	n.a.
Hungary	n.a.	n.a.	n.a.	n.a.
Latvia	n.a.	n.a.	n.a.	n.a.
Romania	n.a.	n.a.	n.a.	n.a.
Slovak rep.	n.a.	n.a.	n.a.	n.a.

n. s. = not specified; n.a. = not available

Source: Umweltbundesamt (2008). Aggregates case study — Data gathering, cited in JRC (2008) End of Waste Criteria: Final report, JRC Scientific and Technical reports, http://susproc.jrc.ec.europa.eu/documents/Endofwastecriteriafinal.pdf

4.5 Other Indicators of Waste Management Performance

Some jurisdictions – Flanders, Wallonia, England and Wales among them – have recognised that setting recycling rates might not always be the most effective way of improving waste management performance. Where household waste is concerned, there may be trade-offs between high recycling rates, and waste prevention. This is especially true in the case of biowaste in suburban and rural areas. Especially in suburban areas

with gardens, or rural areas, high recycling rates can be achieved simply by offering households free garden waste collections, but this may be achieved at the expense of undermining home composting. The overall quantity of collected waste may grow as a result. This shows how recycling rates may be achieved at the expense of increasing the quantity of waste collected.

Setting targets for residual waste (i.e. waste which is not separately collected for recycling, and is not prepared for reuse) can effectively reward both waste recycling and waste prevention. Measures which increase recycling but which do not have a significant effect on reducing residual waste are assessed more effectively through this measure.

At the EU-level, using the municipal waste data reported to Eurostat, the indicator of 'residual waste per inhabitant' cannot be accurately computed at present. In Figure 4-21, we show the amount of municipal waste landfilled and incinerated per inhabitant). In Figure 4-22, we show the amount of waste generated minus the amount reported as being recycled or composted. Both figures are problematic as the reporting of municipal waste is not consistent across countries or comparable. For instance the quantity of waste treated is often less than the reported quantity generated, the treatment figures for some countries exclude MBT so that the residual waste can be expected to be higher for some countries.

The above displayed indicator has the potential to function as a valuable indicator of performance across EU countries. It also acts to even up performance between those Member States with lower recycling rates but lower waste generation per inhabitant, and those with higher recycling rates, but higher waste generation per inhabitant. At present, however, the applicability of the indicator is limited by the differences in reporting of municipal waste.

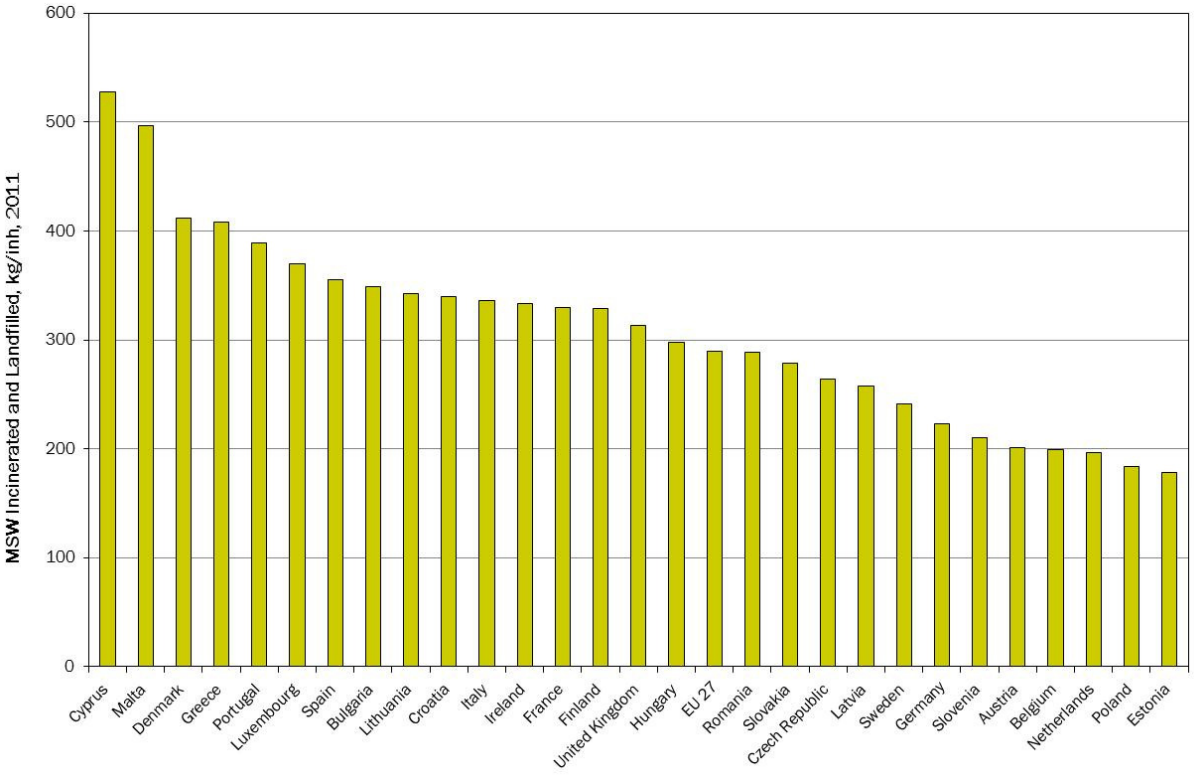
4.6 Summary

The following points summarise the key issues raised in this chapter:

- There are substantial issues associated with reporting against the recycling targets set out in the various Directives;
- There is no clear definition of municipal waste and this is leading to inconsistencies in the data being reported by Member States; and
- The above is leading to the generation of non-comparable data and makes it very difficult to set European wide waste prevention targets.

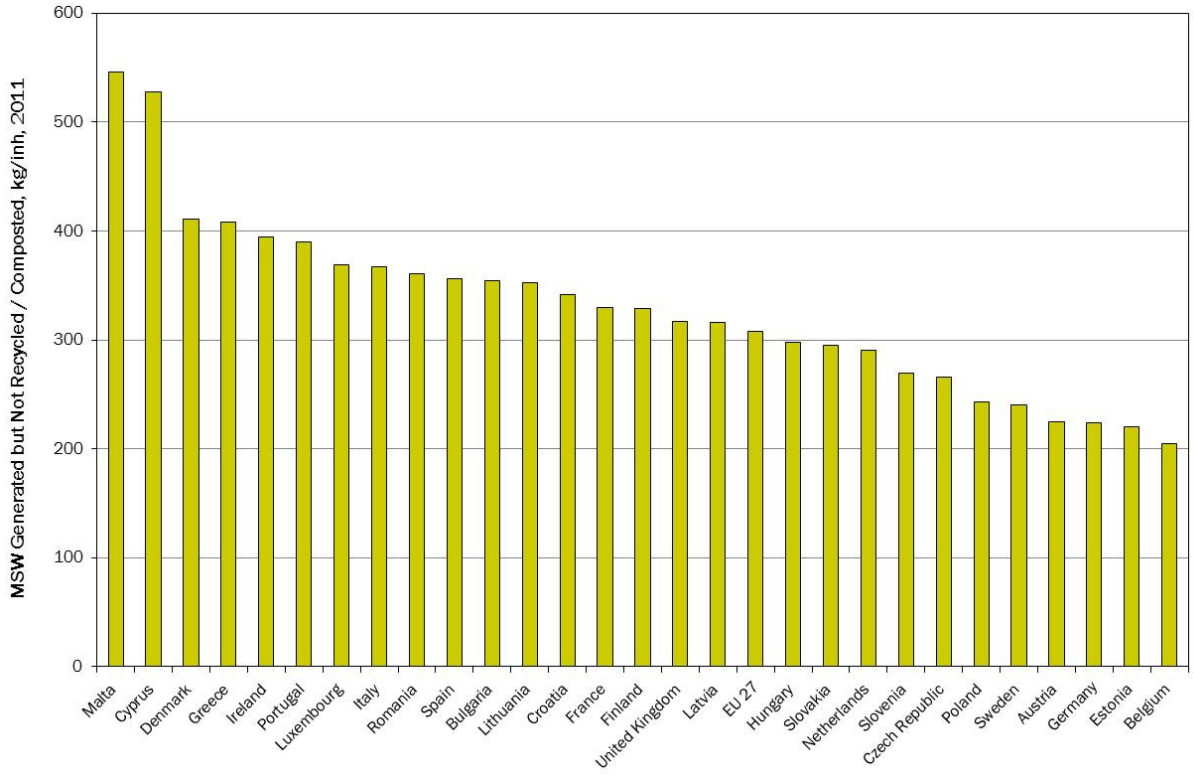
The non-comparability of, for example, maniple waste, is appropriate for a situation in which data is reported under a 'gentleman's' agreement. However, it is a completely different matter when the definitions are used to establish legally binding targets which could, in principle, trigger legal proceedings. In this context, definitions must be clear and performance reporting should reflect a comparable measure of performance across all Member States.

Figure 4-21: Municipal Waste Incinerated and Landfilled, kg per inhabitant (2011 Data)



Source: Eurostat.

Figure 4-22: Municipal Waste Generated and not Recycled or Composted, kg per inhabitant (2011 Data)



Source: Eurostat.

5.0 Articulating the Vision of the Roadmap and the 7th Environmental Action Programme

5.1 The Vision for Improved Resource Efficiency

The Roadmap to a Resource Efficient Europe (the Roadmap) states:

> *"If waste is to become a resource to be fed back into the economy as a raw material, then much higher priority needs to be given to re-use and recycling. A combination of policies would help create a full recycling economy, such as product design integrating a life-cycle approach, better cooperation along all market actors along the value chain, better collection processes, appropriate regulatory framework, incentives for waste prevention and recycling, as well as public investments in modern facilities for waste treatment and high quality recycling".* [57]

It then highlights a set of aspirational objectives for 2020, including:

1. Waste is managed as a resource;
2. Waste generated per capita is in absolute decline;
3. Recycling and reuse of waste are economically attractive options for public and private actors due to widespread separate collection and the development of functional markets for secondary raw materials;
4. More materials, including materials having a significant impact on the environment and critical raw materials, are recycled;
5. Waste legislation is fully implemented;
6. Illegal shipments of waste have been eradicated; and
7. Energy recovery is limited to non-recyclable materials, landfilling is virtually eliminated and high quality recycling is ensured.

It goes on to list some actions which the Commission will undertake, including the following:

1. *"Stimulate the secondary materials market and demand for recycled materials through economic incentives and developing end-of-waste criteria (in 2013/2014);*
2. *Review existing prevention, re-use, recycling, recovery and landfill diversion targets to move towards an economy based on re-use and recycling, with residual waste close to zero (in 2014);*
3. *Assess the introduction of minimum recycled material rates, durability and reusability criteria and extensions of producer responsibility for key products (in 2012);*
4. *Assess areas where legislation on the various waste streams could be aligned to improve coherence (in 2013/2014);*
5. *Continue working within the EU and with international partners to eradicate illegal waste shipments with a special focus on hazardous waste;*

[57] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 Final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

6. *Ensure that public funding from the EU budget gives priority to activities higher up the waste hierarchy as defined in the Waste Framework Directive (e.g. priority to recycling plants over waste disposal) (in 2012/2013); and*
7. *Facilitate the exchange of best practice on collection and treatment of waste among Member States and develop measures to combat more effectively breaches of EU waste rules (in 2013/2014)".*

Member States are urged to:

> *"...ensure full implementation of the EU waste acquis including minimum targets through their national waste prevention and management strategies (continuous)".*

In the 7th Environmental Action Programme (EAP), the objectives are essentially restated.[58] Paragraph 40 essentially restates the aspirational objectives, with some subtle changing in wording:

> *"Additional efforts are needed to reduce per capita waste generation* ***and waste generation*** in absolute terms. ***Limiting*** energy recovery to non-recyclable [59] materials, ***phasing*** out landfilling ***of recyclable or recoverable waste*** [60], ***ensuring*** high quality recycling ***where the use of the recycled material will not lead to overall adverse environmental or human health impacts,*** and ***developing*** markets for secondary raw materials ***are also necessary to achieve resource efficiency objectives****"*.

Other issues are raised, for example, in respect of food waste (Paragraph 37):

> ***"The Commission should present a comprehensive strategy to combat unnecessary food waste and work with Member States in the fight against excessive food waste generation. Measures to increase composting and anaerobic digestion of discarded food, as appropriate, would be helpful in this regard".***

Paragraph 40 also considers the types of measure to be deployed:

> *"market-based instruments* ***and other measures*** *that privilege prevention, recycling and re-use should be applied much more systematically throughout the Union****, including extended producer responsibility, while the development of non-toxic material cycles should be supported****. Barriers facing recycling activities in the Union internal market should be removed and existing prevention, re-use, recycling, recovery and landfill diversion targets reviewed so as to move towards*

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[58] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

[59] 'recycling' defined in Article 3.17 of Directive 2008/98/EC as "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations".

[60] 'recovery' defined in Article 3.15 of Directive 2008/98/EC as "any operation the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy".

*a **lifecycle-driven** 'circular' economy, with a cascading use of resources and residual waste close to zero".*

In summarising what is required, the 7th EAP outlines the following:

> *"Fully implementing Union waste legislation. Such implementation will include applying the waste hierarchy **in accordance with the Waste Framework Directive** and the effective use of market-based instruments and **other** measures to ensure that: (1) landfilling **is limited to residual (i.e. non-recyclable and non-recoverable) waste, having regard to the postponements provided for in Article 5(2) of the Landfill Directive** [61]**;** (2) energy recovery is limited to non-recyclable materials, **having regard to the provisions of Article 4(2) of the Waste Framework Directive** ; (3) recycled waste is used as a major, reliable source of raw material for the Union, **through the development of non-toxic material cycles;** (4) hazardous waste is safely managed and its generation is reduced; (5) illegal waste shipments are eradicated, **with the suppor of stringent monitoring;** and (6) **food waste is reduced. Reviews of existing product and waste legislation are carried out, including a review of the main targets of the relevant waste directives, informed by the Roadmap to a Resource Efficient Europe, so as to move towards a circular economy**; and internal market barriers for environmentally-sound recycling activities in the Union are removed. **Public information campaigns are required to build awareness and understanding of waste policy and to stimulate a change in behaviour". .***

Another important document which sets out the Commission's position on access to raw materials is the Raw Materials Initiative. [62] This document highlights the importance of recycling to ensure safe access to raw materials. The 2008 Communication states that:

> *"Securing reliable and undistorted access to raw materials is increasingly becoming an important factor for the EU's competitiveness and, hence, crucial to the success of the Lisbon Partnership for growth and jobs".*

The document goes on to say:

> *"Strategies to enhance resource efficiency, recycling and reuse are important to address social and economic development in a context of restricted access to resources and high import dependency".*

The Raw Materials Initiative recommended that a three 'pillared' approach be adopted in order to secure access to raw materials over the medium to long-term. The third pillar of this Initiative is of relevance to this work as it seeks to promote the need for improved resource efficiency and recycling across European Member states. It aims to:

> *"Boost overall resource efficiency and promote recycling to reduce the EU's consumption of primary raw materials and decrease the relative import dependence".*

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[61] Council Directive 1999/31/EC of 26.4.1999 (OJ L 182, 16.7.199, p.1).

[62] Communication from the Commission to the European Parliament and the Council (2012) *The Raw Materials Initiative — Meeting Our Critical Needs for Growth and Jobs in Europe*, COM(2008) 699 final, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0699:FIN:en:PDF

As with the Roadmap, this document helps to give a clear steer on European ambitions for creating a resource efficient society.

5.2 Interpreting the Roadmap and 7th Environmental Action Programme

Some of the concepts are clear enough in terms of the direction of travel that they suggest. What is less clear is exactly how the aspirational objectives should be articulated in targets, and in policy, which the European Commission could propose, and which would not lead to perverse, or inequitable outcomes.

For example:

1. On the desire to reduce food waste, what measures could be undertaken to ensure this, and how would reporting be undertaken?
2. On the aspiration to ensure 'waste per capita' is in absolute decline, exactly how should this be applied in terms of the 'waste' to be covered? Given the range of circumstances in the different Member States, is this to be applied to each country, or to the EU as a whole (and if the latter, how that could be assured without requiring that it was the case for each Member State)?
3. On the desire to limit energy recovery to 'non-recyclable' materials, how should this be operationalized? The intention is clear: to prevent the situation arising in which excessive capacity for incineration (and, perhaps, other forms of residual waste treatment) is developed, and potentially undermines the development of recycling. The 7th EAP makes reference to a definition of 'recycling' from the Waste Framework Directive, which is not the same as a definition of what is to be considered 'recyclable'. If it was intended that the definition of 'recyclable' should be based on the definition of 'recycling' in the Waste Framework Directive, then 'recyclable' would be defined as:

   > *"any **material capable of undergoing a** recovery operation by which **it can be** reprocessed into products, materials or substances whether for the original or other purposes. It includes the reprocessing of organic material but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations"*.

   In practice, this would mean that the vast majority of material could not be incinerated, and the genuinely 'non-recyclable' fraction would be expected to decline over time as recycling technologies improve and as eco-design improves recyclability of waste streams**.** There might also be a gap between what is 'recyclable' and what is actually recycled, especially if defining what is recyclable pays no heed to economic constraints.

4. On the phasing out of landfill, the question might be how can this be done in such a way that it does not lead to the problem discussed in the previous point: if landfill is banned, than as experience of other countries has indicated (Denmark, Sweden, Germany, Netherlands, Austria), the need to have alternative forms of residual waste treatment in place at the time the ban takes effect can lead to the development of excess capacity for other ways of managing residual waste, such as incineration, but also, MBT. This potentially limits the potential for recycling. How can targets and policies be designed in such a way as to preserve flexibility in the overall strategy to improve recycling, whilst also exerting pressure on landfilling? The 7th EAP also notes that landfill should be "*limited to residual (i.e. non-recyclable and non-recoverable) waste, having regard to the postponements*

provided for in Article 5(2) of the Landfill Directive". Following from the discussion above regarding the definition of 'recyclable', the implied message here is that virtually no waste could be landfilled. Whilst this might be considered consistent with the specific objective, it is less clear what should happen if incineration of non-recyclable waste is effectively outlawed: all waste would need to be either prepared for reuse, recycled or, where it arises as residual waste, treated through means such as MBT, presumably, with a view to as much of that residual waste as possible being 'recycled' or sent for recovery (at, for example, cement kilns);

5. The 7th EAP objective that "*recycled waste is used as a major, reliable source of raw material for the Union*" raises some questions as to how this would be achieved. The EU is not a 'closed market' for either primary or secondary materials, and trade in both with other parts of the world is significant. The aim – to encourage more circular use of materials, and to keep them in the 'chain of use' for as long as possible – is a laudable one, but recycled waste can be, and is, a source of raw material for a range of countries, not just those in the EU. To restrict movement of the material to other countries without good reason raises questions regarding the legitimacy of what might be perceived as barriers to trade, and hence, challengeable under World Trade Organisation (WTO) rules.

These questions raise issues of policy design and coherence, and of sequencing, recognising how waste management systems work. Time is a crucial dimension for consideration in delivering the vision contained within the Roadmap.

In this respect, it is important to recognise the following types of time lag:

1. Recycling infrastructure can be developed relatively quickly. The crucial component of recycling services is well designed collection services (and sorting / recycling processes as necessary). Whilst commercial and industrial waste producers might be less constrained in contractual terms, and whilst some municipalities may collect wastes through a publicly owned company, other municipalities might contract for waste collection services for a period of the order 5 to 7 years (reflecting, broadly speaking, the useful life-time of the vehicles). In principle, there is no reason why – and there is plenty of experience to demonstrate this – recycling rates in a given municipality cannot increase rapidly from 10% to 50% / 60% / 70% in a relatively short space of time. The main constraints (becoming less pressing over time) will be:
    a. constraints imposed by existing contracts; and
    b. availability of appropriate biowaste treatment infrastructure.

    Another constraint may be contracts for residual waste treatment which include clauses for 'guaranteed minimum tonnages'. If these exist, then they may limit a municipality's appetite for additional recycling for the simple reason that the avoided costs of managing residual waste (part of the financial rationale for recycling / preparation for reuse / waste prevention) may be close to zero at the margin.

2. For new residual waste treatment capacity, the time required to plan, procure, construct and commission some of the more capital intense facilities can take several years. Although the time might vary across countries somewhat, a period of around five to seven years is not unusual, the period being longer where the facility arouses local opposition, or shorter where the facility does not provoke a public response. It should be noted, however, that it is possible to procure residual waste management services from existing facilities (rather than new

ones) and in these situations, the lead times from planning through to use of a facility can be very much shorter.

3. Incineration plants will be designed to operate not for 5 years, but for 20 (or more) years. In terms of understanding how capacity for incineration will develop, a view as to how the world might look like over a reasonable time horizon is required.

Taking these points into account:

1. In considering how much capacity is needed for dealing with residual waste, a long term view is required regarding where the full implementation of the ambitions in the Roadmap to a Resource Efficient Europe might take us, and over the period for which new facilities are likely to be functioning (20 to 25 years). This could be considered either in terms of the amount of residual waste per inhabitant that could be considered 'the maximum', or the percentage of the overall municipal waste stream that might still be expected to be 'residual waste' in the longer-term, say 2035.

2. In this respect, we know that the most advanced municipalities are achieving recycling rates of the order 80%+. These tend to be suburban / semi-rural areas, not large cities. The best performing large cities seem to be moving towards 50% recycling, though this is not yet common. Given that large cities exert a significant influence on overall recycling rates at the national level, the 'national' rate that could be achieved in the longer-term is likely to depend on:

    a. the relative significance of large cities in a given country (and the nature of the housing stock in these cities);
    b. the extent to which recycling improves (for example, through improved eco-design) in large cities over time.

    At the same time, it should be considered that 'the limits to recycling' have moved considerably over the last twenty years or so with progressive increases in the upper bounds of achievement over time. Evidently, once high rates are achieved, progress tends to be more incremental over time.

3. Given this picture going forward, then it seems sensible to anticipate national rates of recycling of the order 70% (or more) in the longer-term. The Flemish Region already achieves this level, although it might be suggested that the Region does not have a large population living in major metropolitan areas. Given the potential advances in technology, and the expected developments in eco-design, 70% seems a suitable figure for municipal waste recycling that strikes the balance between 'realism' and 'aspiration' for the longer-term (2030/35).

4. If this figure is considered reasonable, then the 'trajectory' for achieving this outcome needs to be considered. The existing targets for municipal waste (and ones that are being considered in the current revision process) will take municipalities to 50% somewhere in the 2020s. Between this time, and the 2030s, movement towards the 70% level would be expected.

What are the implications for this? First of all, residual waste treatment should not be developed such that it becomes 'excessive'. Suppose we consider three types of residual waste treatment:

1. The longer-term 'throughput-based' residual waste treatment which carries with it a high level of capital investment (for example, incineration plants);

2. The medium-term 'throughput-based' residual waste treatment which carries with it a moderate level of capital investment (for example, MBT plants);
3. Landfills, considered as 'stock' facilities which are filled at a variable rate over time (and not so heavily dependent on guaranteed throughput from one year to the next).

These three types of facility offer different levels of flexibility within an overall waste management strategy. The first type of facility has a capacity that is fixed for 20 years or so, the second type is a little more flexible, with a lower level of 'regret' if throughput declines (as may be hoped), and the third is flexible in respect of its throughput.

In principle, it would be important to ensure that no more waste than is considered likely to be residual waste over the long-term (the life of incineration facilities) should be committed to such facilities going forward. In this respect, it is important to note that we can observe four types of situations at present:

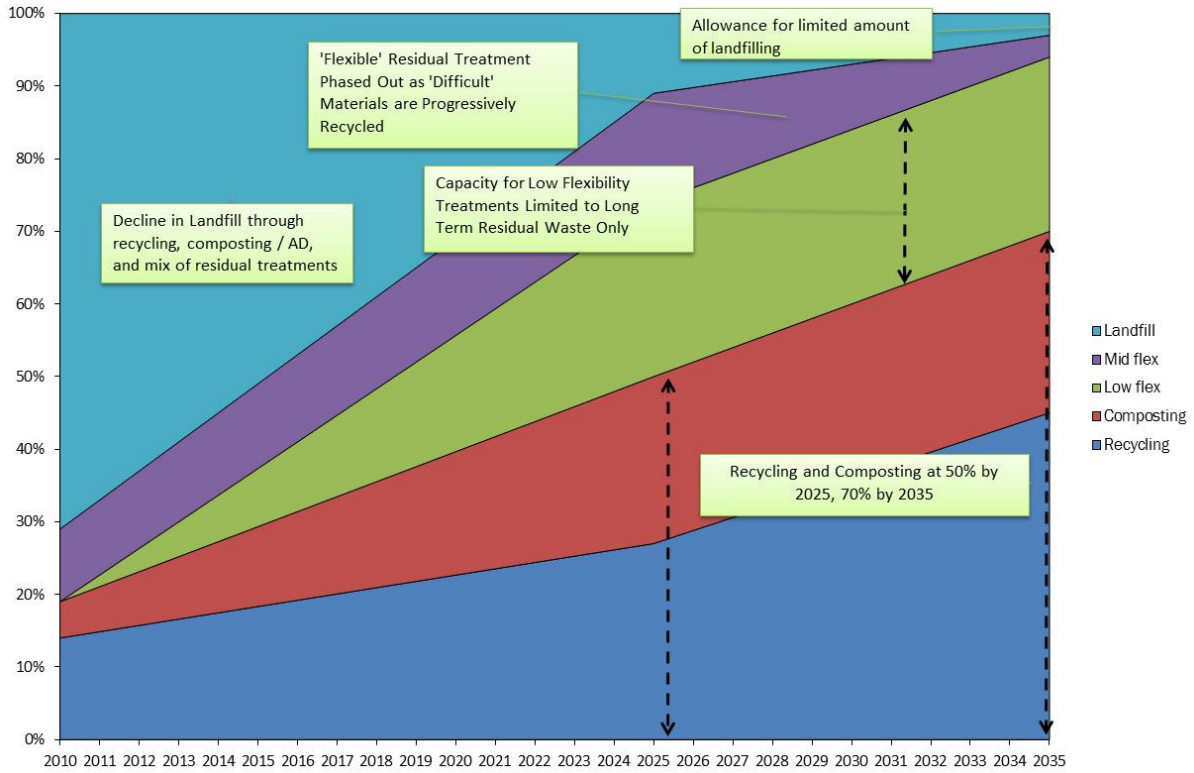
1. **Type 1 Countries** – Those countries where recycling rates are increasing, and where the non-landfill residual waste treatment infrastructure accounts for a relatively small proportion of waste generated at present, and where there is a *limited* amount of additional capacity planned for the future;
2. **Type 2 Countries** – Those countries where recycling rates are increasing, and where the non-landfill residual waste treatment infrastructure accounts for a relatively small proportion of waste generated at present, and where there is a *large* amount of additional capacity for residual waste treatment planned for the future;
3. **Type 3 Countries** – Those countries where recycling rates are moderate, and where the non-landfill residual waste treatment infrastructure accounts for the majority, or at least a high proportion of, residual waste; and
4. **Type 4 Countries** – Those countries where recycling rates are relatively high, and where the non-landfill residual waste treatment infrastructure accounts for the majority, or all of, residual waste.

The suggestion is that countries in each of the above categories will require different strategies in order to implement the ambitions set out within the Roadmap and 7th EAP. These strategies are summarised for each type of country in the sections below.

5.2.1 Type 1 Countries

Here, the main issue is to increase recycling further, but care needs to be taken to ensure that the progress of recycling is not hindered by excessive treatment capacity. The opportunity exists to ensure that recycling is able to develop relatively unimpeded. In principle, the best approach is to develop recycling relatively rapidly so as to ensure that the amount of waste landfilled falls quickly, consistent with the aim of ensuring that the reduction in landfilling takes place through measures in the upper tiers of the hierarchy. Development of residual waste treatment capacity should respect the need for a sensible balance between treatments which are moderately flexible, and least flexible, so as not to limit further progress in waste prevention, preparation for reuse and recycling. A stylised view of potential progress is given in Figure 5-1;

Figure 5-1: Stylised Evolution of Treatment in Type 1 Member States



5.2.2 Type 2 Countries

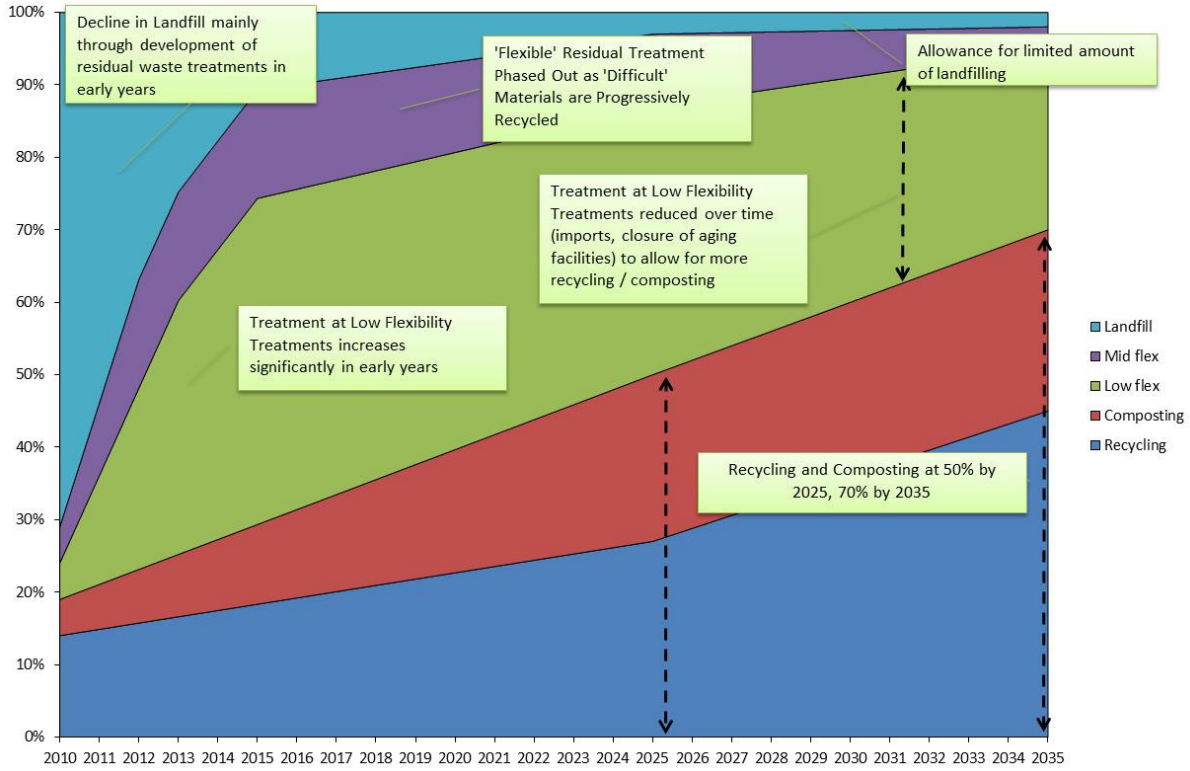
Here, the issue relates to the planned treatment capacity in future. In principle, this could undermine recycling services for years to follow if this is heavily slanted towards the less flexible investments in residual waste treatment. There are two possibilities here:

1. If the Member State is one with a relatively low rate of waste generation, and relatively low per capita income generation, then notwithstanding efforts to prevent waste, waste generated per capita may increase. This might have the effect of reducing the proportion of waste which is dealt with through such treatments so allowing for increases in recycling rates. Equally, this should not undermine efforts at waste prevention; and / or
2. The country could seek to make treatment capacity available to other countries. Evidently, this would be possible only where the facilities were defined as recovery facilities, allowing for the export from the originating country.

Both of these would allow for the further development of recycling, though clearly, the first is premised on the growth in waste, itself an undesirable phenomenon. If all the treatment capacity is of the less flexible variety, then the risk is that the country becomes locked in to low rates of recycling for a period similar to that of the lifetime of the facility. This would be problematic if the facilities were all being built anew, and it seems clear that countries should 'pull back' from such investments in cases where they are clearly excessive. Partly for this reason, the Commission has acted to ensure that European

Regional Development Funds / Cohesion Funds are not dedicated to these areas.[63] However, the fact that the Communication from the Commission allows for the calculation of the 50% recycling rate through any of four different methods actually means that it is entirely possible for the target to be met with a recycling rate of the order of 25% (see Section 4.3.1.1). A stylised view of potential progress is given in Figure 5-2.

Figure 5-2: Stylised Evolution of Treatment in Type 2 Member States



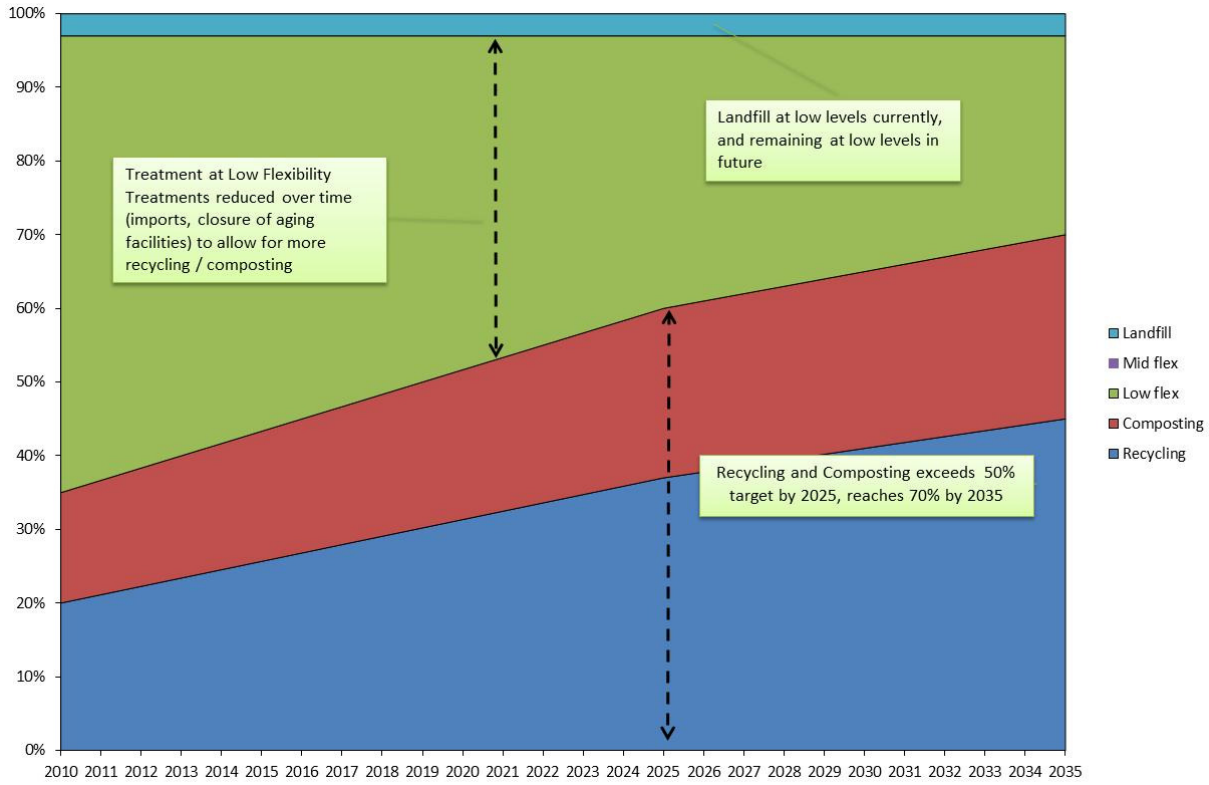
5.2.3 Type 3 Countries

Most of the countries in this situation have developed residual waste treatment capacity over a reasonable period of time. In principle, therefore, these countries may be able to

[63] The legislative proposal governing the allocation of the above funds has recently been proposed for the period 2014 – 2020. The proposed legislation states that: "Public intervention in the waste management sector shall complement efforts by the private sector, in particular producer responsibility. Actions should support innovative approaches that promote a closed-loop economy and need to be consistent with the waste hierarchy". *Ex ante* conditionalities for the waste sector include: *"Implementation of Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives, in particular the development of waste management plans in accordance with the Directive and with the waste hierarchy"*. See: European Commission (2013) *Amended proposal for a regulation of the European parliament and of the council laying down common provisions on the European Regional Development Fund, the European Social Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development and the European Maritime and Fisheries Fund covered by the Common Strategic Framework and laying down general provisions on the European Regional Development Fund, the European Social Fund and the Cohesion Fund and repealing Council Regulation (EC) No 1083/2006, COM(2013) 246 final,* http://ec.europa.eu/regional_policy/what/future/index_en.cfm#4

reduce the amount of treatment capacity progressively over a period of time as facilities reach the end of their operating life. This may be more difficult if the investments are small in number and of a large average capacity. In such situations, again, there may be a strong rationale to seek to attract waste from other countries with a shortfall of treatment capacity in order to make use of existing capacity (subject to the facilities being designated as meeting the R1 criterion), whilst allowing for the further development of recycling. It should be noted that many of the countries in this situation – with low landfilling rates – are also those most likely to be experiencing over-capacity in incineration (typically, resulting from implementing landfill bans in the past). A stylised view of potential progress is given in Figure 5-3.

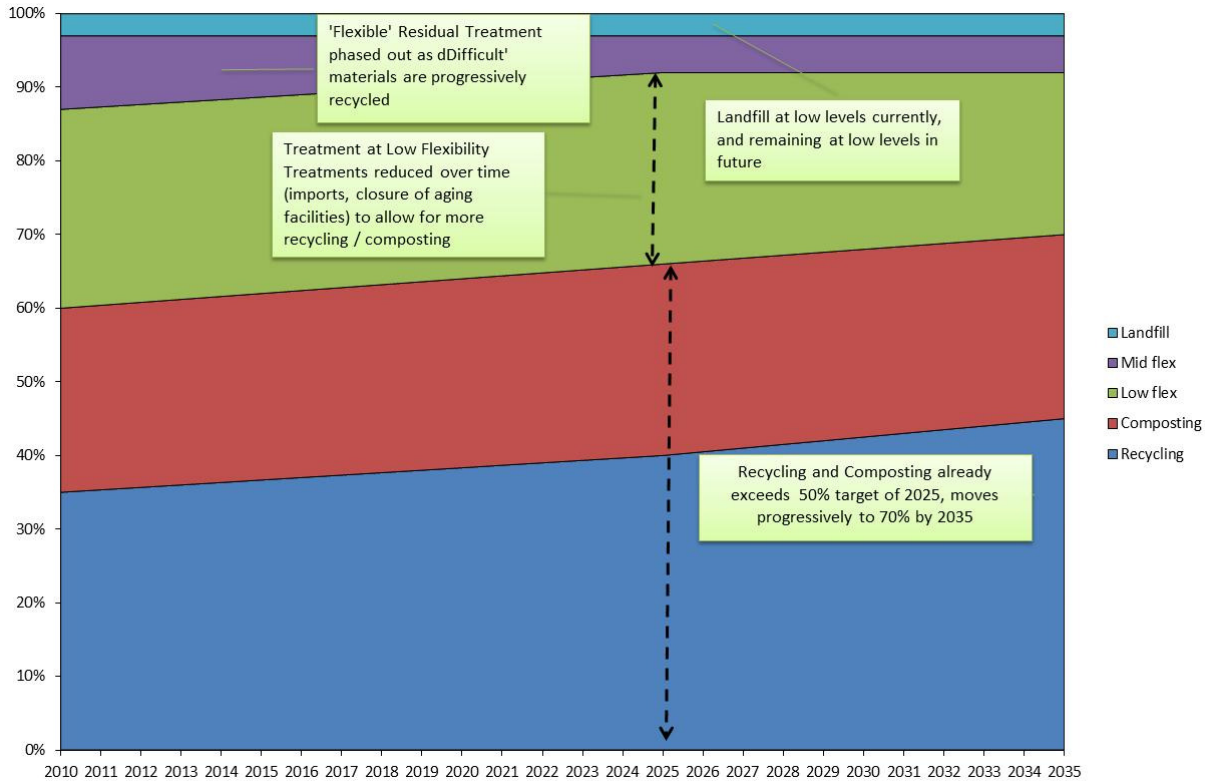
Figure 5-3: Stylised Evolution of Treatment in Type 3 Member States



5.2.4 Type 4 Countries

Finally, in countries such as Germany and Austria, despite high recycling rates, the fact that untreated residual waste is effectively banned from landfill means that the overall level of residual waste treatment may be sufficient to deal with more residual waste than is generated in the country. Efforts to prevent waste, or to prepare it for reuse, or recycle waste, will tend to increase the extent of over capacity unless wastes are found from elsewhere, or capacity is progressively reduced (for example, as facilities reach the end of their useful life). Equally, the treatment over-capacity may be reflects in low prices for treatment, which might limit the stimulus to further efforts to move waste up the hierarchy.

Figure 5-4: Stylised Evolution of Treatment in Type 4 Member States



It is important to note that a range of factors complicate the picture as described above:

1. First, it is easy to consider this simply in terms of 'municipal waste' (with the various issues of definition and scope that the term carries with it – see Section 4.3.1.2). There is additional flexibility that may be available to some countries (such as Type 2 countries) in treating at residual waste treatment facilities some of the wastes from industry which are not suitable for recycling;
2. Second, the introduction of the R1 criterion, and the resulting designation of many residual waste treatment facilities as recovery installations, has opened up an EU-wide market in the treatment of residual waste. As noted above, some countries, or companies within countries, are clearly viewing this as an opportunity, and are developing their ability to offer waste management services to those in other countries who are lacking such treatments;[64]
3. Third, we have characterised treatments for residual waste as varying in their flexibility, and we have suggested that this would influence the way in which they are deployed in the context of a Member State's strategy for dealing with waste in the coming years. However, the degree to which a facility can be considered flexible is not the only characteristic which will affect the nature and extent of its deployment. A number of drivers may lead to an increase in the demand for fuels prepared from waste at installations which are not, primarily, waste treatment

[64] See, for example, various articles on the website of the Dutch Waste Management Association (http://www.wastematters.eu/news-from-europe/news-from-europe/high-grade-waste-processors-seek-foreign-waste.html)

facilities, such as cement kilns and power stations. Other policies at the EU level, such as the EU-ETS may influence the extent to which this becomes attractive, as will the price of fuels more generally. Consequently, the balance of deployment of the different residual waste treatments in future, as well as the strength of the financial incentives favouring recycling and composting, will be influenced by the way in which the incentives and policy drivers in the market for energy interact with the market for waste management services; and

4. Finally, and crucially, the above is a stylised representation of how treatment shares could evolve over time from a strategic perspective. The figures are presented in terms of shares of the overall market for waste management. The reality, however, is somewhat different:
    a. waste quantities do not remain stable from one year to the next, and indeed, they tend to fluctuate from one year to another, though with the state of the economy influencing expenditure, and waste generation patterns. This means that setting targets in terms of, for example, maximum percentages of waste to be treated in a given way potentially makes it possible that maximum limits may be exceeded as a result of waste quantities fluctuating over a given period (this being made marginally more likely, perhaps, if waste prevention is actively pursued); and
    b. the national picture reflects the averaging out of what all municipalities and businesses are doing within a country. If the Roadmap's objectives are to be reflected in targets, then it is likely that for any given municipality or business, specific opportunities will arise, over time, where changes have to be made to collection systems to ensure that the desired rates of recycling can be achieved. These periodic opportunities will need to be seized, so that in specific locations, there may be significant step-changes made. The steady progress of a country towards a given target is likely to reflect a group of municipalities making significant changes in any given year rather than all municipalities making small changes one year after the next. In this respect, the good news is that there is plenty of evidence of rapid movements in municipalities from low recycling rates of the order 15% to high rates of the order 70%. The pace of movement from 15% to 70% at the Member State level, however, would be slower, reflecting the averaging of performance across the whole country.

These matters need to be considered in setting targets, and in the Member States' development of their Plans for meeting (existing or new) targets.

5.3 Summarising the Objectives of the Review of Targets

The Impact Assessment Guidelines clearly states that the objectives for any assessment should be clearly articulated. Given the above discussion we have summarised the key objectives of this study as follows:

1. Give substance to the hierarchy through encouraging waste prevention;
2. Give substance to the waste hierarchy through encouraging preparation for reuse;
3. Ensure that waste materials are used effectively through high-quality recycling at progressively higher levels of performance; and
4. Limit the amount of waste landfilled to that which unavoidable, and in so doing, to ensure that the development of treatment capacity for residual waste does not hinder the pursuit of options higher in the waste hierarchy.

These objectives are consistent with the Roadmap and the 7th EAP and provide a firm basis upon which the policy options discussed in this work can be considered and appraised.

The pace at which these objectives can be met has to be given serious consideration. Targets have already been set under the Waste Framework Directive and the Landfill Directive, which extend (accounting for derogations) out to 2020. For the Waste Framework Directive in particular, plans to meet these targets have only recently been put in place. As such, and partly to ensure the credibility of policy making, it is likely to be necessary to defer the introduction of these policies to dates some way beyond 2020. This is likely especially in respect of measures which have the potential to give rise to excess residual waste treatment capacity, such as landfill bans.

6.0 Summary of Consultation Responses

The consideration of issues and options by the project team, informed by one-to-one interviews with key stakeholders, was used as the basis for the design of a web-based questionnaire (see Appendix 1.0 for the full questionnaire which outlines the key issues and options which were identified). This was used as the basis for a web-based consultation which ran between 4th June and 10th September 2013.[65] This chapter provides a summary of the consultation responses with a detailed breakdown of the results being contained in Appendix 2.0.

6.1 Response Rates

A total of 670 people responded to the consultation. Of the three main groups of stakeholders the majority of responses were from European citizens (48% of total responses); however, it was clearly evident that a number of these respondents also responded to the consultation in an official capacity (e.g. as a member of a trade body, or as an industry representative). Industry, not-for profit and academic organisations made up 44% of the total responses. Of this group, the percentage of responses from each sub-group – relative to all 670 responses – was as follows:

- Industry trade bodies/organisations: 20%;
- Industry representatives: 12%;
- Not-for-profit/non-governmental organisations: 8%
- Academic institutions: 1%
- Other: 3%

A smaller number of responses were received from public authorities (7% of total responses or 49 responses in total). Full details of response rates for all stakeholders for each section of the consultation are given in Appendix 2.0.

6.2 Waste Framework Directive

A number of suggested options for changes to the Waste Framework Directive were identified in the consultation. The following options were included in the consultation as part of a scoring matrix:

Targets on Municipal Waste, Article 11(2)(a)

- **Option 1** - Establish a single target and calculation method based only on the quantity of *municipal* waste collected. This would require that a consistent definition of municipal waste is used in all Member States.
- **Option 2** - Extend the existing targets to include other specific waste streams beyond paper, metal, plastic and glass (for example, wood, food waste, textiles, and other materials in municipal waste).
- **Option 3** - Establish a single target and calculation method based only on the quantity of *household* waste collected. This would require that a consistent definition of household waste is used in all Member States.
- **Option 4** - Adjust the targets so that biowaste is also included.

[65] European Commission (2014) *Consultation on the Review of the European Waste Management Targets*, http://ec.europa.eu/environment/consultations/waste_targets_en.htm

- **Option 5** - Set targets which reflect environmental weightings for materials (for example, through reference to greenhouse gas savings achieved through recycling).
- **Option 6** - Improve monitoring and validation of the reports submitted by Member States so that the consistency and reliability of data can be validated.
- **Option 7** - Introduce requirements on businesses to sort a range of waste materials for recycling and composting / anaerobic digestion.

