ANNEX 5: FULL MODELLING REPORT

Contribution of ARCADIS

USE OF ECONOMIC INSTRUMENTS AND WASTE MANAGEMENT PERFORMANCES – Task 3

BIO-IS, IEEP for DG ENV

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Voeg logo in

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Revision		
Version	**Date**	**Remarks**
1	25.02.2011	Baseline scenario, methodology and outcome (due date 28.02.2011)
Final draft	01.10.2011	Revised baseline scenario Two scenarios defined Effect on baseline evolution modelled To do : BIO-IS : environmental effects assessed

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USE OF ECONOMIC INSTRUMENTS AND WASTE MANAGEMENT PERFORMANCES – Task 3

PART 1. Situation

1 Task description

This report includes the contribution of ARCADIS on the project SR1004 "Use of economic instruments and waste management performances – Task 3"

ARCADIS has been attributed following tasks:

3.1 Scenario development

3.2. Modelling

5.3 Participation stakeholder event

IEEP and BIO-IS contribute in subtasks of task 3 while Ecologic, Umweltbundesamt and Eunomia give feedback.

In this report the contribution to task 3 will be documented, as the ARCADIS input for the general report (part 2) and its annexes (part 3).

To be added : the assessment of the environmental impact of the realisation of scenario 1 and 2. To be performed by BIO-IS.

PART 2. Contribution to general report

2 Task 3 Scenario development and modelling

2.1 Baseline scenario

2.1.1 Scope and methodology

The scope of the modelling exercise is to find out what could be the effect in quantitative and qualitative terms of implementing new (sets of) economic instruments. These effects have to be expressed as a difference with a benchmark situation in which these instruments are not present. For this reason we define a baseline scenario as a **do-nothing** scenario. What would happen in the EU-27 and in its individual Member States if no supplementary policy measures are taken, and if the actual existing waste treatment options persist in future? This is a theoretical construction to act as a benchmark. The modelling of the baseline scenario excludes on purpose the assumption of compliance with the EU recycling and landfill diversion targets. This is necessary because new economic instruments will be needed to achieve compliance with these targets.

The baseline scenario models MSW generation driven by

- Varying degrees of empirically observed decoupling of average MSW generation from household consumption
- Demographic evolutions in the Member States.
- Evolutions in the composition of MSW

The waste treatment is modelled assuming a status quo in the distribution of MSW in terms of percentage over the operational waste treatment options in the Member States.

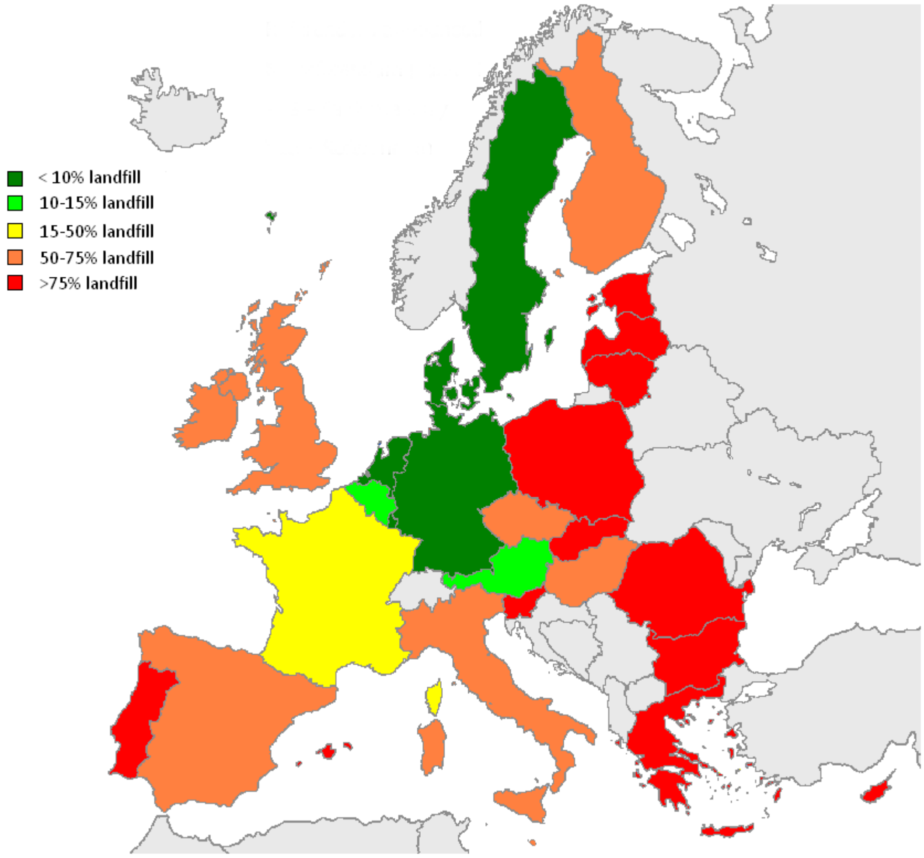
The methodology is described in detail in annex.

2.1.2 Outcome

Average municipal waste generation per capita increases slightly from 446 kg/inh to 532 kg/inh. The driving force is the coupling or only relative decoupling of MSW generation from consumption in 20 Member States. Only 7 Member States show absolute decoupling, mainly bases on their level and kind of household consumption.

Demography increases in EU-27 from 495.809.146 inhabitants in 2008 to 521.883.935 inhabitants in 2025. Combined with an increasing MSW generation per capita this gives an increase from 221 million tonnes in 2008 to 277,5 million tonnes in 2025. Biowaste remains the largest composing element, and the impact of paper increases.

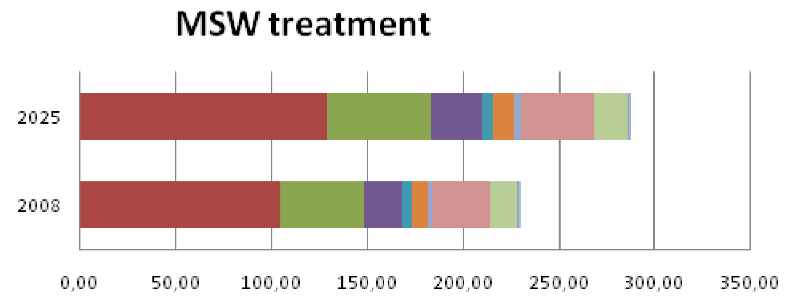
The distribution of MSW over the different waste treatment options for 2008 remains, in the scope of this baseline scenario, unaltered in 2025. Of course this neglects the effect of autonomous market evolutions (driven by prices, resource scarcity and energy scarcity) towards increasing material recovery or energy recovery. On MSW generated and collected, 45,6% goes to landfill, 18,7% to incineration, 8,8% to paper cardboard recycling, 2,1% to plastic recycling, 3,8% to glass recycling , 1,1% to metals recycling, 13% to other recycling options, 6,1% to composting, 0,5% to backyard composting, and 0,2% to anaerobic digestion.



Map 1 : Geographic distribution of average percentages of MSW being landfilled in the baseline scenario

In absolute figures the increase on needed landfill capacity and incineration capacity is obvious. Recycling and composting augments as well in this scenario in line with the increasing waste generation.

An overview of the increase of MSW production, and its split over the different treatment options is expressed in million tonnes (Mt) in Table 1. This table is composed as a sum of the baseline scenarios developed for each individual Member State:



Mt	2008	2025
landfill	104,93	128,55
incineration	42,98	54,70
paper cardboard recycling	20,27	26,19
plastic recycling	4,76	5,92
glass recycling	8,73	11,18
metals recycling	2,63	3,46
other recycling	29,92	37,97
composting	13,97	17,61
backyard composting	1,10	1,39
AD	0,57	0,73

Table 1 : Overview EU-27 : MSW treatment in the Baseline Scenario, assuming increasing waste generation and no shifts in the MSW treatment options.

Data for individual Member States, both on generation and treatment, as well as EU-27 overviews, are included in annex.

2.2 Definition of scenarios implementing a mix of economic instruments

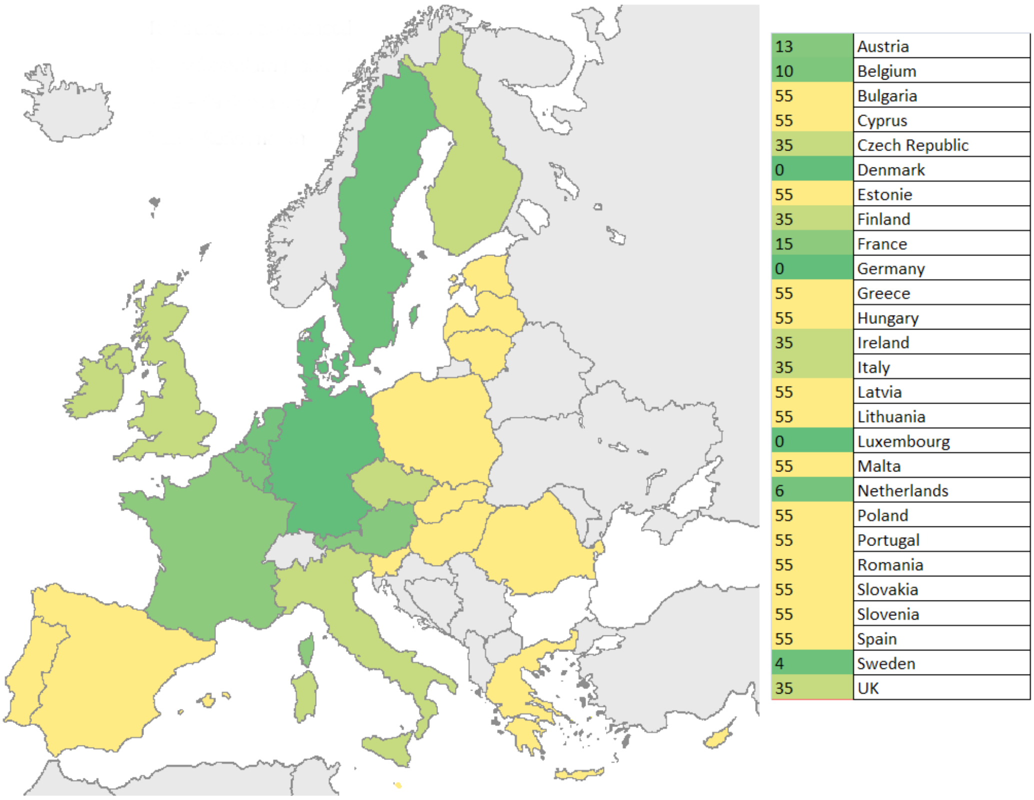
An empirical research has been realised on the relation between the height of the landfill tax and the percentage of MSW being landfilled for time series in Austria, Denmark, Finland, France, Ireland, Latvia, Netherlands, Poland, Sweden, Slovakia and UK two scenarios are defined. The data show that:

- Member States depending largely on landfilling can reduce landfill to 55% of the generated MSW by imposing landfill taxes up to 40 euro/ton
- Member States depending largely on other waste treatment techniques can reduce landfill to 15% of the generated MSW by imposing landfill taxes up to 40 euro/ton.

We define the scenarios as a situation in which all Member States reach a level of landfill tax of at least 40 euro/ton, which leads to a landfill diversion as follows :

High landfilling Member States : BG, CY, EO, GR, HU, LV, LT, MT, PL, PT, RO, SK, SI, ES	<55%
Low landfilling Member States : AT, BG, DK, FR, DE, LX, NL, SV	<15%
Intermediate Landfilling Member States : CZ, SF, IE, IT, UK	<35%

For Member States with an intermediary position, a reduction to a landfill dependence of 35% is assumed.



Percentages of landfilling MSW, assuming that in 2025 a landfill tax of 40 €/t or more would be imposed

Map 2 : Percentages of landfilling MSW, assuming that in 2025 a landfill tax of 40 €/t or more would be imposed

We assume that these percentages will be reached rather synchronous with reaching the level of 40 euro/ton. In this analysis we assume that these targets will be reached in 2025, and we assume –for the sake of the exercise – a gradual increase in landfill taxes from the actual level towards the level of 40 euro/ton.

In **scenario A** the distribution of waste derived from landfills will be distributed over the different alternatives (recycling, composting, incineration) in line with the actual distribution.

Scenario B is a variation on scenario A. Next to the increased landfill tax, a mixture of economic instruments (of which PAYT and EPR might be the more important) is taken into account. These instruments favour source separate collection and recycling. Scenario B is developed in a way recycling and composting are the final destination of all wastes diverted from landfill. All bio-waste diverted would be composted and all non biowaste would be recycled. Of course this is a maximalist scenario.

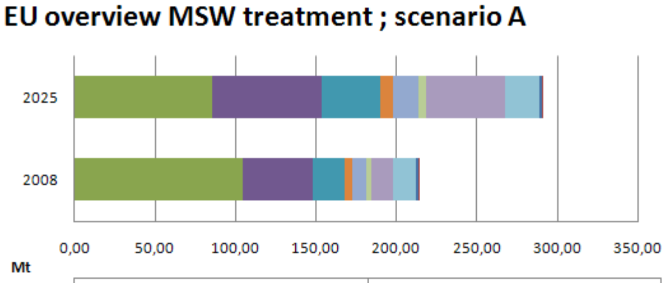
2.3 Quantitative outcome of scenario A

The amount of MSW diverted from landfill in 2025 in EU-27 is 43 Mt compared to the baseline scenario or 19 Mt compared to the 2008 quantities.

Of the total of 291,5 Mt MSW generated and collected in 2025, 29,4% goes to landfill, 23,2% to incineration, 12,6% to paper cardboard recycling, 2,6% to plastic recycling, 5,3% to glass recycling, 1,7% to metals recycling, 16,8% to other (or non specified) recycling options, 7,5% to composting, 0,5% to backyard composting, and 0,3% to anaerobic digestion.

Data for individual Member States, as well as more detailed EU-27 overviews, are included in annex.

Table 2 : Quantities of MSW treated in 2025, applying scenario A



	2008	2025
landfill	104,93	85,79
incineration	42,98	67,74
paper cardboard recycling	20,27	36,61
plastic recycling	4,76	7,66
glass recycling	8,73	15,56
metals recycling	2,63	4,94
other recycling	13,97	48,89
composting	13,97	21,89
backyard composting	1,10	1,50
AD	0,57	1,01

Table 3 : Results of scenario A, compared to the start situation in 2008 and to the baseline situation in 2025

Mt	EU : result of scenario A				
	2008	baseline 2025	scenario A 2025	Δ 2008	Δ baseline 2025
landfill	104,93	128,55	85,79	-19,15	-42,76
incineration	42,98	54,70	67,74	24,76	13,04
paper cardboard recycling	20,27	26,19	36,61	16,34	10,42
plastic recycling	4,76	5,92	7,66	2,90	1,74
glass recycling	8,73	11,18	15,56	6,83	4,38
metals recycling	2,63	3,46	4,94	2,31	1,48
other recycling	13,97	37,97	48,89	34,92	10,93
composting	13,97	17,61	21,89	7,91	4,28
backyard composting	1,10	1,39	1,50	0,40	0,11
AD	0,57	0,73	1,01	0,44	0,27

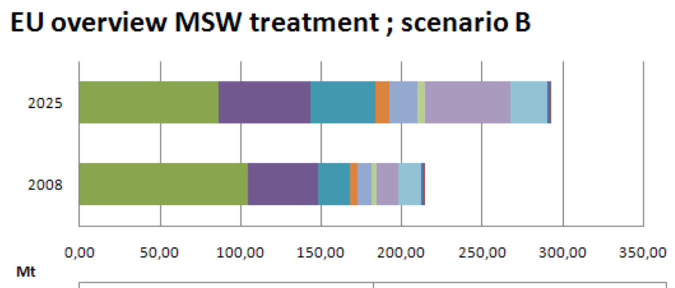
2.4 Quantitative outcome of scenario B

The amount of MSW diverted from landfill in 2025 in EU-27 is 43 Mt compared to the baseline scenario or 19 Mt compared to the 2008 quantities, as in scenario A. The difference is to be found in the way in which the diverted waste will be treated:

Of the total of 291,5 Mt MSW generated and collected in 2025, 29,5% goes to landfill, 19,5% to incineration, 13,7% to paper cardboard recycling, 2,8% to plastic recycling, 5,9% to glass recycling, 1,8% to metals recycling, 17,9% to other (or non specified) recycling options, 7,9% to composting, 0,5% to backyard composting, and 0,4% to anaerobic digestion.

Data for individual Member States, as well as more detailed EU-27 overviews, are included in annex.

Table 4 : Quantities of MSW treated in 2025, applying scenario B



	2008	2025
landfill	104,93	86,47
incineration	42,98	57,21
paper cardboard recycling	20,27	40,25
plastic recycling	4,76	8,26
glass recycling	8,73	17,23
metals recycling	2,63	5,41
other recycling	13,97	52,35
composting	13,97	23,09
backyard composting	1,10	1,52
AD	0,57	1,15

Table 5 : Results of scenario B, compared to the start situation in 2008 and to the baseline situation in 2025

	EU : result of scenario B				
Mt	**2008**	**baseline 2025**	**scenario B 2025**	**Δ 2008**	**Δ baseline 2025**
landfill	104,93	128,55	86,47	-18,47	-42,08
incineration	42,98	54,70	57,21	14,24	2,51
paper cardboard recycling	20,27	26,19	40,25	19,98	14,06
plastic recycling	4,76	5,92	8,26	3,51	2,34
glass recycling	8,73	11,18	17,23	8,50	6,05
metals recycling	2,63	3,46	5,41	2,78	1,95
other recycling	13,97	37,97	52,35	38,38	14,38
composting	13,97	17,61	23,09	9,12	5,49
backyard composting	1,10	1,39	1,52	0,42	0,13
AD	0,57	0,73	1,15	0,58	0,42

2.5 Environmental effect

For scenario A we calculated that, as a consequence of introducing a landfill tax of 40 eur/ton, and compared to the do nothing baseline scenario:

- 42,76 million tonnes of MSW will be less landfilled.
- 13,04 million tonnes of MSW will be supplementary incinerated.
- Recycling of paper, plastics, glass and metals will increase respectively with 10,42 million tonnes, 1,74 million tonnes, 4,38 million tonnes and 1,48 million tonnes.
- Supplementary 10,93 million tonnes of other waste fractions, or of the above mentioned materials in other fractions, will be recycled.
- Composting will increase with 4,28 million supplementary tonnes, backyard composting with 0,11 million tonnes and anaerobic digestion with 0,27 million tonnes.

The environmental effect of these shifts can be assessed as:

- The decline of landfilled MSW will result to a reduction of 46.213.200 tn CO2 eq. (when considering landfills with 20% landfill recovery) or 33.376.200 tn CO2 eq. (if taking into account the carbon sink effect).
- The increased amount of incinerated waste corresponds to a reduction of CO2 emissions in the amount of 3.129.600 tn CO2 eq.
- Increased recycling of paper, plastics, glass and metals will result to a total reduction of 10.532.204 tn CO2 eq. The avoided natural resource depletion is estimated at the amount of 230.580 tn Sb eq. The fossil resource depletion is estimated at 10.488.180 toe. For other waste fractions the supplementary recycling will reduce CO2 emissions by 821.882 CO2 eq. The avoided natural

resource depletion is estimated at 20.494 tn Sb eq and the fossil resource depletion is estimated at 913.202 toe.

- Composting and backyard composting will reduce CO2 emissions by 35.120 tn CO2 eq. or 263.400 tn CO2 eq. (if carbon sink effects are taken into account)

For scenario B we calculated that, as a consequence of introducing a landfill tax of 40 eur/ton and introducing supplementary economic instruments which lead to the effect that all supplementary diverted MSW goes to recycling or composing, and compared to the do nothing baseline scenario:

- 42,08 million tonnes of MSW will be less landfilled.
- 2,51 million tonnes of MSW will be supplementary incinerated (mainly recycling residues).
- Recycling of paper, plastics, glass and metals will increase respectively with 14,06 million tonnes, 2,34 million tonnes, 6,05 million tonnes and 1,95 million tonnes.
- Supplementary 14,38 million tonnes of other waste fractions, or of the above mentioned materials in other fractions, will be recycled.
- Composting will increase with 5,49 million supplementary tonnes, backyard composting with 0,13 million tonnes and anaerobic digestion with 0,42 million tonnes.

The environmental effect of these shifts can be assessed as:

- The decline of landfilled MSW will result to a reduction of 45.446.400 tn CO2 eq. (when considering landfilling with 20% landfill recovery) or 32.822.400 tn CO2 eq. (if taking into account the carbon sink effect).
- The increased amount of incinerated waste corresponds to a reduction of CO2 emissions in the amount of 602.400 tn CO2 eq
- Increased recycling of paper, plastics, glass and metals will result to a total reduction of 16.754.444 tn CO2 eq. The avoided natural resource depletion is estimated at the amount of 310.870 tn Sb eq. The fossil resource depletion is estimated at 14.145.480 toe. For other waste fractions the supplementary recycling will reduce CO2 emissions by 1,081.305 CO2 eq. The avoided natural resource depletion is estimated at 26.963 tn Sb eq and the fossil resource depletion is estimated at 1,201,449 toe.
- Composting and backyard composting will reduce CO2 emissions by 44.960 tn CO2 eq. or 337.200 tn CO2 eq. (if carbon sink effects are taken into account)

PART 3. Contribution to technical annex

3 Methodological annex

3.1 Link with (bio-) waste prevention study

Task 3 is a modelling exercise, to analyse the potential impacts of the use of economic instruments at the EU level and for each MS. The modelling exercise builds on the results of the modelling conducted under the Waste TS study[1], and is performed in line with the *"Study on the evolution of (bio-) waste generation / prevention and (bio-)waste prevention indicators."* [2] We call this study SR1008, service request 1008 within the waste policy framework contract between the Commission and the study consortium lead by BIO-IS. The actual study on *"the use of economic instruments and waste management performances"* is referred to as SR1004, service request1004 within the same framework contract.

Both studies are closely related, and share the same assumptions, the same basic data and the same methodology for assessing future waste generation. Differences between both are presented below:

Study on the evolution of (bio-) waste generation / prevention and (bio-)waste prevention indicators	Study on the use of economic instruments and waste management performances
SR1008	SR1004
Municipal waste, inert waste and other non-municipal waste	Municipal waste
Generation	Generation and treatment
All 27 MS and EU-27	All 27 MS and EU-27
Time horizon 2020	Time horizon 2025
Generation MSW driven by demography, economic growth and degrees of decoupling from consumption	
No assessment of treatment made in this analysis	Baseline: Treatment driven by continuation of actual trends, no use of the assumption

[1] IEEP, ECOLOGIC, ARCADIS, UMWELTBUNDESAMT, BIO INTELLIGENCE SERVICES, VITO for DG ENV (2010), Supporting the thematic strategy on waste prevention and recycling, Service request five under contract ENV.G.4/fra/2008/0112. http://ec.europa.eu/environment/waste/pdf/Final%20Report%20final%2025%20Oct.pdf

[2] UMWELTBUNDESAMT, ARCADIS, BIO-IS for DG-ENV (2011), In preparation

	of compliance with Landfill Directive or Waste Framework Directive targets. Scenario: treatment altered due to the effects of economic instruments

In SR1008 an assessment of trends for waste generation from now to the target year of 2020 is made. The trend analysed is a description of how waste generation would evolve if observed actual trends in waste generation would persist in future.

In this exercise SR1004 we take over the results on MWS generation from SR1008, we expand it to the year 2025 and we add an analysis on how waste treatment will evolve. This will act as a baseline to benchmark the effects that can be made by the implementation of economic instruments.

3.2 Scope of the exercise

This baseline is a *"business-as-usual"* scenario and not a *"what–if"* scenario. We are not analysing what would happen with waste treatment if Member States would be compliant with the targets from the waste Framework Directive or the Landfill Directive. The implementation of existing waste policy and thus the compliance with the set targets is observed as one of the major challenges for waste policy and for environmental policy in general. Complying with existing EU policy targets will request for many Member States a considerable and persistent effort on developing alternatives for landfill, on top of what is already undertaken. It has been argued by some that new directives (e.g. on bio-waste) or the application of new (economic) instruments could be necessary as a tool for reaching the targets.

We understand the scope of this exercise as an assessment of the effects of the general application of two predefined scenarios with economic instruments compared to a situation where these instruments are not applied. **We cannot however consider the application of the economic instruments as something done on top of reaching the EU targets, but as a possible important instrument in the policy mix needed for reaching the targets.** For this reason, we take over the assessment on generation of waste as in SR1008, and we will add the assessment on treatment of waste. We assume a status quo on the actual percentages of collection coverage and the actual distribution of waste over the different waste treatment options. This means that no changes in the way waste is treated are included in the baseline. The relative proportions of municipal solid waste being recycled, disposed of, incinerated… remains unaltered. The collection coverage for MSW does not change, and no visible effects of waste prevention initiatives on waste quantities are observed above what is already achieved in 2008. It is not to be expected that a baseline constructed in this way would lead to compliance with the targets for all Member States.

