Impact Assessment Institute

The Institute for Impact Assessment and Scientific Advice on Policy and Legislation

"Impartial Analysis for Policy Making"

Report scrutinising the

"IMPACT ASSESSMENT

Accompanying the document

Proposal for a Directive of the European Parliament and of the Council

amending Directives 2008/98/EC on waste, 94/62/EC on packaging and packaging waste, 1999/31/EC on the landfill of waste, 2000/53/EC on end-of-life vehicles, 2006/66/EC on batteries and accumulators and waste batteries and accumulators, and 2012/19/EU on waste electrical and electronic equipment"

SWD (2014) 207

and on the "COMMISSION STAFF WORKING DOCUMENT

Additional analysis to complement the impact assessment SWD (2014) 208 [207] supporting the review of EU waste management targets"

SWD (2015) 259

IAI-CircEcon-161003f October 3rd 2016

Main findings

Waste management is a highly complicated policy area, due to the many waste streams, multiplicity of actors and differentiation between Member States, regions and municipalities. The analysis that supports the Circular Economy legislative package relies on a Waste Management Model that calculates costs and benefits in environmental, financial and other terms. The original 2014 legislative proposal was replaced by a new proposal in December 2015, with numerically lower recycling and higher landfill targets.

The following significant observations result from detailed scrutiny of the package:

- The Waste Management Model is a complex and highly developed tool providing valuable information to support policy making at EU and Member State level.
- The model and its underlying calculations are not fully available to stakeholders, representing a critical lack of transparency, preventing detailed external scrutiny that would provide interested parties with greater confidence in the conclusions.
- The cost/benefit analysis makes the case for introducing waste management targets in aggregate for the European Union, but the legislative proposal does not reflect the results. This calls into question the value placed on the model.
- The outputs of the model do not bear a coherent relation to individual Member State waste management conditions. In particular, the 2020 and 2030 targets appear to be in conflict, with early treatment investments later being phased out.
- Consequently, the analysis lacks insights into the feasibility for individual Member States of reaching the targets.
- The analysis therefore fails to translate the case for waste management targets into proportional policy measures for individual Member States.
- The method for determining derogations to the recycling and landfill targets is inconsistently applied, does not reflect the needs of Member States and creates a two-sizes-fit-all policy where multiple different starting conditions apply.

Overall benefits for the EU as well as the feasibility and benefits for individual Member States would be optimised by tailored targets and measures that take into account the multiplicity of different conditions. This study has therefore investigated alternative options for target setting at Member State level, based on the following parameters:

- A uniform mass-per-capita target for residual waste and for landfill.
- Differentiated percentage targets for recycling and landfill for each Member State, calculated based on starting conditions and GDP per capita.
- Differentiated mass-per-capita targets for residual waste and landfill for each Member State, converted from the tailored percentage targets, with the option of an upper ceiling and lower floor to avoid outliers.

The Impact Assessment Institute, based on its scrutiny of the evidence, therefore recommends consideration of differentiated options for Member State target setting. These may include but are not limited to those investigated in this study, to achieve the joint objectives of maximum benefit with feasible objectives.

Accompanying statement

This report has been written according to the guiding principles of the Impact Assessment Institute: transparency, objectivity, legitimacy and credibility. It analyses the subject matter from a purely factual and scientific point of view, without any policy orientation. In respecting these principles it has been compiled following its written Study Procedures[i].

The analysis is open to review and criticism from all parties, including those whose work is scrutinised. Contacts with all relevant parties are recorded to ensure transparency and to guard against "lobbying" of the results.

By its nature the report has a critical characteristic, since it scrutinises the subject document with its main findings entailing the identification of errors, discrepancies and inconsistencies. In performing this work, the intention of the report is to be constructive in assisting the authors of the subject document and its background information as well as all relevant stakeholders in identifying the most robust evidence base for the policy objective in question. It should therefore be seen as a cooperative contribution to the policy making process.

This report is also to be considered as a call for additional data. Peer review is an essential step laid down in the procedures of the Impact Assessment Institute and this is manifested in the openness to further review and to identify new data. Even at publication of the final version, the report explicitly requests additional data where the readily available data was not sufficient to complete the analysis, and is open to newly arising data, information and analysis.

Additional data requested

The Impact Assessment Institute appreciates the additional detailed data on the chronological output of the model per Member States provided by the European Commission in response to the draft version of this study.

In order to conduct a comprehensive investigation of the figures published in the Impact Assessment and accompanying analysis, full access to the Waste Management Model for all interested stakeholders, allowing scenario analysis and full scrutiny of the figures and calculations, is requested.

Visualisation

The following table provides a visual overview of the results of this report for each element of the evidence presented in the Impact Assessment, using an assessment from 1 to 7 to indicate the level of confidence (1 = highest, 7 = lowest confidence level).

Element	**Assessment level & description (1…7)**		**Notes**
Rhetoric	2	Minor questions identified on analysis and/or evidence	The text is generally quite balanced and does not prejudge the results of the analysis.
Assumptions	2	Minor questions identified on analysis and/or evidence	Apart from those inherent in the data (see next row), the assumptions appear to be a sound and reasonable basis for analysis.
Background data	4	Concerns identified with analysis and/or evidence	GHG damage costs include significant uncertainties and the robustness of Member State background data is in question.
Analysis	6	Serious concerns identified with analysis and/or evidence	The lack of availability of the analytical model and the absence of sufficient detail in the published results prevents an understanding by stakeholders of the calculation method and results.
Results	6	Serious concerns identified with analysis and/or evidence	Due to the lack of transparency and the incoherence of the modelling results and their usage, the analysis is called into question.
Conclusions	6	Serious concerns identified with analysis and/or evidence	The lack of coherence of the results leads to high uncertainty in the validity of the conclusion, also reflected in the lack of consistent application of the results in the legislative targets.

Key to assessment levels

1	2	3	4	5	6	7
Correct analysis, fully evidenced	Minor questions identified on analysis and/or evidence	Several questions identified on analysis and/or evidence	Concerns identified with analysis and/or evidence	Substantial concerns identified with analysis and/or evidence	Serious concerns identified with analysis and/or evidence	Incorrect analysis / evidence absent

Contents

1 Introduction

Waste management, when considered at the EU level, is highly complicated, due to the waste hierarchy, the number of waste streams and the need to address waste individually for each Member State.

This IAI study scrutinises the evidence presented for the Circular Economy legislative package, the coherence of the package itself with that evidence and performs reanalysis of the data where this adds value to the evidence. Specifically, the following documents are scrutinised:

2014 package:

- Combined Waste Directive COM (2014) 397 final
- Consolidated Impact Assessment SWD (2014) 207 final
- "Impact Assessment on Options Reviewing Targets – Final Report", report of the contractors, February 2014
- 'Development of a Modelling Tool on Waste Generation and Management' Headline Report plus 11 annexes, February 2014

2015 package:

- Amending Directive on Waste COM (2015) 595 final
- Amending Directive on Packaging and Packaging Waste COM (2015) 596 final
- Amending Directive on the Landfill of Waste COM (2015) 594 final
- Amending Directive on Vehicles, Batteries and Electronic Waste COM (2015) 593 final
- Directive on Waste Additional Analysis SWD (2015) 259 (in this study treated as a supplementary Impact Assessment) (hereafter "Additional Analysis")
- Eunomia 'Further development of the European reference Model on Waste Generation and Management' – May 2015
- Eunomia 'Support to the Waste Targets Review - Analysis of New Policy Options' - October 2015
- Eunomia "Support to the waste target review – final report" and appendixes - September 2016.

The above documents have been scrutinised on the basis that they should be consistent, present sufficient detail for full understanding of the results, allow reconciliation by the stakeholder and enable full comparison of different options and scenarios.

2 Transparency

2.1 Comparability of legislative proposals

The Commission published two separate "Circular Economy" legislative proposals for changes to the original 2008 waste legislation, in July 2014 (COM(2014) 397) and again in December 2015 (COM(2015) 593, 594, 595 and 596). Each of these amend the existing Waste Framework Directive 2008/98/EC and associated directives on vehicles, batteries and electrical equipment. The detailed amendment proposals provide a list of changes and new clauses to be applied to the original legislation.

In the second Circular Economy legislative proposal from December 2015, many of the clauses in the 2014 proposal have been reordered and renumbered. This made it very difficult to gain a clear understanding of the overall history of the proposals, especially the differences between the 2014 and 2015 versions. In particular, changing from a consolidated legislative proposal in 2014 to four separate proposals in the 2015 package increases the effort required for stakeholders to gain a complete overview of the proposed changes.

Clarity and transparency would have been greatly improved if all the proposed changes had been in equivalent format in both 2014 and 2015 proposals and published in a three column format showing original clauses, 2014 changed clauses and 2015 changed clauses.

In particular, this would have provided stakeholders with a clear method for understanding the relative level of ambition of each element of the two proposals, to enable comparison and provide confidence in the overall nature of the legislative provisions. The IAI compiled such a comparison, is shown in Section 3 below.

2.2 Analytical model

There are many numerical targets included in the 2015 legislative proposals. Impacts of a number of scenarios for these targets are assessed using a complex spreadsheet model developed by the Commission's subcontractors, Eunomia and the Copenhagen Resource Institute (CRI). The results are included in the 2014 Commission Impact Assessment and the Additional Analysis accompanying the 2015 proposals.

It is clear that a tremendous amount of work went into creating this model and the resulting scenario analysis. As such it is a highly valuable tool for informing policy in this domain both at EU and Member State level with substantial potential for identifying beneficial paths to effective waste management.

Below and in the following chapters a number of important observations are made about the model, its use and results, which should be taken into account in the context of its use for policy making in Circular Economy.

2.2.1 Model complexity

The model is necessarily complex because of the diversity of waste types and the many different possible process routes the different types of waste undergo as they move through the processing hierarchy. The model is further complicated by differences in the organisation and processing of waste in different Member States (MS) which requires a large set of MS specific data to be included in the model.

The outputs of the model include financial costs/benefits incurred by individual Member States, social costs/benefits, impacts on employment and reduction in greenhouse gas

emissions. These outputs can be reported by individual Member State or grouped as aggregate EU data.

The detailed operation of the model is documented in a "Headline Report" issued by the subcontractors, together with lengthy appendices. This report presents with good clarity a complete top-level description of the model, which is divided into modules with clear flow diagrams for each of these. Some of the sources of input data used in the model are described in the headline report but most of the highly detailed and differentiated information is found in its 11 appendices.

2.2.1 Stakeholder access

Theoretically, it might be possible to use the information provided to reconstruct all the calculations of the model (for each Member State individually) and thereby gain a full understanding of the source of all the model results. This would represent a huge task, probably not dissimilar to the effort required to create the model in the first place. Furthermore, attempts to do this would be hampered by the lack of key input data, especially that relating to individual Member States (see Section 4.1 below). Therefore, to enable stakeholders fully to understand the model and its results, only direct and complete access to the model would allow this to be done with a reasonable amount of time and resources.

The European Environment Agency (EEA), which now maintains the model, organised workshops in 2015 and 2016 (before and after publication of the 2015 legislative proposal and Impact Assessment) for Member States, providing some access to the model.

The IAI itself was also kindly provided with a tutorial on the model by the EEA. This provided a general overview of the functioning, calculation method, background data and nature of the results.

The model itself has not been made fully available to external parties by the European Commission. Following requests made in the draft version of this IAI study, the European Commission provided the IAI with detailed chronological data on the outputs of the model by Member State and stated that this data is available to any party requesting it. In parallel the Commission published some of this additional data (for one scenario) as an appendix to the contractor's Final Report in September 2016. This data has proven useful in better understanding the model and its calculations.

For an important area of public policy of this type, the proper benchmark is full access for all stakeholders to the input data, calculations and raw output data of the model. This would allow interested stakeholders to gain a full understanding of the source of the results and enable scenario analysis to test alternative possibilities. In turn this would provide greater stakeholder confidence in the results presented in the Impact Assessment and generate a broader source of analysis to feed into the subsequent legislative process.

Such a step would likely involve the application of additional resources on the part of the European Commission. Due to the importance of stakeholders having a full understanding of the legislation by which they are affected, this would be a productive use of such resources and should be given priority as a matter of policy. Ideally the model should be made publicly available at the latest at the time of first publication of results, so that these can be fully scrutinised.

2.2.2 Comparison of 2014 and 2015 background data

Background data for the 2014 European Commission Impact Assessment is documented in a separate report of the contractors[ii].

Accompanying the 2015 revised legislative proposal and its Additional Analysis (Impact Assessment) was an additional report of the contractors "Analysis of New Policy Options". This describes in detail additions to the model to support the introduction of the revised targets.

There are a number of changes to the model implemented for the 2015 version, which are detailed on page 9 of the Additional Analysis. Together these changes sum to material differences and can therefore be expected to affect comparability between the 2014 and 2015 data.

In particular, the 2015 targets include extended timescales (up to 2035 for some scenarios), which were adopted in order to cover the timeframe of the 5 year derogations to the 2030 deadline to be allowed for certain Member States. Whilst this is a necessary amendment, required to measure the effects of all the assessed scenario provisions, it makes comparability with the 2014 scenarios impossible without full access to the background data and model. Such comparability is necessary for stakeholders to gain a clear understanding of the dynamics of the changes between the two proposals.

The "New Policy Options report" does include a table showing how the changes affect the overall results for two of the 2014 scenarios. However, this does not include sufficient detail to provide the necessary transparency for clear comparability of the figures, nor can the effect on other scenarios be assessed. A viable solution would have been to republish the 2014 scenarios with the 2035 timeframe, enabling direct comparison. The same information detailed at Member State level would be necessary to provide a fully transparent picture.

In addition, there are some difficulties in comparing the data presented in the 2015 Additional Analysis with that from the original 2014 Impact Assessment and its background documents because of differences in the aggregation of results between data for individual Members States versus EU-wide data. For example, in the 2014 report the impact on individual Member States of the recommended scenario (3.9c) is only presented as aggregate EU28 data. The effect on individual Member States of this scenario versus those in the 2015 report cannot be evaluated.

In the 2014 background documentation, financial costs/benefits for each country are split into collection costs and treatment costs, with external costs split into GHG and air quality effects, providing useful detail. This detail is not provided in the background document for the 2015 Impact Assessment, preventing more effective scrutiny of the figures.

2.3 Scenario designations

Amongst the documentation for the 2014 and 2015 Impact Assessments as many as four different numbering schemes for the scenarios have been found:

- 2014 Eunomia reports: scenarios 1 to 4
- 2014 Impact Assessment: Scenarios 3.1 to 3.4a, b and c
- 2014 and 2015 Impact Assessment: Scenarios 3.1 to 3.7 and 3.8a to 3.9d
- 2015 Impact Assessment: Scenarios 1 to 19

In addition, in one instance in the 2014 Impact Assessment (page 47), scenario 3.1 appears to have been designated as 4.1.

This multiplicity of designations as well as the error represent an additional burden on stakeholders wishing to understand and compare scenarios. The unclear presentation diminishes the transparency of the presented information.

Annex I contains a comparison of the scenario designations according to the known information, which is open to verification by the Commission and other stakeholders.

3 Legislative comparison

As indicated in Section 2.1 above, the original 2014 legislative proposal was withdrawn, with a revised proposal adopted in December 2015. The following table compares the main provisions of the two version of the legislation:

	Original 2014 proposal	Revised 2015 proposal
Interim MSW recycling targets	2020: changed to include all MSW	2025: 60% (50% derogation)
Binding MSW recycling target 2030	70%	65% (60% derogation)
Binding packaging waste target 2025	70%	No target
Binding Packaging waste target 2030	80%	75%
Reuse	No change	Reuse included in recycling targets
Landfill target 2030	5% ("endeavour", review in 2025)	10% ("ensure")
Derogation MSW recycling & landfill	No derogations.	5-year derogation for EE, GR, HR, LV, MA, RO and SK.
Construction & demolition waste	No change	Removes "other material recovery" from target definition
EPR	MS shall influence the design of products without distorting the internal market.	MS may influence the design of products and shall ensure the functioning of the internal market. Exchange of information between MS and EPR schemes.
Prevention	Member States shall take the appropriate waste prevention measures. EEA shall publish annual report.	Member States shall take measures to prevent and shall monitor and assess. EEA shall publish annual report. Commission may adopt implementing acts to establish indicators and shall adopt implementing act to establish common methodology
By-products	Delegated acts establishing detailed criteria for specific substances or objects.	MS are given responsibility; Delegated acts establishing detailed criteria for specific substances or objects. Reporting on technical regulation adopted.
End-of-waste status	Shall be deemed to be recycled for the purpose of the calculation of the targets; Specific waste streams focused.	MS are given responsibility. May be considered prepared for reuse, recycled or recovered for calculation of the targets. Scope expanded; Reporting on technical regulation adopted.
Food Waste reduction	MS shall take measures: "endeavour" to reduce by 30% 2017 to 2025.	MS shall take measures to reduce and shall monitor and assess - refers to SDGs, halving by 2030.
Bio Waste	Separate collection	Measures to encourage processing and treatment
Early Warning	System requires at-risk MS to issue compliance plan	Commission / EEA Reporting only

The numerical targets for municipal solid waste (MSW) recycling are higher and for landfill are lower in the 2015 proposal in terms of the percentage and the derogations, with a slightly different calculation method and nature of the targets (e.g. endeavour vs ensure).

In the 2015 proposal, a new MSW recycling target for 2025 has been introduced, but conversely the packaging waste target for 2025 has been removed.

Regarding the non-numerical provisions, there is a mix of those that have become slightly less demanding and some that are slightly more demanding in the 2015 proposal compared to 2014.

4 Input Data Used by the Model

Data inputs to the model include:

- Inputs to the waste flow model such as the mix of waste at any given point, the actual treatment processes used and costs of processes.
- Financial data: a large number of data inputs, many specific to Member States.
- Data on labour costs in each Member State.

These are each assessed below.

4.1 Financial Data Inputs

The derivation of the financial data is described in Appendix 4 to the Waste Model Headline Report. This appendix provides a full description of the methodology used to obtain the various data required which involved a combination of published data, data obtained from visits to Member States and analytical work.

This appendix is particularly difficult to comprehend because there are many individual numbers and tables embedded in lengthy paragraphs of text: some of these numbers are key data required by the model while others are part of background explanatory material. The tables summarise certain groups of financial input data but many other data are not summarised in this way. This results in a significant level of both obscurity and ambiguity in determining the actual figures that are used in the model.

This appendix would have benefitted from a series of tables that comprehensively and clearly document all the input data used in the model in order to provide better transparency. Some of these tables should have presented data common to all MS but many others would need to be tabulated by individual MS.

A good example that illustrates the difficulties in understanding this appendix is Section 2.3 which deals with different mechanical biological treatments (pp 26-29) where different numbers used for different treatments are mentioned in the text but not summarised in any table.

There have been modifications made to the model since the publication of the 2014 Headline Report which are described in the Eunomia 'Further development of the European Reference Model on Waste' report. This report focuses mainly on the impacts that the model changes have on the outputs of the model with some tables updating figures originally presented in the original 2014 Headline Report. There is no additional detail on the aggregate input data used by the model.

The Headline Report, Section 4.0 states that "capital costs [are] assumed to be constant across countries". This is a major assumption, considering that variance between Member States would have a significant influence on the level of financial costs and benefits. No evidence is presented to back up this assumption.

4.2 Member State Data Inputs

The data that are specific to individual Member States and their method of determination are described in Appendix 1 of the Headline Report. This appendix (running to over 600 pages) is structured in the form of individual sections, each relating to a single Member State. The data includes information on different waste flows that feed into the fundamental structure of the waste model plus financial and employment data.

Each section follows a standard format that includes information about the process followed in obtaining the data and a section presenting eight standardised charts plus two tables summarising the results in terms of progress to date against the existing targets and projected future progress.

It is clear from reading the various texts describing the collection of data for individual MS that difficulties were encountered in obtaining data that was complete, accurate and consistent between different MS. This arose from great variability in the categorisation and level of detail of the information available per MS. In many instances it was necessary to make judgements and assumptions. The model thus uses estimated data when adequate MS figures were not available. This makes it difficult to compare the overall status between one MS and another, and these difficulties are explicitly acknowledged in the reports, for example the Headline Report section 3.5.

These difficulties raise concerns about the reliability of the data, especially given the projections of outcomes over long timescales. Small errors in the baseline data could be amplified into significant errors in final outcomes predicted by the Waste Management Model. These data reliability issues call into question the robustness of the results produced by the model.

The later contractor report 'Further Development of EU Waste Model' (which was used to generate the data for the 2015 Impact Assessment) includes a revised appendix (App 3) detailing individual MS data. This appendix now has an introductory section preceding the MS data which details changes to the 'Collections' module (with new data input tables) and a new section describing (in descriptive terms) the main uncertainties associated with the model.

The formatting of the individual MS sections is also more standardised with each individual MS section including a series of 13 standard tables. Five of these tables detail revisions to input data with the remainder presenting model outputs. This revision makes it easier to compare some of the model results between different MS but still leaves much of the input data obscure (as also referred to in Section 4.1 above).

Appendix 3 of the 'Further Development' document provides information on the total waste input for each Member State for the full implementation scenario and 70% MSW recycling scenario. However, there is no information in this or any other report on the waste input to the model for the investigated scenarios of the Additional Analysis, nor the detail of individual waste input (e.g. direct to landfill or incineration) provided in the Appendix to the original Headline Report. The IAI was able to ascertain from information provided by the EEA that the waste inputs for the investigated scenarios are conceptually calculated from the baseline scenario as outputs to the model. They are therefore modified by the model according to the targets for recycling and landfill.

It is likely that when the new legislation is implemented it will be necessary to revise targets for some MS to match actual performance against original targets. It is understood that the EEA will work on updating the key input data throughout 2017, intending to reduce some of the uncertainties in the data through consultation with the Member States. It would be beneficial to provide all the background data that is used as input to the model to allow full scrutiny.

4.3 Parameters used for model calculations

4.3.1 Baseline

The Impact Assessments use the scenario of full implementation of the existing legislation including its 2020 targets as the baseline for evaluating the policy scenarios. In addition, the background report includes "Business as Usual", "Current Outlook" and "MS Intentions" scenarios.

Therefore, the modelling results for the scenarios assume full implementation, with the cost/benefit figures for the new targets calculated accordingly. This assumption appears likely to be too timid for many of the advanced Member States and are potentially not attainable by others. The figures in Annex 5 of the 2014 Impact Assessment indicate that many Members States are far from meeting the 2020 targets, with the accompanying text indicating that half of them require acceleration in their annual improvements in recycling rates. Section 7.3.2 of the Headline Report states "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". This indicates clearly that significant investments were expected as the baseline, during a period in which public investment was significantly squeezed. At the same time, many of the Member States are expected to exceed their 2020 targets.

For any Member States not attaining the 2020 targets, the scenarios for 2030 are likely to be more difficult to reach than apparent from the modelling results (yet in some cases the model may actually show this as a higher net social benefit!). Conversely for those MS that are expected to exceed the 2020 targets, the 2030 targets may require less effort than the model predicts or might even be achieved before the chosen deadline.

4.3.2 Parameters for external costs and benefits

External costs/benefits are comprised of the following elements:

- Costs/benefits of GHG emissions/reductions.
- Costs/benefits of air pollutant emissions/reductions.

<u>GHG</u>

GHG emissions are evaluated in € terms by applying a "damage" cost per tonne of CO2 equivalent emitted. According to the assumptions applied to the effects of each waste stream, the level of GHG benefit for the scenarios appears to have been calculated accurately.

The level of the damage cost has been set according to the following table presented in the Eunomia "New Policy Options report":

Year	2015 -2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
	€ per tonne $CO_{2\,eq}$										
Carbon Damage Cost	€ 32.0	€ 32.6	€ 33.2	€ 33.8	€ 34.4	€ 35.0	€ 39.4	€ 43.8	€ 48.2	€ 52.6	€ 57.0

Source: Section 2.2 of Appendix 6 in Eunomia Research & Consulting, and Copenhagen Resource Institute (2014) Development of a Modelling Tool on Waste Generation and Management, Report for European Commission Directorate-General for the Environment, February 2014, http://ec.europa.eu/environment/waste/pdf/waste-generation-management-model.zip

Table 1: GHG damage cost

Since the selection of this figure can have a significant influence on the resulting costs/benefits of the scenarios, it is relevant to scrutinise its use. The following issues arise:

- According to the source document, the figure until 2029 is the European Environment Agency's figure for GHG damage costs. From 2030 onwards, the projected cost of EU ETS carbon allowances, provided by European Commission climate & energy modelling, is used.
- The use of two different methods for calculating the damage cost is inconsistent, since different assumptions apply for the pre-2030 and post-2030 periods. A consistent application would use either the projected market price of carbon or the estimated damage cost. There is no explanation in the text why the two different methods have been used.
- The Commission's most recent energy modelling from its 2014 Impact Assessment on Climate and Energy projects allowance prices in 2030 between €11 and €53, with the preferred policy scenario (GHG40) being at €40 in 2030, rising from today's €5. No information could be found on the Commission's modelling of EU ETS allowance prices to 2035, although an interpolation is possible between the figures for 2030 and 2050.
- Three alternative scenarios could be considered:
    1. Continued use of the damage cost of carbon out to 2035 (around €38)
    2. Interpolating the carbon cost from €5 in 2015 to €35 in 2030 then (as in the table above) out to €57 in 2035.
    3. Using the figures from European Commission's preferred climate & energy scenario (GHG40), interpolating from €5 in 2015 to €40 in 2030 and then interpolating to €101 in 2035 (towards €264 in 2050).
    4. A 15% increase compared to the figures in the table above, as used in the sensitivity analysis in the 2015 New Policy Option report

The resulting figures for GHG damage cost for the three options are shown in the table below, along with a rough figure for the change in the GHG external cost/benefit figures for the preferred scenarios (17/3.9c) shown in the right hand column.