Construction & Demolition Waste Targets, Article 11(2)(b)

- **Option 8** - The 70% recycling target should not include backfilling.
- **Option 9** - Provide clear definitions of recycling and material recovery, and how these should be calculated for the C&D waste stream.
- **Option 10** - Mandate sorting of wastes at C&D sites with a special attention to hazardous waste.
- **Option 11** - Require facilities which sort 'mixed' C&D wastes to achieve a high level of recycling of the input materials.

Respondents were asked to rank each of the above options on a scale of 1 to 5, where:

- 1 = poor idea, not worth consideration;
- 3 = moderately good idea, may be worth further consideration; and
- 5 = very good idea, definitely deserves further consideration.

Figure 6-1 (for options relating to Targets on Municipal Waste) and Figure 6-2 (for options relating to the Construction & Demolition Waste Targets) display the weighted average ranks calculated from all stakeholder responses for each of the options presented in the consultation. The options are numbered in the figures in the same way as in the text above. This analysis demonstrates that, for an average response, all suggested changes to the Waste Framework Directive are supported by stakeholders. Stakeholders showed the most support for increasing monitoring and validation of the reports submitted by Member States so that the consistency and reliability of data can be validated (Option 6). In general, stakeholders also demonstrate a clear preference for establishing a single target and calculation method based only on the quantity of *municipal* waste collected (Option 1), rather than collected *household* waste (Option 3). This preference was also shown by respondents from Member State public authorities; however, the difference in ranking between the two options was less marked than for other stakeholder groups.

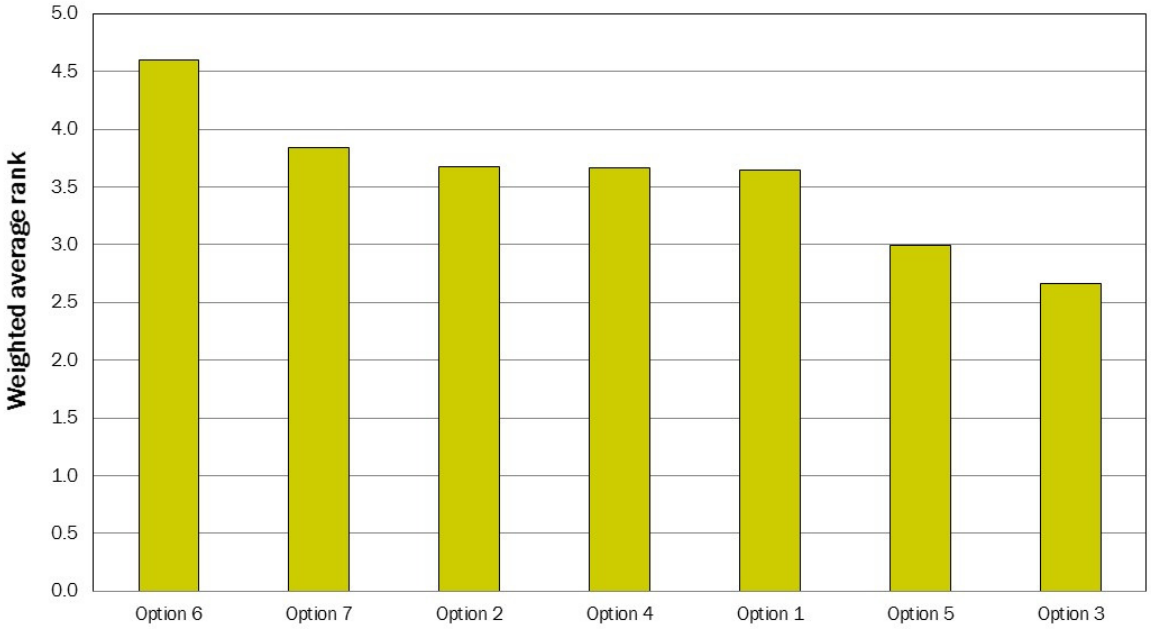
There also appeared to be some support for extending the existing targets to include more specific waste streams (Option 2), including biowaste into the target (Option 4), and requiring businesses to sort their wastes out for recycling (Option 7).

Of the suggested changes to construction and demolition targets, stakeholders were most keen to see clear definitions of recycling and material recovery and the associated calculation methodologies (Option 9), and also showed support for measures which would require increases in the sorting and recycling of C&D waste (Options 10 and 11). There was no strong support for removing backfilling from the C&D target (Option 8).

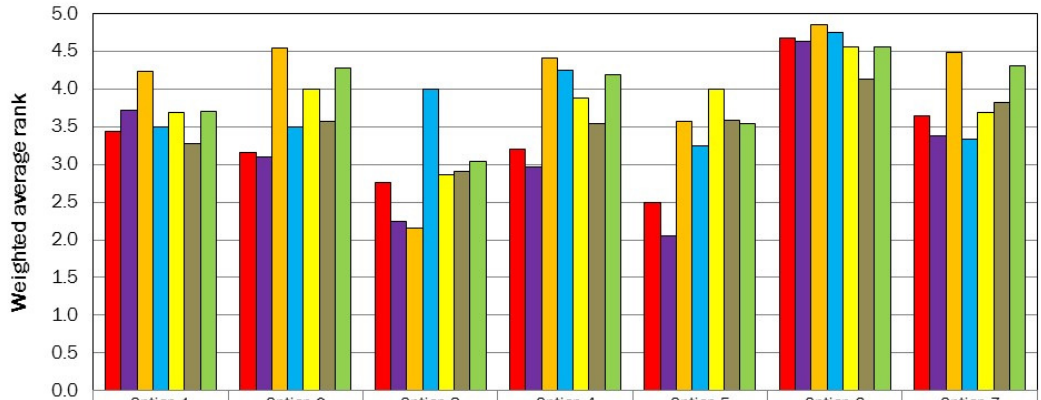
The responses from all stakeholders can be compared with specific responses from each stakeholder group. It can be seen that the views of each of these stakeholder groups are similar to the responses for all stakeholders. The main differences between stakeholder groups are in the overall level of support for changes to the Waste Framework Directive. European Citizens responded with higher than average support for all options, while industry trade bodies and representatives were less supportive of changes. The strongest acceptance of the proposed changes came from not-for-profit organisations.

Figure 6-1: Scoring of Options by all Stakeholders: Targets on Municipal Waste*

A) Overall Results



B) Results by Stakeholder Group

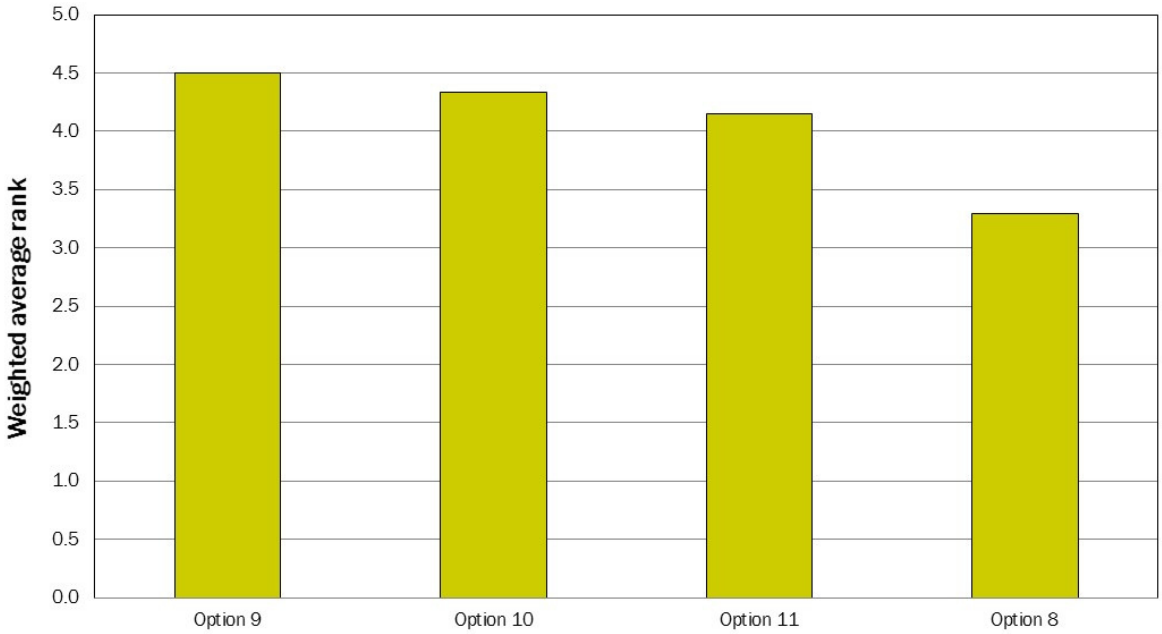


	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Industry Trade Bodies	3.4	3.2	2.8	3.2	2.5	4.7	3.6
Industry Representatives	3.7	3.1	2.2	3.0	2.1	4.6	3.4
Not-for-Profit Organisations	4.2	4.5	2.2	4.4	3.6	4.9	4.5
Academic Institutions	3.5	3.5	4.0	4.3	3.3	4.8	3.3
Other Organisations	3.7	4.0	2.9	3.9	4.0	4.6	3.7
Public Authorities	3.3	3.6	2.9	3.5	3.6	4.1	3.8
European Citizens	3.7	4.3	3.0	4.2	3.5	4.6	4.3

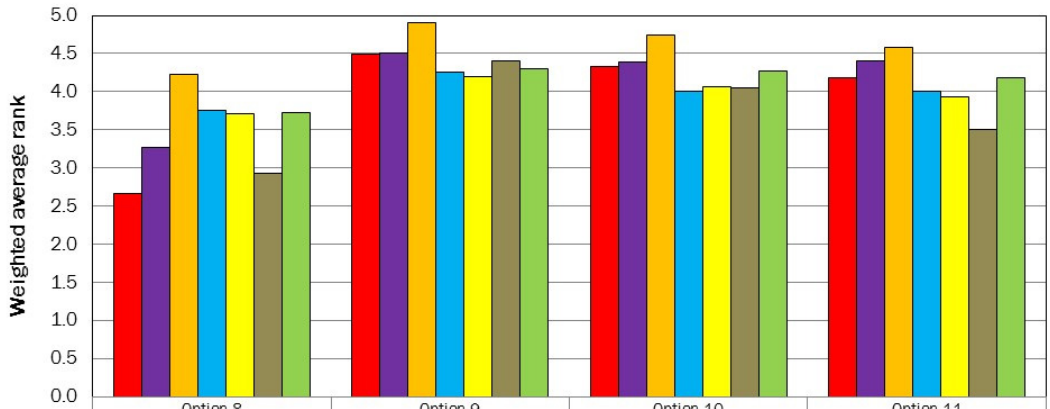
Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

Figure 6-2: Scoring of Options by all Stakeholders: Construction & Demolition Waste Targets*

A) Overall Results



B) Results by Stakeholder Group



	Option 8	Option 9	Option 10	Option 11
Industry Trade Bodies	2.7	4.5	4.3	4.2
Industry Representatives	3.3	4.5	4.4	4.4
Not-for-Profit Organisations	4.2	4.9	4.8	4.6
Academic Institutions	3.8	4.3	4.0	4.0
Other Organisations	3.7	4.2	4.1	3.9
Public Authorities	2.9	4.4	4.0	3.5
European Citizens	3.7	4.3	4.3	4.2

Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

Furthermore, the general preference of all stakeholders for the usage of the term *municipal* (Option 1) over *household* (Option 3) when establishing a single target and calculation method is particularly pronounced in responses from not-for-profit organisations. While, with the exception of industry, stakeholder groups indicated only marginal support for setting targets which reflect environmental weightings for materials (Option 5).

In addition to the listed options which were scored as part of the closed-ended scoring matrix respondents were also asked to list solutions that they felt had not already been identified and should potentially be considered. These open-ended responses were coded to identify the different themes that emerged from these responses. In order of preference, the most common themes (i.e. those identified 10 or more times by respondents) of suggested solutions to emerge from the consultation were:

- Introduce waste prevention and/or reuse targets;
- Resource efficiency should be considered when setting targets;
- There should be a clear distinction between different types of recycling (e.g. closed-loop vs. open-loop);
- C&D recycling targets should include backfilling under certain clearly defined conditions;
- Targets should encourage/mandate separate collections (of dry recyclables and/or food waste) and the issues of separate collections should be clearly resolved by the European Commission;
- Targets should be specified on a kg/capita basis and reduced over time;
- All organisations collecting and recycling waste should report on quantities received/processed, there should be better reporting of end destinations; and
- Introduce recycling targets for commercial and/or industrial waste.

6.3 Landfill Directive

A number of suggested options for changes to the Directive targets were identified in the consultation. Respondents were asked to rank each of the following options as part of a scoring matrix:

- **Option 1** - Revise the targets so that they are set in such a way that they do not penalise countries whose economies are growing faster after starting from a lower base.
- **Option 2** - Establish a legal obligation for reporting on 'municipal waste' and enforcing the use of a single definition of the term by all Member States.
- **Option 3** - Standardise the approach to performance measurement and progress reporting.
- **Option 4** - In Member States where no data exists for 1995, a more recent baseline year should be set with targets adjusted accordingly.
- **Option 5** - Clarify when treated waste should be considered 'no longer biodegradable' from the perspective of the Landfill Directive.
- **Option 6** - Further tighten existing targets (e.g. move progressively towards zero biodegradable municipal waste sent to landfill).
- **Option 7** - Progressively include *all biodegradable* wastes (not just biodegradable wastes of municipal origin) within targets similar to the existing ones.
- **Option 8** - Introduce targets for the progressive reduction in the quantity of residual waste irrespective of how it is subsequently managed (whether it is sent to incineration, MBT or landfill, or any other residual waste management method).

- **Option 9** - Define 'pre-treatment' in an unambiguous manner so that the ban on landfilling waste that is not pre-treated is applied equally across all countries.

The responses of all stakeholders, listed by the weighted average rank for each option, are presented in Figure 6-3. The options in this figure are numbered in the same way as they are in the text above.

As this figure demonstrates, with the exception of Option 1, which proposed to revise the targets so that they are set in such a way that they do not penalise countries whose economies are growing faster after starting from a lower base, stakeholders were generally supportive of all suggested changes to the Landfill Directive. Interestingly, public authorities in Member States also did not support Option 1, with many respondents giving it the lowest rank of 1. Limited support was also shown for the proposals to introduce targets for the progressive reduction in the quantity of residual waste, and in fact industry representatives were somewhat opposed to this change.

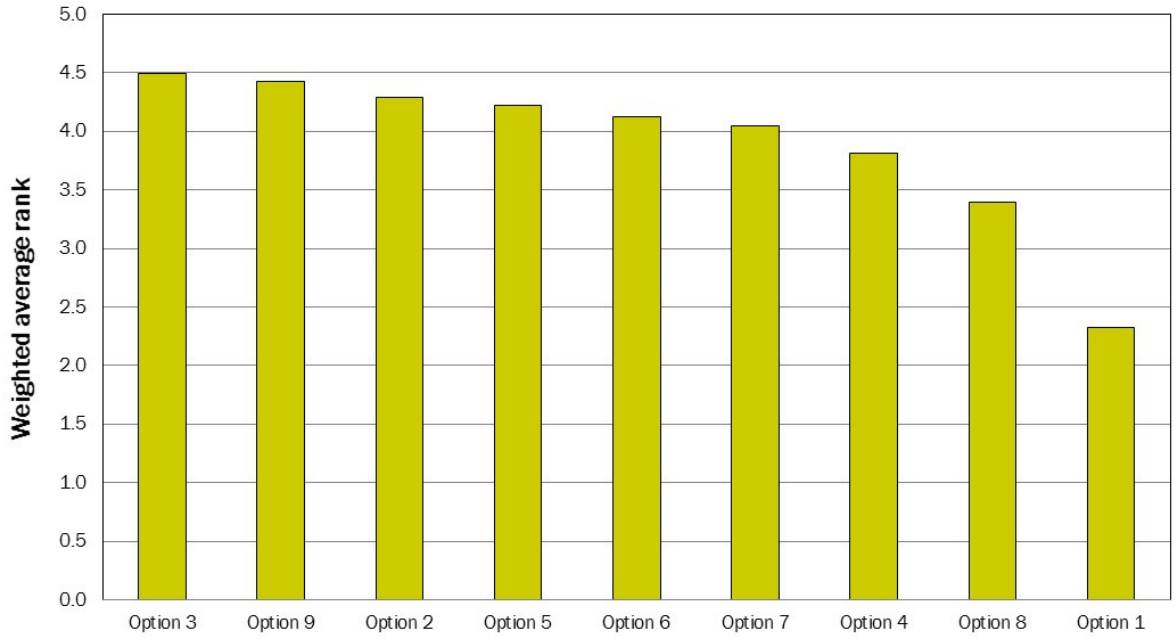
Similarly to responses received for the Waste Framework Directive (Section 6.2), European citizens were more supportive of the proposed changes compared to public authorities and industry groups, yet there is little to compare between stakeholder groups. Assessing the responses from the three major stakeholder groups, there appeared to be most support for establishing a legal obligation for reporting on municipal waste and enforcing the use of a single definition of the term (Option 2), standardising the approach to performance measurement and progress reporting (Option 3), and defining 'pre-treatment' in an unambiguous manner (Option 9).

In addition to the listed options which were scored as part of the closed-ended scoring matrix respondents were also asked to list solutions that they felt had not already been identified and should potentially be considered. These open-ended responses were coded to identify the different themes that emerged from these responses. In order of preference, the most common themes (i.e. those identified 10 or more times by respondents) of suggested solutions to emerge from the consultation were:

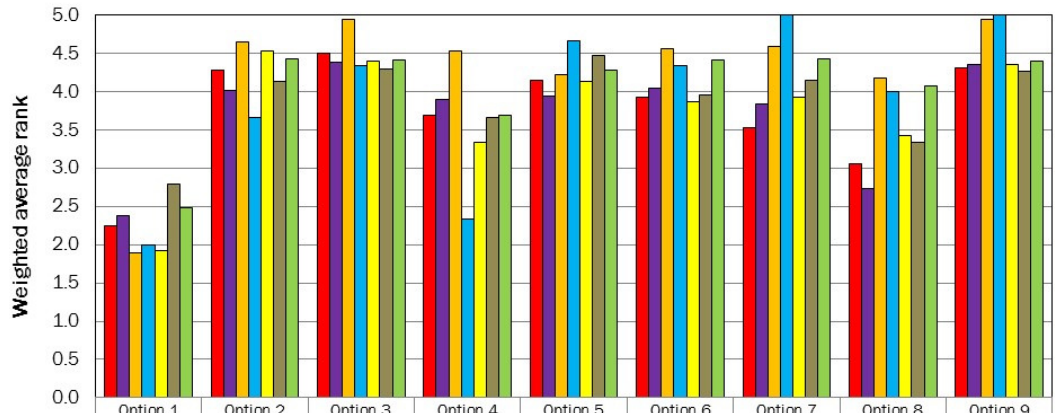
- Introduce landfill bans for recyclable and/or combustible materials;
- Residual waste reduction targets should be specified (e.g. reduction in kg per capita per year) with suitable (i.e. environmentally sound and cost effective) alternatives treatment/recycling options are in place;
- Member states should be financially rewarded for legislation which moves waste up the hierarchy;
- Include more material streams in landfill diversion targets;
- Residual waste reduction targets should be set in the Waste Framework Directive not in the Landfill Directive;
- Progressive introduction of landfill bans on untreated waste;
- Adopt the legal framework as devised by the German Landfill Ordinance which excludes the disposal of plastic waste in bulk in landfills;
- No landfill bans unless feasible alternatives can be identified i.e. landfilling is not simply replaced by incineration; and
- Introduce a mandatory landfill tax.

Figure 6-3: Scoring of Options by all Stakeholders*

A) Overall Results



B) Results by Stakeholder Group



	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9
Industry Trade Bodies	2.3	4.3	4.5	3.7	4.2	3.9	3.5	3.1	4.3
Industry Representatives	2.4	4.0	4.4	3.9	3.9	4.1	3.8	2.7	4.4
Not-for-Profit Organisations	1.9	4.7	5.0	4.5	4.2	4.6	4.6	4.2	4.9
Academic Institutions	2.0	3.7	4.3	2.3	4.7	4.3	5.0	4.0	5.0
Other Organisations	1.9	4.5	4.4	3.3	4.1	3.9	3.9	3.4	4.4
Public Authorities	2.8	4.1	4.3	3.7	4.5	4.0	4.2	3.3	4.3
European Citizens	2.5	4.4	4.4	3.7	4.3	4.4	4.4	4.1	4.4

Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

6.4 Packaging and Packaging Waste Directive

A number of suggested options for changes to the Directive targets were identified in the consultation. Respondents were asked to rank each of the following options as part of a scoring matrix:

- **Option 1** - The methodology for calculating recycling rates should be standardised so that data (and hence performance levels) are comparable across Member States.
- **Option 2** - Remove from the Packaging Directive the target for packaging waste from municipal sources and include it into the Waste Framework Directive to ensure full consistency with the existing target on municipal waste recycling.
- **Option 3** - Bring the recycling targets for different materials closer together to ensure a more level playing field.
- **Option 4** - Incorporate "weightings" for materials recycled based on environmental benefits derived from recycling the material.
- **Option 5** - The targets for some packaging materials could be subdivided into subcategories; for example, metals could be divided into non-ferrous and ferrous metals. The same could apply for plastic; for example, separate targets could be set for PET, LDPE, and HDPE.
- **Option 6** - Set specific targets for recycling of packaging waste from households to encourage further recycling of household packaging.
- **Option 7** - Remove from the Directive the maximum limit of 80% that stipulates how much packaging waste a Member State is allowed to recycle.
- **Option 8** - Introduce a target for prevention of packaging waste (the development of waste prevention targets is covered in a broader manner in a later section of this consultation).
- **Option 9** - Adjust the definitions for reuse and recycling in the Packaging Directive to be consistent with those contained in the Waste Framework Directive.
- **Option 10** - Expand the recycling target to include reuse, by allowing the reuse of packaging to be credited to the recycling target.
- **Option 11** - Introduce targets for reuse for commercial transit packaging.
- **Option 12** - Introduce targets for reuse for all packaging.

The responses of all stakeholders, listed by the weighted average rank for each option, are presented in Figure 6-4. The responses received indicate that the levels of support for each of the options vary considerably. Significant levels of support were shown for only two options, that is, to standardise the methodology for calculating recycling rates (Option 1), and to remove from the directive the maximum limit of 80% that stipulates how much packaging waste a Member State is allowed to recycle (Option 7). Responses also demonstrate a more limited level of support for setting specific targets for the recycling of packaging waste from households (Option 6) and adjusting the definitions for reuse and recycling in the Packaging Waste Directive to be consistent with those contained in the Waste Framework Directive (Option 9).

The views of stakeholders on bringing the recycling targets closer together (Option 3) were relatively neutral. On average, all other options were met with at least some opposition. The views of stakeholders were least favourable towards the proposal to subdivide the targets for packaging materials into subcategories (Option 5), while the suggestion to remove from the Packaging Directive the target for packaging waste from municipal sources and including it into the Waste Framework Directive (Option 2) was also one of the more strongly opposed options. Significant opposition was also shown by industry groups, both trade bodies, and to a greater extent, representatives, to the

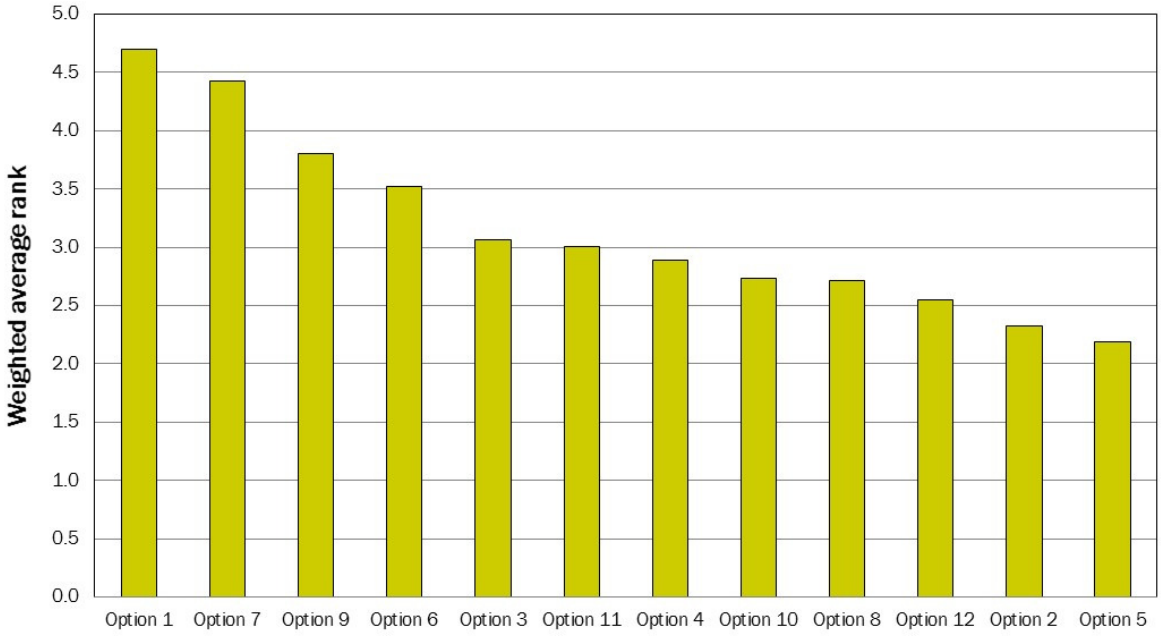
suggestions to expand the recycling target to include reuse (Option 10) and to introduce targets for reuse for all packaging (Option 12). In comparison, public authorities demonstrated the highest levels of support of any of the three major stakeholder groups. Unlike the general trend observed for all stakeholders, this group showed most support for the suggestion to adjust the definitions for reuse and recycling in the Packaging Waste Directive to be consistent with those contained in the Waste Framework Directive (Option 9).

As previously discussed for the Waste Framework Directive and Landfill Directive, respondents were also asked to list solutions that they felt had not already been identified and should potentially be considered. These open-ended responses were coded to identify the different themes emerging from the consultation, the most common of which (i.e. those identified 10 or more times by respondents) are listed below in order of preference:

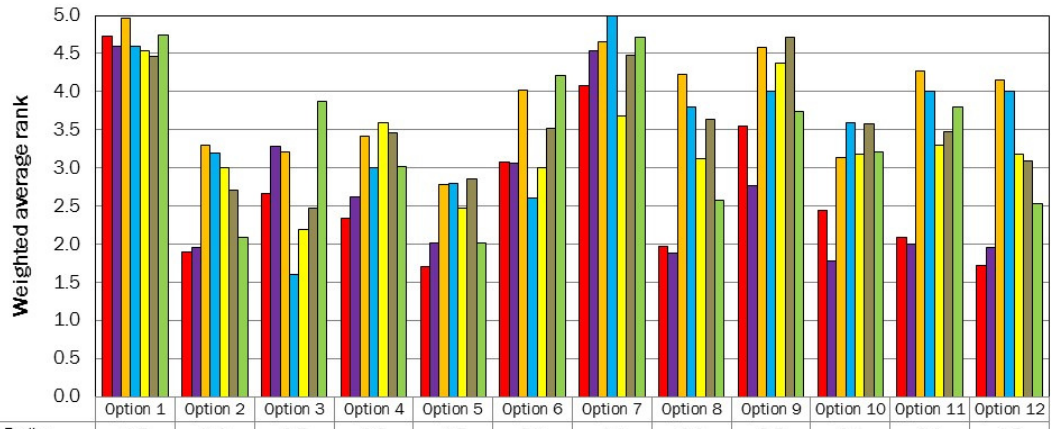
- Introduce a 60% minimum target per member state for each packaging material by 2020;
- A prevention target for packaging should not be considered (e.g. because packaging helps to prevent food waste, issues with health and safety);
- Different types of recycling should be differentiated in the directive (e.g. closed- vs. open-loop recycling);
- Introduce an incremental ban on the landfilling and/or incineration of packaging waste;
- The use of Extended Producer Responsibility, Eco-design, and other fiscal instruments should be extended/enhanced;
- Target should set minimum levels for use of recycled materials in packaging;
- Make source segregation of packaging materials mandatory;
- Place greater emphasis on the European CEN standards;
- Resource efficiency/environmental impacts should be the most important consideration when setting targets; and
- Set targets to limit the use of packaging that cannot easily be recycled.

Figure 6-4: Scoring of Options by all Stakeholders*

A) Overall Results



B) Results by Stakeholder Group



	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8	Option 9	Option 10	Option 11	Option 12
Industry Trade Bodies	4.7	1.9	2.7	2.3	1.7	3.1	4.1	2.0	3.5	2.4	2.1	1.7
Industry Representatives	4.6	2.0	3.3	2.6	2.0	3.1	4.5	1.9	2.8	1.8	2.0	2.0
Not-for-Profit Organisations	5.0	3.3	3.2	3.4	2.8	4.0	4.7	4.2	4.6	3.1	4.3	4.2
Academic Institutions	4.6	3.2	1.6	3.0	2.8	2.6	5.0	3.8	4.0	3.6	4.0	4.0
Other Organisations	4.5	3.0	2.2	3.6	2.5	3.0	3.7	3.1	4.4	3.2	3.3	3.2
Public Authorities	4.5	2.7	2.5	3.5	2.9	3.5	4.5	3.6	4.7	3.6	3.5	3.1
European Citizens	4.7	2.1	3.9	3.0	2.0	4.2	4.7	2.6	3.7	3.2	3.8	2.5

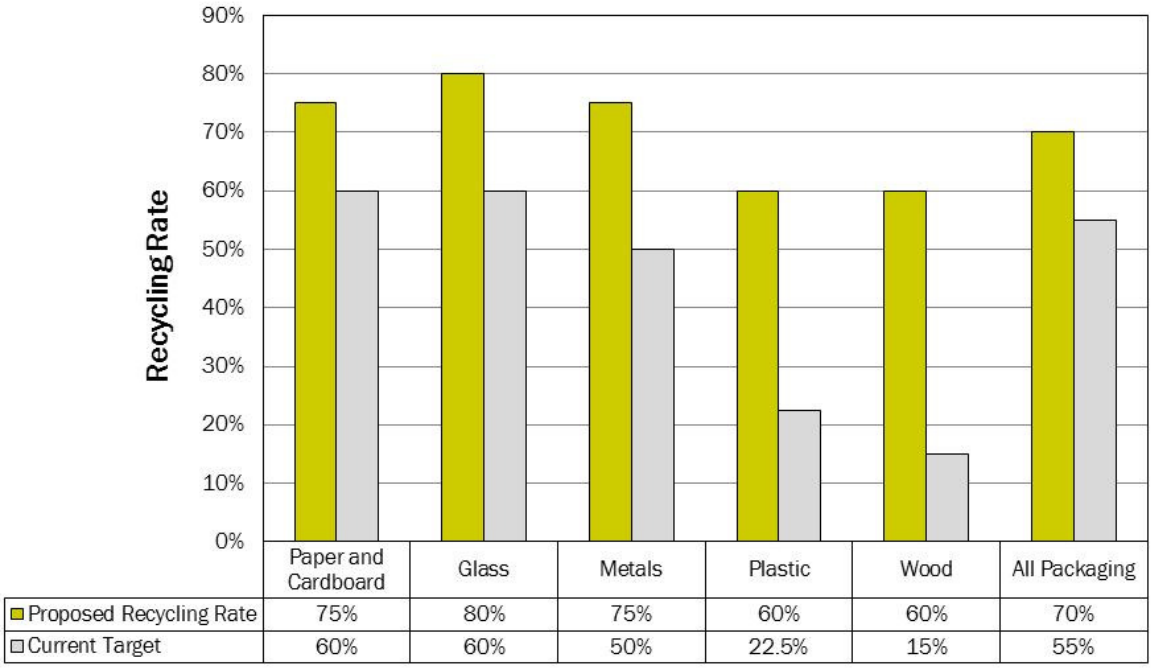
Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

The final questions of this section of the consultation asked stakeholders to state the highest level of recycling they believe could reasonably be achieved for the materials included in the current target. They were also asked, for each material, to comment on the year in which they felt this target could be reasonably achieved. The results of these

questions, that is, the weighted average recycling rates, and the proposed years for achieving these rates, are presented in Figure 6-5 and Figure 6-6 respectively.

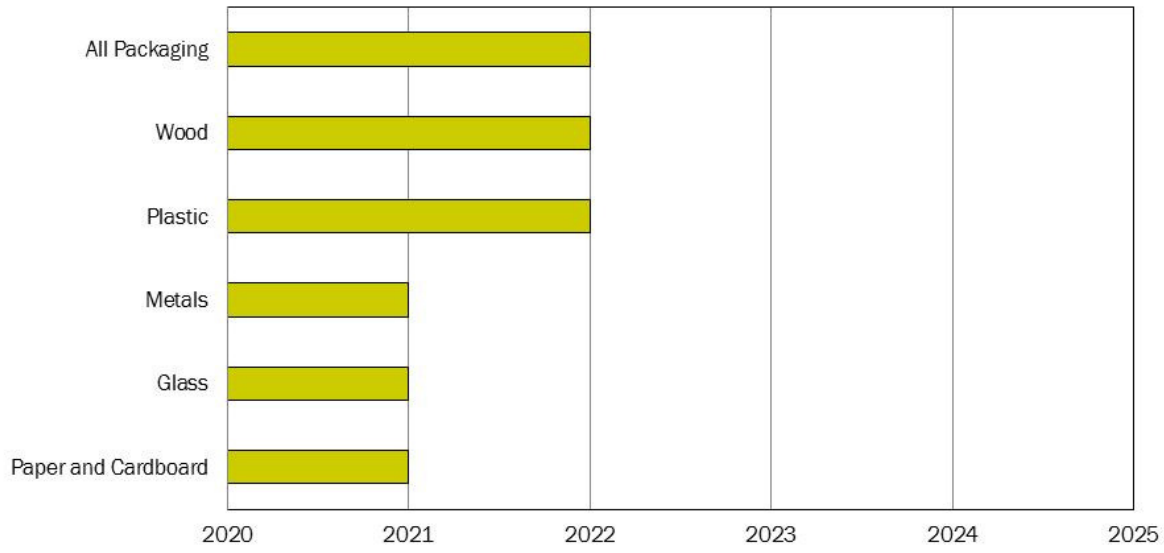
Judging by the responses to this question from the different stakeholder groups, it appears that there is an appetite for increasing the existing targets for the different packaging materials to somewhere between 60% and 80% by between 2021 and 2024.

Figure 6-5: Weighted Average Recycling Rate Reported by all Stakeholders and Year in Which Proposed Recycling Rate May be Achieved



	Paper and Cardboard	Glass	Metals	Plastic	Wood	All Packaging
Proposed Recycling Rate	75%	80%	75%	60%	60%	70%
Current Target	60%	60%	50%	22.5%	15%	55%

Figure 6-6: Year for Achieving Proposed Recycling Rate Reported by all Stakeholders*



**Note: the calculated average weighted rank for each material was rounded up to the nearest year.*

6.5 Roadmap to a Resource Efficient Europe

6.5.1 Waste Prevention

Stakeholders were asked to state whether they agreed with the principle that there should be targets for waste prevention. Responses to this question are summarised in Table 6-1. In total, 55% of respondents agreed with this principle. Of the three main groups of stakeholders public authorities were the most supportive of targets for waste prevention, with 84% agreeing with the principle. General support was also shown by not-for-profit organisations, of which 78% agreed with the principle. Conversely, only 43% of industry groups and representatives were supportive of waste targets, while the responses from European Citizens were very close to the views of all stakeholders (56% agreed with the principle).

Table 6-1: Should the Commission Set New Waste Prevention Targets?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	256	57	35	42	4	12	41	65
	%	55%	42%	44%	78%	67%	60%	84%	56%
No	No.	206	79	45	12	2	8	8	52
	%	45%	58%	56%	22%	33%	40%	16%	44%
Total	***No.***	***462***	***136***	***80***	***54***	***6***	***20***	***49***	***117***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Respondents in favour of waste prevention targets were also asked which waste streams, materials, or products they thought should be targeted (respondents were allowed to identify up to four items). In order of preference, the ten materials most frequently suggested by participants were:

- Hazardous waste;
- 'Total waste';
- Food;
- Packaging;
- Industrial waste;
- Biowastes;
- Plastics;
- Residual waste;
- Metals; and
- WEEE.

The most frequently mentioned materials are also presented for each of the three main stakeholder groups in Table 6-2. A full list of all materials for these three stakeholder groups is available in Appendix 2.0.

Table 6-2: List of Waste Streams, Materials or Products that could be the Focus of Waste Prevention Targets

Industry, Not-for-Profit, Academic and Other Organisations		Public Authorities		European Citizens	
Waste Streams / Materials / Products	No. of Responses	Waste Streams / Materials / Products	No. of Responses	Waste Streams / Materials / Products	No. of Responses
Hazardous waste	28	Food	11	Packaging	5
"Total" waste	20	WEEE	7	Hazardous waste	4
Residual waste	16	Packaging	6	Biowastes	4
Industrial waste	15	Biowastes	5	Plastics	4
Food	12	Textiles	5	Metals	3
Biowastes	11	Metals	5	Industrial waste	2
Plastics	11	Plastics	5	WEEE	2
Packaging	11	Composite materials	4	Batteries	2
Metals	8	Municipal waste	3	Aluminium cans	2
Composite materials	8	Industrial waste	3	Plastic bottles	2
Municipal waste	7	"Total" waste	3	"Total" waste	2
Household waste	5	Household waste	2	Residual waste	2
WEEE	5	C&D waste	2	Composite materials	2

Respondents were also asked to rank a number of options for the introduction of waste prevention targets. As in other sections of the consultation this ranking was on a scale of 1 to 5. The five options that were put forward were:

- **Option 1** - In line with the proposal in the Roadmap, a requirement that waste generated per capita is in decline by 2020.
- **Option 2** - Targets for decoupling of municipal waste from economic growth in line with Article 9(c) of the Waste Framework Directive. For example, the difference between the annual change in municipal waste per capita (X%) and the annual change in GDP per capita (Y%) should demonstrate a decoupling tendency such that over comparable (e.g. four year) periods, the value of (Y – X) is increasing in value.
- **Option 3** - Consistent reporting of household waste arisings across Member States would act to produce a level playing field for setting absolute targets on waste prevention (e.g. no greater than X kg per household per year). The targets could exhibit a declining trend over time.
- **Option 4** - New requirements could be set on Member States to incrementally increase the number of prevention measures in place and the overall coverage of these measures. For example, the number of households who have signed up to

say “no” to unwanted mail, or the number of households covered by measures to reduce food wastage.

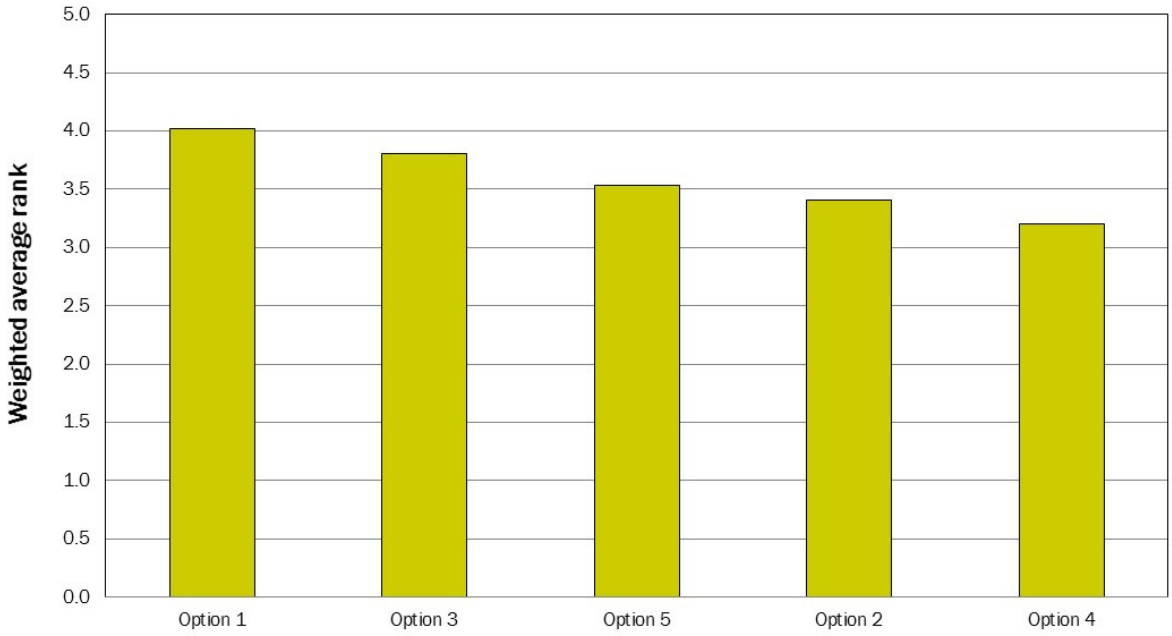
- **Option 5** - Introduce requirements for progressive coverage of households by pay-as-you throw schemes.

The responses of all stakeholders, listed by the weighted average rank for each option, are presented in Figure 6-7. The responses indicate at least some level of support for all suggested options. Stakeholders were most keen on, in line with the proposal in the Roadmap, introducing a requirement that waste generated per capita is in decline by 2020 (Option 1). The most marginal levels of support were for the proposal to introduce new requirements for Member States to incrementally increase the number of prevention measures in place and the overall coverage of these measures (Option 5). Industry trade bodies demonstrated limited opposition towards this option.

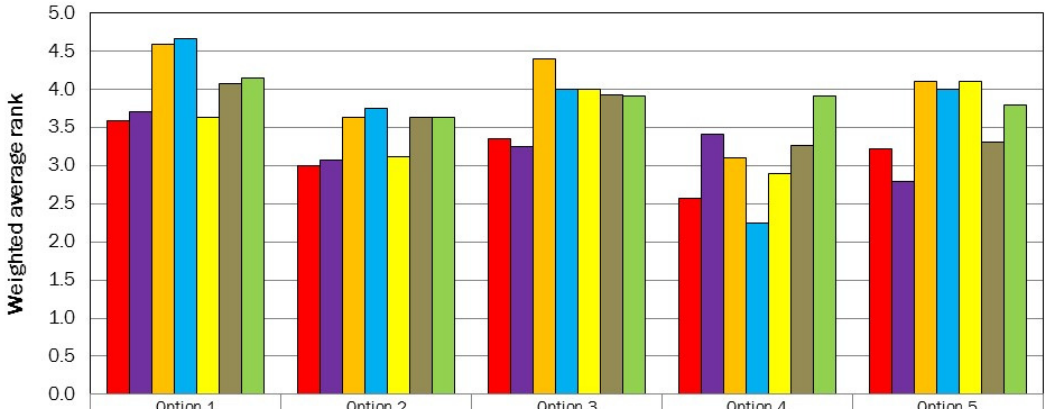
In general, support levels were roughly similar across the three major stakeholder groups. The least support for these options came from industry trade bodies and representatives, while European citizens were the most supportive group overall. This group, in contrast to the trend for other stakeholder groups, were least supportive of the suggestion to introduce targets for decoupling of municipal waste from economic growth in line with Article 9(c) of the Waste Framework Directive (Option 2).

Figure 6-7: Scoring of Options by all Stakeholders*

A) Overall Results



B) Results by Stakeholder Group



	Option 1	Option 2	Option 3	Option 4	Option 5
Industry Trade Bodies	3.6	3.0	3.4	2.6	3.2
Industry Representatives	3.7	3.1	3.2	3.4	2.8
Not-for-Profit Organisations	4.6	3.6	4.4	3.1	4.1
Academic Institutions	4.7	3.8	4.0	2.3	4.0
Other Organisations	3.6	3.1	4.0	2.9	4.1
Public Authorities	4.1	3.6	3.9	3.3	3.3
European Citizens	4.1	3.6	3.9	3.9	3.8

Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

6.5.2 Preparation for Reuse

Stakeholders were first asked to state whether they agreed with the principle that separate targets should be set for preparation for reuse. Responses to this question are summarised in Table 6-1. In total, 46% of respondents agreed with this principle. Industry groups were quite strongly opposed to the prospect of setting targets for preparation for reuse, with only 28% of industry trade bodies, and 25% of industry representatives, showing support for this principle. Of the three main groups of stakeholders public authorities demonstrated the most support (63% agreed with the principle), followed by European citizens, of which 60% were supportive of the principle.

Figure 6-8: Should the Commission Set New Preparation for Reuse Targets?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	211	38	20	39	3	10	31	70
	%	46%	28%	25%	72%	50%	50%	63%	60%
No	No.	251	98	60	15	3	10	18	47
	%	54%	72%	75%	28%	50%	50%	37%	40%
Total	***No.***	***462***	***136***	***80***	***54***	***6***	***20***	***49***	***117***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Respondents in favour of setting new preparation for reuse targets were also asked which waste streams, materials, or products they thought should be targeted (respondents were allowed to identify up to four items). In order of preference, the ten materials most frequently suggested by participants were:

- WEEE;
- Furniture;
- Textiles;
- Beverage bottles;
- End-of-life vehicles;
- Toys;
- Glass;
- Glass bottles;
- Plastics; and
- Bulky Waste

The most frequently mentioned materials are also presented for each of the three main stakeholder groups in Table 6-3. A full list of all materials for these three stakeholder groups is available in Appendix 2.0.

Table 6-3: List of Waste Streams, Materials or Products that could be the Focus of Preparation for Reuse Targets

Industry, Not-for-Profit, Academic and Other Organisations		Public Authorities		European Citizens	
Waste Streams / Materials / Products	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**
Textiles	35	Textiles	15	WEEE	10
WEEE	35	Furniture	13	Furniture	7
Furniture	34	WEEE	10	Textiles	3
Beverage bottles	13	End-of-life vehicles	3	Glass	2
Toys	6	Construction & Demolition waste	2	Glass bottles	2
Glass bottles	4	Glass	2	End-of-life vehicles	2

6.5.3 Recycling Rates

The European Commission is keen to see that more materials are recycled, especially materials that have a significant impact on the environment. In light of this, stakeholders were asked whether they thought that recycling rates should be increased and /or made to include more materials/waste streams. The responses to this question are summarised in Table 6-4, and demonstrate a relatively high level of support for this principle from all stakeholders (84% overall). European citizens were the most supportive of all the stakeholder groups (98% agreed with the principle). The 'lowest' levels of support came from industry trade bodies, but support from this group was still strong (74% of respondents agreed with the principle).