Next to this baseline/benchmark, two different policy scenarios are defined that can be compared with this baseline to assess the benefits reached.

3.3 Overview of steps taken, main assumptions and thumb-rules

The work performed includes following steps:

- The integration of the MSW generation outlook from SR1008.
- The development of a baseline with the assumption that the collection coverage and the division of waste treatment over the different treatment options (landfill, incineration, composting, recycling of different fractions) will remain stable at the actual level.
- the definition of scenarios with the implementation of economic instruments.
- the modelling of these scenarios to find the quantitative differences with the baseline
- the translation of these quantitative differences in environmental impacts.

Main assumptions and thumb-rules are:

a) Total MSW generation is related to the number of inhabitants and evolves in line with demographic evolutions.
b) Average MSW generation is related to average consumption patterns and evolves in line with economic growth.
c) The growth of average MSW generation is differentiated by the degree of decoupling of the waste generation from the consumption expenditures.
d) The assessment of MSW generation, based on these three assumptions, is made in SR1008 and is taken over in this study, expanded to 2025.
e) A baseline 2008-2025 assumes the continuation of the actual waste management policy in a Member State. Where economic or other instruments are already applied they remain in force at the same level. Where no economic or other instruments are applied, they are not considered for the baseline 2008-2025.
f) Two scenarios in which we assume that defined economic instruments are used by all Member States are compared with the baseline where only some Member States apply these instruments as today.
g) The quantifiable benefit from these instruments is calculated by making the distinction between the scenario outcome and the baseline.

This will lead to a clear and quantified view on the possible impacts of two different policy mixes of key economic instruments on MSW generation and treatment of the Member States.

3.4 Analysing the trends in the baseline

3.4.1 Data used

The main focus is on municipal waste data, with a time horizon of 2025.

We calculate a trend for the generation and treatment of waste based on a limited set of the more robust data available. These are in general the waste generation and treatment quantities as reported in compliance with Regulation 2150/2002/EC on Waste Statistics, and as included in the EUROSTAT public accessible database, and general indicators and existing assessments on evolutions in economy and demography. These quantitative data are confronted with empirically observed trends of coupling and decoupling with economic parameters.

Data on average municipal solid waste generation are retrieved from the structural indicator "Municipal waste generated, kg per capita". A structural indicator tracks the progress made towards four basic objectives, specified in the renewed Lisbon Strategy of 2006, updating the goal originally set at the Lisbon European Council in 2000. The EUROSTAT Environmental Data Centre on Waste publishes this specific structural indicator in time series from 1995 to 2008.[3]

Data on municipal waste treatment are retrieved from a mixture of sources. Data collected under the Waste Statistics Regulation 2150/2002/EC for 2008 have been taken as a basis, complemented with data collected for or reported by Member States in the frame of the report "*Assessment of the options to improve the management of Bio-waste in the European Union*", prepared by ARCADIS Belgium and Eunomia for the European Commission in 2010.[4]

Data on collection coverage and on municipal waste composition are retrieved from the United Nations Statistics division[5] or from alternative data sources. For Member States where no data are available, an average is applied.

Data for economic indicators, as described above, are retrieved from EUROSTAT national accounts statistics final consumption aggregates (nama_fcs)[6]. Assessments on future evolutions are retrieved from the report "EU energy trends to 2030, update 2009"[7]

3.4.2 Basic assumptions

The trend analysis is based upon an approach that is already applied in several other studies[8], but adapted to the specific scope of this exercise.

[3] http://epp.eurostat.ec.europa.eu/portal/page/portal/waste/data/sectors/municipal_waste
[4] http://ec.europa.eu/environment/waste/compost/pdf/ia_biowaste%20-%20final%20report.pdf
[5] http://unstats.un.org/unsd/environment/Time%20series.htm#Waste
[6] http://epp.eurostat.ec.europa.eu/portal/page/portal/national_accounts/data/database
[7] http://ec.europa.eu/energy/observatory/trends_2030/doc/trends_to_2030_update_2009.pdf

[8]

* Assessment of the options to improve the management of bio-waste in the European Union", finalised for DG ENV on 11.01.2010
* Preparatory study for the review of the thematic strategy on the prevention and recycling of waste, finalised for DG ENV on 25.10.2010

The basic assumption used for assessing municipal waste generation can be summarised as follows:

- The generation of total municipal waste depends in a linear (coupled) way on the evolution of demography
- The generation of average municipal waste per capita depends in a (coupled or decoupled) way on consumption behaviour, which is connected to economic welfare in a Member State
- The actual (2008) waste collection and waste management practices remain unaltered until 2020.

Please note that the impact of already deployed economic or other waste policy measures in some Member States is included in this baseline. For example where Pay-as-you-throw (PAYT) systems have been introduced, this will be reflected both in the amount of waste being generated and in the recycling rates of specific waste fractions. This will be reflected in the start values on waste generation and treatment for 2008.

Expanding the PAYT practice over other Member States can be an aspect covered by the two scenarios defined under chapter 3.6.

Other aspects do play a role, like shifts in cultural habits, climatologic impact on bio-waste generation, biases through the quality of waste statistics, specific market conditions, export and import of waste fractions… Because of the difficulty to assess these effects and the less robust nature of data on these aspects they are not taken into consideration in the modelling.

Social and cultural habits do vary significantly between the different Member States, as identified by OECD (2004, Addressing the Economics of Waste). They are seen as some of the principal factors that influence the generation of waste. In the baseline assessment cultural and social differences are reflected both in differing demographic trends and in differing waste generation quantities and compositions, as included in the start data for 2008. These effects will remain visible in the range of variation of the baseline results in 2025, although we assume a kind of harmonisation in consumption patterns and waste composition with expected increasing economic welfare and socio-cultural integration in a free market driven growth-economy.

3.4.3 Defining decoupling

The relation of average municipal waste generation with economic growth can be described using the concept of decoupling:

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* Analysis of the evolution of waste reduction and the scope of waste prevention, finalised for DG ENV on 11.10.2010
* Analysis of the waste flow in the Campania Region in view of the assessment of the Waste Management Plan for Campania (WMPC) that the Italian authorities will submit to the Commission at the end of 2010-beginning of 2011, finalised for DG ENV on 18.10.2010
* Analysis for ENPI countries on social and economic benefits of enhanced environmental protection, in progress, for EUROPEAID
* Study on the evolution of (bio-) waste generation / prevention and (bio-)waste prevention indicators, in progress, for DG ENV.

OECD[9] situates decoupling as follows: *"The term "decoupling" has often been used to refer to breaking the link between "environmental bads" and "economic goods." In particular, it refers to the relative growth rates of a pressure on the environment and of an economically relevant variable to which it is causally linked."* Applied on municipal waste generation per capita (the pressure on the environment) the growth rate may be compared with the growth rate of GDP or an alternative indicator for economic welfare (increasing consumption as the driving force). A decoupling indicator can describe the relationship between the change in environmental pressure as compared to the change in the driving force over the same period.

Decoupling occurs when the growth rate of average waste generation is less than that of the GDP or the consumption expenditure over a given period. In most cases, however, absolute changes in environmental pressures are of fundamental concern. Hence the importance of distinguishing between absolute and relative decoupling. If GDP displays positive growth, **"absolute decoupling"** is said to occur when the growth rate of the waste generation is zero or negative — i.e. pressure on the environment is either stable or falling. **"Relative decoupling"** is said to occur when the growth rate of the waste generation is positive, but less than the growth rate of GDP. In the literature, the terms strong and weak are sometimes used as synonyms for absolute and relative, respectively.

OECD states that the term decoupling is not used when the environmental pressure variable increases at a higher rate than the economic driving force. But this is as well a situation where environmental pressure is not coupled to (and thus decoupled from) its economic driving force. In the report "Analysis of the evolution of waste reduction and the scope of waste prevention" the term **"negative decoupling"** is introduced for these cases, cited in the study "Evolution of (bio-) waste generation/prevention and (bio-) waste prevention indicators" as **"reverse decoupling"**.

3.4.4 Modelling steps

In the development of the baseline following steps are taken. Steps 1 to 7 are developed in SR1008. The next steps are elaborated in this study:

Step 1: A yearly growth percentage is calculated for the parameters 'total population' and 'household expenditures', based on EUROSTAT data for each MS.

Step 2: The actual (total and average) waste generation is retrieved, for MSW waste in total and for selected waste streams

Step 3: The evolution of the average waste generation is calculated by applying the growth rate for household expenditure on it, taking into account the variable degree of decoupling that is applicable for the Member State. The degree of decoupling is calculated for each individual Member State. See

[9] OECD Environment Directorate, indicators to measure decoupling of environmental pressure from economic growth (2002)

Annex 1.

Step 4: The evolution of the total waste generation is calculated by multiplying the average generation with the total population size. By doing so a strict coupling (no decoupling) between waste generation and demographic evolution is assumed.

Step 5: The composition of the municipal waste generated is assessed, by combining data from dustbin analyses with data on selectively selected fractions from municipal origin. Data sources are individual country analyses and UN[10] data.

Step 6: The evolution of the composition of municipal waste fractions is calculated by comparing it with a benchmark, assuming that with increasing welfare the consumption patterns and the waste composition will approach the composition of municipal solid waste in western Europe. Flanders is used as benchmark for 2020 because of the reliability of its statistics. See however paragraph 3.4.5 on uncertainties

Step 7: Future waste generation for all municipal solid waste fractions is calculated, disregarding the fact if they are collected with the mixed waste of as a separate fraction. These data represent tot maximum potential for e.g. recycling or separate collection.

Step 8: Data on the actual distribution over waste treatment options is collected and represented in percentages, based primarily on the studies "*ETC/SCP working paper 2/2009, EU as a Recycling Society - Present recycling levels of Municipal Waste and Construction & Demolition Waste in the EU.*" and *"Assessment of the options to improve the management of bio-waste in the European Union."*

Step 9: No target results are calculated and no trend towards reaching these targets is modelled. A continuation of the actual status quo is assumed.

Step 10: The total applied capacities for waste treatment are calculated, by taking the total amount of municipal waste generated, distracting the amount not collected, and distributing the amount over the assessed percentages for the different waste treatment options. The quantities are calculated up to the time horizon of 2025.

Step 11: The analysis is performed for all Member States. To achieve a result for the European Union as a whole these results are counted together.

3.4.5 Uncertainties

- External, not yet foreseen, macro-economic effects can have an impact on demographic trends.

[10] http://unstats.un.org/unsd/environment/Time%20series.htm#Waste

- Waste composition of Flanders is not an overall applicable benchmark for 2020, as Flanders is an extreme densely populated area and thus not always representative for more rural areas. Using these data as a benchmark does not reflect possible differences in waste composition due to climatologic conditions. A case-by-case assessment of future waste composition for each Member State would however request a thorough analysis of future waste management patterns, which we like to exclude from the baseline analysis, but like to include in the scenario analyses.
- Uncertainties occur in the used basic data ;
  - the MSW generation is retrieved from the EUROSTAT Structural Indicator, based upon the OECD/EUROSTAT joint questionnaire. Member States report MSW data using different assumptions on what to include or exclude, e.g. from pure household waste to a mix of household + retailers waste.
  - The MSW composition data of UN are compiled from different sources, for different years, and may be of varying quality.
  - The assessed degree of decoupling is based upon a limited time series of available and consistent data.
- The methodology is kept as simple as possible, excluding as far as possible factors for which no data are available, like the future impact of social or cultural shifts.

3.5 Selection of waste streams and waste treatment options

Following **waste streams** are identified as relevant for the exercise on municipal solid waste:

	Benchmark
bio waste	36 %
paper and cardboard	17 %
plastics	6 %
glass	6 %
metals	2 %
textiles	2 %
hazardous household waste	1 %
Other	30 %

Table 6 : Waste streams of municipal solid waste

Remark that no fraction of ‘mixed municipal waste’ is included, because mixed municipal waste is composed of the above mentioned fractions. The amounts of waste generated that are assessed are the total of a waste generated, disregarding if it is collected separately or if it is a component of mixed waste.

The identified waste fractions form the core of the generated municipal solid waste. The category ‘other’ included all less important waste streams and those waste streams (e.g. dipers) for which no reliable or easily accessible data exist until now.

The benchmark percentages are derived from Flemish data for 2009.[11]

Following **waste treatment options** are identified:

bio-waste composting
bio-waste backyard composting
bio-waste anaerobic digestion
paper/card recycling
plastic recycling
glass recycling
metals recycling
other recycling
incineration
landfill

Table 7 : List of waste treatment options

Take into account that no preparatory activities are included , like MBT, but that municipal solid waste going to MBT will be distributed over incineration, recycling or landfill, as this is the final destination of municipal solid waste being pre-treated by MBT. In this way compatibility with the actual reporting format from the Waste Statistics Regulation is respected.

3.6 Defining the economic instrument scenarios

3.6.1 Scope of the scenarios

The outcome of this subtask is the definition of two scenarios. The scenarios are to describe economic instruments that are identified as most successful (based on the results of tasks 1 and 2).

The difficulty in defining a testable scenario consist in splitting up the effect of a set of economic instruments from the effects of other policy instruments or the effects of autonomous market evolutions. In the baseline no new policy strategies are included, a mere continuation of the actual split over the different waste treatment options is

[11] Calculated from : inventarisatie huishoudelijke afvalstoffen 2009, OVAM dec. 2010

bio waste	35.56%
paper and cardboard	16,89%
plastics	5,76%
glass	6,23%
metals	2,00%
textiles	2,24%
hazardous household waste	0,91%
other	30,42%

assumed. Defining the scenarios is an exercise in defining target values as a possible outcome of a new strategy in which sets of economic instruments are included, assuming a cause-effect relationship.

Whereas the baseline scenario describes the situation of what could happen if merely the existing policy is continued, the Commission is interested in what would happen if successful economic instruments would be applied in all MS. The model as described above however measures the policy results (e.g. the effects of MS reaching quantified targets) but it does not include a cause-effect relationship between concrete policy measures (e.g. economic measures) and the waste treatment situation.

3.6.2 Data availability

The major limiting factor for the scenario exercise is data availability, next to the methodological restraint that it is difficult in a real world scenario to distinguish between the effect of different, similarly applied instruments.

The largest set of available data concerns time series on landfill quantities for MSW, and heights of landfill taxes for MSW. For this reason the scenarios focus on the economic instrument of landfill tax as a tool to achieve landfill diversion of MSW fractions. The instrument will result in decreasing percentages of MSW sent to landfill and accordingly increasing percentages of MSW sent to composting, recycling or incineration.

Time series from Austria, Denmark, Finland, France, Ireland, Latvia, Netherlands, Poland, Sweden, Slovakia and UK have been available, and have been analysed to find trends in the relation between the height of the landfill tax in euro/ton and the landfill diversion achieved. The analysis is included in Annex 2.

Other instruments will have an effect on how the waste, once diverted from landfills, will be treated, either recycling (favoured by source separate collection and PAYT mechanisms) or incineration (favoured by green certificates for electricity from renewable energy sources) or composting/MBT (favoured by investment subsidies) or other less capital intensive alternatives. No sufficient data are however available to derive the impact of these economic instruments on the waste treatment options in a reliable way.

3.6.3 Description of scenario A

The analysis on the landfill taxes and the percentages of MSW being sent to landfill, as performed in Annex 2, lead to following conclusions. These conclusions are based on empirical findings using the available time series:

- Member States depending largely on landfilling can reduce landfill to 55% of the generated MSW by imposing landfill taxes up to 40 euro/ton

- Member States depending largely on other waste treatment techniques can reduce landfill to 15% of the generated MSW by imposing landfill taxes up to 40 euro/ton.

In scenario A we assume that all Member States reach a level of landfill tax of at least 40 euro/ton, which leads to a landfill diversion as follows :

High landfilling Member States	<55%
Low landfilling Member States	<15%
Intermediate Landfilling Member States	<35%

We assume that these percentages will be reached rather synchronous with reaching the level of 40 euro/ton. In this analysis we assume that these targets will be reached in 2025, and we assume –for the sake of the exercise – a gradual increase in landfill taxes from the actual level towards the level of 40 euro/ton.

In scenario A following targets apply for each Member State:

Table 8 : Scenario A target values for landfill tax and landfill percentages of MSW

Member State	Actual % landfill of generated MSW	Actual level of landfill tax (euro/ton)	Target level of landfill tax in 2025	Target level of landfill % of MSW in 2025
Austria	15	€ 26	**€ 40**	15
Belgium	13	€ 82 (Fl) - € 60 (W)	€ 82 (Fl) - € 60 (W)	13
Bulgaria	78	€ 3	**€ 40**	55
Cyprus	86	-	**€ 40**	55
Czech Republic	56	€ 20,50	**€ 40**	35
Denmark	0	€ 63	€ 63	0
Estonie	78	€ 12	**€ 40**	55
Finland	58	€ 40	**€ 40**	35
France	35	€ 20	**€ 40**	15
Germany	5	-	**€ 40**	5
Greece	87	-	**€ 40**	55
Hungary	67	-	**€ 40**	55
Ireland	61	€ 50	€ 50	35
Italy	58	€10 to € 50	**€ 40** to €50	35
Latvia	83	€ 7,50	**€ 40**	55
Lithuania	86	€22 in 2012	**€ 40**	55
Luxembourg	0	-	**€ 40**	0
Malta	86	-	**€ 40**	55
Netherlands	10	€ 107,49	€ 107,49	10
Poland	92	€ 25	**€ 40**	55
Portugal	81	€ 3,50	**€ 40**	55
Romania	82	-	**€ 40**	55
Slovakia	76	€ 13,28	**€ 40**	55
Slovenia	86	€ 19	**€ 40**	55
Spain	72	€ 10	**€ 40**	55
Sweden	6	€ 49	€ 49	6
UK	58	€ 55,35	€ 55,35	35

In this scenario the distribution of waste derived from landfills will be distributed over the different alternatives (recycling, composting, incineration) in line with the actual distribution.

Table 9 : Distribution of waste treatment options in percentages, for MSW in 2025 under scenario A

2025 scenario A	landfilled	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	***sum***
Austria	13	35	10	2	3	2	18	9	5	3	*100,00*
Belgium	10	25	10	2	6	2	27	15	1	1	*100,00*
Bulgaria	55	2	7	1	2	0	31	2	1	0	*100,00*
Cyprus	55	1	5	2	1	3	33	0	0	0	*100,00*
Czech	35	11	22	5	7	1	17	2	0	0	*100,00*
Denmark	0	51	13	1	3	3	17	13	0	0	*100,00*
Estonia	55	0	14	3	6	3	5	8	7	0	*100,00*
Finland	35	6	22	1	7	1	17	10	0	1	*100,00*
France	15	40	13	1	7	1	19	2	0	0	*100,00*
Germany	0	28	14	7	6	1	27	14	2	0	*100,00*
Greece	55	0	21	2	4	3	16	0	0	0	*100,00*
Hungary	55	10	7	1	1	1	10	12	3	0	*100,00*
Ireland	35	0	22	3	5	2	23	7	3	0	*100,00*
Italy	35	22	13	3	6	2	12	7	0	0	*100,00*
Latvia	55	0	15	5	10	8	7	0	0	0	*100,00*
Lithuania	55	0	10	2	16	1	0	16	0	0	*100,00*
Luxembourg	0	0	15	3	12	2	32	30	0	6	*100,00*
Malta	55	0	1	0	0	0	44	0	0	0	*100,00*
Netherlands	6	36	9	1	4	2	29	12	1	0	*100,00*
Poland	55	4	22	5	11	3	0	0	0	0	*100,00*
Portugal	55	6	16	3	8	3	5	2	0	0	*100,00*
Romania	55	1	4	1	1	2	32	5	0	0	*100,00*
Slovakia	55	22	3	2	6	1	8	2	0	0	*100,00*
Slovenia	55	0	16	4	4	4	7	10	0	0	*100,00*
Spain	55	17	14	2	5	2	3	2	0	2	*100,00*
Sweden	4	41	20	1	6	3	12	9	2	1	*100,00*
UK	35	9	11	2	5	2	22	15	0	0	*100,00*

3.6.4 Description of scenario B

Scenario B is a variation on scenario A. Next to the increased landfill tax, a mixture of economic instruments (of which PAYT and EPR might be the more important) is assumed. These instruments favour source separate collection and recycling. Although we lack data to substantiate this assumption, we develop a scenario in which recycling and composting would be the final destination of all wastes derived from landfill. All bio-waste diverted would be composted and all non biowaste would be recycled. Of course this is a maximalist scenario.

Scenario B would reach following shifts in waste treatment options in 2025:

Table 10 : Distribution of waste treatment options in percentages, for MSW in 2025 under scenario B

2025 scenario B	landfilled	landfill diversion	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	*sum*
Austria	13	0	35	10	2	3	2	18	9	5	3	*100,00*
Belgium	10	0	25	10	2	6	2	27	15	1	1	*100,00*
Bulgaria	55	24	1	7	1	2	0	32	2	1	0	*100,00*
Cyprus	55	32	0	6	2	1	3	33	0	0	0	*100,00*
Czech	35	21	7	24	5	7	1	18	2	0	0	*100,00*
Denmark	0	0	51	13	1	3	3	17	13	0	0	*100,00*
Estonia	55	23	0	14	3	6	3	5	8	7	0	*100,00*
Finland	35	23	4	22	1	7	1	18	11	0	1	*100,00*
France	15	20	31	16	2	9	2	23	2	0	0	*100,00*
Germany	0	0	28	14	7	6	1	27	14	2	0	*100,00*
Greece	55	32	0	21	2	4	3	16	0	0	0	*100,00*
Hungary	55	13	7	7	1	1	1	11	13	4	0	*100,00*
Ireland	35	25	0	22	3	5	2	23	7	3	0	*100,00*
Italy	35	23	14	16	3	7	2	14	8	0	0	*100,00*
Latvia	55	28	0	15	5	10	8	7	0	0	0	*100,00*
Lithuania	55	31	0	10	2	16	1	0	16	0	0	*100,00*
Luxembourg	0	0	0	15	3	12	2	32	30	0	6	*100,00*
Malta	55	31	0	1	0	0	0	44	0	0	0	*100,00*
Netherlands	6	0	36	9	1	4	2	29	12	1	0	*100,00*
Poland	55	38	1	24	6	12	3	0	0	0	0	*100,00*
Portugal	55	27	2	18	3	9	4	6	2	0	1	*100,00*
Romania	55	28	0	4	1	1	2	32	5	0	0	*100,00*
Slovakia	55	22	12	4	3	9	1	12	3	0	0	*100,00*
Slovenia	55	31	0	16	4	4	4	7	10	0	0	*100,00*
Spain	55	18	10	17	3	6	2	3	2	0	2	*100,00*
Sweden	4	0	41	20	1	6	3	12	9	2	1	*100,00*
UK	35	23	6	12	2	5	2	24	16	0	0	*100,00*

3.7 Analysing the environmental impact of the scenarios

Methodology

In order to quantify the environmental impacts of the two scenarios, a literature review was carried out to identify impact factors per unit of waste reduction or treatment. The focus of the estimates is on GHG emissions.

Environmental impacts that are not included are the following:

- Impacts from ecotoxic pollutants, as no realistic assumption could be developed on the released of amount of heavy metals and organic pollutants;
- Impacts that occur outside the EU (from material imports and waste exports);
- Impacts from other waste fractions, as no data is available to define the breakdown into specific materials.

3.7.2 Greenhouse Gas Emissions

As mentioned in section 3.2 the distribution of waste derived from landfills will be distributed over various means of waste treatment. Therefore the estimates of environmental benefits (in terms of GHG emission reductions) are based on changes that occur in the amount of waste that is recycled, composted or incinerated. Similarly the reduction of landfilled waste leads to avoided emissions that would occur if that waste was disposed of.

Table 11 gives an overview of the CO_2 equivalent impact factors for several waste treatment activities and production of primary materials. The table shows both the benefits and burdens. Benefits refer to the use of waste streams as a secondary raw material. All steps of waste management are taken into account (collection, transport, sorting, etc). Burdens include the CO_2 equivalent emissions generated when using primary material and energy sources. The analysis of the results of the two scenarios for the determination of the environmental impacts is based on key impact factors which are chosen according to the type of treatment and materials that is analysed each time. Specifically:

- Incineration;
- Recycling (paper, plastics, glass, and metals);
- Composting (including back yard composting) and anaerobic digestion.

In the last subsection the avoided GHG emissions are estimated based on the decline of landfilling in the two scenarios.

