European Environment Agency
European Topic Centre on Waste and
Materials in a Green Economy

Scenarios for municipal waste recycling based on the European Reference Model on Municipal Waste

A contribution to the first Early Warning report

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1 Introduction

In the 2015 Circular economy package[1], the European Commission (EC) has proposed measures for better and more uniform implementation of waste legislation, including early warning mechanisms. This includes, *inter alia,* a proposal for the revision/amendment of three directives (Directive 2008/98/EC on waste (Waste Framework Directive, WFD), Directive 94/62/EC on packaging and packaging waste and Directive 1999/31/EC on the landfill of waste) which explicitly refer to a support by the EEA to the EC to draw up early warning reports on the progress of Member States (MS) towards the achievement of targets laid down in the directives.

The aim of the early warning procedure is to anticipate implementation risks and to provide a basis for the EC to take action ahead of the targets' deadlines. The EEA shall support the EC in developing the early warning reports related to the recycling targets for municipal waste, packaging waste and diversion from landfill as included in the Circular economy package.

While the first official early warning report for the proposed new recycling targets of the Waste Framework Directive would be due in 2022, the EC is planning to test the procedure and produce a first early warning report already in 2018, focusing on the achievement of the target to recycle 50 % of some fractions of household and similar wastes by 2020 as required by the 2008 Waste Framework Directive and according to the calculation methods chosen by the MS.

1.1 EEA support to the Early Warning report

The EEA with support from the ETC/WMGE contributes to the first early warning report through updating the European Reference Model on Municipal Waste (in this report: 'the waste model') and applying it to calculate distance from the 2020 targets on recycling as laid down in the 2008 Waste Framework Directive as well as related impacts.

The calculation of the distance in 2020 from the recycling target of the 2008 WFD is based on a baseline scenario. Related impacts are shown in this report by comparing the impacts of the baseline scenario with a scenario that simulates full implementation of existing targets ('full implementation scenario') (Box 1).

The waste model was originally developed by a consortium led by Eunomia Research and Consulting Ltd. for the European Commission as a tool for the Impact assessment accompanying the Circular economy package. Since the end of 2015, the waste model is hosted by the EEA, supported by the ETC/WMGE. Throughout 2017, the EEA and ETC/WMGE have updated the waste model with recent data and projections. This included an update of the existing baseline scenarios included in the waste model that was transferred to the EEA in 2015. The update mainly builds on data and information provided by Member States through a questionnaire in 2017 and which was collected by

[1] European Commission (2015) Proposal for a Directive of the European Parliament and of the Council Amending Directive 2008/98/EC on Waste, COM(2015) 595 Final, December 2015, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52015PC0595

a consortium led by Eunomia Research and Consulting Ltd. under contract with the EC[2]. The results of these calculations can contribute to identify implementation risks and quantify related impacts.

Box 1 Scenarios used in the report

Baseline scenario - The baseline scenario represents an expert opinion for future generation and management of municipal solid waste in each Member State. This scenario presents a critical view of the effects of known policy measures and planned waste treatment capacity as reported by the Member States as part of this project. Thus, the scenario presents a possible future development which is inevitably uncertain. It is used as one of several possible factors, helping to identify a potential risk of not meeting the target for recycling, thus forming a basis for dialogue.

Full implementation scenario – This scenario simulates a situation where each Member State fully meets both the 50% recycling targets of the 2008 WFD and the targets for the diversion of biodegradable municipal waste from landfill as laid down in the 1999 Landfill Directive. It takes into account that MS can choose between four different methods to monitor compliance with the recycling targets, as well as time derogations for the Landfill diversion targets. This scenario is kept static after 2020, i.e. it does not consider post-2020 targets and thus the shares of MSW sent to the different waste management options do not change after 2020. However, it takes into account projected changes in waste generation.

1.2 Contents of this report

This report consists of four parts:

A **Headline report** in which the results of the calculations with the waste model are presented. These results include distance to target analysis for all 28 Member States for the WFD target (= 50% recycling by 2020) according to the method chosen by the country. It also includes a comparison of the baseline scenario to the full implementation scenario for three impact categories:

- Financial costs and environmental costs (externalities - monetarised greenhouse gas emission and key air pollutant costs), expressed as NPV[3]
- Employment
- Greenhouse gas (GHG) emissions

All results are shown for the year 2020, while the distance to the target is also shown for the year 2025.

Annex 1 includes more detailed country specific analysis for those countries that have been identified to be at risk for not meeting the WFD recycling target. The analysis shows, for the period 2015-2025:

[2] Eunomia Research and Consulting Ltd. *et al.*, The Early warning Mechanism - Study to Identify Member States at risk of non-compliance with the 2020 target of the WFD and to follow-up the compliance promotion exercise phase 1 and 2, under Framework Contract ENV.C.2/FRA/2013/0023.