Table 6-4: Should the Commission Increase or Expand Existing Recycling Targets?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	390	101	66	44	5	17	42	115
	%	84%	74%	83%	81%	83%	85%	86%	98%
No.	No	72	35	14	10	1	3	7	2
	%	16%	26%	18%	19%	17%	15%	14%	2%
Total	**No**	**462**	**136**	**80**	**54**	**6**	**20**	**49**	**117**
	%	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**

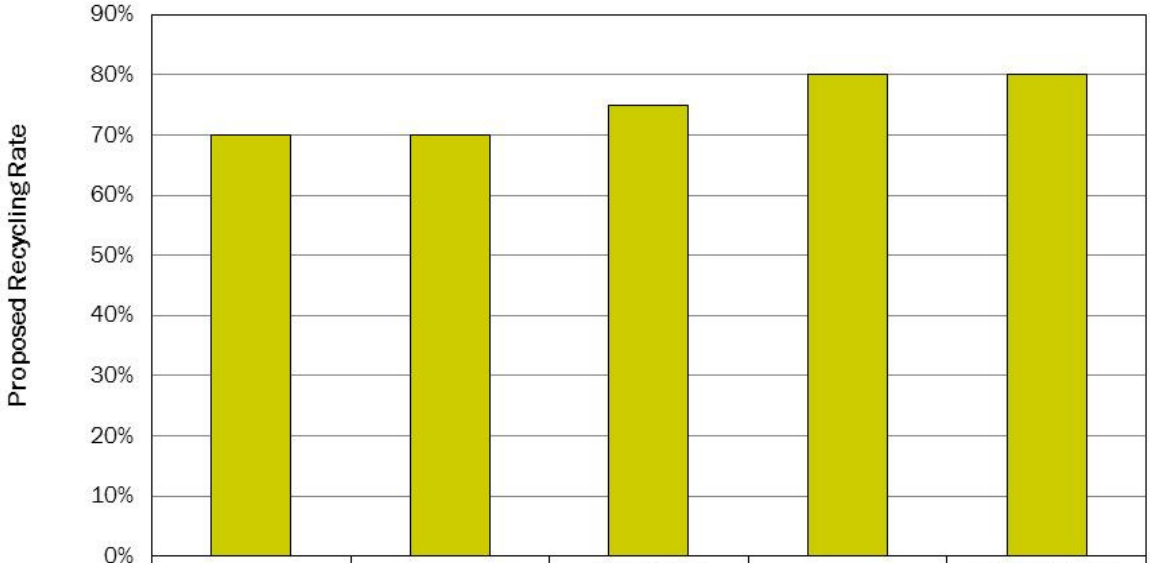
Stakeholders who believed that current recycling targets should be revised, were asked to say what they felt was the 'highest' level of recycling that could reasonably be obtained for the following waste streams by 2025:

- Household waste;
- Municipal waste;
- Commercial waste;
- Industrial waste; and
- Construction and demolition waste.

The weighted average recycling rates for each waste stream reported by all stakeholders are presented in Figure 6-9. In general these showed relatively little variation, with lower recycling rates proposed by industry groups and higher rates proposed by public authorities and European citizens.

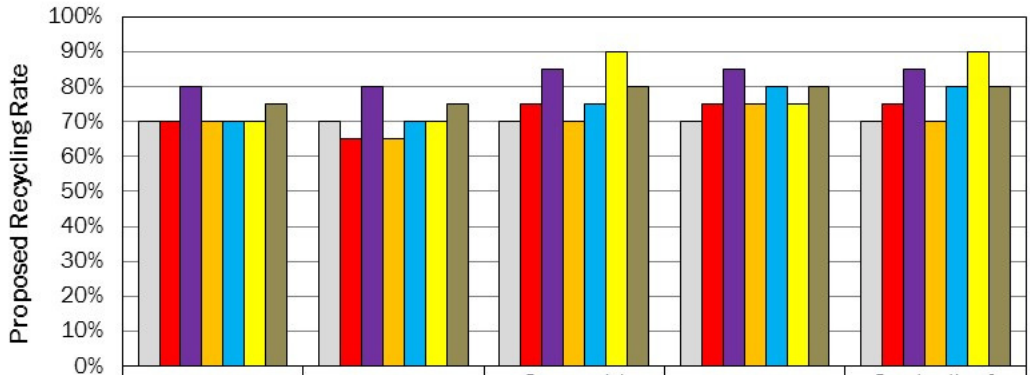
Figure 6-9: Average of Highest Achievable Recycling Rates Reported by all Stakeholders

A) Overall Results



	Household Waste	Municipal Waste	Commercial Waste	Industrial Waste	Construction & Demolition Waste
Recycling Rate	70%	70%	75%	80%	80%

B) Results by Stakeholder Group



	Household Waste	Municipal Waste	Commercial Waste	Industrial Waste	Construction & Demolition Waste
Industry Trade Bodies	70%	70%	70%	70%	70%
Industry Representatives	70%	65%	75%	75%	75%
Not-for-Profit Organisations	80%	80%	85%	85%	85%
Academic Institutions	70%	65%	70%	75%	70%
Other Organisations	70%	70%	75%	80%	80%
Public Authorities	70%	70%	90%	75%	90%
European Citizens	75%	75%	80%	80%	80%

Stakeholders were also asked to state whether they supported an approach which would set targets relative to the existing situation in each Member State (for example, setting recycling rates that increased by a given amount each year). The results demonstrate that 60% of all stakeholders agreed with this approach (Table 6-5). An assessment of responses by stakeholder group shows that the percentage of respondents supportive of this approach varied between 50% (for other organisations) and 82% (for not-for-profit organisations). European citizen demonstrated the least support of the three major stakeholder groups, with 51% of respondents supportive of the suggested approach.

Table 6-5: Should Recycling Targets be Set According to the Situation within Individual Member States?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	193	45	32	32	3	8	21	52
	%	60%	58%	70%	82%	60%	50%	58%	51%
No	No.	128	32	14	7	2	8	15	50
	%	40%	42%	30%	18%	40%	50%	42%	49%
Total	***No.***	***321***	***77***	***46***	***39***	***5***	***16***	***36***	***102***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

The consultation also asked stakeholders whether they thought that there was a case for setting recycling targets on waste streams, materials, or products that are not already covered by targets in existing Directives. A range of answers were provided and each of these was coded to identify commonality across responses. In order of preference, the ten materials most frequently suggested by participants were:

- Biowastes;
- Textiles;
- Plastics;
- Beverage cartons;
- Commercial and industrial waste;
- Commercial waste;
- Bulky waste;
- Industrial waste;
- Furniture; and
- Hazardous waste.

The most frequently mentioned materials are presented for each of the three main stakeholder groups in Table 6-6. A full list of all materials for these three stakeholder groups is available in Appendix 2.0.

Table 6-6: List of Waste Streams, Materials or Products that could be the Focus of New Recycling Targets

Industry, Not-for-Profit, Academic and Other Organisations		Public Authorities		European Citizens	
Waste Streams / Materials / Products	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**
Biowastes	49	Biowastes	9	Biowastes	9
Textiles	28	Plastics	6	Beverage cartons	6
Commercial and industrial waste	18	Textiles	5	Industrial waste	3
Bulky waste	17	Commercial waste	3	Textiles	3
Commercial waste	15	Industrial waste	2	Plastics	3
Beverage cartons	15	Hazardous waste	2	Commercial waste	2
Plastics	14	Food	2	Tyres	2
Industrial waste	12	Critical materials	2	Commercial and industrial waste	2

6.5.4 Limiting Incineration of Waste Which Might Otherwise be Recycled

Stakeholders were asked whether they supported the notation that a maximum level should be set for the amount of waste that can be incinerated for different waste streams. The responses to this question are presented for each group of stakeholders in Table 6-7. Of all the responses received, 57% were supportive of the proposal. Industry trade bodies and public authorities showed some opposition to this proposal, with support rates of 43% and 39% respectively. Conversely, European citizens showed strong support, with 80% agreeing with the notation.

Table 6-7: Should the Commission Set Maximum Levels on the Amount of Waste that can be Incinerated?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	264	58	48	33	3	9	19	94
	%	57%	43%	60%	61%	50%	45%	39%	80%
No	No.	198	78	32	21	3	11	30	23
	%	43%	57%	40%	39%	50%	55%	61%	20%
Total	***No.***	***462***	***136***	***80***	***54***	***6***	***20***	***49***	***117***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Those in support of the idea that maximum levels of incineration should be set were asked more specifically which waste stream (or streams) this should apply to. The results for each waste stream are presented in Table 6-8 and broken down by stakeholder group.

Table 6-8: Number of Stakeholders Who Do and Do Not Support Maximum Incineration Levels for Different Waste Streams

Waste Stream / Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Household/Municipal Waste									
Yes, introduce limits on incineration	No.	151	27	24	30	2	5	12	51
	%	89%	84%	89%	100%	67%	71%	75%	94%
No, do not introduce limits on incineration	No.	18	5	3	0	1	2	4	3
	%	11%	16%	11%	0%	33%	29%	25%	6%
Commercial Waste									
Yes, introduce limits on incineration	No.	135	25	14	30	2	6	11	47
	%	90%	86%	78%	100%	67%	75%	73%	100%
No, do not introduce limits on incineration	No.	15	4	4	0	1	2	4	0
	%	10%	14%	22%	0%	33%	25%	27%	0%
Industrial Waste									
Yes, introduce limits on incineration	No.	118	19	14	29	1	4	7	44
	%	81%	73%	74%	100%	33%	57%	50%	92%
No, do not introduce limits on incineration	No.	28	7	5	0	2	3	7	4
	%	19%	27%	26%	0%	67%	43%	50%	8%
Construction & Demolition Waste									
Yes, introduce limits on incineration	No.	110	16	13	27	0	4	9	41
	%	76%	64%	68%	93%	0%	50%	64%	89%
No, do not introduce limits on incineration	No.	34	9	6	2	3	4	5	5
	%	24%	36%	32%	7%	100%	50%	36%	11%

Respondents who supported the idea of applying maximum levels of incineration to either one or more of the above waste streams were asked to state what they believed was an appropriate maximum level (as a percentage of each waste stream). The results of this question are presented in Table 6-9, where the weighted average maximum incineration rate for each waste stream is presented for each group of stakeholders.

Table 6-9: Average Maximum Levels of Incineration Suggested by Stakeholders

Waste Stream	All Stakeholders	Stakeholder Group						
		Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Household/Municipal Waste	21%	28%	23%	14%	23%	32%	23%	23%
Commercial Waste	21%	27%	25%	12%	23%	30%	23%	23%
Industrial Waste	19%	24%	23%	12%	20%	29%	23%	20%
Construction & Demolition Waste	20%	20%	28%	14%	25%	15%	25%	20%

In addition to these waste streams stakeholders were asked to identify any other waste streams to which a maximum level of incineration should apply. In order of preference, the ten materials most frequently suggested by participants were:

- Packaging;
- Biowastes and/or Biomass;
- Medical waste;
- Plastics;
- Paper and card;
- Wood;
- WEEE;
- Tyres;
- Hazardous waste; and
- Waste oils.

The most frequently mentioned materials are presented for each of the three main stakeholder groups in Table 6-6. A full list of all materials for these three stakeholder groups is available in Appendix 2.0.

Table 6-10: List of Waste Streams to which it was Suggested Maximum Incineration Levels Should Apply

Industry, Not-for-Profit, Academic and Other Organisations		Public Authorities		European Citizens	
Waste Streams / Materials / Products	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**	**Waste Streams / Materials / Products**	**No. of Responses**
Packaging	18	Tyres	2	Packaging	9
Biowastes and/or Biomass	14	Biowastes and/or Biomass	1	Biowastes and/or Biomass	6
Medical waste	13	Plastics	1	Medical waste	3
Plastics	10	Waste oils	1	Not a relevant response	3
Paper and card	7	Medical waste	1	Hazardous waste	3
Wood	3	PVC	1	Batteries	2
WEEE	3	Non-toxic waste streams that can easily be recycled (e.g. paper)	1	Tyres	2

6.5.5 Landfill

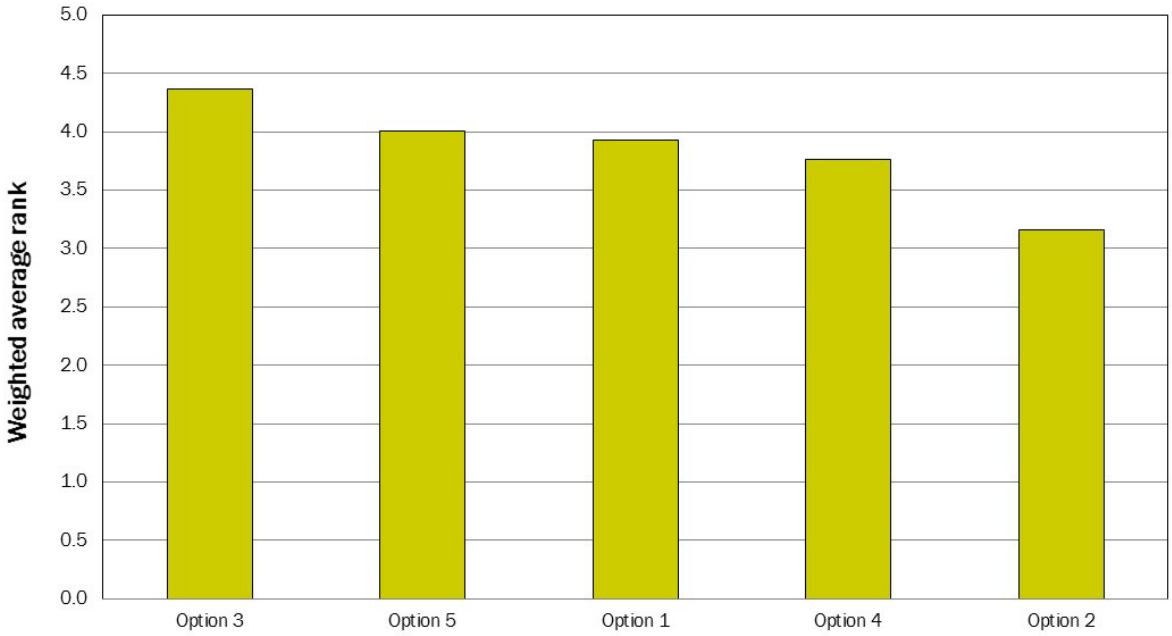
There are a number of possible ways in which the Commission's aspirational target that landfill should be 'virtually eliminated' could be implemented. Several options for achieving this were presented in the consultation:

- **Option 1** - Landfilling should be limited to residues from a specified range (to be determined) of waste treatment operations.
- **Option 2** - Landfilling should be limited to a certain percentage of waste generated (for instance 5%) from a particular date.
- **Option 3** - Landfilling of recyclable/compostable waste (to be defined) should be banned.
- **Option 4** - Landfilling of waste that is combustible should be banned.
- **Option 5** - Landfilling of waste should be banned if it has not been treated to a level where the potential to lead to methane emissions from landfills has been virtually eliminated.

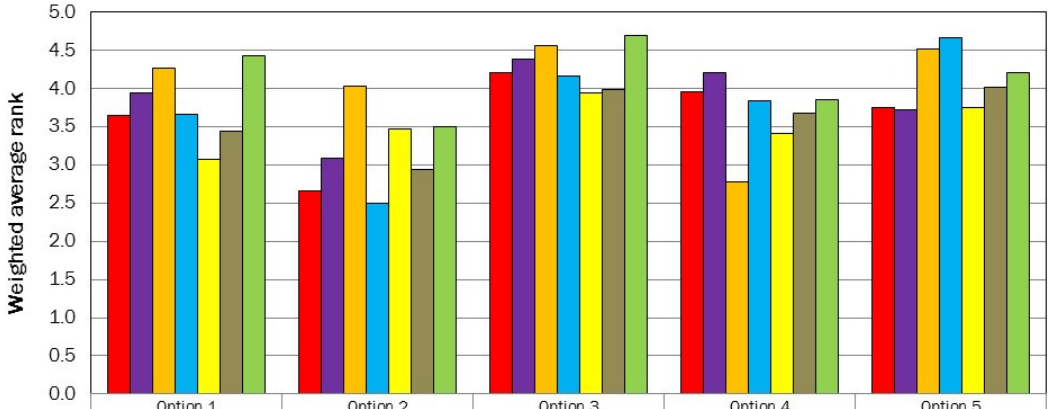
As described for previous sections, respondents were asked to rank the above options on a scale of 1 to 5. The responses of all stakeholders, listed by the weighted average rank for each option, are presented in Figure 6-10.

Figure 6-10: Scoring of Options by all Stakeholders*

A) Overall Results



B) Results by Stakeholder Group



	Option 1	Option 2	Option 3	Option 4	Option 5
Industry Trade Bodies	3.6	2.7	4.2	3.9	3.7
Industry Representatives	3.9	3.1	4.4	4.2	3.7
Not-for-Profit Organisations	4	4	5	3	5
Academic Institutions	3.7	2.5	4.2	3.8	4.7
Other Organisations	3.1	3.5	3.9	3.4	3.8
Public Authorities	3.4	2.9	4.0	3.7	4.0
European Citizens	4.4	3.5	4.7	3.8	4.2

Note on rankings: **1 = poor idea, not worth consideration; **3** = moderately good idea, may be worth further consideration; and **5** = very good idea, definitely deserves further consideration.*

The views of all stakeholders appear to show at least some support for all options. Stakeholders were most supportive of banning landfilling of recyclable/compostable waste (Option 3). The lowest level of support was shown for the suggestion to limit landfill to a certain percentage of waste generated from a particular date (Option 2).

The responses from all stakeholders can be compared with specific responses from each stakeholder group. The responses of the main three stakeholder groups follow the same general trends as presented in Figure 6-10. Absolute levels of support did vary somewhat between stakeholder groups. Public authorities, industry trade bodies and industry representatives all showed varying degrees of opposition to Option 2 (described above). Overall, European citizens were the most supportive of the proposed options out of the three major stakeholder groups.

In addition to the listed options which were scored as part of the closed-ended scoring matrix respondents were also asked to list solutions that they felt had not already been identified and should potentially be considered. These open-ended responses were coded to identify the different themes that emerged from these responses. In order of preference, the most common themes (i.e. those identified 5 or more times by respondents) of suggested solutions to emerge from the consultation were:

- Introduction of targets should be staged or reduced by a given percentage each year;
- Set landfilling and incineration rates as a maximum amount of pre-treated waste per capita which decreases over time;
- Feasible alternatives must exist before landfill bans are implemented;
- Outright bans are inappropriate - some landfilling will always be necessary;
- The target should focus on distinct waste streams that can easily be monitored/identified (e.g. C&I waste and municipal waste);
- Targets and/or bans should not be set, Member States should use other instruments to achieve objectives;
- Introduce mandatory landfill taxes; and
- Introduce a requirement that all waste should be sorted prior to landfilling and/or incineration.

Respondents were also asked whether they supported an approach which would set targets relative to the existing situation in each Member State (for example, setting a landfilling reduction percentage per year). Responses to this question are presented in Table 6-11. The results of the consultation demonstrate that 68% of all stakeholders were supportive of this approach. The most supportive group of stakeholders were European citizens, of which 83% of respondents showed support.

Table 6-11: Should Landfilling Targets be Set According to the Situation within Individual Member States?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	176	49	30	31	3	6	23	34
	%	68%	60%	67%	78%	75%	46%	64%	83%
No	No.	84	32	15	9	1	7	13	7
	%	32%	40%	33%	23%	25%	54%	36%	17%
Total	***No.***	***260***	***81***	***45***	***40***	***4***	***13***	***36***	***41***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

6.6 Targets as a Tool in Waste Legislation

The first question in this section of the consultation asked whether stakeholders thought that the Commission should go further than simply setting targets for Member States to achieve. The responses received to this question are summarised in Table 6-12. In general, stakeholder groups strongly agreed that the Commission should go further in their actions.

Table 6-12: Should the Commission go Further than Simply Setting Targets?

Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Yes	No.	394	116	61	48	3	18	41	107
	%	85%	85%	76%	89%	50%	90%	84%	91%
No	No.	68	20	19	6	3	2	8	10
	%	15%	15%	24%	11%	50%	10%	16%	9%
Total	***No.***	***462***	***136***	***80***	***54***	***6***	***20***	***49***	***117***
	%	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***	***100%***

Those who felt that setting targets was insufficient for achieving the objectives set out in the Roadmap were asked to state, by simply entering 'yes' or 'no', whether they believed a number of listed options were appropriate. The responses received to these options were analysed for each group of stakeholders and the results have been summarised in Table 6-13. For each of these options, the vast majority of responses agreed that the 'non-target' option was appropriate.

Table 6-13: Number of Stakeholders Who Stated that Proposed 'Non-target' Options were either Appropriate or Inappropriate

Waste Stream / Answer		All Stakeholders	Stakeholder Group						
			Industry Trade Bodies	Industry Representatives	Not-for-Profit Organisations	Academic Institutions	Other Organisations	Public Authorities	European Citizens
Option 1: Develop guidance on the implementation of effective producer responsibility schemes to improve the transparency of the systems as well as their cost effectiveness.									
Appropriate	No.	314	85	37	44	3	14	35	96
	%	85%	79%	64%	98%	100%	82%	90%	94%
Inappropriate	No.	57	22	21	1	0	3	4	6
	%	15%	21%	36%	2%	0%	18%	10%	6%
Option 2: Develop guidance on the proper implementation of the waste hierarchy.									
Appropriate	No.	302	100	53	39	2	16	36	56
	%	93%	95%	93%	87%	100%	89%	95%	92%
Inappropriate	No.	24	5	4	6	0	2	2	5
	%	7%	5%	7%	13%	0%	11%	5%	8%
Option 3: Ensure a closer monitoring by the Commission of progress accomplished by Member States in applying the waste hierarchy.									
Appropriate	No.	339	98	51	45	2	14	29	100
	%	92%	91%	89%	98%	67%	88%	81%	97%
Inappropriate	No.	30	10	6	1	1	2	7	3
	%	8%	9%	11%	2%	33%	13%	19%	3%
Option 4: Develop criteria for municipalities to implement services of a minimum standard to enable sorting of a range of waste materials for recycling and composting/anaerobic digestion.									
Appropriate	No.	255	69	41	43	2	10	27	63
	%	85%	79%	85%	96%	100%	63%	73%	95%
Inappropriate	No.	46	18	7	2	0	6	10	3
	%	15%	21%	15%	4%	0%	38%	27%	5%
Option 5: Improve the consistency of the definitions used in the legislation and ensure proper monitoring by improved data collection and systematic reliability and validity checks of data reported.									
Appropriate	No.	366	109	57	46	3	16	35	100
	%	98%	98%	97%	100%	100%	94%	95%	98%
Inappropriate	No.	9	2	2	0	0	1	2	2
	%	2%	2%	3%	0%	0%	6%	5%	2%

6.7 Citizen Consultation

It will be evident from the results discussed in the above sections that European citizens were given the option of responding to the more technical consultation that was open to all stakeholders. In addition, the Commission developed a number of standalone questions to which citizens could respond if they did not wish to respond to the longer consultation that was open to all stakeholders. Citizens were able to express their views in one of three ways:

1. Through the shorter citizen consultation;
2. Via the technical consultation that was open to all stakeholders; or
3. Through both the shorter citizen consultation and the longer technical consultation.

The results of those citizens who responded to the technical consultation have already been presented in the sections above. The results of the shorter citizen consultation are not reproduced here, but can be viewed in Appendix 2.0.

6.8 Summary

Considering the consultation as a whole the general views of stakeholders can be summarised as follows:

- There was overriding support for greater ambition in recycling, across waste streams;
- There was support for further reducing landfilling;
- Support was also shown for limiting incineration; and
- There was less support for waste prevention/reuse targets.

The views expressed as part of this consultation helped to shape the choice of policy options which were chosen for inclusion in the detailed cost-benefit analysis (see Appendix 3.0 for more details).

7.0 Front-Running Policy Options

This section presents the rationale and process whereby a number of front-running options were selected for inclusion in the Impact Assessment after careful consideration of a long list of options which emerged through stakeholder engagement and detailed analysis of the targets and some associated issues.

The process whereby an initial range of front-running policy options was identified was described in Section 3.3. As described, an initial list of options was defined after detailed analysis of a long list of options by the project team and careful consideration of the views of stakeholders, which were taken into account via a number of interviews and a comprehensive online consultation. The main target-based measures emerging from this review are outlined below. The full analysis of how these initial front-running options were identified is presented in Appendix 3.0 and the reader is referred to this for further details and a detailed explanation of the rationale behind the choices.

7.1 Waste Prevention Targets

7.1.1 Decoupling Targets

For most waste streams, the challenge regarding the availability of data is a significant one and presented significant challenges when it came to recommending a waste prevention target. It was decided that it would not be appropriate to introduce a decoupling target for municipal waste at this stage. Notwithstanding the difficulties of setting waste prevention targets at the EU level, not least, given the divergence in incomes and consumption levels across the EU, Member States are strongly encouraged to consider setting such targets within their own Waste Prevention Programmes (WPPs). This is especially the case for those Member States at higher per capita income levels where, although recycling rates may be higher, consumption is also at much higher levels, leading to higher levels of waste generation.

If a decoupling target were introduced for municipal waste – or indeed if it was used as an indicator by Eurostat – it would rely upon the measurement of municipal waste generation being harmonized across Member States. This is clearly not the case at present. A pre-requisite for sensible target setting for municipal waste prevention is likely to be a reporting system which covers the same wastes across all countries.

A potential indicator for monitoring the pace and extent of decoupling in Member States could be as follows:

1. Measure the average compound rate of change in municipal waste generation over a given time period (say a six year period) (A%);
2. Measure the average compound rate of change in a relevant economic indicator (for example, GDP per capita, or a measure of private consumption – preferably, an indicator which is already available, or easy to calculate from data which is already available) over the same time period (B%); and
3. Set targets for a change in the figure (B-A) such that this shows an increasing tendency over time. So, for example, the reported figure for the period 2017-2023 would need to be [x%, e.g. 15%] lower than in the period 2023-2029.

Note the time horizons suggested here would be intended to allow for definitions and reporting mechanisms to be developed, and for Member States to consider the measures to be used to achieve this. That having been said, it should be noted that if there is a specified % target in point 3 above (rather than a simple requirement for a

reduction), those countries that have moved furthest to act prior to 2017 in the above example would be placed at a relative disadvantage. Given that we would not wish to see strategic gainsaying of the measure holding back performance on waste prevention in the meantime, it might be better, in the first instance, to simply seek to ensure that the measure (B-A) is on a declining trend.

Note also that the above approach does not fall into the trap – exemplified by the discussion on relative versus absolute decoupling – of making it more difficult for countries which are growing faster to demonstrate good performance. This approach simply measures the gap between the change in waste quantities and the change in an economic indicator, and seeks to ensure that the 'gap' is widening over time (so decoupling is 'deepening').

7.1.2 Prevention Targets for Specific Waste Streams

Just under a half (45%) of stakeholders were of the opinion that no prevention targets should be set at all, whereas 55 % of the stakeholders support the introduction of prevention targets. Among the 'yes'-respondents, public authorities dominate, possibly reflecting the fact that the public authorities, according to the Waste Framework Directive's Article 29, have the responsibility to establish waste prevention programmes, and therefore, they might appreciate some specific measures and targets. Among the no respondents, the industrial trade bodies, industry representatives and European citizens were dominant.

The supporters of waste prevention targets suggested a large number of different waste streams to be targeted. The consultation showed that public authorities support, first of all, initiatives on food, WEEE and packaging, whereas industry, not-for profit-organisations and other organisations suggested a stronger focus on hazardous waste, total waste and residual waste. The last of these is not necessarily achieved through waste prevention, but can be achieved through additional recycling, and preparation for reuse.

It should be noted that the difficulties faced in setting a target which can be applied across all 28 Member States is not a difficulty which confronts each Member State as it develops its own WPP. Member States are, therefore, encouraged to set waste prevention targets for waste streams as appropriate. For those Member States currently generating smaller quantities of waste, the 'prevention' targets might be those which suggest an improvement in resource efficiency rather than a reduction in absolute quantities of waste. For the higher income Member States, on the other hand, absolute reductions (for example, targets expressed in kg per capita, or kg per household) would be more appropriate.

Acknowledging the difficulties associated with setting absolute reduction targets for the whole of the EU, it is still interesting to understand what the likely costs and benefits of such a target could be. A number of the stakeholders who felt that a waste prevention target should be introduced reported that food waste should be targeted. At the time of this work there was also interest in food waste prevention targets coming out of a parallel work stream which was being undertaken on the *Sustainability of the Food System*.[66] As part the work on the *Sustainability of the Food System* we were requested

[66] European Commission (2013) *Sustainable Food*, Date Accessed: 28 November 2013, Available at: http://ec.europa.eu/environment/eussd/food.htm

to consider an absolute reduction target for the prevention of food waste arising in the municipal waste stream. For this purpose we used the European Reference Model on Municipal Waste Management to model three scenarios and these provided a useful indication of the kind of benefits that may be derived should Member States decide to set food waste prevention targets as part of their WPPs. The description of the target and the results of this analysis are described in Appendix 11.0.

7.1.3 Additional Waste Prevention Measures

Given that conventional approaches to target setting were deemed difficult for waste prevention (not least, given issues associated with data quality), alternative approaches were suggested as follows:

- New requirements could be set on Member States to incrementally increase the number of prevention measures in place, and the overall coverage of these measures, with special focus on initiatives for food waste; and
- Introduce requirements for progressive coverage of households by pay-as-you throw schemes.

Note that in respect of the last of these, it was suggested that this could be made a requirement for Member States who were failing to meet recycling targets under, especially, Article 11(2)(a), but it was also recognised that this would have to predicated on the existence of high quality, and convenient, recycling services (so as to avoid the issue of dumping).

7.1.4 Summary

In summary, no 'decoupling targets' have been proposed in the review, based mainly on the view that the data does not allow for such targets to be set in a fair and transparent manner, the relative levels of income are so different in the different Member States, and also because measurement could prove difficult in the case of specific streams Member States are, however, well placed to establish their own targets on the basis of specific data and information that they may hold. For that reason, Member State should be encourage to set specific targets for preventing waste under their waste prevention programmes.

7.2 Preparation for Reuse Targets

The most frequently mentioned materials in the consultation were:

- WEEE;
- Furniture;
- Textiles;
- Beverage bottles; and
- End-of-life vehicles (ELVs).

In principle, the WEEE and ELVs Directives are not the subject of this review. It was felt more appropriate to review the case for such targets under the respective Directives.

In terms of reuse of textiles and furniture, the absence of clear information regarding exactly what happens today, and what the potential for reuse may be in different countries, makes it difficult to set targets at the pan-European level. That having been said, the benefits associated with reuse are clearly recognised (see Appendix 5.0). As with prevention targets, therefore, Member States are encouraged to set ambitious targets for preparation for reuse / reuse within their waste management plans / waste

prevention plans, particularly as regards furniture and textiles, but also, WEEE, vehicle parts and beverage containers.

7.3 Recycling Targets

7.3.1 Municipal Waste

Consultees felt that in the longer term a recycling target of 70% would be appropriate for municipal waste (Section 6.5.3). This will be challenging to achieve, but with sufficient lead time to progress to that target, experience suggests that it is likely – subject to some clarity in what can count towards the target, and the definition of 'municipal waste' – to be possible to achieve this. Given the clear steer from stakeholders as part of the public consultation and the Commission's broader objectives with respect to improving resource efficiency (Section 5.0), it was felt that more ambitious recycling targets warranted further investigation. In order to maintain credibility and ensure consistency with current plans, it was agreed that the Waste Framework Directive target of 50% by 2020 should not be changed. However, in order to give a clear signal on the future evolution of this target and the Commission's focus on improving resource efficiency within the Union, it was argued that medium- to long-term targets should be set. This would help to provide Member States and private investors with sufficient time to respond and would also help to prevent over investment in costly infrastructure that may discourage efforts to promote recycling or waste prevention in the future.

Some municipalities and/or regions already have recycling/preparation for reuse rates in the region of 70% to 85%. It is believed that this is close to the upper limit of what can readily be achieved by most Member States. In order to test the costs and benefits associated with different options three Scenarios were modelled using the European Reference Model on Municipal Waste Management (Table 7-1). These Scenarios reflect a range of ambitions and suggest different timings for when the targets may be introduced. Further discussion of what the 70% recycling/preparation for reuse rate may imply is presented in Appendix 6.0.

Table 7-1: Modelled MSW Preparation for Reuse and Recycling Scenarios

Scenario	Target Year		
	2020	2025	2030
60% MSW recycling/preparation for reuse target by 2030	50%	50%	60%
65% MSW recycling/preparation for reuse target by 2030	50%	-	65%
70% MSW recycling/ preparation for reuse target by 2030	50%	60%	70%
Calculation method used to measure Member State performance against the target[1]	Measured using existing approach (i.e. one of 4 Methods)	Calculation Method 4 for all Member States (i.e. % MSW recycled)	

Note: 1. Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods – see: Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF.

Although favoured by most stakeholders, it was felt that defining material based reuse/recycling targets for municipal waste would be unnecessary if the recycling target was sufficiently ambitious. Indeed, if recycling rates were to be raised to 70%, or somewhere within this region, it would be reasonable to suspect that the vast majority of readily recyclable materials – including, both the 'dry' and 'wet' fractions – would have to be collected for recycling or prepared for reuse. In this instance the inclusion of material specific targets would increase the administrative burden associated with reporting against the target without actually altering the reality that all readily recyclable materials would have to be captured. Imposing additional material-based targets and the related reporting obligation on the Member States therefore appears to have a limited added value, while limiting the flexibility which should be left to the Member States to ensure that local conditions and specific waste compositions are taken into account when planning their recycling collection schemes. Note that this does not imply a change in the definition of recycling, rather, it seeks to ensure that recycling – as currently defined – is reported more accurately.

7.3.2 Construction and Demolition Wastes

A measure to remove backfilling from the Article 11(2)(b) target did not find much favour with consultees for reasons which are not entirely clear. Given the reticence shown by some stakeholder groups for this measure and the limited data on C&D arisings, composition and treatment pathways, it was decided that this measure would not be analysed in detail. Instead, it was suggested that measures aimed at encouraging on-site sorting of C&D waste, and especially hazardous waste, should be encouraged. There was also support for making the definition of 'backfilling' very clear in terms of how it could contribute to the existing target.

7.3.3 Packaging Waste

New recycling targets were suggested for packaging waste as part of an extension of the existing targets in Article 6(1) of the Packaging and Packaging Waste Directive. This suggestion reflects the outcomes of the consultation and the levels of performance already reportedly being achieved by some Member States. These appear self-explanatory, but as we indicate below, they need to be predicated on better reporting of what is actually being recycled (and monitoring and checking of what is being reported). Once this is done, it may well be that the recycling rates currently reported to Eurostat change (and many are likely, in our view, to fall).

Consultees suggested that these targets could be met by early in the 2020s. The targets are likely to be most challenging for plastics, which is the material for which the greatest number of Member States currently report achieving the recycling target, which is comparatively low at present (at 22.5%). The packaging recycling rates being achieved by some of the better performing Member States show that there is significant scope to improve the rates being achieved in other Member States over the medium-term (see Section 4.2.3).

The possibility to define additional targets for materials having a larger impact on the environment and on energy demand, such as non-ferrous metals – mainly aluminum – should be considered. Some Member States are meeting the target on metal without making the same level of progress on non-ferrous metals as they do on ferrous metals, with ferrous metals tending to dominate in the combined weight. It is therefore proposed to progressively increase the recycling rate in order to make progress towards the actual performances met in the 'top 3' Member States - 95% for paper/cardboard, 91% for

metals, 95% for glass, and 81% for wood. The case of plastics is a little different: the actual 'top 3' Member States are recycling 46% of packaging plastics. According to the EU plastic industry, the target could be increased to 62% with additional efforts on source separation of waste, although close inspection shows this to be a figure for the quantity that could be collected (and that the level of actual recycling that would be achieved is much lower).[67] Knowing the significant impact of plastics on the environment, it is proposed to increase the target to 45% by 2020 and to 60% by 2025. New longer-term targets could be fixed by 2030 on the basis of the evolution of the types of plastics placed on the market and the development of new recycling technologies. A detailed outline of the above rationale is provided in Appendix 7.0.

The suggested targets for individual packaging materials are summarised in Table 7-2. It can be seen that these increase progressively until 2030, with interim targets in 2020 and 2025. As part of the review process some consideration was given to including the reuse of packaging materials within these targets. Although this has not been considered as part of the analysis here, Appendix 12.0 considers how this may be done in the future.

Table 7-2: Modelled Packaging Recycling Scenario

Scenario	Target Year		
	2020	2025	2030
Increased packaging targets			
• Plastics	45%	60%	60%
• Non-ferrous metal	85%	90%	90%
• Ferrous metal	70%	80%	90%
• Glass	70%	80%	90%
• Paper/Cardboard	85%	90%	90%
• Wood	50%	65%	80%

In respect of recovery, it was felt that the target was no longer necessary. Quite apart from the fact that few packaging recovery systems strongly influence the non-recycling recovery landscape, if other policies were limiting landfill (see next section), then the case for such a target falls away.

7.4 Landfilling

A core objective of the 7th EAP is to phase out landfilling (see Section 5.0).[68] Six Member States are currently landfilling less than 5% of their municipal waste, which might be considered as corresponding to 'unrecoverable residual waste'. These Member States have all introduced landfill taxes followed for most of them by landfill bans on specific types of materials or waste streams.

[67] BIO Intelligence Service (2013) *Study on an Increased Mechanical Recycling Target for Plastics*, Report for Plastics Recyclers Europe, August 2013, www.plasticsrecyclers.eu/news/plastics-can-be-recycled-more-60-2020

[68] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

While it was acknowledged that the option of limiting landfill to a certain percentage of municipal waste was not strongly favored by most stakeholder groups in the Consultation on European Waste Management Targets (Section 6.5.5), it was a strongly favored option coming out of the Consultation on the Green Paper on Plastic Waste which was undertaken in parallel to this study.[69] Given this and the fact that it remains a core objective of the Commission's resource efficiency agenda, the Commission was interested in investigating the costs and benefits associated with the introduction of a landfill restriction of this nature. To that end, a landfill ban scenario was modelled as shown in Table 7-3, in which the amount of MSW sent to landfill falls to 5% of total MSW arisings by 2030.

The intention would be that the landfill ban would replace the existing landfill reduction target for biodegradable municipal waste for which the latest deadline is 2020. The Landfill Directive Article 5(2) target, with all its associated issues, would therefore be dropped and replaced with a ban which could be measured more easily.

Table 7-3: Modelled Landfill Ban Scenarios

Scenario	Target Year		
	2020	2025	2030
Limiting the landfilling of MSW residual waste to 5%	-	-	5% of MSW to landfill

7.5 Target Waste Streams for 'Requirements to Sort' Waste

Given the difficulties in setting specific recycling targets for many waste streams, mainly related to data quality issues, but recognizing the desire to make progress on some specific waste streams, it was suggested that, in line with approaches already taken in a number of countries, some 'requirements to sort' specific waste streams could be introduced for businesses. These measures are often targeted at businesses in key sectors and above a certain size / level of waste generation. Although there is much discussion of the need for 'landfill bans'; for some materials, in our consultations with stakeholders, it often became clear that what they were discussing was 'a measure to increase recycling of the target material'. In this context, it should be recognized that landfill bans do not guarantee any additional recycling of materials (not least, in countries which already have them in place) whilst requirements to sort waste for recycling address the desirability of increasing recycling in a more direct manner.

Business food waste was highlighted as one possible area, but it was felt that this could be extended to other materials (the typical dry recyclables, for example). In addition, sorting of wastes at C&D sites, with a special focus on hazardous waste (to improve recyclability of the remainder) was recommended.

[69] BIO IS (2013) *Analysis of the Public Consultation on the Green Paper "European Strategy on Plastic Waste in the Environment",* Report of the European Commission, November 2013, http://ec.europa.eu/environment/waste/plastic_waste.htm

7.6 Paving the Way for New Targets

7.6.1 Data and Statistics

There are some important principles which underpin the setting of any targets, especially if they are to be uniformly applied across all Member States. In essence, these relate to issues surrounding definitions of what is being reported on, and the way in which performance data is reported. Many of the stakeholders consulted as part of this project felt that the quality of data being used to assess performance did not reflect the 'on-the-ground' reality. It is no exaggeration to state that, from the perspective of this review, the absence of reliable statistics that allow for a like-for-like comparison of Member States' performance in respect of waste management has been a major obstacle to the setting of targets which focus on the upper tiers of the hierarchy. For example, if targets are to be set for, for example, waste prevention, then in order for each Member State to be treated fairly and equally by such targets, or equally, in order that one can know how the target will take effect, then it stands to reason that the target should apply to the same waste stream. The data available does not allow, for example:

- A proper comparison of household waste quantities, since some countries lack the ability to differentiate between household and municipal wastes, so that the data on waste generation reported under the Waste Statistics Regulation (WStatR) as arising from households sometimes relates to waste from households and businesses using the same system used to collect household waste;
- A proper comparison of municipal waste generated, since although the definition of municipal waste seeks to be clear about what should, or should not be, included within the definition, Member States do not apply this definition correctly (so that what is reported as 'municipal waste' effectively covers different waste streams in different Member States);
- A meaningful comparison of recycling performance across Member States, partly for the above reasons, but also, because different Member States choose to report 'recycling' at different points in the flow of materials from the generator of waste to the point where it is actually recycled. In respect of packaging, this problem is, arguably, exacerbated by the fact that the Commission Decision of 2005 (Decision 2005/270/EC) effectively allows for such an approach.[70] The fact that Member States should do this only where losses post sorting are 'not significant' makes light of the difficulties in understanding the true extent of such losses, as well as the moral hazards which arise when entities obliged to achieve the stated recycling rates are those reporting what has been achieved;
- A meaningful understanding of sectoral performance in respect of waste management since the reporting of data under WStatR does not require the reporting of the management of waste on a sectoral basis, and the treatment figures under WStatR relate to waste treated in the country concerned (irrespective of its origin), not the treatment of the waste which originates in the country itself;

[70] European Commission (2005) *Commission Decision of 22nd March 2005 Establishing the Formats Relating to the Database System Pursuant to Directive 94/62/EC of the European Parliament and of the Council on Packaging and Packaging Waste*, Decision 2005/270/EC, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32005D0270:EN:NOT

- Any understanding of the extent of progress in respect of reuse and preparation for reuse, since the reporting of this is almost wholly absent, though some Member States make voluntary reports on this in respect of packaging waste;

These and other issues have made it extremely difficult to consider, at the level of the EU, how targets should be set in respect of, for example:

- Household waste prevention targets – it would have been interesting to set absolute caps on the generation of household waste per household or per inhabitant, but as long as this reporting suffers from the existing shortcomings, it is unclear how these could, or should, be set;
- Municipal waste prevention targets - these would appear to be open to abuse if Member States were able to meet targets through periodic adjustments in the scope of what is reported as municipal waste;
- Sectoral waste prevention / recycling targets; and
- Targets in respect of recycling for specific sectors.

Another target which could have been considered, and which the consulting team felt held considerable merit, would have been a target for the generation of residual household waste per inhabitant. In many respects, this indicator is one of the fairest across Member States with different levels of household income, and hence, consumption. Across the 28 Member States, actual individual consumption, adjusted for purchasing power parity, varies by a factor of 2.5 (see Section 4.0 of the main report). In this context, setting targets in terms of percentage, or absolute reductions from the current level in each Member State would appear to be unfair.

It has also to be considered that whereas the reporting of statistics under a gentleman's agreement may carry with it no 'sanction' for misreporting or poor performance, the situation changes once Member States are required to meet targets which have a legal basis. In such circumstances, the need for performance data to reflect accurately – within reason - what it is intended to be measured is a more pressing one.

Eurostat is taking steps to address some of the above shortcomings, and the steps being taken are expected to lead to progressive improvements in the future. It is not clear, however, how long it would take before such a process enables a more meaningful comparison of performance. In addition, much of the data reported to Eurostat is not widely used at present, with the data reported under the Waste Statistics Regulation, for example, being unable to indicate performance under the key waste Directives. There would appear to be considerable potential for rationalisation of the reporting of data, therefore, at the same time as its quality is enhanced. In principle, this may enable Member States to experience a reduction in some areas of reporting which are currently required under WStatR, at the same time, encouraging them to generate data of higher quality for reporting against the key targets in various Directives.

In what follows below, we consider the matter of reporting on 'recycling', and the reporting on 'municipal waste'.

7.6.2 Reporting on Recycling

It is clear that there are various stages at which losses can occur in the passage of materials from the point at which they are collected to the point at which they are actually recycled (see Figure 4-8 in Section 4.2.1.1). These losses can result from a number of factors including, for example, the rejection of non-target materials, or the mis-sorting of materials into the wrong waste stream. The nature and extent of these losses are discussed in more detail in Appendix 9.0. In essence, the amount of material

lost along the 'recycling chain' varies depending on the approach to collection, the type of material – for example, metals are typically easier to sort than plastics and thus have lower loss rates – and the sophistication of the sorting technology where this is used / necessary. Therefore, what is collected for recycling is not necessarily the same as what is recycled though systems which sort materials on the vehicle, and the materials collected under deposit refund schemes come closest to this approximation. Even after sorting of materials (and some materials will go through various 'sorts' at different facilities), losses may not be insignificant. Generally, therefore, what is recycled is less than the output from a 'first sort' of material which is sent for recycling, and this, in turn, will be less than what is collected for recycling.

As materials in waste have diversified, and as, more recently, collection and sorting systems have increased in their scope (in terms of materials, particularly plastics) and sophistication, the complexity of the material flows has increased. In many cases, it would appear that the systems of data capture, some of which have never been especially comprehensive, are failing to keep pace with these developments.

In principle, an accurate approach demands that what has been collected in the Member State concerned is tracked through to the point at which it enters a recycling process. In practice, because of the approaches to sorting, handling and marketing of materials, this is a relatively complex process.[71] In order to understand the quantity of, and fate of, all wastes, therefore, a means to track materials through processes in such a way as to obtain mass balances seems to be an essential requirement. In principle, Member States could seek to understand this through surveying facilities. There may, however, be moral hazards associated with this where facilities have an interest in reporting outcomes in a manner which does not reflect the prevailing reality. In addition, the increasing complexity of the flows of materials would also make this a rather extensive exercise (the survey would have to follow the materials from one facility to another, through bulking processes, treatment processes, primary, secondary and tertiary sorting processes, etc.).

It is recommended, therefore, that Member States develop systems of data capture that allow them to understand the fate of materials as they pass from the point of collection through to the point where they are actually recycled. Where these are purely 'paper based', it seems likely that the complexity of the flows from one facility to another, combined with the number of facilities, would make any sensible interpretation of the data an enormous undertaking. It is known that some countries, such as the UK, which have based their systems on such an approach have made little or no use of the data which this system generates. As such, there appear to be strong arguments for implementing systems of electronic data capture and manipulation, whereby waste is effectively tracked from the point of generation through the various stages of treatment which it may undergo on its journey to being prepared for reuse, recycled, treated or disposed. Such systems should be designed so that flows of waste into, and from, each treatment facility can be examined straightforwardly on the basis of the information reported.

[71] See for example, Eunomia Research & Consulting (2011) *Survey of Welsh Local Authorities: Reporting of End Destinations in WasteDataFlow*, Report for Welsh Local Government Association, June 2011, www.wlga.gov.uk/download.php?id=4317&l=1

In the context of an agenda encouraging increasing resource efficiency and seeking to help a circular economy to flourish, continuation of the status quo no longer appears adequate. As increasing value is accorded to materials in the waste stream, stakeholders need to understand the fate of materials in order to know what quantities of which materials are managed in different ways from various sources. Hence, improved accuracy of data and reporting is expected not only to ensure that the reporting of performance in respect of recycling is made on a more comparable basis, but also, to facilitate the planning of investments which might be made in managing waste in a more sustainable manner in future.