Table 11 CO_2 equivalent per tn (Prognos 2008)

Material waste stream	Treatment of waste	CO_2 emissions (kg CO_2 equivalent	Benefit (+)/ Burden (-) (kg CO_2 equivalent)
Paper	Production of deinking pulp (DIP) from waste paper and energy	180	820
	Production of primary fibre and energy	1000	
Plastics	Production of PE/PP flakes from plastic waste and energy (SF = 0,7)	1040	160
	Production of primary PE/PP and energy	1200	
	Production of R-PET from plastic waste and energy (SF = 1)	960	1640
	Production of primary PET and energy	2600	
	Production of R-PS from plastic waste and energy (SF = 0,9)	1100	1700
	Production of primary PS and energy	2800	
	Production secondary PVC from plastic waste and energy (SF = 0,9)	790	740
	Production of primary PVC and energy	1530	
	Co-incineration of mixed plastic waste in a cement kiln	2890	520
	Substitution of fossil fuels	3410	
Glass	Provision of waste glass	20	
	Savings by the substitution of 1 t of primary glass through secondary glass at a calculation point of 75 % secondary glass share	200	180

Material waste stream	Treatment of waste	CO_2 emissions (kg CO_2 equivalent	Benefit (+)/ Burden (-) (kg CO_2 equivalent)
Steel	Production of steel from electric arc furnace route (estimate for secondary)	no valid data	1000
	Production of steel from blast furnace route (estimate for primary)		
Aluminium	Production secondary aluminium	700	11100
	Production primary aluminium	11800	
Copper	Production secondary copper	1690	1180
	Production primary copper	2870	
Biowaste	Compost production and application	87	8
	Production and use of fertilizer and organic substance (e.g peat) in a functional equivalent to compost	95	
	Compost production and application (carbon sink allocated)	*35*	*60*
	Production and use of fertilizer and organic substance (e.g peat) in a functional equivalent to compost	95	
	Anaerobic digestion, energy generation and compost production of biowaste	57	81
	Electricity and heat substitution and substitution of compost application	138	
	Anaerobic digestion, energy generation and compost production of biowaste(carbon sink allocated)	*-8*	*146*
	Electricity and heat substitution and substitution of compost application	138	
Residual waste	Incineration of residual waste	300	70
	Electricity and heat substitution (EU average for WtE plants)	370	
	Incineration of residual waste	300	240
	Electricity and heat substitution (optimised WtE-plant)	540	
	Biological stabilisation and co-incineration of residual waste	250	
	Substitution of fossil fuels	320	70
	Landfilling of residual waste - rate for landfill gas 20% (average)	1080	-1080
	Landfilling of residual waste with subtraction of carbon sink	780	-780
	Optimised landfilling of residual waste - rate for landfill gas 50%	690	-690
	Landfilling of residual waste with subtraction of carbon sink	390	-390

3.7.2.1 Incineration

The main assumption that is taken for the estimation of the environmental impact of this type of treatment is that all forecasted amounts of waste will be incinerated in Waste-to-Energy (WtE) plants. It is also assumed that by 2025 all WtEs will be technologically advanced. In this context, the benefits arising from the increase of incineration levels corresponds to use of optimised WtE plants (0,24 tn CO_2 equivalent).

Table 12 provides the estimates of the environmental impact for both scenarios by using the assumptions mentioned above. For scenario A and scenario B, the benefits will be 3.129.600 tn CO_2 eq. and 602.400 tn CO_2 eq., respectively.

Table 12 Environmental Impacts of incineration

Scenario	MSW waste incinerated (Ml. tn)	Impacts factor (tn CO_2 eq./tn)	Benefit (+)/ burden (-) (tn CO_2 eq.)

Scenario A	13,04	0,24	3129600
Scenario B	2,51	0,24	602400

3.7.2.2 Recycling

To calculate more accurately the environmental impact of recycling, it is necessary to estimate the fraction of plastics and metals. According to the impact factors in Table 11, paper is considered as one material whereas for metals and plastics different fractions are analysed with a differing impact factor for each fraction.

Table 13 shows the estimated environmental impacts per fraction of plastic. The total amount of recycled plastic was split into sub-products and the impacts are estimated for each sub-product. The total benefits for scenario A and scenario B are 986.126 tn CO_2 eq. and 1.326.170 tn CO2 eq., respectively.

Table 13 Breakdown of plastics into subcategories (Arcadis, 2010)[12] and environmental impacts

Fraction	Breakdown	Recycling of plastics in scenario A (ml tn)	Recycling of plastics in scenario B (ml tn)	Impacts factor (tn CO_2 eq./tn)	Benefit (+)/ burden (-) in scenario A (tn CO_2 eq)	Benefit (+)/ burden (-) in scenario B (tn CO_2 eq)
PET	9,78%	0,17	0,23	1,64	279157	375417
PE/PP	63,04%	1,10	1,48	0,16	175513	236035
PS	10,87%	0,19	0,25	1,7	321522	432391
PVC	16,30%	0,28	0,38	0,74	209935	282326
Total	100,00%	1,74	2,34	1,06*	986126	1326170

*Average

The environmental impacts of paper recycling are shown in Table 14. Only one waste fraction is considered. The environmental benefit of paper recycling in scenario A is estimated at the amount 8.544.400 tn CO_2 eq. and for scenario B the impact is estimated at 11.529.200 tn CO_2 eq.

Table 14 Environmental impacts of paper recycling

Scenario	MSW waste incinerated (Ml. tn)	Impacts factor (tn CO_2 eq./tn)	Benefit (+)/ burden (-) (tn CO_2 eq)
Scenario A	10,42	0,82	8544400
Scenario B	14,06	0,82	11529200

As in the case of paper, glass is considered as one material. The environmental benefits of glass recycling are estimated at 788.400 tn CO_2 eq. for scenario A and 1.089.000 tn CO_2 eq. for scenario B.

[12] Estimates based on Plastics Europe, demand by plastics, 2008

Table 15 Environmental impact of glass recycling

Scenario	MSW waste incinerated (Ml. tn)	Impacts factor (tn CO_2 eq./tn)	Benefit (+)/ burden (-) (tn CO_2 eq)
Scenario A	4,38	0,18	788400
Scenario B	6,05	0,18	1089000

For metals, three waste fractions are considered: aluminium, copper and steel. Recycling of aluminium entails a very high environmental benefit because the production of primary aluminium is highly energy intensive. These benefits (per tonne) are about 10 times higher when compared to copper and steel. However this difference is not reflected in the total benefits of scenarios A and B, because aluminium represents only 3,19% of the total amount of metals that are recycled. For scenario A the environmental benefits are 213.277 tn CO_2 eq. and for scenario B 2.810.074 tn CO_2 eq.

Table 16 Breakdown of metals into subcategories (Arcadis, 2010)[13] and environmental impacts

Fraction	Breakdown	Recycling of plastics in scenario A (ml tn)	Recycling of plastics in scenario B (ml tn)	Impacts factor (tn CO_2 eq./tn)	Benefit (+)/ burden (-) in scenario A (tn CO_2 eq)	Benefit (+)/ burden (-) in scenario B (tn CO2 eq)
Aluminium	3,19%	0,05	0,06	11,10	52430	690798
Copper	65,96%	0,98	1,29	1,18	115188	1517681
Steel	30,85%	0,46	0,60	1,00	45660	601596
Total	100,00%	1,48	1,95	4,43	213277	2810074

The recycling of other waste includes other fractions than glass, paper, metals or plastics, but also the recycling of these materials when included in packaging waste, The estimation of the impact of this category is based on the weighted average of impact factors of metals, glass, paper and plastics. The impacts of scenarios A and B are shown in Table 17.

Table 17 Environmental impacts of other waste fractions

Waste fraction	Average impact factor (tn CO2 eq./tn)	Recycling of other waste fractions in scenario A (ml tn)	Recycling of other waste fractions in scenario B (ml tn)	Benefit (+)/ burden (-) in scenario A (tn CO2 eq)	Benefit (+)/ burden (-) in scenario b (tn CO2 eq)
Metals	1,44	10,93	14,38	821882	1081305
Glass	0,18				
Paper	0,82				
Plastics	0,57				
Total	0,75	10,93	14,38	821882,159	1081305,16

[13] Estimates based on Eurostat (2005)

3.7.2.3 Composting

There is debate about whether composting can act as a carbon sink or not. However if we assume that CO_2 contained in biowaste can be stored for more than 100 years in the soil, then the carbon sink effect must be taken into account (Prognos, 2008). In the context of this study we estimate both options; composting with and without the carbon sink effect. The environmental impacts of commercial composting and backyard composting are considered as equal.

The environmental impacts of composting are shown in Table 18. If the carbon sink effect is taken into account the environmental benefits are estimated at the amount of 263.400 tn CO_2 eq. for scenario A and 337.200 for scenario B. When carbon effects are excluded, the environmental impacts are considerably lower (35.120 and 44.960 respectively).

Table 18 Environmental impacts of composting (including back yard composting)

Scenario	Total composting (Ml. tn)	Impacts factor (tn CO_2 eq./tn)	Impacts factor (with carbon sink effect) (tn CO_2 eq./tn)	Benefit (+)/ burden (-) (tn CO_2 eq)	Benefit (+)/ burden (-) (with carbon sink effect) (tn CO_2 eq)
Scenario A	4,39	0,008	0,06	35120	263400
Scenario B	5,62	0,008	0,06	44960	337200

Similarly, the benefits of anaerobic digestion are estimated at the amount of 21.870 tn CO_2 eq. and 34.020 tn CO_2 eq. for scenarios A and B respectively (carbon sink not allocated) and 39.420 tn CO_2 eq. and 61.320 tn CO_2 eq. when the effects are taken into account.

Table 19 Environmental impacts of anaerobic digestion

Scenario	Anaerobic digestion (Ml. tn)	Impacts factor (tn CO_2 eq./tn)	Impacts factor (with carbon sink effect) (tn CO_2 eq./tn)	Benefit (+)/ burden (-) (tn CO_2 eq)	Benefit (+)/ burden (-) (with carbon sink effect) (tn CO_2 eq)
Scenario A	0,27	0,081	0,146	21870	39420
Scenario B	0,42	0,081	0,146	34020	61320

3.7.2.4 Landfilled waste

Two options for landfill are considered in this study:

- Landfill with a 20% recovery rate of landfill gas
- Landfill where the potential of storing carbon for more than 100 years (carbon sink effect) is taken into account.

The results for both of these options are presented in Table 20. In both cases the decline of the emissions are steep. As expected, if the carbon sink effect is taken into account, the benefits arising from reduced landfilling are lower than when compared to the other option (33.376.200 tn CO_2 eq. in scenario A and 32.822.400 tn CO_2 eq in scenario B). Landfilling with an option of a 20% recovery rate of gas, results in a reduction of 46.213.200 tn CO_2 eq. in scenario A and 45.446.400 tn CO_2 eq. in scenario B.

Table 20 Avoided emissions from reduced landfilled waste

Scenario	**Decline of landfilled waste (Ml. tn)**	**Impact factor (20% of landfill gas recovered) (tn CO_2 eq./tn)**	**Impact factor (with carbon sink effect) (tn CO_2 eq./tn)**	**Benefit (+)/ burden (-) (20% of landfill gas recovered) (tn CO_2 eq)**	**Benefit (+)/ burden (-) (with carbon sink effect) (tn CO_2 eq)**
Scenario A	42,79	-1,08	-0,78	-46213200	-33376200
Scenario B	42,08	-1,08	-0,78	-45446400	-32822400

3.7.3 Resource depletion

In addition to the GHG emissions already calculated in the above subsection, another important environmental impact is the resource depletion that is avoided through the increased recycling rates that are calculated in scenarios A and B.

To assess the benefits of the scenarios the two following environmental indicators are taken into account:

- Natural resource depletion (expressed in tonnes Sb equivalent)
- Fossil resources depletion (expressed in tonnes oil equivalent)

The calculation of the impacts is based on Life Cycle Inventories (LCI) of various materials that include the following stages: material production, packaging production, and end of life steps (recycling, incineration, landfill).

The database used for the LCI is Ecoinvent v2.2. For the determination of the impacts of paper we consider the impacts of cardboard, for metals the impacts of steel, for plastics the impacts of PET bottles and for glass the impacts of clear glass.

We assume that all materials recycled are used as inputs in the production phase and therefore they represent avoided quantities of raw materials. The tables below show the environmental benefits of recycling in terms of natural and fossil resources depletion. The LCIs used for the calculation are also shown.

Table 21 Avoided resource depletion in scenario A

Resource	**Avoided quantities (Ml. tn)**	**Natural resource depletion (tn Sb eq/tn)**	**Fossil fuels depletion(tn Sb eq/tn)**	**Natural resource depletion avoided (tonnes Sb eq.)**	**Fossil resource depletion avoided (tonne oil eq.)**
Plastics	1,74	0,038	1,736	66120	3020640
Paper	10,42	0,01	0,464	104200	4834880
Glass	4,38	0,007	0,325	30660	1423500
Metal	1,48	0,02	0,817	29600	1209160

Total				230580	10488180

Table 22 Avoided resource depletion in scenario B

Resource	Avoided quantities (Ml. tn)	Natural resource depletion (tn Sb eq/tn)	Fossil fuels depletion(tn Sb eq/tn)	Natural resource depletion avoided (tonnes Sb eq.)	Fossil resource depletion avoided (tonne oil eq.)
Plastics	2,34	0,038	1,736	88920	4062240
Paper	14,06	0,01	0,464	140600	6523840
Glass	6,05	0,007	0,325	42350	1966250
Metal	1,95	0,02	0,817	39000	1593150
Total	-	-	-	310870	14145480

The estimations of the avoided resource depletion from other waste are shown in Table 23. The estimates are based on the average impact factors of plastics, paper, glass and metals.

Table 23 Avoided resource depletion in Scenarios A and B from the recycling of other waste

<table>
<tr><th>Resource</th><th>Avoided quantities (Ml. tn) in Scenario A</th><th>Avoided quantities (Ml. tn) in Scenario B</th><th>Average natural resource depletion (tn Sb eq/tn)</th><th>Average fossil fuels depletion(tn Sb eq/tn)</th><th>Resource depletion avoided (tonnes Sb eq.) in Scenario A</th><th>Fossil resource depletion avoided (tonne oil eq.) in Scenario A</th><th>Resource depletion avoided (tonnes Sb eq.) in Scenario B</th><th>Fossil resource depletion avoided (tonne oil eq.) in Scenario B</th></tr>
<tr><td>Plastics</td><td rowspan="4">10,93</td><td rowspan="4">14,38</td><td rowspan="4">0,01875</td><td rowspan="4">0,8355</td><td rowspan="4">20494</td><td rowspan="4">913202</td><td rowspan="4">26963</td><td rowspan="4">1201449</td></tr>
<tr><td>Paper</td></tr>
<tr><td>Glass</td></tr>
<tr><td>Metal</td></tr>
</table>

4 Annex with results : baseline scenario

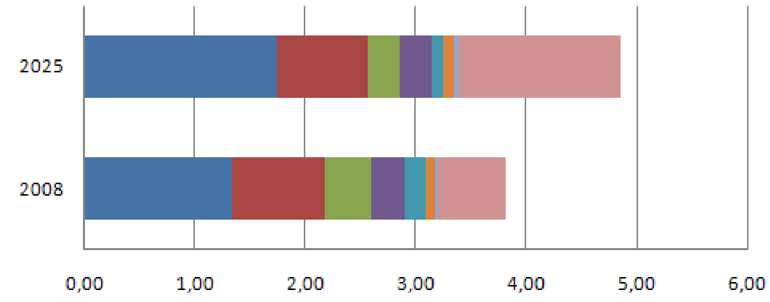
4.1 How to read the figures

- The figures are in line with the modelling performed for the study "*on the evolution of (bio-) waste generation / prevention and (bio-)waste prevention indicators*" DG ENV (2011)
- The evolution in municipal waste generation is based upon assumptions on the number of consumers and their consumption and waste generation behaviour, and the actually observed level of coupling or decoupling between consumption and municipal waste generation.

- For some Member States, data on economic growth, as the basis of this analysis, need to be reviewed in light of the financial and dept crises between 2008 and the date of publication. This may entail a revision of the increase of waste generation. However 2025 as a horizon is sufficiently far away in future to cope with even large conjuncture movements.
- The figures are based on a business as usual scenario on the different waste treatment options, and does not take into account shifts in technology or in political preferences. For this reason, one may assume that the quantities destined for composting and anaerobic digestion with energy recovery may be interchangeable.
- MBT is not included as waste treatment option, because it is a pre-treatment operation preceding incineration, landfill or recycling of different fractions.
- The landfilling and incineration figures include treatment of the recycling and composting residues
- The fraction 'other recycling' needs to be read as 'other or not specified recycling'. It includes recycling of other fractions than glass, paper, metals or plastics, but also the recycling of these materials when included in packaging waste, WEEE, … and other waste fractions which are not included in the Waste Statistics Regulation annex II categories for recycling of 06 (metals), 07.1 (glass), 07.2 (paper), 07.4 (plastics). When data availability is limited, this could also effect in an increased quantity of 'other recycling. The sum of glass, plastics, metal, paper and other recycling corresponds tot total recycling as reported, excluding composting.

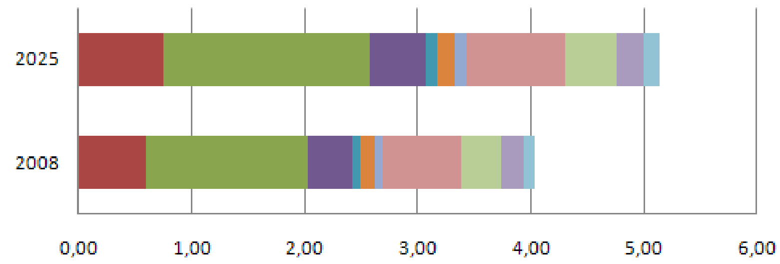
4.2 Austria

MSW generation



	2008	2025
bio waste	1,34	1,75
paper and cardboard	0,84	0,82
plastics	0,42	0,29
glass	0,31	0,29
metals	0,19	0,10
textiles	0,08	0,10
hazardous household waste	0,04	0,05
other	0,61	1,46

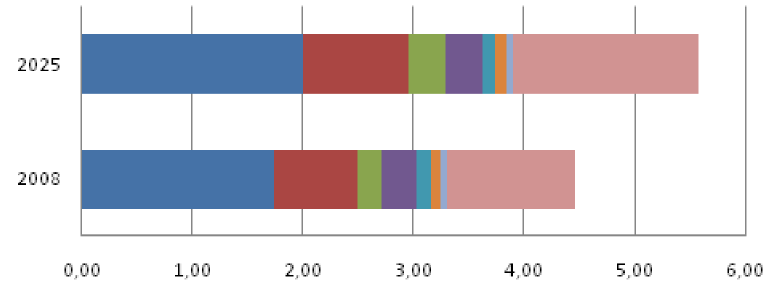
MSW treatment



	2008	2025
landfill	0,59	0,76
incineration	1,44	1,82
paper cardboard recycling	0,39	0,49
plastic recycling	0,08	0,10
glass recycling	0,12	0,15
metals recycling	0,08	0,10
other recycling	0,69	0,88
composting	0,35	0,45
backyard composting	0,19	0,24
AD	0,11	0,14

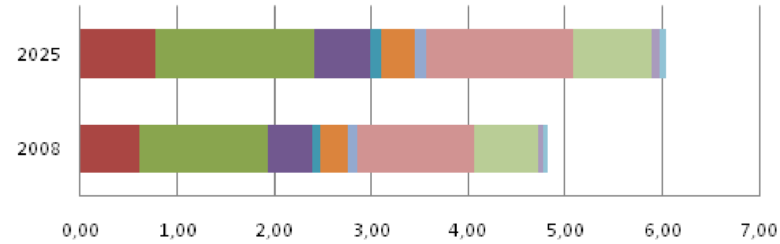
4.3 Belgium

MSW generation



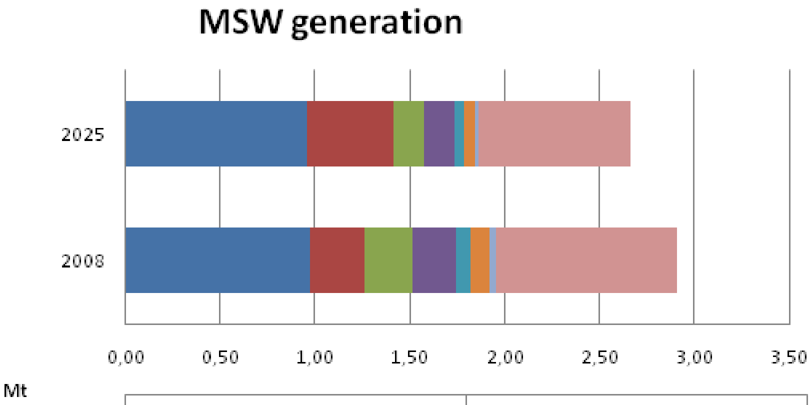
Mt	2008	2025
bio waste	1,74	2,01
paper and cardboard	0,76	0,95
plastics	0,22	0,33
glass	0,31	0,33
metals	0,13	0,11
textiles	0,09	0,11
hazardous household waste	0,04	0,06
other	1,16	1,67

MSW treatment

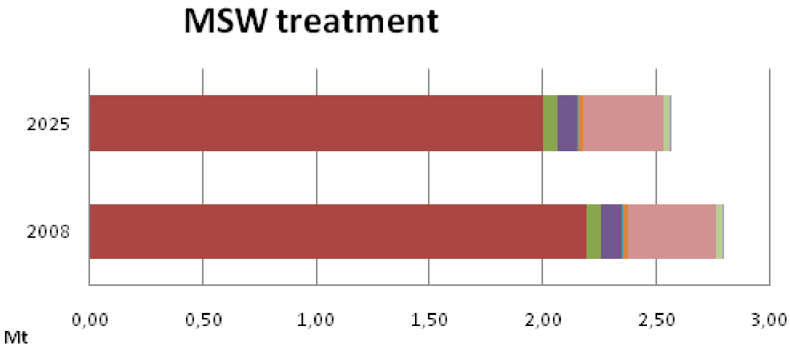


Mt	2008	2025
landfilled	0,62	0,78
incinerated	1,31	1,64
paper cardboard recycling	0,46	0,58
plastic recycling	0,08	0,10
glass recycling	0,28	0,36
metals recycling	0,09	0,11
other recycling	1,21	1,51
composting	0,66	0,82
backyard composting	0,06	0,08
AD	0,05	0,06

4.4 Bulgaria

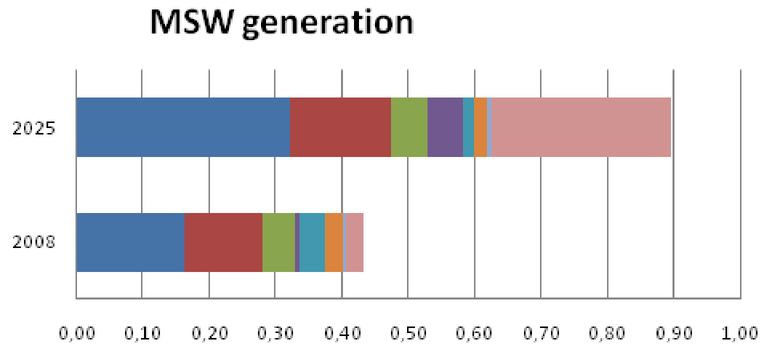


	2008	2025
bio waste	0,98	0,96
paper and cardboard	0,29	0,45
plastics	0,25	0,16
glass	0,23	0,16
metals	0,07	0,05
textiles	0,11	0,05
hazardous household waste	0,03	0,02
other	0,96	0,80

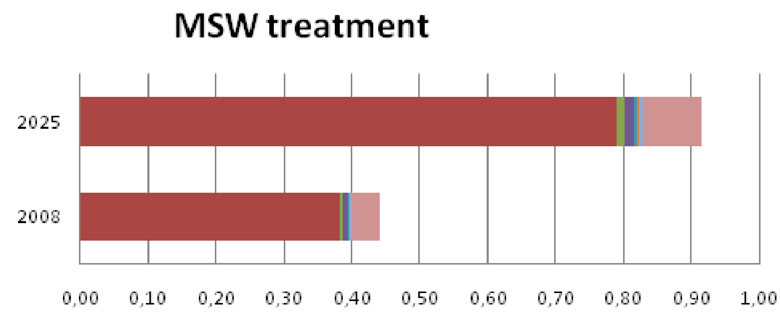


	2008	2025
landfilled	2,19	2,01
incinerated	0,07	0,06
paper cardboard recycling	0,09	0,08
plastic recycling	0,01	0,01
glass recycling	0,02	0,02
metals recycling	0,00	0,00
other recycling	0,39	0,36
composting	0,03	0,03
backyard composting	0,01	0,01
AD	0,00	0,00

