Council of the European Union

Brussels, 4 December 2015
(OR. en)

Interinstitutional File:
2015/0274 (COD)

14974/15
ADD 1

ENV 770
CODEC 1661

COVER NOTE

From:	Secretary-General of the European Commission, signed by Mr Jordi AYET PUIGARNAU, Director
date of receipt:	3 December 2015
To:	Mr Jeppe TRANHOLM-MIKKELSEN, Secretary-General of the Council of the European Union
No. Cion doc.:	SWD(2015) 259 final
Subject:	COMMISSION STAFF WORKING DOCUMENT Additional analysis to complement the impact assessment SWD (2014) 208 supporting the review of EU waste management targets Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 1999/31/EC on the landfill of waste

Delegations will find attached document SWD(2015) 259 final.

Encl.: SWD(2015) 259 final

EUROPEAN
COMMISSION

Brussels, 2.12.2015
SWD(2015) 259 final

COMMISSION STAFF WORKING DOCUMENT

Additional analysis to complement the impact assessment SWD (2014) 208 supporting the review of EU waste management targets

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council amending Directive 2008/98/EC on waste

Proposal for a Directive of the European Parliament and of the Council amending Directive 94/62/EC on packaging and packaging waste

Proposal for a Directive of the European Parliament and of the Council amending Directive 1999/31/EC on the landfill of waste

Proposal for a Directive of the European Parliament and of the Council amending Directives 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EC on waste electrical and electronic equipment

{COM(2015) 593 final}
{COM(2015) 594 final}
{COM(2015) 595 final}
{COM(2015) 596 final}

Table of Contents

1. INTRODUCTION 2
1.1. Purpose of the document 3
1.2. External expertise and consultation of interested parties 3
2. ADDITIONAL POLICY OPTIONS 5
3. ANALYSIS OF IMPACTS – METHODOLOGICAL ASPECTS 9
4. COMPARING THE OPTIONS 10
4.1. Costs- benefits analysis 11
4.2. Complementary qualitative assessment 15

List of Annexes

Annex 1: Effects of the model update

Annex 2: Sensitivity Analysis

Annex 3: Member States specific results for the new target options

1. INTRODUCTION

1.1. Purpose of the document

The purpose of this present document is to present additional analytical elements which supplement the impact assessment on the waste target review presented by the Commission in 2014 (SWD/2014/0208, further referred to as "the impact assessment").[1]

Following the withdrawal of the legislative proposal reviewing the waste targets (COM/2014/0397 final) and in light of the first reactions to the previous legislative proposal, the Commission decided to analyse the impacts of a number of additional options and variants with the aim of taking better into account the different starting positions of each Member States. In particular, this complementary analysis focuses on assessing options for the application of a more differentiated approach to target-setting and on quantifying the added-value of introducing a landfill diversion target in addition to recycling targets.

This supplementary analysis is exclusively focused on assessing the potential impacts of the new policy options and in all other respects the impact assessment remains fully valid and should be read in conjunction with this document.

1.2. External expertise and consultation of interested parties

Additional data and information were gathered in order to prepare this supplement.

Evidence base

A consortium led by Eunomia Research & Consulting was used to gather the evidence required to support this complementary analysis. The modelling tool used for the impact assessment was updated before being used to analyse the new policy variants. Unless otherwise specified, the results presented in this document are based on this supporting study and from the modelling tool.[2] A summary of the main features of the model is provided in the impact assessment itself (Annexes 8 -10).

Stakeholder consultation

In addition to the consultation already carried out in the impact assessment (see Annexes 3 and 4 of the impact assessment), the following additional developments were taken into consideration:

- Member States presented their preliminary views in Council. 8 meetings of the Working Party on Environment were organised under the Italian Presidency between July and December 2014. A first complete technical examination of the 2014 proposal took place and a ministerial debate was held in October 2014. Member States shared the overall objective of the proposal, acknowledging the need to take action by setting a legal framework which is able to steer investments in the right direction. However, the overall ambition level was considered too high in the light of the wide differences in waste management performance across the Member States. Some Member States also mentioned

[1] European Commission (2014) *Impact Assessment Accompanying the Document: Proposal for Reviewing the European Waste Management Targets*, July 2014, http://ec.europa.eu/environment/waste/target_review.htm

[2] Eunomia Research & Consulting (2015) *Support to the Waste Targets Review: Analysis of New Policy Options*, Report for DG Environment of the European Commission

that waste prevention and reuse, which are at the top of the waste hierarchy, were not sufficiently addressed in the proposal. Many called for a greater focus on better product design to promote prevention, reuse and recycling.

- Other more technical issues were raised (e.g. definitions, calculation and reporting methods, how to incentivise re-use, specific requirements for producer responsibility schemes) during the initial examination of the proposal, which confirmed key findings from the 2014 Fitness Check[3]. In order to develop pragmatic solutions on such technical issues, the Commission organised additional technical consultations of key stakeholders in June 2015 and gathered additional information in September 2015 through questionnaire sent to the Member States. A broader stakeholder conference on the circular economy attended by around 700 persons was also organised by the Commission in June 2015.[4] A specific session on waste management was held on this occasion.

- The report issued by the European Parliament in July 2015 (EP/ A8-0215/2015) calling notably for ambitious targets similar to the first proposal was also taken into account as well as the opinion formulated by the Committee of the Regions (CDR/4083/2014) and from the European Economic and Social Committee (EESC/05002/2014). More specifically the European Parliament called on the Commission to include in its new proposal the following elements:

  - clear and unambiguous definitions;

  - developing waste prevention measures;

  - setting binding waste reduction targets for municipal, commercial and industrial waste to be achieved by 2025;

  - clear minimum standards for extended producer responsibility requirements to ensure transparency and cost effectiveness of the extended producer responsibility schemes;

  - applying the 'pay-as-you-throw-principle' for residual waste combined with mandatory separate collection schemes for paper, metal, plastic and glass in order to facilitate the high quality of recycling materials; introducing mandatory separate collection for biowaste by 2020;

  - increasing recycling/preparation for reuse targets to at least 70 % of municipal solid waste and 80 % recycling of packaging waste by 2030, based on a solid reporting method preventing the reporting of discarded waste (landfilled or incinerated) as recycled waste, using the same harmonised method for all Member States with externally verified statistics; an obligation for recyclers to report on the 'input' quantities of waste going into the sorting plant as well as on the 'output' quantity of recyclates coming out of the recycling plants;

  - strictly limiting incineration, with or without energy recovery, by 2020, to non-recyclable and non-biodegradable waste;

  - a binding, gradual reduction of all landfilling, implemented in coherence with the requirements for recycling, in three stages (2020, 2025 and 2030), leading to a ban on

[3] SWD/2014/0209 final
[4] http://ec.europa.eu/environment/circular-economy/index_en.htm

all landfilling, except for certain hazardous waste and residual waste for which landfilling is the most environmentally sound option;

- encourage Member States to introduce charges on landfilling and incineration.

In summary, there is a large consensus between the consulted parties on the need to harmonize the reporting and calculation methods of recycling targets as well as to improve the comparability and reliability of statistics. Minimum requirements for extended producer responsibility schemes are also seen by many as necessary, even though there are divergences on how exactly they should be defined. Diverging views have also been expressed on the level of ambition of the targets.

The results of the consultations were taken into account to improve the legislative proposal on some key technical aspects and to fine tune the main options and their variants to be considered in more detail in this supplement.

2. ADDITIONAL POLICY OPTIONS

Three options were described and analysed in the original impact assessment (see page 44). Options 1 "Ensuring full implementation" and 2 "Simplification, improved monitoring, dissemination of best practices" are not discussed in this supplementary analysis.

As shown in Figure 1 below, additional analysis (in the form of two additional sub-options and a number of variants under each of them) was only conducted under Option 3 (i.e. Upgrade EU targets).

First, two new main Options (Options 3.8 and 3.9) were introduced to assess the impacts of alternative target-setting approaches:

- Under Option 3.8 ***("progression rates")***, each Member State is set to achieve the proposed EU-wide targets by following a customised compliance path developed on the basis of common average progression rates and taking as a point of departure their current performance levels.

- Under Option 3.9 ***("time derogations")***, all Member States are set to achieve the proposed EU-wide targets by the same deadlines, but a number of Member States would have the possibility to request a time derogation of maximum 5 years in case they prove to be unable to meet them and where they comply with certain conditions.

Both Options allow for a differentiated approach taking into the Member States' current performance, but do so in two different ways and to a different extent.