7.6.3 Reporting on Municipal Waste

Section 4.3.1 outlines a number of issues associated with the current definition of municipal waste and why this is ambiguous and leading to significant inconsistencies in Member State reporting. A clear building block underpinning any target should be a consistent means of measurement and verification. The potential for improving the reporting on municipal waste has to start from a clear definition about what it is that should be reported upon. The current definition is lengthy, and appears to have been extended over time rather than being sensibly reformulated.

We review four possible ways in which municipal waste can be defined in Appendix 9.0. From this we draw a number of conclusions which should be considered in order to ensure that improved harmonisation occurs across the 28 Member States. These recommendations include updated definitions for both household and municipal waste and it is suggested that Member States report on both waste streams in future.[72] Member States should also be required to report on reuse/preparation for reuse and ensure that their reporting allows for a clear understanding of the mass balance of materials to obtain a clear understanding of how materials flow through the system.

7.7 Going Beyond Targets

As well as some of the matters mentioned above in respect of reporting, the review suggests that additional measures which could be used to foster improved performance in Member States which show signs of 'falling behind' include:

1. Introducing economic instruments where Member States are moving too slowly to meeting legally binding targets;
2. Two linked measures regarding the development of quality recycling services, as follows:
    a. Member States not fulfilling binding targets or moving too slowly in fulfilling have an obligation to develop criteria for municipalities (competent authorities) to implement services of a minimum standard to enable sorting of a range of waste materials for recycling and composting / anaerobic digestion; and
    b. Pay as you throw schemes for collection and treatment of household and municipal waste.
3. Develop EU guidance on the proper implementation of the waste hierarchy with focus on the EU binding targets and an obligation for Member States to develop a

[72] They are already required to do this under WStatR.

national guidance on the same items. One possibility for giving the EU guidance more impact could be to link the fulfillment of the EU guidance as a condition for receiving funding from the EU Cohesion Fund.

7.8 Summary of Options to be Modelled

For the sake of clarity, and ease of reference, the scenarios carried forward into the modeling stage are presented in Table 7-5 below. This table also includes a number of additional Options which were modelled to assess variations on the scenarios outlined above.

For the purposes of analysing the possible impacts of introducing derogations as part of Option 3.4.b Member States were categorised into three groups as shown in Table 7-4. These country groupings are referred to in Table 7-5.

Table 7-4: Tentative Grouping of Member States Based on Current Performance

Group 1	Group 2	Group 3
Member States landfilling less than 10% of municipal waste and recycling more than 40% of their MSW (2010)	**Member States landfilling between 10% and 60% of municipal waste and recycling between 30% and 40% of their MSW (2010)**	**Member States not covered by Group 1 or 2**
The following 7 Member States: AT, BE, DE, SE, DK, NL, and LU	The following 7 Member States: IE, SP, SI, IT, FR, FI, and UK	14 remaining Member States

7.8.1 Supporting Measures

In addition to the above recommendations on reforming the targets, the project team proposed a range of measures which reflect the aspirations of the Resource Efficiency Roadmap. A number of the measures outlined above are predicated upon the matter of data quality and comparability being addressed. From the various review processes outlined in Appendix 3.0, these are as follows:

1. Establish a legal obligation for reporting on 'municipal waste' and implementing a single unambiguous definition of the term, to be used by all Member States (see Section 7.6.3 for more details).
2. Ensure, as far as possible, one standardised approach is in place for performance measurement and progress reporting against any target which is set in any Directive. Specifically, the following should be avoided:
    a. Allowing Member States to report, as 'recycling', waste that has been collected for recycling, or waste that is the output of sorting plants; and
    b. Establishing Guidance that diminishes the potential for making cross checks on the quality of data, for example, between waste generated and waste treated.

    These comments apply equally to Directives, and associated targets, on packaging, landfill and the Waste Framework Directive. It should be noted that, as well as becoming a clear pre-requisite for making further proposals on targets in the various Directives, the above was strongly favoured by stakeholders (see Appendix 3.0). Stakeholders felt that specific, detailed and binding EU- guidance

to Member States regarding how implementation will be monitored and data reported should be developed.

3. Monitoring and validation of the reports submitted by Member States needs to be enhanced so that the consistency and reliability of data can be validated. In this respect, it was noted that the process of statistical validation has to become more than a desk exercise, and should be informed by the operational realities which prevail in the Member States. So, for example, if the collection schemes are known to be of relatively low quality, or inconvenient, then the reporting of high recycling rates should be a trigger for some checks on this. Equally, comparatively high rates of recycling of one material vis a vis others (for example, under the Packaging Directive) ought to be investigated more closely.
4. The targets under the Packaging Directive could potentially allow for some recognition of reuse in the recycling target (a detailed discussion of how this may work is included in Appendix 12.0).
5. The maximum limit of 80% recycling in the Packaging Directive should be removed.
6. The recovery target under the Packaging Directive is no longer required.
7. Regarding the Article 11(2)(b) Waste Framework Directive target on C&D waste, there is deemed to be a need to provide clear definitions (also giving examples) of recycling and material recovery / backfilling, and how these should be calculated for the C&D waste stream.
8. The definitions for terms such as 'municipal waste', 'reuse', 'recycling' and 'composting' should be set out clearly in the Waste Framework Directive, with all other Directives cross-referencing these definitions. This would ensure consistency of application of the definitions across all Directives. It is recognized that specific terms may have to be defined for the first time in new Directives. It might be helpful for definitions to be updated in this regard.

Another measure which found favour as a result (in considering measures beyond targets) was as follows:

> *"Ensure proper monitoring by an obligation to introduce centralized registers on national or regional level that waste generators, waste collectors and waste treatment facilities have to report data to in an electronic version"*.

Clearly, such a measure would not be without its costs, but it might also bring significant benefits, both in terms of performance monitoring, but also, in respect of clamping down on illegal movements of waste. The costs of introducing such a scheme are discussed in more detail in Appendix 8.0.

Finally, it was suggested that in future, the following matters might usefully be reported on:

1. The level of packaging reuse;
2. With appropriate boundaries, the level of reuse, and preparation for reuse, of items such as (W)EEE, furniture and textiles; and
3. Generation and management of food waste, preferably by sector.

The above measures summarise the key measures which are not target based, but which underpin the setting of targets. We believe this would improve the effectiveness of existing measures, and allow for a proper monitoring of implementation and performance across Member States. Importantly, this also means that the actual level of performance currently achieved might be different to what is currently reported once the reporting is clarified and properly harmonized.

We recognize that it is tempting, in situations such as this, to try to ensure that 'time series data' is, in some way, consistent. We would encourage the Commission and Eurostat to set such considerations aside in the first instance, and consider, rather, the need to establish a sound basis for data gathering and performance measurement. If the objective is to maintain consistency with the past, then clearly, it will not be possible to overcome the limitations of existing data and performance reporting, which is exactly what the above measures seek to achieve.

In addition, it seems clear from the fate which has befallen some Directives and the reporting against them, notably the Waste Framework Directive, that where reporting matters are not more clearly delineated in the Directive itself, too much scope for dilution of the meaning of the Directive is left open. As a result, as a matter of principle, there is much to be said for seeking to ensure that more of the requirements in respect of reporting are dealt with in the Directives themselves so as to leave less room for 'interpretation' once the Directive has been agreed. It is clear that where this does not happen, the intent of the Directives can be readily dissipated.

Table 7-5: Summary of Modelled Options

Option Number	Description of Option		Target Year			Comments
			2020	2025	2030	
Option 1.0	Business as usual		-	-	-	This is Baseline 1 as outlined in Section 3.4. This Baseline presents an objective view of likely future waste management based upon realistic expectations for the performance and delivery of future waste management systems.
Option 2.0	Full implementation of existing targets		50%	-	-	This scenario assumes full implementation of the existing targets. This includes the current 50% recycling/preparation for reuse target in the Waste Framework Directive, performance against which can be measured by one of four methods.
Option 3.1.a	60% MSW recycling/preparation for reuse target by 2030		50%	50%	60%	Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods.[1] These Options assumed that Member States will use their chosen method for the existing 2020 target. For the 2025 and 2030 targets these Options assume that calculation Method 4 is used by all Member States (i.e. % MSW recycled).
Option 3.1.b	65% MSW recycling/preparation for reuse target by 2030		50%	-	65%	
Option 3.1 .c	70% MSW recycling/preparation for reuse target by 2030		50%	60%	70%	
Option 3.2.a	Increased packaging targets without split target for metals	Plastics	45%	60%	60%	This Option assumes separate targets for each type of packaging material listed here, other than for metals for which a combined target was modelled.
		Metal	80%	90%	90%	
		Glass	70%	80%	90%	
		Paper/Card	85%	90%	90%	
		Wood	50%	65%	80%	
Option 3.2.b	Increased packaging targets with split targets for metals	Plastics	45%	60%	60%	This Option is identical to Option 3.2.a other than for considering separate targets for ferrous and non-ferrous metals.
		Non-ferrous metal	85%	90%	90%	
		Ferrous metal	70%	80%	90%	
		Glass	70%	80%	90%	
		Paper/Card	85%	90%	90%	
		Wood	50%	65%	80%	
Option 3.3	Limiting the landfilling of MSW residual waste to 5%		-	-	5% of MSW to landfill	This Option assumes that landfilling is restricted to 5% of MSW generated in 2030.
Option 3.4.a	Combination of Options 3.1.c, 3.2.b, and 3.3		as above	as above	as above	This is a combined scenario that looks at the overall impact of introducing a 70% MSW recycling and preparation for

Option Number	Description of Option	Target Year			Comments
		2020	2025	2030	
					reuse target in 2030 alongside a 5% landfill ban in 2030. In addition to this, it also assumes that packaging recycling rates are increased as shown under Option 3.2.b above.
Option 3.4.b	Combination of Options 3.1.b, 3.2.b, and 3.3 with different deadlines for some Member States	as above, but with different timings for Group 1 and Group 2 countries	as above, but with different timings for Group 1 and Group 2 countries	as above	The different deadlines assumed in this Option are as follows: Group 1 and 2 Member States (see Table 7-4) are obliged to meet the 2020 recycling/preparation for reuse target using Method 4 only, whereas Group 3 countries would be given until 2025. All countries would be obliged to meet the 60% recycling/preparation for reuse target by Method 4 in 2025 and 70% recycling/preparation for reuse in 2030. In terms of the landfill ban in this Option Group 1 countries are required to meet the 5% target by 2020, whereas Group 2 and 3 countries have until 2030 to achieve the target.
Option 3.4.c	Combination of Options 3.1.b, 3.2.b, in addition to limiting the landfilling of all waste sent to Category B landfills to 5% of total arisings by 2030.[2]	as above	as above	as above, but including ban on waste going to Category B landfills	This Option simply scales the benefits for a combined scenario by prorating Option 3.4.a to the totality of wastes landfilled at Category B landfills in 2011.

Notes:

1. *Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF.*
2. *Council Decision of 2003/33/EC refers to B1a, B1b, B2, and B3 landfills. Category B landfills are those that are licensed to accept non-hazardous waste and it is these landfills which form the focus of this analysis. See Commission Decision of 19th December 2002, Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Pursuant to Article 16 of and Annex II to Directive 1999/31/EC, Decision 2003/33/EC, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003D0033&from=EN.*

8.0 Analysis of Front-Running Policy Options

This section of the report analyses the policy Options presented in Table 7-5. For the main targets affecting municipal waste the impacts were assessed using the European Reference Model on Municipal Waste Management.[73] A separate module was created to assesses the scenarios which related to packaging waste as not all of this material falls inside the municipal waste stream (see Section 3.4 for an explanation of these models). A detailed breakdown of all results by Member State is presented in Appendix 10.0.

8.1 Business as Usual Scenario

We present here the results of the business as usual scenario. This scenario is the Baseline 1 scenario which, as stated in Section 3.4, refers to the likely outlook of future waste management in each Member State based upon currently available information and a realistic expectation for the performance of future waste management systems. This baseline was developed as part of the Member State consultation and country visits that took place as part of the development of the European Reference Model on Municipal Waste Management. It should be noted, therefore, that these figures reflect information provided by Member States, as well as an estimation of future performance.

The model outlined above allows for the 'distance to targets' to be assessed for each Member State. These assessments are made against a predefined baseline projection of likely future performance in a given Member State. If we assess the likely distance of Member States from the 50% recycling/preparation for reuse target in 2020 against business as usual it is evident that 10 Member States are likely to miss the target under Method 2 (i.e. the calculation method which allows the 50% target to be achieved with the least amount of effort). This is summarised in Table 8-1 below. Under the more challenging methods – that is, Method 3 and Method 4 – a total of 20 Member States could fail to achieve the targets and the distance to targets will be far greater than under the first two calculation methods.

[73] Eunomia Research & Consulting and Copenhagen Resource Institute (2014) *Development of a Modelling Tool on Waste Generation and Management*, Report for the European Environment Agency and DG Environment at the European Commission, February 2014, www.wastemodel.eu

Table 8-1: Distance to the Waste Framework Directive 50% Recycling and Preparation for Reuse Target in 2020

Member State	Target Met				Amount by Which Recycling Target is Exceeded (+ve) or Unmet (-ve), %				Chosen Method[1]
	Method 1	Method 2	Method 3	Method 4	Method 1	Method 2	Method 3	Method 4	
Austria	Yes	Yes	Yes	Yes	8%	24%	9%	9%	Method 2
Belgium[2]	Yes	Yes	Yes	Yes	4%	27%	5%	5%	Method 4
Bulgaria	Yes	Yes	No	No	0%	6%	-26%	-26%	Method 3
Croatia	No	No	No	No	-20%	-19%	-31%	-31%	Method 2
Cyprus	No	No	No	No	-15%	-12%	-29%	-29%	Method 1
Czech Republic	Yes	Yes	No	No	0%	0%	-25%	-25%	Method 2
Denmark	Yes	Yes	Yes	Yes	12%	19%	5%	5%	Method 4
Estonia[3]	No	Yes	No	No	-6%	0%	-17%	-17%	Method 2
Finland	No	Yes	No	No	-6%	3%	-14%	-14%	Method 4
France	No	Yes	No	No	-15%	5%	-12%	-12%	Method 2
Germany	Yes	Yes	Yes	Yes	24%	23%	14%	14%	Method 4
Greece	No	No	No	No	-12%	-9%	-25%	-25%	Method 2
Hungary	No	Yes	No	No	-5%	2%	-19%	-19%	Method 2
Ireland[3]	Yes	Yes	Yes	Yes	10%	20%	2%	2%	Method 1
Italy	No	Yes	No	No	-2%	7%	-8%	-8%	Method 2
Latvia[3]	No	No	No	No	-12%	-11%	-33%	-33%	Method 4
Lithuania	No	Yes	No	No	-3%	2%	-21%	-21%	Method 2
Luxembourg	Yes	Yes	No	No	10%	22%	0%	0%	Method 3
Malta	No	No	No	No	-27%	-21%	-37%	-37%	Method 1
Netherlands[2]	Yes	Yes	Yes	Yes	2%	25%	3%	3%	Method 4
Poland	No	No	No	No	-17%	-15%	-30%	-30%	Method 2
Portugal	No	No	No	No	-21%	-21%	-38%	-38%	Method 2
Romania[3]	No	No	No	No	-24%	-20%	-37%	-37%	Method 2
Slovakia	No	No	No	No	-16%	-10%	-31%	-31%	Method 2
Slovenia	No	Yes	No	No	-1%	5%	-7%	-7%	Method 4
Spain	No	No	No	No	-12%	-7%	-27%	-27%	Method 4
Sweden	Yes	Yes	Yes	Yes	20%	24%	10%	10%	Method 2
United Kingdom	Yes	Yes	Yes	Yes	10%	20%	2%	2%	Method 3
No. missing target	**17**	**10**	**20**	**20**	-	-	-	-	-

Notes:

1. *Unless otherwise identified the chosen calculation methods were taken from the Directive 2008/98/EC Implementation Reports produced by each Member State. This information was correct as of 12th December 2013.*
2. *At the time the modelling was undertaken Belgium and the Netherlands had not identified which calculation methods they intend to use, for the purposes of the modelling it was assumed that Method 4 would be used by both countries.*
3. *Information on the chosen calculation method was provided by contacts in each Member State as part of the model development and could not be verified through the Directive 2008/98/EC Implementation Reports which had not been received at the time of modelling (i.e by 12th December 2013).*

According to Baseline 1 projections 15 Member States will not have achieved the Landfill Directive target for the diversion of biodegradable municipal waste by 2020. Table 8-2 and Figure 8-1 shows the extent to which these Member States will miss their specific diversion target. The figures are expressed in terms of the amount by which the countries exceed the amount of biodegradable waste they are allowed to landfill in the final target year (2016 or 2020) (the final target), expressed as a percentage of that final target amount. All of these countries, other than for Spain and Hungary, have a derogation, meaning they need to achieve the Article 5(2)(c) target by 2020.[74] The Czech Republic is likely to be the furthest from the target as it is forecast to exceed the amount it is allowed to landfill by 111%. There are a number of other Member States, including Slovakia, Romania, Latvia, and Cyprus, that are also likely to miss the target by a significant margin.

Table 8-2: Distance to the Landfill Directive Biodegradable Municipal Waste Diversion Target set in Article 5(2)(c) in 2020

Member State	Target Deadline	Amount by which Landfill Target is Exceeded in 2020, %
Czech Republic	Derogation to 2020	111%
Slovakia	Derogation to 2020	81%
Romania	Derogation to 2020	81%
Latvia	Derogation to 2020	71%
Cyprus	Derogation to 2020	70%
Croatia	Derogation to 2020	67%
Greece	Derogation to 2020	65%
Malta	Derogation to 2020	63%
Poland	Derogation to 2020	23%
Lithuania	Derogation to 2020	21%
Portugal	Derogation to 2020	21%
Bulgaria	Derogation to 2020	17%
Slovenia	Derogation to 2020	7%
Spain	2016	5%
Hungary	2016	3%

[74] European Environment Agency (2013) *Managing Municipal Waste – A Review of Achievements in 32 European Countries*, EEA Report No 2 / 2013, www.eea.europa.eu/publications/managing-municipal-solid-waste/download

Figure 8-1: Distance to the Landfill Directive Biodegradable Municipal Waste Diversion Target set in Article 5(2)(c) in 2020

The full details on Baseline 1 are discussed as part of the report which accompanies the European Waste Management Model. Before we examine the Options considered in this report, we summarise how the full implementation scenario (Option 2) compares to Baseline 1.

8.2 Full Implementation Scenario

All of the Options analysed below are compared against a scenario under which full implementation of the existing legislation is assumed. This is because the proposed legislative changes build on the existing legislation which Member States are already obliged to implement. This work is not intended to provide an *ex-post* analysis of the current legislation, but uses the results presented here to illustrate the approximate distance that still needs to be travelled in order to achieve full implementation across the EU28.

Apart from measures taken to improve implementation such as improved statistics, promotion of economic instruments, improvement of the functioning of the extended producer responsibility schemes and other measures that may be required to meet

existing targets, no additional changes in the legislation are included in the full implementation scenario.

By comparing the costs against the full implementation scenario it is possible to identify the additional costs and benefits associated with implementing the changes proposed by each Option presented in Table 7-5. The full details of how this is done and some of the key assumptions are summarised in Appendix 4.0. In summary, the model takes into account the following costs and benefits:

- **Costs of waste collection and treatment** – Achieving higher recycling rates will require changes to the collection systems operating in a number of Member States as they move towards capturing greater quantities of material. For example, a Member State may start with 'bring systems' focusing mainly on 'dry recyclables', but the model assumes a progressive move towards door-to-door collection systems in order to target a wide range of recyclables, and biowaste. In order to achieve the higher recycling rates modelled in these policy Options it is assumed that Member State collection systems will have to evolve over time. The changing collection costs associated with this transition are taken into account within the model. The model also accounts for changing amounts of waste requiring disposal, treatment or recycling and this is factored into the final costs presented here. The costs are expressed net of revenues from the sale of materials to recyclers.
- **Environmental damage costs** – the model accounts for environmental damages, also known as external costs, associated with emissions to air. The model defines the damage costs for GHGs and a number of common air pollutants and also identifies what emissions are likely from a comprehensive range of waste treatment and disposal technologies. In this way damage costs can be calculated depending on the quantity of waste being treated via each form of technology. Further details of what is included and excluded from the environmental damage cost calculations are provided in Appendix 4.0.
- **Effects on employment** - The upper tiers of the waste hierarchy (preparation for reuse and recycling) are much more labour intensive than disposal and incineration; thus, the movement of waste up the hierarch is generally associated with an increase in employment opportunities. Based on changes in material flows, the model allows for a high level assessment of the likely impacts that each scenario will have on employment.

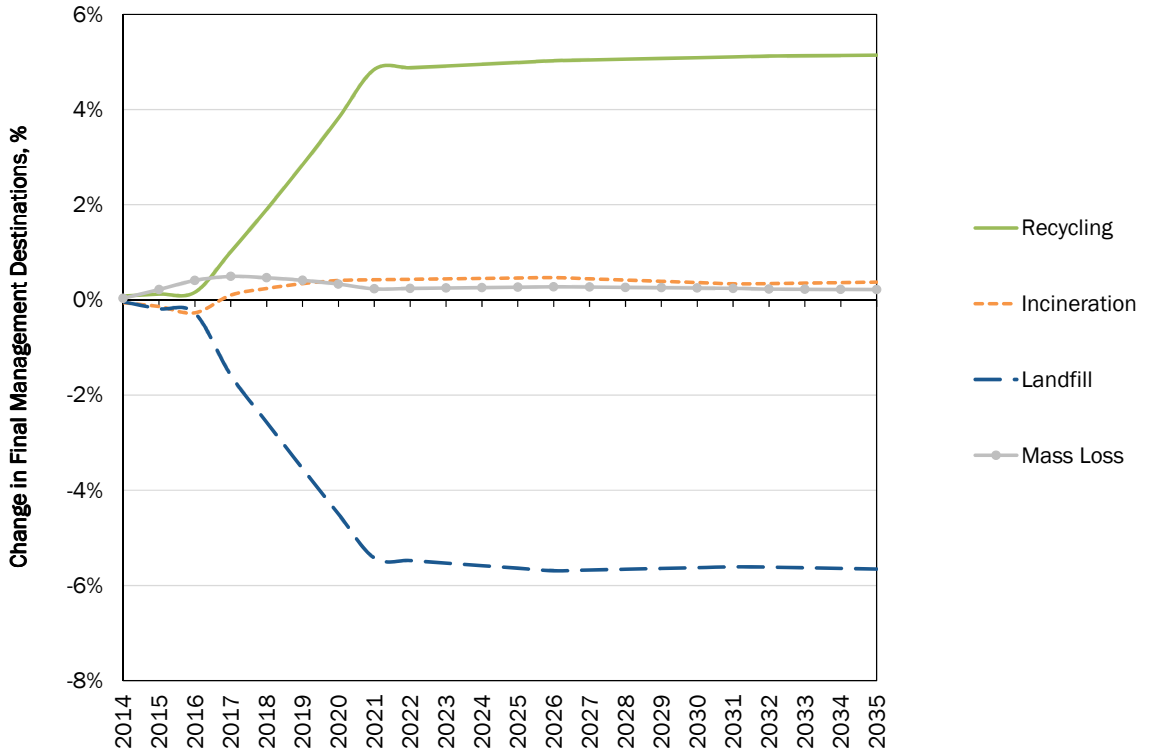
We present below a summary of the expected financial, environmental, and employment impacts associated with moving from the business as usual scenario to full implementation.

8.2.1 Change in Final Management Destinations

As detailed in Figure 8-3 below, moving from the business as usual scenario to the full implementation scenario implies a 5% increase in recycling rates across the EU28, with landfilling falling by just under 6%. The rate of incineration is anticipated to remain relatively constant, increasing by less than 1% in the short-term as new facilities come online. In this figure, and similar ones shown for other Options below, 'mass loss' refers to the relative proportion of the total waste stream that is lost due to moisture loss and breakdown of organic matter (loss into the gaseous phase) at MBT facilities. The reason for presenting things in this way is related to the way in which Eurostat currently defines 'treatment', a matter which is critically discussed in Appendix 9.0. Under this particular

Option, mass loss from the treatment of municipal waste through MBT is shown to increase, reflecting an increased reliance on the technology for treating residual waste across the EU28. It is worth noting, that the outputs from MBT plants are either sent for recycling, incineration, or for disposal at landfill, and thus these material flows are reflected under one of these three options.

Figure 8-2: Full Implementation vs Business as Usual – Change in Final Management (EU28)



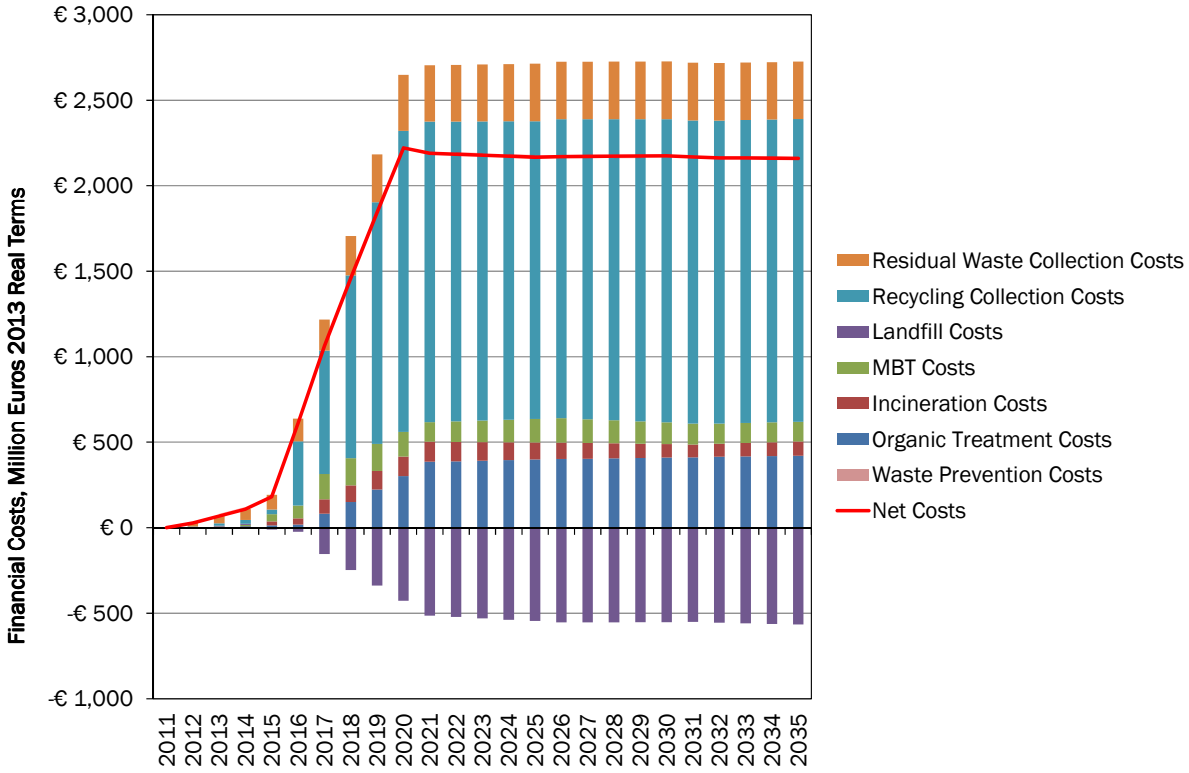
8.2.2 Financial Costs

A comparison of the full implementation scenario against business as usual indicates that changes will have to be made between now and 2020 if Member States are to be fully compliant with the existing targets (Figure 8-3). These costs are largely associated with investments required to improve collection services whilst there are some offsetting benefits in terms of savings on residual waste management. The steep rise in costs after 2016 is the result of the fact that it was assumed that Member States who are currently failing to meet the relevant targets only start responding to these obligations after this date.

Given the fall in the amount of residual waste being treated one would intuitively expect there to be net savings as a result of reduced residual waste collection costs. However, when comparing the financial costs of going from business as usual to full implementation in Figure 8-3 it is evident that there are increased costs associated with collecting residual waste (although, these are minimal and reduce over time). This is because in order to achieve a 50% recycling rate, it is assumed that a number of Member States will have to change their collection systems to increase capture rates and improve public participation in recycling. In essence, there are no savings associated with reduced collection of residual waste as it is more costly to collect residual waste

when moving from bring site refuse collection to kerbside collected refuse. In the business as usual scenario a number of Member States are using bring systems for the collection of residual waste, but in the full implementation scenario these are switched to kerbside collection services to enable greater levels of recycling. This switch results in higher costs (per tonne) of collecting both residual waste and recyclables, but is deemed necessary for achieving higher capture rates and providing effective biowaste collection services.

Figure 8-3: Full Implementation vs Business as Usual - Financial Costs (EU28)

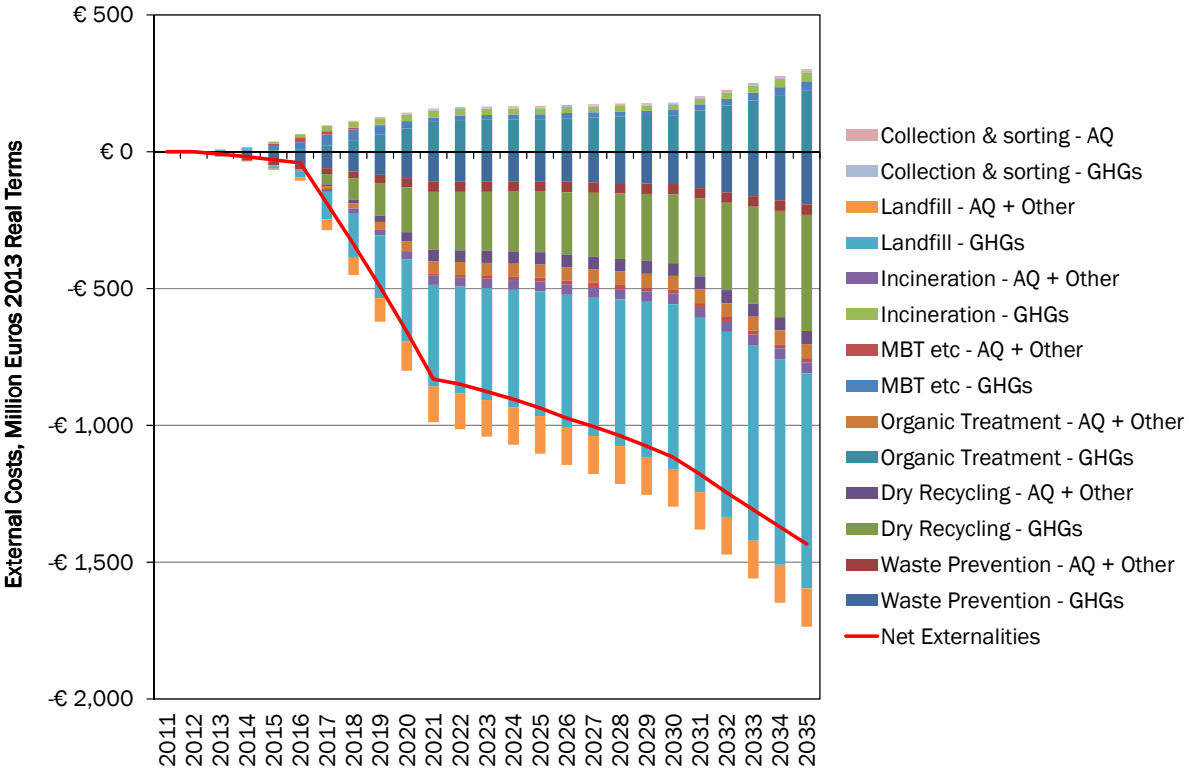


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.2.3 Environmental Costs

There are clear environmental benefits to be gained from full implementation (Figure 8-4). The majority of these benefits are realised prior to 2020 when the 50% recycling/preparation for reuse target and the final Landfill Directive target have to be met; however, the benefits continue to accrue steadily over time once full implementation is achieved. This is because of the way that emissions from landfill are accounted for and the fact the damage costs for greenhouse gases are assumed to increase over time. Waste landfilled in one year will continue to emit methane for a number of years afterwards. Thus, avoided landfilling under full implementation results in ongoing benefits beyond the date at which full implementation is achieved.

Figure 8-4: Full Implementation vs Business as Usual - Environmental Externalities (EU28)



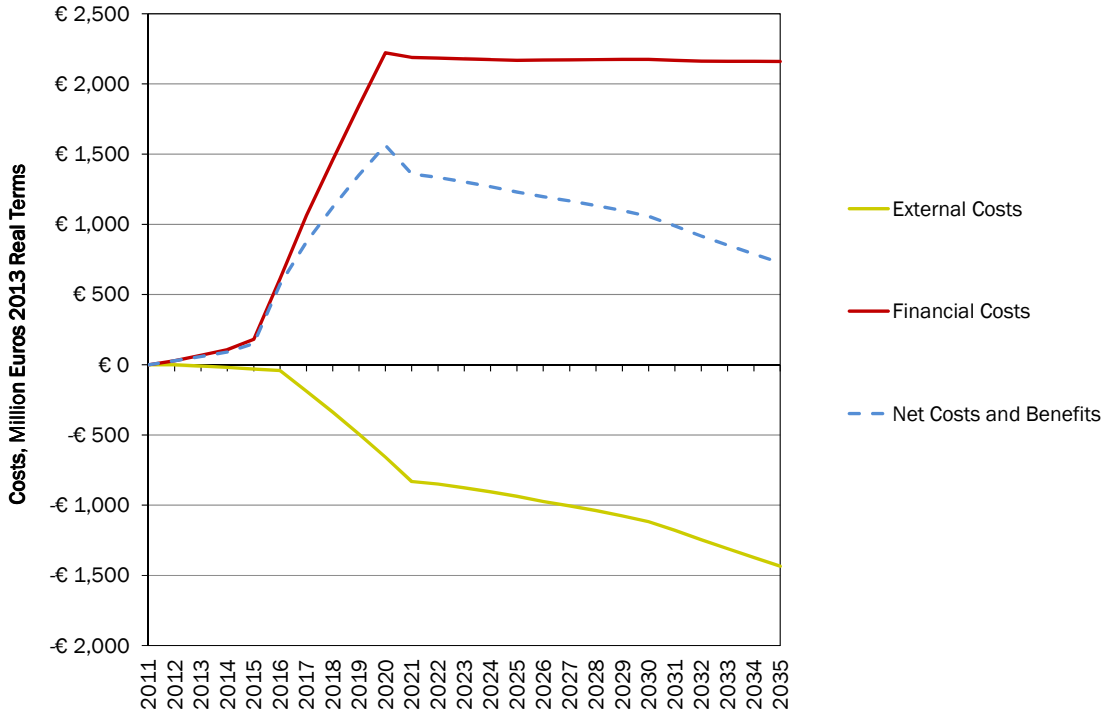
Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.2.4 Net Social Costs

There is a net cost associated with full implementation relative to business as usual as the cost of implementation outweighs the environmental benefits (Figure 8-5). The overall picture shows that the net costs will increase steadily until 2020 to approximately €1,500 million, before falling off to reach about €1,000 in 2030 and just over €500 million per year by 2035. These costs are the result of the trends discussed in the above sections.

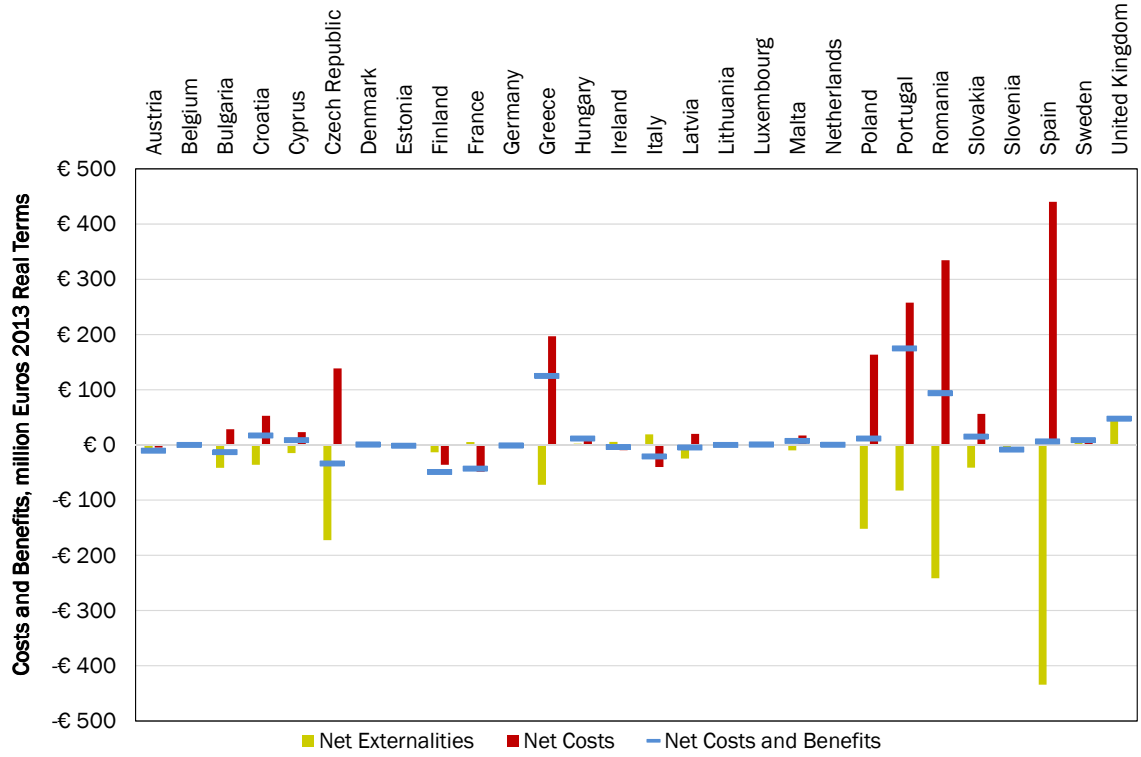
Figure 8-6 provides an indication of the Net Present Value (NPV) of the financial and environmental costs for each Member State (covering the period 2014 – 2030). In line with the European Commission approach to impact assessments, a discount rate of 4% per annum was applied for each country. From this it is clear that some countries – for example, the Czech Republic, Greece, Poland, Portugal, Romania, Slovakia, and Spain – will likely face fairly high direct financial costs as a result of having to modify parts of their recycling collection services in order to achieve full implementation (e.g. by transferring from a reliance on bring site collections to door-to-door collections which, although more expensive, allow for greater capture of food waste and dry recyclables).

Figure 8-5: Full Implementation vs Business as Usual – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-6: Full Implementation vs Business as Usual – Net Social Costs and Benefits by Member State (NPV 2014-2030)

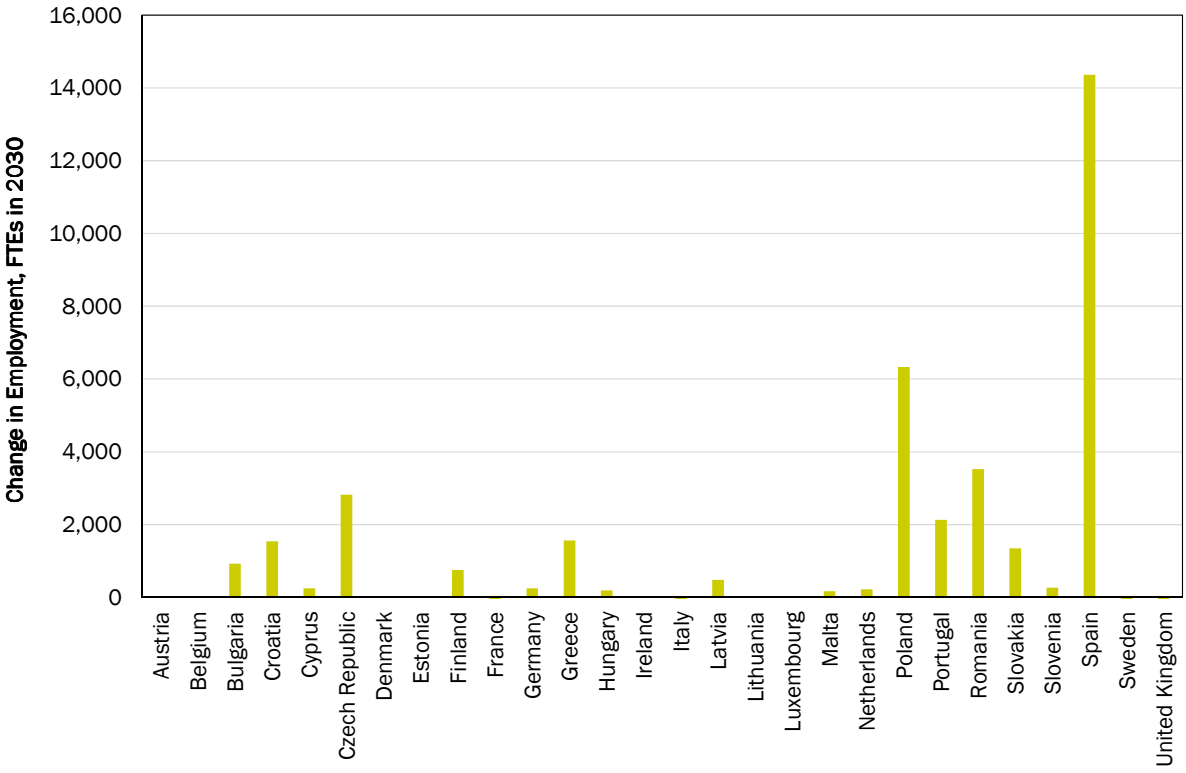


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.2.5 Employment

Moving from business as usual to full implementation may lead to an increase in employment (Figure 8-7). The estimated increase in direct employment is 37 thousand FTEs (Full Time Equivalents) across the EU28 by 2030.

Figure 8-7: Full Implementation vs Business as Usual – Change in Employment by 2030 (Full Time Equivalent)



8.3 60% MSW Recycling/Preparation for Reuse Target by 2030 (Option 3.1.a)

The details of this scenario are summarised in Table 8-3. Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods.[75] This scenario assumes that Member States will use their chosen method for the existing 2020 target (see Table 8-1). For the 2025 and 2030 targets it is assumed that calculation Method 4 is used by all Member States (i.e. % of total MSW recycled). It is worth noting that the modelling assumes that the scope of waste reported as MSW remains as it is today. We note, in passing, that a correct and uniform application even of the existing definition against which Member States are meant to report would, most likely, lead to some significant changes in the amounts reported (and their origin).

[75] Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF

Table 8-3: Summary of Option 3.1.a

Option Number	Option	Target Year		
		2020	2025	2030
Option 3.1.a	60% MSW Recycling/Preparation for Reuse Target by 2030	50%[1]	50%[2]	60%[2]

Notes: 1. Measured by one of four methods.

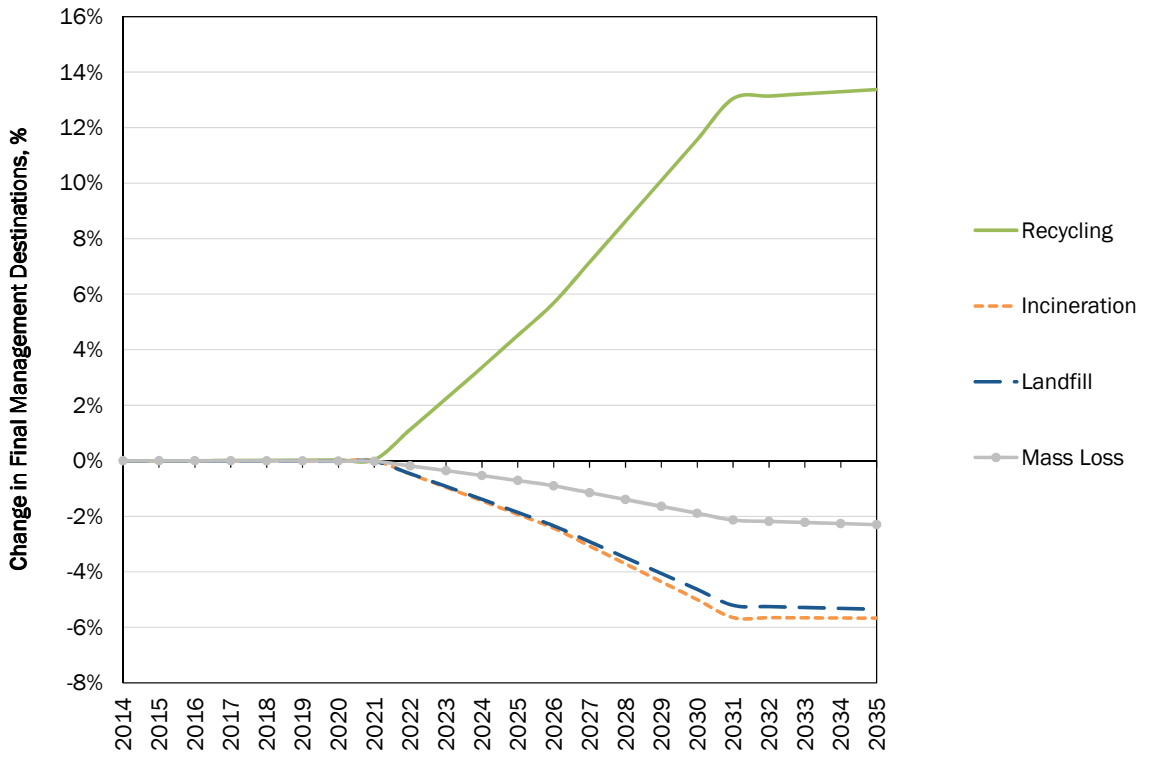
2. Measured by Method 4 only.

8.3.1 Change in Final Management Destinations

Figure 8-8 shows that compared to the full implementation scenario Option 3.1.a implies just over 13% increase in recycling rates across the EU28 between 2020 and 2030. Intuitively one would expect to see a 10% increase in recycling rates between 2020 and 2030 as the target rises from 50% to 60%. The greater than 10% increase is directly attributable to the fact that there is no consistent measurement method being applied for calculating the 2020 target. The increased recycling rates result in a corresponding decrease in the amount of residual waste requiring treatment and/or disposal. Across the EU28 landfilling and incineration are both shown to decrease by around 5% by the time 60% recycling is achieved in 2030. The mass loss line represents losses from MBT processes, the use of which is also reduced under this scenario.[76] These effects occur because in some countries, investments in incineration and MBT are made in the full implementation scenario, so the higher target effectively forestalls some of the investment in incineration and MBT in these countries.

[76] Here the negative mass loss shows that, relative to full implementing, evaporative/oxidative losses are less as a results of smaller volumes of material passing through MBT facilities.