4.5 Cyprus

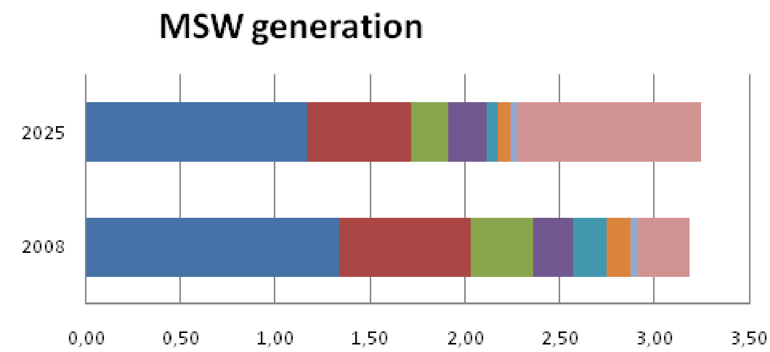


Mt	2008	2025
bio waste	0,16	0,32
paper and cardboard	0,12	0,15
plastics	0,05	0,05
glass	0,01	0,05
metals	0,04	0,02
textiles	0,03	0,02
hazardous household waste	0,00	0,01
other	0,03	0,27

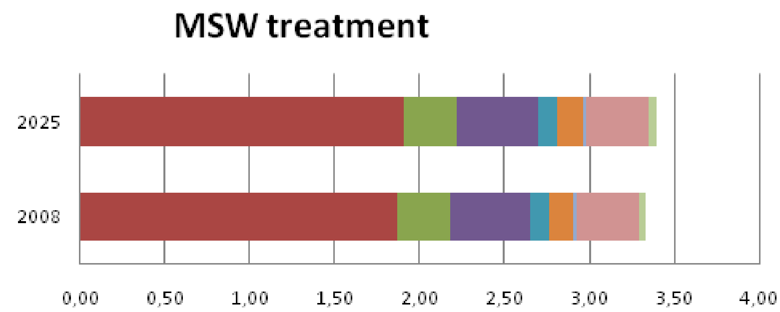


Mt	2008	2025
landfilled	0,38	0,79
incinerated	0,01	0,01
paper cardboard recycling	0,01	0,01
plastic recycling	0,00	0,00
glass recycling	0,00	0,00
metals recycling	0,00	0,01
other recycling	0,04	0,08
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

4.6 Czech Republic

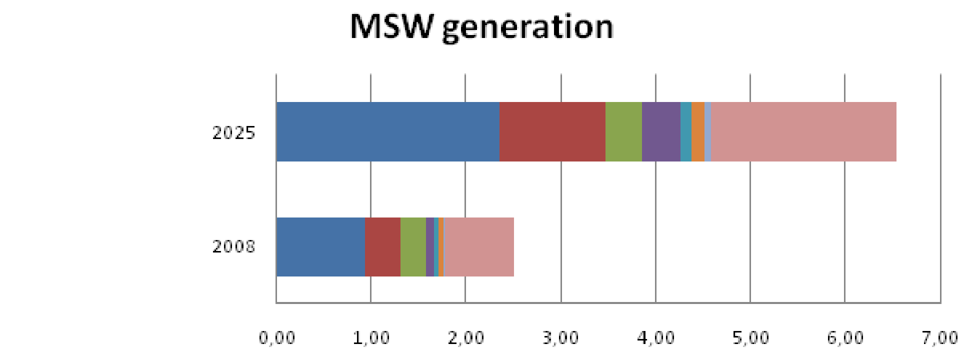


Mt	2008	2025
bio waste	1,33	1,17
paper and cardboard	0,69	0,55
plastics	0,33	0,19
glass	0,21	0,19
metals	0,18	0,06
textiles	0,13	0,06
hazardous household waste	0,03	0,03
other	0,28	0,97

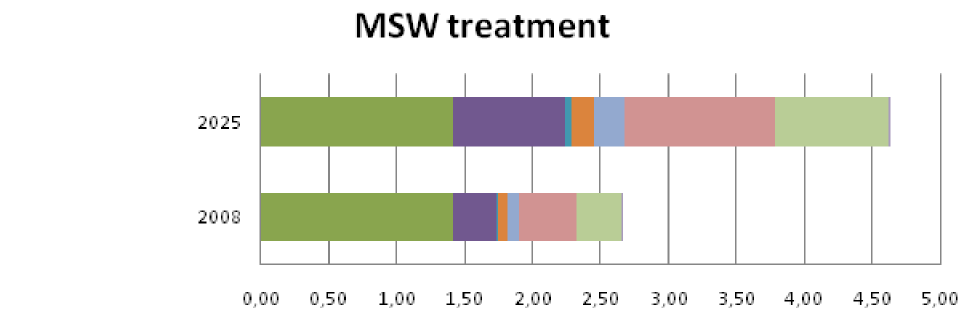


Mt	2008	2025
landfilled	1,87	1,90
incinerated	0,31	0,31
paper cardboard recycling	0,47	0,48
plastic recycling	0,11	0,11
glass recycling	0,15	0,15
metals recycling	0,02	0,02
other recycling	0,36	0,37
composting	0,05	0,05
backyard composting	0,00	0,00
AD	0,00	0,00

4.7 Denmark



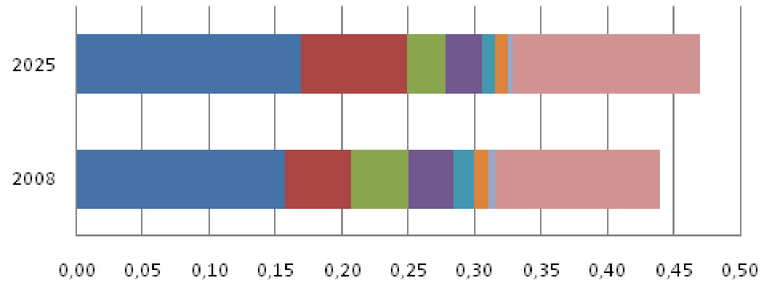
Mt	2008	2025
bio waste	0,93	2,36
paper and cardboard	0,38	1,11
plastics	0,28	0,39
glass	0,08	0,39
metals	0,05	0,13
textiles	0,05	0,13
hazardous household waste	0,03	0,07
other	0,73	1,96



Mt	2008	2025
landfilled	0,00	0,00
incinerated	1,42	1,42
paper cardboard recycling	0,32	0,82
plastic recycling	0,02	0,05
glass recycling	0,06	0,17
metals recycling	0,08	0,22
other recycling	0,42	1,11
composting	0,32	0,84
backyard composting	0,00	0,01
AD	0,00	0,00

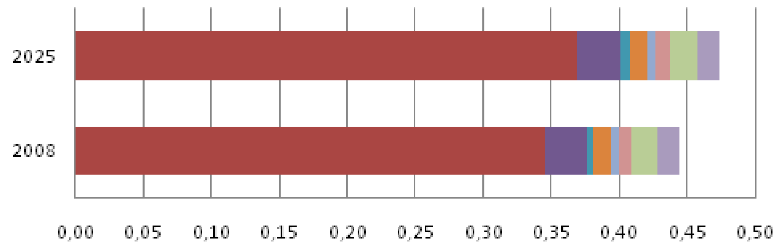
4.8 Estonia

MSW generation



Mt	2008	2025
bio waste	0,16	0,17
paper and cardboard	0,05	0,08
plastics	0,04	0,03
glass	0,03	0,03
metals	0,02	0,01
textiles	0,01	0,01
hazardous household waste	0,00	0,00
other	0,12	0,14

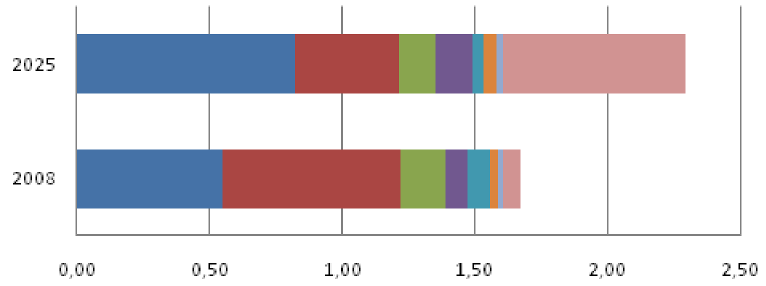
MSW treatment



Mt	2008	2025
landfilled	0,35	0,37
incinerated	0,00	0,00
paper cardboard recycling	0,03	0,03
plastic recycling	0,01	0,01
glass recycling	0,01	0,01
metals recycling	0,01	0,01
other recycling	0,01	0,01
composting	0,02	0,02
backyard composting	0,02	0,02
AD	0,00	0,00

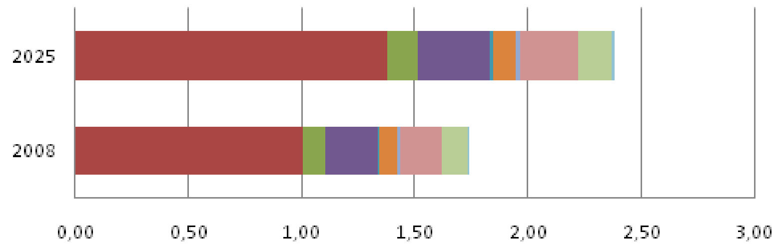
4.9 Finland

MSW generation



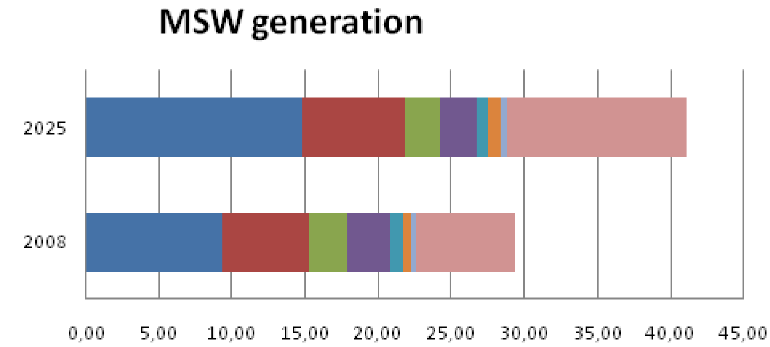
Mt	2008	2025
bio waste	0,55	0,82
paper and cardboard	0,67	0,39
plastics	0,17	0,14
glass	0,08	0,14
metals	0,08	0,05
textiles	0,03	0,05
hazardous household waste	0,02	0,02
other	0,07	0,69

MSW treatment

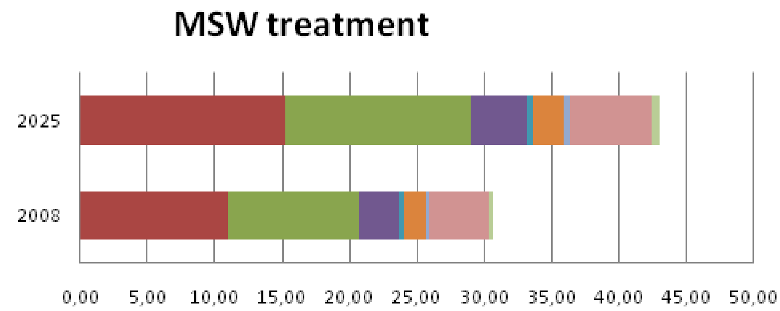


Mt	2008	2025
landfilled	1,01	1,38
incinerated	0,10	0,13
paper cardboard recycling	0,23	0,32
plastic recycling	0,01	0,01
glass recycling	0,08	0,10
metals recycling	0,01	0,02
other recycling	0,18	0,25
composting	0,11	0,15
backyard composting	0,00	0,00
AD	0,01	0,02

4.10 France



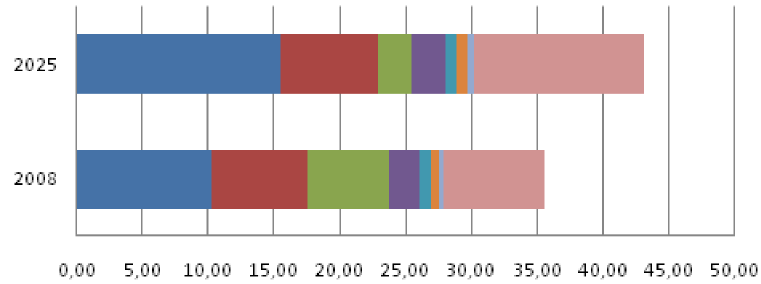
Mt	2008	2025
bio waste	9,38	14,81
paper and cardboard	5,87	6,99
plastics	2,64	2,47
glass	2,93	2,47
metals	0,88	0,82
textiles	0,59	0,82
hazardous household waste	0,29	0,41
other	6,74	12,34



Mt	2008	2025
landfilled	10,90	15,29
incinerated	9,77	13,70
paper cardboard recycling	3,00	4,21
plastic recycling	0,33	0,46
glass recycling	1,63	2,29
metals recycling	0,34	0,47
other recycling	4,31	6,05
composting	0,43	0,60
backyard composting	0,00	0,00
AD	0,00	0,00

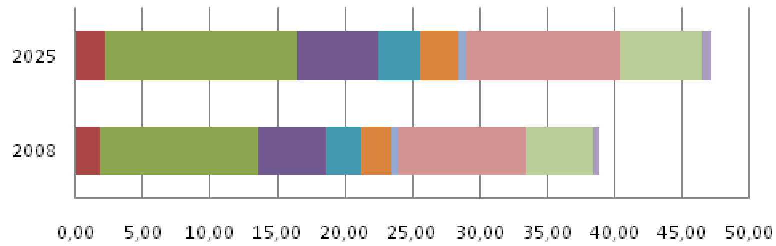
4.11 Germany

MSW generation



Mt	2008	2025
bio waste	10,29	15,53
paper and cardboard	7,30	7,33
plastics	6,19	2,59
glass	2,34	2,59
metals	0,75	0,86
textiles	0,71	0,86
hazardous household waste	0,35	0,43
other	7,67	12,94

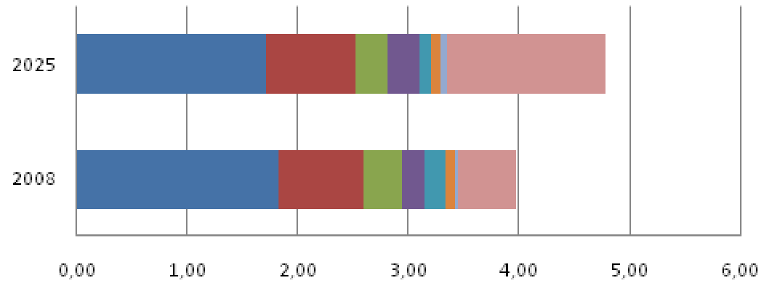
MSW treatment



Mt	2008	2025
landfilled	1,77	2,14
incinerated	11,78	14,27
paper cardboard recycling	5,04	6,11
plastic recycling	2,52	3,06
glass recycling	2,31	2,80
metals recycling	0,49	0,59
other recycling	9,48	11,49
composting	4,96	6,01
backyard composting	0,55	0,67
AD	0,00	0,00

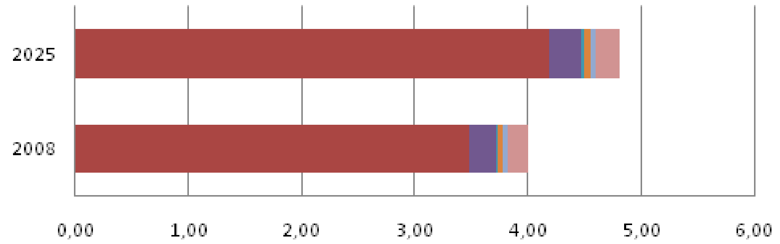
4.12 Greece

MSW generation



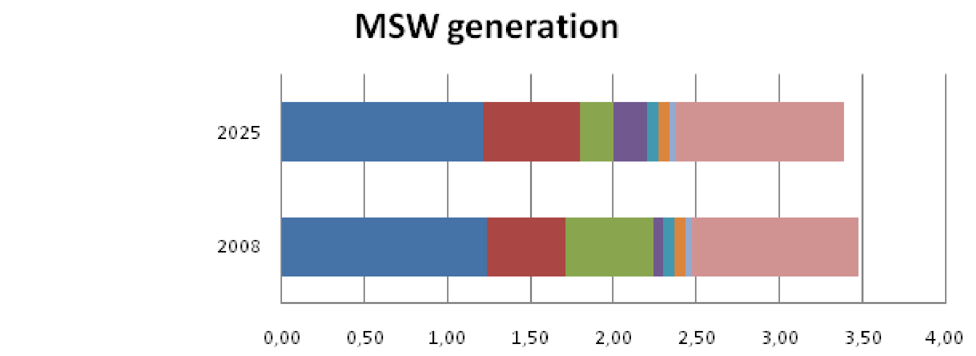
Mt	2008	2025
bio waste	1,82	1,72
paper and cardboard	0,78	0,81
plastics	0,35	0,29
glass	0,19	0,29
metals	0,19	0,10
textiles	0,08	0,10
hazardous household waste	0,04	0,05
other	0,51	1,43

MSW treatment

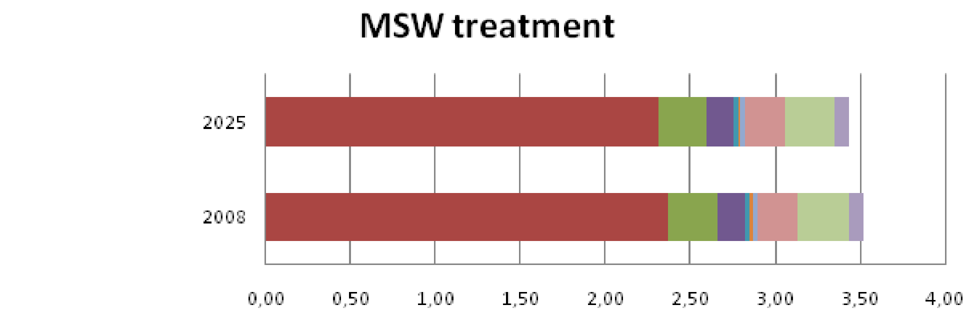


Mt	2008	2025
landfilled	3,48	4,19
incinerated	0,00	0,00
paper cardboard recycling	0,24	0,28
plastic recycling	0,02	0,03
glass recycling	0,04	0,05
metals recycling	0,04	0,05
other recycling	0,18	0,22
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

4.13 Hungary

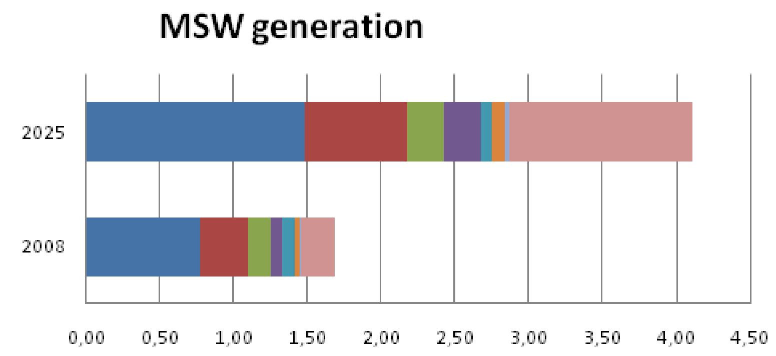


Mt	2008	2025
bio waste	1,24	1,22
paper and cardboard	0,47	0,58
plastics	0,53	0,20
glass	0,06	0,20
metals	0,06	0,07
textiles	0,07	0,07
hazardous household waste	0,03	0,03
other	1,00	1,02

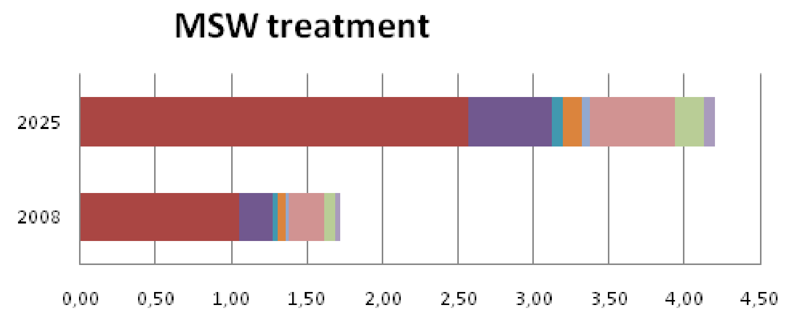


Mt	2008	2025
landfilled	2,37	2,31
incinerated	0,29	0,28
paper cardboard recycling	0,17	0,16
plastic recycling	0,02	0,02
glass recycling	0,02	0,02
metals recycling	0,03	0,03
other recycling	0,24	0,23
composting	0,30	0,29
backyard composting	0,09	0,08
AD	0,00	0,00

4.14 Ireland



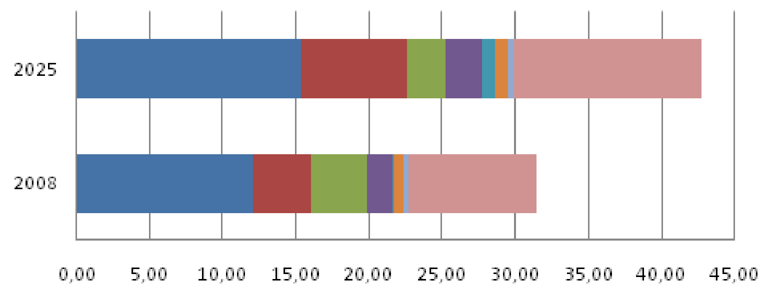
Mt	2008	2025
bio waste	0,77	1,48
paper and cardboard	0,33	0,70
plastics	0,15	0,25
glass	0,08	0,25
metals	0,08	0,08
textiles	0,03	0,08
hazardous household waste	0,02	0,04
other	0,22	1,23



Mt	2008	2025
landfilled	1,05	2,57
incinerated	0,00	0,00
paper cardboard recycling	0,23	0,55
plastic recycling	0,03	0,07
glass recycling	0,05	0,12
metals recycling	0,02	0,05
other recycling	0,23	0,57
composting	0,08	0,19
backyard composting	0,03	0,08
AD	0,00	0,00

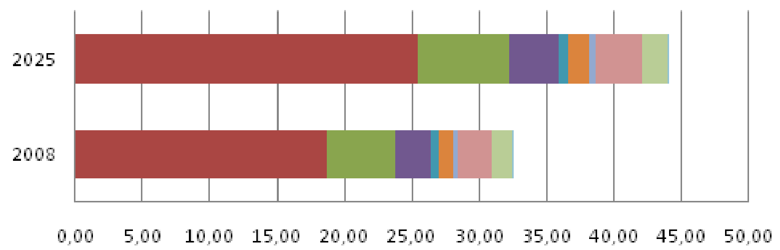
4.15 Italy

MSW generation



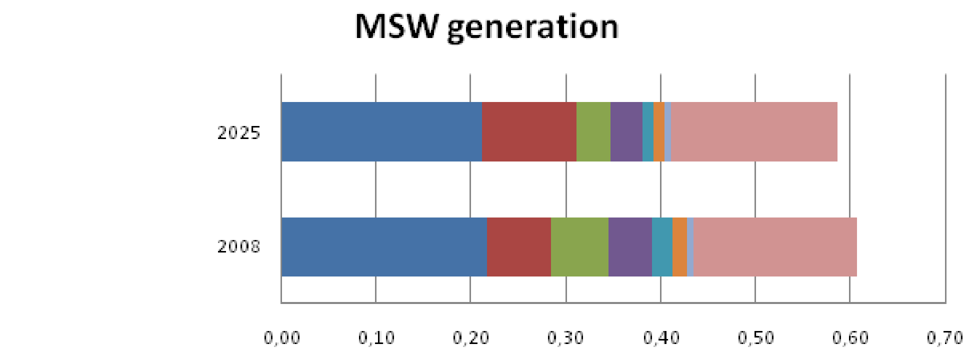
Mt	2008	2025
bio waste	12,05	15,38
paper and cardboard	3,98	7,26
plastics	3,80	2,56
glass	1,74	2,56
metals	0,17	0,85
textiles	0,65	0,85
hazardous household waste	0,32	0,43
other	8,74	12,82