	2015	**2020**	**2025**	**2030**	**2035**	**Change in external benefit (€19.6bn)**
0. Eunomia figures	€32	€32	€32	€35	€57	-
1. Standard damage cost assuming constant progression rate	€32	€32	€32	€35	€38	-€2bn
2. ETS price with interpolation, then Eunomia figures post 2030	€5	€15	€25	€35	€57	-€1.3bn
3. ETS price from GHG 40 scenario with interpolation	€5	€17	€28	€40	€101	+€4.7bn
4. 15% increase (sensitivity analysis in 2015 Additional Analysis)	€37	€37	€37	€40	€66	+€1.7bn

Table 2: Estimated GHG damage costs under different assumptions

These figures highlight a significant number of uncertainties in the assessment of external GHG costs/benefits of the presented scenarios:

- The results are highly dependent on the assumptions. Even two scenarios derived from ETS price scenarios give significantly different results.
- The climate and energy figures themselves, extracted from the 2014 Climate & Energy Impact Assessment[iii], are questionable due to lack of transparency, as concluded in the IAI's own scrutiny study[iv] on that Impact Assessment.
- No information could be found on the EU ETS allowance price projected by European Commission modelling in the intervening years between 2030 and 2050, thereby requiring the above interpolation as an estimate.
- The figures above also demonstrate that the effects of including the costs/benefits for the 2030 – 2035 timeframe can be large.

To be fully consistent with EU Climate and Energy policy, the analysis would use the projected EU ETS allowance price. However, due to the wide variations in the projected figures for allowance price shown above, the results vary significantly, precluding a coherent application. If the ETS price is used, the method used to calculate it needs to be robust and fully transparent.

In conclusion, the uncertainties put into question the level of costs/benefits reported for the scenarios. Different reasonable assumptions would significantly increase or decrease the external GHG benefit of the scenarios under consideration, to the extent that they may affect policy decisions.

The variations in the total GHG benefits (maximum €4.7bn) are significantly smaller than the figure for total external benefits (€19.4bn) and the different scenarios would not affect the existence of a substantial external benefit at an EU28 level, even if the magnitude may be affected. They may however have effects at individual Member State level that in some cases are sufficiently material to change the overall conclusions.

<u>Air quality</u>

From the charts in the New Policy Options report, the calculated benefits (Scenario 3.9c vs Full Implementation) in relation to air quality are approximately a third as large as the GHG benefits. These have been calculated using figures for the damage cost of pollutants generated by the European Environment Agency for the year 2010, which do not appear to have been updated. A multiple increase in the costs per unit of pollutants would be needed to make a material difference to the modelling results strictly in terms of the € value of calculated external benefits.

It is however relevant to consider the local effects of pollution, which are not reflected in the modelling results either at European or Member State level. This is relevant for example for landfill sites and incineration plants, which have in some cases generated local opposition due to their emissions and for which the implied local damage cost may be many times higher than that for the EU as a whole. Where the assessed scenarios may lead to decisions implementing or removing facilities with local emissions implications, it would make sense to evaluate the potential effects on local air quality and in terms of potential local citizen concerns. This would avoid policies which, according to the model, may appear optimum but where local conditions may not be conducive.

4.3.3 Parameters for financial costs and benefits

Financial costs/benefits are comprised of the following elements:

- Collection costs/benefits (including cost of collections and revenue for materials).
- Treatment costs.

Cost of collection and of treatment is derived from the individual Member State data, for which the concerns about robustness indicated in Section 0 above need to be taken into account.

The financial benefits of collection derive from the revenues from recycled materials. The actual benefits achieved by Member States are dependent on the quality of the recycled material and the price obtained for the material. A sensitivity analysis on the price parameter was performed and included in the New Policy Options report, with variations per material of -40% and +10%, with the exception of glass for which a -25% / +10% variance was used. No reasoning for the magnitude figures, in particular their non-symmetrical nature, was found in the background documentation.

The aggregate result of the -40% price reduction for all materials is a €6bn drop in the financial benefits for the preferred scenario, representing about 25% of €24.5bn net social benefit, whilst cancelling out the projected €4.9bn financial benefit entirely. It could be expected that the effect of this on individual Member States would be significant, especially in relation to their ability to implement policies to meet the scenario targets. However, without the ability to perform scenario analysis directly using the model and assess the detailed results, there is not sufficient detail in the publicly available data to assess this explicitly.

Selecting the same magnitude for the upper bound as for the lower bound, i.e. +40%, would result in an increase in the benefits of the same magnitude as that indicated above, i.e. about €6bn. This could be expected for some Member States to change financial costs into financial benefits for the scenarios investigated.

Treatment costs are detailed in the background data for each Member State. As indicated earlier, there are significant deficiencies in the quality of data for some Member States. According to the new Policy Options Report Figure 4-22, treatment costs (collection costs) are a substantial proportion of the financial costs/benefits. The financial costs/benefits are therefore likely to be highly sensitive to that background data and changes could therefore significantly affect the numerical results of the model, causing additional uncertainty.

4.3.4 Boundary conditions

From the documentation provided about the model, it is not fully clear what boundary conditions and factors are set to guide the calculated solutions – i.e. what parameters are optimised. What is clear from the background documentation is that the final destination proportions to recycling and landfill are set according to the percentage targets and derogations, using a “goal-seek” function to calculate the path. More detailed information on the calculation mechanism is necessary for stakeholders to understand the calculation mechanism and therefore scrutinise the results of the model effectively.

5 Modelling results – costs and benefits

The Eunomia/CRI reports provide data derived from the software model to show the relative financial costs and benefits and impact on jobs, GHG and air pollution emissions created for the different scenarios that are modelled. A ‘scenario’ is a combination of target outcomes resulting from a set of policies implemented over a defined timescale. These data are

presented in the form of graphs or tabulated numerical data. Selections from these data are incorporated in the Impact Assessments.

This analysis focuses mainly on the 2015 Impact Assessment and background information, as this refers to the active legislative proposal. Some analysis is performed using data from 2014, since in some cases additional information is available from the 2014 documentation.

From the investigation that was possible without direct access to all the data and functions of the model, it is not possible to determine if the analytical model is a coherent and robust tool for calculation of the costs and benefits of different scenarios for waste management. The model is highly developed and comprehensive and it can however be determined that, according to the known input, the outputs appear to be within reasonable bounds.

5.1 Overall comparison of scenarios

The 2015 Additional Analysis includes the following table listing the social costs and benefits of the new scenarios compared to the baseline scenario of full implementation of existing targets:

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 3: Costs and benefits table from 2015 Additional Analysis

A preferable analytical approach would have been to perform scenario analysis across a wider range of incremental targets to identify the optimum cost/benefit figures for recycling and landfill for EU28 overall and for each individual Member State.

A notable observation is that the scenario corresponding to the provisions of the legislative proposal (3.9c) exhibits the lowest net social benefits of all those presented, both in terms of costs/benefits and (with one exception in each case) in terms of jobs and aggregate GHG reduction. There is no clear explanation in the text of the Impact Assessment nor in the legislative proposal as to why this scenario has been selected.

A number of additional questions arise regarding the selection of the final scenario in the legislative proposal (3.9c):

- Why were the scenarios with progressive rates not selected or adapted, due to their higher aggregate benefits?

- The scenario including the landfill target (3.9c) increases costs compared to the equivalent without the landfill target (3.9a), but there is no explanation why 3.9c has been selected.
- Going from a 65% MSW recycling and 10% landfill target (scenario 3.9c) to a 70% MSW recycling and 5% landfill target (scenario 3.9d) increases external benefits by over €6bn, with an increase in financial costs by only €0.9bn. The magnitude of this benefit could have justified finding a solution to ensure the additional costs were manageable for those Member States most affected by them.

The 2014 Impact Assessment and the 2015 Additional Analysis have both devoted considerable space to discussion of the model and its outputs, in particular the cost/benefit figures. However, the observations above indicate that the cost/benefit figures have not been consistently used when selecting the proposed policy target scenario.

When the resources are employed to develop a specific and quantifiable analysis method for policy making, it is appropriate to use that method consistently and to be fully transparent when decisions are made that are not aligned with the raw numerical evidence. By not selecting the scenarios with the highest benefits and by not providing a clear explanation for that decision making, the rationale for using the cost/benefit figures and the role of the Impact Assessment are called into question. (Note these comments are to be seen in the context of the concerns identified about the coherence of the cost/benefit figures themselves, as discussed in Section 5.4).

As stated in the Additional Analysis, Section 1.2, a number of Member States considered the overall level of ambition of the 2014 proposal was too high due to wide differences in waste management performance. This indicates that feasibility at Member State level was not sufficiently taken into account by the modelling, which is a clear weakness of using the model for determining policy targets. This is further investigated below.

5.2 Interpretation of financial and external costs and benefits

It is necessary to differentiate consistently between financial and external costs and benefits, especially due to the uncertainty inherent in the external cost/benefit figures. Quoting a single aggregated figure for social costs and benefits provides an important societal benchmark, but the financial and external costs/benefits are each of a very different nature and the aggregate figure in itself has limited practical relevance.

In particular, Member States and municipalities have to consider their financial investments and cash flows on their own merits, even if these may bring quantifiable non-financial external benefits. The external benefits, in particular reduction in greenhouse gas emissions, are public goods that do not necessarily distil coherently into concrete monetary figures.

Taking the preferred scenario (17 / 3.9c) from the 2015 Additional Analysis, the following chart shows the differentiation between the financial and external elements of the total social cost/benefit, for each Member State, normalised by comparing to GDP. For each Member State, the recycling / landfill percentages in 2013 are shown in brackets):

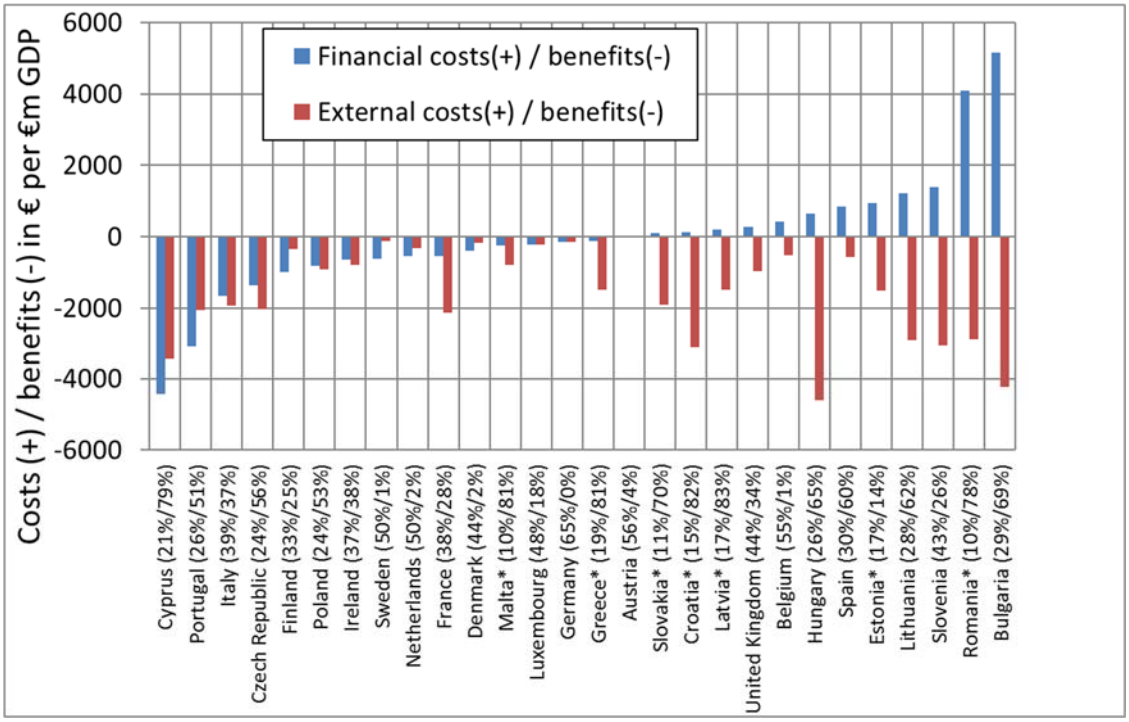


Figure 1: Financial and external costs and benefits for the preferred scenario 17/3.9c

External costs (red bars) are negative (benefits) for all Member States, which is explained by the reductions in GHG and air pollutants achieved by meeting the targets for recycling and landfill.

Financial costs (blue bars) are negative for just over half the 15 Member States, positive for 12 and very close to zero for one. Romania and Bulgaria, with the highest financial costs, are also the only Member States for which the net social costs (financial plus external) are positive.

In assessing the external and financial costs, it is to be recognised that the 5-year derogations were included in the modelling, thus the conditions are not fully comparable between different Member States. The marginal effect of the derogation on external and financial costs would have been useful additional information.

In contrast to the aggregate financial, external and net social benefits of this scenario (and of all others scenarios presented), the cost and benefits fall unequally between Member States. Those Member States whose financial costs are positive are likely to have greater difficulty in making the investments required to meet the targets, endangering their attainment. As evident from the chart, many of the Member States with the highest financial costs are also the ones with the greatest external benefits (compared to GDP). The costs are therefore a particular impediment to substantial potential gains.

5.3 Selection of targets and derogations

5.3.1 Recycling rates

The additional burden on some Member States in meeting the MSW recycling targets has been recognised in the 2015 Additional Analysis and the legislative proposal by introducing 5-year derogations for seven Member States with MSW recycling levels less than 20% in 2013. As shown by the asterisks* in the chart in Figure 1 above, these Member States are all in the group with positive or zero net financial costs. Having net positive financial costs could also

be considered a relevant parameter for determining burden and therefore validity of the derogation. However, many Member States with financial costs per unit GDP similar to or greater than those seven are not given the option of the derogation.

In addition, there are eight Member States with MSW recycling levels in 2013 between 20 and 30%. Using this parameter alone, their status is not dissimilar to some of those just below the 20% level. Four of the eight are strongly in the net financial benefits region, the other four strongly in the net financial costs (see Figure 2 below, key: <20% with derogation, between 20% & 30% no derogation).

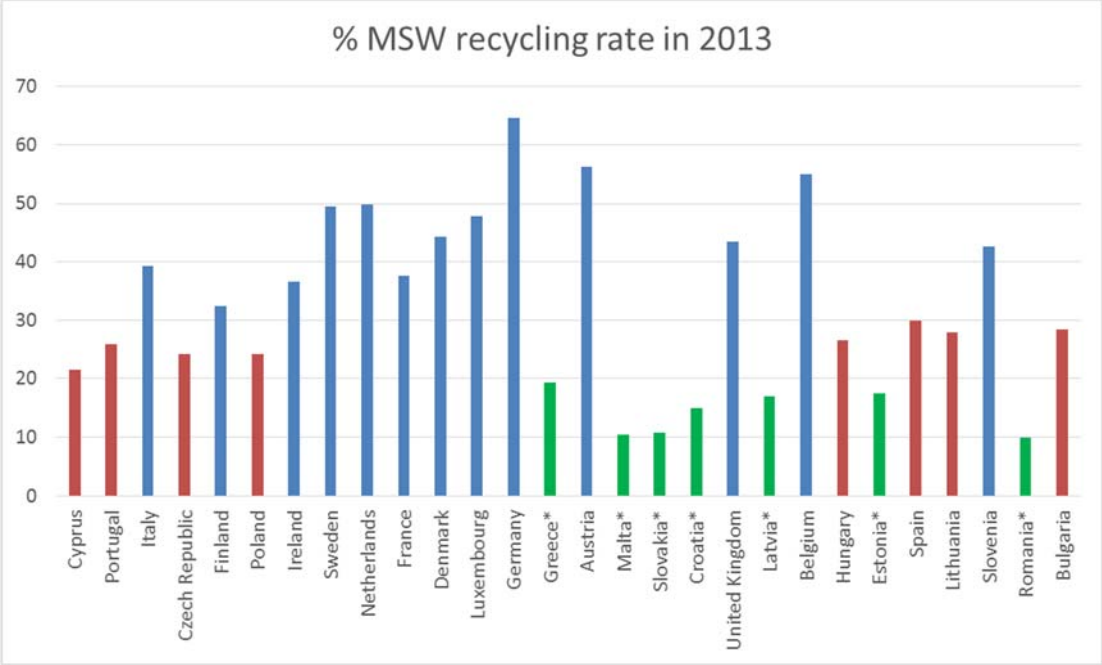


Figure 2: MSW recycling rate in 2013

The general lack of a correlation between the financial costs per unit GDP and the starting point for the MSW recycling rate (2013 figure) for each Member State is clearly illustrated in the following chart.

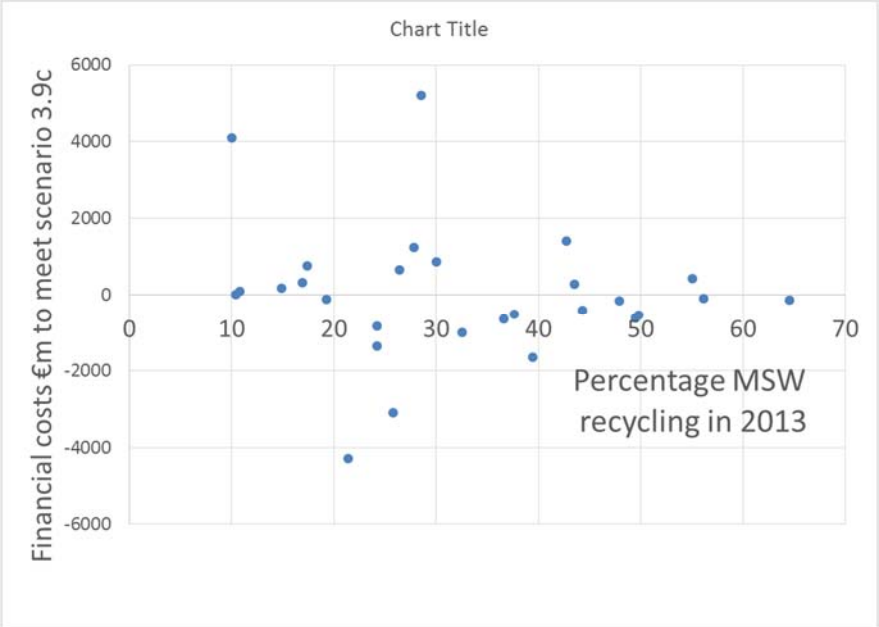


Figure 3: Financial costs vs MSW recycling rate (maybe should do this for scenario 2)

This analysis above demonstrates that the MSW recycling rate in 2013 does not correlate well with another parameter measuring the burden, namely the financial costs. Of the two, the starting point (MSW recycling rate in 2013) directly measures the distance to target and can therefore reasonably be accepted as one potential measure of feasibility. The lack of correlation calls into question the use of the cost/benefit figure in determining the effort required to meet the target. It also indicates that the sharp cut-off for the derogation at 20% is not expedient, since this boundary appears unlikely to designate a clear differentiation in burden. It also appears to be unlikely that a single parameter for the derogation (5 year delay in reaching the target) takes sufficiently into account the differing conditions of those Member States.

Further to the above, a number of Member States have MSW recycling rates in 2013 already approaching the selected 65% target, with one Member State within one percent of achieving it. However, none of the modelled scenarios take into account the possibility of additional external and financial costs or benefits that could be accrued by these early achievers exceeding the 2030 targets.

The detailed annual cost/benefit data for each Member State provided by the European Commission in response to the draft version of this study has permitted additional analysis of the cost/benefit figures – see section 5.4 below.

5.3.2 Landfill

For landfill, the same seven Member States are given 5-year derogations in the 2015 proposal as for the MSW targets. However, the 2015 Additional Analysis assumed in its calculations that the landfill derogation would be given to those Member States landfilling more than 65% of their waste in 2013, which is a different set of States (see below, common ones are underlined – for country codes see Annex II):

- <20% MSW in 2013 (derogation for MSW & landfill): EL, EE, HR, LV, MA, RO, SK
- >65% landfill in 2013 (no derogation): CY, CZ, EL, HR, LV, MA, RO, SK

In addition, the efficacy of a sharp cut-off for determining the landfill derogation can be questioned in the same way as the similarly designed cut-off for the MSW derogation.

The legislation therefore includes a derogation scheme for landfill that was not addressed in the Impact Assessment. In particular, it is observed that the landfill derogation is applied to Estonia, whose case study on its success in reducing landfill was included in the 2014 Impact Assessment (Estonia's landfill percentage in 2013 is recorded as 13.7%). This is a material discrepancy, since the legislation therefore proposes a derogation for a list of Member States that does not represent those for which it is most needed.

The following chart shows the additional financial cost (compared to GDP) for each Member State of the landfill options in scenario 3.9c compared to scenario 3.9a without landfill targets. It would be reasonable to consider those Member States with the highest financial costs as the ones most in need of additional time to meet the targets. As is clear from the chart, those with highest financial costs (blue bars) do not consistently correspond to those granted derogations (marked with asterisk*).

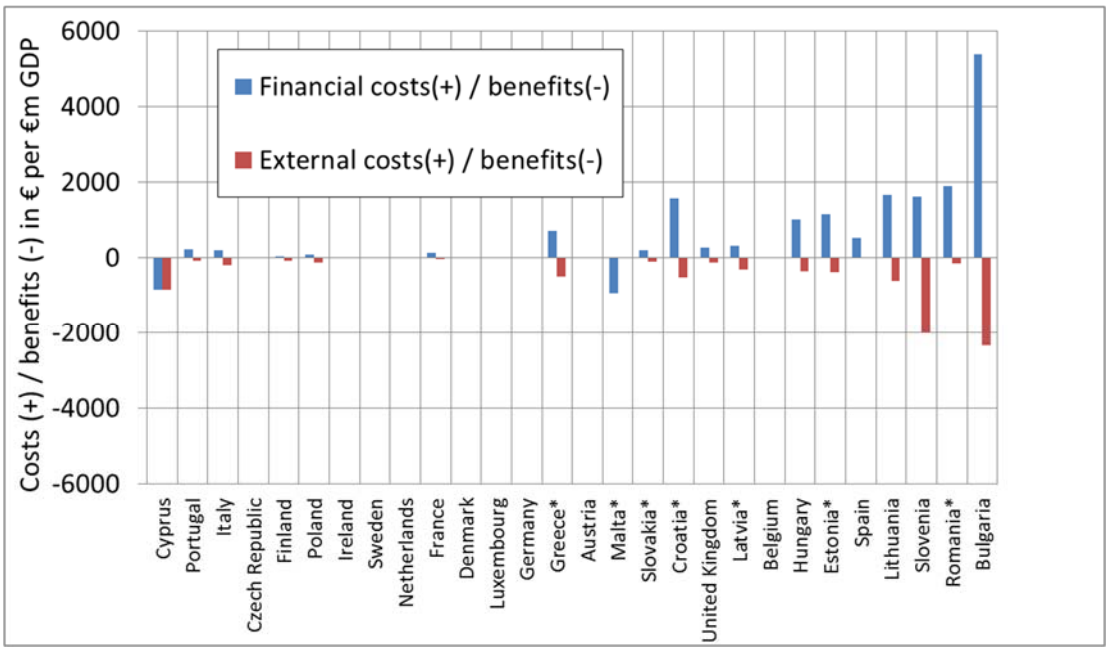


Figure 4: Chart showing effect of landfill target on financial and external costs of each Member State

In the following chart, initial landfill percentage in 2013 is plotted against the financial costs (per unit GDP) of introducing the 10% landfill target (scenario 3.9c vs 3.9a).

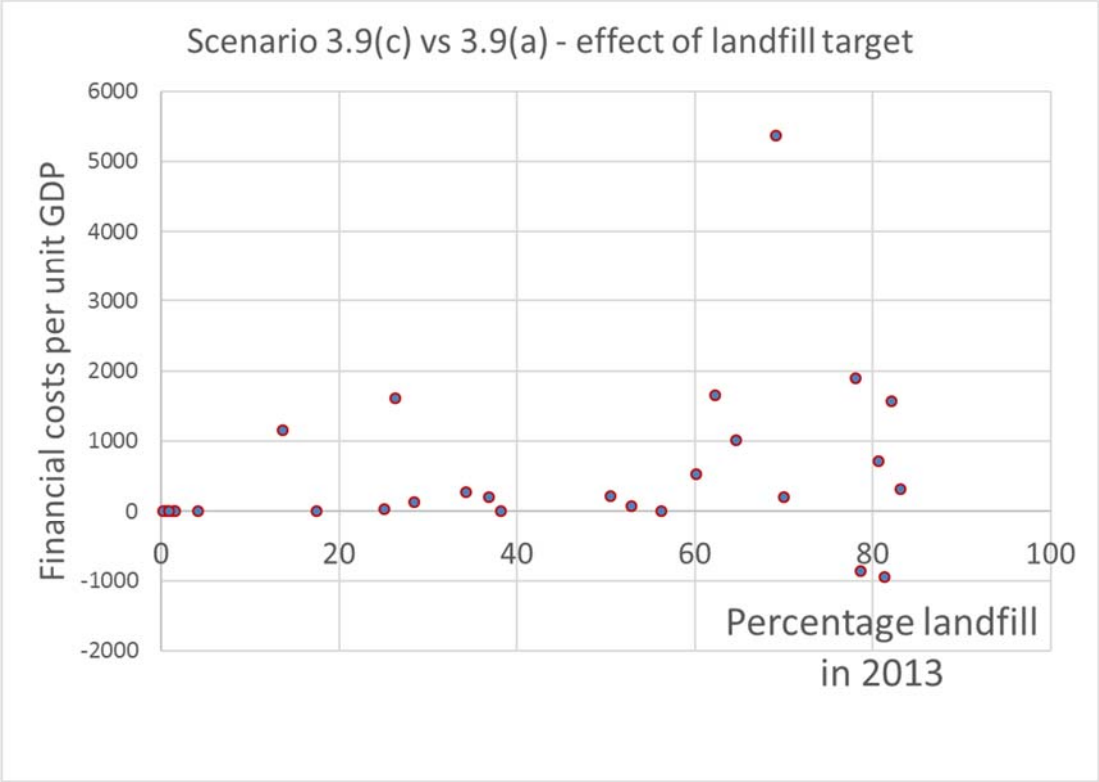


Figure 5: Chart showing effect of landfill target on financial and external costs of each Member State

These two graphs demonstrate the lack of correlation between starting conditions (landfill percentage in 2013) and the financial costs of reaching the landfill target. Again this calls into question the suitability of the cost/benefit figures in determining the effort required to meet the target.

A more accurate analysis could have been performed by plotting the above charts for the case without the landfill derogation, therefore assessing all Member States on a level playing field. However, this scenario was not generated and without access to the model, it is not currently possible to create it.

Similar to the case for recycling, the modelling does not consider the possibility of certain Member States being in a position to beat the 2030 landfill target. Except those already beating the target in 2013, in the output from the model improvements cease for almost all other Member States once the target is reached.