[3] financial costs are based on the social metric approach (i.e. subsidies and taxes are not taken into account) and shown in 2015 prices

- the development of municipal solid waste management for both the baseline scenario and the full implementation scenario;
- the calculated recycling rates according to the chosen method in the baseline scenario, and comparing calculated to reported data.
- the change in impacts when moving from the baseline scenario to the full implementation scenario (financial and environmental costs, employment and GHG emissions).

Annex 2 describes the updates of data and baselines for each Member State, including gap-filling where it was necessary and assumptions made on the interpretation of data where data provided did not fully fit into the model structure.

Annex 3 describes the updates that were done to the waste model with respect to material revenues, electricity revenues and reject rates.

2 Modelling results

2.1 Summary of 2017 data updates in the European Reference Model on Municipal waste

The results presented in this report are based on the updated version of the waste model (version of December 2017). The comprehensive update means that results produced with the December 2017 version of the waste model are not comparable with modelling results of previous model versions. Different updating activities might pull results in the same direction, or balance each other out. The updated version of the waste model better reflects the situation from 2015 onwards than the previous version of the waste model.

2.2 Distance to the 50% recycling target of the Waste Framework Directive (2008/98/EC)

Table 1 gives an overview of the recycling rates calculated by the waste model using the method chosen by each MS for the years 2020 and 2025. For the target year 2020 this is also shown in Figure 1. Box 2 explains the four calculation methods for showing compliance with the target according to the Commission Decision 2011/753/EU[4], and how the waste model simulates them.

[4] 2011/753/EU: Commission Decision of 18 November 2011 establishing rules and calculation methods for verifying compliance with the targets set in Article 11(2) of Directive 2008/98/EC of the European Parliament and of the Council (notified under document C(2011) 8165).

Box 2 Assumptions made in the waste model regarding the calculation of recycling rates following the four calculation methods according to Commission Decision 2011/753/EU

Calculation Method 1 - *Preparation for reuse and recycling of paper, metal, plastic and glass household waste* (Commission Decision 2011/753/EU). This method only includes paper, metals, plastics and glass from **household waste**. As a default the waste model assumes that 80% of the MSW is household waste.

Calculation Method 2 - *Preparation for reuse and recycling of paper, metal, plastic, glass household waste and other single types of household waste or similar waste* (Commission Decision 2011/753/EU). The waste model uses for the fractions paper, metal, plastic and glass an approach that is similar to the one used in calculation method 1 although the calculation is based on the **total amount of MSW**, not only the fraction coming from households. The fractions food, garden, wood, textiles, inerts and others, are only included in the calculation of the recycling rate if their **individual recycling rate is > 50%**, based on the total amount of MSW.

Calculation Method 3 - *Preparation for reuse and recycling of household waste* (Commission Decision 2011/753/EU). In the waste model household waste and non-household waste are modelled in the same way and it is assumed that the composition of household waste and non-household waste in MSW is the same. As a default the waste model assumes that 80% of the MSW is household waste.

Calculation Method 4 - *Preparation for reuse and recycling of municipal waste* (Commission Decision 2011/753/EU). This is calculated using the **total amount of MSW** recycled divided by the total amount of MSW generated. As a default rejects from sorting operations are deducted from separately collected recyclables. This means that the modelling results for the recycling rates according to method 3 and method 4 are the same.

According to the model-results, 12 EU MS reach the 50% recycling target in 2020 using the calculation method chosen by the MS. These MS are: Austria, Belgium, Czech Republic, Denmark, Germany, Ireland, Italy, Lithuania, Luxembourg, Netherlands, Slovenia and Sweden.

Most of the MS not reaching the 50% recycling target were also identified as MS at risk of not meeting this target in a separate assessment performed by a consortium led by Eunomia Research and Consulting Ltd for the EC[5]. Specific and more detailed analysis of the countries at risk can be found in annex 1 of this report. Table 1 does not show results for France and it shows a recycling rate below 50% for the United Kingdom for 2020 and 2025, nevertheless the country was not analysed in detail in annex 1. These decisions are based on the following considerations:

- For France the waste model could not be updated because of a lack of updated data in time for the updating procedure. France has reported a recycling rate of 65.1 % in 2014 (method 2)[6]. It was thus not seen as appropriate to use the waste model without an update to calculate future developments that cannot properly reflect the latest developments, especially not policies put

[5] Eunomia Research and Consulting Ltd. e*t al*., Study to Identify Member States at Risk of Non-Compliance with the 2020 Target of the Waste Framework Directive and to Follow-up Phase 1 and 2 of the Compliance Promotion Exercise, Interim Report, 2017.