MSW treatment

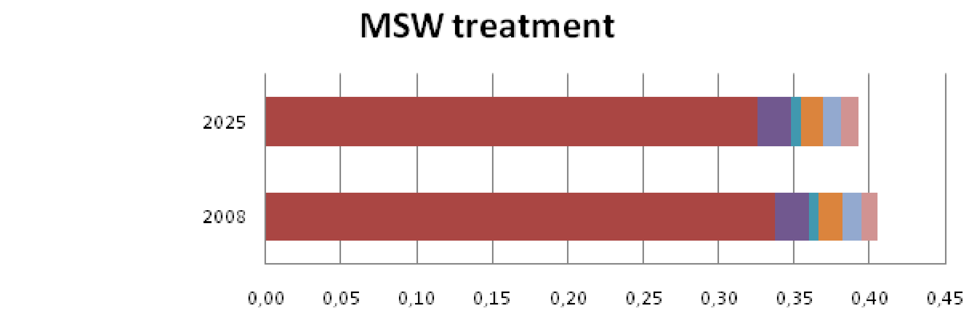


Mt	2008	2025
landfilled	18,72	25,42
incinerated	5,01	6,80
paper cardboard recycling	2,71	3,68
plastic recycling	0,51	0,70
glass recycling	1,14	1,55
metals recycling	0,36	0,50
other recycling	2,50	3,40
composting	1,44	1,95
backyard composting	0,00	0,00
AD	0,08	0,10

4.16 Latvia

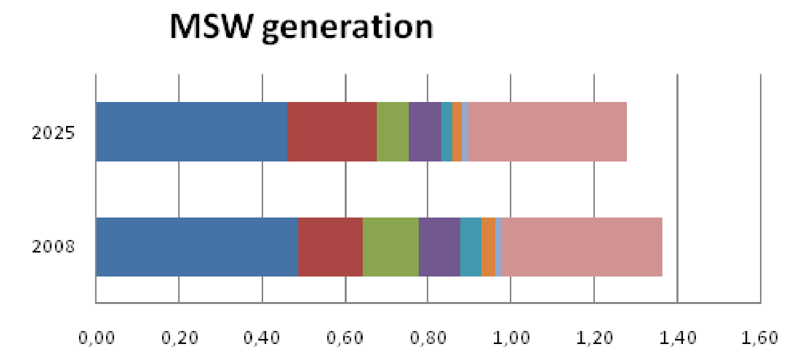


Mt	2008	2025
bio waste	0,22	0,21
paper and cardboard	0,07	0,10
plastics	0,06	0,04
glass	0,05	0,04
metals	0,02	0,01
textiles	0,02	0,01
hazardous household waste	0,01	0,01
other	0,17	0,18

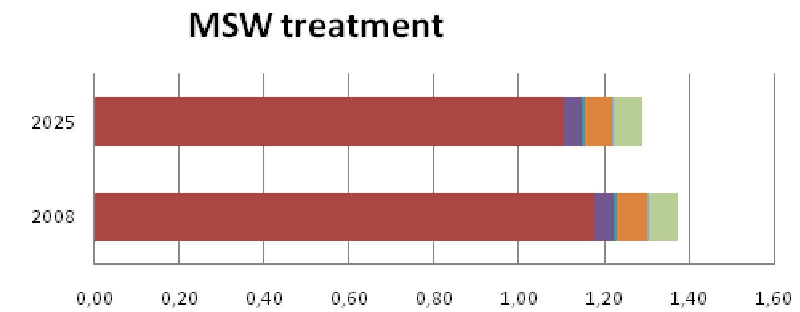


Mt	2008	2025
landfilled	0,34	0,33
incinerated	0,00	0,00
paper cardboard recycling	0,02	0,02
plastic recycling	0,01	0,01
glass recycling	0,02	0,01
metals recycling	0,01	0,01
other recycling	0,01	0,01
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

4.17 Lithuania

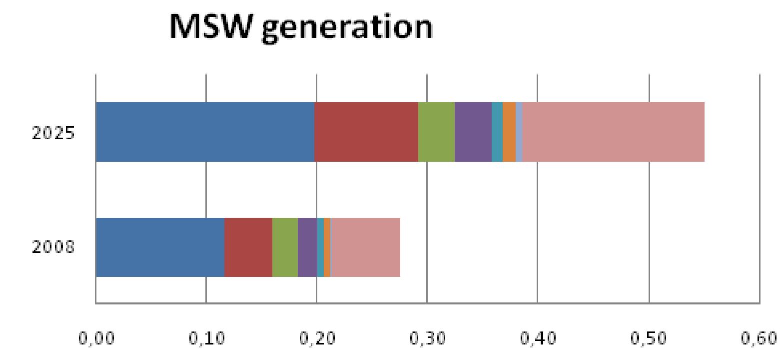


Mt	2008	2025
bio waste	0,49	0,46
paper and cardboard	0,15	0,22
plastics	0,13	0,08
glass	0,10	0,08
metals	0,05	0,03
textiles	0,04	0,03
hazardous household waste	0,01	0,01
other	0,39	0,38

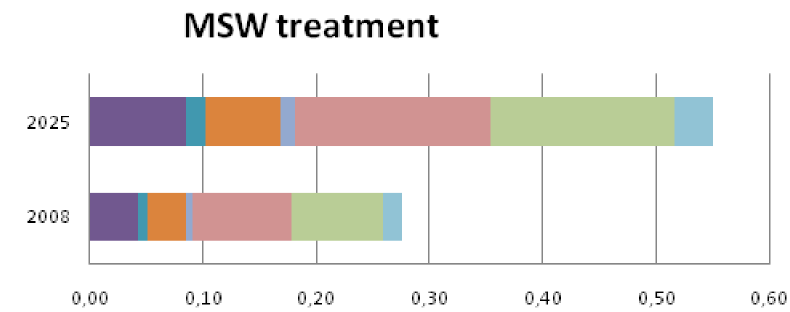


Mt	2008	2025
landfilled	1,18	1,11
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,04
plastic recycling	0,01	0,01
glass recycling	0,07	0,06
metals recycling	0,00	0,00
other recycling	0,00	0,00
composting	0,07	0,07
backyard composting	0,00	0,00
AD	0,00	0,00

4.18 Luxembourg

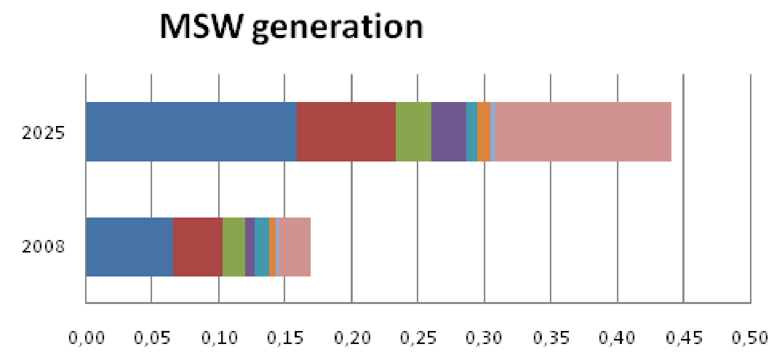


Mt	2008	2025
bio waste	0,12	0,20
paper and cardboard	0,04	0,09
plastics	0,02	0,03
glass	0,02	0,03
metals	0,00	0,01
textiles	0,01	0,01
hazardous household waste	0,00	0,01
other	0,06	0,17

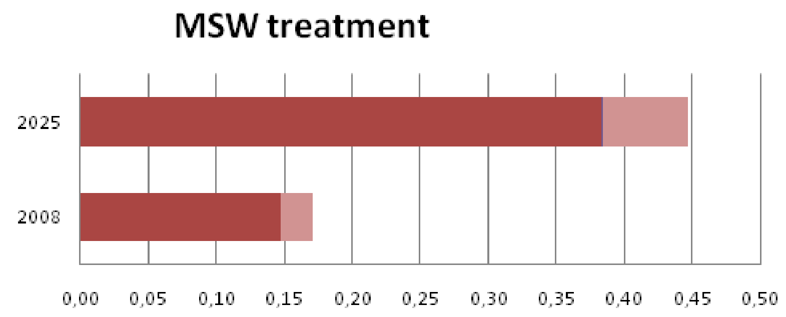


Mt	2008	2025
landfilled	0,00	0,00
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,08
plastic recycling	0,01	0,02
glass recycling	0,03	0,07
metals recycling	0,01	0,01
other recycling	0,09	0,17
composting	0,08	0,16
backyard composting	0,00	0,00
AD	0,02	0,03

4.19 Malta

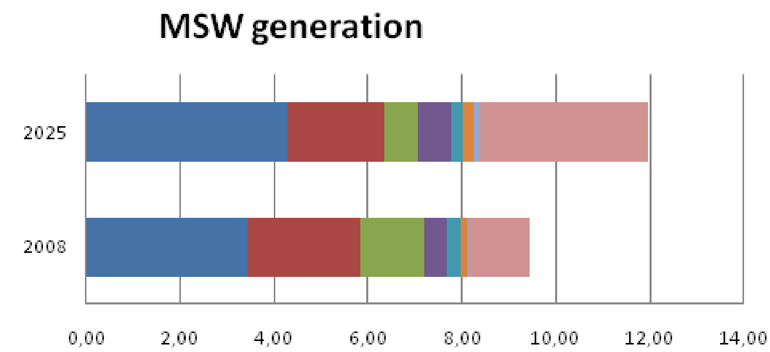


Mt	2008	2025
bio waste	0,07	0,16
paper and cardboard	0,04	0,07
plastics	0,02	0,03
glass	0,01	0,03
metals	0,01	0,01
textiles	0,01	0,01
hazardous household waste	0,00	0,00
other	0,02	0,13

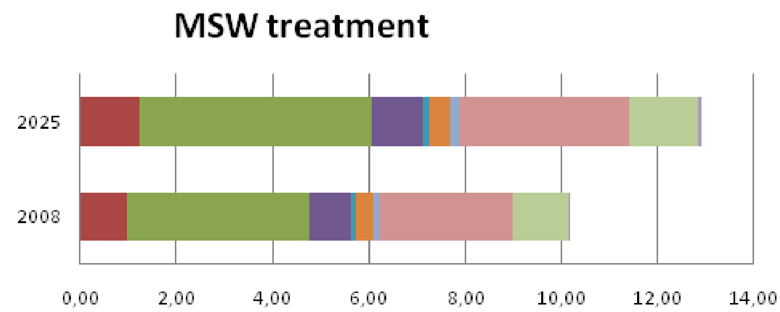


Mt	2008	2025
landfilled	0,15	0,38
incinerated	0,00	0,00
paper cardboard recycling	0,00	0,00
plastic recycling	0,00	0,00
glass recycling	0,00	0,00
metals recycling	0,00	0,00
other recycling	0,02	0,06
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

4.20 The Netherlands



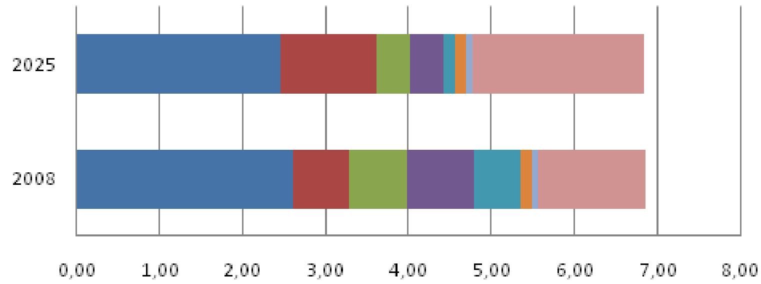
Mt	2008	2025
bio waste	3,44	4,31
paper and cardboard	2,41	2,04
plastics	1,34	0,72
glass	0,47	0,72
metals	0,32	0,24
textiles	0,12	0,24
hazardous household waste	0,05	0,12
other	1,30	3,59



Mt	2008	2025
landfilled	0,98	1,24
incinerated	3,80	4,82
paper cardboard recycling	0,85	1,08
plastic recycling	0,11	0,13
glass recycling	0,34	0,43
metals recycling	0,14	0,18
other recycling	2,78	3,52
composting	1,14	1,44
backyard composting	0,06	0,08
AD	0,00	0,00

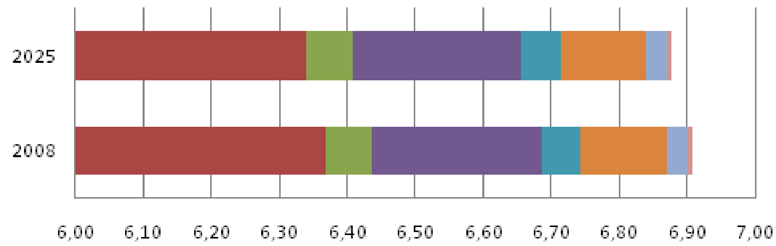
4.21 Poland

MSW generation



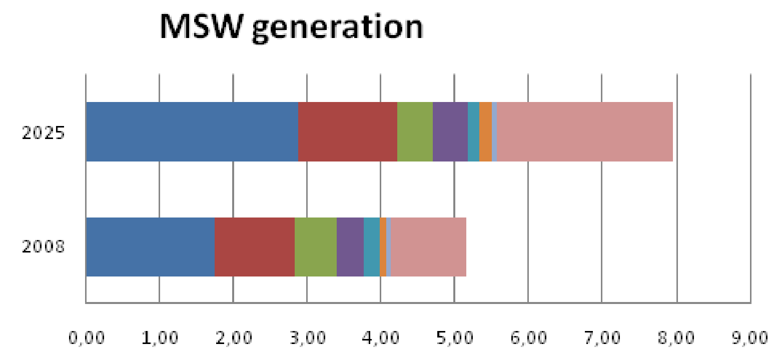
Mt	2008	2025
bio waste	2,61	2,46
paper and cardboard	0,69	1,16
plastics	0,69	0,41
glass	0,82	0,41
metals	0,55	0,14
textiles	0,14	0,14
hazardous household waste	0,07	0,08
other	1,30	2,05

MSW treatment

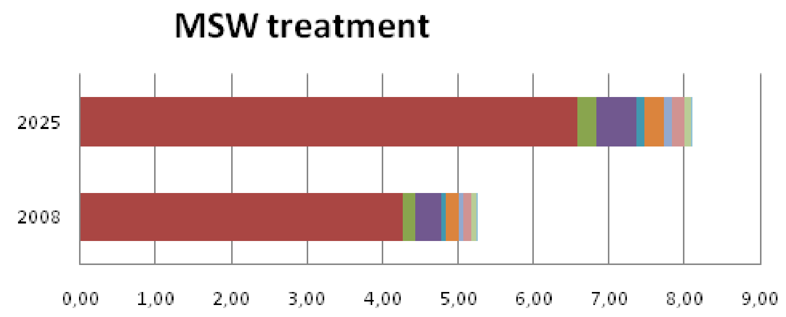


Mt	2008	2025
landfilled	6,37	6,34
incinerated	0,07	0,07
paper cardboard recycling	0,25	0,25
plastic recycling	0,06	0,06
glass recycling	0,13	0,13
metals recycling	0,03	0,03
other recycling	0,01	0,01
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

4.22 Portugal

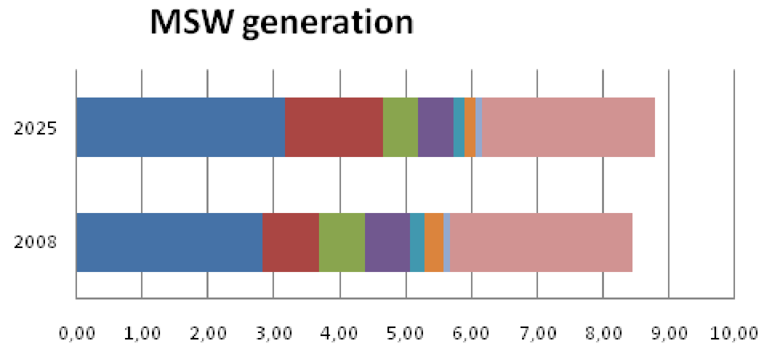


Mt	2008	2025
bio waste	1,75	2,87
paper and cardboard	1,08	1,35
plastics	0,57	0,48
glass	0,36	0,48
metals	0,21	0,16
textiles	0,10	0,16
hazardous household waste	0,05	0,08
other	1,03	2,39

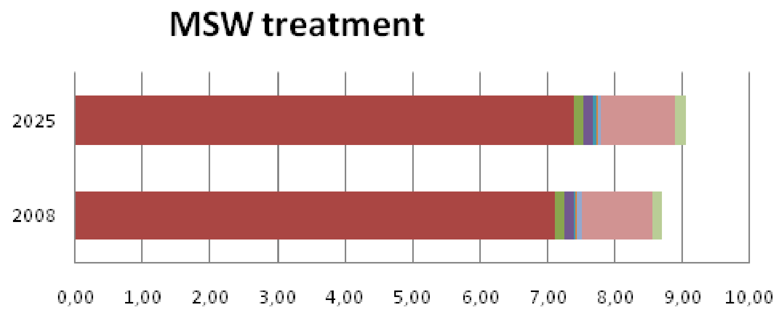


Mt	2008	2025
landfilled	4,27	6,58
incinerated	0,17	0,26
paper cardboard recycling	0,34	0,53
plastic recycling	0,06	0,09
glass recycling	0,17	0,26
metals recycling	0,07	0,11
other recycling	0,11	0,18
composting	0,05	0,07
backyard composting	0,00	0,00
AD	0,01	0,02

4.23 Romania



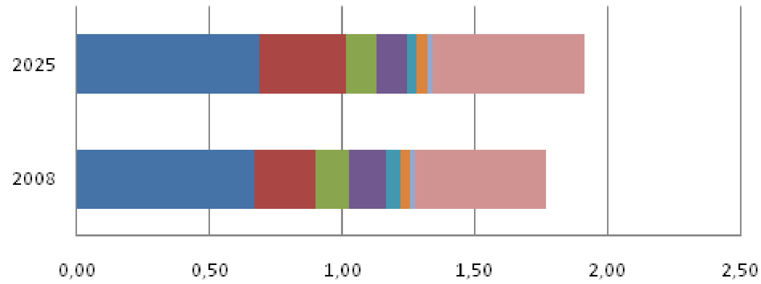
Mt	2008	2025
bio waste	2,84	3,17
paper and cardboard	0,84	1,50
plastics	0,72	0,53
glass	0,67	0,53
metals	0,22	0,18
textiles	0,31	0,18
hazardous household waste	0,08	0,09
other	2,79	2,64



Mt	2008	2025
landfilled	7,11	7,39
incinerated	0,14	0,15
paper cardboard recycling	0,14	0,15
plastic recycling	0,04	0,04
glass recycling	0,03	0,03
metals recycling	0,06	0,06
other recycling	1,04	1,08
composting	0,15	0,16
backyard composting	0,00	0,00
AD	0,00	0,00

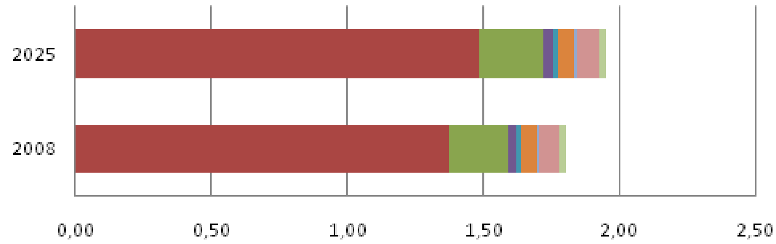
4.24 Slovakia

MSW generation



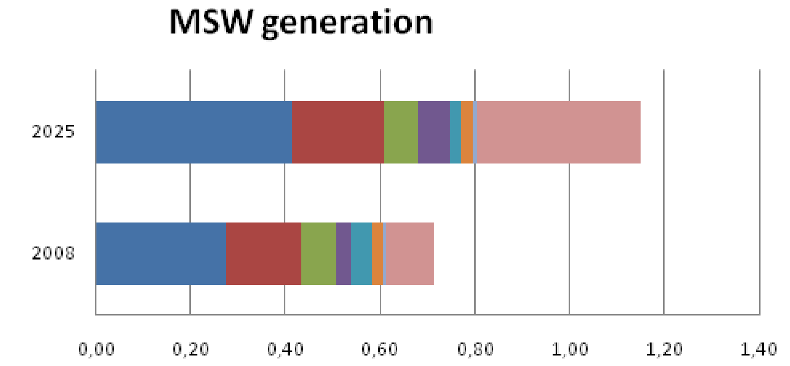
Mt	2008	2025
bio waste	0,67	0,69
paper and cardboard	0,23	0,33
plastics	0,12	0,11
glass	0,14	0,11
metals	0,05	0,04
textiles	0,04	0,04
hazardous household waste	0,02	0,02
other	0,50	0,57

MSW treatment

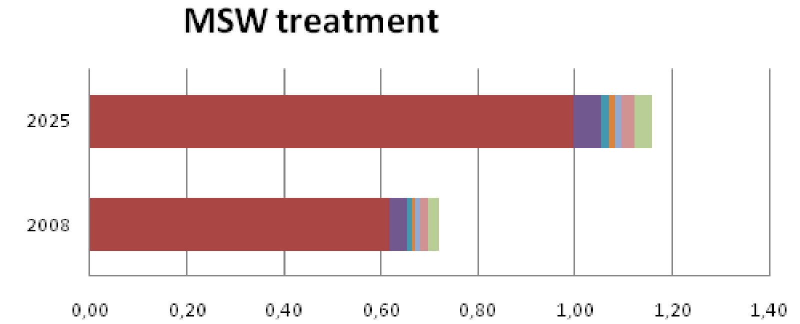


Mt	2008	2025
landfilled	1,37	1,48
incinerated	0,22	0,24
paper cardboard recycling	0,03	0,03
plastic recycling	0,02	0,02
glass recycling	0,06	0,06
metals recycling	0,01	0,01
other recycling	0,08	0,08
composting	0,02	0,02
backyard composting	0,00	0,00
AD	0,00	0,00

4.25 Slovenia



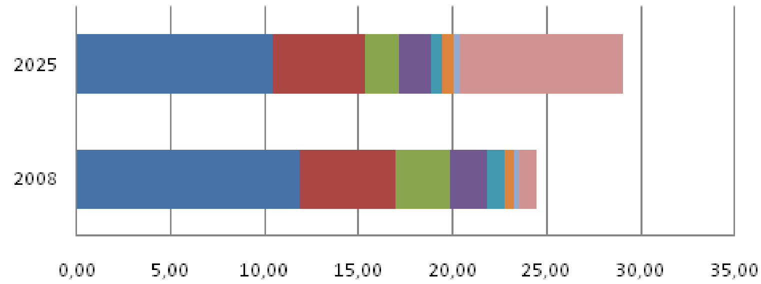
Mt	2008	2025
bio waste	0,28	0,41
paper and cardboard	0,16	0,20
plastics	0,07	0,07
glass	0,03	0,07
metals	0,04	0,02
textiles	0,02	0,02
hazardous household waste	0,01	0,01
other	0,10	0,35



Mt	2008	2025
landfilled	0,62	1,00
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,06
plastic recycling	0,01	0,02
glass recycling	0,01	0,01
metals recycling	0,01	0,01
other recycling	0,02	0,03
composting	0,02	0,04
backyard composting	0,00	0,00
AD	0,00	0,00

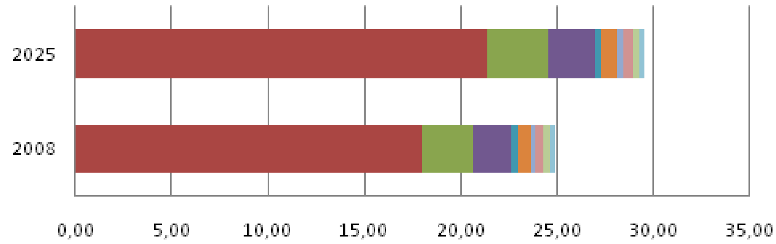
4.26 Spain

MSW generation



Mt	2008	2025
bio waste	11,86	10,45
paper and cardboard	5,08	4,93
plastics	2,91	1,74
glass	1,94	1,74
metals	0,97	0,58
textiles	0,49	0,58
hazardous household waste	0,24	0,34
other	0,96	8,71

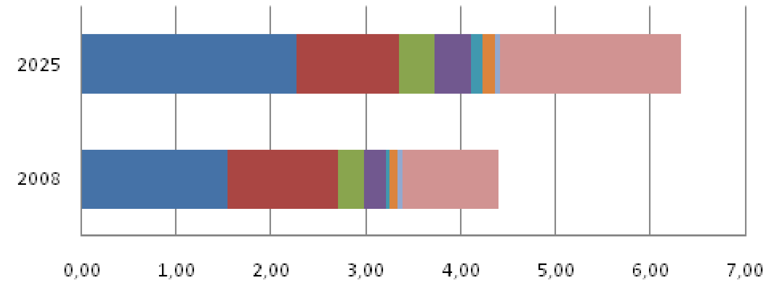
MSW treatment



Mt	2008	2025
landfilled	17,98	21,38
incinerated	2,69	3,20
paper cardboard recycling	2,00	2,38
plastic recycling	0,30	0,36
glass recycling	0,69	0,82
metals recycling	0,26	0,30
other recycling	0,40	0,47
composting	0,28	0,34
backyard composting	0,01	0,01
AD	0,24	0,29