5.3.3 Progressive targets vs derogations

A number of scenarios are assessed in the Additional Analysis in which progressive targets are applied for both MSW preparation for reuse/recycling and for landfill (3.8a, b and c = scenarios 9, 10, 15). As indicated in Section 5.1 above, those progressive targets give rise to higher aggregate benefits over the analysed time period than the scenarios with the fixed 2030 targets and derogations (e.g. 3.9c / 17). This is also acknowledged in section 4.1 of the Additional Analysis, explaining that early achievement of targets for mid and high performing Member States is responsible for the improvement.

As also indicated in Section 5.1, there is however no explanation which justifies the selection for the legislative proposal of the derogation scenario compared to the progressive scenarios and the consequent loss of the benefits.

A comparison of the equivalent progressive and derogation scenarios is informative. The following chart plots the difference per Member State in the financial and external cost/benefits between scenario 3.8c (progressive) and 3.9c (derogation).

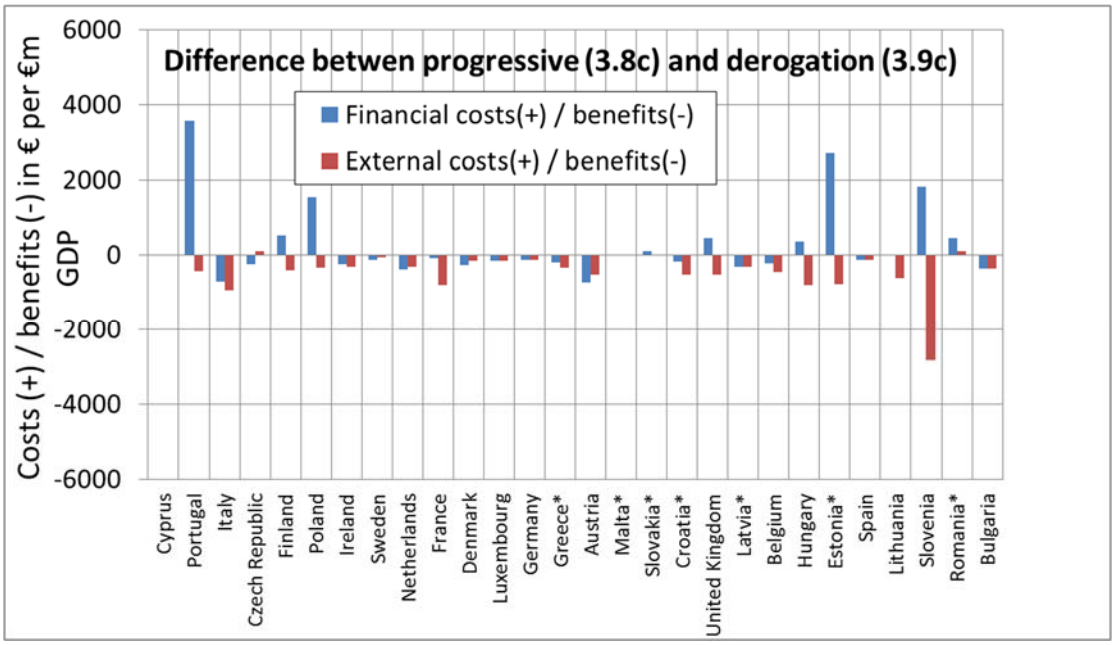


Figure 6: Chart showing the difference in costs and benefits between the progressive and derogation scenarios

For most Member States, the external benefits are higher for the progressive scenarios, which is to be expected due to the earlier attainment of high recycling rates. Regarding financial costs the picture is more mixed, with modest increases or decreases for most Member States. However, for four Member States (PO, PL, EE, SL), the progressive rates bring about a significant increase in financial costs (see Annex II for country codes).

The distinction between the progressive scenarios (3.8) and derogation scenarios (3.9) is significant. The progressive scenarios assume 3.5% reduction in landfill and 3.0%/2.5% increase in recycling per year until reaching 10% landfill and 65% MSW recycling respectively, with some Member States reaching those targets well before 2030. In the derogation scenarios the final landfill target of 10% and MSW recycling target of 65% are reached just in 2030 or 2035 with rates of reduction/increase per year lower than in the progressive scenarios (in some cases much lower).

A compromise between these two strategies would have been worth investigating, to identify a challenging yet feasible solution and maximising performance at EU28 level. The apparent benefits of progressive rates could be reaped if measures were introduced to ensure that Member States subject to apparently significant additional financial costs, including the four above, would not suffer an inordinate burden. This could potentially involve tailored progressive rates for each Member State and, for some Member States final landfill and/or MSW recycling targets beating the standard figures.

5.3.4 Consideration of growth in waste

Since only percentage targets for MSW recycling and landfill have been investigated in the Impact Assessment and Additional Analysis, that analysis has not taken into account the potential growth in the absolute amount of waste over time, either at EU28 or Member State level.

Since the objective of waste legislation is to reduce the absolute amount of waste, consideration of target parameters that take into account total waste amount is a valid approach. Percentage targets incentivise MSW recycling and landfill as a proportion of the total waste, but do not directly incentivise reduction in the total waste nor an absolute reduction in residual (non-recyclable) waste nor landfill.

The following chart shows the percentage growth (in one case decline) by 2030 in total waste mass for each Member State compared to the 2013 baseline:

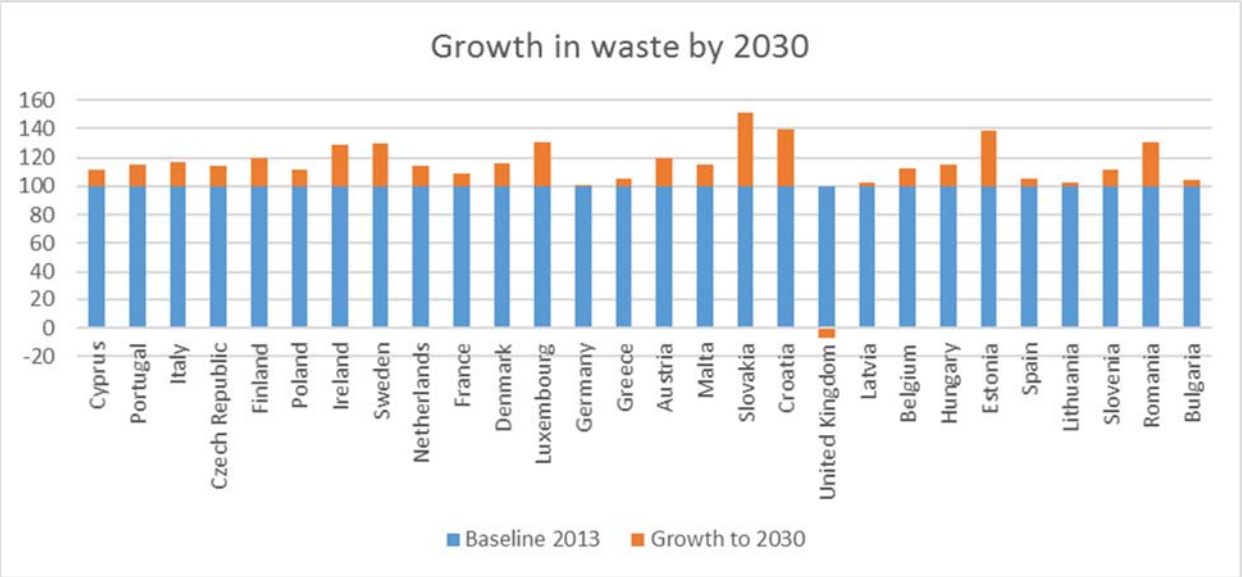


Figure 7: Growth in waste per Member State by 2030

The growth is determined by the inputs provided to the model by the Member States themselves, with further amendment to the figures for the advanced scenarios (e.g. 3.9c). It does not appear that Member States at similar levels of economic development have similar projected waste growth rates. To test this, it is informative to investigate whether these

growth rates correlate to GDP. A comparison is shown graphically in Annex VI, with a correlation factor of 0.007 indicating no correlation. Therefore, if mass targets are considered, there is no clear evidence to demonstrate that they would be systematically more difficult to achieve for certain Member State according to their level of economic development.

Specific options for such targets are addressed in Section 5.6 below.

5.4 Investigation of detailed output of model based on additional detailed information provided on the output data from the model

After the distribution of the draft version of this study to involved stakeholders, the European Commission kindly provided detailed data on the outputs of the European Waste Model and the scenarios investigated in the Circular Economy Impact Assessment.

In particular, the data provided the direct waste inputs, final waste destinations and the cost and benefits per year for each Member State.

5.4.1 Concerns in results for waste flows

In a number of cases, the results generated by the model raise questions about the viability at Member State level. For 10 Member States, there is a significant increase over a few years to 2020 in the proportion of waste that goes to incineration or to mechanical biological treatment (MBT), followed by a significant decrease in the following years. This implies that investments are made in these treatment options, only for them to be made redundant after a short time. This does not appear to correspond to a financially viable waste investment strategy. Two examples are shown in the figure below, with additional examples in Annex III.

In the following graphs, mass loss is taken as a proxy for MBT, since mass loss (through evaporation) is a consequence of this treatment method. For each of the Member States for which mass loss increases and decreases over time, the prevalence of MBT was verified through the data on direct inputs to MBT and bio-waste treatment and the financial costs of MBT.

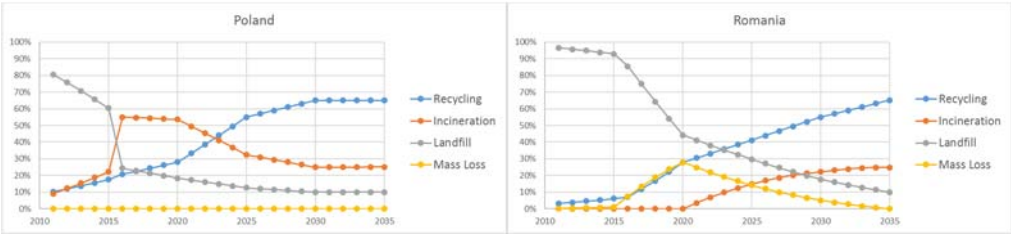


Figure 8: Final destinations of waste for selected Member States (European Waste model output data)

Further analysis indicates that these profiles are needed in order to achieve the 2020 target for recycling. It therefore appears that the 2020 and 2030 targets are in conflict with one another, since meeting the 2020 requires apparent investments in treatment that are then made redundant in meeting the 2030 targets.

5.4.2 Inconsistencies in waste inputs

The detailed results for two Member States exhibit inconsistencies in the data (see figure below). Specifically, for scenario 3.9c compared to full implementation, total waste flows (direct inputs) drop by a few percentage points between 2017 and 2023, reaching 2.8% and

5.6% respectively in 2020, even though there is little change in conditions before 2020. For all other Member States, there is 0.0% change in 2020 (except one other, CY, with 0.3%). There is no explanation in the data or the text for why this effect is observed only for these two Member States, which therefore appears to be an anomaly in the data.

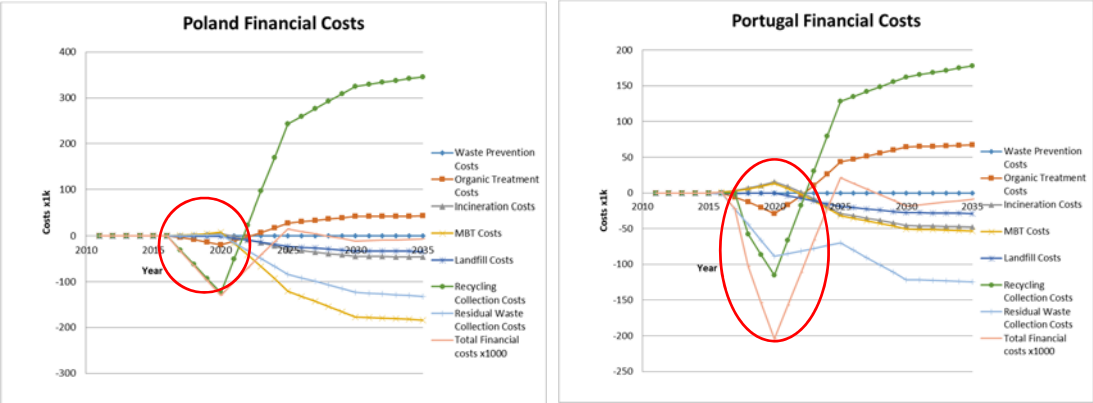


Figure 9: financial cost profile over time for PL and PO, showing anomaly up to 2020 (circled)

These figures materially affect the calculation of financial costs/benefits for these two cases. Assuming the drops are an anomaly in the model data, simply excluding the figures over the period of their occurrence (2016 to 2023) changes the total financial cost/benefit values for scenario 3.9c for these two Member States to approximately zero (compared to the original benefits shown in Figure 1). There is insufficient evidence to determine whether this simple calculation provides an accurate reflection of the situation. However, it does indicate that the effect is material and therefore generates further uncertainty in the efficacy of the model results. Full access to the model would be necessary to test the original of this phenomenon.

Additionally, there is insufficient information provided in the background documentation to review the inputs to the model, as previously indicated in Section 0.

5.4.3 Cash-flow effect of modelling results

The costs of measures to increase MSW recycling and reduce landfill are expected to be front-loaded, i.e. borne in the earlier years as investments to enable longer term financial and external benefits. In cash flow terms therefore, those 12 Member States with net financial costs until 2035 are likely to have relatively even more significant costs in the early years, acting as a financial impediment to implementation of the necessary measures. Some of the other 15 Member States may also have net financial costs in the early years, despite having net financial benefits over the full time period to 2035.

As stated in the Waste Model Headline Report Appendix 4 on the Financial Costs Module, “all costs are considered as annualised figures, i.e. capital investment profiles are not modelled.” This appears to imply that capital costs are accounted for in the financial costs through amortisation, with the actual cash flows undertaken by Member States not reflected.

Additional information is available in the model output data in the form of differentiated cost figures using either private or social metric. The financial cost/benefits according to the social metric are applicable to cost/benefit analysis (and are the costs underlying the analysis in Section 4.3.4 above). As stated in the Headline Report, Section 1.2, “the private metric is intended to represent the market conditions from the perspective of those undertaking waste operations or those developing and operating facilities.” This should therefore give additional information relevant to cash flow and investment.

From the detailed results of the model, the ratio of financial cost according to social metric compared to private metric can be calculated for each Member State (absolute financial costs are positive for all Member States). The Member States thus generate three categories, shown graphically in Annex IV (for country codes see Annex II):

AT, BE, HR, CY, DK, FR, DE, IT, LU, MA, NL, PO, ES, SE all have a ratio that remains steady over time (2011 until 2035). The ratio ranges from 75% to 100%. Private metric and social metric are therefore well aligned, but in most cases the private metric generates a higher absolute cost figure than the social one.

CZ, EE, FI, IE, LV, PL, SK, UK all have a ratio that rises by at least 5 percentage points between 2011 and 2035, ending at levels between 85% and 100% in 2035, indicating that the private metric approaches the social one over time.

For BG, GR, HU, LT, RO, SL the ratio drops by between 10% and 35% between 2011 and 2015 and rises towards or surpassing its initial level by 2030. This indicates that there was an acute factor that caused the private metric financial costs in that period to rise to a level significantly higher than using the social metric.

The above observations indicate significant differences in the cost profiles for Member States, which are material and relevant to the ability of those Member States to invest.

By not taking into account the capital investment profiles, the full budgetary implications for Member States are not clarified. Many of the Member States apparently requiring early investment in order to improve their waste management measures (third group above) are also ones that have been subjected to tight budgetary limitations. The waste management measures implied in the scenarios may therefore be unviable in some cases.

5.4.4 Coherence and consistency of cost/benefit results from model

Figure 1 above demonstrates that even for Member States with similar starting points in terms of MSW recycling and landfill percentage, very different financial and external costs and benefits are exhibited. From the detailed model outputs provided by the European Commission, additional information on annualised waste flows and costs/benefits per Member State is available. For example, for scenario 3.9(c) compared to full implementation, the following graphs show the breakdown of the financial costs/benefits of Czech Republic and Hungary, which have similar starting points in terms of waste destinations:

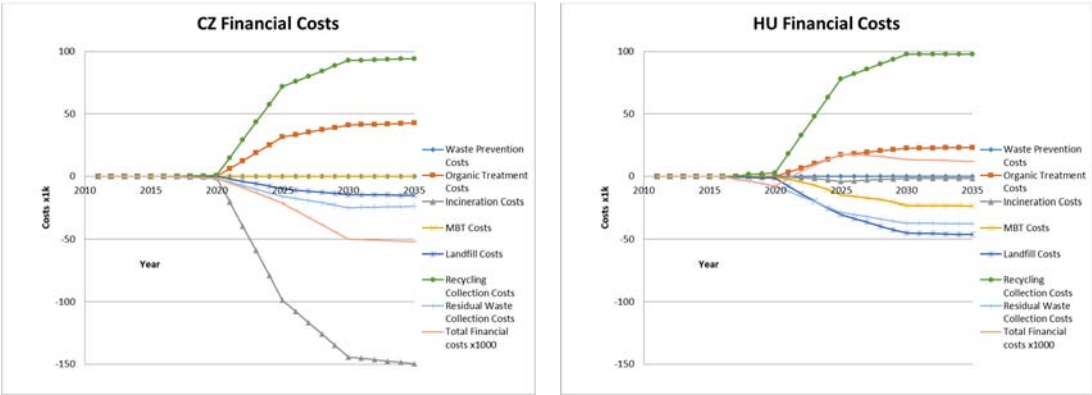


Figure 10: Annual breakdown of financial cost/benefit for scenario 3.9c compared to full implementation for Czech Republic and Hungary (European Waste model output data)

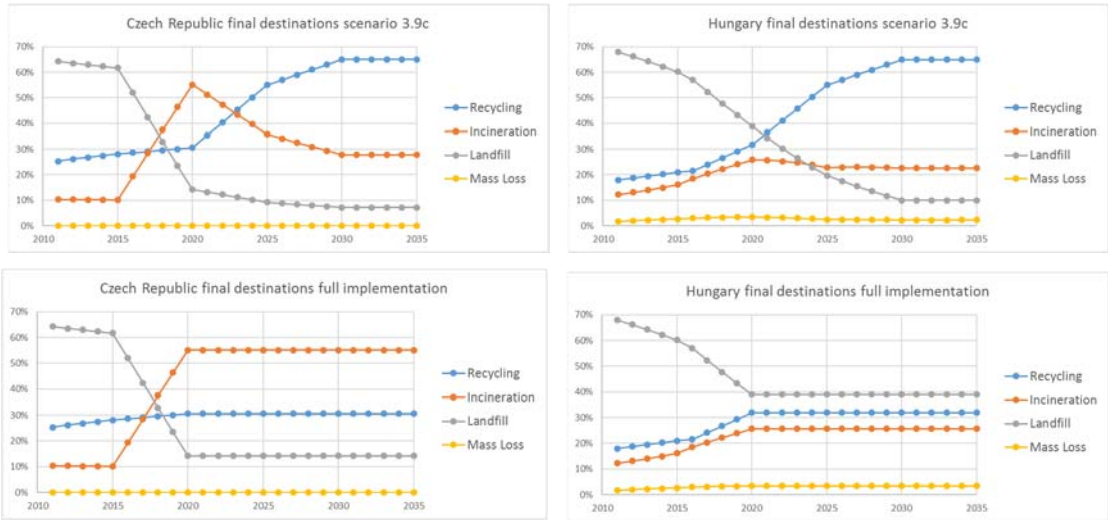


Figure 11: Final waste destinations for Czech Republic and Hungary for scenario 3.9c and full implementation (European Waste model output data)

A reasonable expectation would be for Member States with such similar starting positions in 2015 to undertake similar strategies for meeting the 2030/2035 targets and undergo similar costs. However, the full implementation scenario (not shown above) for the Czech Republic includes a significant increase in incineration between 2015 and 2020, which is maintained until 2035. In scenario 3.9(c) in contrast (shown in Figure 8 above), Czech Republic incineration volume is decreased significantly between 2020 and 2030. According to the cost/benefit profiles, the benefits from reduced incineration account for the difference between the cost/benefit profiles of the Czech Republic and Hungary, with Czech Republic consequently exhibiting a substantial net benefit, Hungary a net cost.

As indicated in Section 5.4.1 above, it does not appear to be a coherent strategy for investment to be made in a waste management capacity (incineration), for that capacity subsequently not to be fully utilised. In particular, for the model to calculate a substantial benefit from this strategy is not consistent with reasonable expectation. No explanation for this use of incineration is found in the background documents, although the Baseline Report for the Czech Republic indicates that the increase in incineration volume is introduced in Baseline Scenario 2.

Equivalent comparisons are shown in Annex V for Italy / UK and for Cyprus / Greece, whose waste destination starting points are also similar.

In order to understand the reasoning behind these figures, full access to the waste model, its input data and its underlying calculations is necessary. Such further analysis should be able to shed light on the phenomena observed.

This is an essential element of the analysis, since the legislative proposal has set target derogations for certain Member States based on initial conditions (MSW recycling and landfill percentage in 2013). The analysis above demonstrates clearly that initial conditions are not a consistent determinant of the model's treatment of the waste scenarios.

5.5 Effects & discussion

The following can be concluded from the above analysis of the model output and its application:

- The model provides a detailed and relevant picture of the conditions and effects of waste management scenarios at Member State and aggregate EU level. It is therefore potentially a very powerful tool for policy making.
- Even with the additional detailed data provided by the European Commission, without full access to the model, the information available to stakeholders is not sufficient to enable full scrutiny of the results and implications for legislation. Full access would be necessary to provide confidence for stakeholders in the modelling analysis, results and conclusions underpinning the consequent policy decisions.
- Member State data is in some cases patchy and unreliable.
- The selection of the targets for the legislative proposal does not follow the optimum scenario for cost/benefit, indicating that the model has not been consistently taken into account for determining policy.
- There appears to be a conflict between the 2020 targets and 2030 targets, generating strategies that lock in treatment options that later become redundant.
- Aggregating external and financial costs/benefits is not a coherent way to assess the figures.
- In some cases identified in the above section, results are generated for which there is no clear explanation for differences, or lack of differences, between Member States.
- The lack of coherence of the results puts into question both the aggregate assessment for the EU28 and the differentiation at Member State level.
- There is no consideration of the composition of waste in determining Member State targets.

From these findings, it is clear that the highly valuable potential of the model is hindered both by a lack of full availability to stakeholders and by its limitations in terms of setting policy targets.

5.5.1 Implication for determining policy targets

The cost-benefit analysis derived from the output of the model has been used as the primary parameter in comparing the options – specifically in the 2015 Additional Analysis chapter 4. The net social benefits (financial plus external costs & benefits), were directly compared between scenarios as a measure to determine their efficacy for generating policy targets.

However, for the costs and benefits to be functional parameters for setting policy, there would need to be an identifiable consistency between the figures and the conditions for waste management in each Member State reflecting the feasibility, as well as the benefits, of target implementation.

As discussed in the above Sections, this consistency is not present. It is to be expected that Member States with different MSW recycling and landfill rates require different levels of effort and investment. If this is not reflected in the figures resulting from the model, in particular if Member States with very different starting conditions exhibit very similar results, those figures do not represent a good proxy to indicate the most effective policy path.

This has consequences regarding the selection of the optimum scenario for policy making:

- A single target is unlikely to extract effectively the maximum benefits of waste treatment options, as it is a one-size-fits-all solution where a multiplicity of conditions exist.
- The method used for selecting those Member States with derogations (in effect, creating a two-sizes-fits-all option) is not coherent with feasibility.
- Considering feasibility of reaching MSW recycling and landfill targets according to starting point and economic capacity can be expected to lead to suitably

differentiated Member State targets and maximise the effectiveness of the legislation.

- Other methods for setting policy (for example per-capita mass-based targets for landfill or residual waste) may include beneficial elements that can be developed.

5.5.2 Conclusions from in-depth analysis of model data

Due to the above findings, it is recommended to investigate alternative options for target setting that differentiate sufficiently between Member States to achieve the joint objectives of maximum benefit with feasible objectives. Potential options are introduced and evaluated below.

5.6 Alternative options for target setting.

Due to the lack of coherence of the results of the model and of the proposed distribution of legislative targets in the preferred scenario (Section 5.1), an assessment of alternative options for legislation is beneficial.

The overall EU targets (i.e. 65% MSW recycling and 10% landfill in the preferred scenario) have been determined with the help of the cost/benefit analysis provided by the model, although this has not been consistently applied (see Section 5.1). As observed in the above Section 5.4, cost/benefit analysis anyway does not appear to be a coherent measure of utility at Member State level and therefore its validity as a useful parameter at EU level is questionable. The analysis below of new target options addresses mainly feasibility at Member State level, using the EU-wide target scenarios as a framework to enable investigation.

In this work, selection of parameters that present a proxy for feasibility (instead of the modelled financial and/or external costs) is necessary in order to determine a reasonable burden sharing between Member States. In fact, this reflects the basic approach applied in the legislative proposal, but will go further by generating greater levels of differentiation between Member States (in place of a simple derogation). Remaining Member State parameters that can be expected to have a relation to feasibility are:

- Starting point for total mass of waste per person – relates to volume of waste to be managed
- Starting point for MSW recycling or landfill (2013 baseline year) – relates to magnitude of task
- GDP per person – relates to ability to pay for waste management measures
- Proportion of population in urban areas – indicates level of concentration of waste

To assist in determining appropriate parameters, the correlation between them is investigated. The following table summarises the level of correlation (R-squared coefficient), presented graphically in Annex VI along with an interpretation scheme for the coefficient.

Correlation coefficient (R^2) between:	Waste mass 2015	GDP per person	% urban population	2013 % MSW recycling	2013 % landfill
Waste mass 2015		0.41	0.25	0.27	0.17
GDP per person			0.33	0.49 (0.62)*	0.49 (0.65)*
% urban population				0.17	0.17
2013 % MSW recycling					0.74 (0.87)**
2013 % landfill					

* Excluding outlier Luxembourg. ** Excluding outlier Estonia. Outliers excluded where it makes a difference of more than 0.05.

Table 4: Correlation factors between various relevant Member State waste parameters

An additional calculation was made of the above parameters vs population density, for which zero correlation was found ($R^2 < 0.05$).

The following conclusions can be drawn from these figures:

- Waste mass exhibits a weak relationship to all other parameters (weak to moderate vs GDP), indicating it is not a strong candidate as a determining parameter.
- GDP per person exhibits a moderate to strong correlation to initial MSW recycling and landfill percentage (excluding the outlier), confirming a reasonable expectation of economic resources as a determinant of recycling ability.
- Urban population percentage is only weakly correlated with the other parameters.
- Starting MSW recycling and landfill percentages are strongly correlated (especially when excluding single outliers in each case), as is reasonable to expect since they are both parameters measuring the success of waste management.