[6] Eunomia Research and Consulting Ltd. e*t al*., Study to Identify Member States at Risk of Non-Compliance with the 2020 Target of the Waste Framework Directive and to Follow-up Phase 1 and 2 of the Compliance Promotion Exercise, Interim Report, 2017.

into place since 2012. In combination with the conclusions of Eunomia's Early Warning report[6], this led to the decision to exclude France from the analysis in this report.

- The United Kingdom has reported a recycling rate of 44% (method 3) in 2015 and is thus quite close to the target already. Unfortunately, due to the limitations explained in Box 2 with regard to method 3, the reported recycling rate cannot be fully reproduced by the waste model, and the calculated recycling rates for 2020 and 2025 in Table 1 are thus lower than what should be expected. These uncertainties, in combination with the conclusions of Eunomia's Early Warning report[6], led to the decision not to perform a detailed analysis in annex 1.

Table 1 Projected recycling rates (%) in 2020 and 2025 following the baseline scenario, for all MS, according to the method chosen by the MS

Country	Calculation method chosen by the country	Model output – recycling rate in 2020 (baseline) %	Model output – recycling rate in 2025 (baseline) %
Austria	Method 2	71%	71%
Belgium	Method 3	59%	61%
Bulgaria*	Method 4	32%	38%
Croatia*	Method 2	31%	43%
Cyprus	Method 2	38%	45%
Czech Republic	Method 2	57%	59%
Denmark	Method 1	53%	55%
Estonia*	Method 2	45%	45%
Finland*	Method 4	40%	40%
Germany	Method 4	57%	57%
Greece*	Method 2	42%	47%
Hungary*	Method 2	46%	46%
Ireland	Method 1	52%	52%
Italy	Method 2	58%	60%
Latvia	Method 4	33%	33%
Lithuania	Method 2	50%	58%
Luxembourg	Method 2	60%	60%
Malta*	Method 1	41%	47%
Netherlands	Method 2	63%	70%
Poland	Method 2	47%	47%
Portugal*	Method 2	34%	40%
Romania[7]	Method 2	26%	40%
	Method 4	21%	30%
Slovakia	Method 4	29%	29%
Slovenia	Method 4	51%	51%
Spain*	Method 4	20%	22%
Sweden	Method 2	58%	58%
United Kingdom	Method 3	44%	44%

* The default methods applied in the model to calculate the recycling rates cannot fully reproduce the methods used in Bulgaria, Croatia, Estonia, Finland, Greece, Hungary, Malta, Portugal and Spain. Additional manual calculations were therefore performed for these countries (see explanations and Table 2 below)

[7]Romania has so far reported based on method 4 but the country has indicated the intention to change to method 2 (see Annex 1 to this report).

The waste model makes some default assumptions for the calculation of the recycling rates following the four calculation methods. However, MS might deviate from these assumptions when they calculate the recycling rate:

- Method 2 gives MS the option to decide which waste fractions beyond paper, metals, plastics and glass to include in the calculation. As a default, the waste model makes assumptions about which waste **fractions** are included in the recycling rate when using method 2. This might differ from the fractions used by the Member State. In the customized method shown in Table 2, a manual calculation was undertaken that takes into account the same fractions as the ones indicated by the MS[8].
- The waste model subtracts **rejects** (losses occurring during sorting operations) when calculating the recycling rate. However, in the Commission Decision 2011/753/EU it is stated that *'Where waste is collected separately or the output of a sorting plant is sent to recycling or other material recovery processes without significant losses, that waste may be considered the weight of the waste which is prepared for reuse, recycled or has undergone other material recovery'.* Therefore an additional manual calculation was done without subtracting rejects for MS for which there was an indication that the MS uses separately collected recyclables instead of actually recycled waste when reporting the recycling rate.
- Finally, the waste model makes assumptions regarding the extraction of recyclables in mechanical biological treatment (**MBT**) plants and mechanical sorting plants for mixed municipal waste. Depending on the type of MBT/sorting technology, it is assumed that a certain share of paper/cardboard, plastics and metals is extracted for recycling. By default, stabilized/biologically treated organic material is not counted as recycled material in the waste model. However, the Commission Decision 2011/753/EU states that "*Where the target calculation is applied to the aerobic or anaerobic treatment of biodegradable waste, the input to the aerobic or anaerobic treatment may be counted as recycled where that treatment generates compost or digestate which, following any further necessary reprocessing, is used as a recycled product, material or substance for land treatment resulting in benefit to agriculture or ecological improvement"*. Therefore an additional manual calculation was done that includes organic input to MBT in the calculation of the recycling target. This was only done for Portugal and Spain because these two countries clearly indicated to include MBT-derived compost or digestate in the calculation of their recycling rate.