Figure 8-8: Option 3.1.a – Change in Final Management Destinations (EU28)



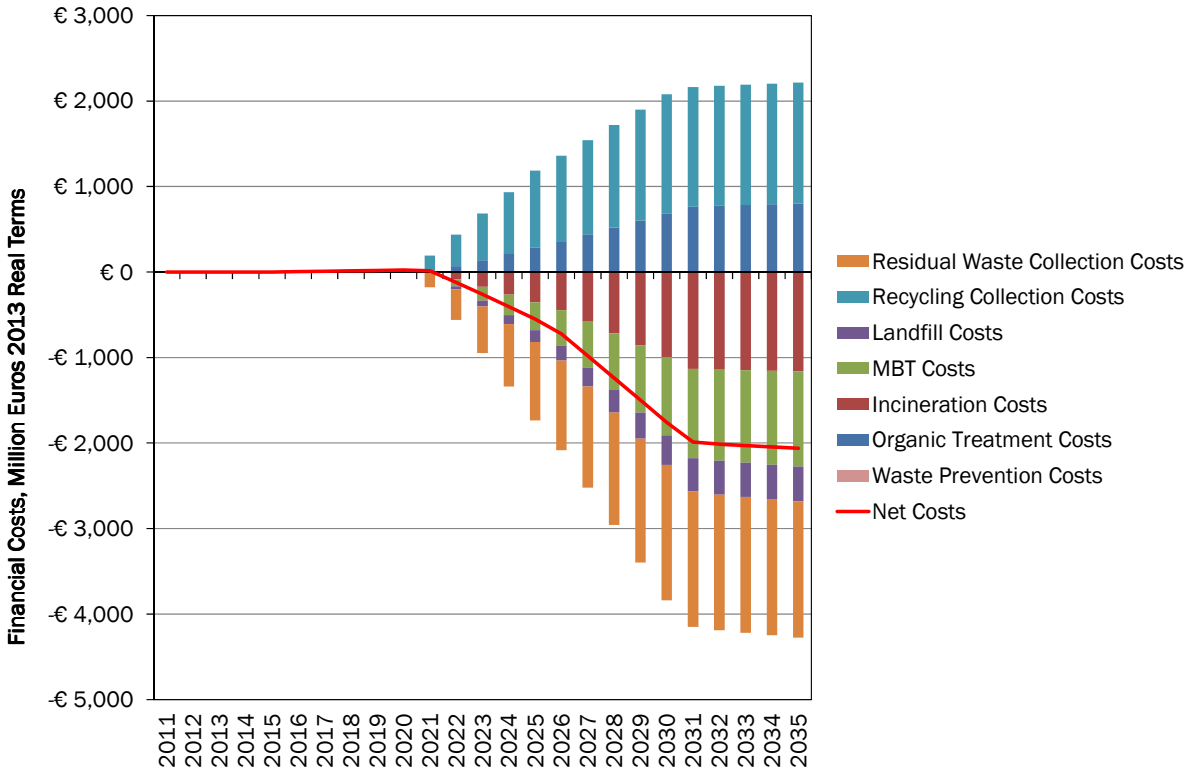
8.3.2 Financial Costs

A breakdown of the financial costs of this scenario, relative to full implementation, is presented in Figure 8-9. From this it can be seen that across the EU28 there are net cost savings to be gained from this Option (indicated by negative cost values). There are two competing costs: one from the increase in the cost of recycling and biowaste treatment and the other from the avoided costs of waste being collected and treated as residual waste. In this scenario the former is always lower than the latter and hence there are net savings to be gained from this Option.

It is important to understand the changes which the model is effectively displaying in this, and other, high recycling scenarios. The modelling assumes that in the full implementation scenario, many countries have already had to invest significantly in the upgrading of collection services relative to the situation they were in in 2011 (the latest year for which data was available at the time the modelling was undertaken). In moving to higher recycling rates, effectively, the capture of materials for recycling increases, reducing (relative to the full implementation scenario) the quantity of residual waste requiring collection. The refuse collection service is modelled as undergoing two changes: first, the collection frequency falls; second, the refuse collection is charged for (pay as you throw is implemented). The combined effect of these changes to refuse collection and the (related) increases in the capture of materials for recycling is that, with relatively small changes in the cost of delivering the recycling collection service, the revenue generated from the sale of materials increases (so the costs, net of revenue generation, decline). At the same time, the reduced frequency of collection of refuse leads to savings on the delivery of the refuse collection service. In summary, the effect of measures which encourage / incentivise the use of the services for recycling is to

improve the efficiency of the logistics, and capture more material for recycling from each household. This explains the effect on collection costs in this and other high recycling scenarios described in this chapter.

Figure 8-9: Option 3.1.a – Financial Costs (EU28)



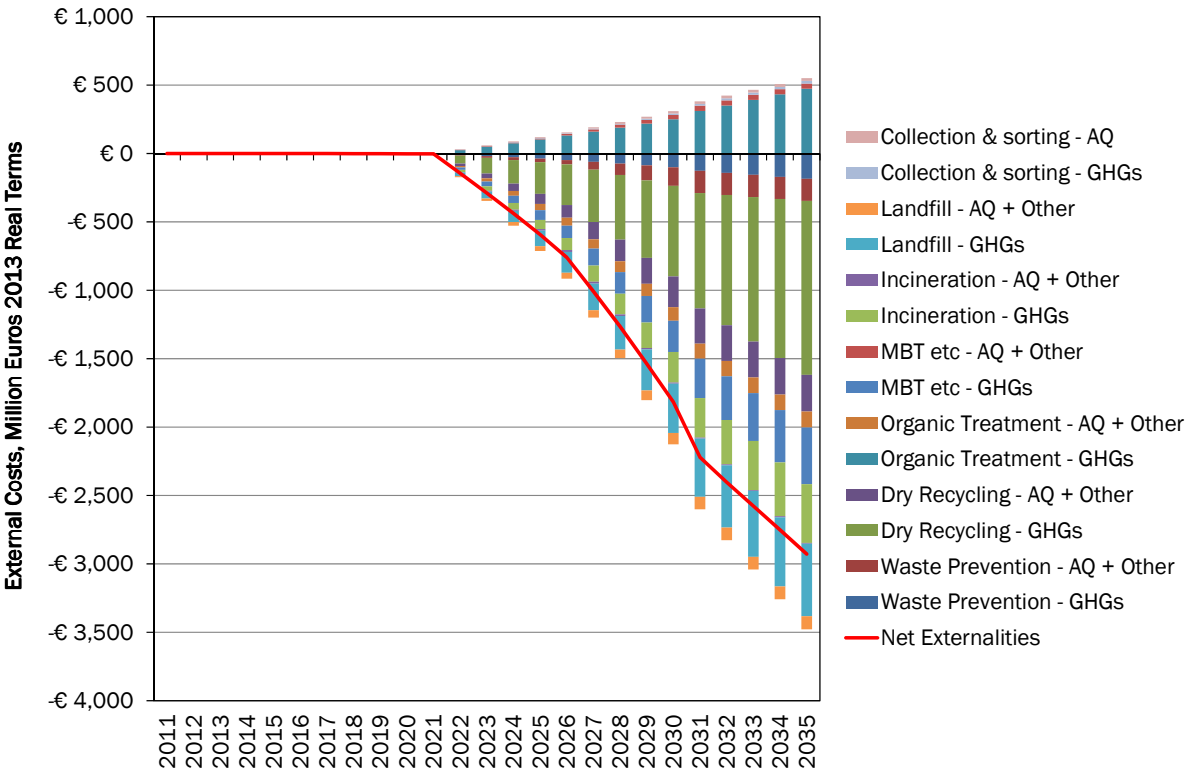
Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.3.3 Environmental Costs

There are significant benefits derived from the recycling of more material (Figure 8-10). The majority of these benefits are associated with the avoided GHG emissions related to recycling but other significant benefits result from avoiding GHG emissions from residual waste treatment and disposal. The benefits outweigh the additional emissions to air that are generated as a result of the treatment of biowaste and the collection of recyclables.

It can also be seen from Figure 8-10 that the benefits continue to accrue after the 60% recycling target has been achieved in 2030. As described above, this is because of the way that emissions from landfill are accounted for and the fact the damage costs for greenhouse gases are assumed to increase over time. Waste landfilled in one year will continue to emit methane for a number of years afterwards. Thus, avoided landfilling under this and subsequent Options means that the environmental benefits continue to improve beyond 2030. In this sense the environmental benefits are different to the financial costs which stabilise once the target is met in 2030.

Figure 8-10: Option 3.1.a – Environmental Externalities (EU28)



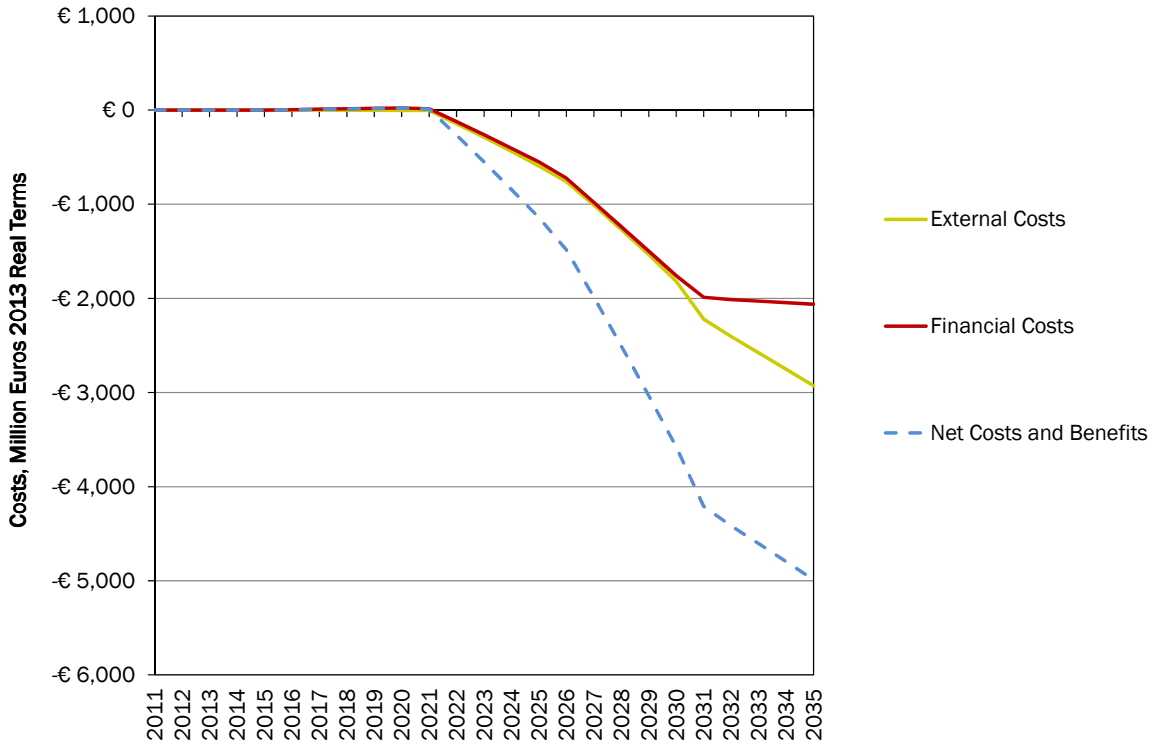
Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.3.4 Net Social Costs

With both the financial and environmental costs proving to be favourable relative to full implementation it is no surprise that the net position of Option 3.1.a is favourable (Figure 8-11). The results depicted in this figure show that by 2030 the net social cost is reduced by more than €3.5 billion per year across the EU28.

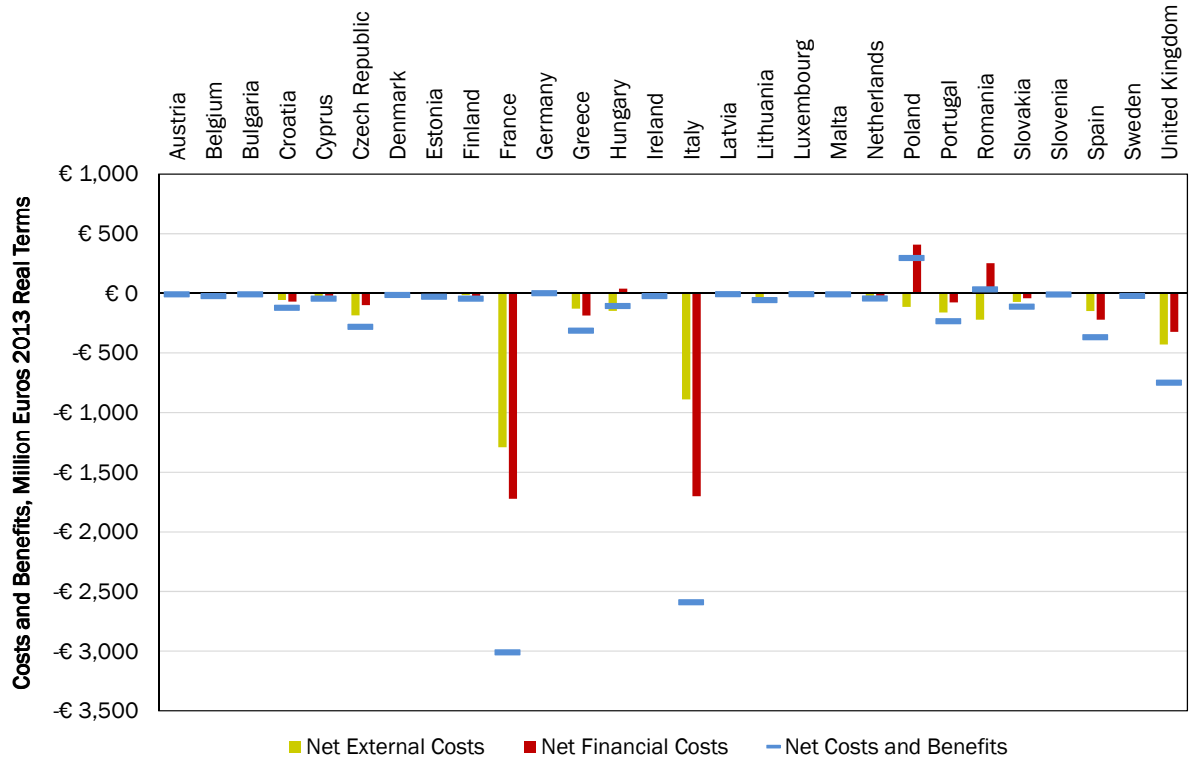
A more detailed view of the net social costs for each Member State is provided in Figure 8-12. This shows that all countries, other than Poland and Romania, will experience a net social benefit (i.e. negative cost), or, where net costs are close to zero, no net cost to society.

Figure 8-11: Option 3.1.a – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-12: Option 3.1.a – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

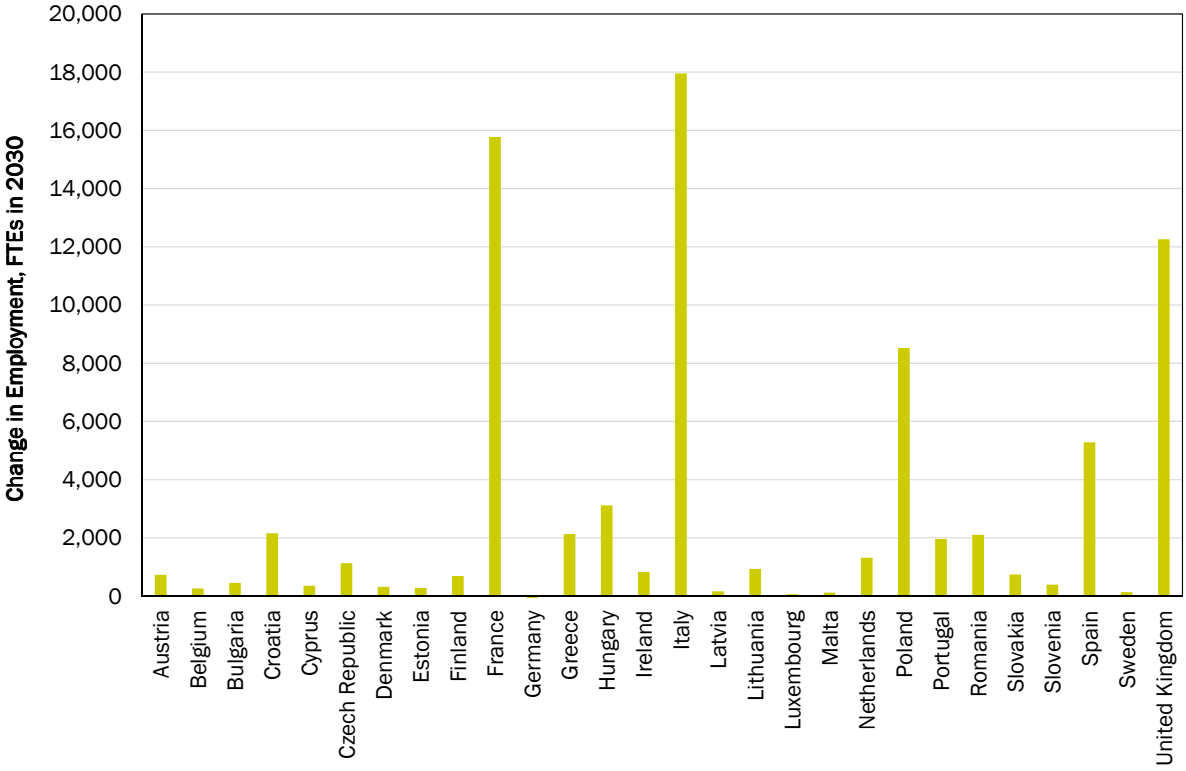


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.3.5 Employment

The employment intensities – that is, FTEs per tonne processed – associated with recycling and preparation for reuse are typically much higher than those for residual waste treatment and disposal. As a results, Option 3.1.a leads to a substantial increase in employment as greater quantities of waste are sent for recycling (Figure 8-13). The extent to which these job opportunities will be realised in Europe depends on the amount of waste that is processed within the European Union's borders as opposed to being exported for treatment abroad. The estimated increase in direct employment under this Option is 79 thousand FTEs across the EU28 by 2030. Note that this is direct employment only with no provision for multiplier effects.

Figure 8-13: Option 3.1.a – Change in Employment by 2030 (Full Time Equivalent)



8.4 65% MSW Recycling/Preparation for Reuse Target by 2030 (Option 3.1.b)

The details of this scenario are summarised in Table 8-4. Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods.[77] This scenario assumed that Member States will use their chosen method for the existing 2020 target (see Table 8-1). For the 2030 targets it

[77] Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF

assumed that calculation Method 4 is used by all Member States (i.e. % of total MSW recycled). For this Option no interim target in 2025 was modelled.

Table 8-4: Summary of Option 3.1.b

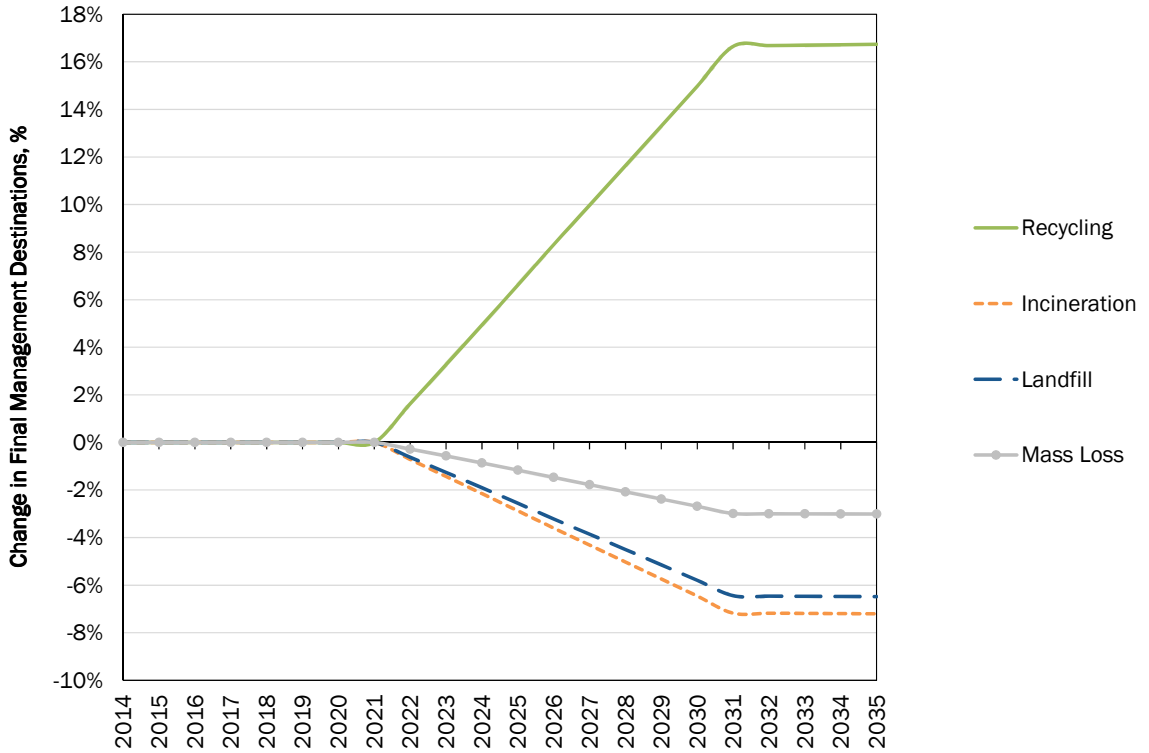
Option Number	Option	Target Year		
		2020	2025	2030
Option 3.1.b	65% MSW Recycling/Preparation for Reuse Target by 2030	50%[1]	-	65%[2]

Notes: 1. Measured by one of four methods.
2. Measured by Method 4 only.

8.4.1 Change in Final Management Destinations

Figure 8-14 shows that compared to the full implementation scenario Option 3.1.b will create a 17% increase in recycling rates across the EU28 between 2020 and 2030. The increased recycling rates result in a corresponding decrease in the amount of residual waste requiring treatment and/or disposal. Across the EU28 landfilling and incineration are both shown to decrease by more than 6% by the time 65% recycling is achieved in 2030. Mass losses from MBT processes also decrease over time as residual waste is diverted away from this treatment technology towards recycling. As stated in Option 3.1.a, these effects occur because in some countries, investments in incineration and MBT are made in the full implementation scenario, so the higher target effectively forestalls some of the investment in incineration and MBT in these countries.

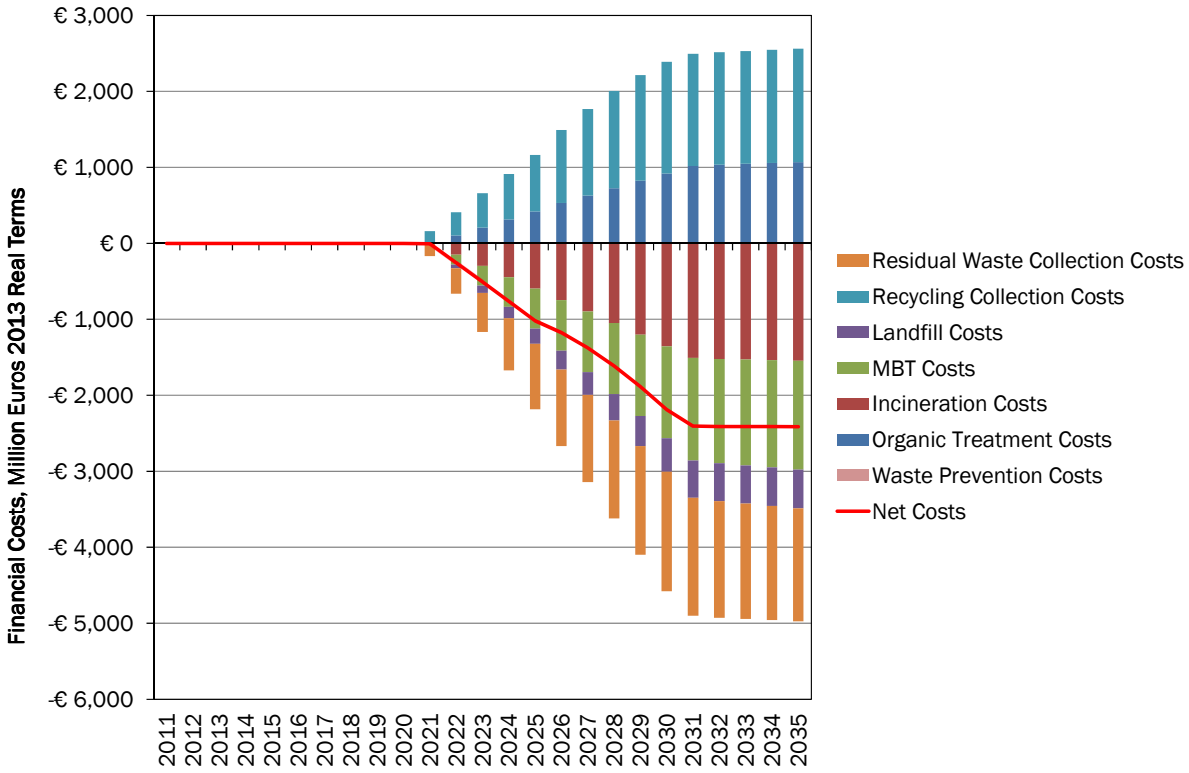
Figure 8-14: Option 3.1.b – Change in Final Management Destinations (EU28)



8.4.2 Financial Costs

A breakdown of the financial costs of this scenario, relative to full implementation, is presented in Figure 8-15. The net financial savings associated with this Option are slightly higher than those associated with achieving 60% recycling in 2030. This is largely due to the cost savings associated with the reduced collection and treatment of residual waste, and the increased efficiency of the recycling logistics.

Figure 8-15: Option 3.1.b – Financial Costs (EU28)

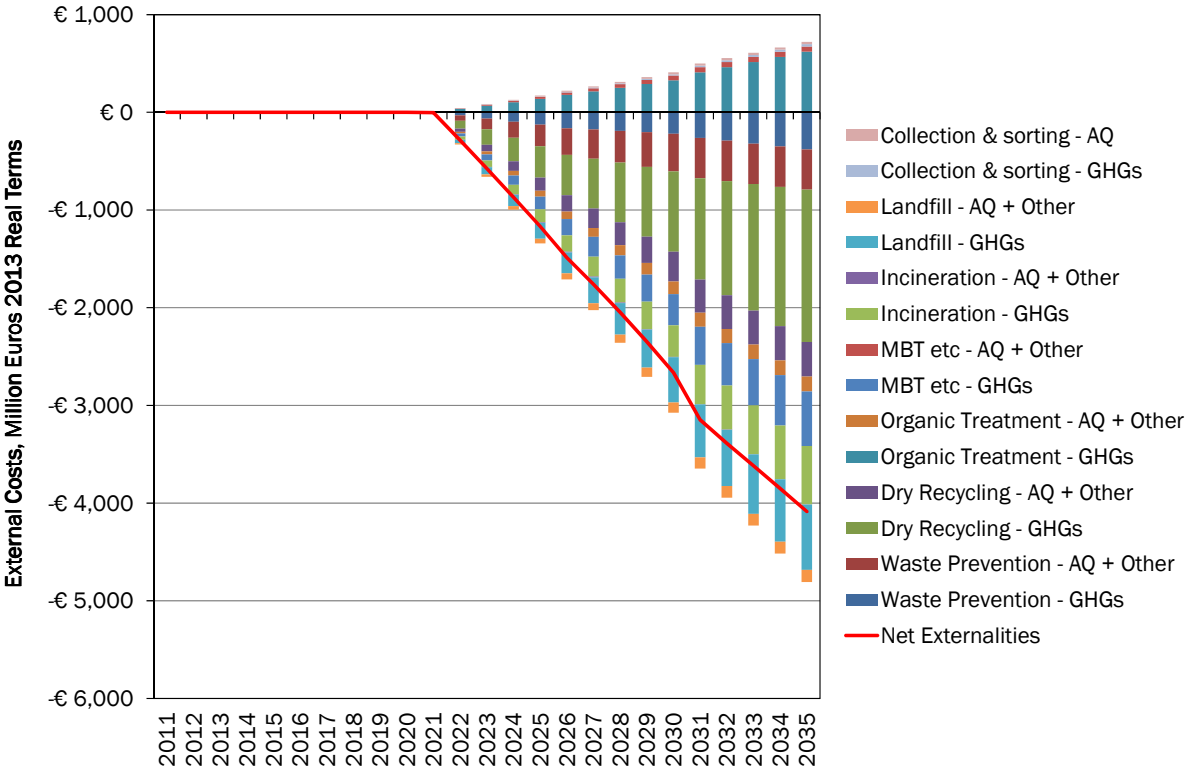


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.4.3 Environmental Costs

The environmental benefits of this Option are higher than those achieved under Options 3.1.a (Figure 8-16). As outlined above the majority of these benefits are associated with the avoided GHG emissions related to recycling, with other significant benefits resulting from avoiding GHG emissions from residual waste treatment and disposal. At all points in time, the benefits, relative to the full implementation scenario, outweigh the additional emissions to air that are generated as a result of the treatment of biowaste and the collection of recyclables.

Figure 8-16: Option 3.1.b – Environmental Externalities (EU28)

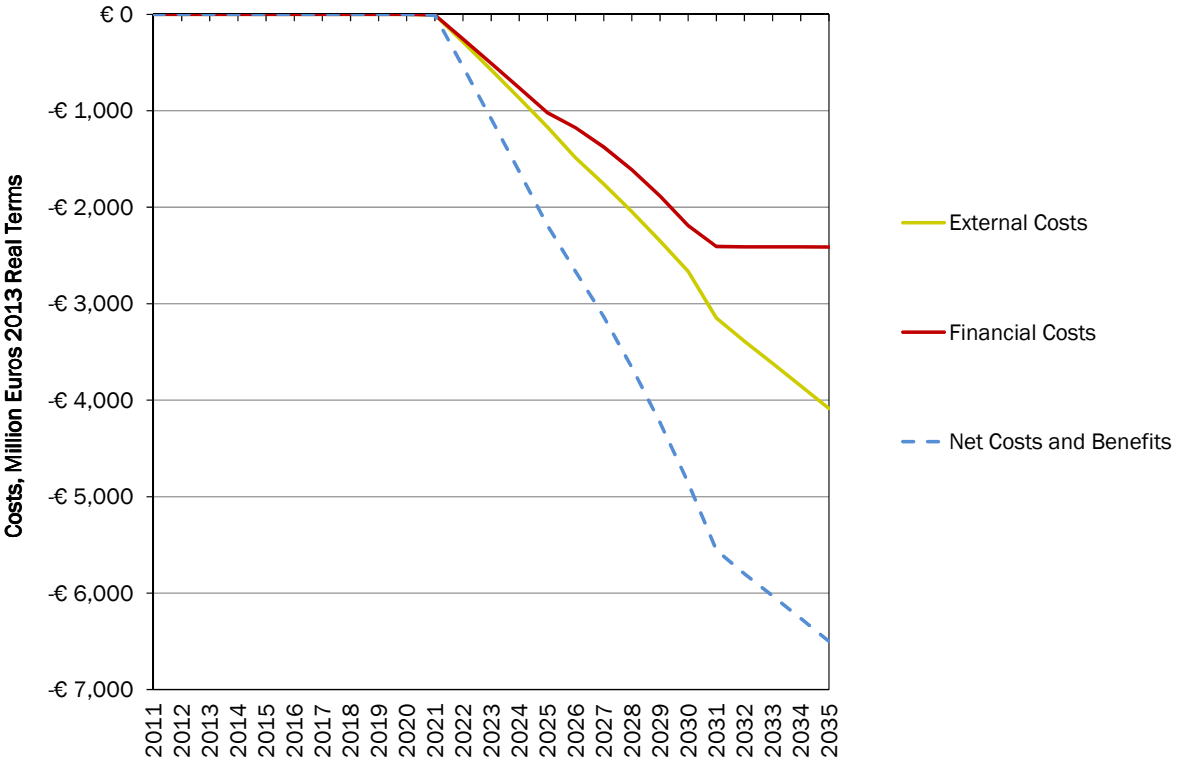


Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.4.4 Net Social Costs

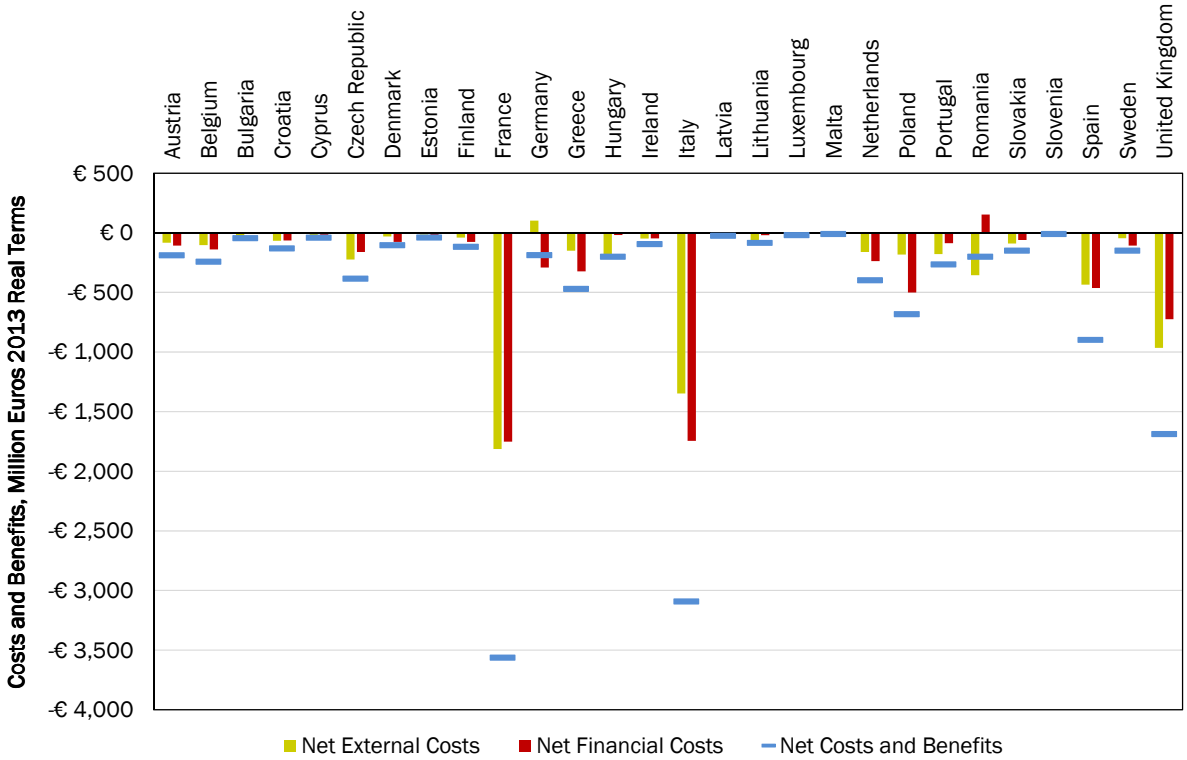
With both the financial and environmental costs proving to be favourable relative to full implementation, the net position of Option 3.1.b is also favourable (Figure 8-17). The results depicted in this figure show that by 2035 the net social cost may be reduced by well over €6,000 million per year (in 2013 real term prices). With a view of the net social costs across all Member States, it is evident that under this Option all Member States experience a net social benefit (Figure 8-18).

Figure 8-17: Option 3.1.b – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-18: Option 3.1.b – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

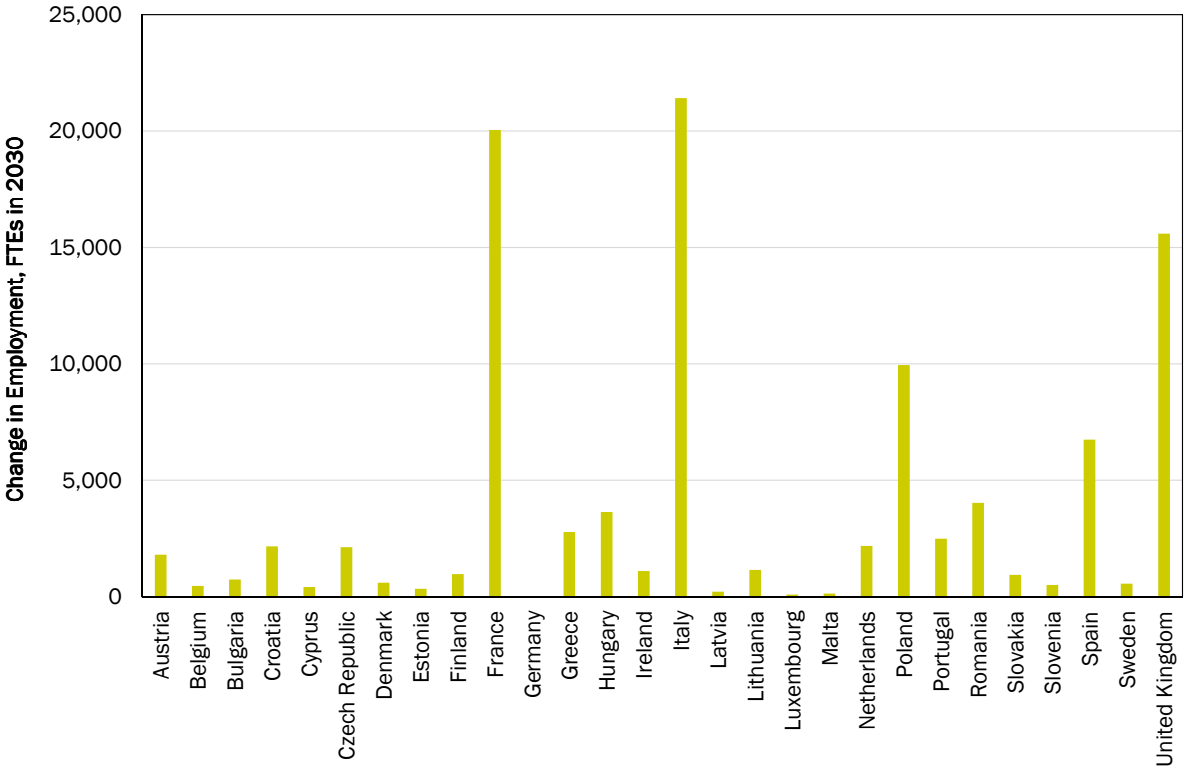


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.4.5 Employment

As mentioned above, the employment intensities associated with the collection and processing of recyclables is typically much higher than those for residual waste collections and treatment/disposal (see Section 4.1.6 in Appendix 4.0). It is therefore of little surprise that Option 3.1.b leads to a significant increase in employment as greater quantities of waste are sent for recycling (Figure 8-19). Again, the extent to which these job opportunities will be realised in Europe depends on the amount of waste that is processed within the European Union's borders as opposed to being exported for treatment abroad. The estimated increase in direct employment is 103 thousand FTEs across the EU28 by 2030. Again, no provision is given for possible multiplier effects.

Figure 8-19: Option 3.1.b – Change in Employment by 2030 (Full Time Equivalent)



8.5 70% MSW Recycling/Preparation for Reuse Target by 2030 (Option 3.1.c)

The details of this Option are summarised in Table 8-5. Commission Decision 2011/753/EU allows Member States to report on their recycling rates using one of four different calculation methods.[78] This scenario assumed that Member States will use their chosen method for the existing 2020 target (see Table 8-1). For the 2025 and 2030

[78] Commission Decision of 18 November 2011, Establishing Rules and Calculation Methods for Verifying Compliance with the Targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council, Decision 2011/753/EU, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:310:0011:0016:EN:PDF

targets it assumed that calculation Method 4 is used by all Member States (i.e. % MSW recycled).

Table 8-5: Summary of Option 3.1.c

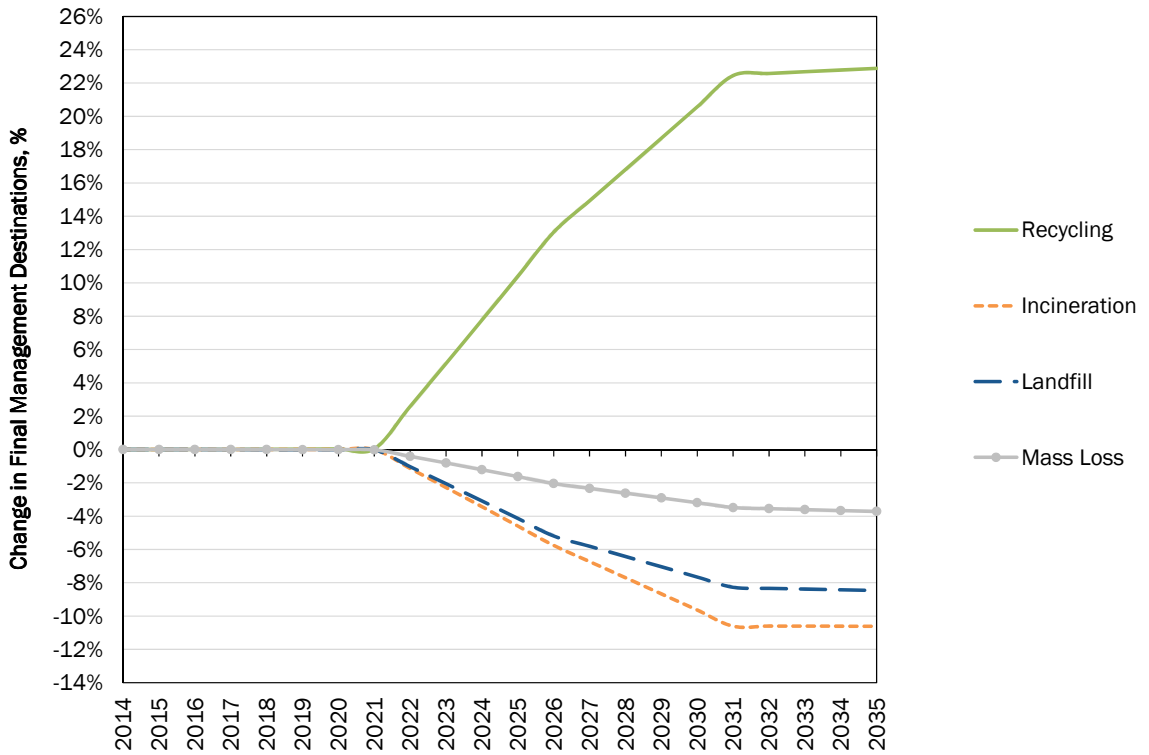
Option Number	Option	Target Year		
		2020	2025	2030
Option 3.1.c	70% MSW Recycling/Preparation for Reuse Target by 2030	50%[1]	60%[2]	70%[2]

Notes: 1. Measured by one of four methods.
2. Measured by Method 4 only.

8.5.1 Change in Final Management Destinations

Achieving the 70% recycling/preparation for reuse target under Option 3.1.c would mean that, relative to the full implementation scenario, Member States would have to increase their recycling rates by over 22% by 2030 (Figure 8-20). The increased recycling rates are offset by a corresponding decrease in the amount of residual waste requiring treatment or disposal. Across the EU28 landfilling and incineration are both shown to decrease steadily until 70% recycling is achieved in 2030. The mass loss line represents losses from MBT processes, the use of which is also substantially reduced under this scenario. These effects occur because in some countries, investments in incineration and MBT are made in the full implementation scenario, so the higher target effectively forestalls some of the investment in incineration and MBT that would have otherwise been made in these countries.

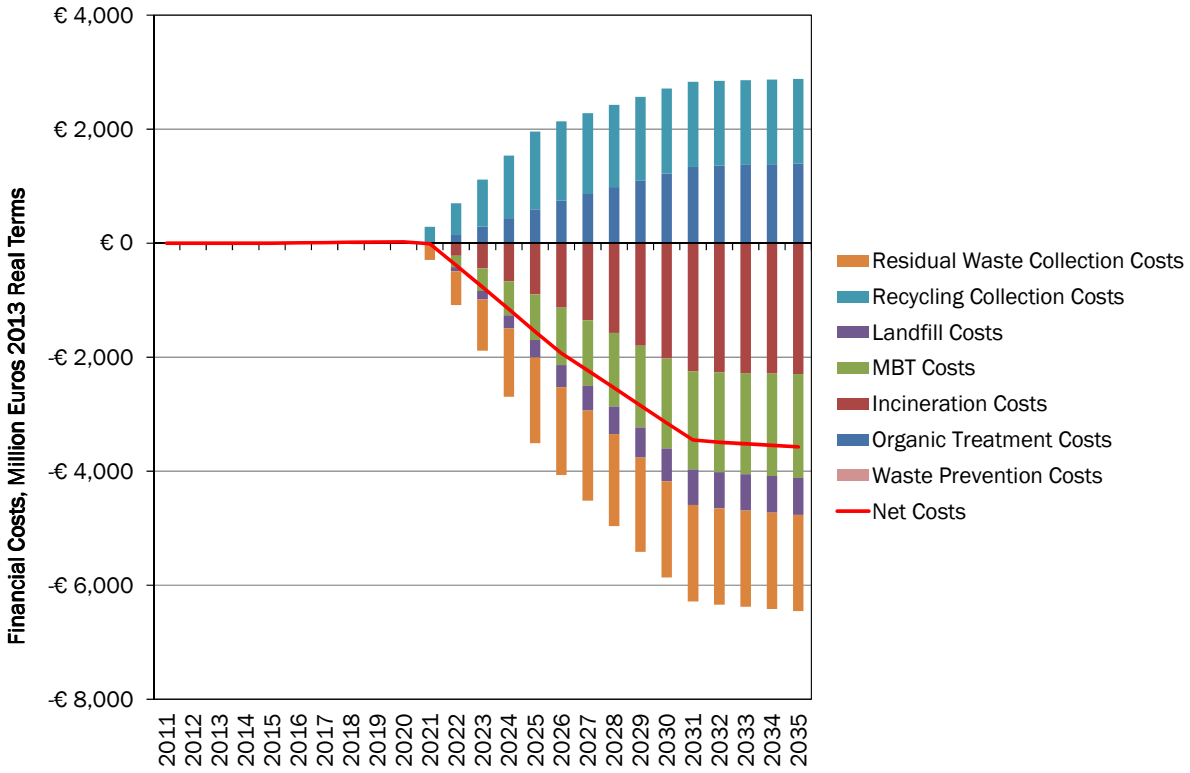
Figure 8-20: Option 3.1.c– Change in Final Management Destinations (EU28)



8.5.2 Financial Costs

Under this Option, as for the previous one, the overall costs across the EU28 are lower than under full implementation (Figure 8-21). This is as a result of significantly reduced residual waste collection and treatment costs. However, for obvious reasons, the effect is more pronounced than in Option 3.1.a and Option 3.1.b.