In the following assessments, the above parameters are investigated considering different options for target setting.

5.6.1 Mass targets for landfill and residual waste

Some organisations (for example, ZeroWaste[v], European Parliament[vi]) have suggested the consideration of a uniform target for mass per person of landfill and/or for residual waste[vii]. The rationale for mass targets was discussed in Section 5.3.4 above. The intention is to set a target which is better geared towards the conditions of individual Member States. As a first order estimate, the targets are compared graphically below, showing for each Member State the uniform mass target, the mass calculated from the respective percentage target (taking into account waste growth until 2030) and the 2013 starting point.

To illustrate one possible option, the landfill target has been set at 50kg per year, the residual waste target at 150kg per year, with percentage targets equivalent to 10% landfill and 65% recycling.

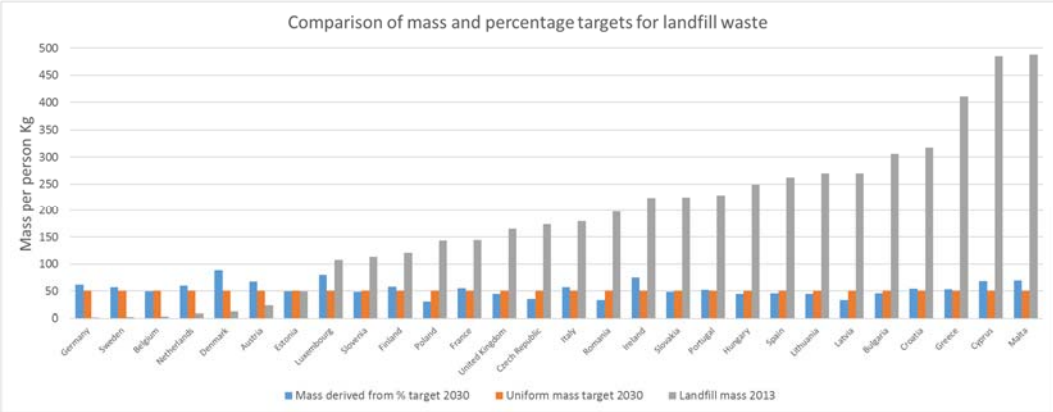


Figure 12: Comparison of current status and notional landfill targets considering a single mass target

For landfill, amonsgt those 21 Member States not meeting the 10% landfill target in 2013, the mass target is lower than the percentage target for some and higher for others.

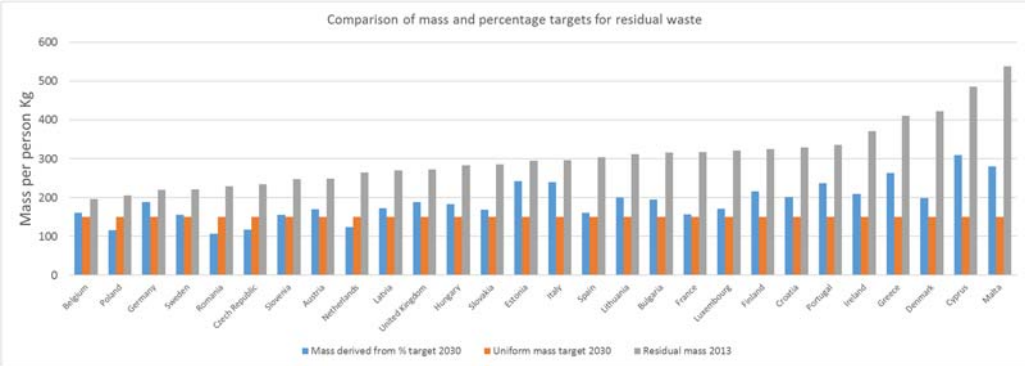


Figure 13: Comparison of current status and notional residual waste targets considering a single mass target

For residual waste, the 2013 starting points for all Member States are above the target. In this case the mass target is lower than the percentage target for four Member States and higher for the others. Residual waste is here understood according to the definition used by ZeroWaste, as "waste which is not fit for prevention, re-use or recycling and needs to be sent for energy recovery or disposal'.

The effects are illustrated in the graph below plotting the difference between the percentage and uniform targets for each Member State. (Figures for residual waste are shown but they are directly proportional to those for landfill.) There is a general trend for uniform mass targets to be lower than the percentage targets for Member States with higher GDP (downwards slope of the points shown by the trend line).

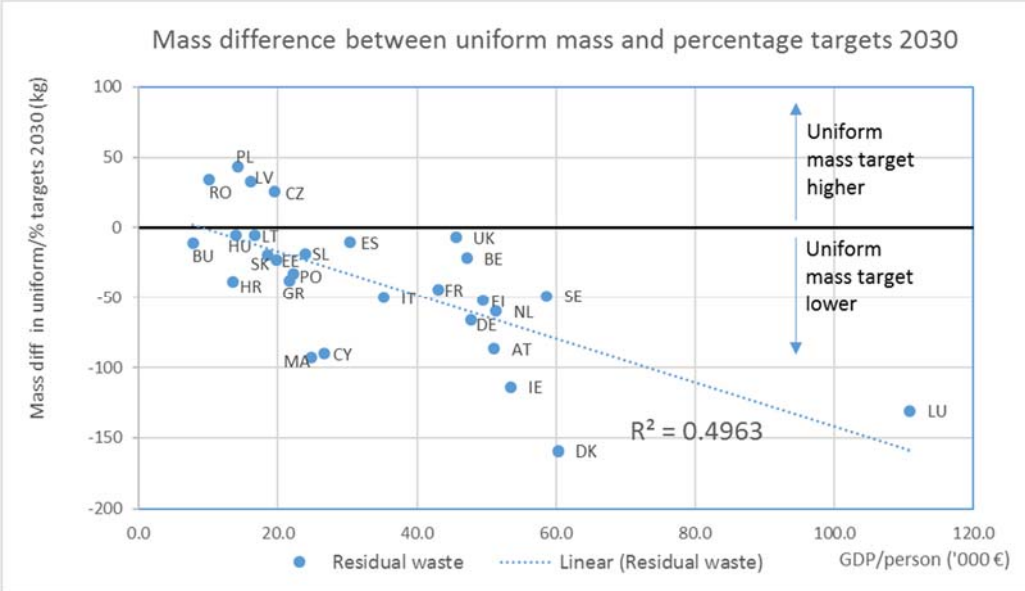


Figure 14: Mass difference between uniform mass target and percentage targets for 2030

The correlation is moderate (R-squared value 0.49 – in fact the same factor as shown in Table 4 above). Therefore, a number of member States are apportioned mass targets which are above or below the ambition level corresponding to their GDP level (i.e. above or below the trend line). An equivalent analysis can be performed with higher or lower uniform targets, whereby the points in the above chart will shift higher or lower accordingly.

It should also be taken into account that the uniform mass targets take no account of starting point and therefore how much reduction in landfill or residual waste each Member State has to achieve up to reach the targets.

The above charts and observations indicate that the mass targets have advantages in terms of burden sharing compared to the percentage target with derogation. For some Member States, they also demonstrate that uniform mass targets are not fully commensurate with their specific conditions. This is also illustrated by the lack of strong correlation between mass of waste generated and GDP or starting points for MSW recycling or landfill.

The uniform mass targets for landfill and residual waste are therefore worth further consideration in ongoing policy making, taking into account the potential inconsistencies across Member States.

5.6.2 Method taking into account initial conditions and economic capacity

Since the clearest correlation identified is that between GDP per person and initial MSW recycling and landfill performance, target setting which takes into account these parameters can be expected to have potential.

An overall EU target for MSW recycling or landfill is selected as a framework (e.g. 65% / 10%). Member States with starting points further from the overall target are given lower (recycling) or higher (landfill) individual targets. Individual targets are also modulated according to GDP per person, with higher recycling / lower landfill targets when GDP per person is higher. These are calculated by an algorithm with the following additional input variables:

- Maximum percentage for individual Member States (e.g. 5% higher/lower than the average, setting an upper/lower limit for individual Member States)
- Extent to which GDP is taken into (factor from zero upwards)

The following graphs present the calculated Member State targets according to overall EU targets equal to those investigated in the Impact Assessment and Additional Analysis, with GDP factor = 1.

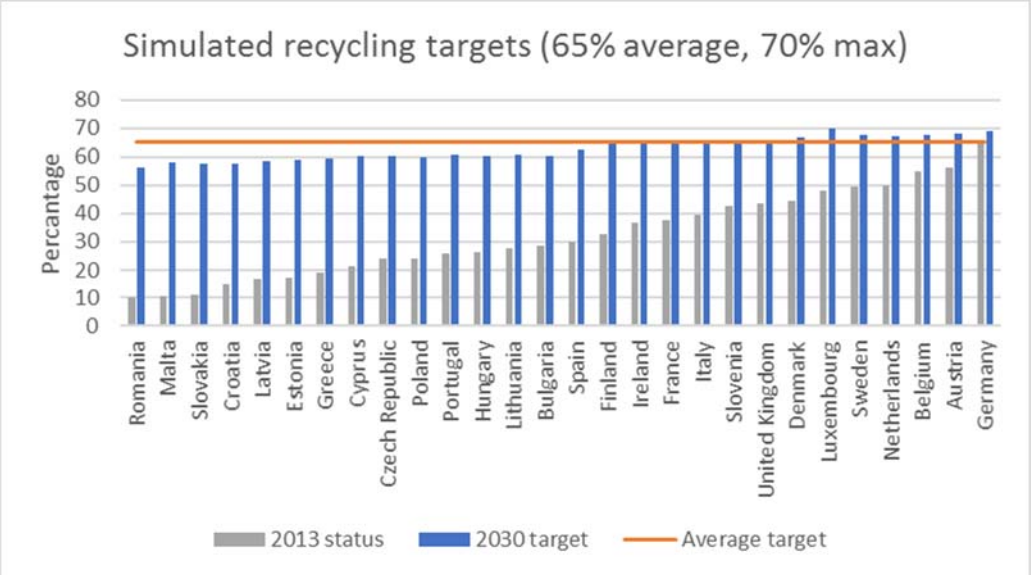


Figure 15: Simulated MSW recycling targets for individual Member States with 65% average, 70% maximum

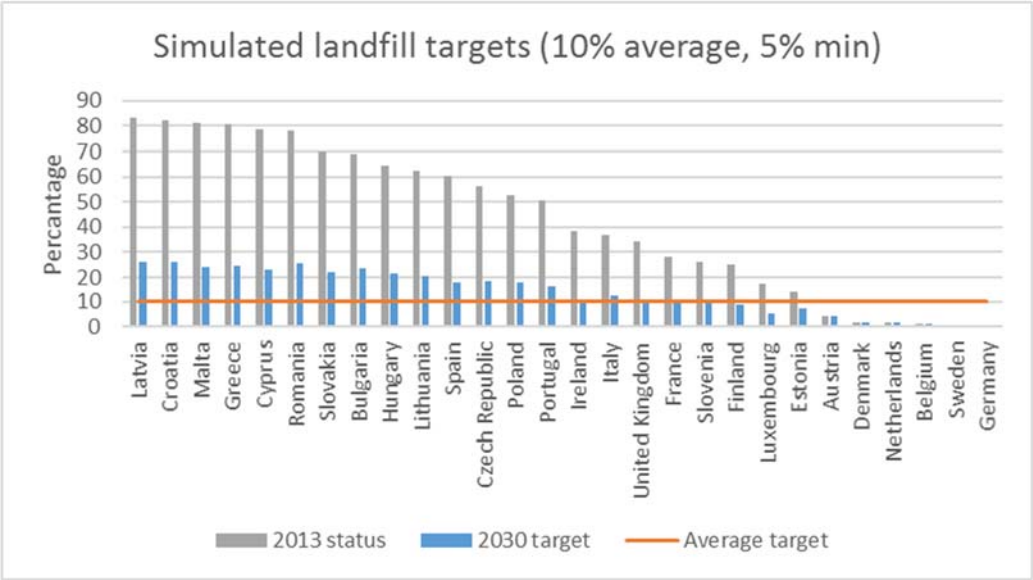


Figure 16: Simulated landfill targets for individual Member States with 10% average, 10% minimum

The above charts show examples of how differentiated targets can be applied. Graphs and data for a number of options with varying parameters are shown in Annex VIII.

The intention of the above outline is to provide policy makers with an alternative approach that reflects the IAI's above finding that feasibility has not been appropriately taken into account when setting targets for Member States. No specific recommendation is made on which option would be the most beneficial, since the complexity of the domain precludes a definitive determination based on the evidence. The reanalysis provided above therefore acts as a resource for policy makers in reaching a political compromise that supports feasibility and optimum potential of the targets.

To facilitate the above, the spreadsheet used for calculating the simulated targets is made publicly available with this study, allowing all stakeholders to perform scenario analysis on target setting options.

5.6.3 Including an absolute mass element in the targets

Reflecting the discussion in Section 5.3.4 on growth in waste volumes and the analysis in Section 5.6.1 above, a mass-based element can be introduced into the target setting calculations in order to incentivise waste prevention. Individual Member State targets for MSW recycling and landfill are calculated according to starting point and GDP per person as in the above section, but are converted to mass targets using the 2013 mass data.

The recycling target is replaced by a target for maximum mass of residual waste, as in Section 5.6.1.

Examples are shown graphically below, with full numerical results shown in the tables in Annex VIII and graphs for a number of scenarios in Annex IX.

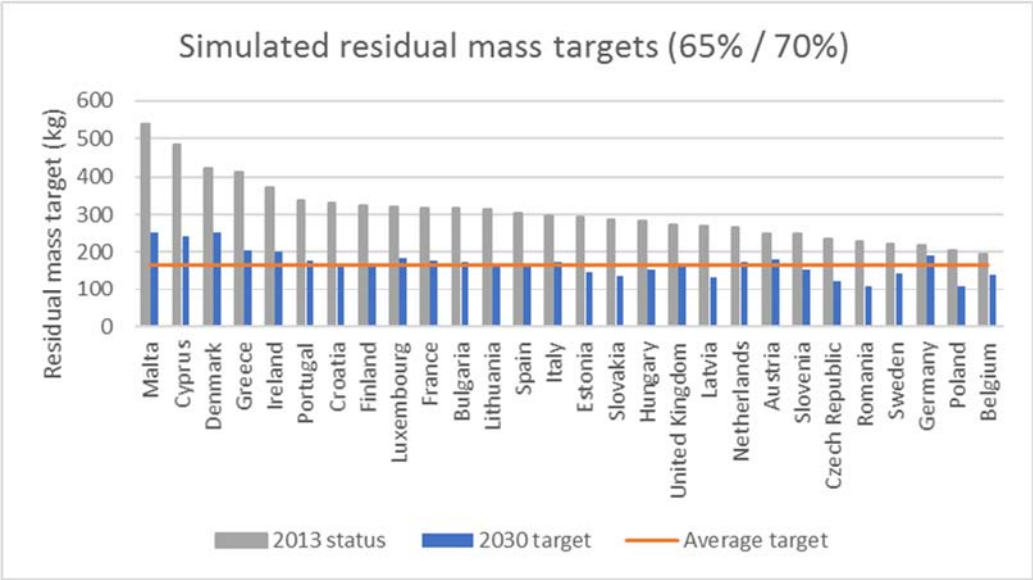


Figure 17: Simulated residual waste mass targets for individual Member States with 65% average, 70% maximum MSW recycling

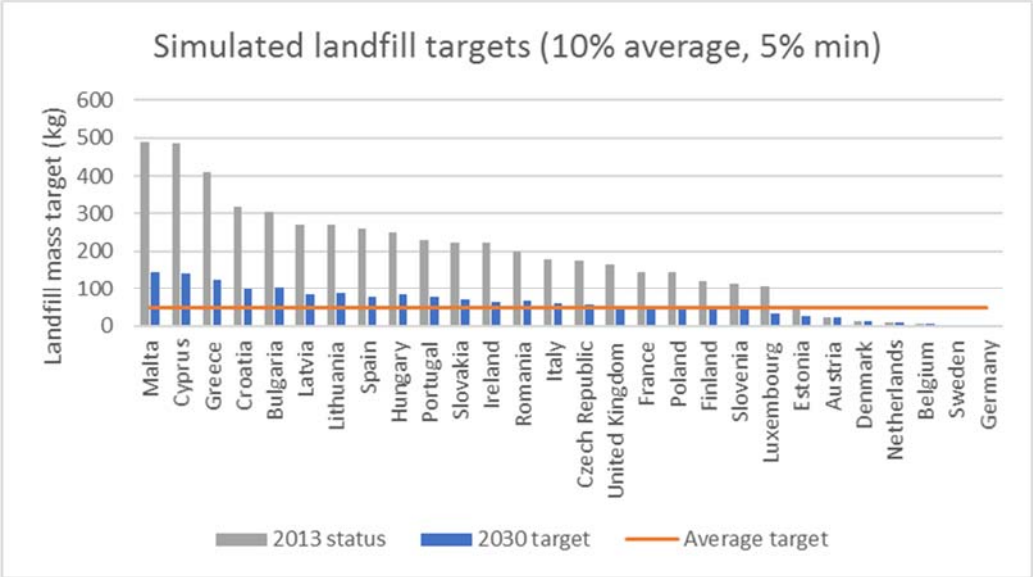


Figure 18: Simulated landfill targets for individual Member States with 10% average, 5% maximum

Since there is a wide range of mass values, a ceiling and/or a floor value could be considered as an addition to the above limits, set, for example, at 15-20% above and below the average, in order to avoid extreme outlying values.

5.6.4 Conclusions from alternative analysis

The scenarios investigated above and shown in Annex VIII are ideas that can support further policy making in this area, extrapolating the analysis from the conclusions of the IAI's assessment of the evidence. As such they are an aid to policy making and potentially a stimulus for generating additional ideas, in which, for example, other factors such as the composition of waste in each member State can also be taken into account. These do not constitute specific recommendations for policy options.

6 Qualitative measures

As regards the qualitative measures, the provisions of 2015 legislative proposal do not fully correspond to the Impact Assessment and the Additional Analysis. The proposal either does not take into account all the IA's data or is based on assertions that do not come from the Impact Assessment.

The following sections review the evidence in the Impact Assessment for the qualitative parts of the legislative proposal, where the effects appear to be of a material nature.

6.1 Greater Harmonisation and Simplification of the Legal Framework on By-Products and End-of-Waste Status.

The 2015 legislative proposal (Article 5) requires Member States to ensure that, under certain conditions, a substance or object resulting from a production process - the primary aim of which is not the production of that substance or object - is considered not to be waste, but to be a by-product. The 2008 Directive merely permitted Member States to do this and was unchanged in the 2014 proposal.

Due to the likely effect on waste streams, the provisions appear to be of a material nature in terms of the ability of Member States to meet the MSW recycling and landfill targets and in terms of administrative burden in transposing and implementing the legislation. However, none of the by-product and end-of-waste status notions are addressed in the Impact Assessment, nor in the Additional Analysis. In particular, these notions could be expected to have an influence on actions like the promotion of waste prevention, the Ecodesign directive, the waste hierarchy and Extended Producer Responsibility.

The 2015 legislative proposal (Article 6) allows waste that is considered to have ceased to be waste to be categorised as being prepared for reuse, recycled or recovered for the purpose of the calculation of the achievement of the Directive's targets. The effect of this is to add the end-of-waste proportion to the numerator for calculating the MSW recycling percentage, instead of removing that proportion from the denominator. This would have the effect of increasing the calculated MSW recycling percentage where the end-of-waste proportion is non-zero. For example, to meet a 70% MSW recycling target under the proposed 2015 rules, assuming 5% considered to be end-of-waste, would have required only 68.5% under the existing rules and 2014 proposal.

This effect has not been addressed in the Impact Assessment, despite its potentially material nature.

The 2015 legislative proposal empowers the Commission to adopt delegated acts to determine the applications of the conditions described in the article "to specific substances or objects" (Article 5(2)). Since the definition of these "specific substances or objects" may itself have material effects, an explicit assessment of impacts of those delegated acts would have been appropriate.

6.2 New Measures to Promote Prevention, Including for Food Waste, and Re-Use

Prevention

Following the 2015 legislative proposal (Article 9), Member States shall take measures to prevent waste generation, using appropriate targets and indicators, and shall monitor and assess the implementation of their waste prevention measures. The Commission may adopt implementing acts to establish indicators to measure the overall progress.

The Impact Assessment (Section 4.3) identifies two main difficulties in setting legally-binding weight-based targets for prevention at the EU level:

1. The need to assess the effectiveness of the National Prevention Programmes to be adopted by the end of 2013.
2. Prevention for packaging waste seems difficult to implement and measure as the packaging materials, distribution systems and consumer demand are constantly changing. In addition the REFIT report highlights that a purely weight-based target could create a disadvantage for heavier but not less environmentally-friendly packaging materials.

These observations appear to be consistent with the presented evidence. A coherent next step would include a full assessment of the National Prevention Programmes as soon as this is feasible, leading to a review of the potential measures for prevention, as indicated in the Impact Assessment. Changing materials, systems and demand notwithstanding, harmonised EU measures can be considered in this future assessment alongside the measures and targets introduced for other waste streams.

Food Waste

The 2014 legislative proposal (Article 9) required Member States to endeavour to reduce food waste generation by 30% between 2017 and 2025. The 2015 proposal simply indicated in Recital 12 that Member States should take measures to reduce food waste, aligned to the United Nations' Sustainable Development Goals of halving food waste by 2030.

A separate Impact Assessment on measures addressing food waste (SWD (2014) 289 final) was published alongside the Impact Assessment on waste. According to the Impact Assessment on food waste, a non-binding target gives Member States the flexibility required to adapt their food waste prevention actions. The last version of the proposal is therefore in accordance with the evidence of the Impact Assessment.

Contrary to the 2014 legislative proposal, the 2015 version does not give a clear definition of food waste. Since the latter version is legislating on the notion in article 9, it would have been necessary to define it. Moreover not defining it may lead to consequences in terms of the nature of prevention measures required. Whilst in the Impact Assessment (on food waste) and the 2014 legislative proposal, food sent to redistribution or food used as feed are no longer considered as waste, they are still considered so in the 2015 version. The 2014 proposal is therefore encouraging redistribution and transformation into feed while the 2015 is not. The 2015 Additional Analysis did not include any updated evidence to accompany this change.

6.3 Introduction of Minimum Operating Conditions for Extended Producer Responsibility

In referring to Extended Producer Responsibility (EPR) schemes, the Impact Assessment states that a minimum level of harmonisation at EU level is necessary to ensure their optimisation. However, the same analysis underlies both the 2014 and 2015 legislative proposals, which are significantly different in their concrete provisions (there is no updated analysis on EPR in the 2015 Additional Analysis). The Impact Assessment does not define "minimum" and does not assess the potential impacts.

The 2014 legislative proposal requires Member States to take measures encouraging EPR, including those influencing the design, development, production and marketing of products. In itself this represents a potential inconsistency with the internal market, since design, development and production is normally harmonised across the EU.

The 2015 legislative proposal removes the requirement, making the measures voluntary, as well as removing the "design" element. It thereby reduces one potential distortion of the single market (design), whilst introducing greater flexibility and therefore greater variability between Member States. No analysis is presented which addresses the rationale for this change.

General requirements for EPR schemes are included in the legislative text, in an Annex in the 2014 version and in the relevant Article 8 in the 2015 version. This is an example of the lack of clarity and comparability of the legislative proposals, as referred to in Section 2.1.

These requirements appear to represent a significant administrative burden for national and local authorities. This burden is not assessed in the Impact Assessment, whereby relevant information is available for analysis from responsible organisations, for example EXPRA for packaging waste.

Unlike the 2014 amended version of the legislative proposal, the 2015 legislative proposal has an indistinct definition of the obligations of the EPR systems although the impact Assessment concludes the definition needs to be as clear as possible.

The 2015 legislative proposal defines financial contributions to comply with the EPR obligations in a broad way, without the clarity recommended by the Impact Assessment. The proposal does not set any limits and the list of financial contributions is open-ended. A potential consequence is that industry may be made responsible for actions that are not part of their remit or influence.

6.4 End-of-life vehicles, batteries and electronic/electrical equipment

The legislative provisions in the Circular Economy package on end-of-life vehicles, batteries and accumulators and electronic/electrical equipment relate to reporting requirements, with changes made between the 2014 and 2015 proposals. There are limited references to these topics in the 2014 Impact Assessment and no reference in the 2015 Additional Analysis, and the references that do exist do not constitute an assessment of the impacts.

This appears to be a minor discrepancy but it would be important in future work in this domain to ensure that effects are fully taken into account, in particular to consider any conflicts between different pieces of relevant legislation.

7 Level of geographical differentiation in analysis

The analysis underlying the Impact Assessment, in particular the modelling work, was performed on a Member State basis. Below this level exist the regions and municipalities, in which the implementation of the Directive is to be carried out. Each Member State has a different profile of municipalities with differing conditions and characteristics, including the following parameters:

- Ratios between urban and non-urban populations
- Sizes of cities
- Physical topologies
- Differences in wealth between the regions
- Differences in the level of autonomy of the regions, between difference MS and within individual MS

Just as the modelling data demonstrates significant differences between Member States, within Member States there are also factors which are likely to affect the relative benefits and costs in different regions. This could significantly affect the ability of some Member States to fulfil the targets.

This does not imply the Impact Assessment should have performed analysis down to municipal level. Whilst this would theoretically be the ideal situation, the level of complexity and the resulting detriment to transparency would have made it impracticable.

However, there are potentially material effects at regional and local level affecting the viability of the targets, which should be taken into account. For example, Member States with relatively more people in urban areas may have more difficulty in meeting recycling targets than indicated by other parameters. Regional effects have been addressed in the Impact Assessment, but not to the extent that would be necessary to align the analytical results fully to the conditions on the ground.

8 Additional issues

The following sections review additional issues arising from an in-depth analysis of the Impact Assessment, where the analysis and conclusions are relevant and material.

8.1 Subsidiarity and proportionality

Subsidiarity and proportionality are two systematic procedural issues which are an essential part of the legislation considerations and the Impact Assessment.

In this Impact Assessment, proportionality is not directly addressed, although it is referred to in Section 2.8 "The EU's right to act and justification". Subsidiarity issues are dealt with in that same section, but not explicitly apportioned to the subsidiarity issue. In the case of waste management, subsidiarity and proportionality are strongly connected, as the determination of the need to work across Member State borders depends on magnitude of the cross-border effects. They are therefore addressed together below.