Second, for both Options 3.8 and 3.9, a number of "variants" were tested. These included a "moderate" and a "high" set of sub-options assessing the impacts of variations in the final recycling rate to be achieved by the Member States. Under the "moderate" variant the final recycling rates are 65% for municipal waste and 75% for packaging waste. Under the "high" variant the final recycling rate are 70% for municipal waste and 80% for packaging waste.

Additional variants on the introduction of a landfill diversion target on top of recycling targets were also tested for each of the Options. In order to better understand the relationship and possible synergies/overlaps between recycling targets and action on landfilling, the analysis has thus attempted to single out the incremental impacts of introducing a landfill diversion

target. For both Options, these variants were designed using same type of differentiation applied for the recycling targets.

Finally, it should be noted that for packaging waste, which also covers industrial and commercial sources, the application of a differentiated approach – whether progressive rates or time derogations - was not considered as a viable option. This is because for packaging waste the differences across Member States are less pronounced (see the impact assessment, page 21), while the risk of creating distortions on the internal market is higher.

To ensure consistency between the municipal waste and the packaging targets, each variant under Options 3.8 and 3.9 includes recycling targets for packaging waste as set out in Table 1 below (similar to Option 3.2 in the impact assessment – see Table 7, page 52 of the impact assessment).

Packaging waste	'Moderate' Targets Option 3.8(a) and Option 3.9(a)			'High' Targets Option 3.8(b) and Option 3.9(b)		
	2020	2025	2030	2020	2025	2030
Overall recycling/reuse	55%	65%	75%	60%	70%	80%
Plastics	40%	55%	Review	45%	60%	Review
Non-ferrous metal [5]	65%	75%	85%	70%	80%	90%
Ferrous metal	65%	75%	85%	70%	80%	90%
Glass	65%	75%	85%	70%	80%	90%
Paper/Cardboard	80%	85%	85%	85%	90%	90%
Wood	45%	60%	75%	50%	65%	80%

Table 1: Proposed recycling targets for packaging waste – moderate and high variants

Option 3.8 – Progression rates

Under this option, the principle of differentiation is implemented for each Member State through the application of annual average progression rates. Specific targets for 2025, 2030 and in some cases 2035 are calculated for each individual Member State by applying common average annual progression rates between 2 and 3 percentage points – starting from a

[5] Compared to the impact assessment a minor correction has been inserted to ensure the same progression rate between ferrous and non-ferrous metals which will ease the monitoring/implementation of the target

predefined baseline year (i.e. 2013)[6] – until a pre-set target recycling rate is reached (i.e. 65% or 70)[7].

The average annual progression rates applied were determined on the basis of an analysis of Member States' performances over the past 15 years[8]. This shows that an annual average increase between 2 and 3 percentage points is feasible and was achieved by a number of Member States in the past, as already explained in the impact assessment (p 51).

Two alternative variants have been developed and tested:

- a 'moderate' variant - Option 3.8 (a) – which assumes an average annual progression rate of 2.5 percentage point until a recycling rate of 65% is achieved; and

- a 'high' variant – Option 3.8 (b) which assumes an average annual progression rate of 3 percentage points until a recycling rate of 50% is achieved and an average annual progression rate of 2 percentage points until a final recycling rate of 70% is reached.

Option 3.8(c) has been developed in order to assess the added value of introducing a landfill diversion for MSW on top of recycling targets. Under this variant, landfill reduction targets for 2025, 2030 and in some cases 2035 are calculated for each individual Member States by applying an average landfill reduction rate of 4 percentage points starting from a predefined baseline year (i.e. 2013) until a final reduction to 10% is reached.

[6] EUROSTAT data on MSW for 2013 being the most recent dataset available

[7] Eurostat (2015) Municipal Waste [env_wasmun], Date Accessed: 23 June 2015, Downloaded from: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_wasmun&lang=en

[8] "Managing municipal solid waste – a review of the achievements in 32 European countries" EEA report N° 2, EEA 2013

Option 3 – Upgrade EU targets (options assessed in the initial impact assessment)

- Option 3.1 – Increase the recycling/reuse target for municipal waste
  - Low: 60% reuse/recycling target by 2030; 50% by 2025 with only one method
  - High: 70% reuse/recycling target by 2030; 60% by 2025 with one method
- Option 3.2 – Increase the packaging waste targets
  - Basis: top Member States results in 2010 combined with stakeholder signals
  - Variant: target for nonferrous metals
- Option 3.3 – Limiting landfilling to residual waste
  - Ban on plastic/paper/glass/metals by 2025 (max 25% landfilling), global ban by 2030 (max 5%)
- Option 3.4 – Combination of options 3.1, 3.2 and 3.3
- Option 3.5 – same as option 3.4 with different deadlines for different groups of countries
- Option 3.6 - same as option 3.4 with more stringent deadline for all Member States with the possibility of time derogation
- Option 3.7 – same as option 3.4 with landfill ban on all similar waste

New Options included in this supplementary analysis
Option 3.8 – Progression Rates

a) Moderate: 65% reuse/recycling target for MSW combined with 75% recycling/reuse target for packaging waste by 2030
b) High: 70% reuse/recycling final target for MSW combined with 80% recycling/reuse target for packaging waste by 2030
c) Option 3.8 (a) + landfill reduction target for municipal waste of maximum 10% with Member States specific deadlines

Option 3.9 –Time derogations applicable to Member States at risk of non-compliance

a) Moderate: 65% reuse/recycling target by 2030 for MSW with possibility of a 5 year time-derogations for7 Member States combined with 75% recycling/reuse target for Packaging waste.
b) High: 70% reuse/recycling target by 2030 for MSW with possibility of a 5 year time-derogations for 7 Member States combined with 80% recycling/reuse target for Packaging waste
c) Option 3.9 (a) + Landfill reduction target for municipal waste (maximum 10% by 2030) with possibility of a 5 year time-derogations for 9 Member States
d) Option 3.9 (b)+ Landfill reduction on municipal waste with possibility of a 5 year time-derogations for 9 Member States S (maximum 5% by 2030)

Figure 1: Summary of the Options and variants considered under Option 3

As explained in the impact assessment, experience shows that reduction rates of 4 percentage points per year seem to be reasonable as such progress has either been achieved or even exceeded in several Member States over recent years.

Option 3.9 – Time derogations

Under this option, differentiation is implemented by setting common EU targets for 2025 and 2030 while envisaging the possibility of granting time derogations to those Member States that are the furthest behind with regards to recycling of municipal waste.

In order to assess the possible impacts of this option, it has been necessary to identify those Member States that may request time derogations for the 2025 and 2030 targets. For the modelling of this option, it was therefore assumed that Member States recycling less than

20% of their municipal waste in 2013[9] would be granted such derogations, thus meeting the common EU targets five years later than all other Member States.

In order to ensure that Member States applying for derogation take the necessary steps to meet the targets on time, it is proposed to link the possibility for a Member State to obtain time derogations with the adoption of a compliance plan, taking into consideration best practices applied in the most advanced Member States.

As listed in Figure 1, two alternative options have been developed based on different degrees of ambition:

- a 'moderate' variant - Option 3.9(a) – which combines a 65% recycling rate for municipal waste by 2030 and 'moderate' targets for packaging waste.

- a 'high' variant – Option 3.9(b) – which combines a 70% recycling rate for municipal waste by 2030 and the 'high' targets packaging waste derogation

Under both variants, 7 Member States would be eligible for a 5-year time derogation for the MSW recycling targets.

Options 3.9 (c) and (d) both allow for the added value of additional measures aiming at limiting landfilling being assessed. In Options 3.9 (c), a maximum diversion target of 10% by no later than 2030 was applied while in Option 3.9 (d) this maximum has been decreased to 5%. Under both these variants, common EU landfill reduction targets for 2025 and 2030 were set, but combined with a regime of time-derogations for those Member States that heavily rely on landfilling of their municipal waste. For the modelling of these variants, it was assumed that Member States landfilling more than 65% of their waste in 2013 [10] would be granted such derogations, thus achieving the common EU targets five years later.