Such additional manual calculations were only performed for MS listed as being at risk to meeting the target, and they are only performed for the calculation of the recycling rate in Table 2, not for the calculation of related impacts. The aim is to better reconstruct the individual calculation of the recycling rates as reported by the MS. Annex 1 gives more detailed information about these manual calculations.

Table 2 gives an overview of the resulting recycling rates for the years 2020 and 2025 calculated using these additional manual calculations for the MS for which this is relevant. The table shows the method which came closest to the reported recycling rate in 2015 (or latest data year). For most

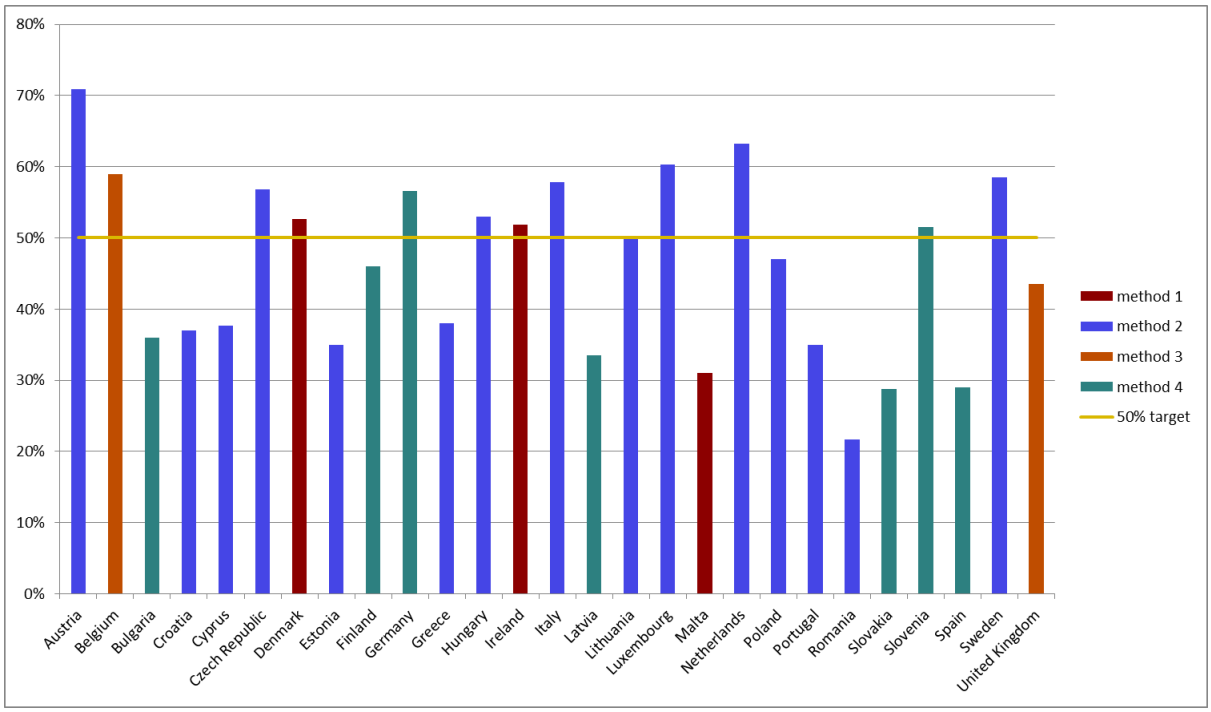
[8] Information about fractions taken into account was derived from the data quality reports submitted to Eurostat accompanying the reporting of data verifying compliance with the targets set in Article 11 (2) of Directive 2008/98/EC.

countries for which these additional calculations are performed, the recycling rate is higher when using the manually adjusted calculation than when using the default calculation in the waste model, except for Estonia. For Hungary, the adaptation of the calculation method has as a result that the MS reaches the 50% recycling target in 2020 in the baseline scenario.

Table 2 Projected recycling rates (%) in 2020 following the baseline scenario using manually customised calculations, according to the method chosen by the MS, for selected MS

Country	Calculation method chosen by the country	Model output – recycling rate in 2020 (baseline) In %	Model output – recycling rate in 2025 (baseline) %
Bulgaria	Method 4, without subtracting rejects	36	43
Croatia	Method 2, without subtracting rejects	37	50
Estonia	Method 2, customised choice of fractions	35	35
Finland	Method 4, without subtracting rejects	46	46
Greece	Method 2, customised split between biowaste and dry recyclables	38	46
Hungary	Method 2, without subtracting rejects	53	53
Malta	Method 1, customised split between biowaste and dry recyclables	31	36
Portugal	Method 2, customised and including stabilised MBT output from biodegradable waste	35	39
Spain	Method 4, including 18% of biodegradable MBT input	29	31