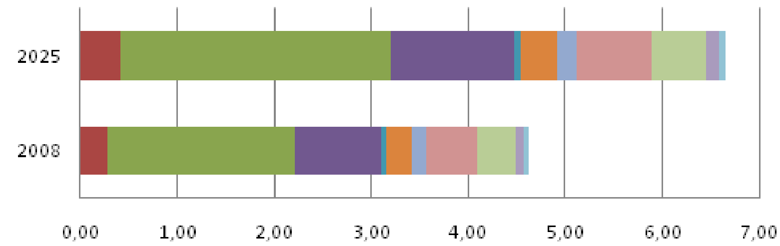
4.27 Sweden

MSW generation



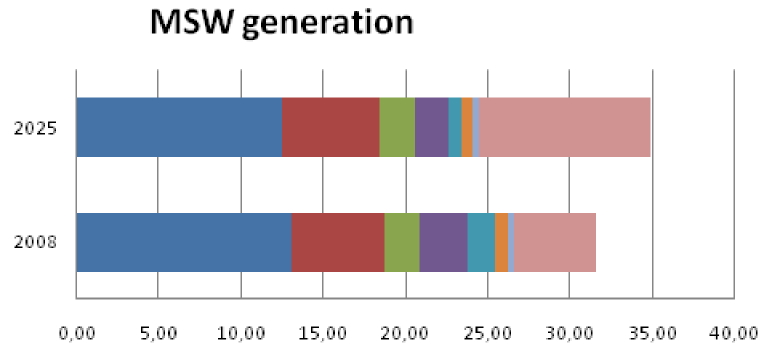
Mt	2008	2025
bio waste	1,54	2,27
paper and cardboard	1,16	1,07
plastics	0,28	0,38
glass	0,23	0,38
metals	0,03	0,13
textiles	0,09	0,13
hazardous household waste	0,04	0,06
other	1,01	1,89

MSW treatment

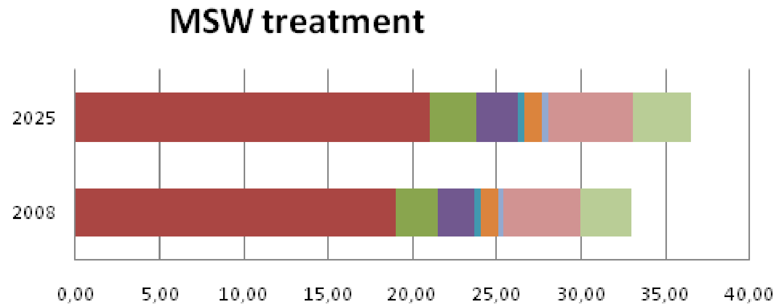


Mt	2008	2025
landfilled	0,29	0,42
incinerated	1,93	2,78
paper cardboard recycling	0,88	1,27
plastic recycling	0,05	0,07
glass recycling	0,26	0,38
metals recycling	0,14	0,21
other recycling	0,53	0,77
composting	0,39	0,57
backyard composting	0,09	0,12
AD	0,05	0,08

4.28 United Kingdom



Mt	2008	2025
bio waste	13,08	12,54
paper and cardboard	5,67	5,92
plastics	2,11	2,09
glass	2,96	2,09
metals	1,64	0,70
textiles	0,79	0,70
hazardous household waste	0,32	0,40
other	4,98	10,45

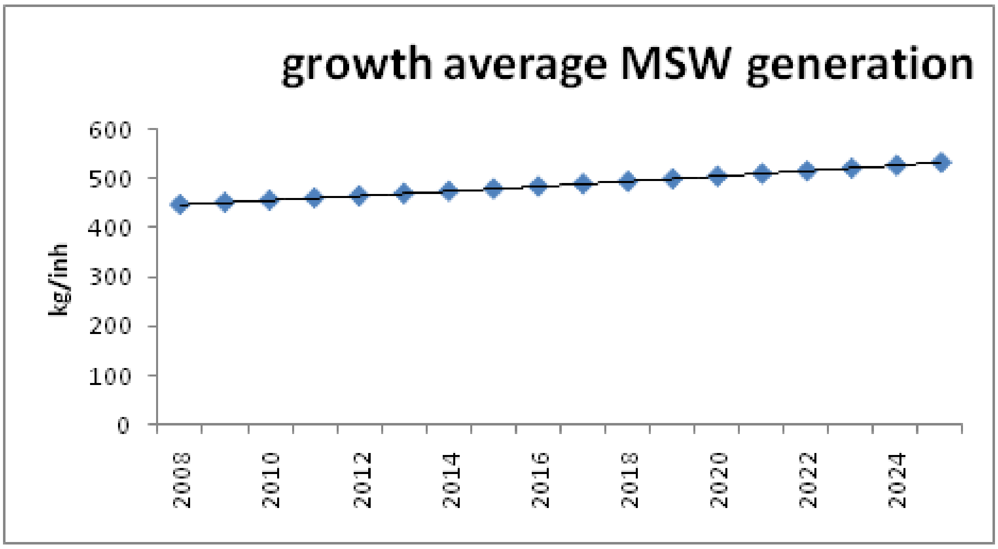


Mt	2008	2025
landfilled	18,99	21,00
incinerated	2,47	2,74
paper cardboard recycling	2,24	2,47
plastic recycling	0,34	0,37
glass recycling	1,02	1,13
metals recycling	0,32	0,35
other recycling	4,57	5,06
composting	3,03	3,35
backyard composting	0,00	0,00
AD	0,00	0,00

4.29 EU-27 conclusions

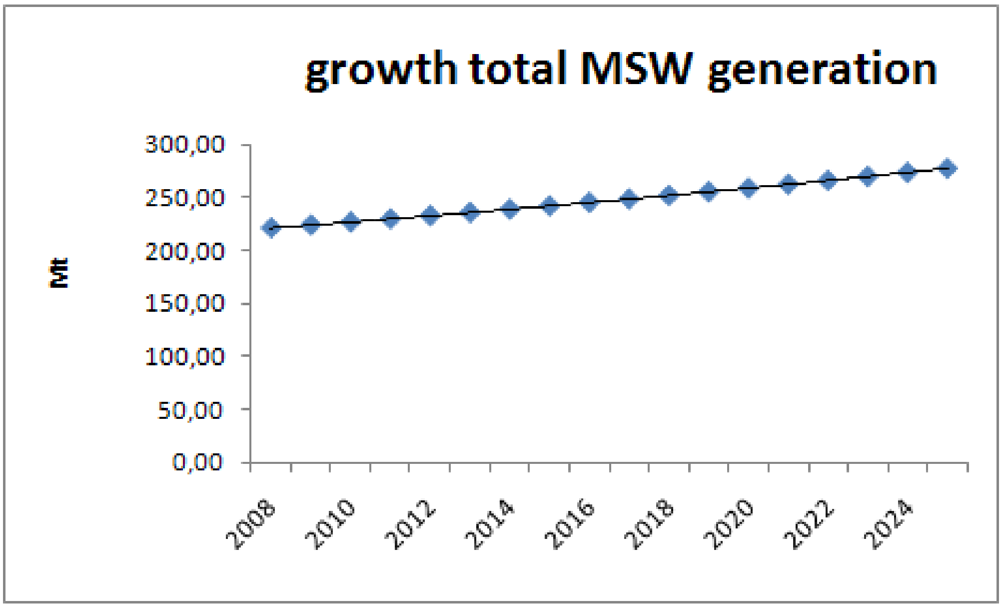
4.29.1 MSW generation

Two driving forces are influencing the evolution of MSW in EU-27. The average waste generation per capita increases in line with increasing consumption, and the total waste generation increases because an larger average generation is applied on a larger total population.



Graph 1 : Average MSW generation in EU-27 from 2008 to 2025 in the baseline scenario

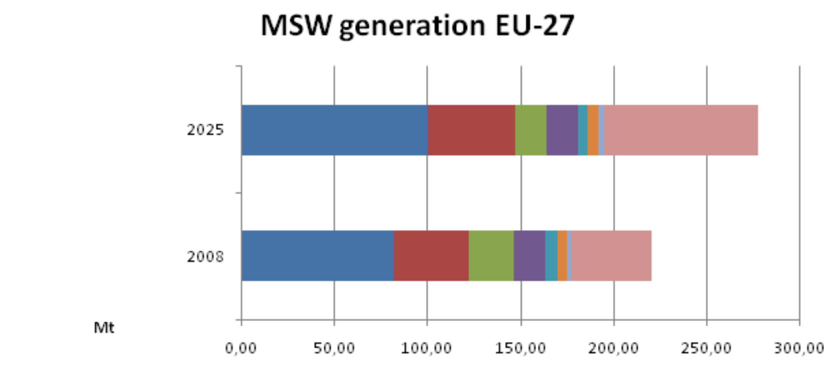
Average waste generation per capita increases slightly from 446 kg/inh to 532 kg/inh. The driving force is the coupling or only relative decoupling of MSW generation from consumption in 20 Member States. Only 7 Member States show absolute decoupling, mainly bases on their level and kind of household consumption.



Graph 2 : Total MSW generation in EU-27 from 2008 to 2025 in the baseline scenario

Demography increases in EU-27 from 495.809.146 inhabitants in 2008 to 521.883.935 inhabitants in 2025. Combined with an increasing MSW generation per capita this gives an increase from 220 million tonnes in 2008 to 277,5 million tonnes in 2025.

Split up over the different waste fractions of which MSW is composed this give following result. Biowaste remains the largest composing element, and the impact of paper increases. “Other” waste types increase and replace partially pure plastics and metal fractions:



	2008	2025
bio waste	81,71	99,90
paper and cardboard	40,15	47,17
plastics	24,46	16,65
glass	16,40	16,65
metals	7,03	5,55
textiles	4,80	5,55
hazardous household waste	2,16	2,88
other	43,46	83,25

Graph 3 : MSW fractions, generated in 2008 and 2025 in EU-27 in the baseline scenario

4.29.2 MSW treatment

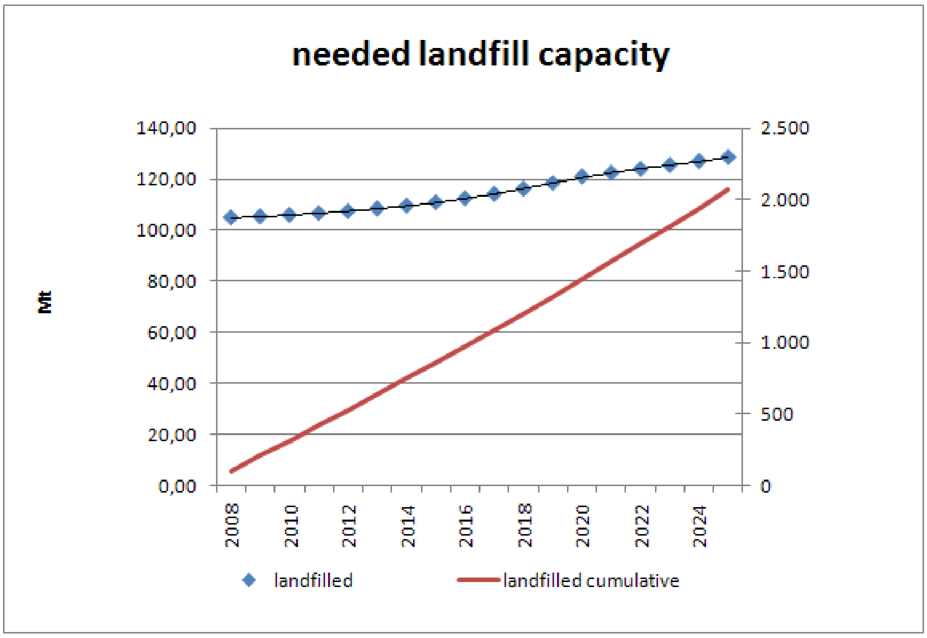
The concept of the baseline model implies that no shifts in the actual distribution of the waste over the existing waste treatment options occur. This means that the distribution for 2008 remains unaltered in 2025. Of course this neglects the effect of autonomous market evolutions (driven by prices, resource scarcity and energy scarcity) towards increasing material recovery or energy recovery. However, we need this baseline to assess the possible effects of new economic instruments. The percentages for the different waste treatment options remain stable, but shift only a little due to shifting waste composition:

	2008 (%)	2025 (%)
landfill	45,6	44,7
incineration	18,7	19,0

paper cardboard recycling	8,8	9,1
plastic recycling	2,1	2,1
glass recycling	3,8	3,9
metals recycling	1,1	1,2
other recycling	13,0	13,2
composting	6,1	6,1
backyard composting	0,5	0,5
AD	0,2	0,3
	100,0	100,0

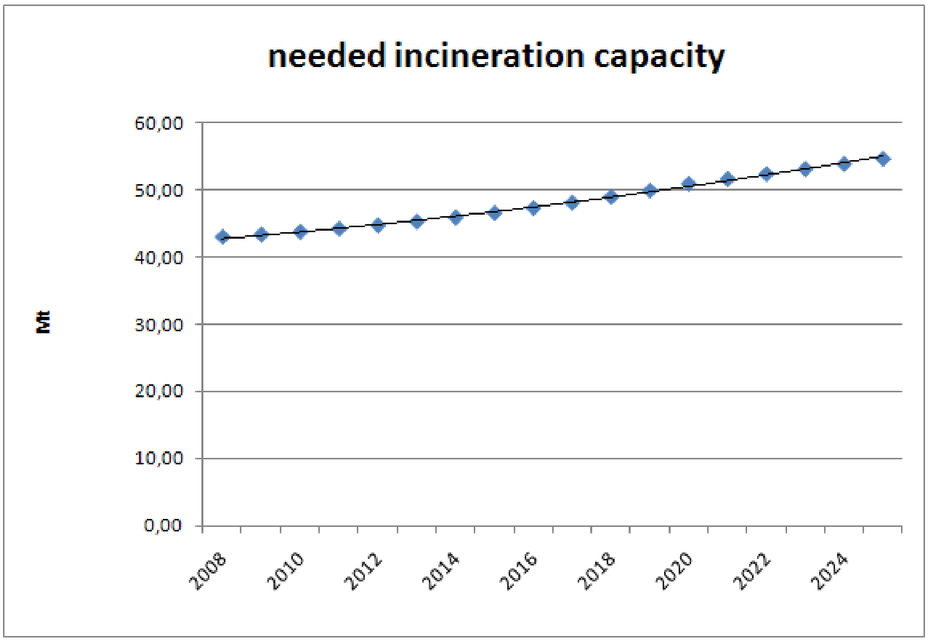
Table 24 : Dispersion of MSW over waste treatment options in 2008 and 2025 in the baseline scenario

Landfill will continue increasing in absolute volumes. The landfill diversion targets for biodegradable waste will not be reached in this do-nothing baseline scenario.



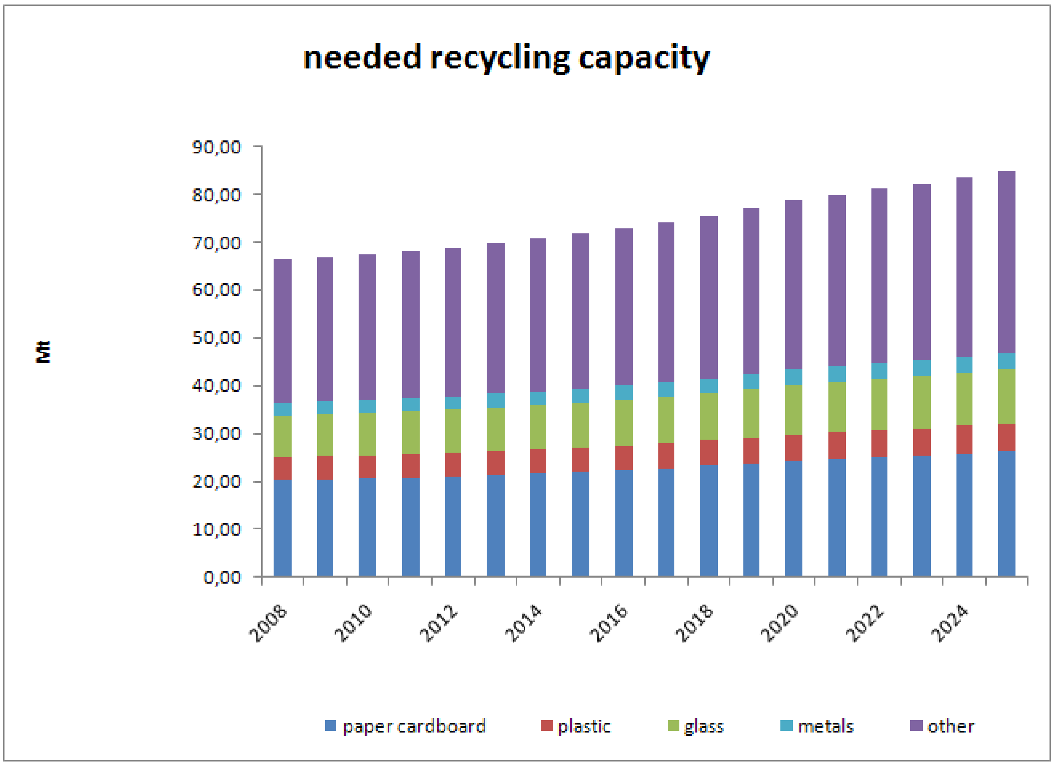
Graph 4 : Needed landfill capacity for EU-27 in the baseline scenario

When the relative percentage of waste incineration remains stable, new capacity for waste incineration will need to be developed in EU-27 under the baseline scenario.

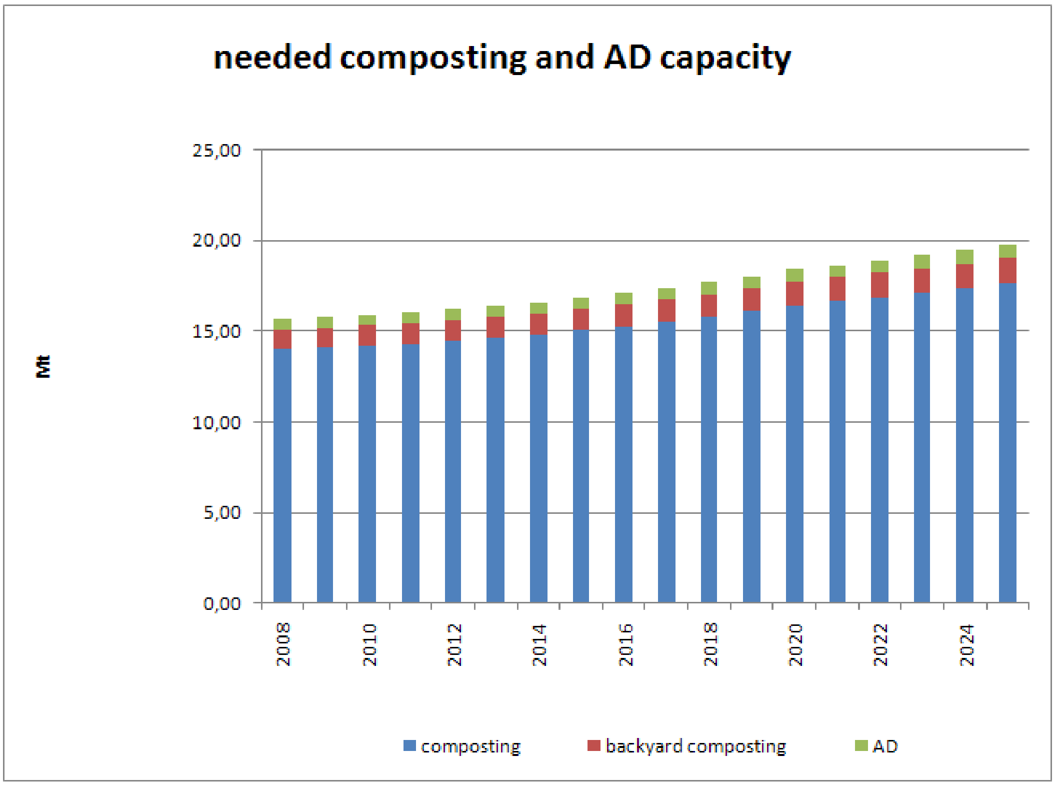


Graph 5 : Needed incineration capacity for EU-27 in the baseline scenario

Recycling capacity will increase in line with increasing generation of recyclable fractions, without shifts to higher recycling percentages. Composting, AD and backyard composting will know a similar trend if the assumptions of the baseline scenario are taken into account.

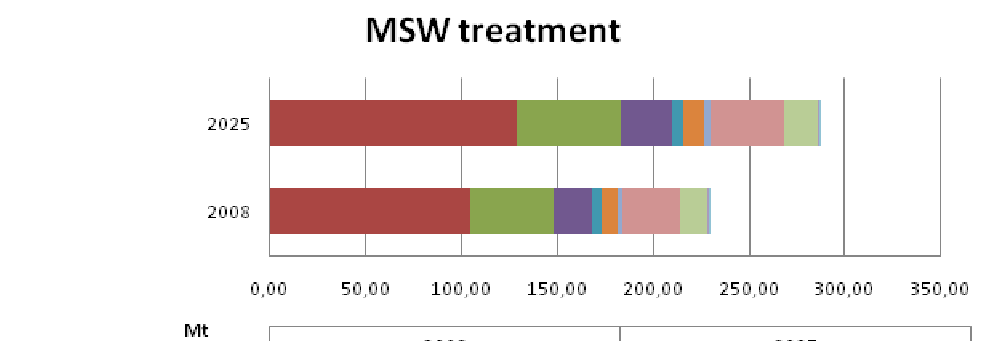


Graph 6 : Needed recycling capacity for EU-27 in the baseline scenario



Graph 7 : Needed composting capacity for EU-27 in the baseline scenario

An overview on the treatment capacity for all options in 2008 and 2025 in the baseline scenario is represented below:



	2008	2025
landfill	104,93	128,55
incineration	42,98	54,70
paper cardboard recycling	20,27	26,19
plastic recycling	4,76	5,92
glass recycling	8,73	11,18
metals recycling	2,63	3,46
other recycling	29,92	37,97
composting	13,97	17,61
backyard composting	1,10	1,39
AD	0,57	0,73

Graph 8 : MSW treatment capacity, needed in 2008 and 2025 in EU-27 in the baseline scenario

4.30 Overview of numeric data per Member State

2008 (Mt)	bio waste	paper and cardboard	plastics	glass	metals	textiles	hazardous household waste	other	**TOTAL**
Austria	1,34	0,84	0,42	0,31	0,19	0,08	0,04	0,61	**3,82**
Belgium	1,74	0,76	0,22	0,31	0,13	0,09	0,04	1,16	**4,46**
Bulgaria	0,98	0,29	0,25	0,23	0,07	0,11	0,03	0,96	**2,91**
Cyprus	0,16	0,12	0,05	0,01	0,04	0,03	0,00	0,03	**0,43**
Czech Republic	1,33	0,69	0,33	0,21	0,18	0,13	0,03	0,28	**3,19**
Denmark	0,93	0,38	0,28	0,08	0,05	0,05	0,03	0,73	**2,51**
Estonia	0,16	0,05	0,04	0,03	0,02	0,01	0,00	0,12	**0,44**
Finland	0,55	0,67	0,17	0,08	0,08	0,03	0,02	0,07	**1,67**
France	9,38	5,87	2,64	2,93	0,88	0,59	0,29	6,74	**29,33**
Germany	10,29	7,30	6,19	2,34	0,75	0,71	0,35	7,67	**35,61**
Greece	1,82	0,78	0,35	0,19	0,19	0,08	0,04	0,51	**3,97**
Hungary	1,24	0,47	0,53	0,06	0,06	0,07	0,03	1,00	**3,48**
Ireland	0,77	0,33	0,15	0,08	0,08	0,03	0,02	0,22	**1,68**
Italy	12,05	3,98	3,80	1,74	0,17	0,65	0,32	8,74	**31,45**
Latvia	0,22	0,07	0,06	0,05	0,02	0,02	0,01	0,17	**0,61**
Lithuania	0,49	0,15	0,13	0,10	0,05	0,04	0,01	0,39	**1,36**
Luxembourg	0,12	0,04	0,02	0,02	0,00	0,01	0,00	0,06	**0,28**
Malta	0,07	0,04	0,02	0,01	0,01	0,01	0,00	0,02	**0,17**
The Netherlands	3,44	2,41	1,34	0,47	0,32	0,12	0,05	1,30	**9,45**
Poland	2,61	0,69	0,69	0,82	0,55	0,14	0,07	1,30	**6,86**
Portugal	1,75	1,08	0,57	0,36	0,21	0,10	0,05	1,03	**5,16**
Romania	2,84	0,84	0,72	0,67	0,22	0,31	0,08	2,79	**8,46**
Slovakia	0,67	0,23	0,12	0,14	0,05	0,04	0,02	0,50	**1,77**
Slovenia	0,28	0,16	0,07	0,03	0,04	0,02	0,01	0,10	**0,71**
Spain	11,86	5,08	2,91	1,94	0,97	0,49	0,24	0,96	**24,45**
Sweden	1,54	1,16	0,28	0,23	0,03	0,09	0,04	1,01	**4,39**
UK	13,08	5,67	2,11	2,96	1,64	0,79	0,32	4,98	**31,55**
EU-27	**81,71**	**40,15**	**24,46**	**16,40**	**7,03**	**4,80**	**2,16**	**43,46**	**220,18**