[9] Estonia, Greece, Croatia, Latvia, Malta, Romania and Slovakia

10 Cyprus, Czech Republic, Greece, Croatia, Latvia, Malta, Romania and Slovakia

3. ANALYSIS OF IMPACTS – METHODOLOGICAL ASPECTS

Model Update

The analysis of impacts of the new variants described in this supplement is based on the same methodology applied described in the impact assessment (see Section 5). Nevertheless, since the impact assessment was finalised, improvements and updates have been introduced in the model used to calculate the cost and benefits of the different scenarios. The modelling tool used for assessing the costs and benefits of the policy options in the impact assessment has been updated in a number of ways.[11] The main changes that have been introduced include:

- All costs have been updated from 2013 to 2015 prices and the deflators used were switched from EU 28 deflators to country specific deflators;

- Given that many of the new policy variants extend out to 2035 the Net Present Value (NPV) reported for the new target variants has been extended out by five years to allow the options to be compared on an equal footing (in the impact assessment the NPV covered the period 2014 to 2030 as none of the options extended beyond this point);

- Labour cost ratios and employment intensity factors were updated in light of new information that has become available over the last two years;

- Material revenues derived from the sale of dry recyclables were updated to account for changes in commodity markets for secondary materials;

- The approach to assessing the costs of civic amenity sites has been improved and the collection module has been improved to more accurately account for, among other things, differences in approaches to collecting waste from houses vs flats/high rise buildings with multiple occupants;

- More realistic potential capture rates for packaging in MSW were applied which had two effects. Firstly, the household collection costs went up due to less revenue being generated from the captured material, and secondly, more material had to be captured from non-MSW sources, again, increasing the costs of the meeting the targets;

- The packaging waste data was updated from 2011 to Eurostat's latest publication for 2012;

[11] Eunomia Research & Consulting (2015) *Support to the Waste Targets Review: Analysis of New Policy Options*, Report for DG Environment of the European Commission.

As an illustration of the possible effects of the updates provided to the model, the impacts of these adjustments in the case of Option 3.1 – high and Option 3.7 (identified as the preferred Option in the initial impact assessment) were calculated. The results are summarised in Annex 1 and from these results it can be concluded that the updated model produces results which are similar and consistent with the initial impact assessment. Expanding the time period by 5 years (up to 2035) will amplify the initial results due to the high expected value of benefits to society in the period 2030-2035(see Annex 1).

Sensitivity Analysis

As detailed in Annex 2, sensitivity analysis has been carried out on the main input parameters used in the model. In summary the results are sensitive to some input parameters including the efficiency of the collection system (such as the introduction of measures to promote prevention and recycling like pay-as thrown schemes), material losses and revenues, valuation of GHG and the cost of capital. From the sensitivity tests conducted it appears that, although the model is clearly more sensitive to changes in some input assumptions than to others, the overall narrative and conclusions do not change significantly at EU 28 level and over the period 2015-2035.

Calculation methods and reporting

As explained in the impact assessment, the existing possibility of using 4 calculations methods for the 2020 recycling target for municipal waste will be maintained mainly for legal certainty reasons and to minimize any short-term disruption to the waste management plans adopted by many Member States.

However, for all new targets (applicable by 2025 and 2030) only one calculation method will be allowed (i.e. calculation method 4). All calculations carried out in the impact assessment as well as in this supplement are based on data reported by Member States to Eurostat and the OECD using a single calculation method that broadly corresponds to the Method 4 under the existing implementing rules. [12]

As in the impact assessment, all calculations have been carried out on the basis of the input to the final recycling process: for each material and for each collection system (door-to-door separate collection, civil amenities centers, bring systems, etc.) specific losses rates have been applied to discount losses occurring between the collection and the input to the final recycling process. [13]

In line with the impact assessment guidelines, calculations have been made assuming full implementation of existing legislation – particularly for what relates to the existing landfill diversion target for municipal biodegradable waste and the existing recycling targets for packaging and municipal waste (see page 21 of the Impact Assessment for more detailed explanations). As regards the 2020 recycling targets for municipal waste, the estimates fully take into account Member States' choices in terms of calculation method and their impacts on actual performance (see page 34 of the Impact Assessment).

[12] Commission Decisions COM/2011/753/EC and COM 2005/270/EC:

[13] This is in line with existing rules requiring Member States to report recycled quantities when they reach the final/effective recycling step. However, according to existing rules, reporting at the level of separate collection (for municipal waste) or at the output of sorting facility (for packaging and municipal waste) is tolerated as long as there are no 'significant' losses (see impact assessment page 36).

4. COMPARING THE OPTIONS

In this section, the relative impacts of the new variants and options are compared. As in the impact assessment, the options and their variants are first compared on the basis of the quantified data available through the model (e.g. costs and benefits, impacts on employment, contribution to greenhouse gas and marine litter reduction). Impacts that are not monetised within the model will also be discussed.

Subsequently, and to complement the cost-benefit analysis, a qualitative assesment on the relative contribution of each option and their variants to the attaintment of the main objectives as defined in the impact asessment is carried out.

4.1. Costs- benefits analysis

Table 2 and Figure 2 (see below) show the net social costs of each option compared to the full implementation scenario presented in the impact assessment.

Options	Financial Costs	External Costs	Net Social Costs	Employment	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Option 3.8						
Option 3.8(a) - moderate	-11.0	-25.7	-36.7	140	-40.1	-543
Option 3.8(b) – high	-14.9	-31.1	-46.1	177	-48.0	-655
Option 3.8(c) - high equal to (a) with landfill (max 10%)	-5.1	-27.8	-32.9	136	-44.1	-613
Option 3.9						
Option 3.9(a) - moderate	-8.6	-18.0	-26.7	144	-41.0	-424
Option 3.9(b) – high	-10.2	-22.7	-32.9	178	-48.5	-523
Option 3.9(c) – equal to (a) with landfill (max 10%)	-4.9	-19.6	-24.5	140	-45.1	-477
Option 3.9(d) – equal to (b) with landfill (max 5%)	-4.0	-25.8	-29.7	176	-55.3	-617

Table 2: Comparison of key indicators for each of the new target variants listed in Figure 1

Notes:

1. *Financial costs are direct costs linked with the implementation of the targets (more separate collection, more revenues from the sales of materials, savings from less residual waste collection and treatment) while external costs represent the costs (or benefits if negative) to be paid (or gained in case of negative external costs) by third parties due to the implementation of the targets (reduced emissions of GHG and air pollutants). Negative costs represent a benefit to society.*
2. *All scenarios compared against the Full Implementation.*
3. *Net social costs = financial costs + external costs.*
4. *Employment figures represent direct employment only (no multiplier effects have been included).*

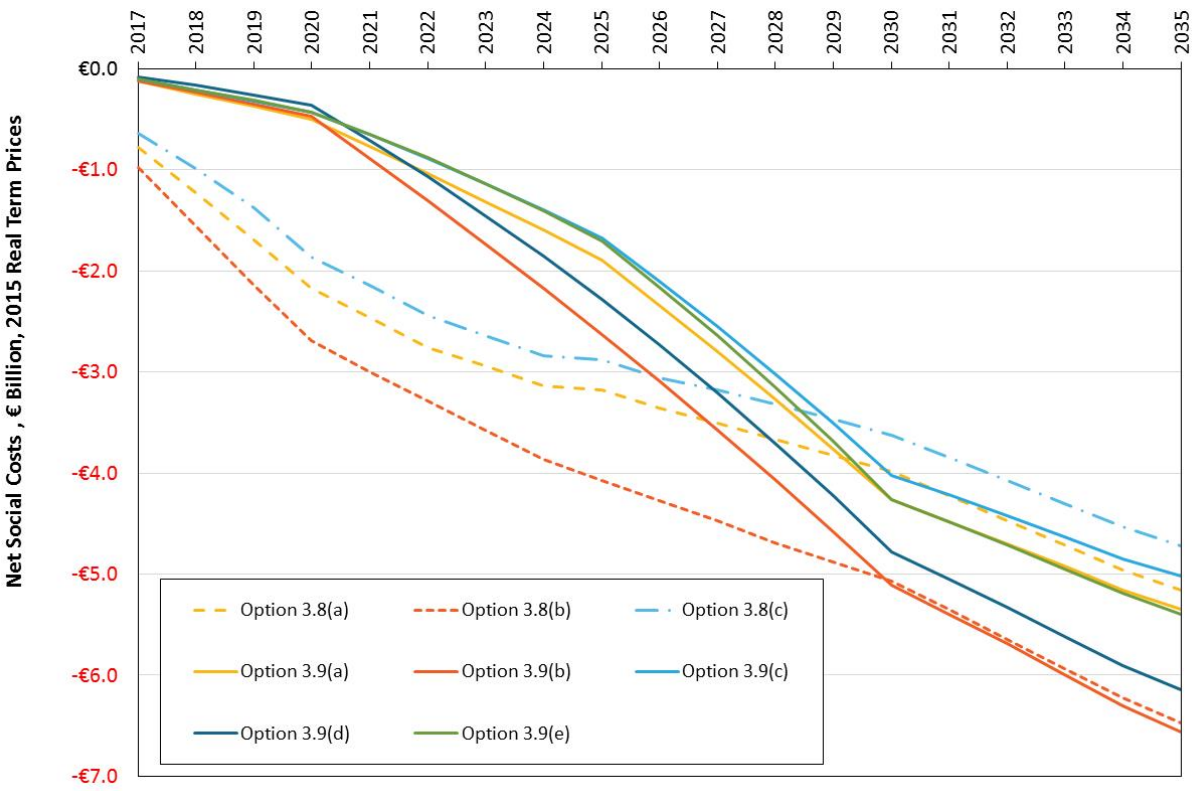


Figure 2: Comparing the net social costs across the EU28 for each of the new target variants listed in Figure 1

The results of the cost/benefit analysis show that all the new options assessed can result in a net-benefit for society at the EU level. However, there are differences between the options and their variants as summarised below:

On the approach to target-setting

- Overall, the "progression rates" approach – that is the variants included under Option 3.8 – shows higher benefits for society over the period 2015-2035 compared to the time derogation approach under option 3.9. This is chiefly explained by the fact that under Option 3.8 those Member States that in 2013 already recycled more than 35% of their municipal waste would have to achieve the final EU target before 2030. It is this early achievement of the targets by a group of eleven mid- and high performing countries[14] that significantly increases the discounted flow of benefits from Option 3.8: the bulk of savings arising from more recycling and less residual waste collection and treatment is captured earlier in these 11 Member States compared to Option 3.9. And this fully compensates for later achievement by a group of under-performing countries, which overall generate less waste, both per capita and in absolute terms.