Figure 1 Recycling rates in 2020 according to the MS' chosen method, model output with adjustments



2.3 Uncertainties in the modelling of future recycling rates

The projected recycling rates for 2020 in Table 1, Table 2 and Figure 1 are subject to a number of uncertainties, both in the input data, assumptions used and how the waste model calculates recycling rates. Uncertainties can currently not be quantified. They include, *inter alia*:

- Uncertainties in the input data used in the model. The waste model uses a range of input data that is in many cases not collected on a regular basis in MS or estimated. This includes, for example, waste composition data and input data to pre-treatment such as MBT and sorting.
- Adjustments and gap filling made to the data to fit them into the model and to remove inconsistencies. Many countries do not have exactly the data that are needed for the model, and in many cases, estimates were needed to fill such gaps.
- MBT extraction rates. The waste model makes assumptions about how much recyclables can be extracted during processing of mixed municipal waste in treatment plants such as MBT or sorting plants for mixed waste, and MS might experience higher or lower extraction rates.
- Reject rates. The waste model operates with standard reject rates (losses occurring during sorting operations), and MS might experience higher or lower reject rates.
- Expert judgement on the effects of the policy measures and their development over time.

Therefore, the projected recycling rates should only be seen as indications and interpreted with caution. Annex 1 and Annex 2 provide further details on these issues for specific MS.

2.4 Impacts related to Municipal solid waste management

Each waste management scenario implies a number of impacts. The following tables and graphs express the changes of the full implementation scenario compared to the baseline scenario regarding environmental and financial cost, for employment and greenhouse gas emissions.

2.4.1 Environmental and financial cost and benefits

For countries reaching both the 2008 Waste Framework Directive's 50% recycling target and the 1999 Landfill Directive targets for the diversion of biodegradable municipal waste from landfill in the baseline scenario, there is no difference in the waste model results for the full implementation scenario and the baseline scenario. This is the case for Austria, Belgium, Denmark, Germany, Italy, Lithuania, Luxembourg, the Netherlands, Slovenia and Sweden.

All countries at risk of not reaching the targets in the baseline scenario will gain an environmental benefit when moving from the baseline scenario to the full implementation scenario.

For most MS, moving from the baseline scenario to the full implementation scenario results in higher financial costs. Exceptions are Estonia, Finland and Latvia. When moving to the full implementation scenario, these MS reduce the amount of waste sent to incineration or MBT, and increase recycling. Overall this change results in lower financial costs related to the full implementation scenario when compared to the baseline. However, it has to be kept in mind that the waste model does not take into account costs for waste treatment capacities that are built but not fully used, for example because waste is diverted from MBT or incineration plants to recycling. In such cases, the calculated financial cost reductions might only be realized if the free incineration or MBT capacities can be filled with imports or other (non-municipal) waste types.

For Bulgaria and the United Kingdom moving to the full implementation scenario has an overall net benefit, because the financial costs are lower than the environmental gain that can be realized.

For Croatia, Cyprus, Czech Republic, Greece, Hungary, Ireland, Malta, Poland, Portugal, Romania, Slovakia and Spain moving toward the full implementation scenario implies an overall net cost (expressed as NPV for the period 2015-2020) because the calculated financial costs are higher than the calculated environmental benefits. For Czech Republic, Hungary and Poland the net cost per inhabitant is relatively small (< €2). For Slovakia and Ireland the cost is moderate, still under €10 per inhabitant. For the other countries (Croatia, Cyprus, Greece, Malta, Portugal, Romania and Spain) the related net cost per inhabitant is high (> €20) (see Figure 2). For countries where there is a net cost, these additional costs are mainly induced by increased collection costs and/or diverting waste from landfill to MBT or incineration. In the case of Portugal and Spain, these cost calculations assume that the 50% recycling target is reached without counting organic material from MBT as recycled, while financial costs would be lower when this would be accounted for.

The modelling results depend on many different factors, including the actual waste management performance of the MS, the developments anticipated in the baseline scenario, the choice of method to show compliance with the recycling target, and many others which widely differ between MS. Differences between MS can therefore only be explained when all these different factors are taken into account at the same time. Detailed information can be found in annex 1 of this report.