Figure 8-21: Option 3.1.c – Financial Costs (EU28)

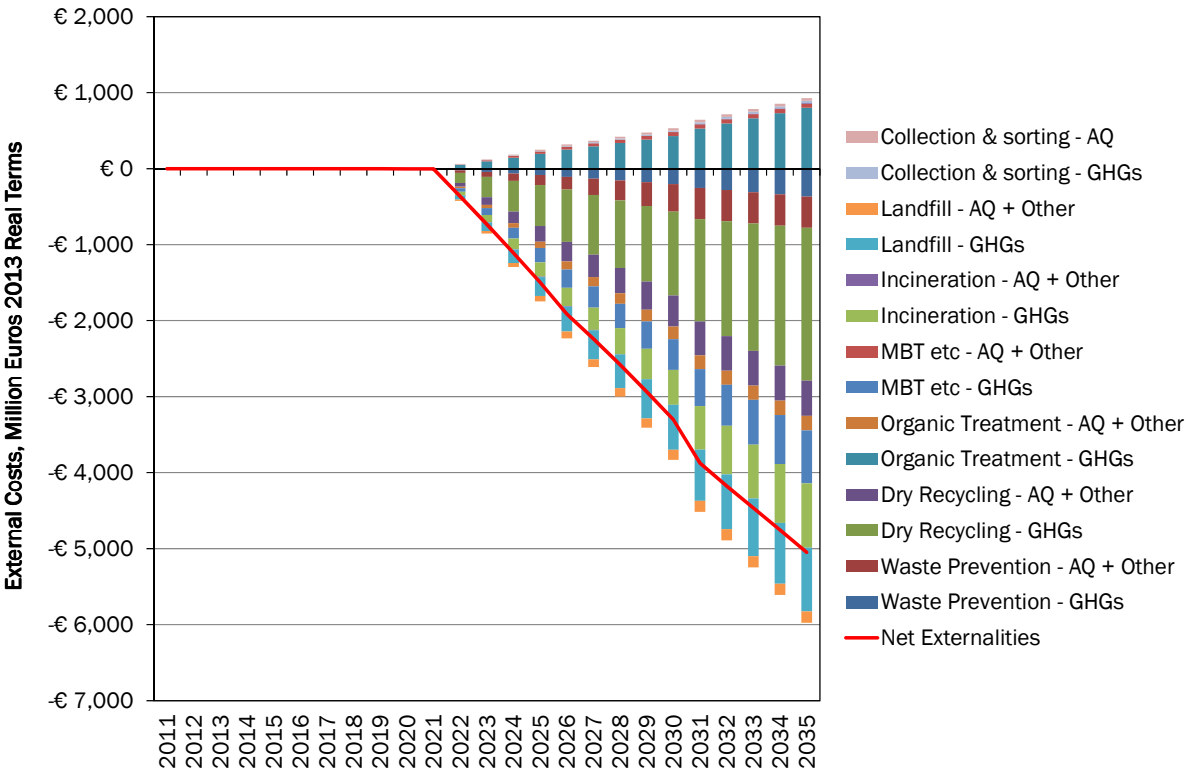


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.5.3 Environmental Costs

The environmental benefits of this Option are higher than those achieved under Options 3.1.a and 3.1.b (Figure 8-22). As outlined under Option 3.1.a the majority of these benefits are associated with the avoided GHG emissions related to recycling, with other significant benefits resulting from avoiding GHG emissions from residual waste treatment and disposal. At all points in time the benefits, relative to the full implementation scenario, outweigh the additional emissions to air that are generated as a result of the treatment of biowaste and the collection of recyclables. Again, significant benefits still accrue after the 2030 target has been achieved, largely reflecting the significant quantities of waste diverted from landfill and the assumed increase in the damage costs for greenhouse gases over time.

Figure 8-22: Option 3.1.c – Environmental Externalities (EU28)



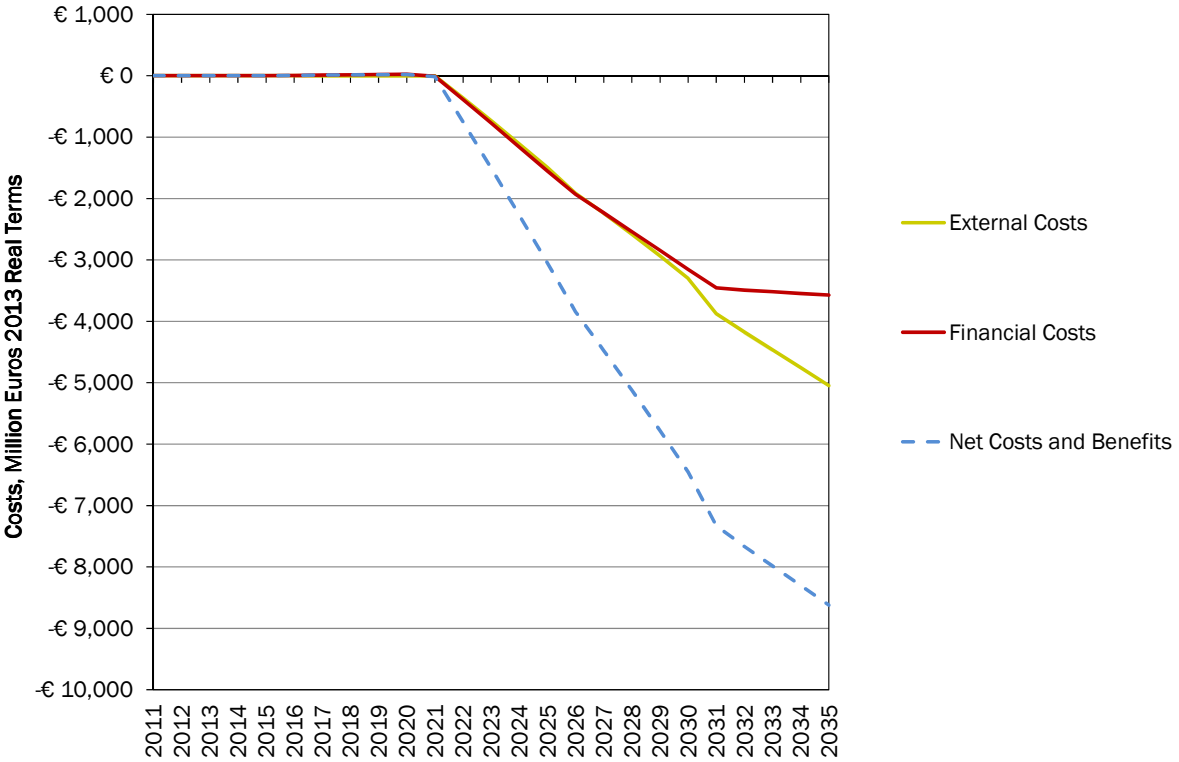
Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.5.4 Net Social Costs

With both the financial and environmental costs proving to be favourable relative to full implementation it is no surprise that the net position of Option 3.1.c is also favourable (Figure 8-23). The results depicted in this figure show that by 2035 the net social cost may be reduced by over €8,000 million per year.

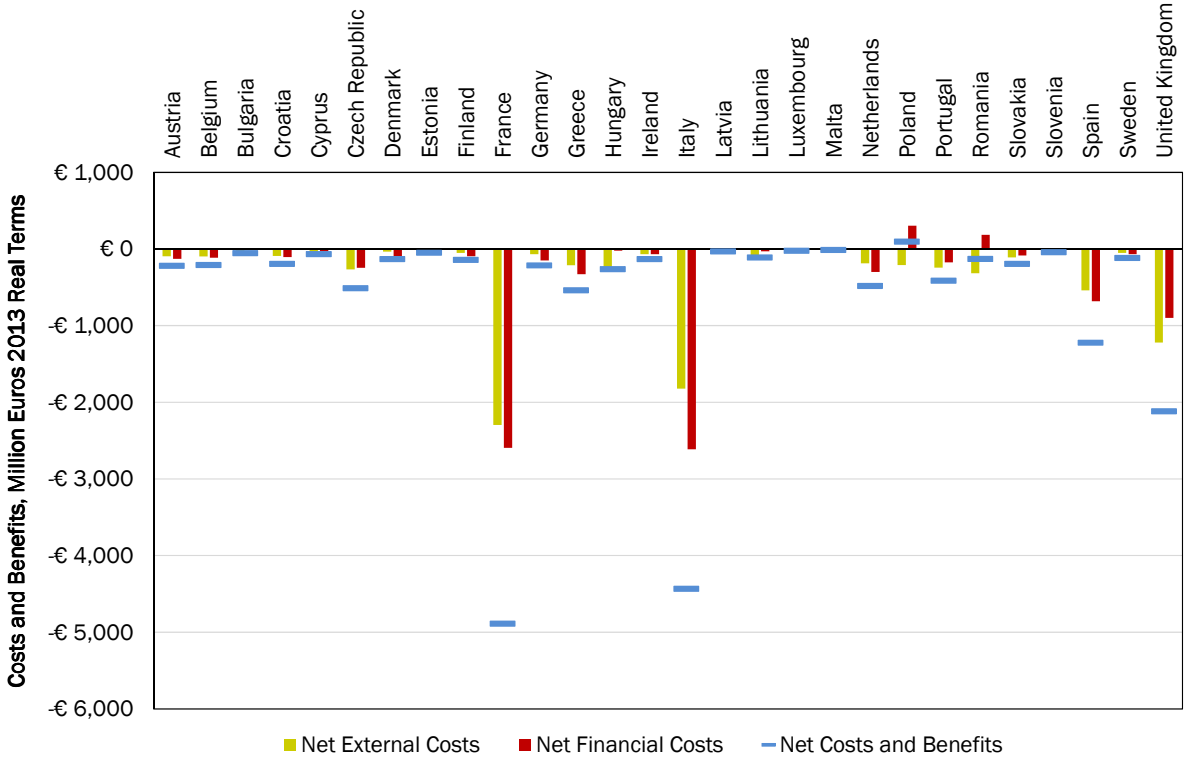
With a view of the net social costs across all Member States, it is evident that under this Option all Member States, other than Poland, experience a net social benefit (Figure 8-24).

Figure 8-23: Option 3.1.c – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-24: Option 3.1.c – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

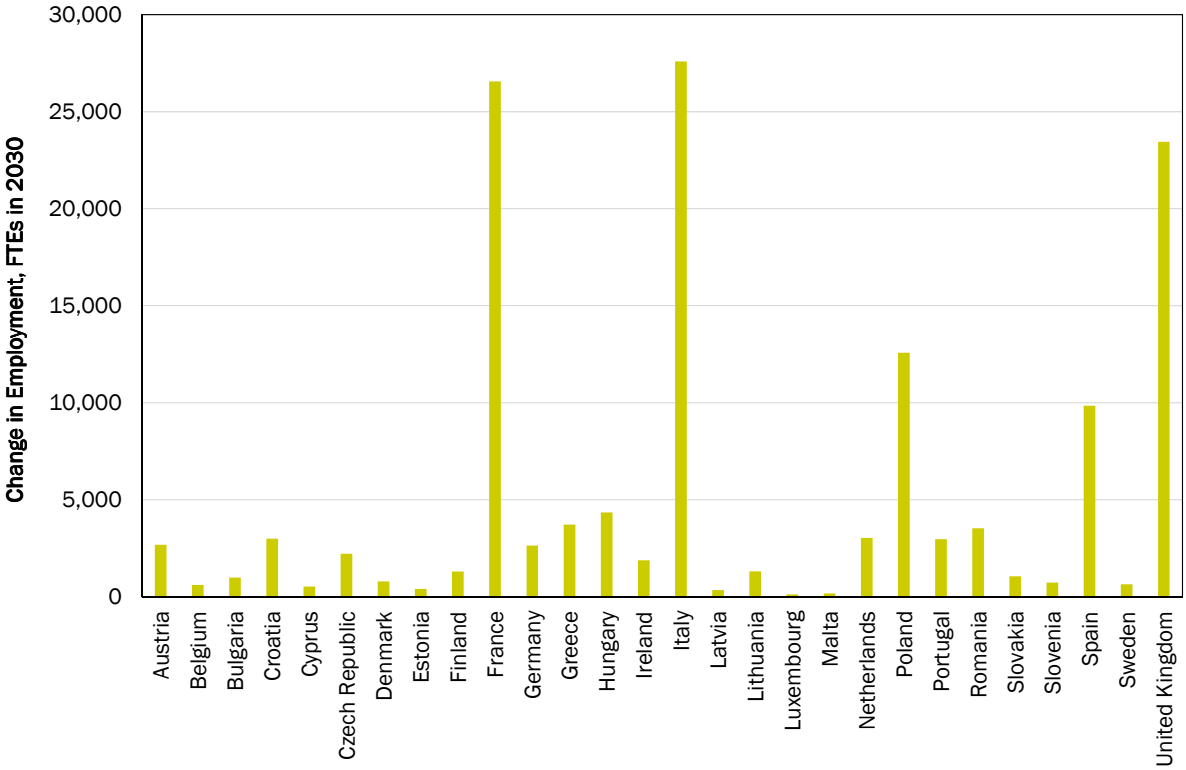


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.5.5 Employment

The employment intensities associated with the collection and processing of recyclables is typically much higher than those for residual waste collections and treatment/disposal (see Section 4.1.6 in Appendix 4.0). It is therefore of little surprise that Option 3.1.c leads to a significant increase in employment as greater quantities of waste are sent for recycling (Figure 8-25). As mentioned above, the extent to which these job opportunities will be realised in Europe depends on the amount of waste that is processed within the European Union's borders as opposed to being exported for treatment abroad. The estimated increase in direct employment is 138 thousand FTEs across the EU28 by 2030. Again, no multiplier effects have been taken into account.

Figure 8-25: Option 3.1.c– Change in Employment by 2030 (Full Time Equivalent)



8.6 Increased Packaging Targets (Option 3.2.a)

The details of this Option are summarised in Table 8-6. Other than for metals for which a combined target was modelled, this Option assumes separate targets for each type of packaging material listed in the table below.

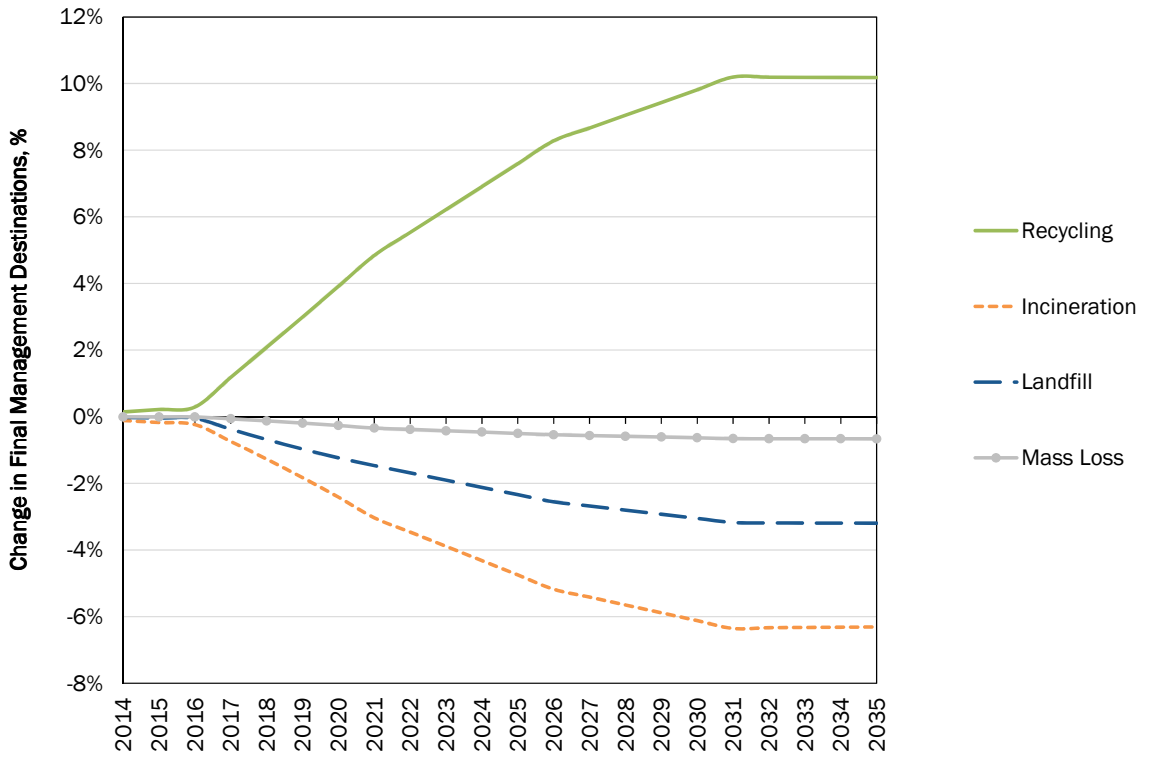
Table 8-6: Summary of Option 3.2.a

Option Number	Option		Target Year		
			2020	2025	2030
Option 3.2.a	Increased packaging targets without split targets for metals	Plastics	45%	60%	60%
		Metal	80%	90%	90%
		Glass	70%	80%	90%
		Paper/Card	85%	90%	90%
		Wood	50%	65%	80%

8.6.1 Change in Final Management Destinations

Compared to the full implementation scenario Option 3.2.a implies a progressive increase in the amount of packaging that is collected and recycled. Given that a substantial proportion of packaging waste is of municipal origin (predominantly primary packaging), an increase in packaging recycling rates will have an influence on the overall municipal waste recycling rates (and vice versa). The results of the model indicate that municipal recycling rates across the EU28 could be increased by more than 8% by 2030 through setting higher recycling targets on packaging waste alone (Figure 8-26).

Figure 8-26: Option 3.2.a – Change in Final Management Destinations (EU28)

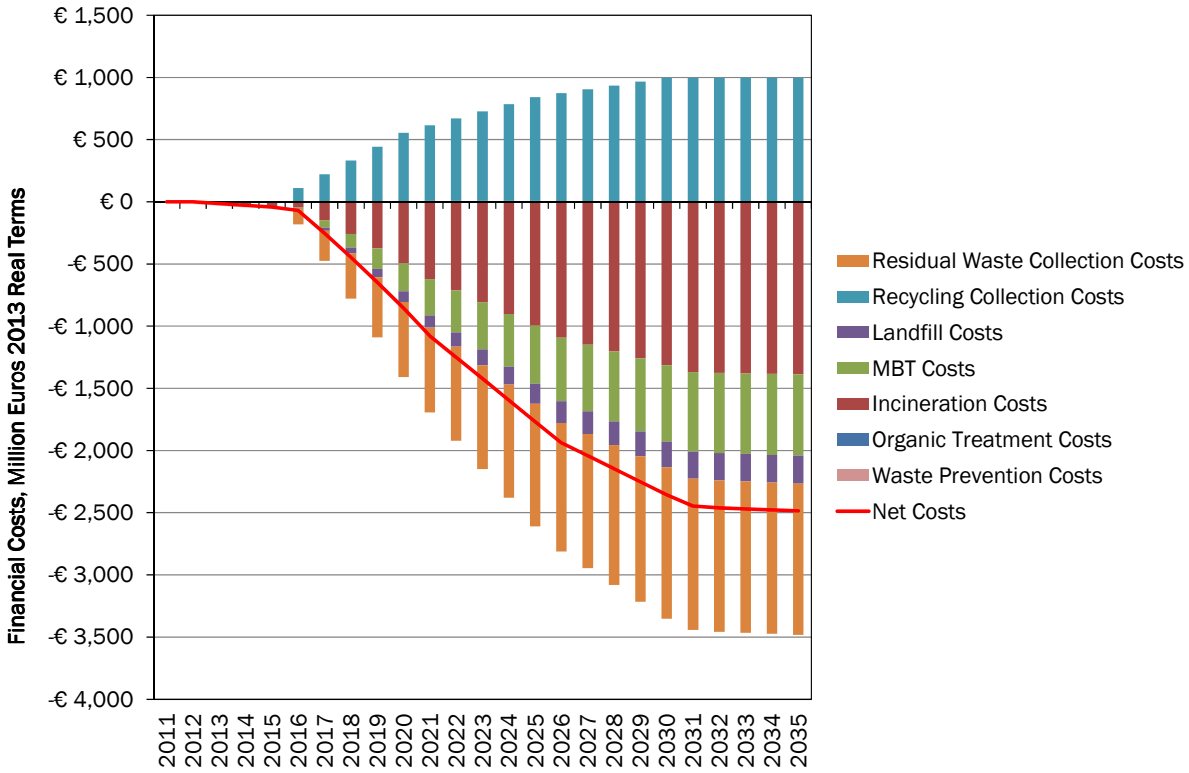


8.6.2 Financial Costs

Under Option 3.2.a the overall costs across the EU28, relative to full implementation, show net benefits very early on (Figure 8-27). As with previous Options this is a result of the two competing effects, one from the increase in the cost of recycling, the other from the avoided costs of waste being collected and treated as residual waste. If anything, the effects are more pronounced. This is because in the MSW recycling scenarios, a considerable proportion of the waste collected and treated for recycling is biowaste. This entails costs both in collection and treatment, whereas the collection of dry recyclables leads to the capture of material which can generally be sold (though sometimes requiring sorting before the materials are sold). There is clearly some uncertainty here around the costs of achieving higher recycling rates for plastics, in particular, and the non-ferrous and ferrous metal fractions. For the metal fractions, it is expected that contributions will be made by residual waste management infrastructure so that the targets are not reliant on source separation alone. For plastics, the targets are very challenging and will likely require further developments of end use markets. In addition, there is uncertainty about the value of the materials that will be recycled, at the margin. It is also, important to note

that the modelling takes a 'whole system view'. The net financial costs cover avoided costs of residual waste collection and treatment/disposal.

Figure 8-27: Option 3.2.a – Financial Costs (EU28)

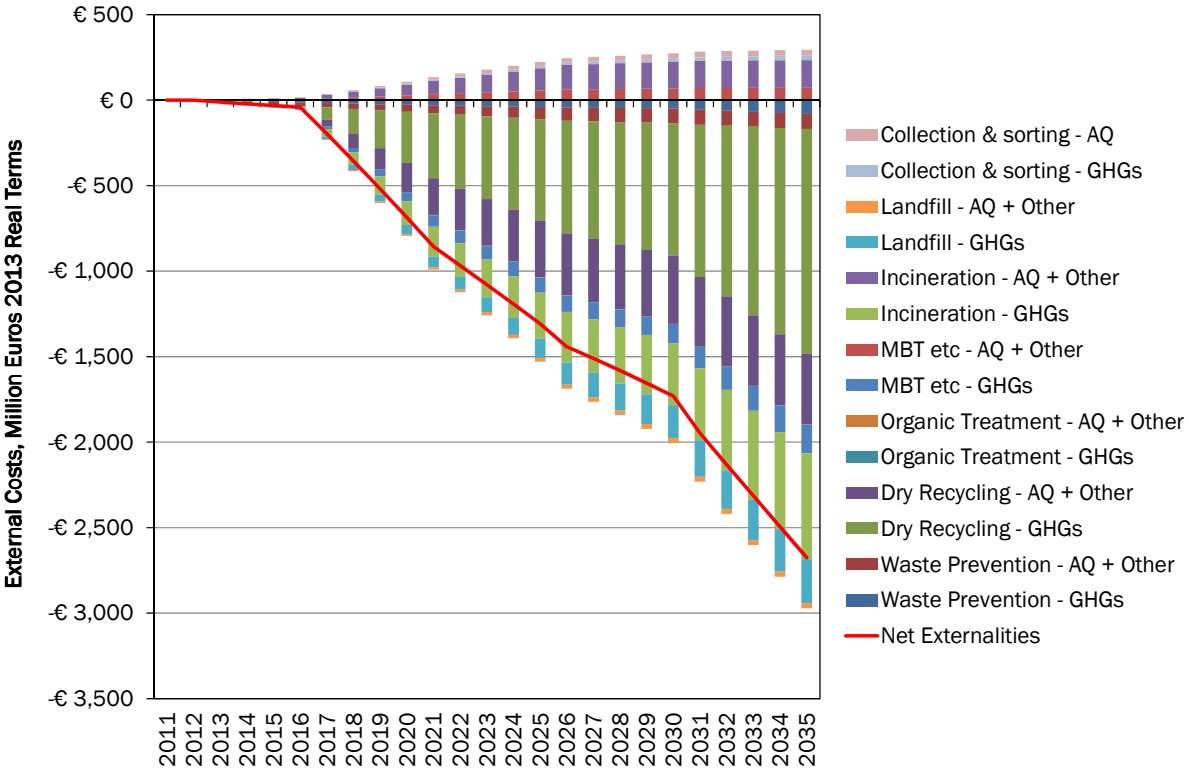


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.6.3 Environmental Costs

Option 3.2.a is associated with significant environmental benefits, primarily due to the reduced reliance on incineration and landfill, both of which are associated with fairly significant environmental impacts (as detailed in Appendix 4.0, these relate to GHGs and emissions to air). As in previous scenarios substantial environmental benefits are also realised after 2030.

Figure 8-28: Option 3.2.a – Environmental Externalities (EU28)

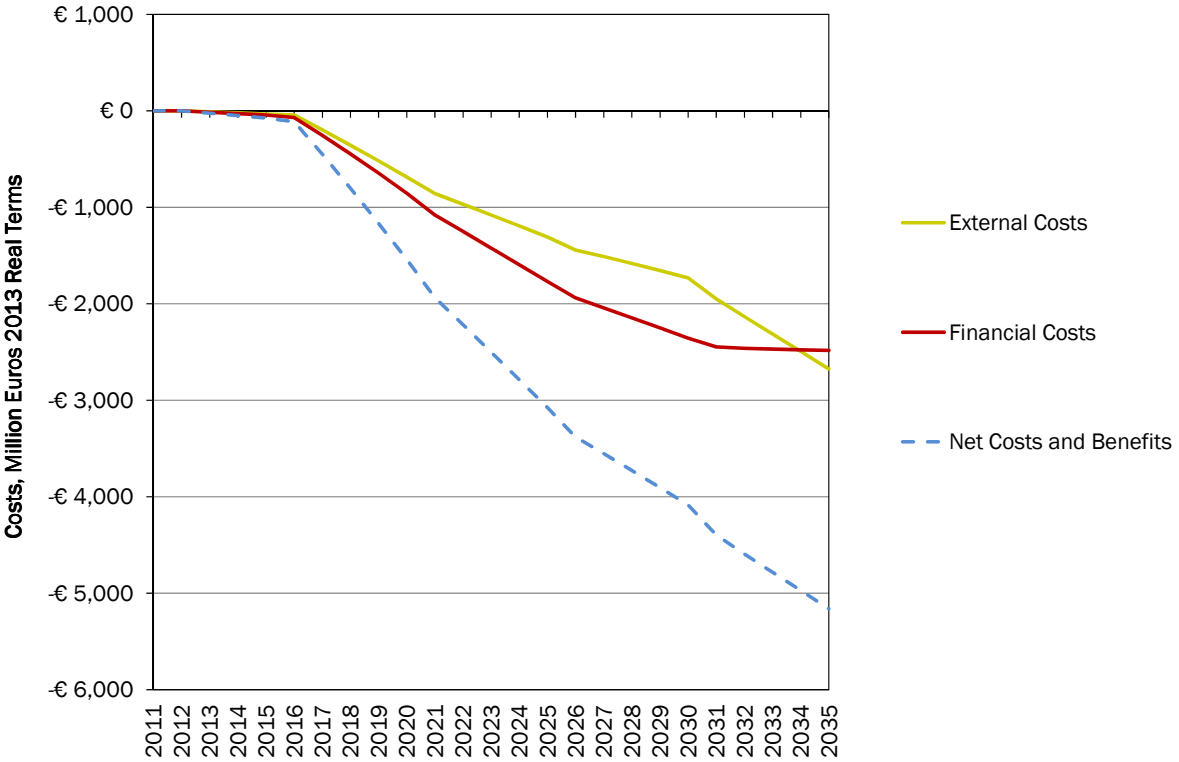


Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.6.4 Net Social Costs

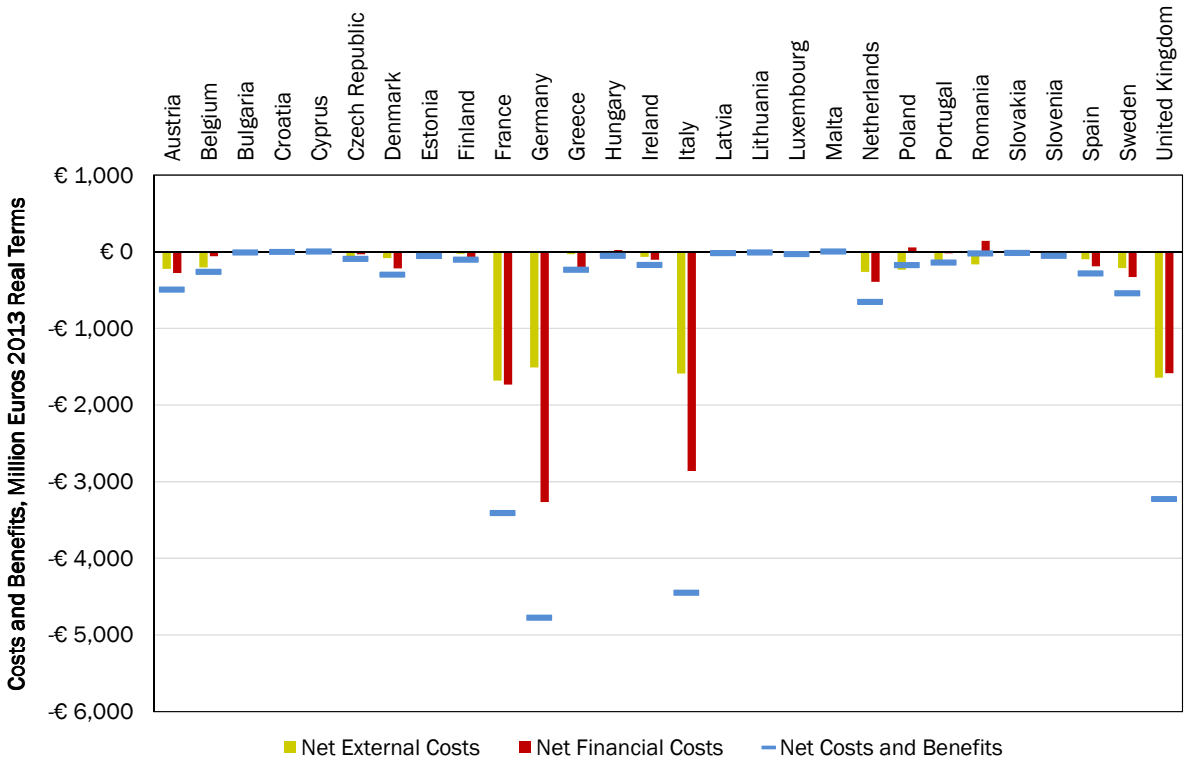
When considering the EU28 as a whole the net position of this Option is very favourable and is clearly linked to overall financial and environmental benefits (Figure 8-29). On a Member State level this Option also yields net social benefits for the vast majority of countries, with only minor cost being incurred by a few (Figure 8-30). It is evident, however, that the variance across Member States is quite significant, this is due, at least in part, to the size of the economies and the relative amount of packaging materials that are placed on the market in the larger economies such as Germany, France, Italy, and the United Kingdom.

Figure 8-29: Option 3.2.a – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-30: Option 3.2.a – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

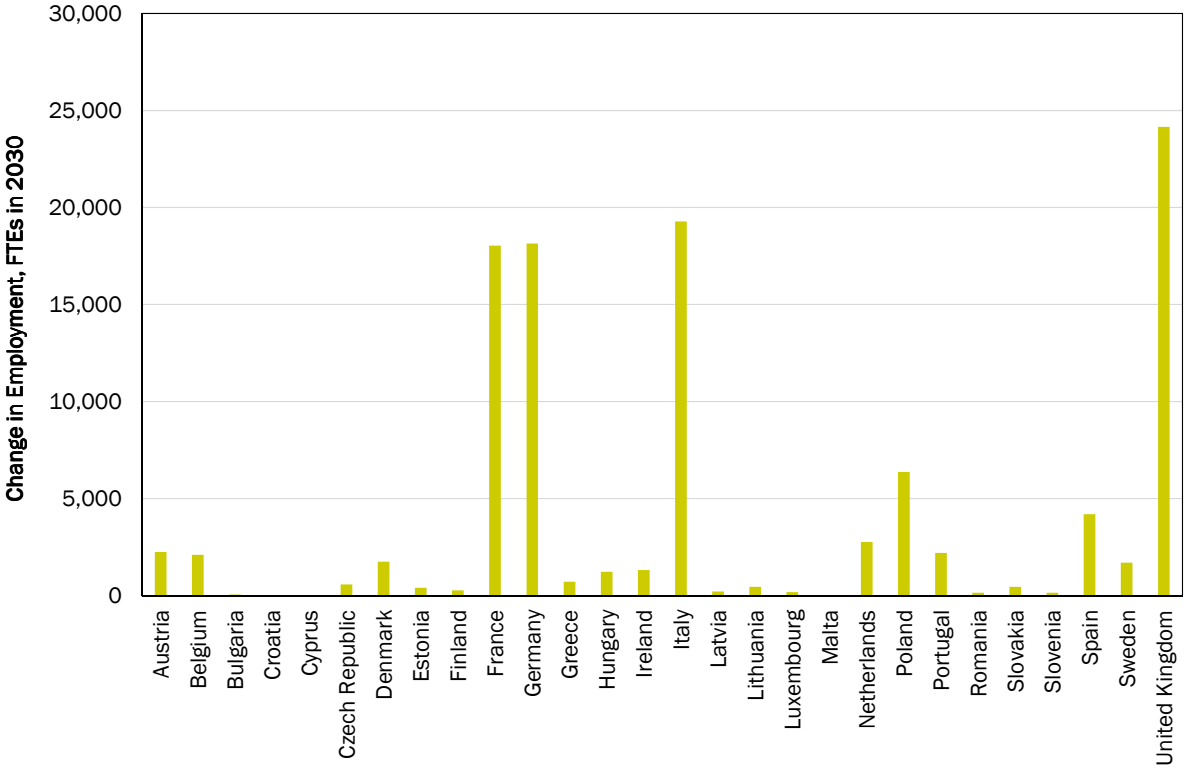


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.6.5 Employment

The high rates of recycling required under Option 3.2.a means that this Option also leads to an increase in employment, with the estimated increase in direct employment being 108 thousand FTEs across all Member States (Figure 8-31) in 2030. As before, whether employment is generated within Europe will depend upon the extent to which viable reprocessing facilities are available in the European Union on competitive terms.

Figure 8-31: Option 3.2.a – Change in Employment by 2030 (Full Time Equivalent)



8.7 Increased Packaging Targets with Metal Split (Option 3.2.b)

Option 3.2.a did not consider the inclusion of a split target between ferrous and non-ferrous packaging metals. An additional variant Option was run in the model to ascertain the additional costs and benefits associated with having a separate target for both materials (Table 8-7).

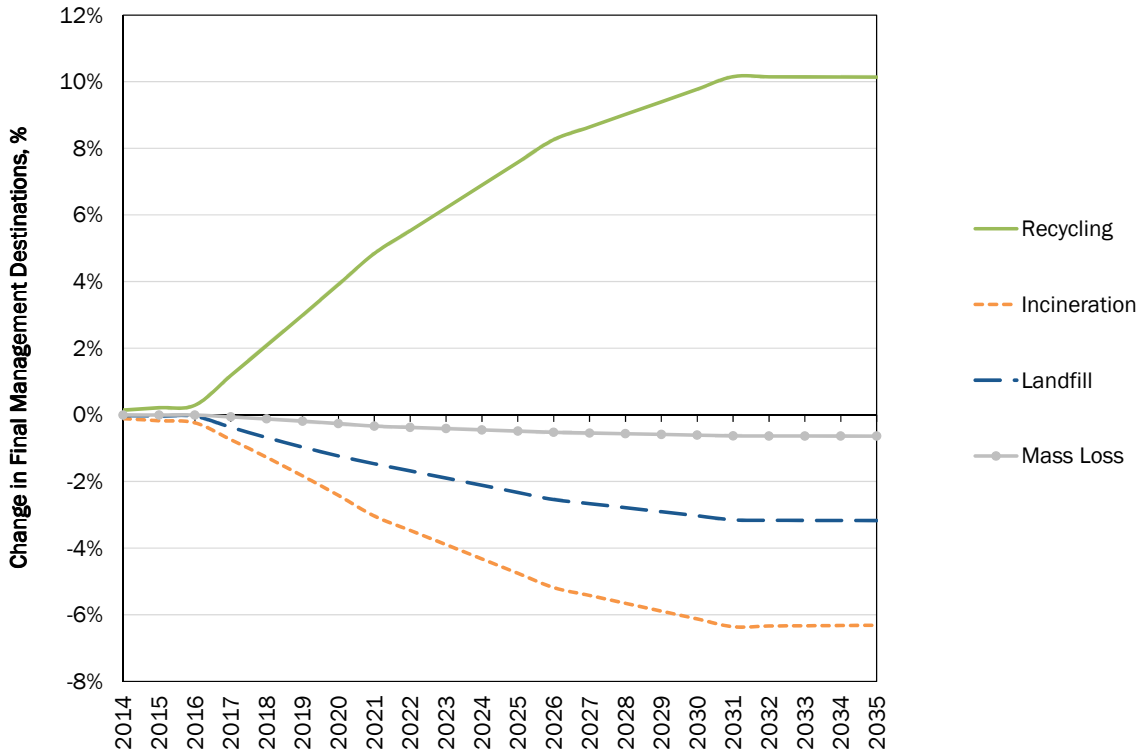
Table 8-7: Summary of Option 3.2.b

Option Number	Option		Target Year		
			2020	2025	2030
Option 3.2.b	Increased packaging targets with split targets for metals	Plastics	45%	60%	60%
		Non-ferrous metal	85%	90%	90%
		Ferrous metal	70%	80%	90%
		Glass	70%	80%	90%
		Paper/Card	85%	90%	90%
		Wood	50%	65%	80%

8.7.1 Change in Final Management Destinations

Mass flows shown in Figure 8-32 are very similar to those shown in Figure 8-26, but differ very slightly because of the higher capture of aluminium relative to the above Option which does not assume a split in the metal targets (in this document the difference between the two figures is virtually imperceptible).

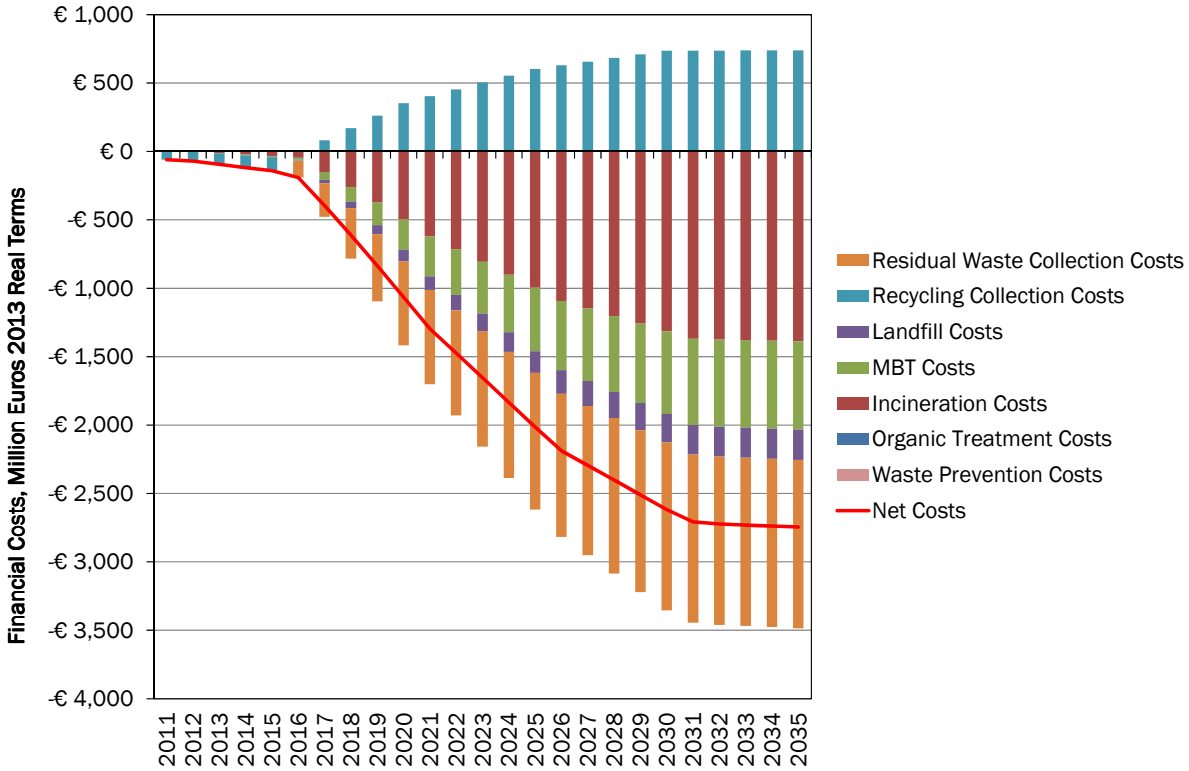
Figure 8-32: Option 3.2.b – Change in Final Management Destinations (EU28)



8.7.2 Financial Costs

Under this variant Option the separate target for non-ferrous metal, assumed to be aluminium, means that greater quantities of this material are captured. The net financial costs shown in Figure 8-33 are slightly lower than those for Option 3.2.a where no split metal target was considered (i.e. there is a greater net financial benefit to having a split target). This relates to the shift, at the margin, to recycling of higher value non-ferrous packaging (mainly aluminium).

Figure 8-33: Option 3.2.b – Financial Costs (EU28)

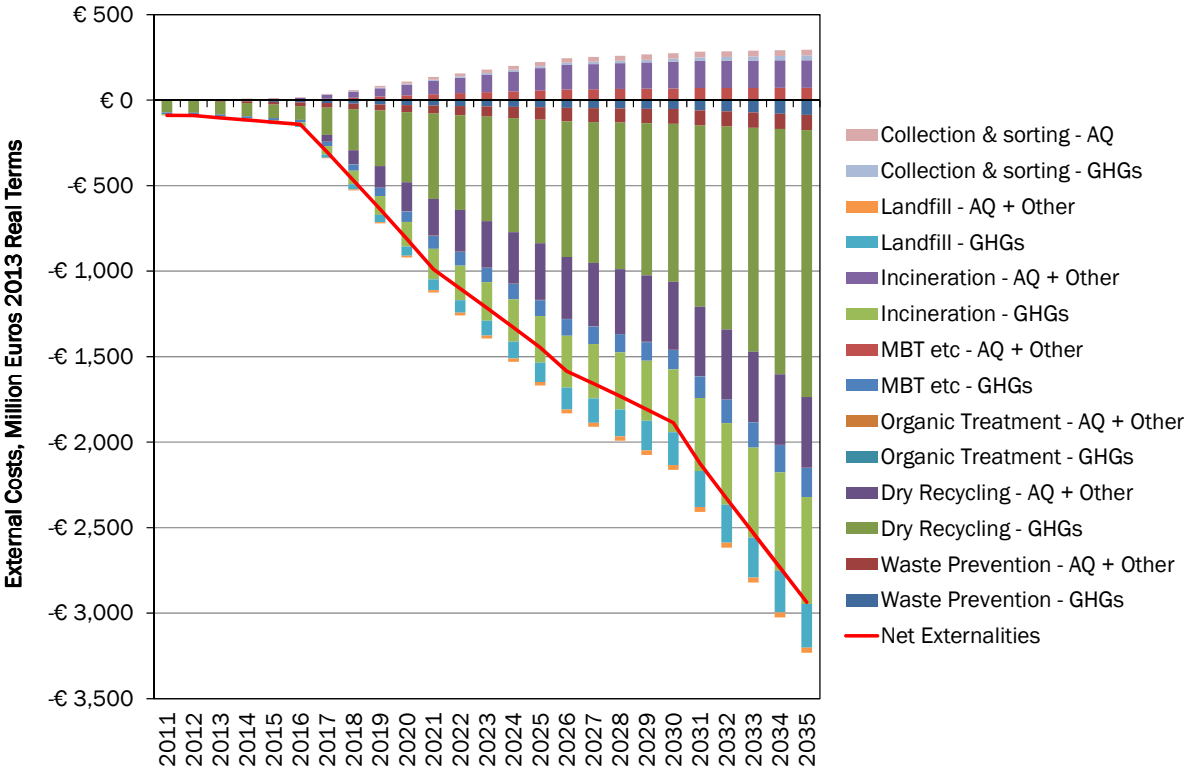


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.7.3 Environmental Costs

The significant environmental benefits associated with recycling aluminium packaging means that any measure which encourages this material to be recycled will likely result in net environmental benefits. This is born out in the results which are presented in Figure 8-34 below. From this it is clearly evident that the net environmental externalities are a lot lower under the split target Option than under Option 4.2.

Figure 8-34: Option 3.2.b – Environmental Externalities (EU28)



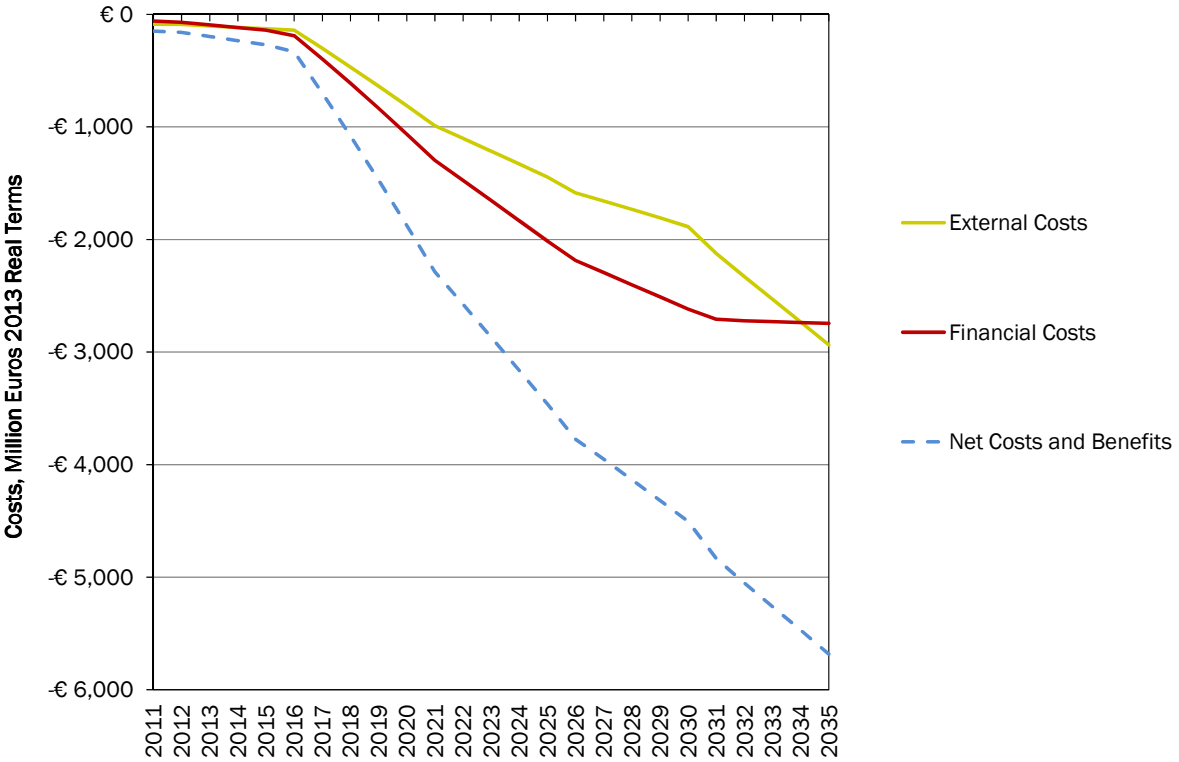
Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.7.4 Net Social Costs

As with Option 3.2.a, the net position of this Scenario is favourable and is linked to overall financial and environmental benefits (Figure 8-35). However, because non-ferrous metal (aluminium) recycling is targeted under this scenario it performs better than Option 3.2.a under which it was assumed that there was no split in the recycling rates for metals. The variance in net social benefits across individual Member States is shown in

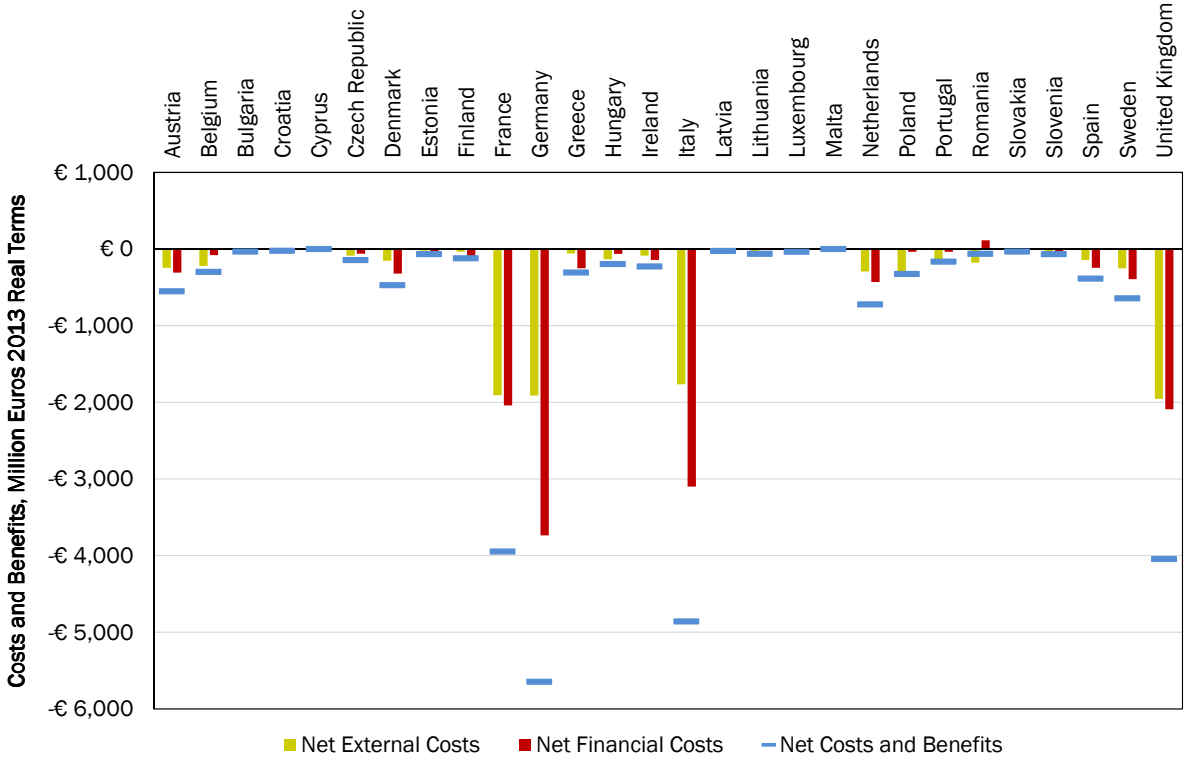
Figure 8-36.