- However, it can be seen from Figure 2 that as of 2030, the yearly benefits for society are very similar between Option 3.8 and 3.9. This shows that in the longer-term, both options lead to positive outcomes that are close in magnitude. It should also be noted that some of the potential benefits of Option 3.9 might have been underestimated as it has been assumed that all Member States will have a linear progression until 2030 and the attainment of the proposed EU targets. It nevertheless appears that some Member States have already

[14] AT, BE, DK, FR, DE, IT, LU, NL, SL, SE and UK would have to meet the recycling target by 2025 although 7 others MS would have to meet the same target 10 years later (see Annex 1, table A1 and A2)

planned to meet the envisaged EU targets earlier [15] and this was not taken into account when Option 3.9 was modelled.

On the final recycling rates

- Higher MSW and packaging waste recycling targets are associated with greater financial savings and environmental benefits. For instance, the modelling suggests that by increasing the MSW recycling target from 65% to 70% and the overall packaging target from 75% to 80% (moving from Option 3.9(a) to 3.9(b)), €6.2 billion of additional benefits for society are realised. Pronounced improvements in the benefits are likewise realised when moving from Option 3.8(a) to 3.8(b) (€9.4 billion).

- As already indicated in the impact assessment, the analysis shows a general tendency according to which the higher the final recycling rates, the greater the overall benefits for society. In all the scenarios going beyond full implementation of the current targets, the model in fact predicts that the costs of additional improvements in separate collection, sorting and recycling will consistently be outweighed by the revenues from the sale of secondary raw materials and the savings generated by reducing the amount of residual waste to be treated (i.e. landfilled or incinerated).

- Finally, the main barriers explaining why some Member States struggle to achieve higher recycling rates despite of clear advantages in terms of cost-savings and environmental benefits are detailed in the impact assessment (section 2.5 and particularly 2.5.1).

On the added value of a landfill reduction target

- The inclusion of a landfill reduction target on top of the MSW and packaging waste recycling packages lead to reduced benefits at society level even though these benefits remain overall positive. For example, Option 3.9(c) sees the benefits at society level reduced by € 2.5 billion over the period 2015-2035 relative to Option 3.9(a): the only difference between these two variants is a restriction on landfilling of MSW to 10% of the total in the case of option 3.9(c).

  The main reason for this is that the environmental benefits generated by a switch from landfill to other residual waste treatments are not sufficiently high to compensate for the financial costs of such a switch. Indeed, a landfill reduction target would force any residual waste out of landfill into more expensive residual waste treatment options, such as incineration or mechanical biological treatment. This explains why for many countries, and the EU28 as a whole, the addition of a landfill diversion target would be slightly more costly than the options which do not include it.

- However, it should be noted that some important environmental benefits linked to landfill reduction measures (e.g. leachates and water pollution, effects of odours and bio-aerosols as well other nuisances, impacts on landscape and financial inconveniences linked with living in the vicinity of waste treatment facilities) cannot be monetised and are therefore not factored in the cost-benefit analysis. This is mainly due to the absence of proper methods to quantify such impacts. As explained in the impact assessment (page 30) social acceptance remains a key issue and this is particularly valid in the case of landfilling even though it might also be valid in case of incineration in some Member States. For all these

[15] Recently adopted waste management plans in FR, AT, BE, NL for instance include a target around or above 65% recycling by 2025

reasons, the benefits of the options aiming at reducing landfilling are likely to be under estimated.

- In addition, as it is the rule in any cost benefit analysis, landfill charges and support measures for energy (e.g. benefits resulting from substituting fossil fuel by fuel derived from non-recyclable waste) are excluded from the analysis. The actual financial cost to be paid by the operators in each Member State will be affected by the level of taxes and subsidies as it is clearly shown in Figure 4 of the initial impact assessment (page 27).

Job creation and GHG

- In terms of job creation, Options 3.8(b), 3.9(b), and 3.9(d) are promising with over 170 thousand Full Time Equivalent (FTE) jobs likely to be created by 2035, with most of these jobs being created in the recycling industry. This is direct employment only with no provision for multiplier effects (which would increase the employment generation figures). The employment intensities – FTEs per tonne processed – associated with recycling and preparation for reuse are typically much higher than those for residual waste treatment and disposal. Thus, Member States which need to implement the largest improvements in their waste management systems could potentially derive the greatest benefit in terms of job creation.

Results per Member State

Detailed results per Member Sate for the main options are provided in Annex 3. From these Tables, it can be concluded that:

- Nearly all the new options and variants assessed are estimated to bring benefits at society level for all Member States with the exception of Options, i.e. 3.8 (c), 3.9 (c) and 3.9 (d) where four Member States are expected to face limited costs at society level(see Annex 3);

- Direct saving (negative financial costs) are expected for most options and most Member States; nevertheless slight increases in financial costs are expected particularly in those Member States still landfilling residual municipal waste under the full implementation scenario. For these Member States a higher proportion of waste will be directly diverted from (low cost)[16] landfilling to recycling meaning that the scope for savings (due to less residual waste treatment by incineration or MBT) is reduced in these circumstances; other factors like labour costs, prices of electricity, type of housing in relation to collection systems etc. also influences the relative position of each Member State;

- Moving towards higher recycling rates is estimated to provide higher benefits at society level for all Member States;

- Options including landfill reduction are expected to reduce social benefits in those Member States still relying on landfilling for their residual waste treatment, knowing that, as explained above, some key benefits were not monetised;

- These conclusions are amplified for larger countries due to a scaling factor: the amount of waste whose fate is changing result in larger changes in cost and benefits particularly in those MS expected to be just at 50% recycling by 2020 (FR, UK, SP, IT), and;

[16] landfill taxes are not taken into account in the cost/benefits analysis (see section 5 of the impact assessment for more details)

- Higher job creation and GHG emission reduction can be expected in those Member States which need to implement the largest improvements in their waste management system.

4.2. Complementary qualitative assessment

In this section a more qualitative comparison of the options and variants is carried out by assessing their relative contribution to each objective identified in section 3 of the impact assessment - (1) simplification, (2) better monitoring/implementation, (3) dissemination best practices, (4) level of ambition in terms of resource efficiency – and their potential performance in terms of coherence and efficiency.

On the approach to target setting

- Options 3.8 and 3.9 are very similar in terms of simplification and improved monitoring and implementation (Objectives 1 and 2). Option 3.8 might appear as more complex as each Member State would have a different target. Nevertheless, both Options have already been applied in other similar legislations of similar nature. Both approaches provide recognition of the Member States' different starting points even though Option 3.8 is more country-specific.

- In terms of implementation, both Options have their own advantages: Option 3.8 might lead to improved results as all targets would be country specific (Objective 2). A more tailor-made approach, setting firm but realistic milestones, could be effective in improving implementation.

  Allowing Member States to postpone for 5 years the deadline for attaining the targets through the use of derogations might incentive these Member States to not take on time the measure necessary to improve their waste management systems. Nevertheless, under option 3.9, this issue could be mitigated through a use of a conditionality mechanisms and additional safety-net requirements. In fact, one of the main advantages of Option 3.9 could be its potential for promotion of best practices which corresponds to Objective 3 and this could help to improve implementation. As mentioned above, time-derogations could be limited to some Member States and could be combined, as in the 2014 proposal, with a conditionality mechanism where Member States requiring time derogation would have to prepare and submit to the Commission a compliance plan including an assessment of best practices or equivalent measures. Even though this approach would increase administrative burden, it would be limited those Member States where it makes sense (maximum of 7 Member States), also bearing in mind that the dissemination of best practices could help avoiding potential infringement procedures.