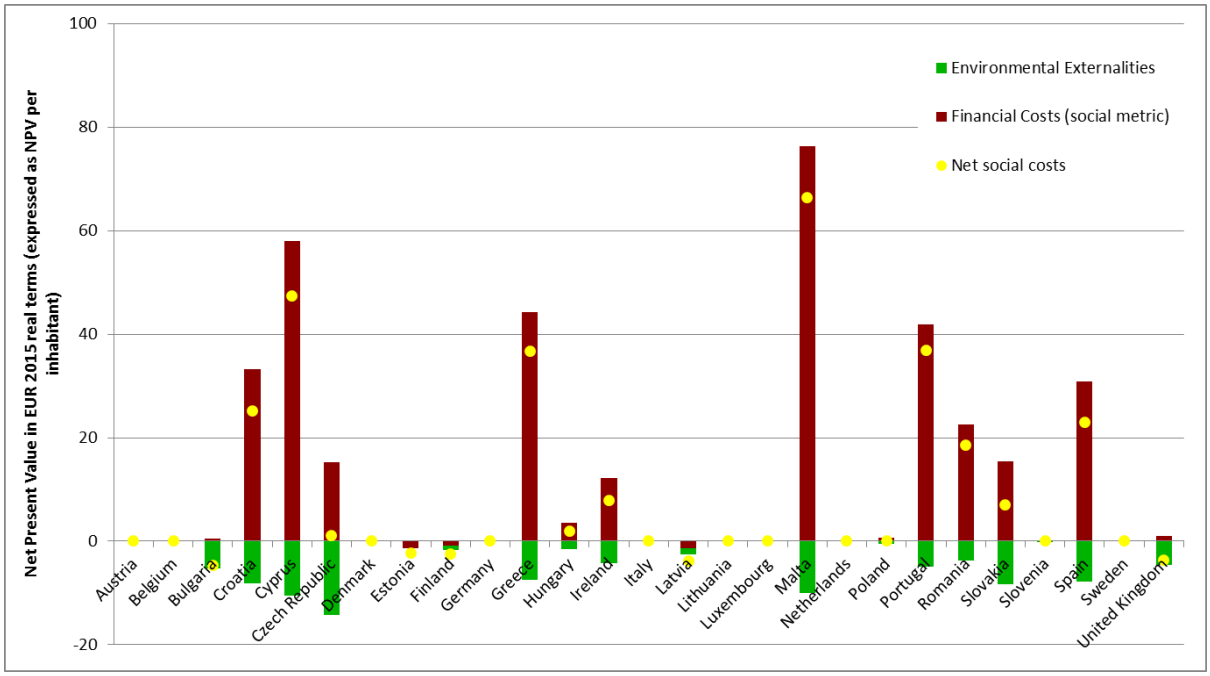
Table 3 Summed financial cost, externalities (environmental costs) and net result for the period 2015 – 2020, full implementation scenario compared to the baseline scenario, for all MS

Million Euro (2015 real terms), 2015 - 2020	Summed Environmental Externalities	Summed Financial Costs (social metric)	Summed Net social cost (NPV[9])
Austria	0	0	0
Belgium	0	0	0
Bulgaria	-38	4	-34
Croatia	-36	147	111
Cyprus	-9	50	41
Czech Republic	-149	161	11
Denmark	0	0	0
Estonia	-1	-2	-3
Finland	-9	-5	-13
Germany	0	0	0
Greece	-84	499	415
Hungary	-16	36	20
Ireland	-20	56	36
Italy	0	0	0
Latvia	-6	-3	-9
Lithuania	0	0	0
Luxembourg	0	0	0
Malta	-4	32	27
Netherlands	0	0	0
Poland	-22	25	2
Portugal	-52	446	394
Romania	-82	480	398
Slovakia	-45	83	38
Slovenia	0	0	0
Spain	-360	1 425	1 065
Sweden	0	0	0
United Kingdom	-289	62	-227

Notes: Environmental externalities and financial costs might not exactly add up to net social costs due to rounding. Negative externalities mean a benefit to the environment; negative financial cost means cost savings.

[9] The NPV is expressed as EUR 2015 real terms using the social metric (discounted at social discount rate of 4% as included in the waste model).

Figure 2 Summed financial costs, environmental externalities and net social costs in Euro per inhabitant, expressed in EUR 2015 real terms, for the period 2015 – 2020, full implementation scenario compared to the baseline scenario



Note: Calculations for Portugal and Spain do not take into account recycling of MBT derived organic material.

Main influencing factors for the environmental externalities are usually benefits due to less landfilling and environmental benefits from recycling (avoided emissions as recycled materials replace virgin materials in a life-cycle perspective).

For most countries, the differences in financial costs between the baseline and the full implementation scenario are dominated by collection costs. This is because higher recycling rates generally require a change in collection systems towards more separate collection and reducing residual waste collection.

Countries that do not meet the Landfill Directive targets for the diversion of biodegradable municipal waste from landfill in the baseline scenario, are assumed to increase the amounts of waste sent to incineration and/or MBT, and this can also influence financial costs considerably. This is for example the case for Malta and Greece.

2.4.2 Employment

For MS at risk of not reaching the targets, employment in the waste sector increases in the waste management sector when moving from the baseline scenario to the full implementation scenario. For all MS additional employment is mostly related to recycling. In Greece, Malta and Romania there is also additional employment created in MBT plants.