Section 2.8 of the Impact Assessment addresses a number of aspects regarding the EU's right to act. However, this chapter does not contain numerical information nor references, that would provide evidence on transboundary issues (GHG emissions, air pollution and resources) relevant to subsidiarity – i.e. indicating whether action at EU level is necessary.

GHG emissions: The results of the model indicate that the GHG emission savings in 2030 for the preferred scenario (3.9c) compared to full implementation is approximately 40MtCO_2 (rising approximately linearly from zero in 2020). This figure is of the same order as the annual reduction in the cap of the EU Emissions Trading System (2.2% = 48.4MtCO2 per year from 2030) and therefore appears to be material in magnitude. The figure cannot be fully verified due to the lack of availability of the model for scrutiny of the underlying calculations but appears to be reasonable to an order of magnitude. The GHG emission reduction element of the effects of waste management does therefore appear to be of material magnitude, which can be considered as a justification for EU-wide action.

Air pollution: The model projects a reduction in external costs of air pollution of scenario 3.9c compared to full implementation of approximately €0.8bn. This compares to a total external cost of pollution from industrial sources in 2012 using the same EEA methodology[viii] of between €40bn and €112bn. The magnitude of the effects of waste management, whilst making a contribution, are very small in comparison to the total air pollution, indicating that action does not pass the subsidiarity test for this parameter – i.e. action at EU level is not necessary to meet the EU-wide objectives for reducing air pollution.

Resources: Figures on resources are included in the output to the model as "Material Captured for Recycling vs Domestic Material Consumption, %". For scenario 3.9c vs full implementation, this figure in 2030 is below 1% EU-wide, again indicating that action at EU level is not necessary to meet the EU-wide objectives for resources.

In summary, subsidiarity and proportionality should have been illustrated in the Impact Assessment with numerical evidence in order to provide a properly-argued and balanced case for taking action at EU level. From a review of the available figures, the case for EU action on waste management is demonstrated in the case of GHG emissions, but not in the case of air pollution and resources. Overall the case for action at EU level is therefore demonstrated.

8.2 Economic conditions

The "Economic Conditions" part of section 2.5 of the 2014 Impact Assessment includes a commentary and accompanying analysis on economic conditions for recycling.

In particular it includes a chart (page 23, figure 4) of landfill percentage vs the level of typical landfill charges. A clear trend visible in the chart is that Member States with lower landfill charges have higher landfill rates. The commentary states explicitly that this correlation is causation "As expected, there is a direct influence of the landfill price on the landfill rates". Further, the language indicates that this data is being used to justify a preconception.

However, the causation is not demonstrated and there are other factors which likely influence the high landfill rates, which are exhibited mostly by Member States with lower GDP per head than the average. In those Member States, the prices of goods and services are in general lower than average, but there is no analysis of their correlation to economic factors such as GDP per head or disposable income.

This data is used to illustrate the rationale for use of economic instruments to encourage recycling and discourage landfill. Whilst it is logical that economic instruments act as an encouragement for certain behaviour, the data as indicated above is not sufficient to demonstrate that application of such instruments in the Member States with higher landfill rates is the appropriate solution. A full analysis would control for other factors, including relative wealth and efficiency of municipal administration.

No direct conclusion from this data and analysis is drawn in the Impact Assessment.

8.3 Estonia case study

Section 2.5 of the 2014 Impact Assessment, page 25 includes a case study highlighting the success of Estonia in reducing landfill.

From an analysis of background information, it is clear that the reduction in waste sent to landfill was achieved through the introduction of two MBT sites and an incinerator. As acknowledged in the Impact Assessment, in the medium term waste imports would be necessary in order for Estonia also to meet the future recycling target.

This case study appears to have been presented as a success story and it would therefore be reasonable to assume it is intended as a model for other Member States with high landfill rates. However, such a policy with high percentages of waste going to incineration and/or MBT is not compatible with the conclusions of the Impact Assessment and the accompanying legislative proposal, that aim at high recycling rates. This is a clear contradiction in the analysis.

8.4 Presentation of data

In certain cases, important data has been presented in a confusing fashion, lacking necessary transparency. In particular, the New Policy Options report underlying the 2015 Additional Analysis includes a number of charts of financial and external costs and benefits.

For example, charts 4-22 and 4-23 below present individual elements of the financial and external costs/benefits respectively. This detail should have been presented in tabular form. This is particularly necessary because the different elements cannot be differentiated from

the colours in the charts, preventing an understanding even of the direction (cost or benefit) of some of the elements.

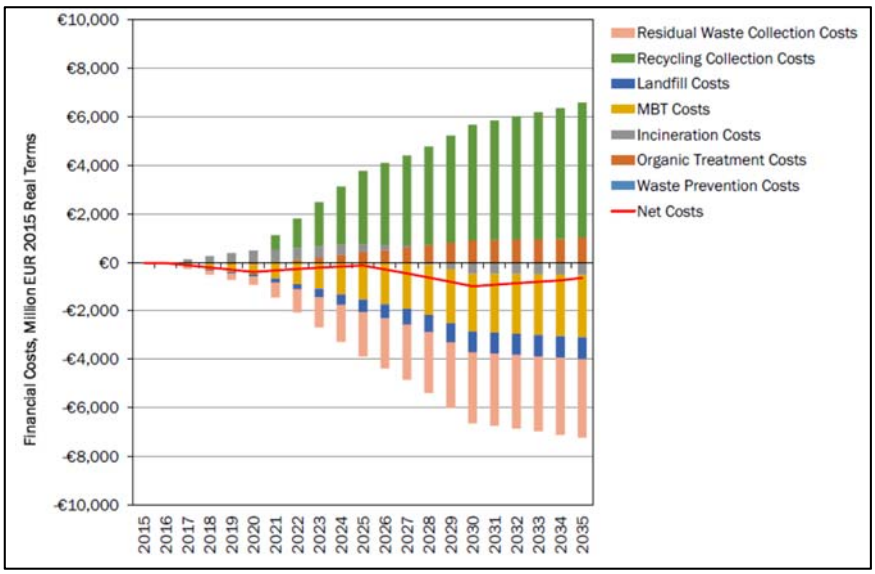


Figure 19: Chart 4-22 Breakdown of financial costs/benefits for Scenario 17/3.9c from New Policy Options report

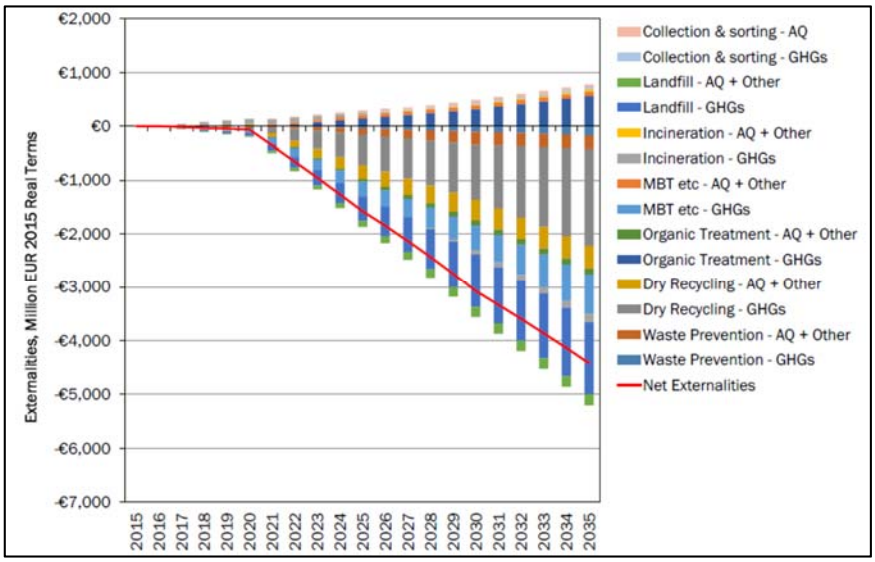


Figure 20: Chart 4-23 Breakdown of external costs/benefits for Scenario 17/3.9c from New Policy Options report

As indicated earlier in the report, full transparency of the output data would have required the above charts and their tabulated data to be published for all Member States individually. This information is essential to understand fully the cash flows for investment and income undergone by Member States, which inform decisions on target setting at Member State level. It was made available to the IAI in response to the draft version of this study.

8.5 Usability of the Impact Assessment

A number of inconsistencies and errors have been identified in the Impact Assessment, detailed as follows:

- The 2014 Impact Assessment is split into six parts, increasing the difficulty for stakeholders to analyse and search the evidence. The six parts have differing levels of text and graphic quality, giving the impression of a hastily prepared document and

making fact-checking and scrutinising the analysis more burdensome than necessary, for example when performing text searches.

- Approximately 40 instances of cross reference errors were found throughout the text, where the relevant references were apparently not identified by the word processing programme ("Error! Reference source not found"). In many cases, access to the cited references was necessary to understand the arguments and evidence, but this was impossible without the citations.
- The contents page in part 4 (of 6) of the Impact Assessment also contains a number of cross-referencing errors, ("Error! Bookmark not defined").
- In part 1 of the Impact Assessment there are many references to section 5 and its subsections. From the content it is apparent that these refer to the sections in part 2 (of 6) numbered as chapter 1 and its subchapters. This deduction requires good familiarity with the document and therefore makes it very difficult for stakeholders to follow the evidence.

The above errors and presentation features are material to the assessment, since they prevent interested stakeholders from accessing the evidence and reasoning. They represent an additional concern in terms of transparency of the evidence. They also indicate a lack of sufficient quality control.

The Additional Analysis document from the 2015 proposal does not contain such errors. However, the scope of the Additional Analysis is not sufficiently broad to compensate for the shortcomings in respect of syntax and drafting errors of the 2014 Impact Assessment, whose content remains relevant as a basis for the new proposal and the assessed scenarios.

Annex I: Designation of scenarios in different documents

The following table attempts to reconcile the different nomenclatures for the waste management scenarios in the 2014 Impact Assessment, the 2015 Additional Analysis and background documentation. Further information to refine the list is welcome.

Eunomia "Headline Project Report"	**2014 Impact Assessment**		**Additional Analysis**	**"New Policy Options" Report**
2014 - 2030	**2014 - 2030**		**2015 - 2035**	**2015 - 2035**
BAU				
Baseline 1				
Baseline 2				
Scenario 1		Option 1		
		Option 2		
Scenario 2.1	Option 3.1a	Option 3.1(low)		
Scenario 2.2	Option 3.1c	Option 3.1(high)		
	Option 3.2a	Option 3.2		
	Option 3.2b	Variant		
Scenario 3	Option 3.3	Option 3.3		
	Option 3.4a	Option 3.4		
	Option 3.4b	Option 3.5		
	Option 3.4b	Option 3.6		
	Option 3.4c	Option 3.7		
Scenario 4				
				Scenario 1
				Scenario 2
				Scenario 3
				Scenario 4
				Scenario 5
				Scenario 6
				Scenario 7
				Scenario 8
			Option 3.8(a)	Scenario 9
			Option 3.8(b)	Scenario 10
			Option 3.9(a)	Scenario 11
			Option 3.9(b)	Scenario 12
				Scenario 13
				Scenario 14
			Option 3.8(c)	Scenario 15
				Scenario 16
			Option 3.9(c)	Scenario 17
			Option 3.9(d)	Scenario 18
				Scenario 19

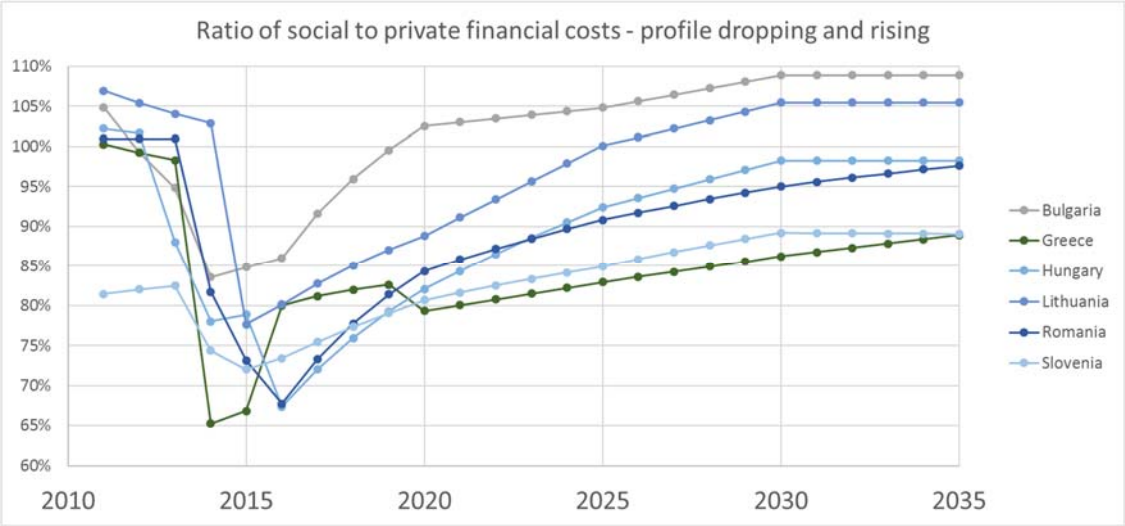
Annex II: List of two letter codes for Member States

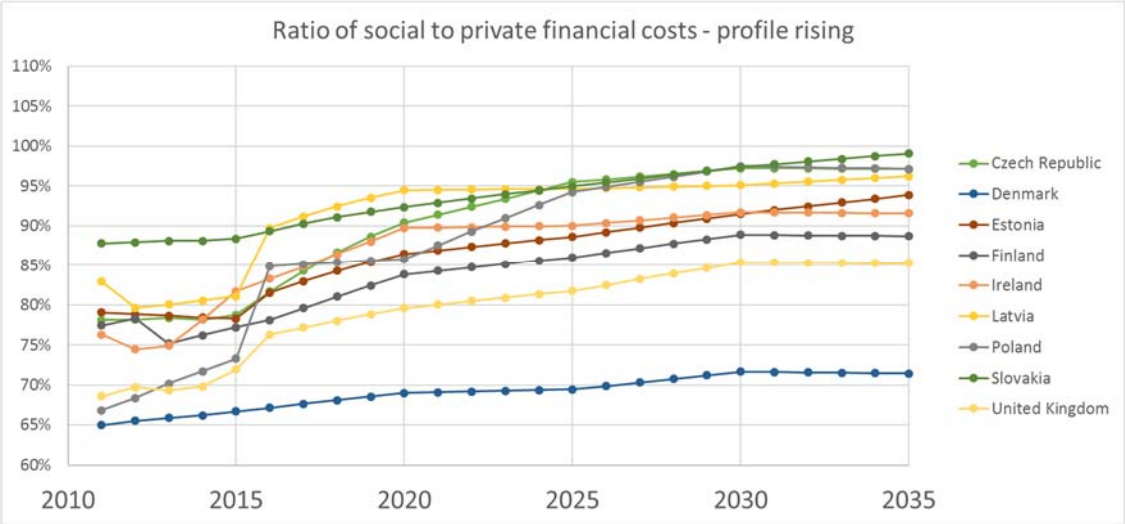
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Cyprus	CY
Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	GR
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV
Lithuania	LT
Luxembourg	LU
Malta	MA
Netherlands	NL
Poland	PL
Portugal	PO
Romania	RO
Slovakia	SK
Slovenia	SL
Spain	ES
Sweden	SE
United Kingdom	UK

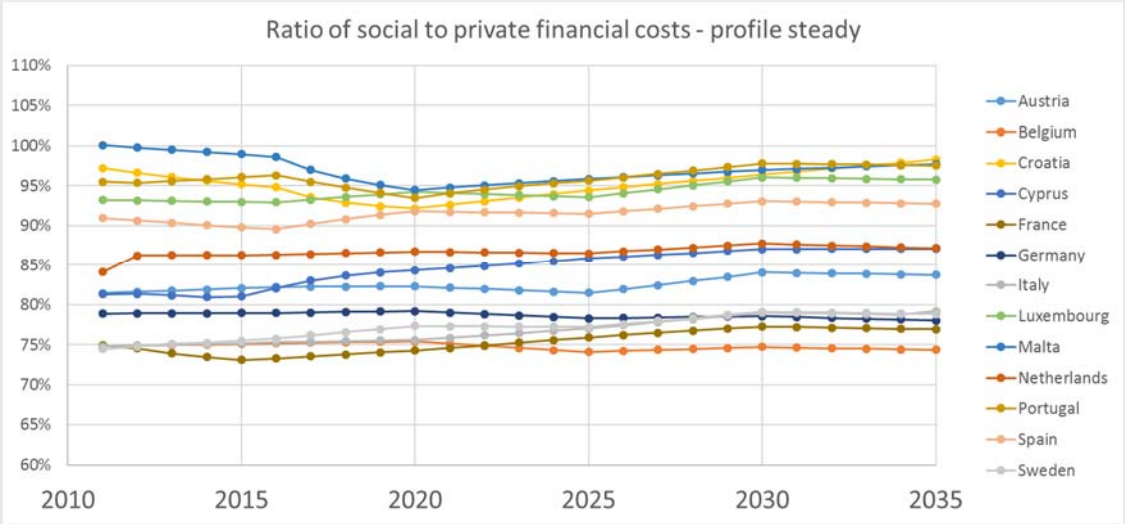
Annex III: Final destinations of waste for selected Member States (European Waste model output data)

The following Member States exhibit rising and then falling percentages of total waste ending in either incineration (red) or MBT (indicated by mass loss).

Annex IV: Profiles of ratio of social costs to private costs for all Member States presented in three categories

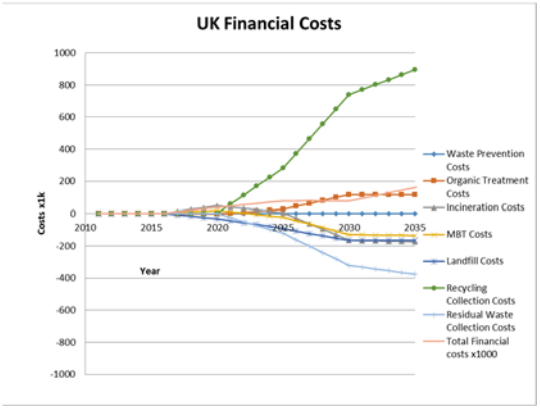


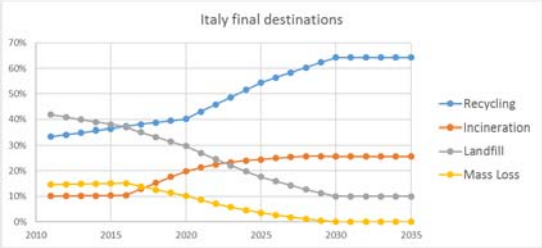


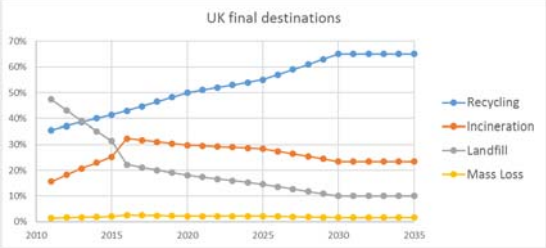


Annex V: Additional examples of differences cost/benefit profiles for Member States with similar starting waste destinations

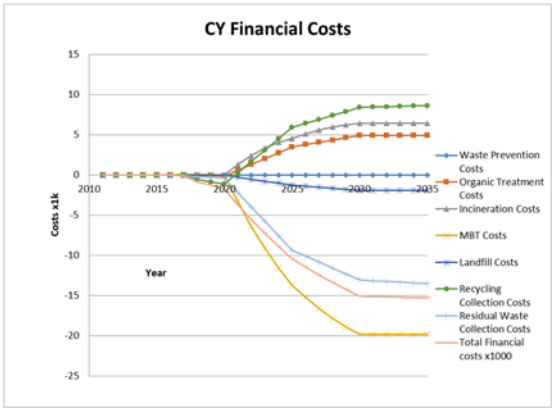
Italy vs UK

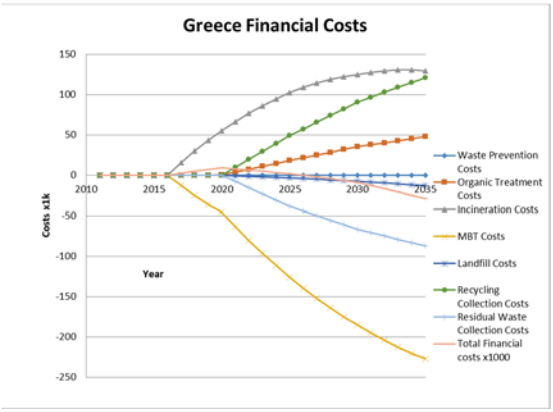


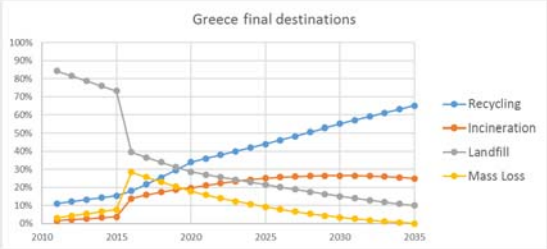


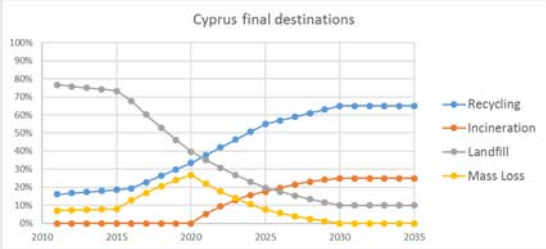


Cyprus vs Greece

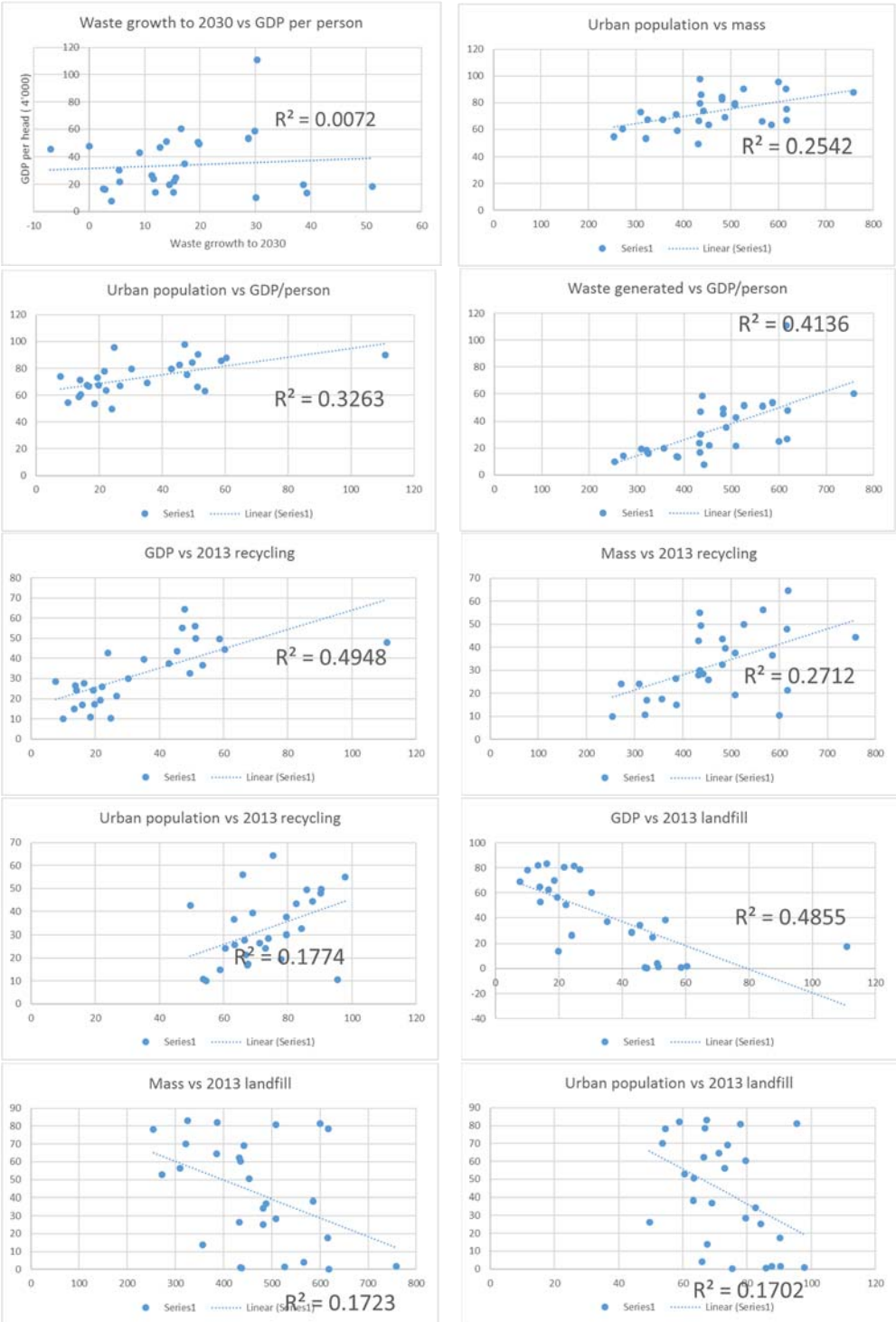








Annex VI: Correlation coefficient between relevant Member State parameters



Interpretation of correlation coefficients (r-squared value):

0.1 absence of correlation

0.3 weak correlation

0.5 moderate correlation

0.7 strong correlation

0.9 near perfect correlation

Annex VII: Table of values for alternative options for differentiated target setting – percentage and mass targets