Figure 8-35: Option 3.2.b – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-36: Option 3.2.b – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

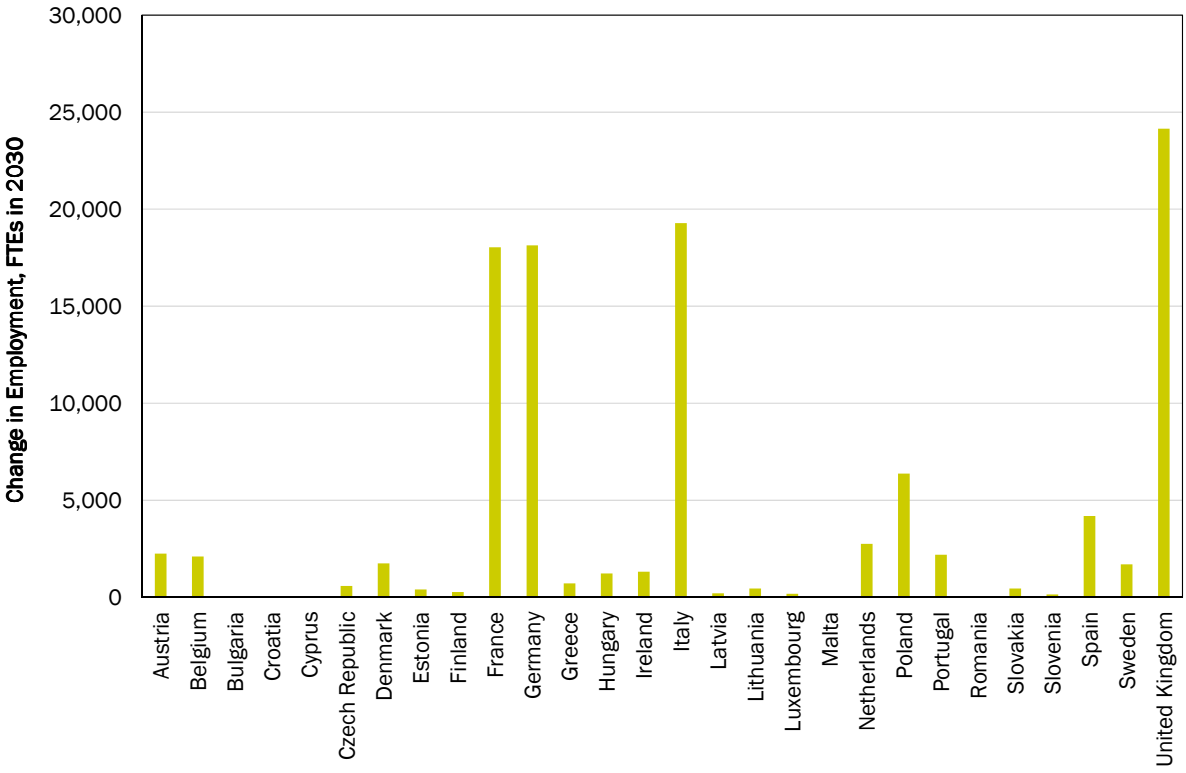


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.7.5 Employment

The unemployment rates under this Option are basically identical to those under Option 3.2.a (Figure 8-37). Given the low density of aluminium and its relatively low proportion in the waste stream it would not be expected that higher capture rates will drastically change mass flows and thereby estimated employment opportunities.

Figure 8-37: Option 3.2.b – Change in Employment by 2030 (Full Time Equivalent)



8.8 Limiting the Landfilling of MSW Residual Waste (Option 3.3)

The details of Option 3.3 are summarised in Table 8-8. In this Option landfilling of residual waste is progressively limited to 5% by 2030 for all Member States (by the trajectories required to meet this target Member States will have to be landfilling less than 25% of MSW generated by 2025). This Option assumes that a 'landfill ban' is implemented in isolation, and as such, Member States are likely to respond by constructing residual waste treatment capacities to deal with the residual waste that remains after full implementation has been achieved.

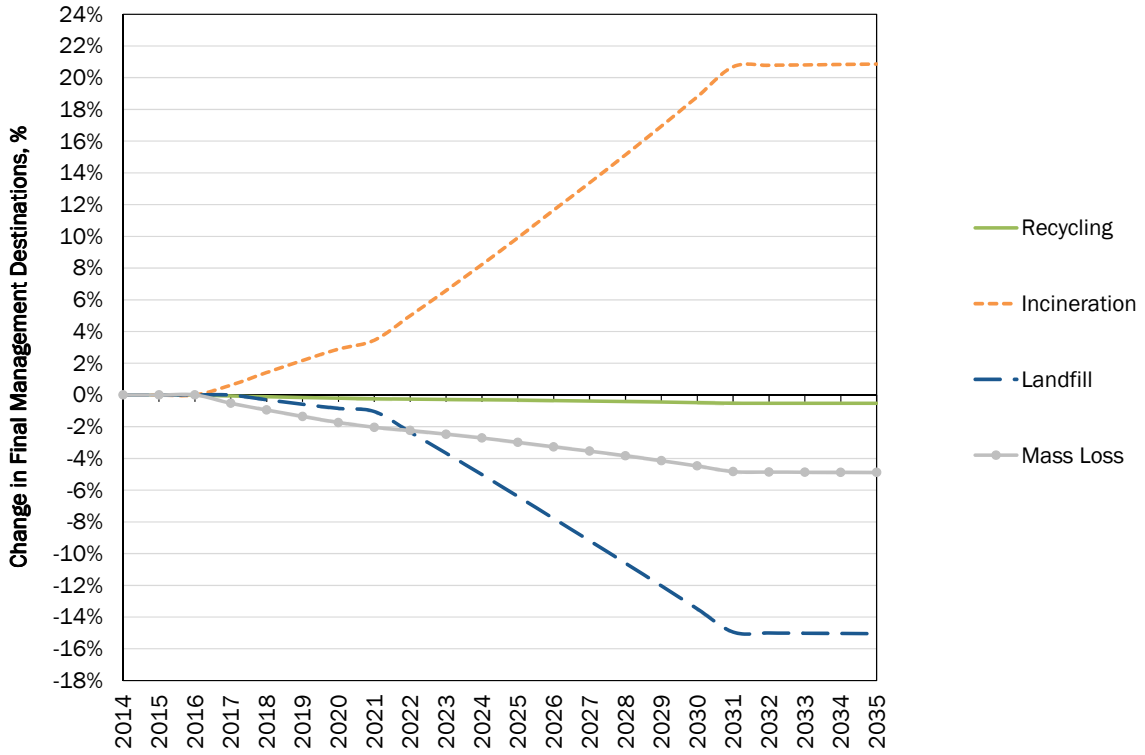
Table 8-8: Summary of Option 3.3

Option Number	Option	Target Year		
		2020	2025	2030
Option 3.3	Limiting the Landfilling of MSW Residual Waste	-	-	5% of MSW to landfill

8.8.1 Change in Final Management Destinations

Compared to the full implementation scenario Option 3.3 implies a progressive increase in the amount of MSW that is sent for incineration. Figure 8-38 shows the modelled changes in management destination. For the purposes of the modelling under this scenario, it has been assumed that implementing this option in isolation is unlikely to lead to significant recycling. In practice, the situation is likely to vary depending on the current level of costs for landfilling in a given country. Where these are lower the ban is more likely to have some effect on recycling. Modelling in this way also helps highlight the effects of switching residual waste from landfill to other waste treatment routes.

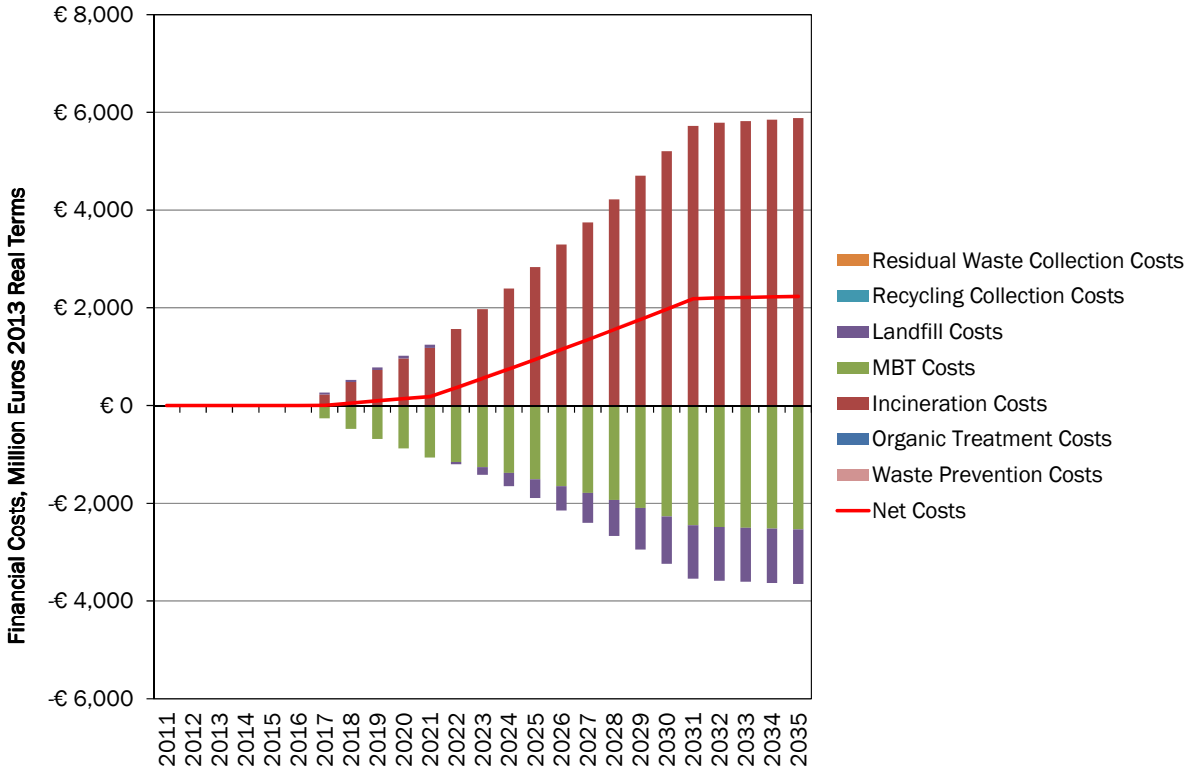
Figure 8-38: Option 3.3 – Change in Final Management Destinations (EU28)



8.8.2 Financial Costs

As stated above, Member States are expected to respond by constructing incineration capacity to deal with the residual waste that remains after full implementation has been achieved. The costs of this upfront investment are clear in Figure 8-39 below. The explanation behind the increase in costs relates mainly to the fact that, because this is a cost benefit analysis and excludes taxes and transfers from the analysis, the costs of avoiding landfilling exclude the effect of instruments such as landfill and incineration taxes, and the support mechanisms in place in some countries for renewable energy. Under these assumptions, the costs of switching from landfill (without tax) to other residual waste management options are relatively high, and not least in those countries where landfill clearly remains a very low cost option.

Figure 8-39: Option 3.3 – Financial Costs (EU28)

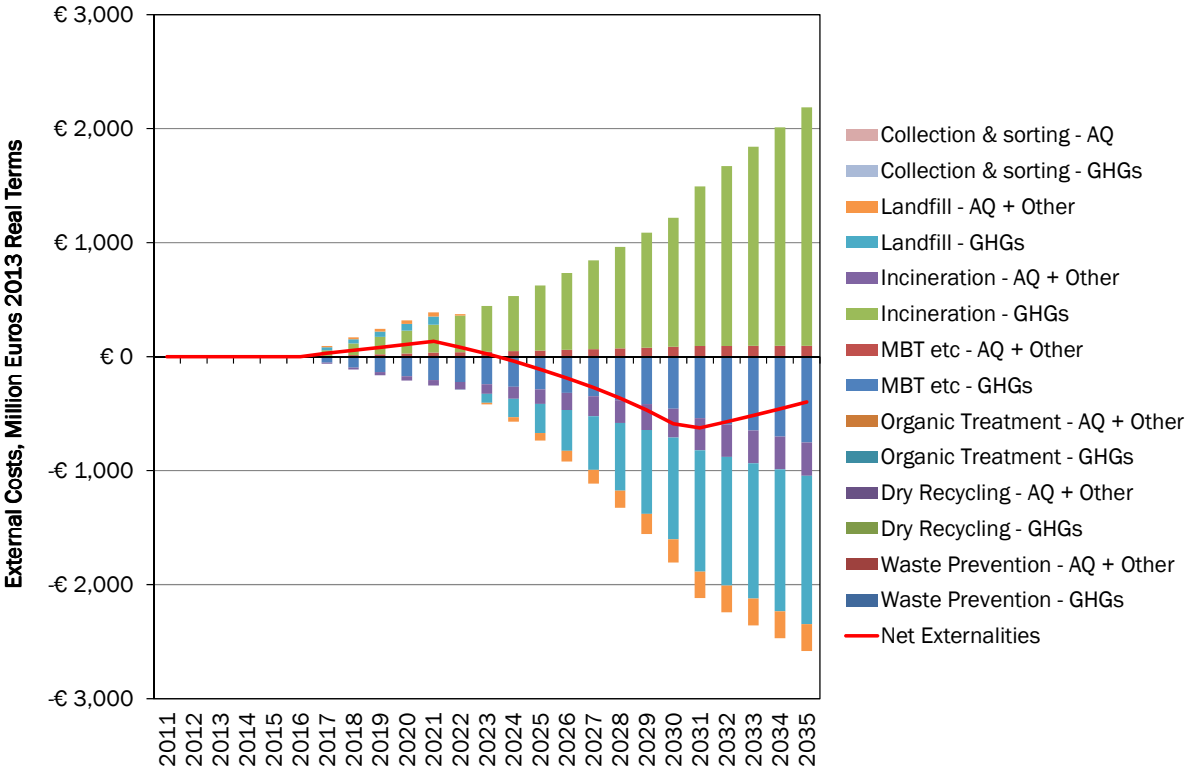


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.8.3 Environmental Costs

Relative to the full implementation scenario Option 3.3 is associated with marginal environmental benefits as materials are diverted from landfill and into incineration (Figure 8-40). This reflects the different emissions and their profiles over time.

Figure 8-40: Option 3.3 – Environmental Externalities (EU28)



Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

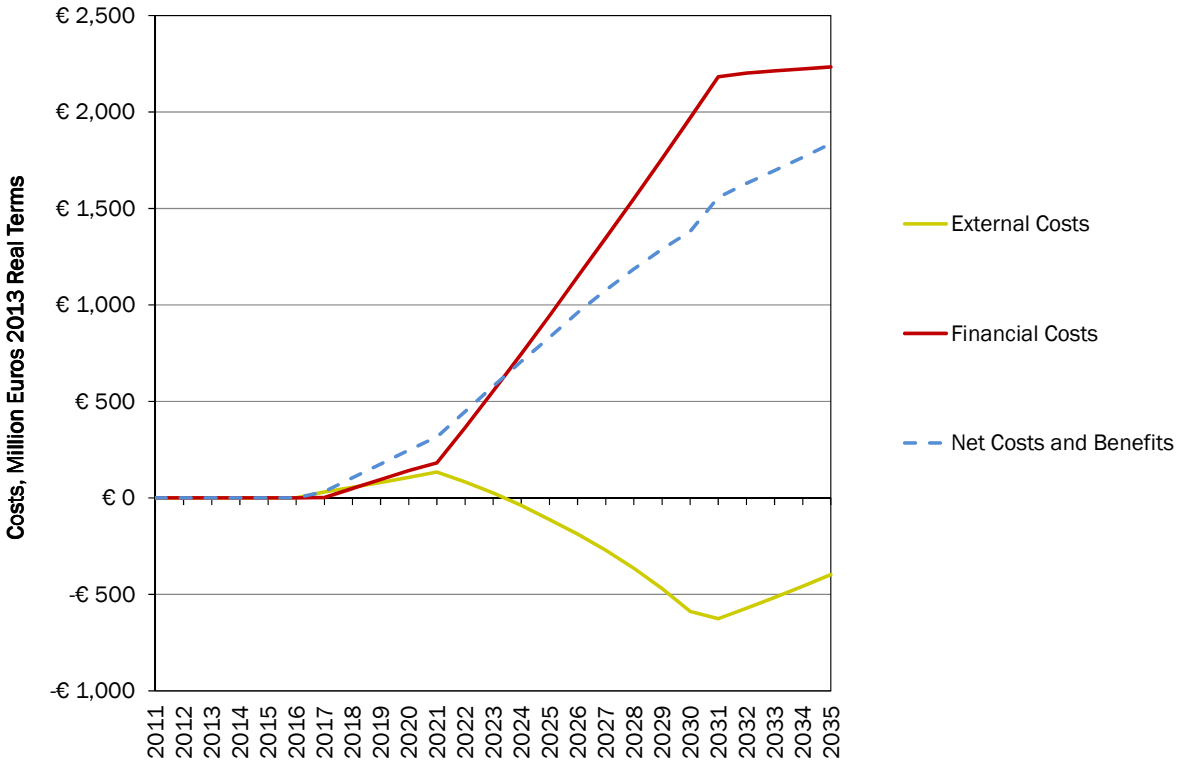
8.8.4 Net Social Costs

The overall position of this Option is that there is a net social cost as Member States respond to the landfill ban by constructing residual waste treatment capacity to deal with the residual waste that remains after Member States have achieved full implementation of the existing legislation. The slight environmental benefits associated with this change in the early years are outweighed by the costs. Essentially, this implies that the additional costs of switching from landfill to other residual waste treatments exceed the benefits that flow from such a switch. This is consistent with a number of other studies on the costs and benefits of landfill and incineration.[79]

[79] See for example: ECOTEC with CSERGE (1999) *Policy Instruments To Correct Market Failure In The Demand For Secondary Materials*, Final Report for the DETR, London: DETR; COWI (2000) *A Study on the Economic Valuation of Environmental Externalities from Landfill Disposal and Incineration of Waste*. Final Report to DG Environment, the European Commission, August 2000; Dijkgraaf, E., and H. Vollebergh (2004) Burn or Bury? A Social Cost Comparison of Final Waste Disposal Methods, *Ecological Economics*, 50, pp.233-247; Enviros and EFTEC (2004) *Valuation Of The External Costs And Benefits To Health And Environment Of Waste Management Options* Final Report for Defra, December 2004; HM Customs & Excise (2004) *Combining the Government's Two Heath and Environment Studies to Calculate Estimates for the External Costs of Landfill and Incineration*, December 2004; Dijkgraaf, E. and H. Volleberegh (2005) Literature Review of Social Costs and Benefits of Waste Disposal and Recycling, in *Rethinking the Waste Hierachy*, EAI: Copenhagen, pp. 80-98; Hogg, D. (2006) *Impact of Unit-based Waste Collection Charges*, Report for the OECD Environment Directorate, Working Group on Waste Prevention and recycling, May 2006.

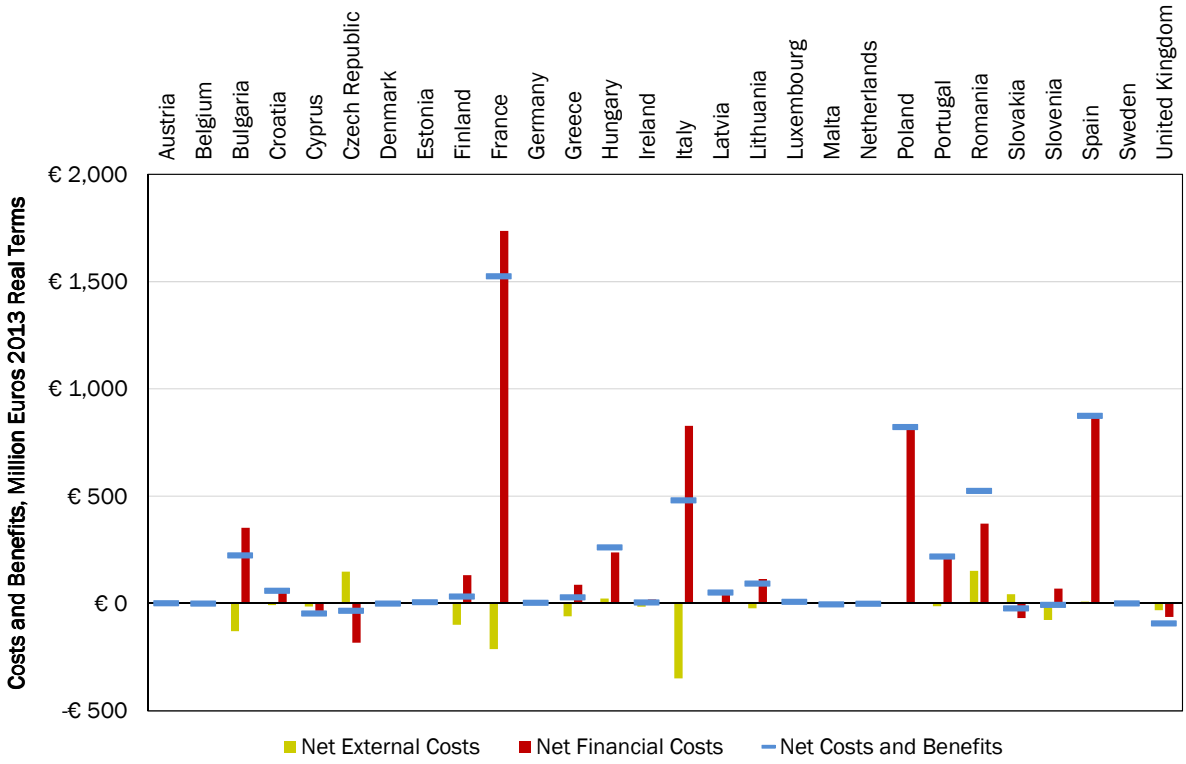
For the vast majority of Member States there is a net social cost to this Option (Figure 8-42). This is due to the fact that significant capital investments are required by some Member States to develop sufficient incineration capacity to treat the residual waste being diverted from landfill.

Figure 8-41: Option 3.3 – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-42: Option 3.3 – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

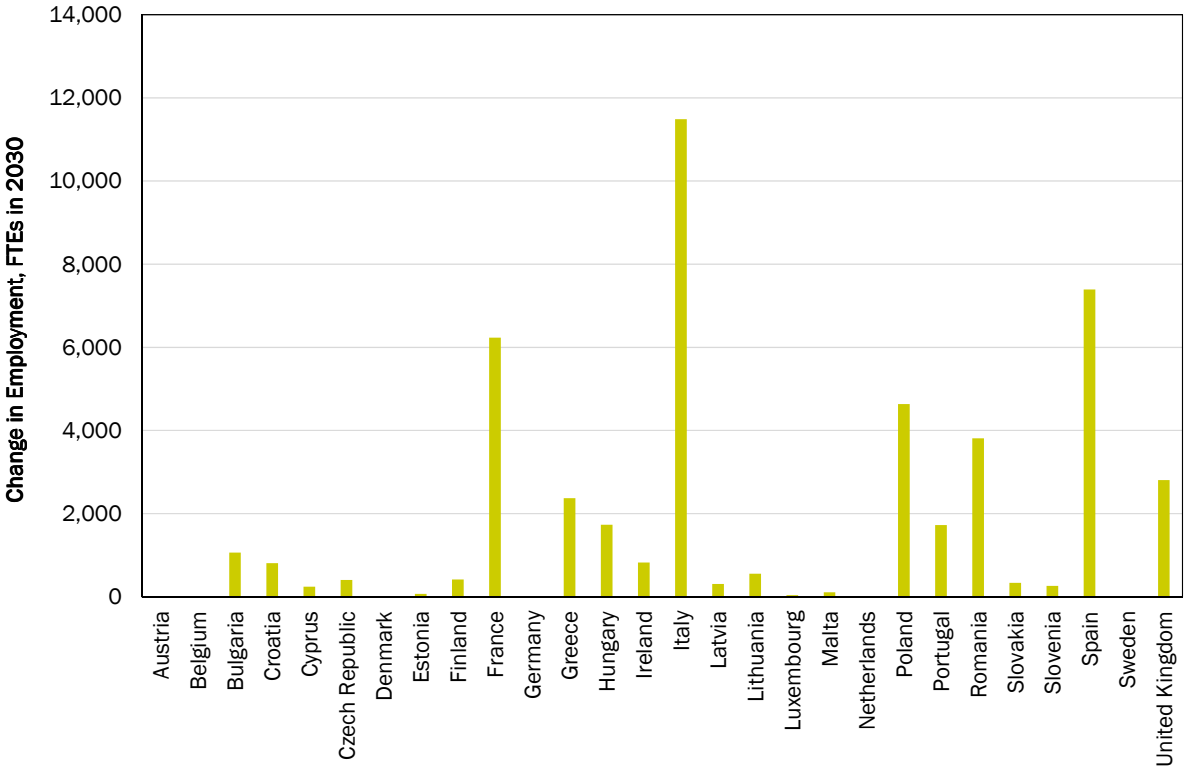


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.8.5 Employment

The employment intensity of landfilling is approximately 1 FTE per 10,000 tonnes of waste landfilled, whilst for incineration it is assumed to be 2 FTEs per 10,000 tonnes of waste processed (see Section 4.6.1 in Appendix 4.0). This Option therefore results in a marginal increase in direct employment of 46 thousand FTEs across the EU28.

Figure 8-43: Option 3.3 – Change in Employment by 2030 (Full Time Equivalent)



8.9 Combination of Options (Option 3.4.a)

Option 3.4.a examines the combined costs and benefits of the following three Options:

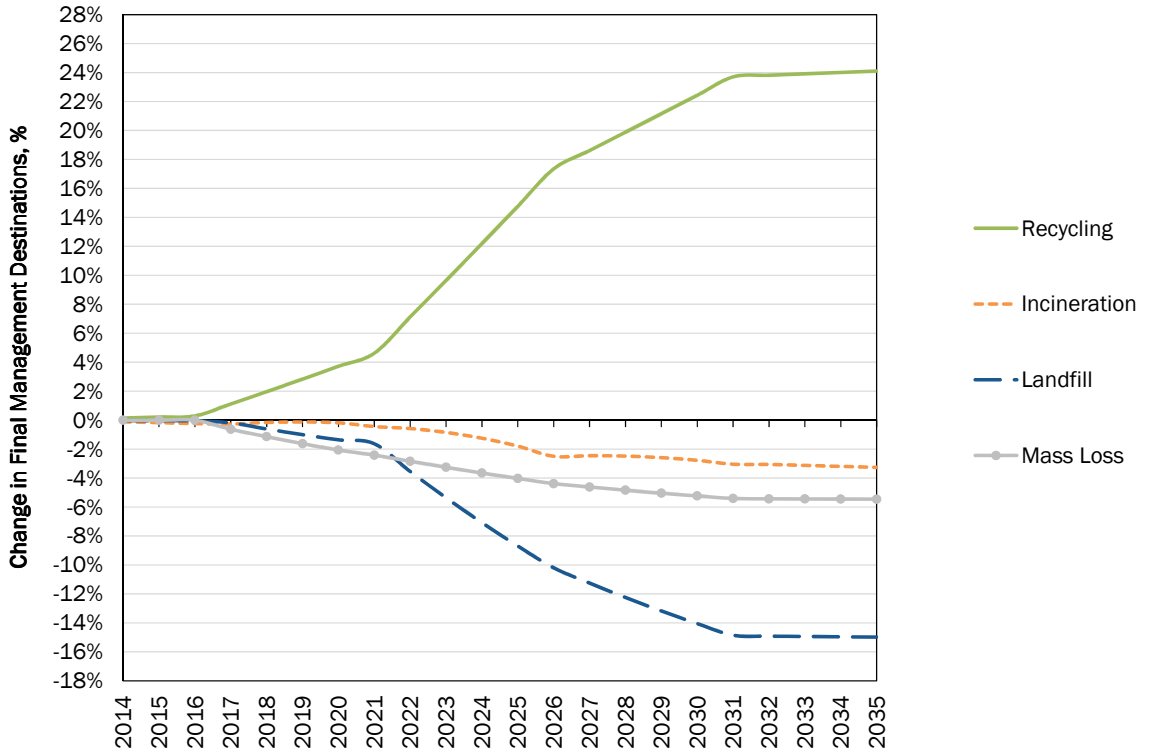
- Option 3.1.c - 70% MSW recycling/preparation for reuse target by 2030;
- Option 3.2.a – Increased packaging recycling targets; and
- Option 3.3 – Limiting the Landfilling of MSW Residual Waste to 5% by 2030.

In this option it is assumed that the targets and deadlines are applied equally to all Member States. The results of this combined Option are presented below.

8.9.1 Change in Final Management Destinations

In order to provide a package of measures that is consistent with the Resource Efficiency Roadmap and 7th EAP, the Option on restricting the landfilling of residual waste has been retained despite the net social costs indicated by the above analysis (Section 8.8). When combined with an ambitious recycling target, the extent of the switch to forms of residual waste treatment such as incineration is more limited. Indeed, at 70% recycling, a maximum of 30% of MSW will be available for residual waste treatment, which is already slightly less than the quantity likely to be incinerated under full implementation of the existing targets. This is shown graphically in Figure 8-44 where it can be seen that relative to the full implementation scenario, the amount of waste being incinerated across the EU28 actually decreases by just less than 4% by 2030 to account for the increased recycling rates. As a result of the landfill ban, landfilling falls off markedly, falling by about 14% by the time the 5% target is met in 2030. This scenario also shows a slow decline in the amount of residual waste being treated via MBT facilities as a greater proportion of waste is separated at source.

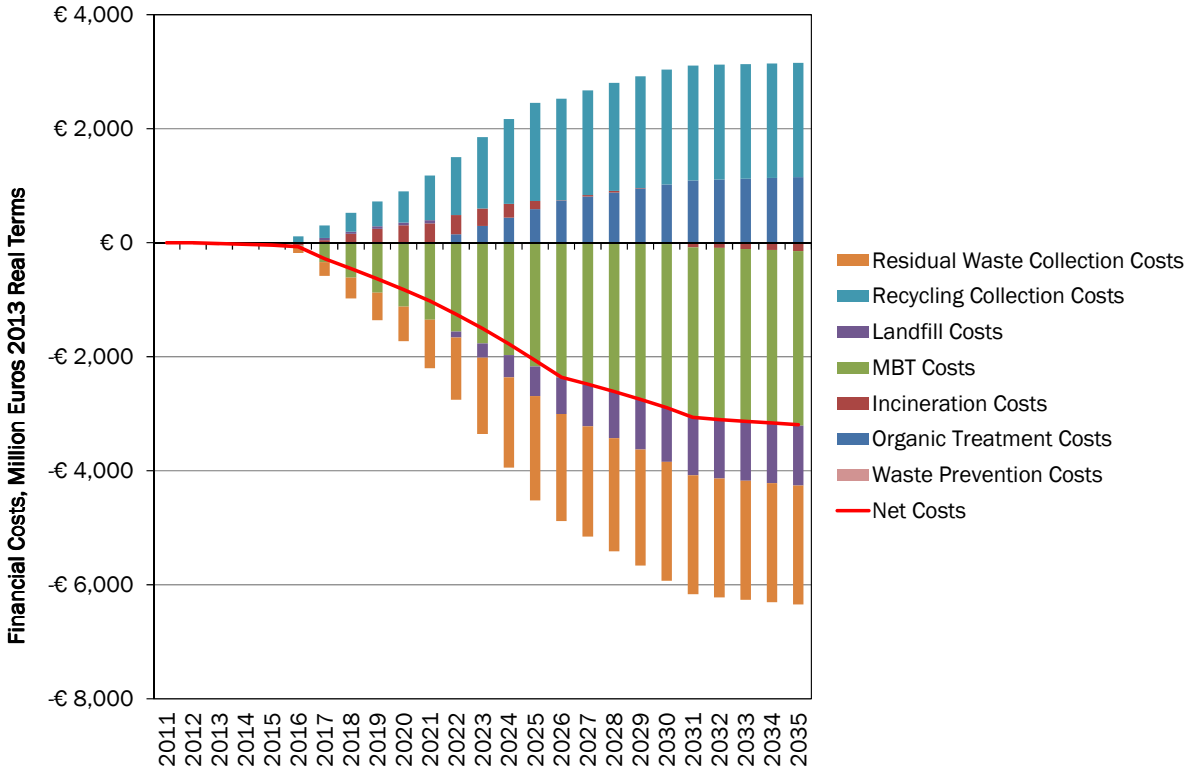
Figure 8-44: Option 3.4.a – Change in Final Management Destinations (EU28)



8.9.2 Financial Costs

As in the Options above the net financial cost of this Option is largely determined by the balance between recycling collection costs and organic waste treatment costs vs. cost savings resulting from reduced collection and treatment of residual waste (Figure 8-45). In the early years the costs outweigh the savings that are made as Member States transition from bring site collection services to door-to-door services, as part of their strategy to ensure that sufficient materials can be captured to meet the 70% recycling/preparation for reuse target included in this Option. Door-to-door collections of residual waste are more expensive than doing so via bring systems; thus, there are no net savings prior to about 2019. After this point the avoided costs of collecting and treating/disposing of residual waste begin to mount up and offset, by some margin, the costs associated with collecting and managing both dry and organic recyclables.

Figure 8-45: Option 3.4.a – Financial Costs (EU28)

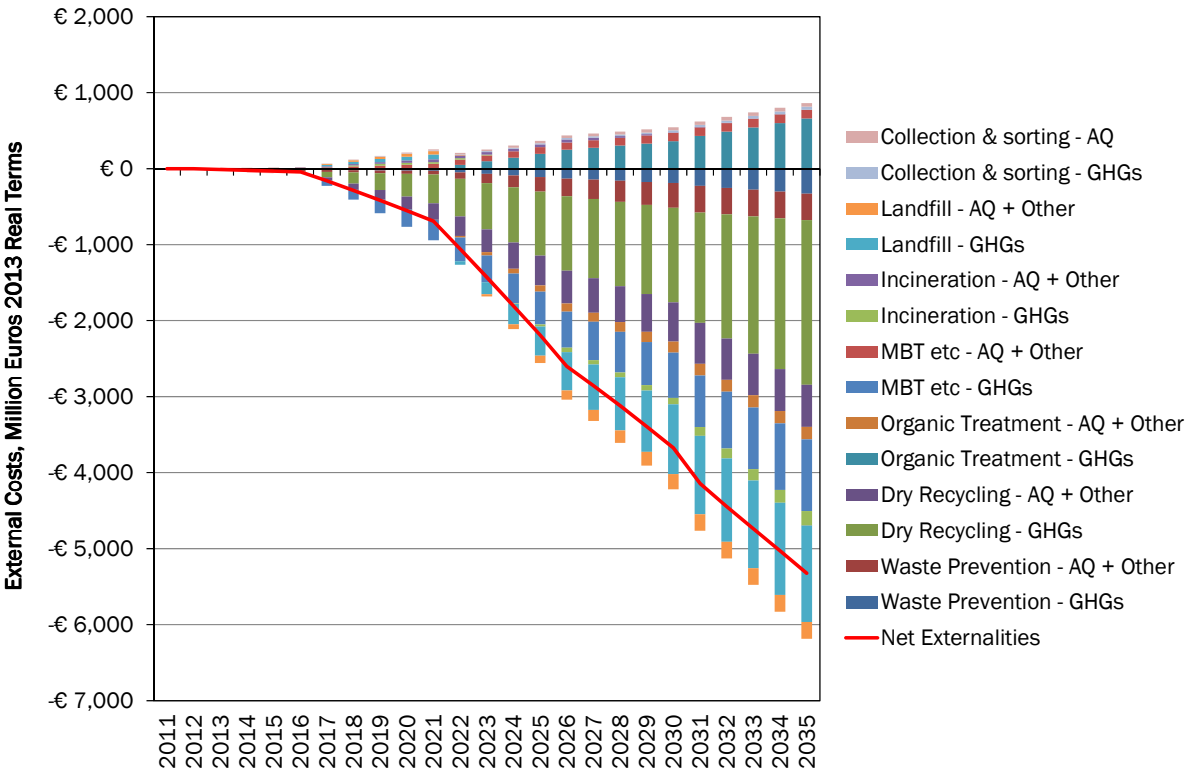


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.9.3 Environmental Costs

The net environmental position of this Option is positive, with clear benefits being derived from the avoided collection and treatment/disposal of residual waste (Figure 8-46). These benefits easily counteract the small amount of emissions to air that result from the collection, sorting and treatment of recyclables.

Figure 8-46: Option 3.4.a – Environmental Externalities (EU28)

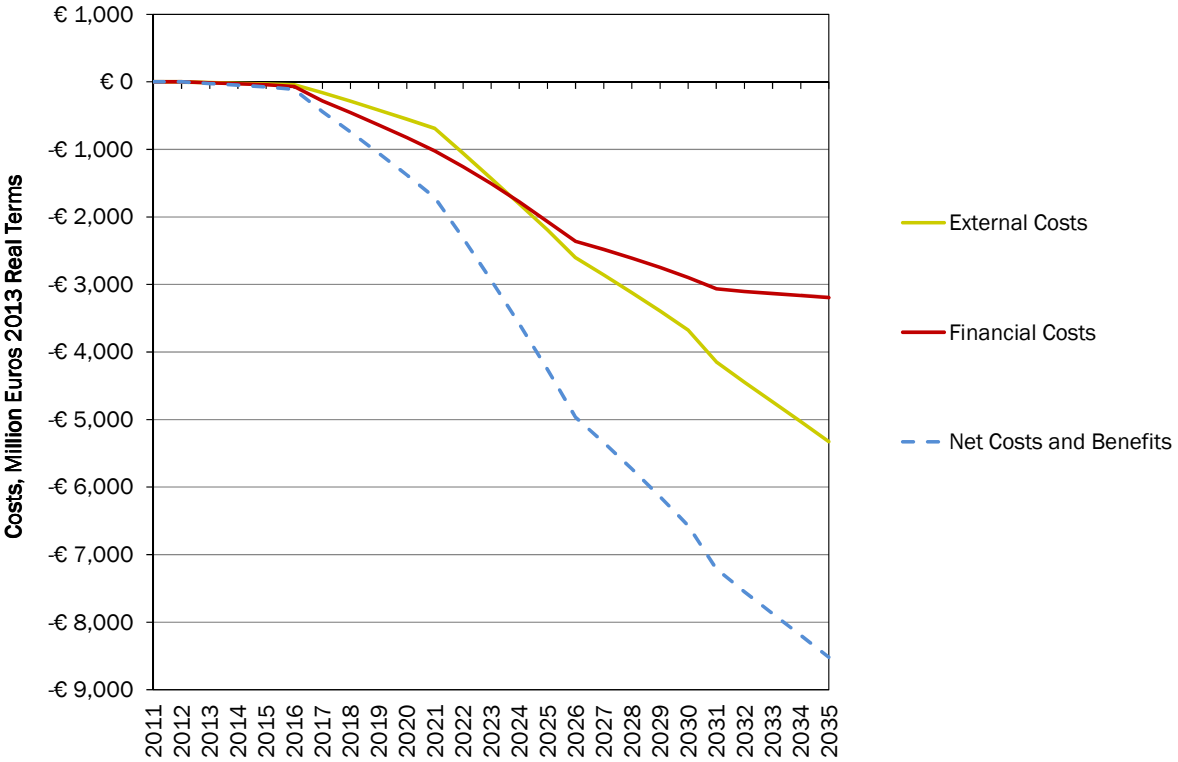


Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.9.4 Net Social Costs

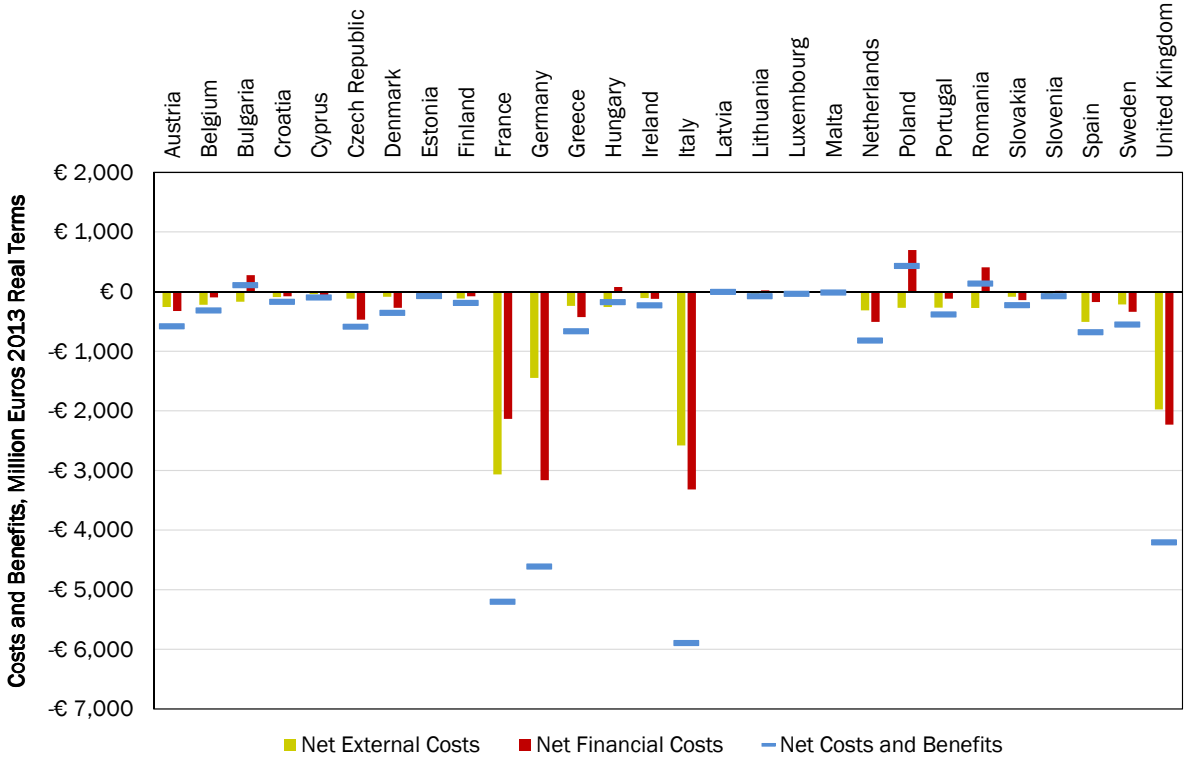
Given the net financial and environmental benefits discussed above it is clear that the overall position is favourable with the net social benefits to society amounting to approximately €8,500 million by 2035 (Figure 8-47). Other than for Bulgaria, Poland and Romania, for whom this Option is associated with very slight net costs, all Member States experience a net benefit under this Option (Figure 8-48).

Figure 8-47: Option 3.4.a – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-48: Option 4.4 – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)

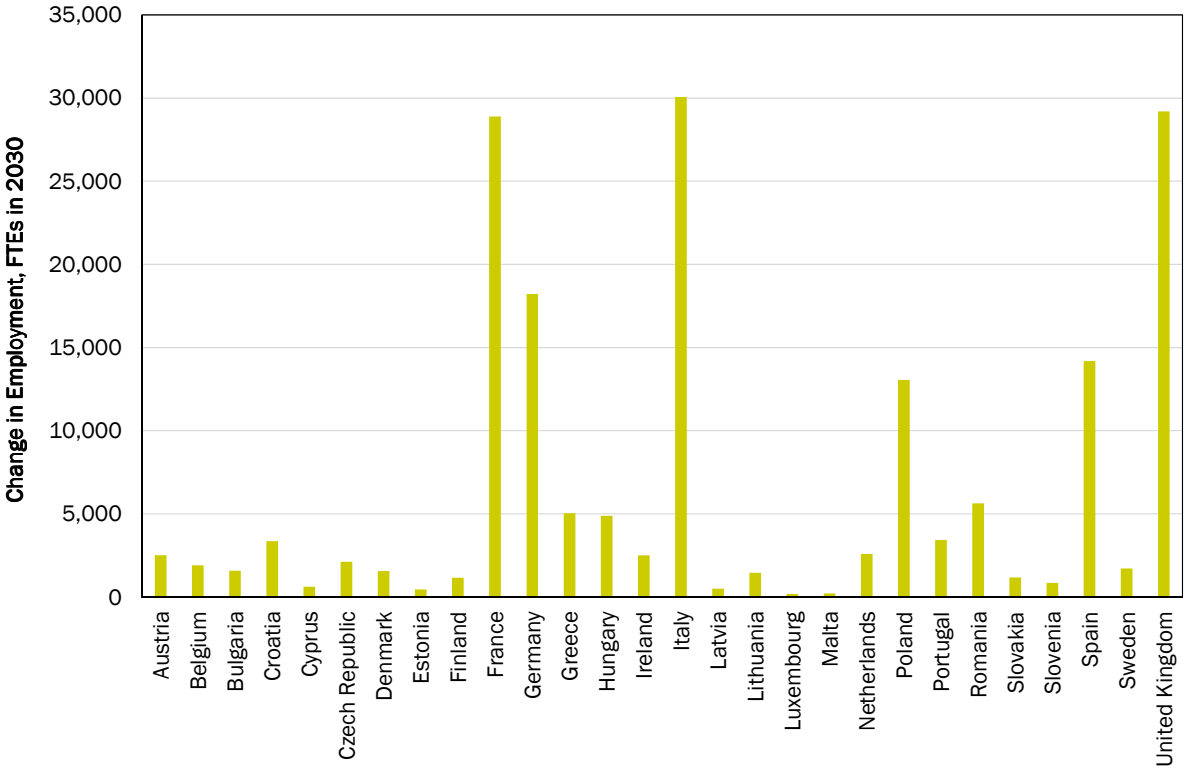


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.9.5 Employment

The approach would generate an estimated 178 thousand FTEs in terms of employment across the EU by 2030. The country specific impacts are shown graphically in Figure 8-49.