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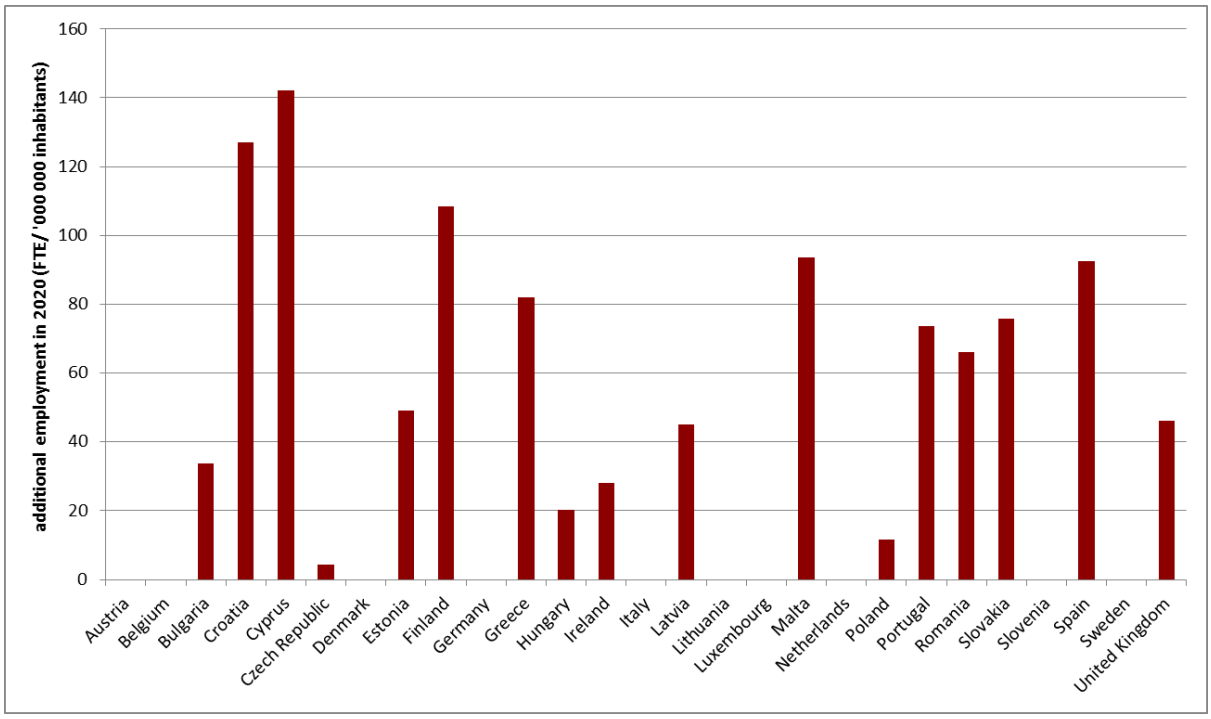
Table 4 Difference in employment in 2020, full implementation scenario against baseline scenario, for all MS

Employees, expressed as FTE	Difference full implementation scenario against baseline scenario 2020
Austria	0
Belgium	0
Bulgaria	248
Croatia	558
Cyprus	123
Czech Republic	44
Denmark	0
Estonia	66
Finland	585
Germany	0
Greece	925
Hungary	202
Ireland	129
Italy	0
Latvia	100
Lithuania	0
Luxembourg	0
Malta	39
Netherlands	0
Poland	443
Portugal	786
Romania	1 411
Slovakia	409
Slovenia	0
Spain	4 274
Sweden	0
United Kingdom	2 911

Figure 3 shows additional employees per 1 000 000 inhabitants in 2020 that would be gained in each country by moving from the baseline to the full implementation scenario.

The figure shows that for most countries for which there will be additional employment, this lies between 50 – 100 employees per 1 000 000 inhabitants. For Bulgaria, Hungary, Ireland and Poland the additional employment per 1 000 000 inhabitants is rather low. As for the financial costs and externalities, employment gains depend heavily on a large amount of different factors. The chosen method for compliance with the recycling target has a high influence on employment with highest gains for method 4 and lowest for method 1 because method 4 is more demanding and requires more waste to be recycled, and employment per tonne is highest for recycling and lowest for landfill.

Figure 3 Job creation by moving from the baseline scenario to the full implementation scenario, additional employees per '000 000 inhabitants in 2020, for all MS



2.4.3 Greenhouse gas emissions

For all countries at risk of not meeting the targets according to the baseline scenario by 2020, GHG emissions are avoided when moving from the baseline to the full implementation scenario.