65% MSW recycling, 10% landfill

MSW recycling average	65%						65%					
MSW recycling maximum	70%						75%					
Landfill average				10%						10%		
Landfill minimum				5%						1%		
GDP effect multiplier	1						1					
Individual targets	**MSW recycling**			**Landfill**			**MSW recycling**			**Landfill**		
	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation
Austria	68.0	181		4.1	23		70.3	168		1.7	10	
Belgium	67.7	140		0.9	4		69.8	132		0.9	4	
Bulgaria	60.3	175	3	23.6	105	4	56.9	190	4	26.7	118	5
Croatia	57.8	163	3	26.4	102	4	52.6	183	5	30.3	117	5
Cyprus	60.5	243	2	23.0	142	4	57.3	264	4	25.9	160	4
Czech Republic	60.4	123	2	18.4	57	4	57.0	133	4	19.9	62	4
Denmark	66.9	251		1.6	12		68.4	239		1.1	9	
Estonia	59.0	146	3	7.3	26		54.7	162	4	5.3	19	
Finland	64.5	171	1	8.7	42		64.2	173	1	6.9	33	
France	64.8	179	1	9.7	50		64.6	180	1	8.3	42	
Germany	69.2	190		0.2	1		72.3	171		0.2	1	
Greece	59.6	206	3	24.5	125	4	55.7	226	4	27.8	142	5
Hungary	60.4	153	3	21.5	83	4	57.0	166	4	23.9	92	5
Ireland	65.4	203		10.8	63	1	65.8	200		9.6	56	
Italy	64.6	173	1	12.1	59	2	64.2	175	1	11.6	56	1
Latvia	58.5	135	3	26.2	85	4	53.9	150	4	30.0	98	5
Lithuania	60.9	169	2	20.5	89	4	57.9	182	4	22.6	98	5
Luxembourg	70.0	185		5.0	31		75.0	154		1.0	6	
Malta	58.2	251	3	24.0	144	4	53.2	281	4	27.3	164	5
Netherlands	67.1	173		1.5	8		68.8	165		1.1	6	
Poland	59.9	109	3	18.2	49	4	56.2	119	4	19.6	53	4
Portugal	61.0	177	2	16.6	75	3	58.0	190	4	17.6	80	4
Romania	56.3	111	3	25.9	66	4	50.2	127	5	29.6	75	5
Slovakia	57.5	136	3	22.2	71	4	52.1	154	5	24.9	80	5
Slovenia	64.5	153	1	10.4	45	1	64.0	155	1	9.3	40	
Spain	62.5	163	2	18.0	78	3	60.6	171	3	19.3	84	4
Sweden	67.4	143		0.6	3		69.4	134		0.6	3	
United Kingdom	65.9	164		10.7	52		66.6	161		9.6	46	
EU28		**166**			**47**			**166**			**47**	

70% MSW recycling, 5% landfill

MSW recycling average	70%						70%					
MSW recycling maximum	75%						80%					
Landfill average				5%						5%		
Landfill minimum				1%						1%		
GDP effect multiplier	1						1					
Individual targets	**MSW recycling**			**Landfill**			**MSW recycling**			**Landfill**		
	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation
Austria	72.7	154		1.3	8		74.9	142		1.3	8	
Belgium	72.4	120		0.9	4		74.3	112		0.9	4	
Bulgaria	65.7	152	2	12.9	57	3	62.4	166	4	12.9	57	3
Croatia	63.6	141	2	14.5	56	3	58.8	160	4	14.5	56	3
Cyprus	66.1	209	2	12.3	76	2	63.1	228	3	12.3	76	2
Czech Republic	65.9	106	2	9.6	30	2	62.7	115	3	9.6	30	2
Denmark	71.8	214		1.1	8		73.4	202		1.1	8	
Estonia	64.7	126	2	3.0	11		60.7	140	4	3.0	11	
Finland	69.7	146	1	3.6	17		69.5	147	1	3.6	17	
France	69.9	153	1	4.3	22		69.8	154	1	4.3	22	
Germany	73.7	163		0.2	1		76.5	145		0.2	1	
Greece	65.2	177	2	13.2	67	2	61.6	195	3	13.2	67	2
Hungary	65.8	132	2	11.5	44	2	62.6	144	3	11.5	44	2
Ireland	70.5	173		4.8	28		71.0	170		4.8	28	
Italy	69.6	148	1	5.7	28	1	69.3	150	1	5.7	28	1
Latvia	64.2	116	2	14.3	46	3	59.9	130	4	14.3	46	3
Lithuania	66.3	146	2	10.9	47	2	63.4	158	3	10.9	47	2
Luxembourg	75.0	154		1.0	6		80.0	123		1.0	6	
Malta	64.0	216	2	12.9	77	2	59.5	243	3	12.9	77	2
Netherlands	72.0	148		1.1	6		73.5	139		1.1	6	
Poland	65.4	94	2	9.6	26	2	61.9	104	4	9.6	26	2
Portugal	66.4	152	2	8.5	39	2	63.6	165	3	8.5	39	2
Romania	62.3	96	3	14.2	36	3	56.5	110	4	14.2	36	3
Slovakia	63.4	118	2	11.9	38	2	58.4	134	4	11.9	38	2
Slovenia	69.5	132	1	4.8	21		68.9	134	1	4.8	21	
Spain	67.8	140	1	9.3	40	2	66.1	148	2	9.3	40	2
Sweden	72.3	121		0.6	3		74.2	113		0.6	3	
United Kingdom	70.8	141		4.8	23		71.5	137		4.8	23	
EU28		**142**			**24**			**142**			**24**	

65% MSW recycling, 10% landfill with GDP effect multiplier = 2

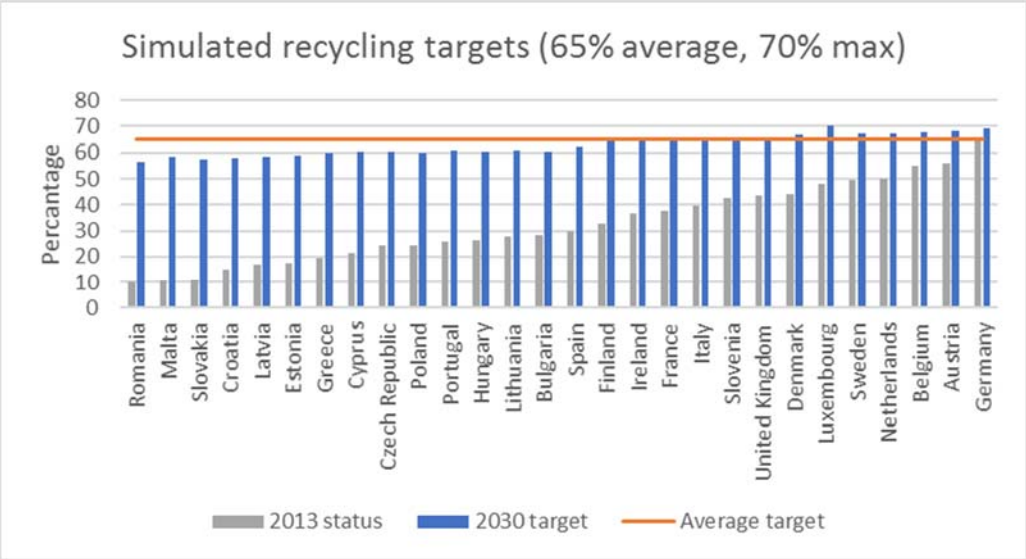
MSW recycling average	65%						65%					
MSW recycling maximum	70%						75%					
Landfill average				10%						10%		
Landfill minimum				5%						1%		
GDP effect multiplier	2						2					
Individual targets	**MSW recycling**			**Landfill**			**MSW recycling**			**Landfill**		
	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation
Austria	68.5	178		4.1	23		71.3	163		1.6	9	
Belgium	68.2	139		0.9	4		70.6	128		0.9	4	
Bulgaria	57.9	186	4	27.3	121	5	52.7	209	6	31.7	140	7
Croatia	55.4	173	4	29.4	114	5	48.4	200	6	34.6	134	6
Cyprus	60.0	247	2	23.3	143	4	56.0	271	4	26.6	164	5
Czech Republic	59.2	127	3	19.6	61	4	54.6	141	5	21.7	67	5
Denmark	68.0	243		1.6	12		70.5	223		1.1	8	
Estonia	57.6	151	3	7.5	27		52.0	172	5	5.7	21	
Finland	65.7	165		7.8	38		66.2	163		5.6	27	
France	65.5	176		9.0	46		65.8	174		7.3	37	
Germany	69.3	190		0.2	1		72.7	169		0.2	1	
Greece	58.5	211	3	25.7	131	4	53.4	237	5	29.8	152	5
Hungary	58.6	160	3	23.8	91	5	53.6	179	6	27.2	105	6
Ireland	66.6	196		9.1	53		68.0	188		7.3	43	
Italy	64.8	172	1	11.6	56	2	64.4	174	1	10.9	53	1
Latvia	56.6	141	3	28.7	93	5	50.3	161	6	33.6	109	6
Lithuania	59.5	176	3	22.2	96	4	55.1	194	5	25.1	109	5
Luxembourg	70.0	185		5.0	31		75.0	154		1.0	6	
Malta	57.3	256	3	24.6	148	4	51.3	292	5	28.4	170	5
Netherlands	67.8	170		1.5	8		70.1	158		1.1	6	
Poland	58.0	114	3	20.0	54	4	52.8	128	6	22.3	61	5
Portugal	60.1	181	3	17.3	79	4	56.1	199	4	18.7	85	4
Romania	53.2	119	4	29.5	75	5	44.7	140	7	34.6	88	7
Slovakia	55.7	142	3	23.9	77	4	48.7	165	6	27.4	88	5
Slovenia	64.1	155	1	10.6	46	1	63.0	160	2	9.8	42	
Spain	62.4	163	2	17.7	77	3	60.2	173	3	19.1	83	4
Sweden	68.3	139		0.6	3		71.1	127		0.6	3	
United Kingdom	66.6	161		9.6	46		67.7	156		8.1	39	
EU28		**166**			**47**			**166**			**47**	

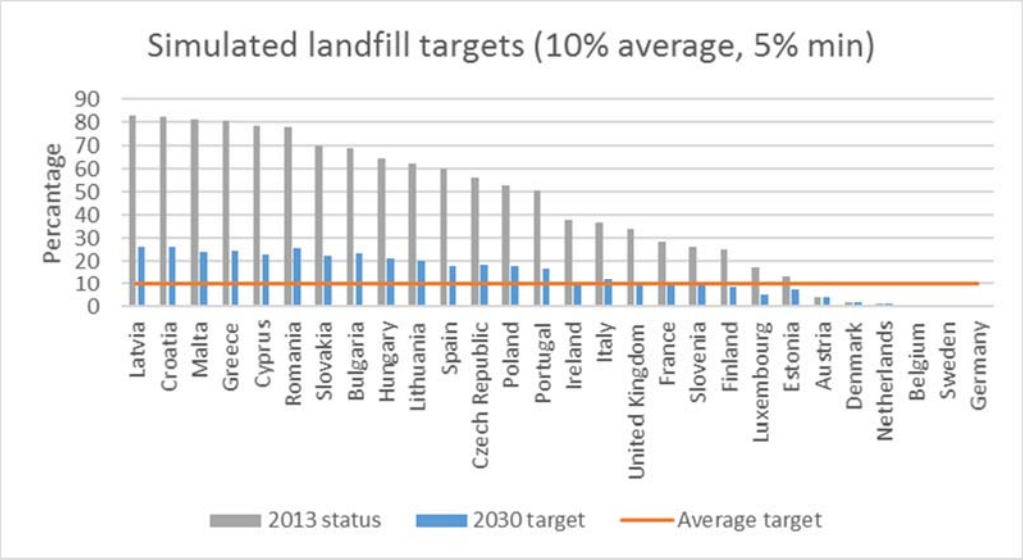
70% MSW recycling, 5% landfill with GDP effect multiplier = 2

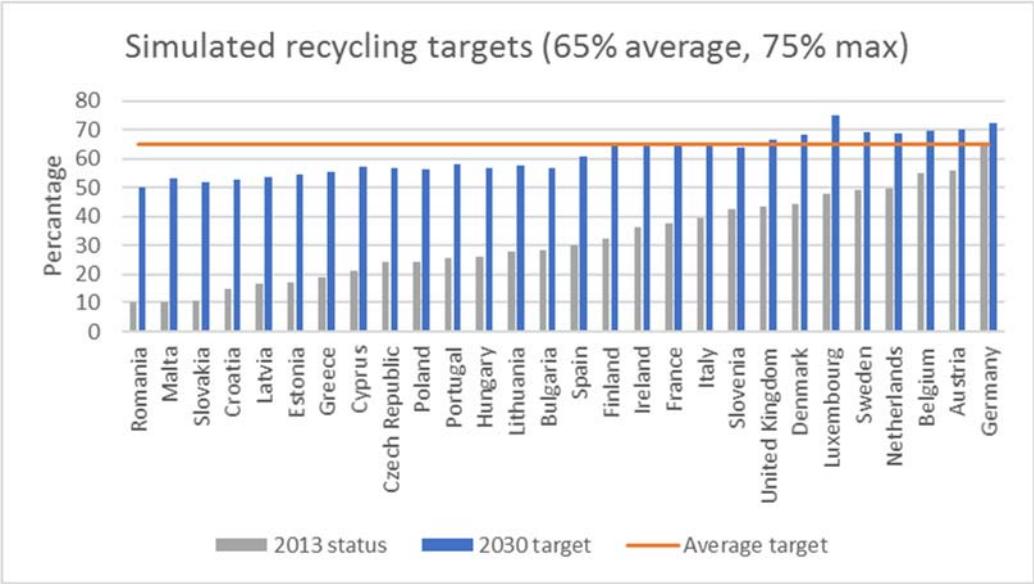
MSW recycling average	70%						70%					
MSW recycling maximum	75%						80%					
Landfill average				5%						5%		
Landfill minimum				1%						1%		
GDP effect multiplier	2						2					
Individual targets	**MSW recycling**			**Landfill**			**MSW recycling**			**Landfill**		
	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation	% target	Residual mass max target (kg)	Years Implied derogation	% target	Landfill max target (kg)	Years Implied derogation
Austria	73.2	152		1.6	9		75.9	136		1.6	9	
Belgium	72.9	118		0.9	4		75.2	108		0.9	4	
Bulgaria	63.2	163	3	31.6	140	7	57.9	186	5	31.6	140	7
Croatia	61.2	150	3	34.5	134	6	54.4	177	5	34.5	134	6
Cyprus	65.5	213	2	26.5	163	5	61.7	236	3	26.5	163	5
Czech Republic	64.6	110	3	21.7	67	5	60.1	124	4	21.7	67	5
Denmark	72.9	205		1.1	8		75.5	186		1.1	8	
Estonia	63.2	131	3	5.7	20		57.8	151	4	5.7	20	
Finland	70.8	141		5.6	27		71.4	138		5.6	27	
France	70.5	150		7.2	37		70.9	148		7.2	37	
Germany	73.9	161		0.2	1		77.1	142		0.2	1	
Greece	64.0	183	3	29.7	151	5	59.2	208	4	29.7	151	5
Hungary	63.9	139	3	27.1	104	6	59.1	158	5	27.1	104	6
Ireland	71.7	166		7.3	43		73.1	158		7.3	43	
Italy	69.8	147	1	10.9	53	1	69.4	149	1	10.9	53	1
Latvia	62.3	123	3	33.5	109	6	56.2	142	5	33.5	109	6
Lithuania	64.7	153	3	25.1	109	5	60.5	171	4	25.1	109	5
Luxembourg	75.0	154		1.0	6		80.0	123		1.0	6	
Malta	63.1	222	2	28.3	170	5	57.5	255	4	28.3	170	5
Netherlands	72.7	144		1.1	6		74.9	133		1.1	6	
Poland	63.5	99	3	22.2	60	5	58.3	113	5	22.2	60	5
Portugal	65.4	157	2	18.7	85	4	61.6	174	4	18.7	85	4
Romania	59.1	104	4	34.5	88	7	51.0	125	6	34.5	88	7
Slovakia	61.5	123	3	27.3	88	5	54.9	145	5	27.3	88	5
Slovenia	68.9	134	1	9.7	42		67.8	139	2	9.7	42	
Spain	67.6	141		19.1	83		65.5	150		19.1	83	
Sweden	73.2	118		0.6	3		75.9	105		0.6	3	
United Kingdom	71.5	137		8.1	39		72.7	132		8.1	39	
EU28		**142**			**24**			**142**			**24**	

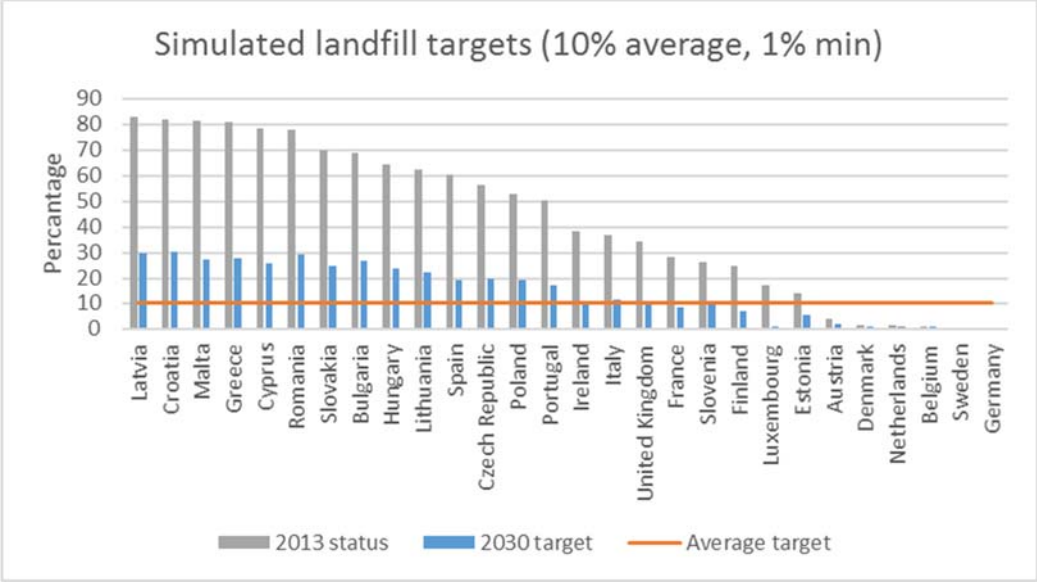
Annex VIII: Graphical representation of alternative options for differentiated target setting – percentage targets

65% MSW recycling, 10% landfill

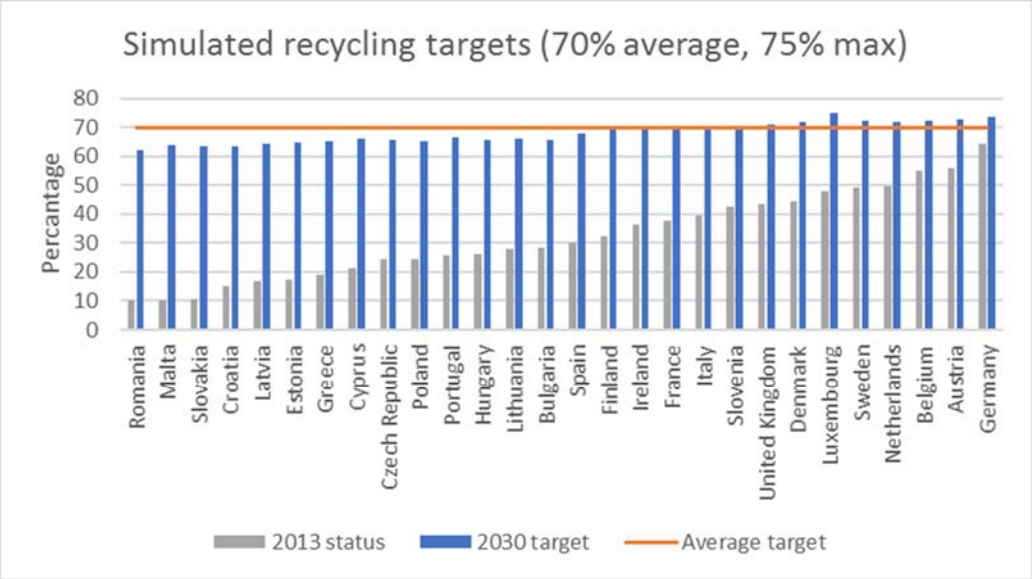


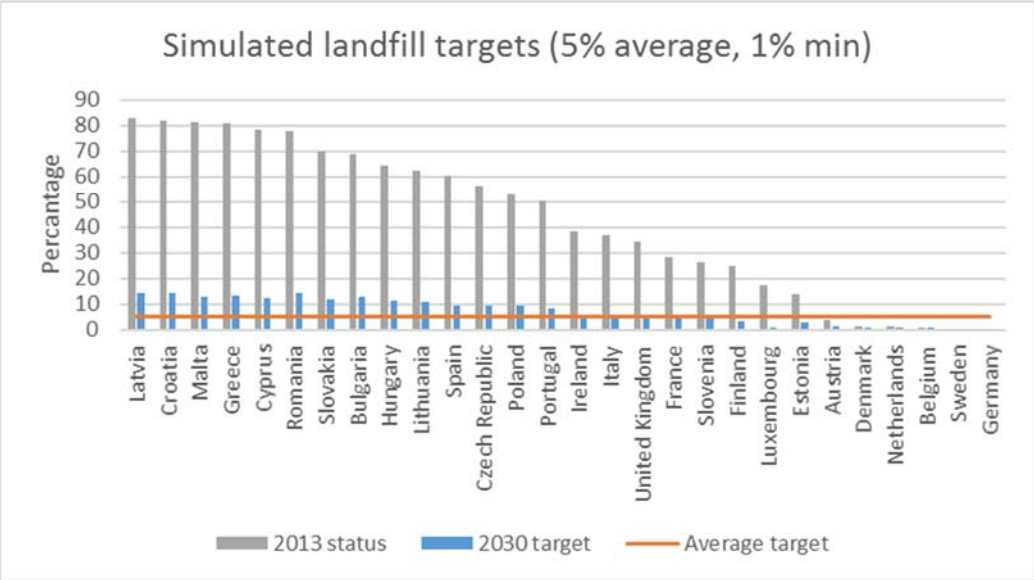


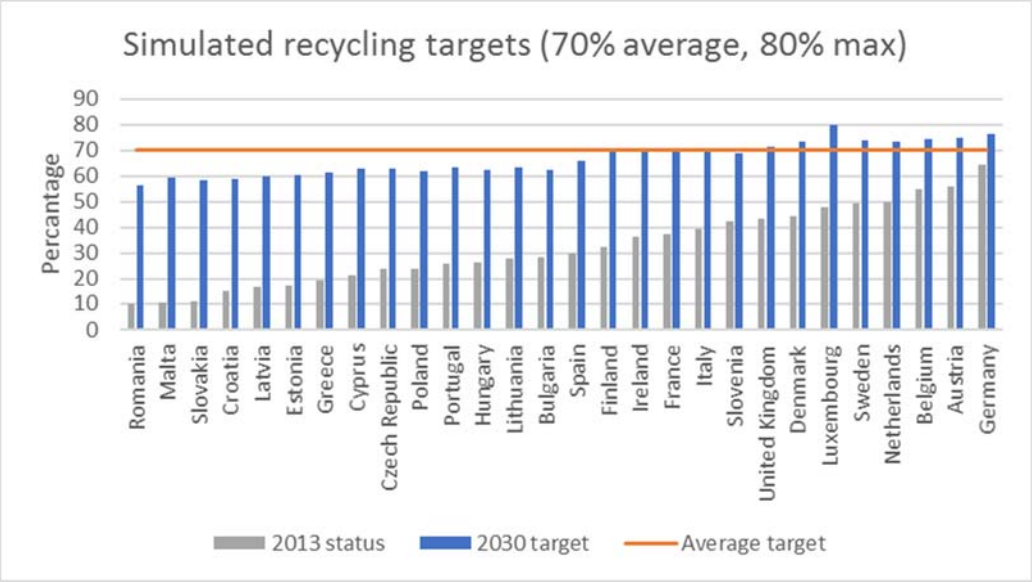

Simulated recycling targets (65% average, 75% max)
Percantage
80
70
60
50
40
30
20
10
0
Romania
Malta
Slovakia
Croatia
Latvia
Estonia
Greece
Cyprus
Czech Republic
Poland
Portugal
Hungary
Lithuania
Bulgaria
Spain
Finland
Ireland
France
Italy
Slovenia
United Kingdom
Denmark
Luxembourg
Sweden
Netherlands
Belgium
Austria
Germany
2013 status
2030 target
Average target


Simulated landfill targets (10% average, 1% min)
Percantage
90
80
70
60
50
40
30
20
10
0
Latvia
Croatia
Malta
Greece
Cyprus
Romania
Slovakia
Bulgaria
Hungary
Lithuania
Spain
Czech Republic
Poland
Portugal
Ireland
Italy
United Kingdom
France
Slovenia
Finland
Luxembourg
Estonia
Austria
Denmark
Netherlands
Belgium
Sweden
Germany
2013 status
2030 target
Average target