Table 25 : Overview table waste generation 2008 in the baseline scenario

2025 (Mt)	bio waste	paper and cardboard	plastics	glass	metals	textiles	hazardous household waste	other	**TOTAL**
Austria	1,75	0,82	0,29	0,29	0,10	0,10	0,05	1,46	**4,85**
Belgium	2,01	0,95	0,33	0,33	0,11	0,11	0,06	1,67	**5,57**
Bulgaria	0,96	0,45	0,16	0,16	0,05	0,05	0,02	0,80	**2,74**
Cyprus	0,32	0,15	0,05	0,05	0,02	0,02	0,01	0,27	**0,90**
Czech Republic	1,17	0,55	0,19	0,19	0,06	0,06	0,03	0,97	**3,25**
Denmark	2,36	1,11	0,39	0,39	0,13	0,13	0,07	1,96	**6,55**
Estonia	0,17	0,08	0,03	0,03	0,01	0,01	0,00	0,14	**0,46**
Finland	0,82	0,39	0,14	0,14	0,05	0,05	0,02	0,69	**2,29**
France	14,81	6,99	2,47	2,47	0,82	0,82	0,41	12,34	**41,14**
Germany	15,53	7,33	2,59	2,59	0,86	0,86	0,43	12,94	**43,14**
Greece	1,72	0,81	0,29	0,29	0,10	0,10	0,05	1,43	**4,78**
Hungary	1,22	0,58	0,20	0,20	0,07	0,07	0,03	1,02	**3,39**
Ireland	1,48	0,70	0,25	0,25	0,08	0,08	0,04	1,23	**4,11**
Italy	15,38	7,26	2,56	2,56	0,85	0,85	0,43	12,82	**42,72**
Latvia	0,21	0,10	0,04	0,04	0,01	0,01	0,01	0,18	**0,59**
Lithuania	0,46	0,22	0,08	0,08	0,03	0,03	0,01	0,38	**1,28**
Luxembourg	0,20	0,09	0,03	0,03	0,01	0,01	0,01	0,17	**0,55**
Malta	0,16	0,07	0,03	0,03	0,01	0,01	0,00	0,13	**0,44**
The Netherlands	4,31	2,04	0,72	0,72	0,24	0,24	0,12	3,59	**11,98**
Poland	2,46	1,16	0,41	0,41	0,14	0,14	0,08	2,05	**6,83**
Portugal	2,87	1,35	0,48	0,48	0,16	0,16	0,08	2,39	**7,96**
Romania	3,17	1,50	0,53	0,53	0,18	0,18	0,09	2,64	**8,80**
Slovakia	0,69	0,33	0,11	0,11	0,04	0,04	0,02	0,57	**1,92**
Slovenia	0,41	0,20	0,07	0,07	0,02	0,02	0,01	0,35	**1,15**
Spain	10,45	4,93	1,74	1,74	0,58	0,58	0,34	8,71	**29,08**
Sweden	2,27	1,07	0,38	0,38	0,13	0,13	0,06	1,89	**6,32**
UK	12,54	5,92	2,09	2,09	0,70	0,70	0,40	10,45	**34,89**
EU-27	**99,90**	**47,17**	**16,65**	**16,65**	**5,55**	**5,55**	**2,88**	**83,25**	**277,66**

Table 26 : Overview table waste generation 2025 in the baseline scenario

2008 (Mt)	landfilled	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	**TOTAL**
Austria	0,59	1,44	0,39	0,08	0,12	0,08	0,69	0,35	0,19	0,11	**4,04**
Belgium	0,62	1,31	0,46	0,08	0,28	0,09	1,21	0,66	0,06	0,05	**4,83**
Bulgaria	2,19	0,07	0,09	0,01	0,02	0,00	0,39	0,03	0,01	0,00	**2,80**
Cyprus	0,38	0,01	0,01	0,00	0,00	0,00	0,04	0,00	0,00	0,00	**0,44**
Czech	1,87	0,31	0,47	0,11	0,15	0,02	0,36	0,05	0,00	0,00	**3,33**
Denmark	0,00	1,42	0,32	0,02	0,06	0,08	0,42	0,32	0,00	0,00	**2,65**
Estonia	0,35	0,00	0,03	0,01	0,01	0,01	0,01	0,02	0,02	0,00	**0,44**
Finland	1,01	0,10	0,23	0,01	0,08	0,01	0,18	0,11	0,00	0,01	**1,74**
France	10,90	9,77	3,00	0,33	1,63	0,34	4,31	0,43	0,00	0,00	**30,70**
Germany	1,77	11,78	5,04	2,52	2,31	0,49	9,48	4,96	0,55	0,00	**38,91**
Greece	3,48	0,00	0,24	0,02	0,04	0,04	0,18	0,00	0,00	0,00	**4,00**
Hungary	2,37	0,29	0,17	0,02	0,02	0,03	0,24	0,30	0,09	0,00	**3,52**
Ireland	1,05	0,00	0,23	0,03	0,05	0,02	0,23	0,08	0,03	0,00	**1,72**
Italy	18,72	5,01	2,71	0,51	1,14	0,36	2,50	1,44	0,00	0,08	**32,48**
Latvia	0,34	0,00	0,02	0,01	0,02	0,01	0,01	0,00	0,00	0,00	**0,41**
Lithuania	1,18	0,00	0,04	0,01	0,07	0,00	0,00	0,07	0,00	0,00	**1,37**
Luxembourg	0,00	0,00	0,04	0,01	0,03	0,01	0,09	0,08	0,00	0,02	**0,28**
Malta	0,15	0,00	0,00	0,00	0,00	0,00	0,02	0,00	0,00	0,00	**0,17**
Netherlands	0,98	3,80	0,85	0,11	0,34	0,14	2,78	1,14	0,06	0,00	**10,20**
Poland	6,37	0,07	0,25	0,06	0,13	0,03	0,01	0,00	0,00	0,00	**6,91**
Portugal	4,27	0,17	0,34	0,06	0,17	0,07	0,11	0,05	0,00	0,01	**5,25**
Romania	7,11	0,14	0,14	0,04	0,03	0,06	1,04	0,15	0,00	0,00	**8,70**
Slovakia	1,37	0,22	0,03	0,02	0,06	0,01	0,08	0,02	0,00	0,00	**1,80**
Slovenia	0,62	0,00	0,04	0,01	0,01	0,01	0,02	0,02	0,00	0,00	**0,72**
Spain	17,98	2,69	2,00	0,30	0,69	0,26	0,40	0,28	0,01	0,24	**24,85**
Sweden	0,29	1,93	0,88	0,05	0,26	0,14	0,53	0,39	0,09	0,05	**4,63**
UK	18,99	2,47	2,24	0,34	1,02	0,32	4,57	3,03	0,00	0,00	**32,97**
EU-27	**104,93**	**42,98**	**20,27**	**4,76**	**8,73**	**2,63**	**29,92**	**13,97**	**1,10**	**0,57**	**229,86**

Table 27 : Overview table waste treatment 2008 in the baseline scenario

2025 (Mt)	landfilled	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	**TOTAL**
Austria	0,76	1,82	0,49	0,10	0,15	0,10	0,88	0,45	0,24	0,14	**5,13**
Belgium	0,78	1,64	0,58	0,10	0,36	0,11	1,51	0,82	0,08	0,06	**6,03**
Bulgaria	2,01	0,06	0,08	0,01	0,02	0,00	0,36	0,03	0,01	0,00	**2,57**
Cyprus	0,79	0,01	0,01	0,00	0,00	0,01	0,08	0,00	0,00	0,00	**0,92**
Czech	1,90	0,31	0,48	0,11	0,15	0,02	0,37	0,05	0,00	0,00	**3,39**
Denmark	0,00	1,42	0,82	0,05	0,17	0,22	1,11	0,84	0,01	0,00	**4,63**
Estonia	0,37	0,00	0,03	0,01	0,01	0,01	0,01	0,02	0,02	0,00	**0,47**
Finland	1,38	0,13	0,32	0,01	0,10	0,02	0,25	0,15	0,00	0,02	**2,39**
France	15,29	13,70	4,21	0,46	2,29	0,47	6,05	0,60	0,00	0,00	**43,07**
Germany	2,14	14,27	6,11	3,06	2,80	0,59	11,49	6,01	0,67	0,00	**47,14**
Greece	4,19	0,00	0,28	0,03	0,05	0,05	0,22	0,00	0,00	0,00	**4,81**
Hungary	2,31	0,28	0,16	0,02	0,02	0,03	0,23	0,29	0,08	0,00	**3,43**
Ireland	2,57	0,00	0,55	0,07	0,12	0,05	0,57	0,19	0,08	0,00	**4,20**
Italy	25,42	6,80	3,68	0,70	1,55	0,50	3,40	1,95	0,00	0,10	**44,11**
Latvia	0,33	0,00	0,02	0,01	0,01	0,01	0,01	0,00	0,00	0,00	**0,39**
Lithuania	1,11	0,00	0,04	0,01	0,06	0,00	0,00	0,07	0,00	0,00	**1,29**
Luxembourg	0,00	0,00	0,08	0,02	0,07	0,01	0,17	0,16	0,00	0,03	**0,55**
Malta	0,38	0,00	0,00	0,00	0,00	0,00	0,06	0,00	0,00	0,00	**0,45**
Netherlands	1,24	4,82	1,08	0,13	0,43	0,18	3,52	1,44	0,08	0,00	**12,92**
Poland	6,34	0,07	0,25	0,06	0,13	0,03	0,01	0,00	0,00	0,00	**6,88**
Portugal	6,58	0,26	0,53	0,09	0,26	0,11	0,18	0,07	0,00	0,02	**8,10**
Romania	7,39	0,15	0,15	0,04	0,03	0,06	1,08	0,16	0,00	0,00	**9,04**
Slovakia	1,48	0,24	0,03	0,02	0,06	0,01	0,08	0,02	0,00	0,00	**1,95**
Slovenia	1,00	0,00	0,06	0,02	0,01	0,01	0,03	0,04	0,00	0,00	**1,16**
Spain	21,38	3,20	2,38	0,36	0,82	0,30	0,47	0,34	0,01	0,29	**29,55**
Sweden	0,42	2,78	1,27	0,07	0,38	0,21	0,77	0,57	0,12	0,08	**6,66**
UK	21,00	2,74	2,47	0,37	1,13	0,35	5,06	3,35	0,00	0,00	**36,47**
EU-27	**128,55**	**54,70**	**26,19**	**5,92**	**11,18**	**3,46**	**37,97**	**17,61**	**1,39**	**0,73**	**287,71**

Table 28 : Overview table waste treatment 2025 in the baseline scenario

5 Annex with results : scenario A

5.1 How to read the figures

- All the remarks made at the head of the annex on the baseline results are equally valid for this exercise.
- The shifts in waste treatment operations is a conservative estimate on what would shift if landfill taxes are imposed, and all other policy measures, traditions or preferences remain the same as in 2008. The distribution over waste treatment options is based on the data available for 2008.
- The figures represent a redistribution of waste being diverted from landfills over the other waste treatment options, according to their actual mutual proportions. Although we assume that shifts in these proportions may occur, this will not be driven by the mere landfill taxes and landfill diversion. Possible shifts are a real shift from composting towards anaerobic digestion with energy recovery, or between recycling and incineration, or due to better data collection an apparent shift between other waste recycling to the more specified waste recycling. Of course these kinds of shifts are not taken into account, as it is the goal of the exercise to see what would be the net result on applying the landfill tax instrument.

5.2 Geographical distribution of effects of scenario A

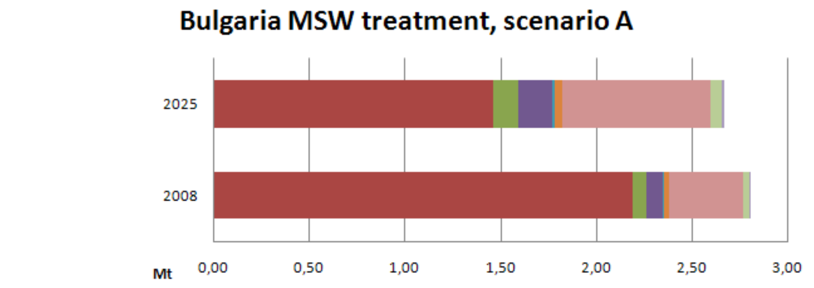
Scenario A has no effect on the performance of following countries, mainly because the landfill tax is already as a high level or the expected landfill reduction is already realized:

Austria, Belgium, Denmark, Germany, Luxembourg, The Netherlands, Sweden. In the other Member States application of scenario A would lead to a shift from landfill to the other waste treatment options.

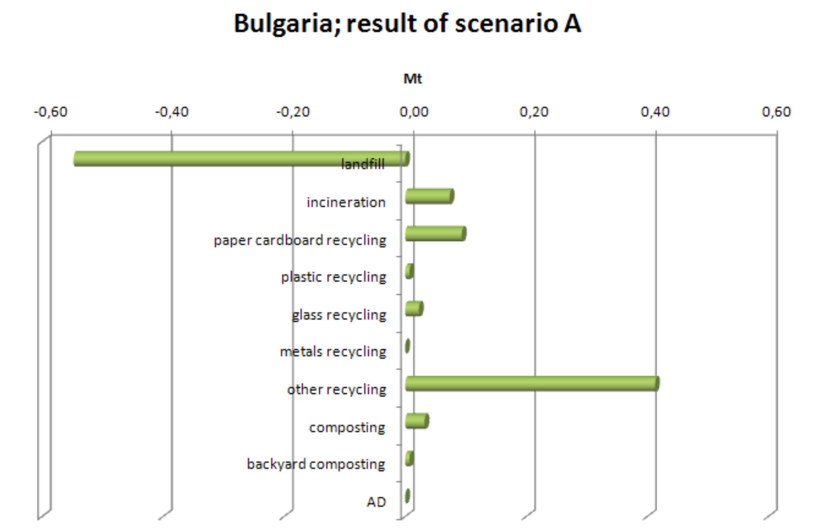
Geographic distribution of the effects of applying scenario A in Member States

Map 3 : Geographic distribution of the effects of applying scenario A

5.3 Bulgaria



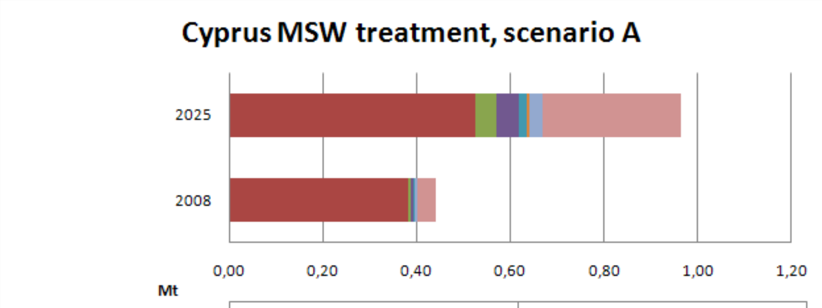
	2008	2025
landfilled	2,19	1,46
incinerated	0,07	0,14
paper cardboard recycling	0,09	0,17
plastic recycling	0,01	0,01
glass recycling	0,02	0,04
metals recycling	0,00	0,00
other recycling	0,39	0,77
composting	0,03	0,06
backyard composting	0,01	0,01
AD	0,00	0,00



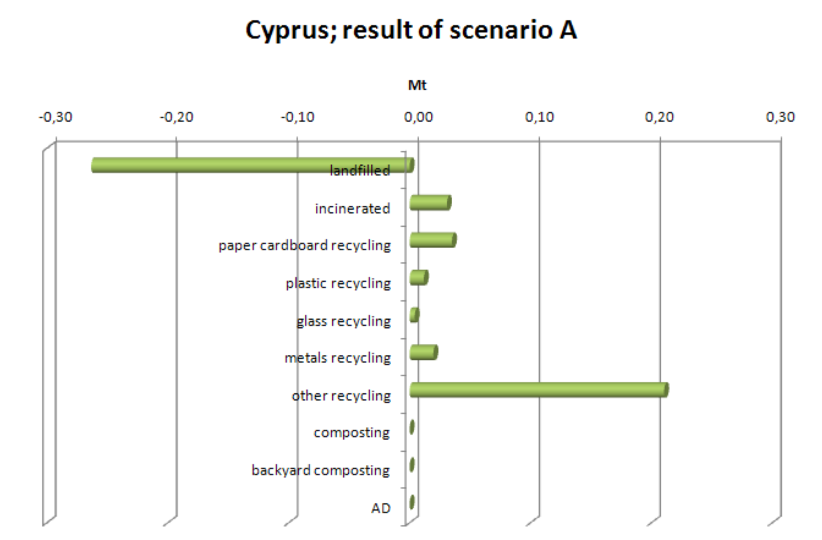
Bulgaria; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	2,01	1,46	-0,55
incineration	0,06	0,14	0,07
paper cardboard recycling	0,08	0,17	0,09
plastic recycling	0,01	0,01	0,01
glass recycling	0,02	0,04	0,02
metals recycling	0,00	0,00	0,00
other recycling	0,36	0,77	0,41
composting	0,03	0,06	0,03
backyard composting	0,01	0,01	0,01
AD	0,00	0,00	0,00

5.4 Cyprus



	2008	2025
landfilled	0,38	0,53
incinerated	0,01	0,04
paper cardboard recycling	0,01	0,05
plastic recycling	0,00	0,02
glass recycling	0,00	0,01
metals recycling	0,00	0,03
other recycling	0,04	0,29
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

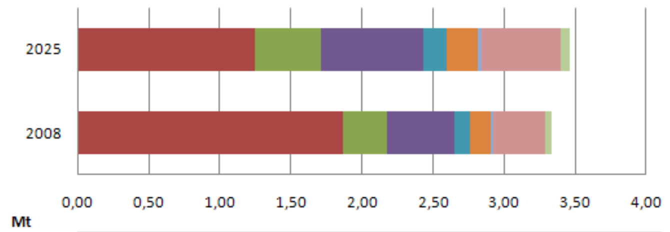


Cyprus; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	0,79	0,53	-0,26
incineration	0,01	0,04	0,03
paper cardboard recycling	0,01	0,05	0,04
plastic recycling	0,00	0,02	0,01
glass recycling	0,00	0,01	0,00
metals recycling	0,01	0,03	0,02
other recycling	0,08	0,29	0,21
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

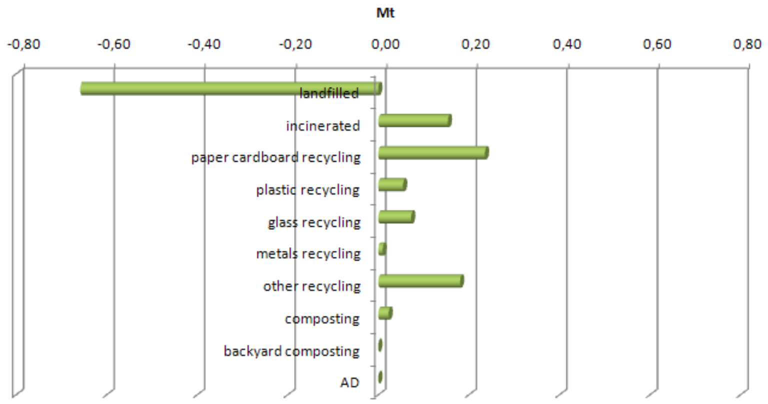
5.5 Czech Republic

Czech Republic MSW treatment ; scenario A



	2008	2025
landfilled	1,87	1,25
incinerated	0,31	0,47
paper cardboard recycling	0,47	0,72
plastic recycling	0,11	0,17
glass recycling	0,15	0,22
metals recycling	0,02	0,03
other recycling	0,36	0,55
composting	0,05	0,07
backyard composting	0,00	0,00
AD	0,00	0,00

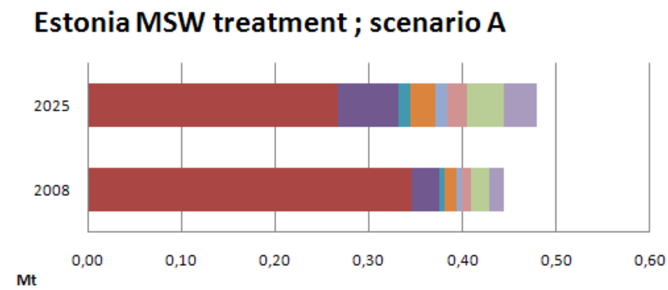
Czech Republic; result of scenario A



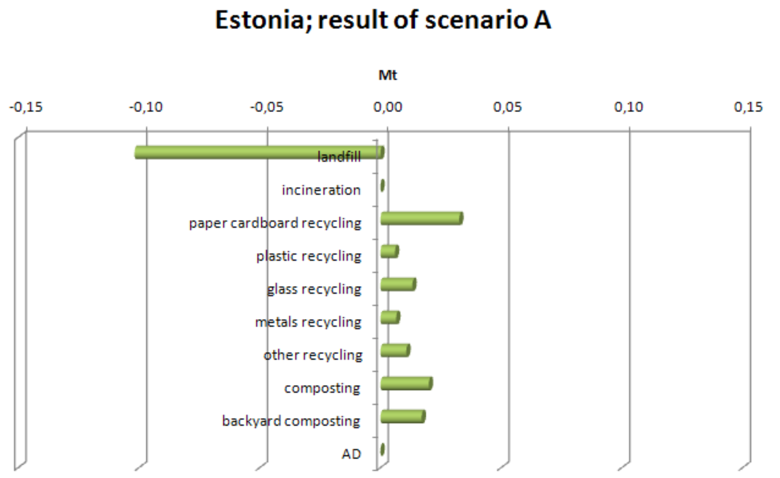
Czech Republic; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	1,90	1,25	-0,66
incineration	0,31	0,47	0,15
paper cardboard recycling	0,48	0,72	0,24
plastic recycling	0,11	0,17	0,05
glass recycling	0,15	0,22	0,07
metals recycling	0,02	0,03	0,01
other recycling	0,37	0,55	0,18
composting	0,05	0,07	0,02
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.6 Estonia



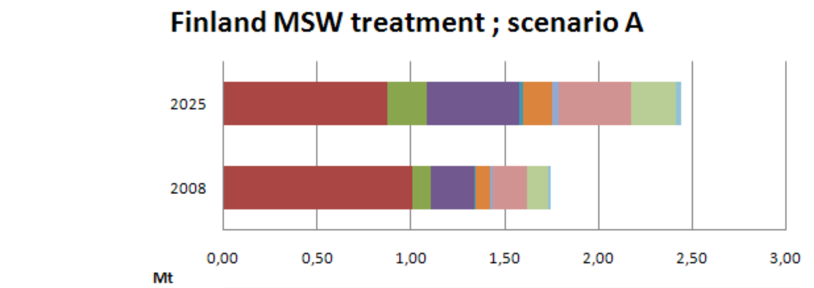
	2008	2025
landfilled	0,35	0,27
incinerated	0,00	0,00
paper cardboard recycling	0,03	0,07
plastic recycling	0,01	0,01
glass recycling	0,01	0,03
metals recycling	0,01	0,01
other recycling	0,01	0,02
composting	0,02	0,04
backyard composting	0,02	0,03
AD	0,00	0,00