- In the medium-term (before 2030), the contribution to the creation of a circular economy and to resource efficiency (objective 4) at the EU28 level is higher under Option 3.8. In fact, more raw materials and resources would be recycled over the first 10 years under Option 3.8 than under Option 3.9, which only the majority of Member States reaching the final MSW targets in 2030. Option 3.8 instead assumes that at least 11 Member States – which include the most economically developed and the largest waste producers in the EU – would meet the final recycling target on MSW well before 2030. Early achievement by this group of countries could also play a decisive role in advancing recycling across the whole EU, in particular by creating a critical mass for the development of a robust European market for secondary raw materials. In the long-run (i.e. as of 2030), however, it should be noted that both options have comparable performances, leading to the same level of yearly societal benefits.

On the final recycling rates

- As regards recycling targets, options which include higher reuse/recycling targets perform better in terms of resource efficiency and level of ambition of the package. However, opting today for moderate target-level could allow taking better account of some of the uncertainties underlined by the sensitivity analysis, in particular regarding waste prevention.

- Against this background, one possibility would be to opt for one of the "moderate" variants for municipal and packaging waste recycling and re-assess the target through a review clause, at later stage (i.e. between 2020 and 2025) with the view to move towards the higher targets, in line with the higher variants tested. This could also allow ensuring more coherence, taking into consideration future potential synergies with actions on the "rest of the circle". For instance, measures on products (e.g. to improve recyclability for instance of the plastics) or consumer policy can help ensure that the model's underlying assumptions materialise so that society gets the highest benefit from increasing recycling rates.

On the added value of a landfill reduction target

- Under both options, variants with only recycling targets and no additional landfilling targets might raise some questions in terms of simplification as the co-existence of multiple EU targets on municipal waste activities could limit the flexibility that national governments and economic actors have during implementation.

- Yet, the options combining recycling/reuse with landfilling targets could perform better in terms of coherence. There are clear synergies between a gradual increase of the reuse/recycling rates and a parallel decrease in the rate of landfilling. Fixing clear long term targets for recycling and landfilling would give the necessary legal certainty to waste operators – whether private or public – to unblock potential investments. Member States still landfilling significant amounts of their waste would be pushed to replace landfilling directly by other waste management practices aligned with the first steps of the waste hierarchy (prevention, re-use and recycling).

- At the same time, giving adequate lead time to reduce landfilling could limit the risk of creating over capacities of residual waste treatment, as it has been the case in some more advanced Member States.

- Experience shows that Member States having effectively achieved high levels of recycling and re-use are those where measures to limit landfilling are the most developed (via specific bans and/or fiscal policies to discourage landfilling together with incentives for recycling). Maintaining landfilling cheap and easy represents a clear barrier for the development separate collection and recycling (see impact assessment page 26/27).

- Reducing landfilling would contribute directly to Objective 4 (level of ambition, resource efficiency) – landfilling represents the worst waste management option of the waste hierarchy as all potential resources are lost when landfilled. In that sense landfilling should be progressively phased out in line with the objectives of the 7th Environmental Action Program proposed by the Commission and endorsed by the Council and the Parliament. Leaving the possibility for the Member States to landfill between 30 and 35 % of their municipal solid waste would be in contradiction with the objective of the Commission to promote circular economy.

In conclusion, all Options and their variants contribute to the attainment of the objectives detailed in the Impact Assessment. In the context of this analytical note it has only been possible to identify the main contributions of each Option and variants to the objectives without ranking these Options and variants between them.

Annex 1: Effects of the model updates in the case of Options 3.1 and 3.7

The following table compares the results between those generated for the impact assessment and those generated using the updated model in the case of one Option (Option 3.1 – high). The comparison is intended to provide an indication of the extent to which the model outputs have changed as a result of the further development and enhancement of the modelling tool.

The Table aims to isolate the impact that the changes listed above have had on the model from those that have occurred as a result of inflating the prices to 2015 real terms prices and adjusting the period over which NPV is calculated to 2015 to 2035.

When comparing the NPV figures for the period 2014 to 2030 it can be seen that the financial costs are virtually unchanged, while the external benefits have increased by about €2.5 billion (the external *costs* have fallen from -€8.5 to -€11 billion, with negative costs representing a benefit to society). This change includes the fact that the prices have all been inflated from 2013 to 2015 real terms prices. As a result of the changes to the financial and external costs the net social cost shows greater benefits to society, but the shift has been relatively slight. It can be concluded that the updated model produces results which are consistent with the initial impact assessment.

Model Version / Model Variations	Financial Costs	External Costs	Net Social Costs[1]	Employ-ment[2]	Reduction in Greenhouse Gas Emissions	
	Net Present Value[3]			1,000 FTEs	Million Tonnes $CO_{2\ eq}$	
First IA Model ***NPV 2014 to 2030, € Billion, 2013 Prices***	-8.4	-8.5	-16.9	In 2030: 138	In 2030: -39	2014 to 2030: -214
Updated Model ***NPV 2015 to 2030, € Billion, 2015 Prices***	-5.5	-10.6	-16.1	In 2030: 135	In 2030: -38	2014 to 2030: -232
Updated Model ***NPV 2015 to 2035, € Billion, 2015 Prices***	-10.1	-20.2	-30.4	In 2035: 139	In 2035: -39	2014 to 2035: -386

Notes:

1. *Net social costs = financial costs + external costs.*
2. *Employment figures represent direct employment only (no multiplier effects have been included).*
3. *Negative costs represent a benefit to society.*

Table A4: Option 3.1- high – differences between the previous and updated version of the model

Extending the calculation of NPV out to 2035 significantly alters the final results. This is because NPV measures the flow of costs over time. In line with the European Commission's approach to impact assessments, a discount rate of 4% per annum was used again as part of this additional analysis. Despite the fact that future costs and benefits are discounted, the addition of an extra five years of costs and benefits significantly alters the final, aggregated NPV figure.

This is clearly shown in Figure 2 where the area under the graph provides a hypothetical example of the flow of money over time. Triangle 'A' shows the flow of costs between 2020 and 2030, whereas the flow of costs between 2020 and 2035 will include the entire area shown by 'A' and 'B'. This provides an illustration of why extending NPV to 2035 has such a marked impact on the results, even after the effects of discounting are taken into account.

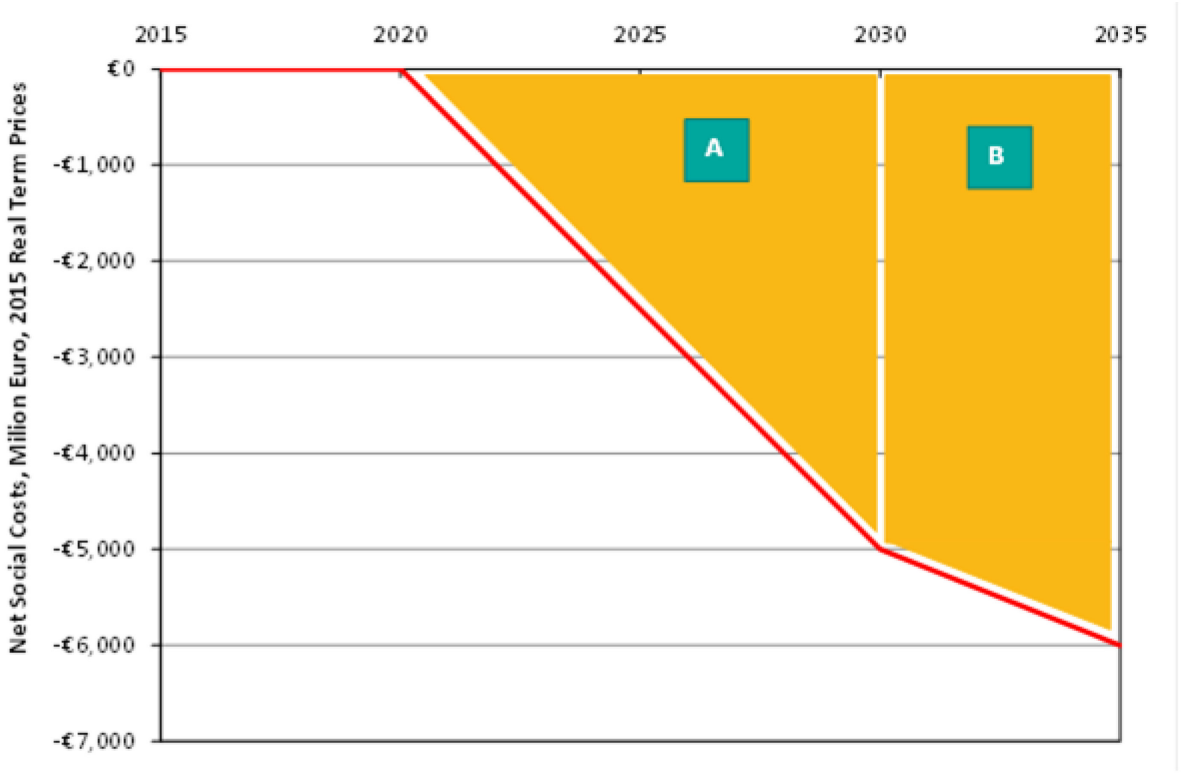


Figure A1: Net Present Value (NPV) measures the flow of costs over time which is represented by the area under the graph