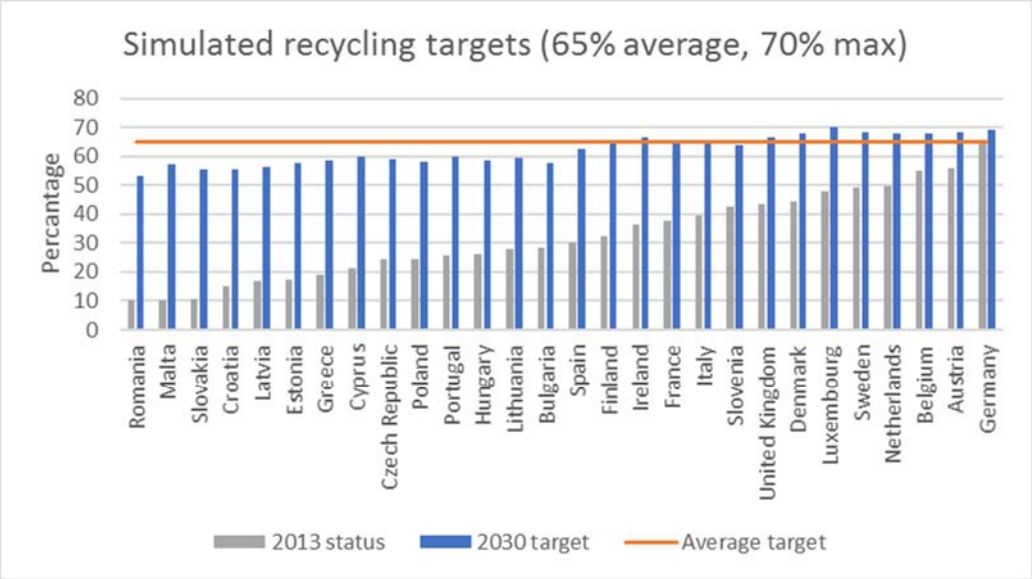
70% MSW recycling, 5% landfill

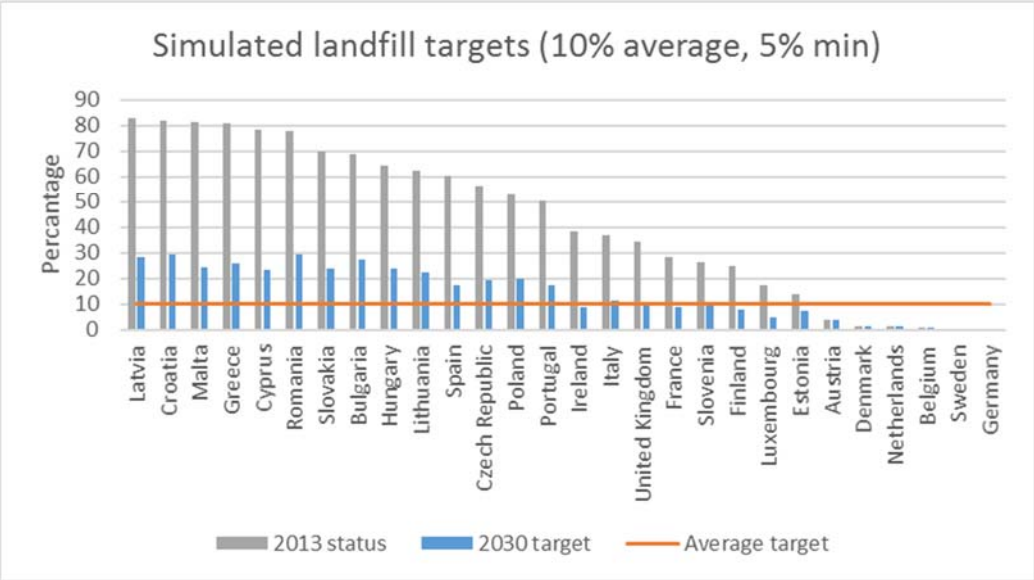


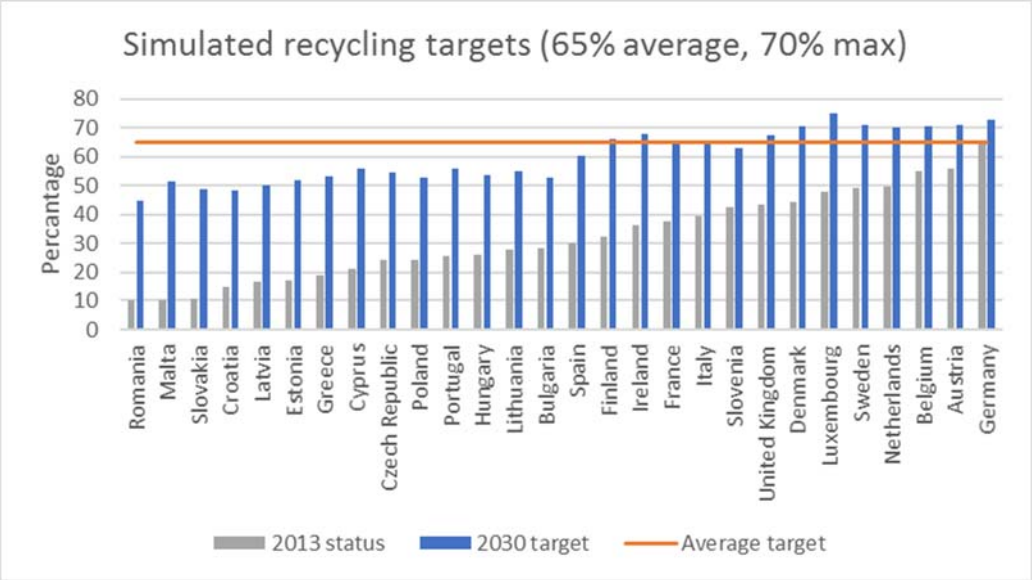



Simulated recycling targets (70% average, 80% max)
Percantage
90
80
70
60
50
40
30
20
10
0
Romania
Malta
Slovakia
Croatia
Latvia
Estonia
Greece
Cyprus
Czech Republic
Poland
Portugal
Hungary
Lithuania
Bulgaria
Spain
Finland
Ireland
France
Italy
Slovenia
United Kingdom
Denmark
Luxembourg
Sweden
Netherlands
Belgium
Austria
Germany
2013 status
2030 target
Average target

65% MSW recycling, 10% landfill with GDP effect multiplier = 2






Simulated recycling targets (65% average, 70% max)
Percantage
80
70
60
50
40
30
20
10
0
Romania
Malta
Slovakia
Croatia
Latvia
Estonia
Greece
Cyprus
Czech Republic
Poland
Portugal
Hungary
Lithuania
Bulgaria
Spain
Finland
Ireland
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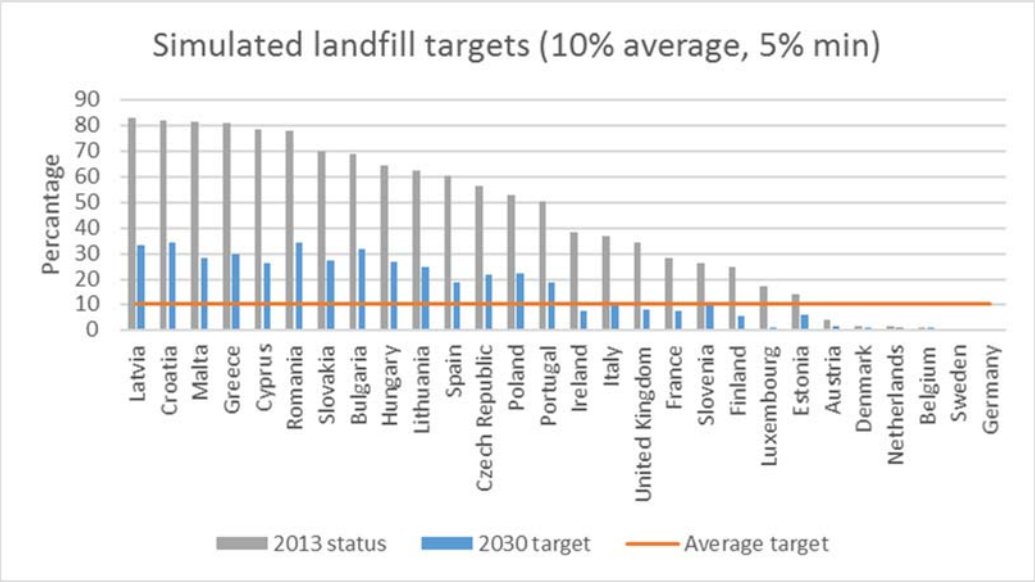
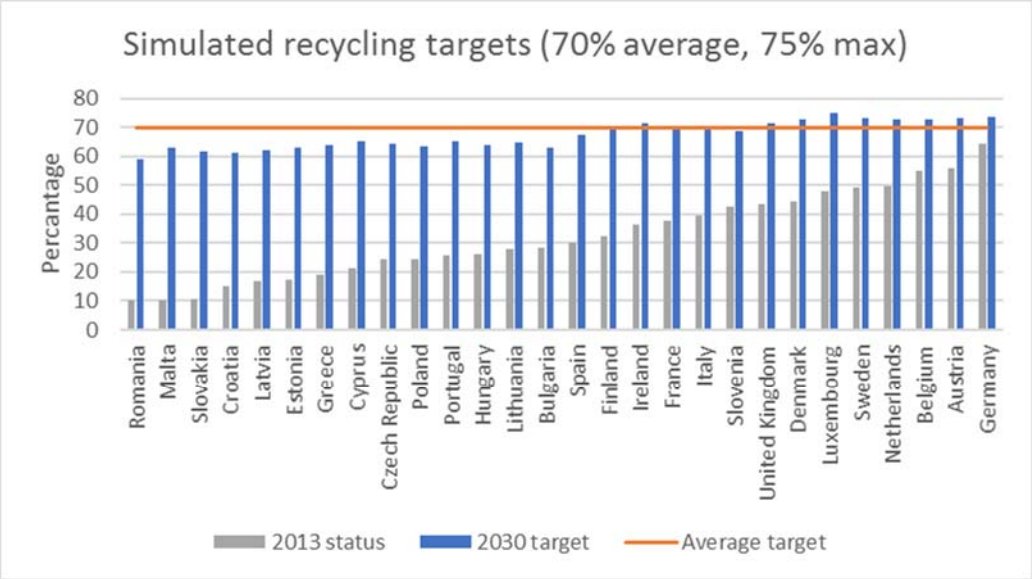
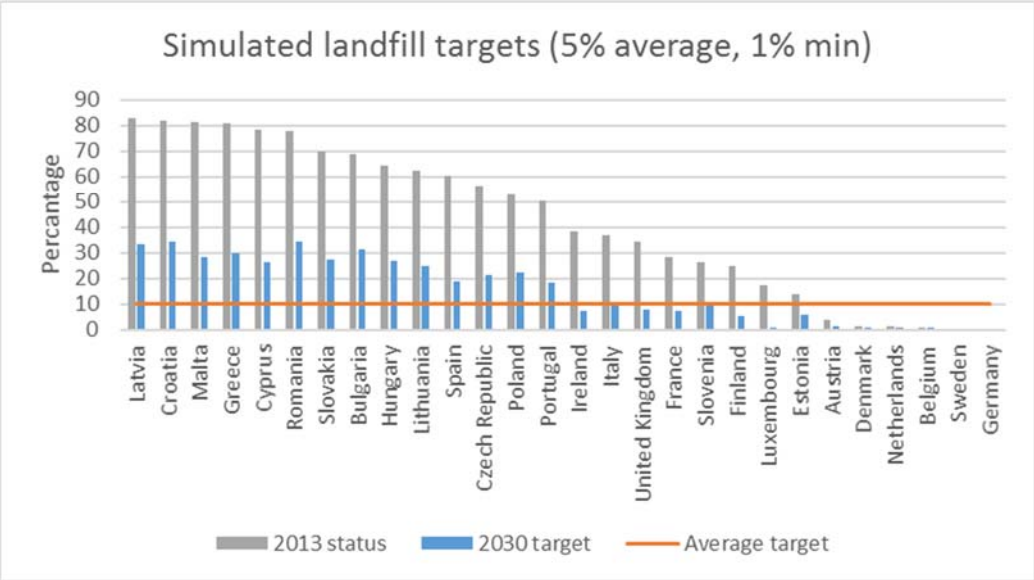
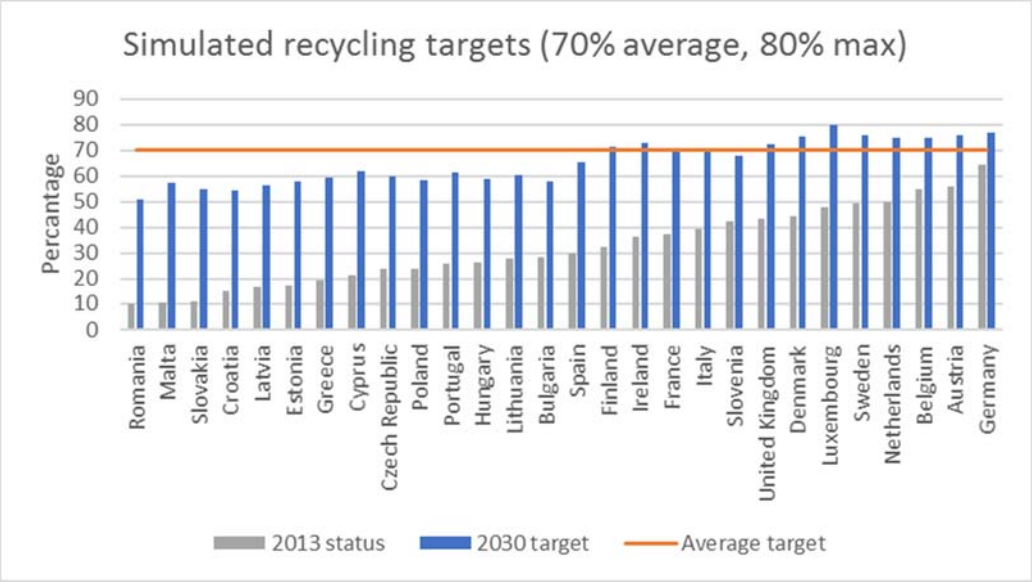
Italy
Slovenia
United Kingdom
Denmark
Luxembourg
Sweden
Netherlands
Belgium
Austria
Germany
2013 status
2030 target
Average target


Simulated landfill targets (10% average, 5% min)
Percantage
90
80
70
60
50
40
30
20
10
0
Latvia
Croatia
Malta
Greece
Cyprus
Romania
Slovakia
Bulgaria
Hungary
Lithuania
Spain
Czech Republic
Poland
Portugal
Ireland
Italy
United Kingdom
France
Slovenia
Finland
Luxembourg
Estonia
Austria
Denmark
Netherlands
Belgium
Sweden
Germany
2013 status
2030 target
Average target

70% MSW recycling, 5% landfill with GDP effect multiplier = 2

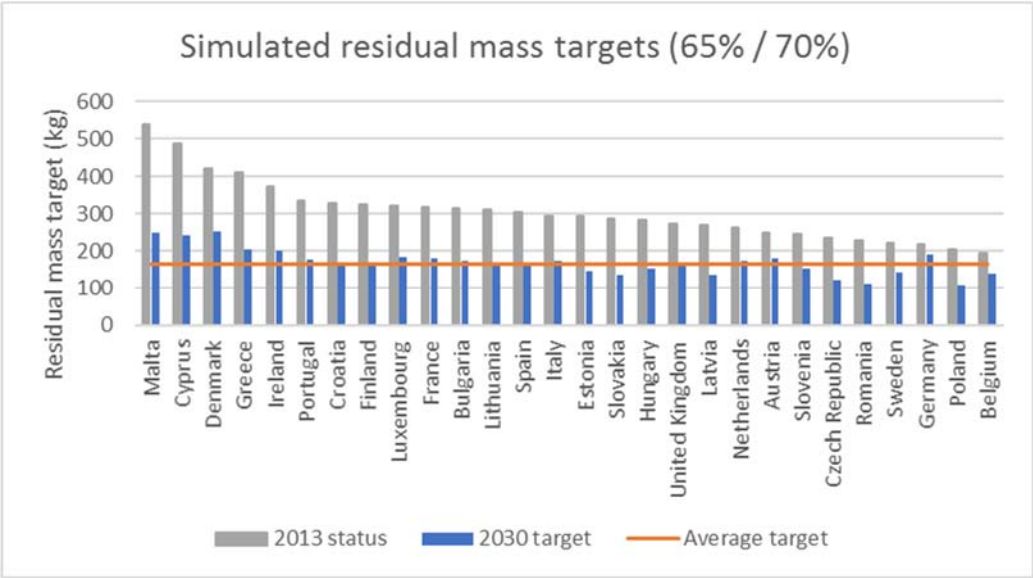


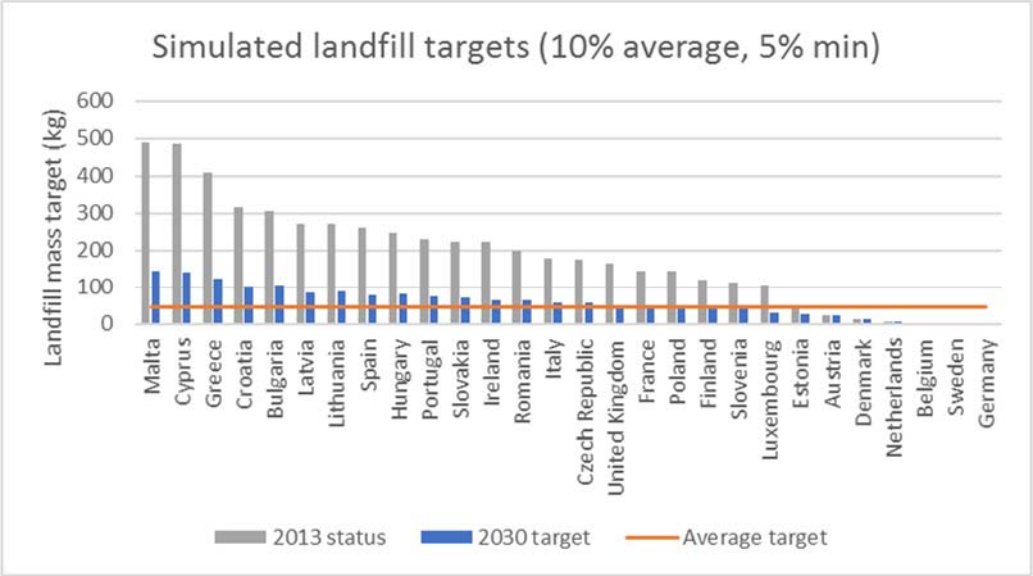


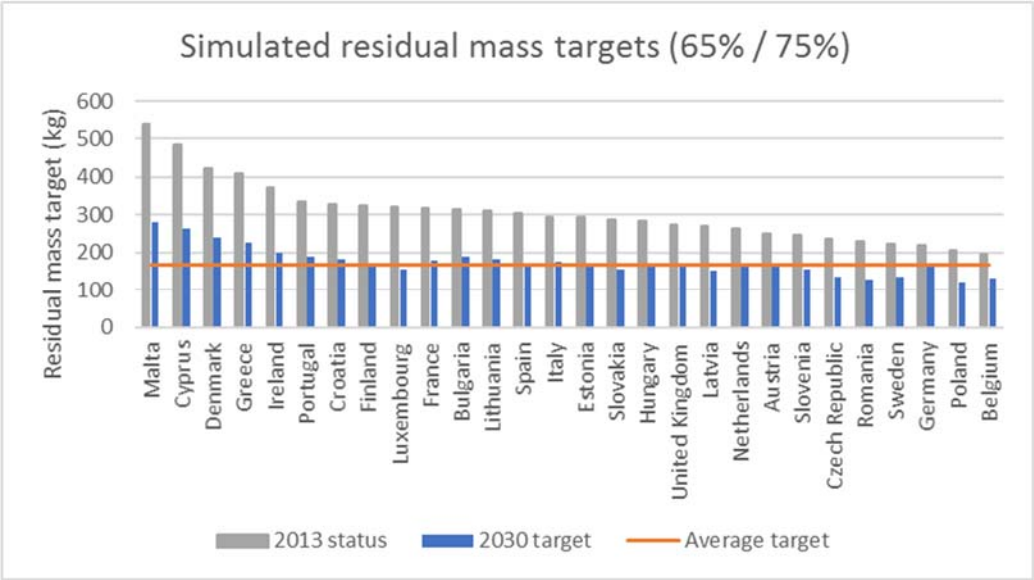

Simulated recycling targets (70% average, 80% max)
Percantage
90
80
70
60
50
40
30
20
10
0
Romania
Malta
Slovakia
Croatia
Latvia
Estonia
Greece
Cyprus
Czech Republic
Poland
Portugal
Hungary
Lithuania
Bulgaria
Spain
Finland
Ireland
France
Italy
Slovenia
United Kingdom
Denmark
Luxembourg
Sweden
Netherlands
Belgium
Austria
Germany
2013 status
2030 target
Average target

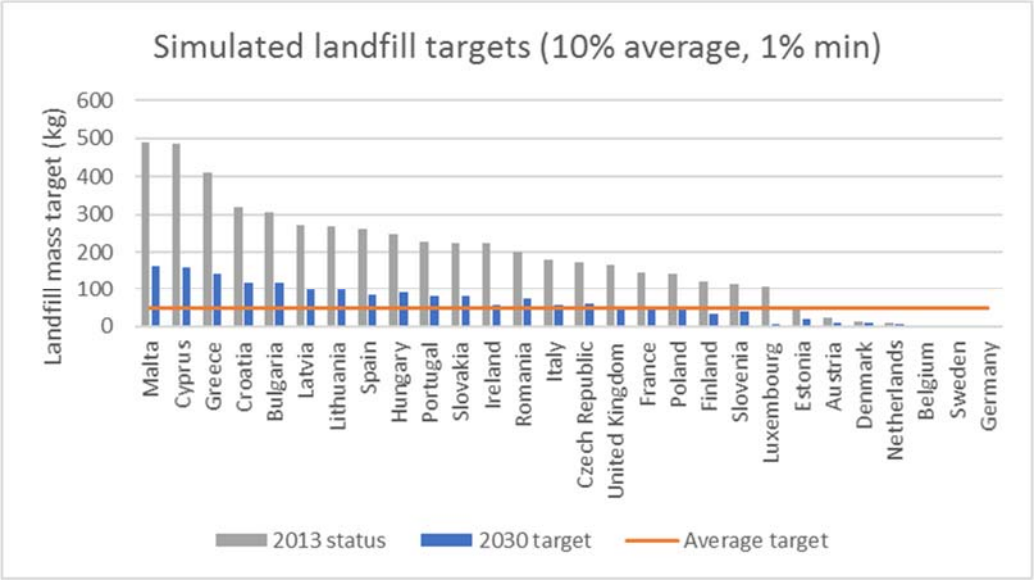
Annex IX: Graphical representation of alternative options for differentiated target setting – mass targets

65% MSW recycling, 10% landfill

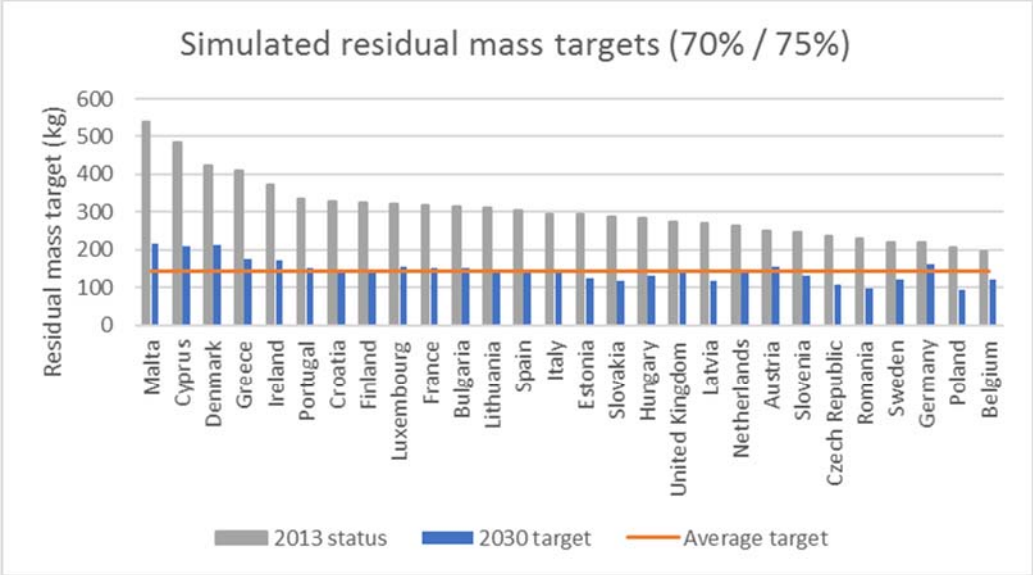


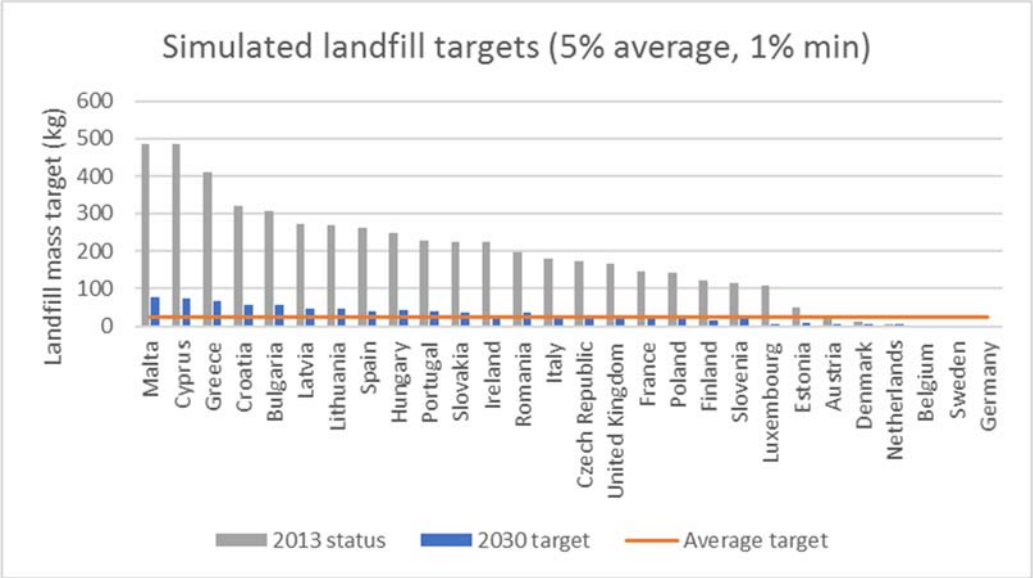


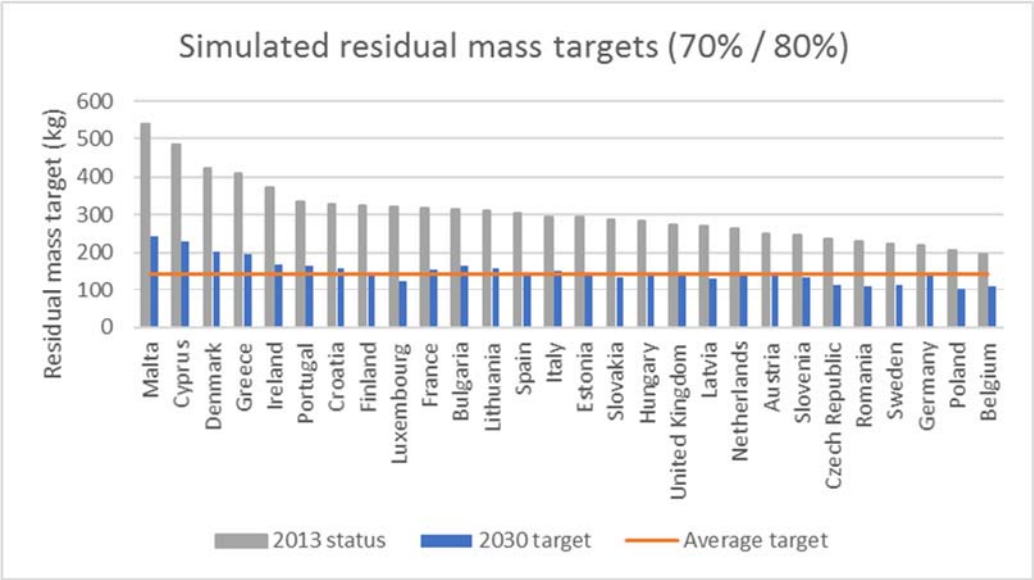

Simulated residual mass targets (65% / 75%)
Residual mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Denmark
Greece
Ireland
Portugal
Croatia
Finland
Luxembourg
France
Bulgaria
Lithuania
Spain
Italy
Estonia
Slovakia
Hungary
United Kingdom
Latvia
Netherlands
Austria
Slovenia
Czech Republic
Romania
Sweden
Germany
Poland
Belgium
2013 status
2030 target
Average target