Figure 8-49: Option 3.4.a – Change in Employment by 2030 (Full Time Equivalent)



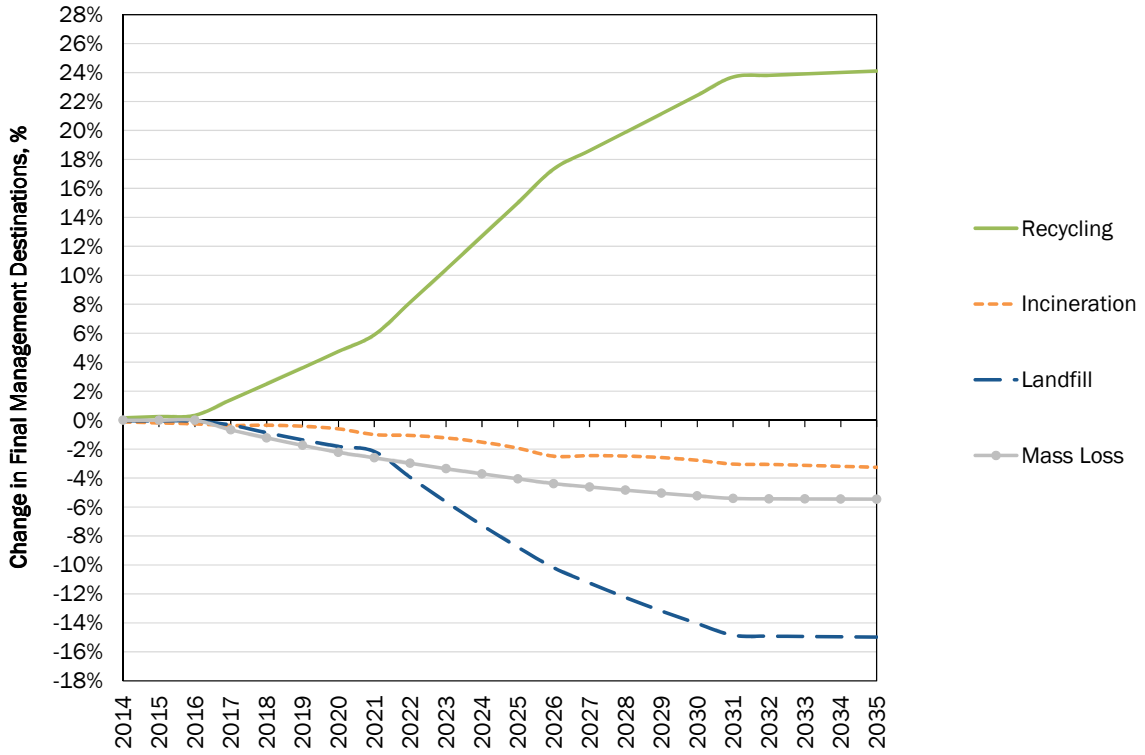
8.10 Combination of Options with Member State Derogations (Option 3.4.b)

This scenario assumed that Group 1 and 2 Member States (see Table 7-4) would be obliged to meet the 2020 recycling/preparation for reuse target using method 4 only, whereas Group 3 countries would be given until 2025. All countries would be obliged to meet the 60% recycling/preparation for reuse target by Method 4 in 2025, and 70% target in 2030. In terms of the landfill ban in this Option, Group 1 countries are required to meet the 5% target by 2020, whereas Group 2 and 3 countries have until 2030 to achieve the target.

8.10.1 Change in Final Management Destinations

The results of this Option are very similar to Option 3.4.a, the only difference being that recycling rates start to increase a little earlier as Group 1 and 2 Member States have to report against the 2020 target using calculation Method 4 (i.e. % total municipal waste recycled), as opposed to their chosen method (see Table 8-1). Landfilling also reduces earlier as Group 1 Member States have to achieve less than 5% landfilling of MSW by 2020 (a number of them have already achieved this). However, by 2030 the mass flows are identical to Option 3.4.a as all Member States achieve the relevant targets.

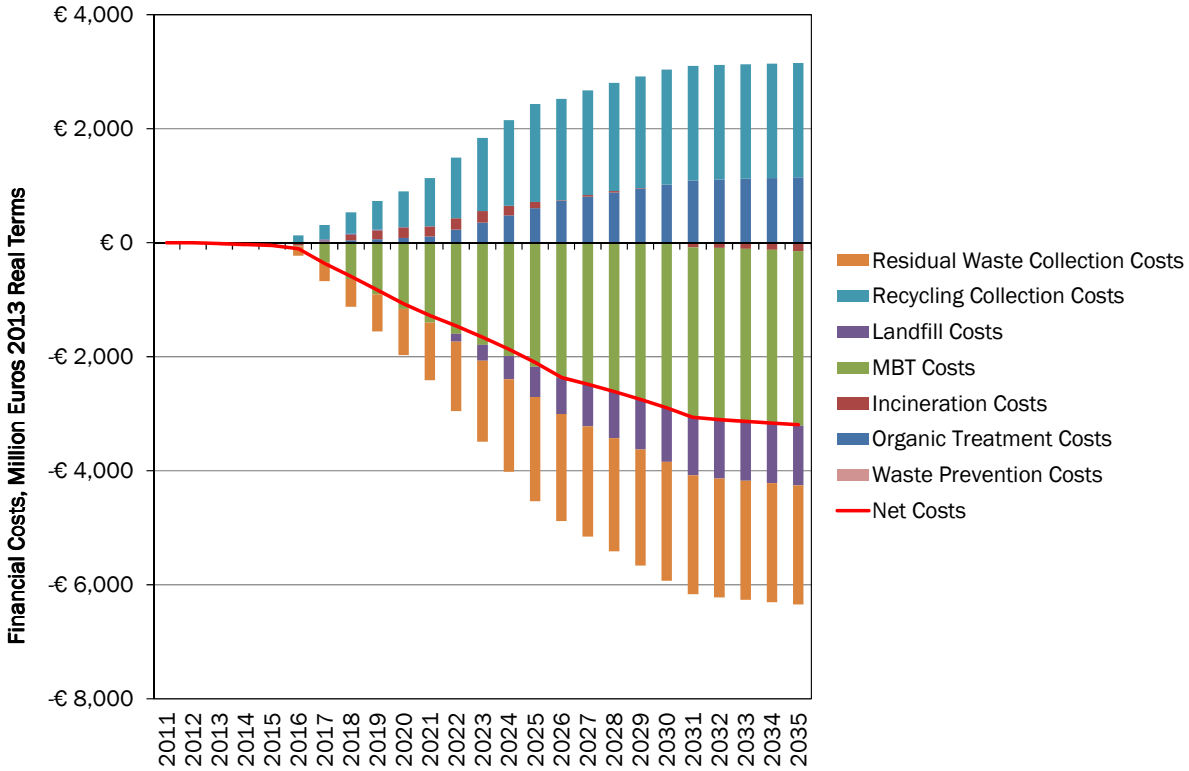
Figure 8-50: Option 3.4.b – Change in Final Management Destinations (EU28)



8.10.2 Financial Costs

Given the very minor changes in mass flows compared to Option 3.4.a, this option yields some additional financial savings in the early years as the amount of residual waste requiring collection and treatment is reduced (Figure 8-51). In the longer term, however, there is very little difference between the two Options.

Figure 8-51: Option 3.4.b – Financial Costs (EU28)

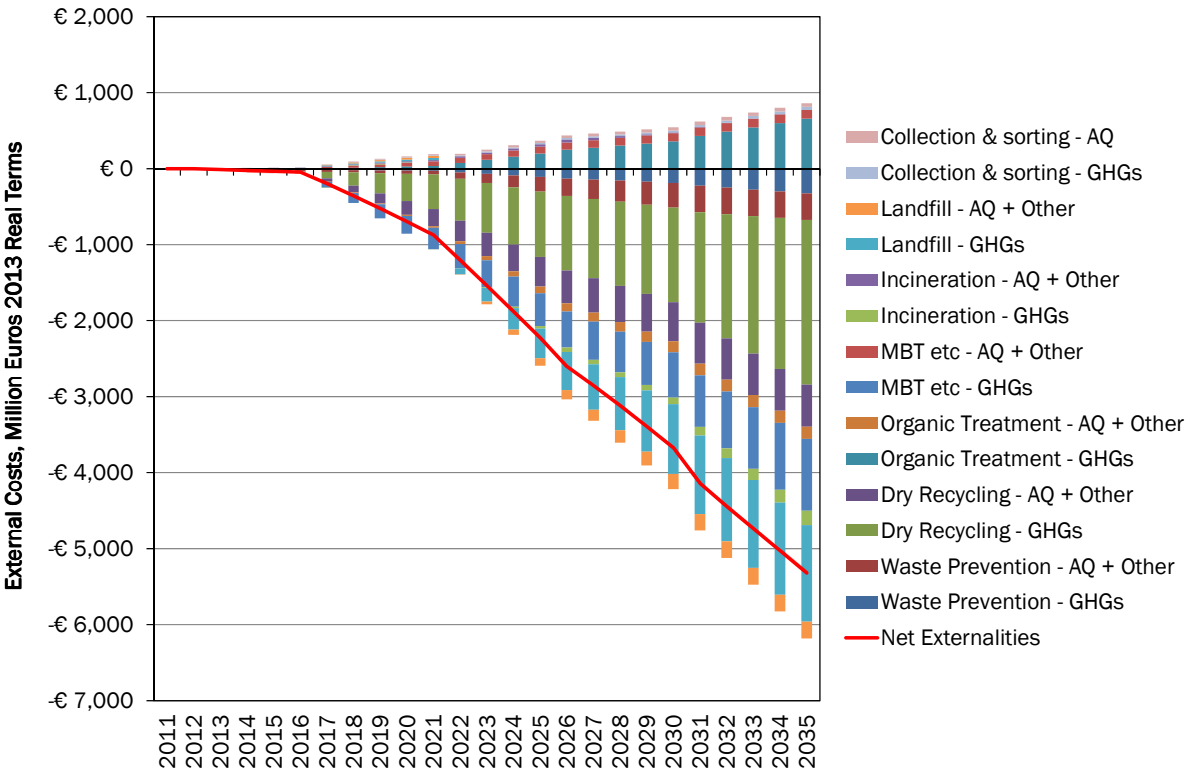


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.10.3 Environmental Costs

As above, some environmental benefits are accrued in the early years relative to Option 3.4.a, but the two Options have very similar outcomes by 2030 (Figure 8-52).

Figure 8-52: Option 3.4.b – Environmental Externalities (EU28)

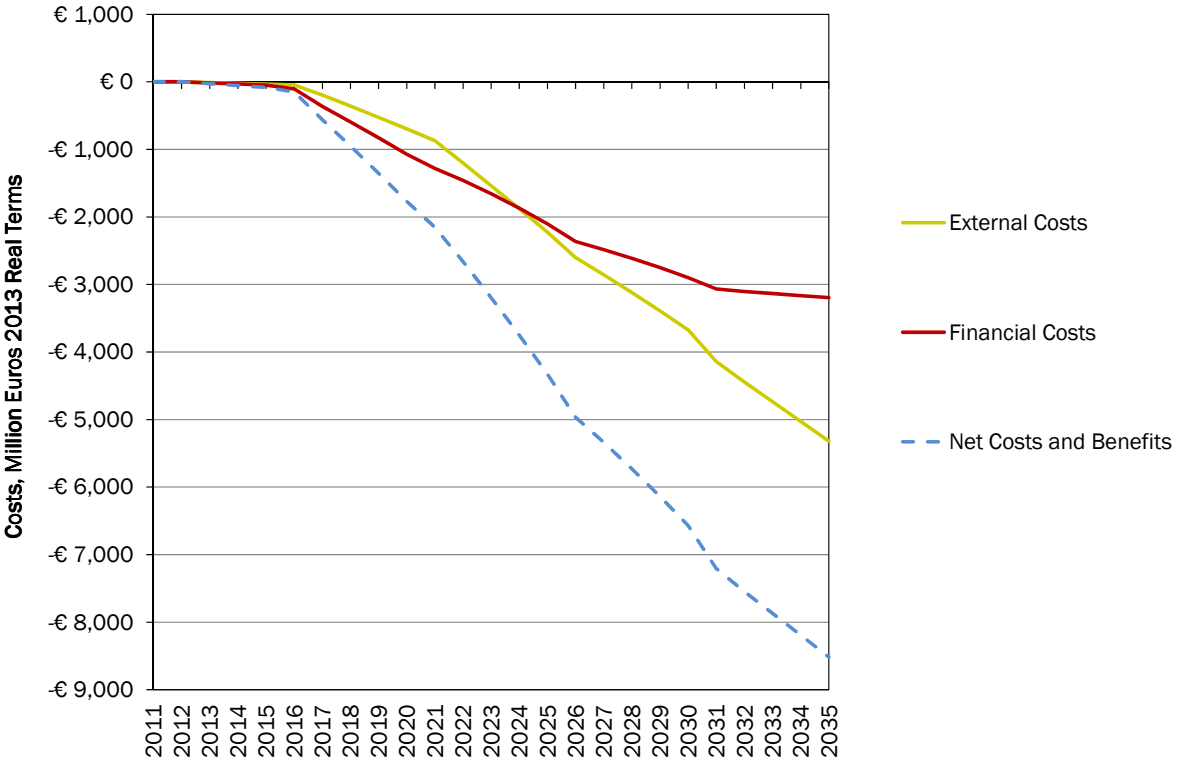


Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.10.4 Net Social Costs

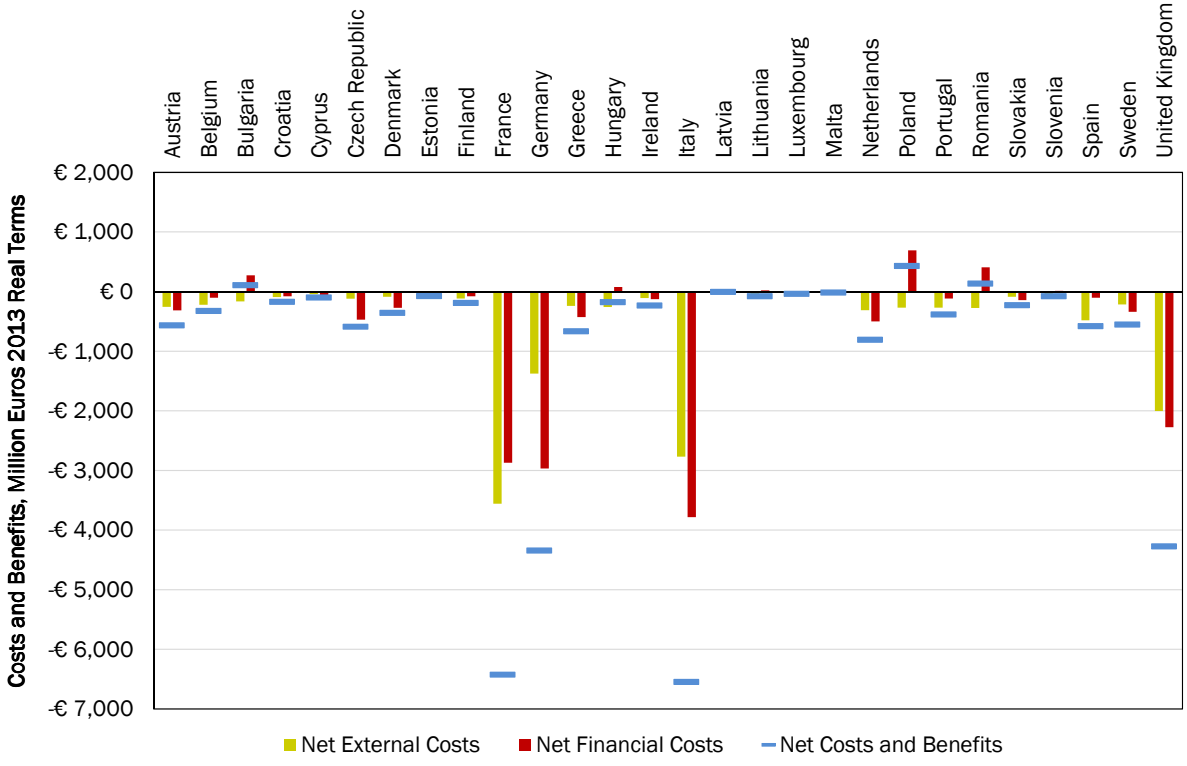
Given the net financial and environmental benefits discussed above, the overall position is favourable with the net social benefits to society being in the region of €8,500 million in 2035 (Figure 8-53). As with Option 3.4.a there is a net positive benefit for all Member States, other than for Bulgaria, Poland, and Romania, as countries benefit from reductions in the overall financial and environmental costs relative to full implementation (Figure 8-54).

Figure 8-53: Option 3.4.b – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

Figure 8-54: Option 3.4.b – Net Social Costs and Benefits by Member State (NPV 2014 – 2030)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.10.5 Employment

By 2030 this option will result in the same number of FTEs across the EU28 as Option 3.4.a (i.e. 178 thousand – see Section 8.9.5).

8.11 Combination of Options with Limiting Landfilling at Category B Landfills (Option 3.4.c)

Council Decision of 2003/33/EC refers to various categories of landfill. Catergory B includes B1a, B1b, B2, and B3 landfills.[80] These landfills are those that are: a) not landfills for inert waste only; and b) are licensed to accept only non-hazardous waste. It is these landfills which form the focus of this analysis. The high level modelling of this scenario suffers from a number of shortcomings, not least of which were:

- The absence of any quality data on the composition of the non-municipal waste landfilled in the EU28; and
- The lack of a clear counterfactual in terms of how such wastes might be managed in future.

In the absence of alternative information, we have assumed, as a relatively crude approximation, that the results of extending the ban on landfill in this way would be to generate additional recycling, as well as a shift in the management of residual waste from landfill to various treatment options. We have effectively scaled the benefits for a combined scenario by combining Option 3.4.a to the totality of wastes landfilled at Category B landfills in 2011. The effects, therefore, resemble the effects described for municipal waste. It should be noted, however, that the different waste compositions will, in reality, affect environmental benefits, whilst the costs may be expected to be rather different, in reality, than for the municipal wastes, because of the different impacts on the current logistics.

Restricting landfilling at Category B landfills to 5% in 2011 would mean that around 58 million tonnes of waste could be diverted from landfill (compared to 103 million tonnes of MSW landfilled). For the purposes of this Option it was assumed that by 2030 this waste is removed from landfill and sent to the following destinations:

- 50% to dry recycling;
- 20% to organic treatment;
- 15% to MBT; and
- 15% to incineration.

This Option used the same unit costs for each treatment / collection type as used in the MSW specific scenarios outlined above to calculate the total costs and benefits for the change in management of the additional 58 million tonnes of waste. These costs and benefits were then overlaid on Option 3.4.a to come up with an overall view of what the likely costs and benefits would be for this Option. Due to fact that this analysis included non-municipal waste it was not possible to generate Member State specific results from

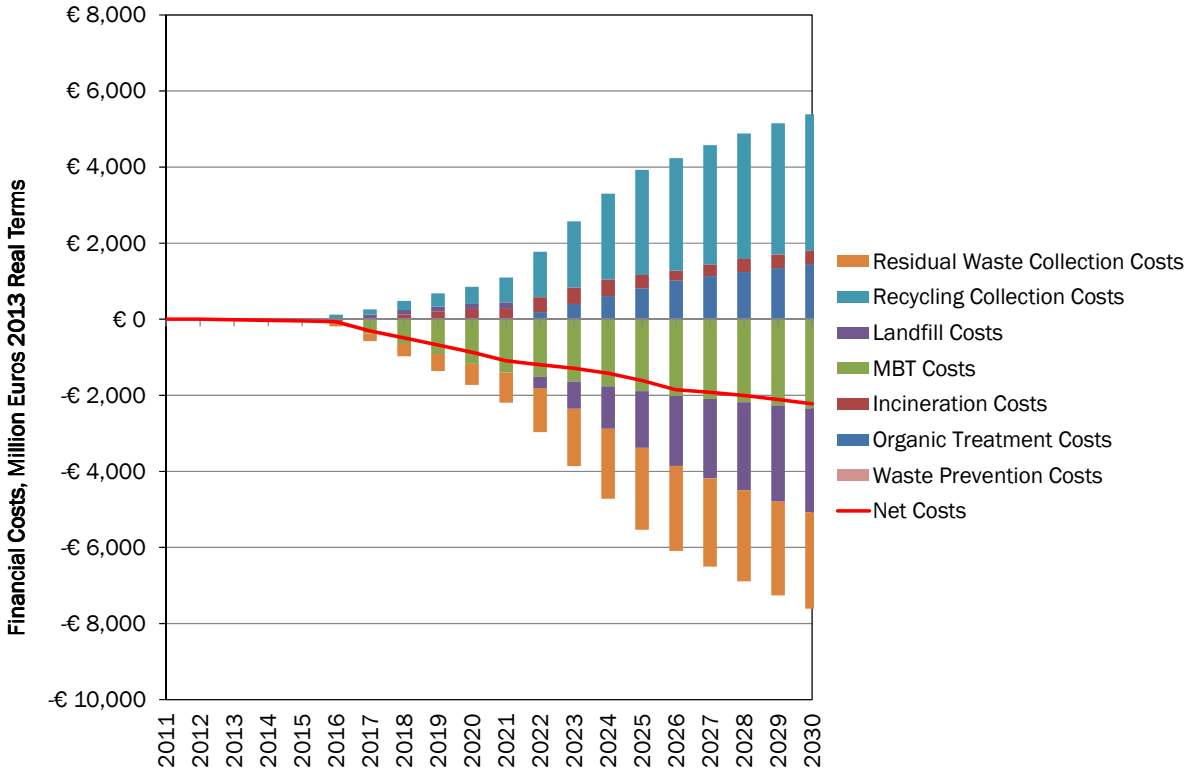
[80] Commission Decision of 19th December 2002, Establishing Criteria and Procedures for the Acceptance of Waste at Landfills Pursuant to Article 16 of and Annex II to Directive 1999/31/EC, Decision 2003/33/EC, http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32003D0033&from=EN

the European Reference Model on Municipal Waste Management and thus only results for the EU28 are discussed here.

8.11.1 Financial Costs

The financial costs of this Option are slightly higher than Option 3.4.a (although they still represent a significant saving relative to full implementation - Figure 8-55). The slightly higher costs under this Option are largely due to the fact that a much greater quantity of waste is being considered and it was assumed that a maximum of 50% of the non-MSW going to landfill would end up being recycled by 2030.

Figure 8-55: Option 3.4.c – Financial Costs (EU28)

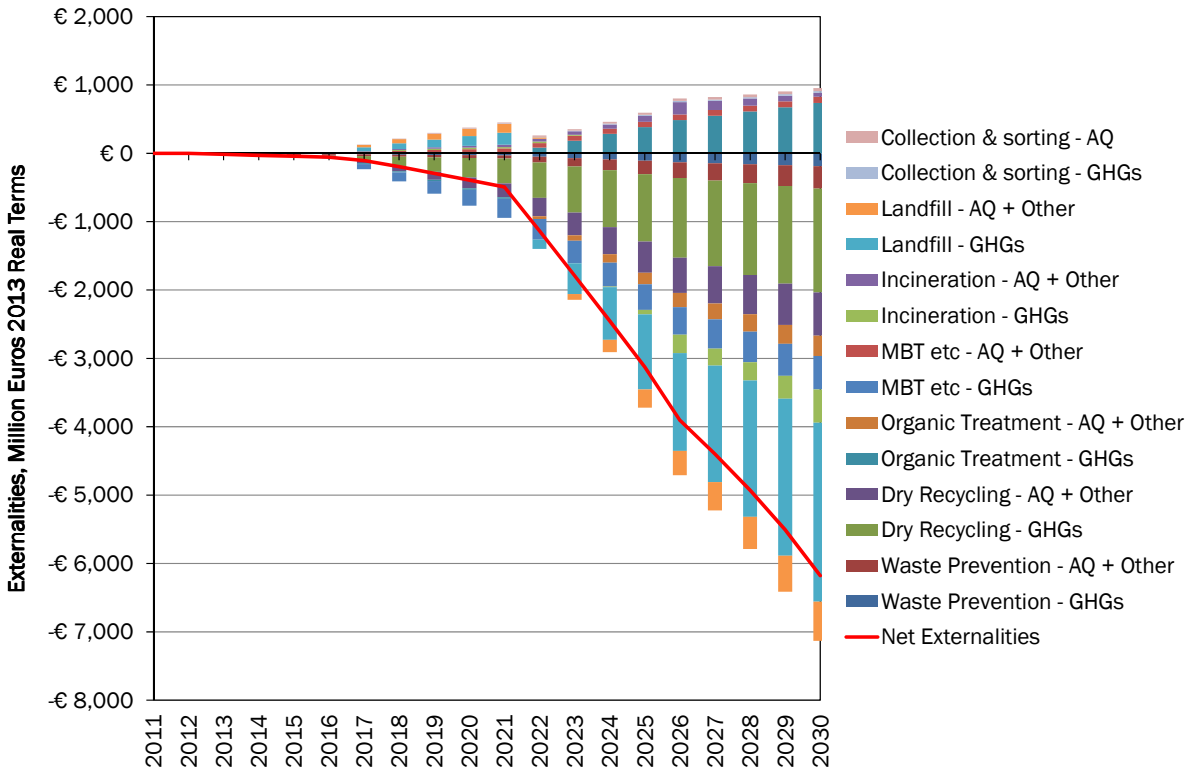


Note: Positive costs denote a cost to society whilst negative costs represent savings.

8.11.2 Environmental Costs

Relative to the full implementation scenario Option 3.4.c is associated with significant environmental benefits as substantial quantities of materials are diverted from Category B landfills (Figure 8-56). Given the sheer volume of material being covered by this Option the environmental benefits outstrip those achieved under any of the other policy options discussed above.

Figure 8-56: Option 3.4.c – Environmental Externalities (EU28)

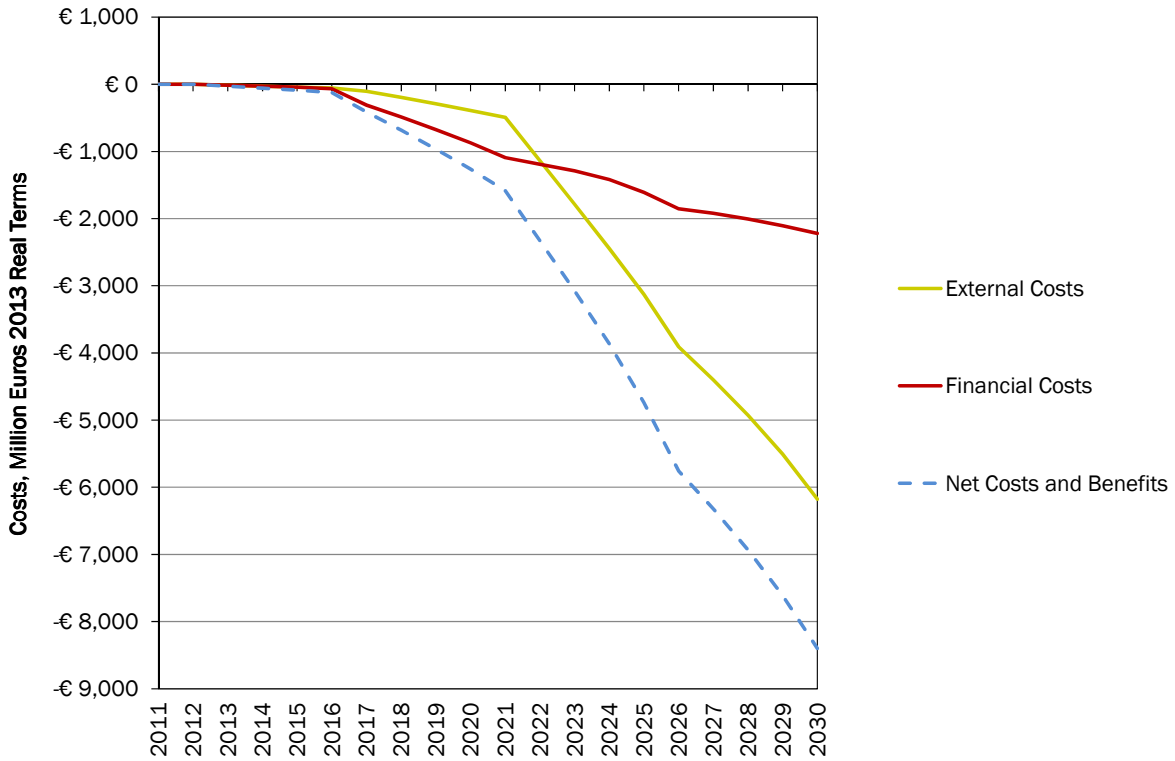


Note: Positive external costs denote a cost to society whilst negative costs represent a benefit.

8.11.3 Net Social Costs

Given the substantial environmental benefits and financial savings it is no surprise that the net position of this Option is very favourable (Figure 8-57). Despite the slightly lower financial savings relative to Options 3.4.a and 3.4.b, the much greater environmental benefits of this Option mean that overall it delivers a much greater benefit to society. An added advantage of this Option would be that the landfill ban element could be easier to monitor/enforce as tracking the origin of waste arriving at landfill sites is notoriously difficult (once materials have been bulked and delivered to a landfill site it is very difficult to differentiate between municipal and non-municipal waste). One possible drawback could be that the 5% landfilled is waste that is more likely to generate negative impacts when landfilled. On the other hand, the restriction is likely to lead to the 5% 'quota' being taken up mainly by landfilling of wastes for which no obvious, economically viable alternative exists (or where, locally, other facilities experience operational problems).

Figure 8-57: Option 3.4.c – Net Social Costs and Benefits (EU28)



Note: Positive costs denote a cost to society whilst negative costs represent savings.

9.0 Comparison of Policy Options and Packages

Section 8.0 described the results associated with the individual Options and a number of combinations of these options. This section seeks to bring all of this information together and compare the various policy Options to better understand how they interact and perform relative to each other. The figures in Section 8.0 provided an overview of the year by year changes in financial and environmental costs and benefits. In order to more easily compare the overall impact of individual Options it is more instructive to look at the Net Present Value (NPV) of the flows of the costs and benefits for the period 2014 to 2030. In line with the European Commission approach to impact assessments, a discount rate of 4% per annum was applied.

The impacts from 2014 to 2030 of each Option for the key indicators is summarised in Table 9-1. It is important to note that in terms of the NPV costs presented in the table below, negative values represent a benefit to society. In financial terms negative values mean a direct saving relative to the full implementation scenario, whilst in terms of environmental externalities negative values reflect reduced damage costs relative to full implementation.

Table 9-1: Comparing the Costs of the Options[1]

Option Number[2]	Financial Costs	External Costs	Net Social Costs	Employment	GHG Reduction	
	NPV 2014-2030, € Billion 2013 Real Term Prices[3]			1,000 FTEs in 2030[4]	Million Tonnes $CO_{2\ eq}$ in 2030	Million Tonnes $CO_{2\ eq}$, 2014-2030
Option 3.1.a	-€3.73	-€3.96	-€7.69	79	-23	-107
Option 3.1.b	-€6.91	-€6.61	-€13.52	103	-32	-166
Option 3.1.c	-€8.41	-€8.49	-€16.91	138	-39	-214
Option 3.2.a	-€11.20	-€8.45	-€19.66	108	-20	-183
Option 3.2.b	-€13.48	-€10.05	-€23.53	108	-24	-250
Option 3.3	€5.64	-€0.65	€4.99	46	-13	-49
Option 3.4.a	-€12.65	-€13.00	-€25.65	178	-44	-308
Option 3.4.b	-€13.62	-€13.58	-€27.20	178	-44	-320
Option 3.4.c	-€10.70	-€18.27	-€28.97	-	-62	-443

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against a scenario of full implementation (Option 2).*
2. *The details of each Option are summarised in Table 7-5 in Section 7.8.*
3. *Net social costs = financial costs + external costs.*
4. *Employment figures represent direct employment only (no multiplier effects have been included)*

The results presented in Table 9-1 indicate that the greatest net benefit is delivered by Option 3.4.c in which the net social costs amounts to a NPV of -€28.97 billion in 2013 real term prices. This Option effectively combines the 70% recycling/preparation for reuse target for MSW (Option 3.1.c), with increased targets for the recycling of packaging waste (Option 3.2.a) and measures to limit landfilling at Category B landfills to 5% by 2030. Overall this Option performs better than Options 3.4.a and 3.4.b which only consider applying a landfill ban to MSW. The inclusion of all waste sent to Category B landfills obviously brings with it additional environmental benefits and this is reflected in the lower environmental costs of this Option (NPV of -€18.27 billion).

Options 3.4.a and 3.4.b combine the 70% recycling/preparation for reuse target for MSW (Option 3.1.c), with increased targets for the recycling of packaging waste (Option 3.2.a) and measures to limit landfilling of MSW to 5% by 2030 (Option 3.3). There is considerable overlap between higher recycling targets for MSW and for packaging waste. As would be expected this gives some additional net benefit relative to the Options which examine the 70% recycling/preparation for reuse target, the packaging waste recycling targets, and landfill ban in isolation.

In terms of job creation, Options 3.4.a and 3.4.b are very promising with an estimated 178 thousand jobs likely to be created by 2030, with most of these jobs being created in the recycling industry (these jobs may not necessarily be confined to Europe and will largely depend on the amount of material that is reprocessed within the Union). Due to the nature of the modelling required for Option 3.4.c it was not possible to calculate employment impacts by Member State; however, the diversion of non-MSW away from Category B landfills will help to generate additional jobs in the recycling sector which would mean that employment under this Option would be in excess of 178 thousand by 2030.

The net social costs of Option 3.4.b are slightly higher than that of Option 3.4.a as the timings applied in this Option assume that Group 1 and 2 Member States (see Table 7-4) are obliged to meet the 2020 recycling target using Method 4 only, whereas Group 3 countries would be given until 2025. All countries would be obliged to meet the 60% recycling/preparation for reuse target by Method 4 in 2025 and 70% recycling/preparation for reuse in 2030. In terms of the landfill ban in this Option Group 1 countries are required to meet the 5% target by 2020, whereas Group 2 and 3 countries have until 2030 to achieve the target. Given that the environmental benefits are realised earlier on, the NPV of this Option shows a greater overall social benefit.

From this analysis it would appear that there is a very strong case for going for a combination of policy measures that includes:

1. The 70% MSW recycling/preparation for reuse target (Option 3.1.c);
2. The packaging recycling targets (Option 3.1.a or 3.2.b); and
3. Limiting the amount of residual waste landfilled at Category B landfills to 5% by 2030.

It should be noted that limiting the amount of waste landfilled, on its own, does not necessarily deliver net social benefits. However, the measure features strongly in both the Roadmap to a Resource Efficient Europe and the 7th EAP (see Section 5.0).

Although both Options 3.4.a and 3.4.b provide very attractive opportunities and, relative to full implementation, result in significant financial savings and environmental benefits, it would be difficult to enforce the ban on sending only MSW to Category B landfills. Extending the ban to all non-hazardous waste sent to such landfills would be both environmentally beneficial and easier to monitor/enforce (it is very difficult to identify the source of materials once they have been bulked and delivered to landfill).

Option 3.4.c is in clear alignment with the objectives underpinning this review, which have been framed by the Roadmap to a Resource Efficient Europe and the 7th EAP.[81,82]

[81] European Commission (2011) *Roadmap to a Resource Efficient Europe*, COM(2011) 571 final, http://ec.europa.eu/environment/resource_efficiency/about/roadmap/index_en.htm

In this regard, this Option would appear to encapsulate much of the ambitions set out in these documents to improve resource efficiency and employment opportunities within the European Union.

[82] Decision of the European Parliament and of the Council (2013) Decision of the European Parliament and of the Council on a General Union Environment Action Programme to 2020 "Living Well, Within the Limits of our Planet", November 2013, http://ec.europa.eu/environment/newprg/

10.0 Conclusions and Recommendations

This Targets Review Project has undertaken a wide ranging and comprehensive review of the waste management targets, and some of the associated issues, in the Waste Framework Directive, the Landfill Directive and the Packaging and Packaging Waste Directive. This work has allowed the Commission to respond to the review clauses set out in the Directives and bring the targets within these Directives in line with the Commission's ambitions of promoting resource efficiency and reducing greenhouse gas emissions.

The review process was informed by the public consultation and a detailed analysis of a long list of policy options. This analysis allowed a number of front-running policy options to be identified for further scrutiny of their likely financial, environmental, and social costs and benefits. A cost-benefit approach was taken and modelling based largely on the European Reference Model on Municipal Waste Management was used for the purpose, with a number of adaptions and additions being made to the model to allow non-municipal waste streams to be analysed

It is clear from the analyses of the front-running Options carried out in the above sections, that there are significant financial and environmental benefits to be gained from the combination of the following three proposed targets:

- 70% MSW recycling/preparation for reuse of MSW by 2030;[83]
- Ambitious recycling targets for packaging materials; and
- A ban on landfilling which will limit the amount of residual waste going to Category B landfills.

Given the clear benefits associated with this package of targets it is recommended that the Commission give serious consideration to Option 3.4.c.

During the course of the project a number of interesting and relevant policy options were investigated and considered by the project team. However, not all of these were included as part of the package of Options analysed in Section 8.0, either because they did not lend themselves to detailed analysis of the type undertaken here, or because they were related to non-target measures that are essential for supporting the implementation and monitoring of the targets outlined above. Below is a summary of the recommendations that have emerged as a part of this work:

- **Recommendations arising from the analysis of the front-running policy Options:**
    1. Instead of extending the Landfill Directive in its current form, replace the diversion target for biodegradable municipal waste with a progressive reduction in landfilling of all wastes, as set out in the Options above;
    2. The maximum limit of 80% recycling in the Packaging Directive should be removed.
    3. Given the intention to increase recycling targets, both the overall recycling target, and the target for 'recovery' in the Packaging Directive should be removed.

[83] The setting of an ambitious recycling target means that there is little need for targets focused on individual waste streams. At recycling rates of 70% all of the key materials will have to be captured from the municipal waste stream, with the remaining 30% being comprised of marginal materials.

4. Regarding the Article 11(2)(b) Waste Framework Directive target on C&D waste, there is deemed to be a need to provide a clear definition of recycling and material recovery / backfilling, and how these should be calculated for the C&D waste stream.

- **Measures to support the targets:**
  5. Establish a legal obligation for reporting on 'municipal waste' based upon a single unambiguous definition of the term, to be used by all Member States.
  6. Monitoring and validation of the reports submitted by Member States needs to be enhanced so that the consistency and reliability of data is assured.
  7. The definitions for key terms such as 'municipal waste', 'reuse', 'recycling' and 'composting' should be set out clearly in the Waste Framework Directive, with all other Directives cross-referencing to these definitions (so as to avoid inconsistencies across definitions used in different Directives).
  8. Enhance the quality of data, and the monitoring of the movement of wastes, possibly through an obligation to introduce centralized registers on national or regional level such that waste generators, waste collectors and waste treatment facilities have to report data to an e-data system.
  9. Introduce economic implementation mechanisms for Member States moving too slowly to meeting legally binding targets (e.g. pay-as-you throw schemes for collection and treatment of household and municipal waste).
  10. Member States not fulfilling binding targets or moving too slowly in fulfilling should be obliged to develop criteria for municipalities (competent authorities) to implement services of a minimum standard to enable sorting of a range of waste materials for recycling and composting / anaerobic digestion.
  11. Develop EU guidance on the proper implementation of the waste hierarchy with focus on the EU binding targets and an obligation for Member States to develop a national guidance on the same items.

- **Additional recommendations:**
  12. In the future the following matters might usefully be reported on, with a view to the development of targets at a subsequent stage:
      - The level of packaging reuse;
      - With appropriate boundaries, the level of reuse, and preparation for reuse, of items such as (W)EEE, furniture and textiles; and
      - Generation and management of food waste, preferably by sector.
  13. The sorting of wastes should be made mandatory at C&D sites above a certain threshold, to be determined, with special attention being given to hazardous waste.
  14. Introduce requirements on businesses to sort a range of waste materials for recycling and composting / anaerobic digestion.
  15. Member States are strongly encouraged to set waste prevention targets in their own Waste Prevention Plans.
  16. The targets under the Packaging Directive should allow for some recognition of reuse in the calculation of the recycling target. This might be possible in future once data is available regarding packaging reuse.
  17. (Preparation for) reuse targets should be considered as part of existing extended producer responsibility legislation (e.g. Directives covering WEEE

and ELVs), or potentially as part of new Directives to cover materials such as furniture, textiles and toys. Member States are strongly encouraged to set such targets in their own Waste Prevention Plans.

10.1 Caveats

It is worth restating here that there are a number of uncertainties associated with the modelling outcomes. The main uncertainties are set out below insofar as they affect the financial and the external costs:

- **Financial costs associated with collection:**
  - The model has, necessarily, to simplify somewhat the complexity of the situation which actually exists in Member States. In each country, there are, and are likely to be in future, a range of different collection systems in place. The model simplifies reality by modelling a narrow range of systems. However, although the range is narrowed, the general tendencies are expected to be a reasonable reflection of the relative costs of systems delivering varying recycling rates. It should also be noted that in the modelling systems are ordered on the basis of a reasonably efficient system of collection. There are good reasons to believe that there are considerable efficiencies to be gained from improving service performance;
  - The model makes assumptions which determine the number of households which can be served by a given vehicle. These are likely to vary from place to place. The model seeks to deal with this through setting different parameters for urban, suburban and rural households;
  - The costs are modelled in real terms. They are essentially deemed to remain constant across time in real terms. The time horizon for the assessment is, however, considerable. Over such a period, the index of some input parameters to the collection model, such as labour costs, might not be the same as the general rate of price increases. As such, the costs might not remain constant in real terms over the time period considered. This is, however, believed to be the most reasonable assumption to make in the circumstances (projecting, for example, the rate of increase in real wages would appear to be rather speculative);
  - The value of materials being captured for recycling is deemed to remain constant in real terms. Following a period in history (roughly spanning the period 1950-2000) over which real prices for commodities have experienced a decline, the last decade has seen that decline completely reversed owing to increased global demand, notably from China. Many commentators believe prices may continue to rise in real terms, but there are, equally reasons why prices, not least in real terms, may decline. As such, the assumption regarding constant prices in real terms seems a reasonable one;
  - For each country, where municipal waste is concerned, the model uses data from Member States regarding the composition of their municipal waste. The composition data is, in the model team's view, of variable quality. Because of the variation in composition from one country to another, the revenue generated from the capture of recyclables varies across countries (affecting net costs). Some countries' assumptions regarding what is, or is not, municipal waste also affect the reported composition of waste; and

- Quite apart from current waste composition, the modelling effectively has to consider waste composition over the period to 2035. Relatively little is known about exactly how waste composition will change in future. What seems certain, however, is that it *will* change. It is to be hoped that those changes that do occur will increase the extent to which materials can be easily recycled. What cannot be known, however, is how such changes will affect the costs of collecting and processing materials, and the revenues generated from selling the materials collected. The assumption of constant composition is, on the one hand, unlikely to reflect reality, but on the other, it is felt that no reasonable alternative assumption exists;
- The model takes 'countries' through progressive stages of development of recycling services to achieve progressively higher recycling rates. There is, therefore, a path-dependent logic to the way in which the model calculates costs, particularly in respect of collection. Given that there is no 'unique' trajectory for all Member States to follow, the model is necessarily a simplification of what is a highly complex and varied reality;

➢ **Financial costs associated with treatment:**

- The costs of treatment are assumed to remain constant in real terms. For some treatments, as well as taking into account the sale of some materials (see above for a discussion) the net costs take into account the sales of energy. The revenue derived from the sales of energy are assumed to be constant in real terms. This implies constant real terms prices for energy. Energy prices could, of course, follow a different path;
- The costs are influenced by assumptions regarding capital costs, assumed to be constant across countries, and the costs of other inputs to the process. Labour costs have been adapted to Member State situations. There is variation in unit capital costs of facilities, but the model assumes a single figure for a given treatment type. This seems reasonable given that the high level, strategic nature of the model means that assumptions regarding the size of specific facilities cannot meaningfully be made; and
- The way in which capital costs are financed will affect the costs for different facilities. In different Member States, there are different patterns of financing and ownership of waste management facilities. Some facilities are funded by municipalities, others are financed using public / private partnerships. These situations lead to variations in the costs of capital, and this affects the costs of operating facilities. The model effectively assumes a single figure for the real cost of capital.

➢ **Environmental externalities:**

- The overall figures for externalities reflect the inclusion and exclusion of various effects in the model. We believe that the main externalities of well operated facilities are captured by the model, but even so, some externalities are not captured by the model (see Section 4.1.5.1 in Appendix 4.0).
- The model assumes different damage costs for the air pollutants with these adapted for each Member State. These are based on the best evidence available, but clearly, uncertainties exist (not least in respect of how mortality is valued);
- The model assumes a profile for the damages associated with GHG emissions. The debate concerning how best to value damages associated

with GHGs continues apace. There are clearly alternative assumptions that could be made in this regard;

- Some characteristics of key processes influence emissions, and hence, externalities. Key amongst these are:
    1. The modelling of the extent to which biodegradable material degrades in landfill;
    2. The capture of methane generated by landfills for energy generation and flaring (and crucially, the amount of methane escaping to the atmosphere);
    3. For technologies generating energy, such as incineration, the nature of the energy source which is assumed to be avoided, at the margin, when new facilities are introduced; and
    4. The modelled GHG emissions from facilities relate back to waste composition. If composition is not well known, then the emissions will be similarly poorly understood (and as noted above, composition is likely to change in future).

It will be clear from the above that the model is complex, and that the results are likely to vary with the nature of assumptions made. That having been said, considerable efforts have been made to ensure assumptions are reasonable, and that the modelling is based on the best information available, within reason, at the time of writing.

List of Appendices

All prepared as separate documents.