Option 3.7 was considered the 'preferred' Option in the initial impact assessment. In this case, the updated results show a bigger change compared to those calculated for Option 3.1- High (see Table below). This is particularly true for the financial costs, where the net benefits have decreased from -€10.7 billion in 2013 real term prices to -€0.1 billion in 2015 real term prices. The reduction in the calculated external benefits has been less marked, these falling from -€18.3 billion in 2013 real terms prices to -€16.6 billion in 2015 real terms prices.

Unlike Option 3.1-high, which is restricted to a MSW recycling target, Option 3.7 includes both packaging waste recycling targets and a landfill diversion target, which covers MSW as well as the landfilling of other 'similar' wastes. It has been shown above that changes to the Municipal Waste Model has caused the financial costs of Option 3.1-high to increase by €2.9 billion. This, therefore, explains part of the reduction in costs recorded in relation to Option 3.7. The remaining €7.8 billion increase in financial costs occurs due to additional improvements to the Packaging Waste and Landfill Diversion parts of the model as detailed in section 3.

Model Version / Model Variations	Financial Costs	External Costs	Net Social Costs[1]	Employ-ment[2]	Reduction in Greenhouse Gas Emissions	
	Net Present Value[3]			1,000 FTEs	Million Tonnes $CO_{2\ eq}$	
Option 3.7						
First IA Model ***NPV 2014 to 2030, € Billion, 2013 Prices***	-10.7	-18.3	-29.0	-	In 2030: -62	2014 to 2030: -443
Updated Model ***NPV 2015 to 2030, € Billion, 2015 Prices***	-0.1	-16.6	-16.7	In 2030: 186	In 2030: -62	2015 to 2030: -419
Updated Model ***NPV 2015 to 2035, € Billion, 2015 Prices***	-0.7	-31.1	-31.8	In 2035: 199	In 2035: -66	2015 to 2035: -739

Notes:

Net social costs = financial costs + external costs

Employment figures represent direct employment only (no multiplier effects have been included)

Negative costs represent a benefit to society.

Annex 2: Sensitivity Analysis

Option 3.9(c) was used for the purpose of assessing the degree to which the model outputs change when the values of a number of assumptions are flexed to their likely upper and lower limits. In summary, when calculating the impact of Option 3.9(c) the results are mainly sensitive to: waste prevention effects resulting from introducing pay-as-you-throw (PAYT) schemes; material losses between the point of collecting recyclables and their final reprocessing; material revenues received from the sale of dry recyclables; the monetised value placed on greenhouse gas; and weighted average cost of capital.

It can be seen from Figure A2 below, for example, that altering the assumed waste prevention impact generated by transitioning to PAYT – which is the most influencing input parameter - will either cause a net difference – in terms of net present value (NPV) – of between + €1.1 billion (+ 4% of the total NPV) of minus €4.7 billion (- 15% of the total NPV) in 2015 real term prices (NPV period covers 2015 to 2035).

It is clear that from the sensitivity tests conducted as part of the analysis that, although the model is clearly more sensitive to changes in some input assumptions than to others, the overall narrative and conclusions do not change significantly. It is therefore safe to assume that although the numbers may vary slightly if different input assumptions are used the overall conclusion that is being drawn will not change.

.

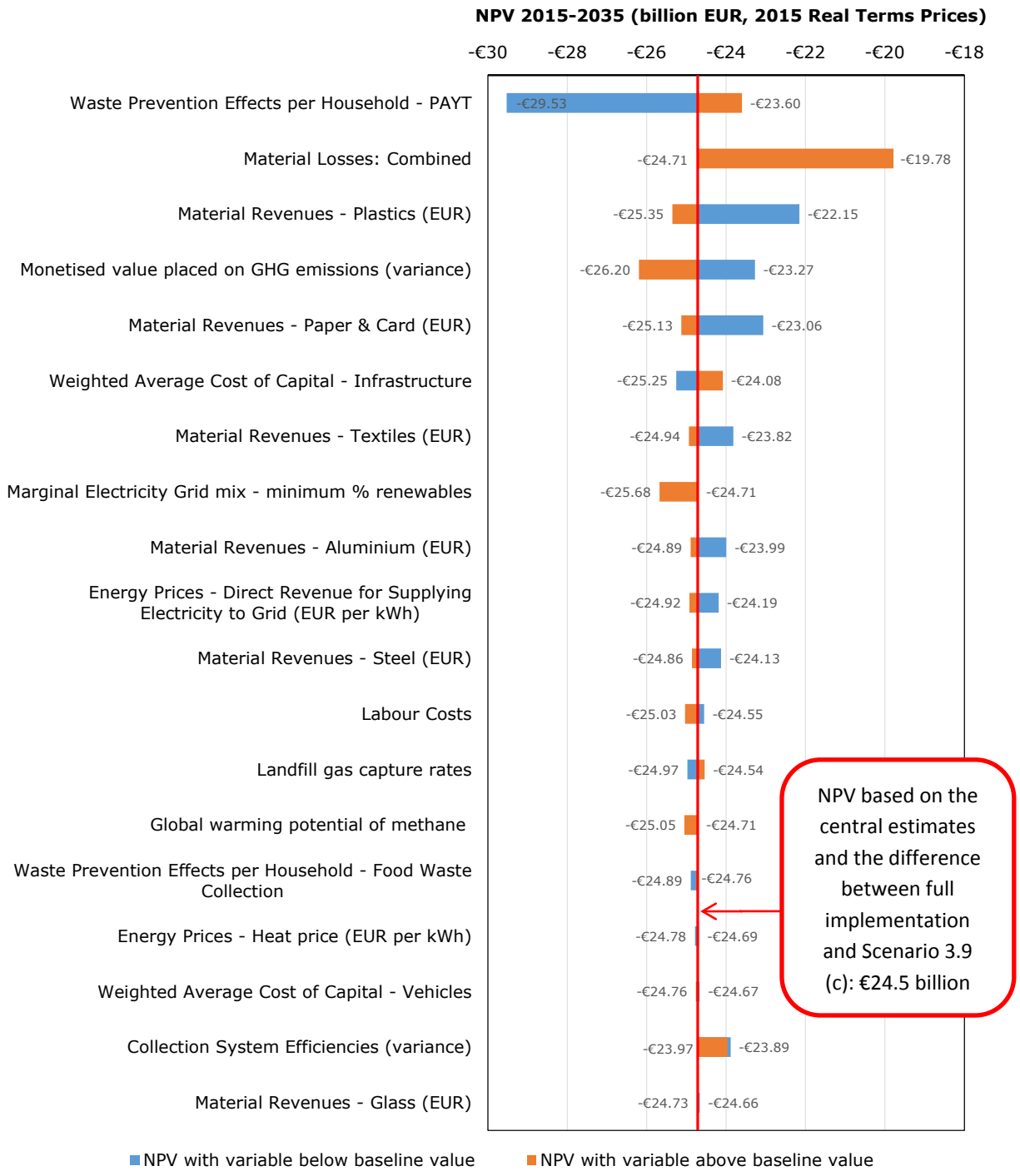


Figure A2: Variance in social cost of waste management in the EU28, Option 3.9(c) compared to full implementation (NPV over 2015 – 2035 in 2015 real term prices)