GHG emissions are calculated through a life-cycle approach. In this approach, GHG emissions result from direct emissions from processes, such as from landfill, incineration, recycling, and from waste collection and transport. In addition, GHG emissions are avoided when recycled materials replace virgin materials and when energy generated from waste replaces other energy. The data shown in Table 5 and Figure 4 show the net GHG emissions (direct emissions minus avoided emissions), i.e. for all countries more emissions are avoided than directly emitted through the move from the baseline to the full implementation scenario.

Table 5 Difference in GHG emissions in the full implementation scenario against the baseline scenario, 2020, for all MS

GHG emissions (Thousand tonnes CO_2 eq)	difference full implementation scenario against baseline scenario 2020
Austria	0
Belgium	0
Bulgaria	-321
Croatia	-267
Cyprus	-102
Czech Republic	-933
Denmark	0
Estonia	-15
Finland	-91
Germany	0
Greece	-965
Hungary	-117
Ireland	-85
Italy	0
Latvia	-47
Lithuania	0
Luxembourg	0
Malta	-38
Netherlands	0
Poland	-190
Portugal	-576
Romania	-1 098
Slovakia	-426
Slovenia	0
Spain	-4 117
Sweden	0
United Kingdom	-1 174

Figure 4 Avoided GHG emissions in kg per inhabitant in 2020, full implementation scenario against baseline scenario, for all MS

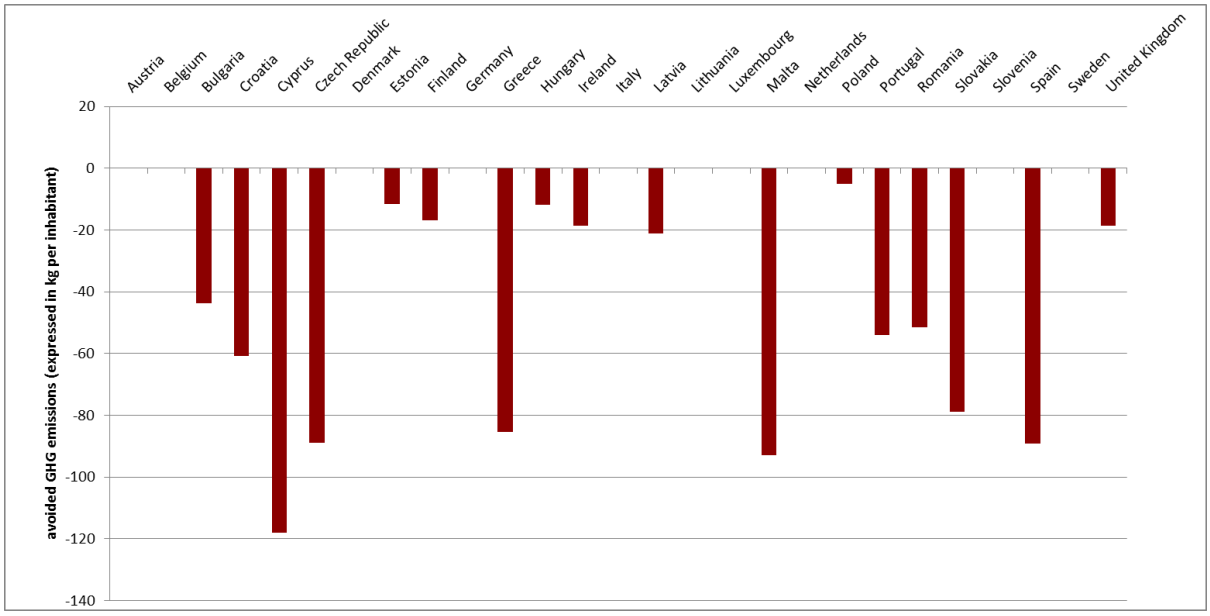


Figure 4 shows that for all countries for which there is a difference between the baseline scenario and the full implementation in 2020, GHG emissions are avoided. For some of the countries these avoided GHG emission per inhabitant are rather low (< 20 kg per inhabitant). This is the case for Estonia, Finland, Hungary, Ireland, Latvia, Poland and the United Kingdom. For the other countries avoided GHG emissions are quite high (> 40 kg per inhabitant). This is the case for Bulgaria, Croatia, Cyprus, Czech Republic, Greece, Malta, Portugal, Romania, Slovakia and Spain. As for the other impact categories, avoided GHG emissions depend heavily on a large amount of different factors, including the actual waste management system and performance of the MS, the developments anticipated in the baseline scenario, the choice of method to show compliance with the recycling target, the national energy mix and many others which widely differ between MS. Differences between MS can therefore only be explained when all these different factors are taken into account at the same time.

Annex 1 **Country-by-country analysis**

Annex 2 **Development of new baselines and data reconciliation and update**

Annex 3 **Updates of energy revenues, reject rates and material values**