Simulated landfill targets (10% average, 1% min)
Landfill mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Greece
Croatia
Bulgaria
Latvia
Lithuania
Spain
Hungary
Portugal
Slovakia
Ireland
Romania
Italy
Czech Republic
United Kingdom
France
Poland
Finland
Slovenia
Luxembourg
Estonia
Austria
Denmark
Netherlands
Belgium
Sweden
Germany
2013 status
2030 target
Average target

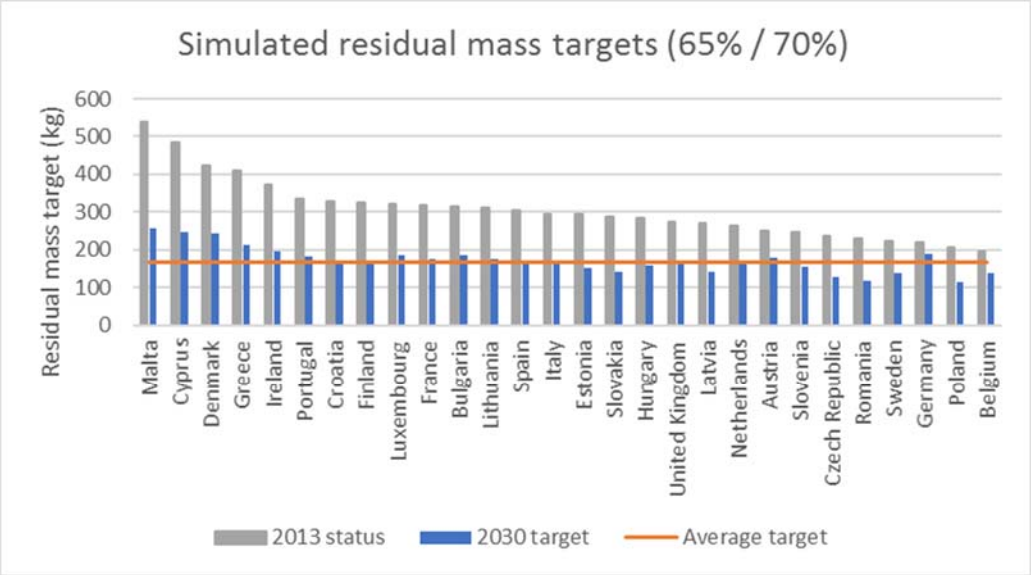
70% MSW recycling, 5% landfill

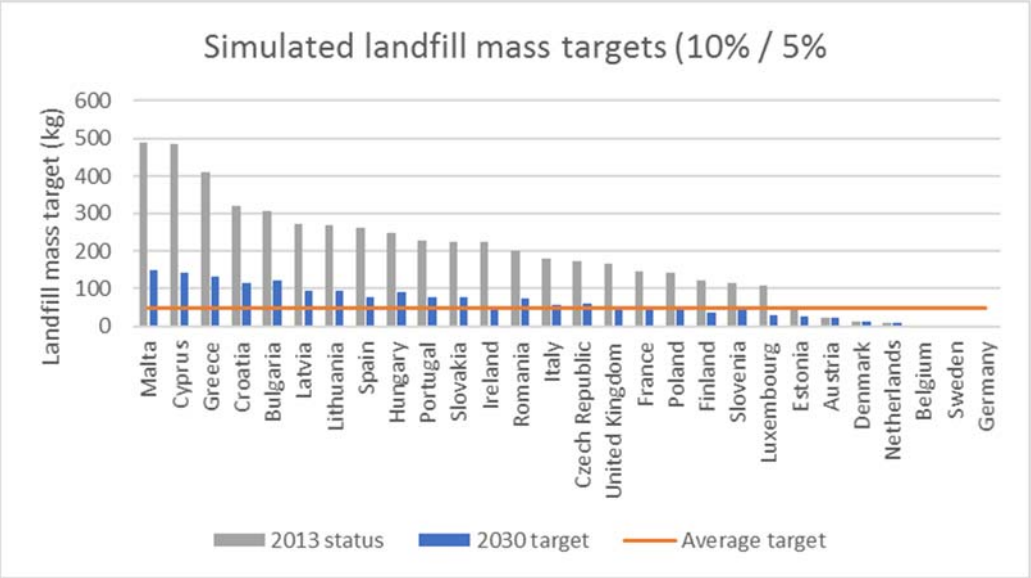


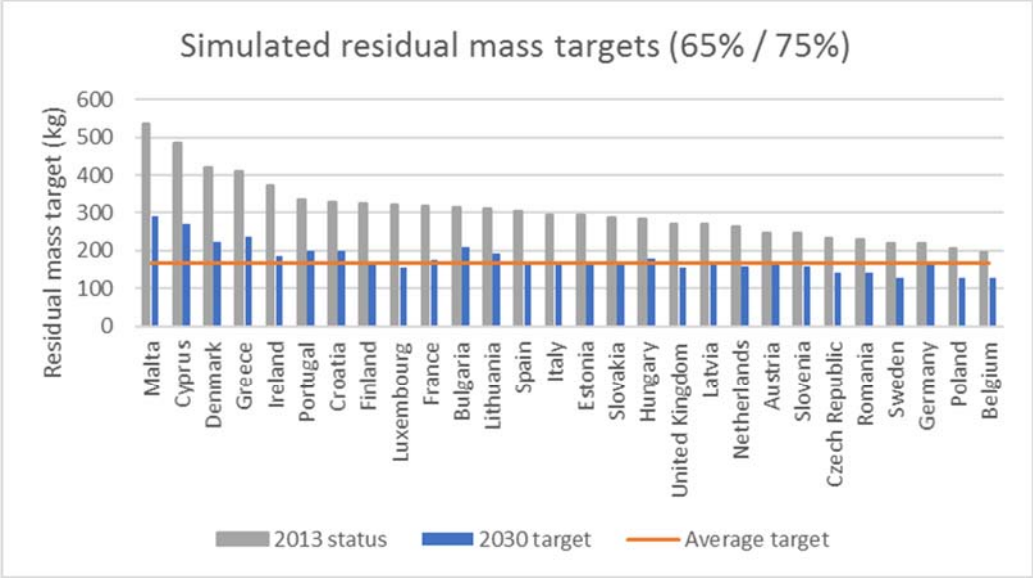



Simulated residual mass targets (70% / 80%)
Residual mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Denmark
Greece
Ireland
Portugal
Croatia
Finland
Luxembourg
France
Bulgaria
Lithuania
Spain
Italy
Estonia
Slovakia
Hungary
United Kingdom
Latvia
Netherlands
Austria
Slovenia
Czech Republic
Romania
Sweden
Germany
Poland
Belgium
2013 status
2030 target
Average target

65% MSW recycling, 10% landfill with GDP effect multiplier = 2






Simulated residual mass targets (65% / 75%)
Residual mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Denmark
Greece
Ireland
Portugal
Croatia
Finland
Luxembourg
France
Bulgaria
Lithuania
Spain
Italy
Estonia
Slovakia
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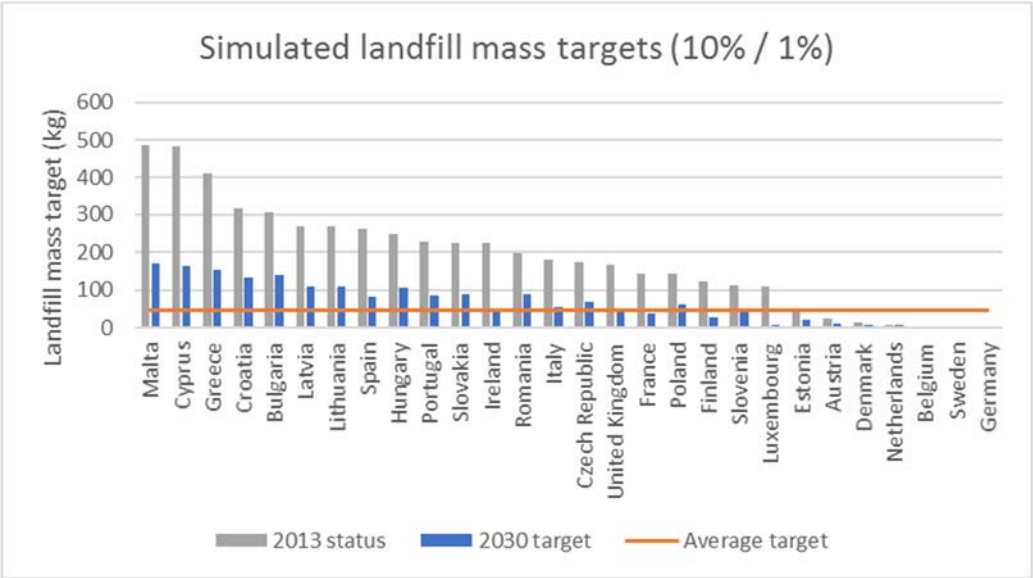
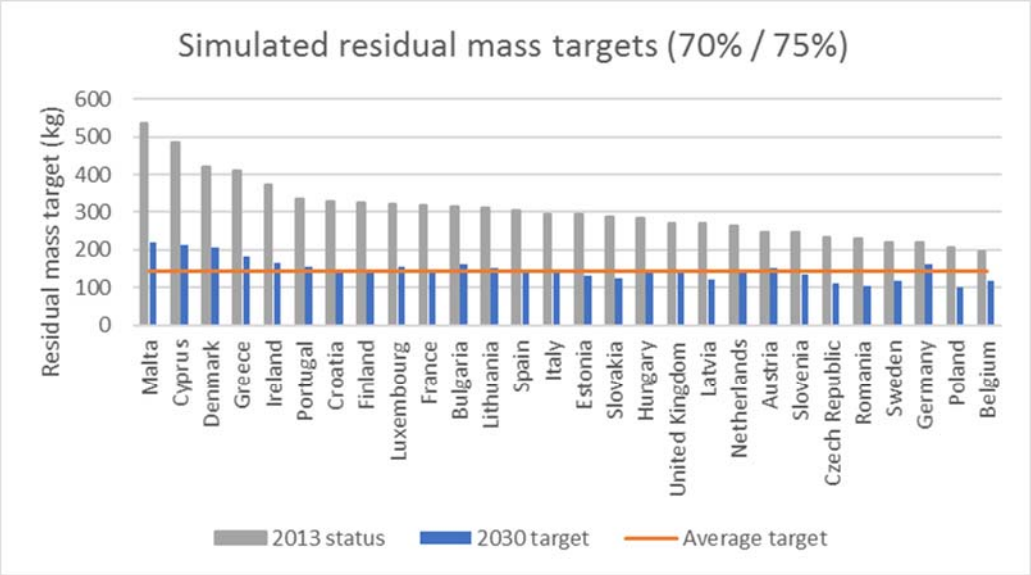
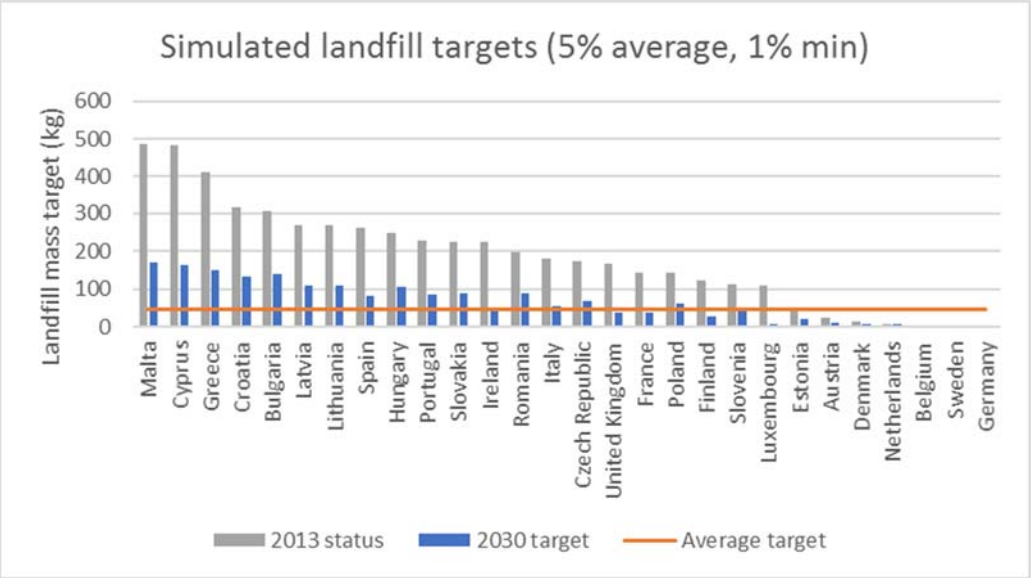
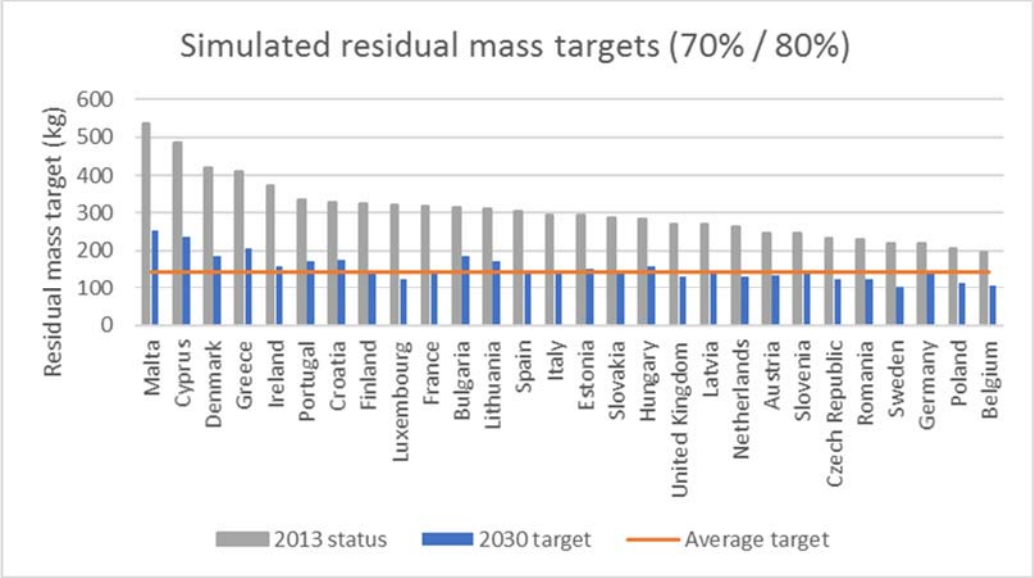
Latvia
Netherlands
Austria
Slovenia
Czech Republic
Romania
Sweden
Germany
Poland
Belgium
2013 status
2030 target
Average target


Simulated landfill mass targets (10% / 1%)
Landfill mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Greece
Croatia
Bulgaria
Latvia
Lithuania
Spain
Hungary
Portugal
Slovakia
Ireland
Romania
Italy
Czech Republic
United Kingdom
France
Poland
Finland
Slovenia
Luxembourg
Estonia
Austria
Denmark
Netherlands
Belgium
Sweden
Germany
2013 status
2030 target
Average target

70% MSW recycling, 5% landfill with GDP effect multiplier = 2






Simulated residual mass targets (70% / 80%)
Residual mass target (kg)
600
500
400
300
200
100
0
Malta
Cyprus
Denmark
Greece
Ireland
Portugal
Croatia
Finland
Luxembourg
France
Bulgaria
Lithuania
Spain
Italy
Estonia
Slovakia
Hungary
United Kingdom
Latvia
Netherlands
Austria
Slovenia
Czech Republic
Romania
Sweden
Germany
Poland
Belgium
2013 status
2030 target
Average target

Annex X: Outreach and expert input

The following meetings took place with experts and interested parties to inform the compilation of this report. These meetings were for exchange of information only and in no way indicate any support for, or endorsement of, the findings of this study on behalf of the parties listed. No person or organisation external to the Impact Assessment Institute has been given access to the content of the study in advance of the peer review of this draft.

Date	**Meeting counterparts**
02/03/2016	European Environment Agency (EEA): introduction to the model used for the management of waste in the Circular Economy package.
22/03/2016	European Automobile Manufacturers' Association (ACEA).
04/04/2016	Officials of the Polish Permanent Representation.
05/04/2016	Representatives of non-governmental organisations active in this policy domain.
25/05/2016	Pavel Telička, Member of the European Parliament.
27/05/2016	EXPRA and Fost Plus.

Annex XI: Responses to comments received from stakeholders on draft report

All comments received from stakeholders to the draft report provided on 8th July 2015 have been taken into account in the compilation of the final report. Where publication was approved by the contributor, the comments are recorded, commented upon by the IAI below, with action taken where new evidence or analysis has thus been highlighted.

Responses were received by the following organisations:

- European Commission DG GROW
- European Environment Agency
- Permanent Representation of Denmark to the EU
- EXPRA
- A representative of an EU Member State government (not to be published)

The responses and corresponding IAI comments are recorded I the following table:

Organisation: European Commission DG ENVI Date: 28th June 2016		
Content of response	**Changes made to report**	**Response of Impact Assessment Institute**
In response to the observations and request for additional data in the draft version of this IAI study, spreadsheets containing detailed annualised data outputs from the model for each Member State.	Yes	This data has been valuable in understanding the results generated by the model, analysing the scenarios and concluding on the legislation.
Organisation: European Commission DG GROW Directorate C "Industrial Transformation & Advanced Value Chains" Date: 28th June 2016		
Content of response	**Changes made to report**	**Response of Impact Assessment Institute**
Thank you for evaluating the Commission impact assessment accompanying the Circular Economy legislative package. We welcome all critical views on the Commission analytical documents which are designed to guide the political decision-making process. As the process is still ongoing, we will certainly use this additional feedback, but also for the same reason, I am unable to comment on the report findings at present. However, referring to your concerns expressed in the report with regard to quality of data and feasibility of individual Member State of meeting the revised recycling targets, I would only like to stress, that the Commission has been aware of the limits of the available data which was one of the reasons for additional flexibility introduced to the	No	The IAI appreciates the encouragement for its work and the continuing commitment to improving the Impact Assessment system.

revised legislative proposal as compared to the one presented in 2014. I am also sure that the additional raw data provided by my colleagues in DG ENV will give more light on the amount of work invested in the analysis in question. In addition, I want to ensure you the Commission is keen to keep improving its impact assessment system and will take into account the findings of your report in its future work as appropriate. The present Commission pays a very high importance to the transparency of the process and quality of analytical work. To this end the Commission has reformed its impact assessment system with the introduction of the Regulatory Scrutiny Board. The new system is supervised by the nominated Vice President for Better Regulation Frans Timmermans.		
Organisation: European Environment Agency Date: 22nd June 2016		
Content of response	**Changes made to report**	**Response of Impact Assessment Institute**
Thank you for giving us the opportunity to comment on your study. Please understand that our comments cannot be seen as a complete peer review, as we will focus on data issues and modelling procedures only, not on the policy-relevant choices regarding the Impact assessment.	No	
In your main findings (p.2) you state that the model lacks transparency, not being available to stakeholders and thus not open to detailed external scrutiny. Please note that the EEA has organised two workshops on the waste model specifically for Member States in March 2015 and May 2016, and thereby has offered access to the waste model. Furthering insight in, and getting feed-back on, the modelling procedures and improving the quality of input data is a key consideration here (see also next point).	Yes (section 2.2.1)	The efforts of the EEA in providing information to stakeholders is a valuable addition to the Impact Assessment work and will be additionally acknowledged in the final report. Our broader concern is that the model, being the main determinant of the analytical results, was not fully available to all stakeholders (Member States and others) to allow independent scrutiny and

		scenario analysis.
On pages 12 and 13, the quality and reliability of the country input data is questioned. The model documentation addresses the nature and quality of input data extensively. The data that the model requires are not always available at the required level of detail in all countries, necessitating some approximations. To provide insight in their implications, sensitivity analysis has been undertaken for a number of parameters by the consortium led by Eunomia. The EEA will work on updating the key input data throughout 2017, and we expect to be able to reduce some of the uncertainties in the data through consultation with the Member States.	Yes (section 4.2)	The IAI comments in this respect acknowledge the significant resources required to compile accurate data and the inherent limitations of any reasonable effort to do so, recognising the issues raised by the EEA. We also emphasise that these limitations constrain the potential accuracy of the modelling and therefore the validity of the results and conclusions. This could potentially result in material discrepancies in some results and therefore incorrectly aligned targets for some Member States.
On p. 18 of the report, the study calls for considering the local effects of air pollution. The damage costs per tonne of air pollutant published by the EEA are country-specific. Taking into account local, sub-national differences would make the model even more complex and would require knowledge not only about local conditions of vulnerability to air pollutants, but also knowledge about the location of future installations. Such data is usually not available.	Yes (section 5.2.2)	The IAI study acknowledges that full sub-national modelling of pollution effects would be excessively complicated. Nevertheless, the lack of assessment of local pollution effects omits an important area of public policy relevant to decision making on the treatment of waste. It would

		appear necessary to take these effects into account when setting policy.
Organisation: Permanent Representation of Denmark to the EU Date: 5th July 2016		
Content of response	**Changes made to report**	**Response of Impact Assessment Institute**
The study covers some important issues regarding the impact assessment. We find especially the lack of transparency troublesome. The published results are not sufficient detailed to provide Member States with an understanding of the effects on Member State level. This is problematic when Member States try to understand how the estimated benefits are expected to mature and what national policy schemes should be implemented to most effectively achieve the goals set out.	No	We appreciate the acknowledgement of our findings.
In addition to these concerns we will like to place attention on the waste collection module. The module consists of 5 different collection systems which correspond to different levels of overall recycling. Based on the current recycling rate of a Member State a mix of collection systems is assumed for the member stat. For Denmark the assumed mix of collection systems poorly resembles the actual collection system. The study would have benefitted from a more flexible framework to model the actual collection systems in place rather than assume a collection system based on current recycling rates.	No	This appears to affirm the study's comments on the lack of fully robust Member State data, potentially resulting in material discrepancies.
The choice of collection system determines the collection rate in the model. This central element could have been advanced by a more thorough documentation of the effect of different collection systems on recycling rates. This especially becomes of importance when moving from collection system 4 to 5, where the only change is the introduction of pay as you throw (PAYT). There is not provided documentation on the effects of PAYT or what type of PAYT-schemes is assumed. According to the conducted impact assessment, around half the collection systems have to be PAYT to realize 65 % recycling. Because the introduction of PAYT implicitly acts to increase the efficiency of collection system 4 the lack of documentation is especially problematical.	No	The issue is duly noted. All projected effects require background documentation to provide a fully comprehensive record of the evidence.
Organisation: EXPRA Date: 5th July 2016		
Content of response	**Changes made to report**	**Response of Impact Assessment**

		Institute
We fully support the statement on page 31 regarding the financial contribution of the obliged industry: "The 2015 legislative proposal defines financial contributions to comply with the EPR obligations in a broad way, without the clarity recommended by the Impact Assessment. The proposal does not set any limits and the list of financial contributions is open-ended. A potential consequence is that industry may be made responsible for actions that are not part of their remit or influence " We strongly believe that each stakeholder can only be made financially responsible for the costs falling under their remit and influence. In this respect, the obliged industry can only be made accountable for the standard costs stemming from the take back of packaging waste and its recycling/recovery process, as long as these exclusively fall within their dedicated collection systems.	No	The IAI appreciates the acknowledgement of its comments.
Concerning the following statement, again on page 31: "These requirements appear to represent a significant administrative burden for national and local authorities. This burden is not assessed in the Impact Assessment." we would like to note that currently (especially for packaging waste) in 25 of 28 EU Member States EPR is implemented and as all of them are revising their legislation regularly, such minimum requirements will help to ease their national revision process. Furthermore, we believe that at present most of the exiting EPR systems (again especially in packaging waste) are aligned with the proposed EPR requirements and respectively these will not represent such a burden, but will more provide for a level playing field. We have recently published an updated brochure with information on EXPRA 25 members (17 of which in EU MS), that you might find interesting: http://www.expra.eu/uploads/downloads/Broshura2016.pdf	Yes (section 6.2)	This point is most relevant for packaging waste and the study has been amended to include a corresponding reference.

[i] "Procedures for Conduct of Studies", Impact Assessment Institute, December 2015 (http://www.impactassessmentinstitute.org/#!procedures/c1q8c).

[ii] "Impact Assessment on Options Reviewing Targets in the Waste Framework Directive, Landfill Directive and Packaging and Packaging Waste Directive" Final Report, Report for the European Commission DG Environment under Framework Contract No ENV.C.2/FRA/2011/0020, 7th February 2014.

[iii] "Impact Assessment Accompanying the document: A policy framework for climate and energy in the period from 2020 up to 2030", European Commission SWD (2014) 15, 22nd January 2014.

[iv] "Report on transparency, consistency and feasibility in the Impact Assessments accompanying the European Commission Communications SWD (2014) 15 and SWD (2014) 255", the Impact Assessment Institute, 14th December 2015.

[v] Press release "Eurostat data for 2014 confirms need for European residual waste target", ZeroWaste, 23rd March 2016 (https://www.zerowasteeurope.eu/2016/03/press-release-eurostat-data-for-2014-confirms-need-for-european-residual-waste-target/).

[vi] Proposed amendments 936, 937, 1054-57, European Parliament Committee on Environment, Public health and Food Safety list of proposed amendments, 18th July 2016 (http://www.europarl.europa.eu/oeil/popups/ficheprocedure.do?lang=&reference=2015/0275(COD)#documentGateway) and proposed amendments 379 & 380, European Parliament Committee on Industry, research and Energy list of proposed amendments, 21st June 2016 (http://www.europarl.europa.eu/committees/en/itre/amendments.html).

[vii] Residual waste is waste not fit for recycling, reuse or prevention.

[viii] "Costs of air pollution from European industrial facilities 2008–2012 — an updated assessment", European Environment Agency Technical report No 20/2014, 24th November 2014 (http://www.eea.europa.eu/publications/costs-of-air-pollution-2008-2012).