Annex 3 – Member States specific results for the new target options

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.36	-0.49	-0.85	2.05	-0.75	-11.69
Belgium	0.11	-0.52	-0.42	2.10	-0.55	-7.37
Bulgaria	-0.01	-0.14	-0.15	0.36	-0.29	-3.55
Croatia	-0.08	-0.18	-0.27	3.06	-0.47	-4.31
Cyprus	-0.09	-0.06	-0.15	0.25	-0.17	-2.01
Czech Republic	-0.32	-0.39	-0.72	1.34	-0.78	-8.80
Denmark	-0.23	-0.11	-0.33	1.07	-0.12	-1.50
Estonia	-0.01	-0.03	-0.04	0.34	-0.12	-1.13
Finland	-0.30	-0.09	-0.39	0.81	-0.10	-1.18
France	-2.75	-8.30	-11.05	27.57	-9.77	-144.21
Germany	-1.03	-1.06	-2.09	9.81	-2.53	-31.01
Greece	-0.26	-0.30	-0.56	1.47	-0.78	-8.10
Hungary	-0.09	-0.66	-0.75	2.51	-1.12	-14.85
Ireland	-0.22	-0.28	-0.50	1.71	-0.75	-9.73
Italy	-5.62	-5.44	-11.05	20.41	-7.57	-110.91
Latvia	-0.01	-0.05	-0.06	0.38	-0.11	-1.41
Lithuania	-0.06	-0.13	-0.19	0.55	-0.24	-3.22
Luxembourg	-0.02	-0.02	-0.05	0.09	-0.03	-0.31
Malta	0.01	-0.01	0.00	0.08	-0.05	-0.47
Netherlands	-0.81	-0.55	-1.36	2.58	-0.65	-9.65
Poland	0.06	-0.51	-0.45	13.01	-1.54	-18.43
Portugal	-0.06	-0.52	-0.59	4.35	-1.17	-14.40
Romania	0.45	-0.51	-0.06	1.88	-1.66	-13.87
Slovakia	-0.01	-0.17	-0.19	0.80	-0.47	-3.67
Slovenia	-0.01	-0.08	-0.09	0.16	-0.10	-1.54
Spain	0.26	-0.93	-0.68	12.22	-2.19	-26.63
Sweden	-0.42	-0.11	-0.53	0.68	-0.25	-3.41
United Kingdom	0.84	-3.99	-3.15	28.78	-5.82	-86.06
EU28	-11.0	-25.7	-36.71	140	-40.1	-543.4

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A5: Financial, External and Net social costs for Option 3.8 (a)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.55	-0.62	-1.18	2.61	-0.95	-14.43
Belgium	0.03	-0.62	-0.59	2.90	-0.68	-9.22
Bulgaria	-0.01	-0.17	-0.18	0.47	-0.39	-4.39
Croatia	-0.10	-0.21	-0.31	3.75	-0.55	-4.96
Cyprus	-0.10	-0.08	-0.18	0.28	-0.19	-2.36
Czech Republic	-0.45	-0.46	-0.91	1.70	-0.91	-10.41
Denmark	-0.37	-0.13	-0.50	1.46	-0.16	-2.10
Estonia	-0.02	-0.04	-0.06	0.38	-0.14	-1.45
Finland	-0.34	-0.11	-0.46	1.08	-0.13	-1.66
France	-3.10	-9.37	-12.47	33.26	-11.00	-162.67
Germany	-2.19	-2.04	-4.23	13.25	-3.48	-46.25
Greece	-0.34	-0.38	-0.73	1.71	-0.90	-10.15
Hungary	-0.11	-0.77	-0.88	2.89	-1.26	-17.10
Ireland	-0.30	-0.34	-0.64	2.42	-0.90	-11.87
Italy	-6.30	-6.21	-12.50	25.15	-8.80	-126.70
Latvia	-0.01	-0.06	-0.07	0.45	-0.13	-1.64
Lithuania	-0.07	-0.15	-0.22	0.66	-0.29	-3.89
Luxembourg	-0.04	-0.03	-0.07	0.13	-0.03	-0.43
Malta	0.01	-0.02	-0.01	0.09	-0.05	-0.51
Netherlands	-1.23	-0.77	-2.00	3.56	-0.90	-13.51
Poland	0.06	-0.63	-0.57	15.53	-1.75	-21.70
Portugal	-0.15	-0.63	-0.78	5.19	-1.31	-16.49
Romania	0.55	-0.67	-0.13	2.13	-1.84	-17.80
Slovakia	-0.01	-0.23	-0.24	0.92	-0.53	-4.79
Slovenia	-0.01	-0.10	-0.12	0.21	-0.13	-1.96
Spain	0.49	-1.18	-0.69	15.19	-2.77	-33.08
Sweden	-0.54	-0.16	-0.70	0.98	-0.36	-4.96
United Kingdom	0.27	-4.93	-4.66	38.41	-7.50	-108.68
EU28	-14.9	-31.1	-46.1	177	-48.0	-655.2

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A6: Member State Specific Results for Option 3.8(b)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.36	-0.49	-0.85	2.05	-0.75	-11.69
Belgium	0.11	-0.52	-0.42	2.10	-0.55	-7.37
Bulgaria	0.27	-0.26	0.01	0.32	-0.50	-6.14
Croatia	0.00	-0.21	-0.21	3.01	-0.42	-3.93
Cyprus	-0.10	-0.08	-0.18	0.22	-0.22	-2.51
Czech Republic	-0.33	-0.39	-0.72	1.34	-0.73	-8.61
Denmark	-0.23	-0.11	-0.33	1.07	-0.12	-1.50
Estonia	0.09	-0.06	0.03	0.33	-0.15	-2.29
Finland	-0.13	-0.20	-0.33	0.81	-0.20	-4.55
France	-1.76	-8.29	-10.05	27.38	-9.83	-147.71
Germany	-1.03	-1.06	-2.09	9.81	-2.53	-31.01
Greece	-0.08	-0.43	-0.50	1.08	-1.10	-12.47
Hungary	0.14	-0.74	-0.59	2.58	-1.13	-15.21
Ireland	-0.22	-0.28	-0.50	1.71	-0.75	-9.73
Italy	-5.08	-6.14	-11.22	19.25	-8.20	-122.17
Latvia	0.00	-0.06	-0.06	0.39	-0.14	-1.75
Lithuania	0.06	-0.17	-0.10	0.59	-0.32	-4.40
Luxembourg	-0.02	-0.02	-0.05	0.09	-0.03	-0.31
Malta	0.00	-0.01	-0.01	0.06	-0.04	-0.43
Netherlands	-0.81	-0.55	-1.36	2.58	-0.65	-9.65
Poland	0.40	-0.67	-0.27	12.71	-1.74	-21.50
Portugal	0.11	-0.57	-0.46	4.20	-1.29	-16.73
Romania	0.91	-0.56	0.34	1.37	-1.74	-15.58
Slovakia	0.02	-0.19	-0.17	0.76	-0.42	-3.96
Slovenia	0.16	-0.29	-0.13	0.12	-0.22	-3.95
Spain	1.04	-0.98	0.07	11.16	-3.15	-37.49
Sweden	-0.42	-0.11	-0.53	0.68	-0.25	-3.41
United Kingdom	2.16	-4.34	-2.18	28.13	-6.96	-107.25
EU28	-5.1	-27.8	-32.9	136	-44.1	-613.3

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A7: Member State Specific Results for Option 3.8(c)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.04	-0.26	-0.30	2.25	-0.78	-7.41
Belgium	0.23	-0.28	-0.05	2.14	-0.57	-5.99
Bulgaria	-0.01	-0.11	-0.12	0.35	-0.29	-2.80
Croatia	-0.08	-0.15	-0.23	3.07	-0.47	-3.60
Cyprus	-0.08	-0.06	-0.15	0.25	-0.17	-1.96
Czech Republic	-0.28	-0.41	-0.69	1.34	-0.87	-9.56
Denmark	-0.14	-0.06	-0.20	1.18	-0.15	-1.69
Estonia	-0.01	-0.03	-0.03	0.34	-0.12	-1.01
Finland	-0.28	-0.07	-0.36	0.81	-0.10	-0.90
France	-1.89	-5.95	-7.84	27.82	-9.74	-114.76
Germany	-0.53	-0.58	-1.11	10.98	-2.84	-25.04
Greece	-0.20	-0.23	-0.43	1.47	-0.78	-6.24
Hungary	-0.05	-0.58	-0.63	2.52	-1.12	-12.88
Ireland	-0.16	-0.20	-0.35	1.73	-0.75	-7.24
Italy	-3.96	-3.68	-7.64	21.00	-7.57	-79.74
Latvia	0.00	-0.04	-0.04	0.38	-0.11	-1.08
Lithuania	-0.02	-0.11	-0.13	0.56	-0.26	-3.00
Luxembourg	-0.01	-0.01	-0.03	0.10	-0.03	-0.25
Malta	0.01	-0.01	-0.01	0.08	-0.05	-0.40
Netherlands	-0.47	-0.27	-0.74	2.72	-0.68	-5.39
Poland	-0.49	-0.42	-0.92	13.04	-1.53	-14.98
Portugal	-0.76	-0.45	-1.20	4.38	-1.25	-12.02
Romania	0.44	-0.55	-0.10	1.88	-1.66	-14.63
Slovakia	-0.01	-0.18	-0.19	0.80	-0.47	-3.80
Slovenia	-0.01	-0.05	-0.06	0.16	-0.11	-1.04
Spain	0.46	-0.77	-0.31	12.28	-2.20	-22.72
Sweden	-0.35	-0.07	-0.42	0.82	-0.30	-2.47
United Kingdom	0.03	-2.41	-2.37	29.43	-6.01	-61.79
EU28	-8.6	-18.0	-26.7	144	-41.0	-424.4

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A8: Member State Specific Results for Option 3.9(a)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.20	-0.39	-0.59	2.73	-0.97	-10.46
Belgium	0.24	-0.40	-0.16	2.90	-0.69	-7.80
Bulgaria	-0.01	-0.16	-0.17	0.47	-0.39	-4.06
Croatia	-0.09	-0.18	-0.27	3.76	-0.55	-4.38
Cyprus	-0.10	-0.07	-0.17	0.29	-0.19	-2.25
Czech Republic	-0.38	-0.48	-0.86	1.70	-1.01	-11.36
Denmark	-0.20	-0.09	-0.29	1.46	-0.17	-2.04
Estonia	-0.01	-0.03	-0.04	0.38	-0.14	-1.22
Finland	-0.33	-0.10	-0.43	1.08	-0.13	-1.33
France	-1.91	-6.99	-8.90	33.31	-10.99	-132.41
Germany	-0.79	-1.08	-1.87	14.12	-3.66	-33.50
Greece	-0.25	-0.28	-0.53	1.71	-0.90	-7.53
Hungary	-0.10	-0.66	-0.76	2.89	-1.25	-14.51
Ireland	-0.22	-0.26	-0.47	2.44	-0.90	-9.31
Italy	-4.48	-4.38	-8.86	25.52	-8.80	-94.36
Latvia	0.00	-0.05	-0.05	0.45	-0.13	-1.35
Lithuania	-0.03	-0.13	-0.16	0.66	-0.29	-3.44
Luxembourg	-0.02	-0.02	-0.04	0.13	-0.03	-0.35
Malta	0.00	-0.01	-0.01	0.09	-0.05	-0.46
Netherlands	-0.86	-0.44	-1.30	3.67	-0.93	-9.06
Poland	-0.51	-0.52	-1.03	15.54	-1.75	-17.97
Portugal	-0.81	-0.54	-1.35	5.21	-1.40	-14.17
Romania	0.42	-0.64	-0.22	2.14	-1.85	-16.82
Slovakia	-0.03	-0.21	-0.24	0.92	-0.54	-4.44
Slovenia	-0.01	-0.07	-0.08	0.21	-0.14	-1.44
Spain	0.58	-1.07	-0.49	15.19	-2.77	-30.43
Sweden	-0.45	-0.11	-0.56	1.05	-0.39	-3.91
United Kingdom	0.37	-3.35	-2.98	37.97	-7.48	-82.41
EU28	-10.2	-22.7	-32.9	178	-48.5	-522.8

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A9: Member State Specific Results for Option 3.9(b)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.04	-0.26	-0.30	2.25	-0.78	-7.41
Belgium	0.23	-0.28	-0.05	2.14	-0.57	-5.99
Bulgaria	0.29	-0.24	0.05	0.31	-0.50	-5.60
Croatia	0.01	-0.18	-0.17	3.03	-0.42	-3.24
Cyprus	-0.10	-0.08	-0.18	0.22	-0.22	-2.49
Czech Republic	-0.28	-0.41	-0.69	1.34	-0.87	-9.56
Denmark	-0.14	-0.06	-0.20	1.18	-0.15	-1.69
Estonia	0.02	-0.04	-0.01	0.34	-0.15	-1.47
Finland	-0.27	-0.09	-0.36	0.81	-0.21	-1.48
France	-1.50	-6.02	-7.53	27.84	-9.97	-117.77
Germany	-0.53	-0.58	-1.11	10.98	-2.84	-25.04
Greece	-0.03	-0.35	-0.38	1.08	-1.10	-10.67
Hungary	0.09	-0.63	-0.54	2.57	-1.13	-13.11
Ireland	-0.16	-0.20	-0.35	1.73	-0.75	-7.24
Italy	-3.53	-4.12	-7.65	19.32	-8.23	-88.79
Latvia	0.01	-0.05	-0.04	0.39	-0.14	-1.49
Lithuania	0.06	-0.14	-0.08	0.59	-0.32	-3.77
Luxembourg	-0.01	-0.01	-0.03	0.10	-0.03	-0.25
Malta	0.00	-0.01	-0.01	0.06	-0.04	-0.37
Netherlands	-0.47	-0.27	-0.74	2.72	-0.68	-5.39
Poland	-0.45	-0.49	-0.94	13.06	-1.60	-16.02
Portugal	-0.71	-0.47	-1.18	4.40	-1.33	-12.98
Romania	0.82	-0.58	0.24	1.37	-1.74	-15.74
Slovakia	0.01	-0.19	-0.18	0.81	-0.49	-4.02
Slovenia	0.07	-0.15	-0.08	0.13	-0.22	-2.30
Spain	1.21	-0.80	0.41	11.14	-3.14	-32.89
Sweden	-0.35	-0.07	-0.42	0.82	-0.30	-2.47
United Kingdom	0.83	-2.82	-1.99	29.60	-7.15	-77.72
EU28	-4.9	-19.6	-24.5	140	-45.1	-476.9

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A10: Member State Specific Results for Option 3.9(c)

Member State	Financial Costs	External Costs	Net Social Costs[2]	Employment[3]	Reduction in Greenhouse Gas Emissions	
	Net Present Value, 2015 to 2035, Billion EUR, 2015 Real Term Prices			1,000 FTEs in 2035	Million Tonnes $CO_{2\ eq}$ in 2035	Million Tonnes $CO_{2\ eq}$, 2015 to 2035
Austria	-0.20	-0.39	-0.59	2.73	-0.97	-10.46
Belgium	0.24	-0.40	-0.16	2.90	-0.69	-7.80
Bulgaria	0.31	-0.30	0.01	0.44	-0.60	-7.13
Croatia	0.01	-0.22	-0.21	3.73	-0.51	-4.15
Cyprus	-0.11	-0.10	-0.20	0.27	-0.25	-2.94
Czech Republic	-0.35	-0.51	-0.86	1.70	-1.07	-12.00
Denmark	-0.20	-0.09	-0.29	1.46	-0.17	-2.04
Estonia	0.03	-0.05	-0.02	0.39	-0.18	-1.81
Finland	-0.25	-0.16	-0.41	1.08	-0.33	-3.30
France	-0.86	-7.15	-8.01	33.35	-11.42	-139.68
Germany	-0.79	-1.08	-1.87	14.12	-3.66	-33.50
Greece	0.02	-0.47	-0.44	1.41	-1.30	-13.65
Hungary	0.06	-0.71	-0.65	2.94	-1.26	-14.72
Ireland	-0.27	-0.24	-0.51	2.45	-0.94	-9.03
Italy	-3.62	-5.22	-8.84	24.58	-9.96	-112.07
Latvia	0.06	-0.05	0.01	0.42	-0.16	-1.71
Lithuania	0.06	-0.14	-0.09	0.63	-0.32	-3.80
Luxembourg	-0.02	-0.02	-0.04	0.13	-0.04	-0.35
Malta	0.00	-0.01	-0.01	0.08	-0.05	-0.49
Netherlands	-0.86	-0.44	-1.30	3.67	-0.93	-9.06
Poland	-0.51	-0.77	-1.28	15.58	-1.98	-21.39
Portugal	-0.71	-0.59	-1.30	5.25	-1.57	-16.10
Romania	0.87	-0.73	0.14	1.72	-2.03	-19.31
Slovakia	0.01	-0.23	-0.22	0.93	-0.58	-4.91
Slovenia	0.07	-0.18	-0.11	0.19	-0.25	-2.82
Spain	1.65	-1.30	0.34	14.45	-4.23	-47.68
Sweden	-0.45	-0.11	-0.56	1.05	-0.39	-3.91
United Kingdom	1.83	-4.09	-2.26	38.22	-9.50	-111.25
EU28	-4.0	-25.8	-29.7	176	-55.3	-617.1

Notes:

1. *Negative costs represent a benefit to society. All scenarios compared against the Full Implementation.*
2. *Net social costs = financial costs + external costs.*
3. *Employment figures represent direct employment only (no multiplier effects have been included).*

Table A11: Member State Specific Results for Option 3.9(d)