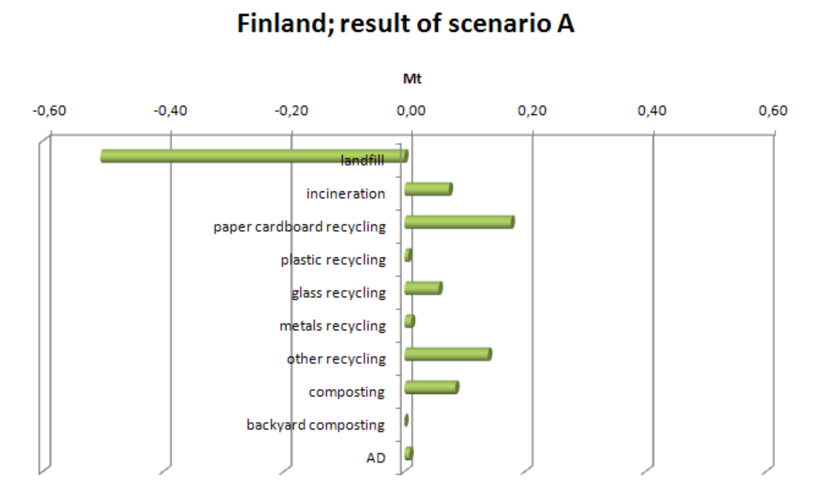
Estonia; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	0,37	0,27	-0,10
incineration	0,00	0,00	0,00
paper cardboard recycling	0,03	0,07	0,03
plastic recycling	0,01	0,01	0,01
glass recycling	0,01	0,03	0,01
metals recycling	0,01	0,01	0,01
other recycling	0,01	0,02	0,01
composting	0,02	0,04	0,02
backyard composting	0,02	0,03	0,02
AD	0,00	0,00	0,00

5.7 Finland



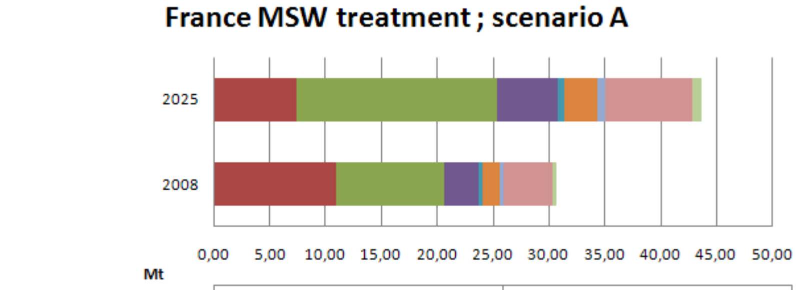
	2008	2025
landfilled	1,01	0,88
incinerated	0,10	0,21
paper cardboard recycling	0,23	0,50
plastic recycling	0,01	0,02
glass recycling	0,08	0,16
metals recycling	0,01	0,03
other recycling	0,18	0,39
composting	0,11	0,24
backyard composting	0,00	0,00
AD	0,01	0,02



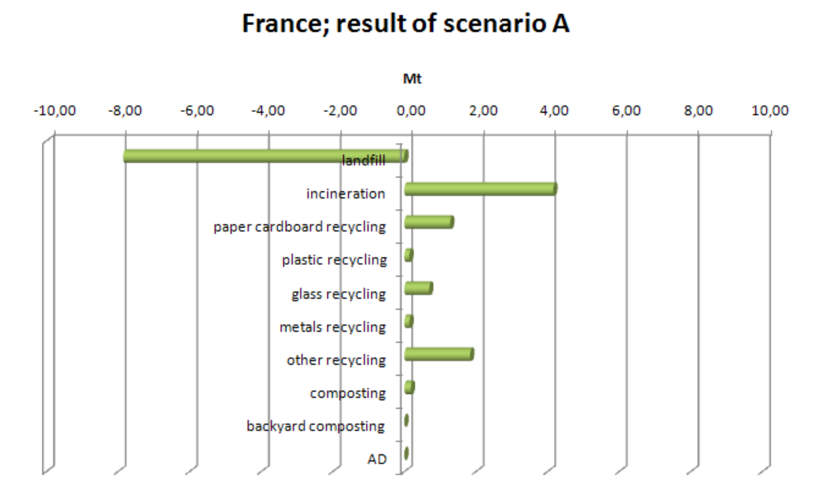
Finland; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	1,38	0,88	-0,50
incineration	0,13	0,21	0,07
paper cardboard recycling	0,32	0,50	0,18
plastic recycling	0,01	0,02	0,01
glass recycling	0,10	0,16	0,06
metals recycling	0,02	0,03	0,01
other recycling	0,25	0,39	0,14
composting	0,15	0,24	0,08
backyard composting	0,00	0,00	0,00
AD	0,02	0,02	0,01

5.8 France



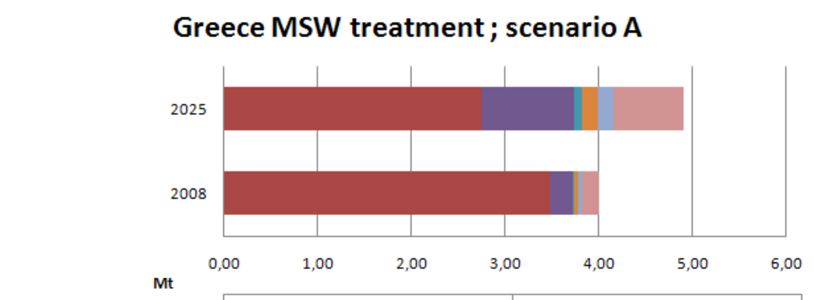
	2008	2025
landfilled	10,90	7,43
incinerated	9,77	17,86
paper cardboard recycling	3,00	5,49
plastic recycling	0,33	0,61
glass recycling	1,63	2,98
metals recycling	0,34	0,62
other recycling	4,31	7,89
composting	0,43	0,78
backyard composting	0,00	0,00
AD	0,00	0,00



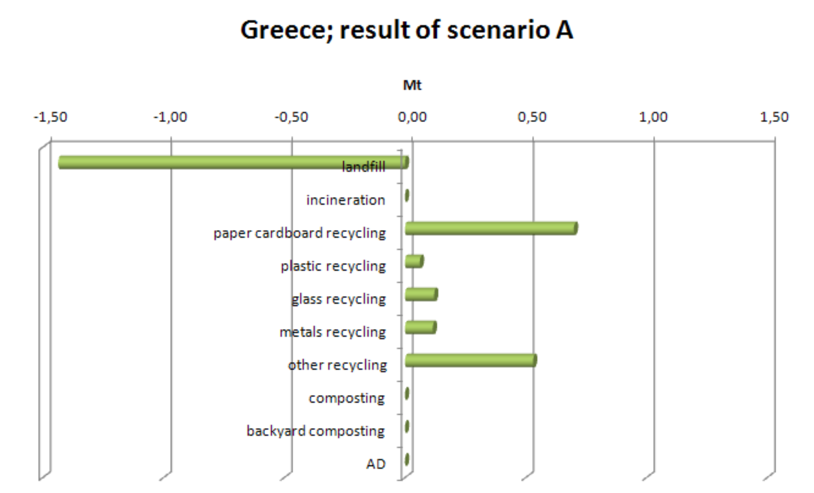
France; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	15,29	7,43	-7,85
incineration	13,70	17,86	4,16
paper cardboard recycling	4,21	5,49	1,28
plastic recycling	0,46	0,61	0,14
glass recycling	2,29	2,98	0,69
metals recycling	0,47	0,62	0,14
other recycling	6,05	7,89	1,84
composting	0,60	0,78	0,18
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.9 Greece



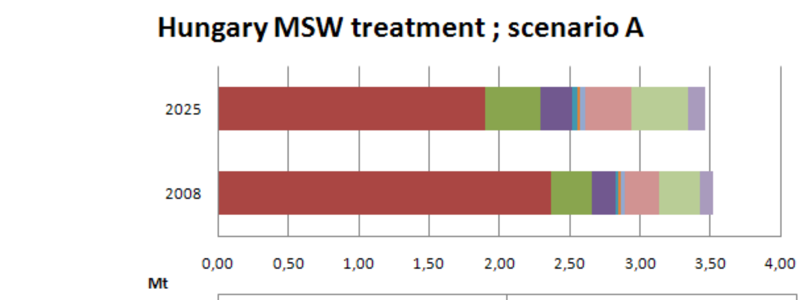
	2008	2025
landfilled	3,48	2,76
incinerated	0,00	0,00
paper cardboard recycling	0,24	0,98
plastic recycling	0,02	0,09
glass recycling	0,04	0,17
metals recycling	0,04	0,16
other recycling	0,18	0,75
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



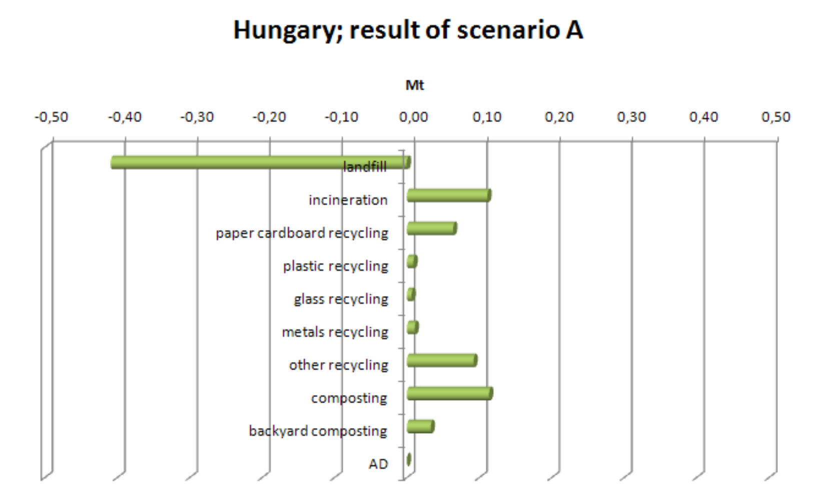
Greece; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	4,19	2,76	-1,44
incineration	0,00	0,00	0,00
paper cardboard recycling	0,28	0,98	0,70
plastic recycling	0,03	0,09	0,06
glass recycling	0,05	0,17	0,12
metals recycling	0,05	0,16	0,12
other recycling	0,22	0,75	0,53
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.10 Hungary



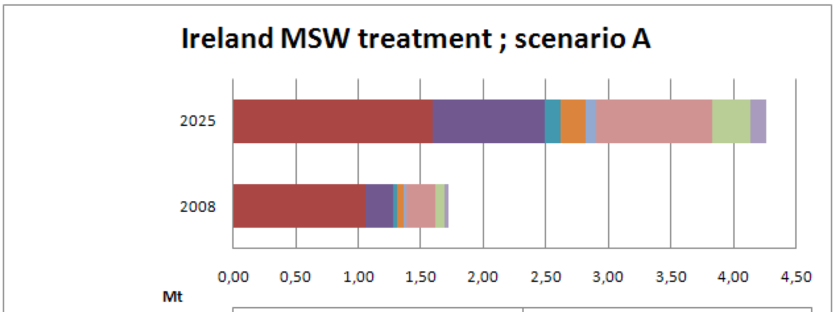
	2008	2025
landfilled	2,37	1,90
incinerated	0,29	0,39
paper cardboard recycling	0,17	0,23
plastic recycling	0,02	0,03
glass recycling	0,02	0,02
metals recycling	0,03	0,04
other recycling	0,24	0,33
composting	0,30	0,40
backyard composting	0,09	0,12
AD	0,00	0,00



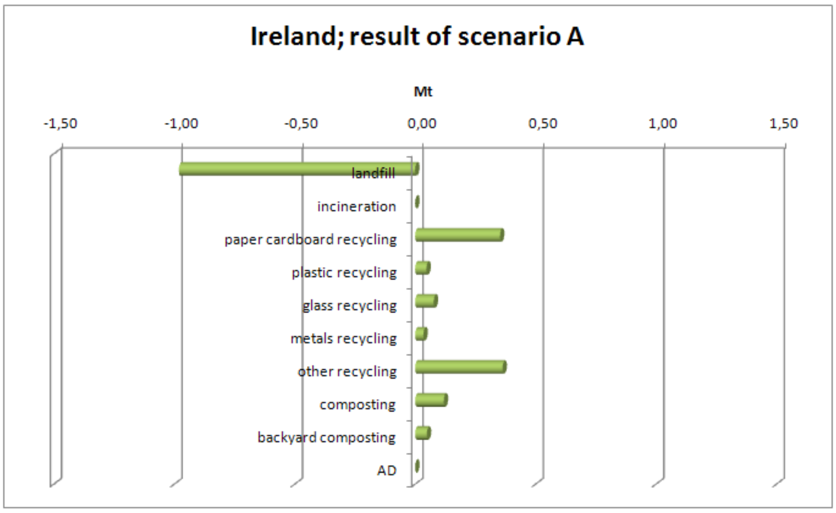
Hungary; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	2,31	1,90	-0,41
incineration	0,28	0,39	0,11
paper cardboard recycling	0,16	0,23	0,06
plastic recycling	0,02	0,03	0,01
glass recycling	0,02	0,02	0,01
metals recycling	0,03	0,04	0,01
other recycling	0,23	0,33	0,09
composting	0,29	0,40	0,11
backyard composting	0,08	0,12	0,03
AD	0,00	0,00	0,00

5.11 Ireland



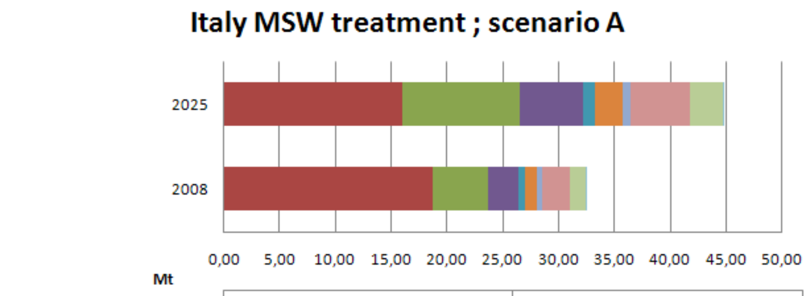
	2008	2025
landfilled	1,05	1,59
incinerated	0,00	0,00
paper cardboard recycling	0,23	0,90
plastic recycling	0,03	0,12
glass recycling	0,05	0,20
metals recycling	0,02	0,09
other recycling	0,23	0,93
composting	0,08	0,31
backyard composting	0,03	0,12
AD	0,00	0,00



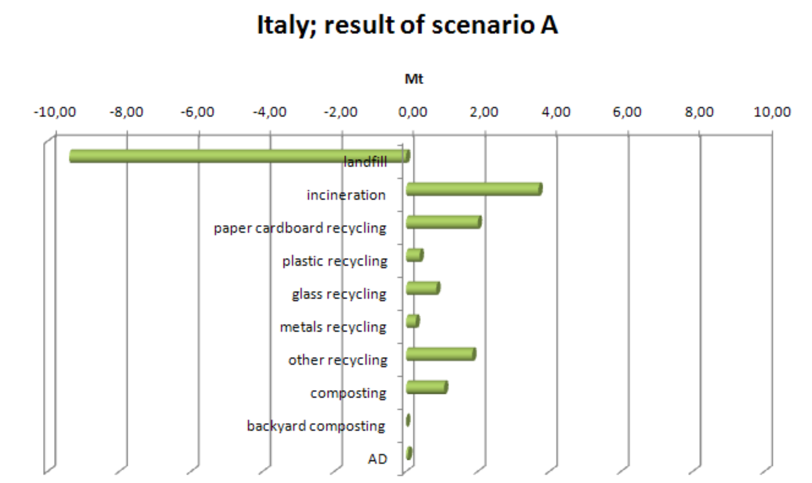
Ireland; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	2,57	1,59	-0,98
incineration	0,00	0,00	0,00
paper cardboard recycling	0,55	0,90	0,35
plastic recycling	0,07	0,12	0,05
glass recycling	0,12	0,20	0,08
metals recycling	0,05	0,09	0,03
other recycling	0,57	0,93	0,36
composting	0,19	0,31	0,12
backyard composting	0,08	0,12	0,05
AD	0,00	0,00	0,00

5.12 Italy



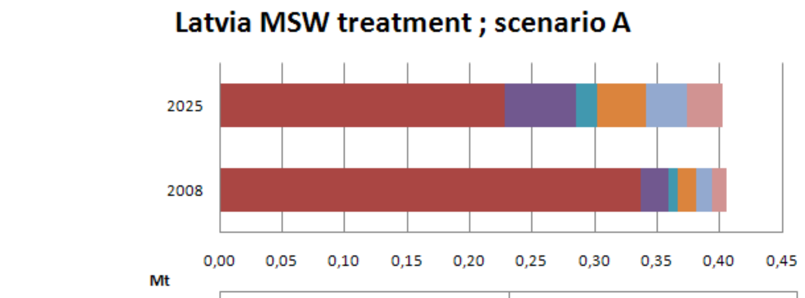
	2008	2025
landfilled	18,72	16,02
incinerated	5,01	10,49
paper cardboard recycling	2,71	5,69
plastic recycling	0,51	1,08
glass recycling	1,14	2,40
metals recycling	0,36	0,76
other recycling	2,50	5,25
composting	1,44	3,02
backyard composting	0,00	0,00
AD	0,08	0,16



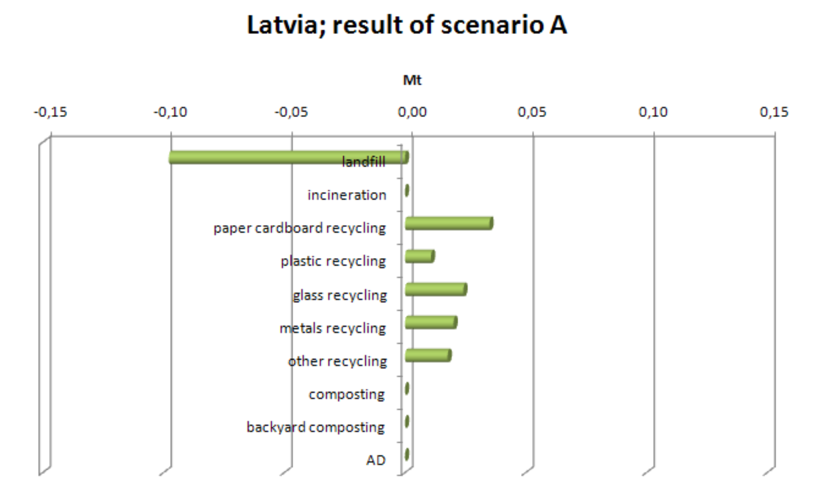
Italy; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	25,42	16,02	-9,40
incineration	6,80	10,49	3,70
paper cardboard recycling	3,68	5,69	2,00
plastic recycling	0,70	1,08	0,38
glass recycling	1,55	2,40	0,84
metals recycling	0,50	0,76	0,27
other recycling	3,40	5,25	1,85
composting	1,95	3,02	1,06
backyard composting	0,00	0,00	0,00
AD	0,10	0,16	0,06

5.13 Latvia



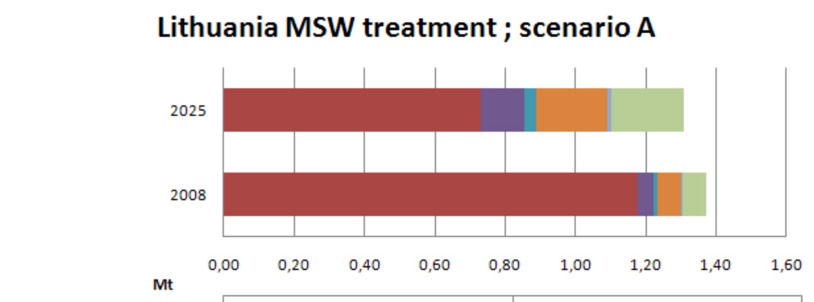
	2008	2025
landfilled	0,34	0,23
incinerated	0,00	0,00
paper cardboard recycling	0,02	0,06
plastic recycling	0,01	0,02
glass recycling	0,02	0,04
metals recycling	0,01	0,03
other recycling	0,01	0,03
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



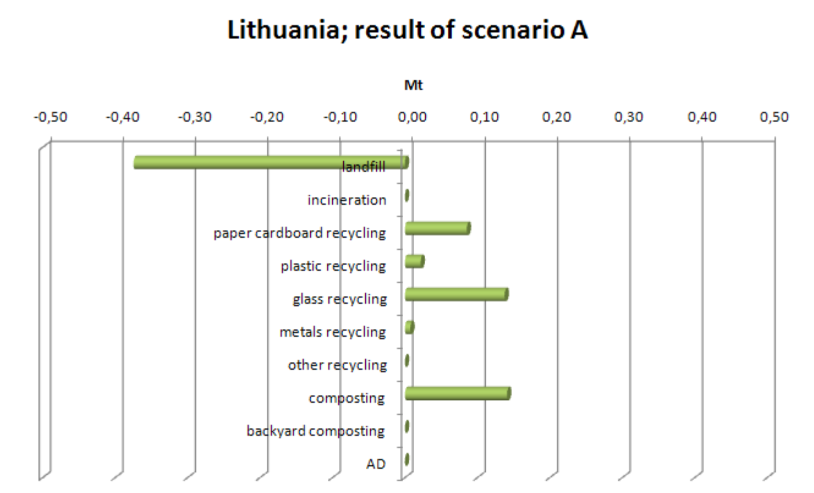
Latvia; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	0,33	0,23	-0,10
incineration	0,00	0,00	0,00
paper cardboard recycling	0,02	0,06	0,03
plastic recycling	0,01	0,02	0,01
glass recycling	0,01	0,04	0,02
metals recycling	0,01	0,03	0,02
other recycling	0,01	0,03	0,02
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.14 Lithuania



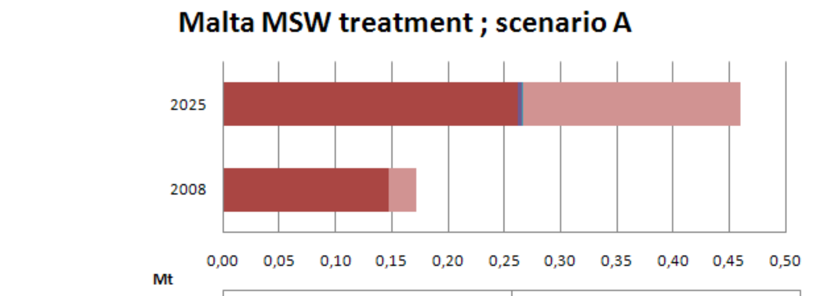
	2008	2025
landfilled	1,18	0,73
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,13
plastic recycling	0,01	0,03
glass recycling	0,07	0,20
metals recycling	0,00	0,01
other recycling	0,00	0,00
composting	0,07	0,21
backyard composting	0,00	0,00
AD	0,00	0,00



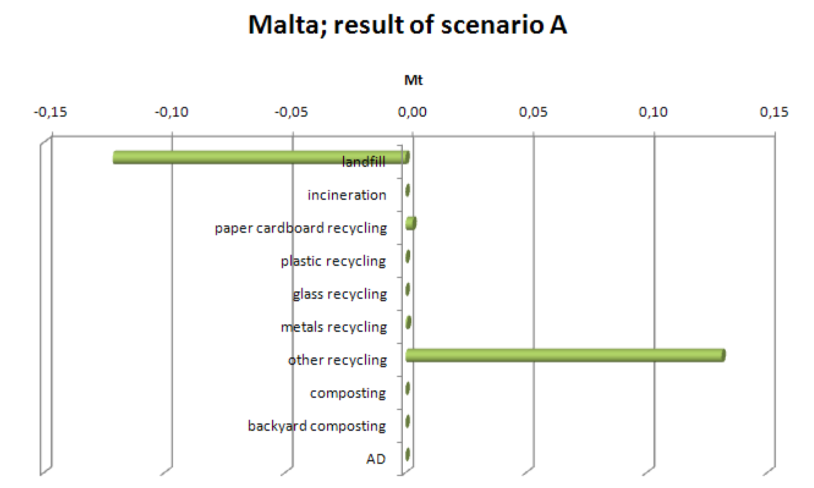
Lithuania; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	1,11	0,73	-0,37
incineration	0,00	0,00	0,00
paper cardboard recycling	0,04	0,13	0,09
plastic recycling	0,01	0,03	0,02
glass recycling	0,06	0,20	0,14
metals recycling	0,00	0,01	0,01
other recycling	0,00	0,00	0,00
composting	0,07	0,21	0,14
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.15 Malta



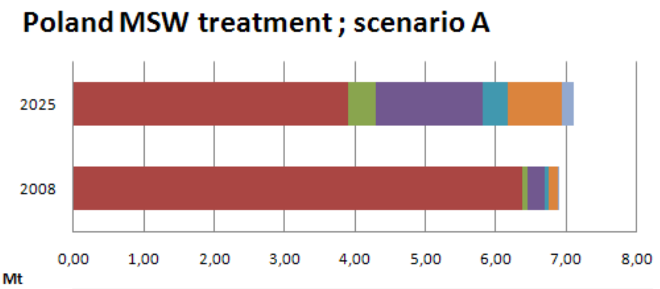
	2008	2025
landfilled	0,15	0,26
incinerated	0,00	0,00
paper cardboard recycling	0,00	0,00
plastic recycling	0,00	0,00
glass recycling	0,00	0,00
metals recycling	0,00	0,00
other recycling	0,02	0,19
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



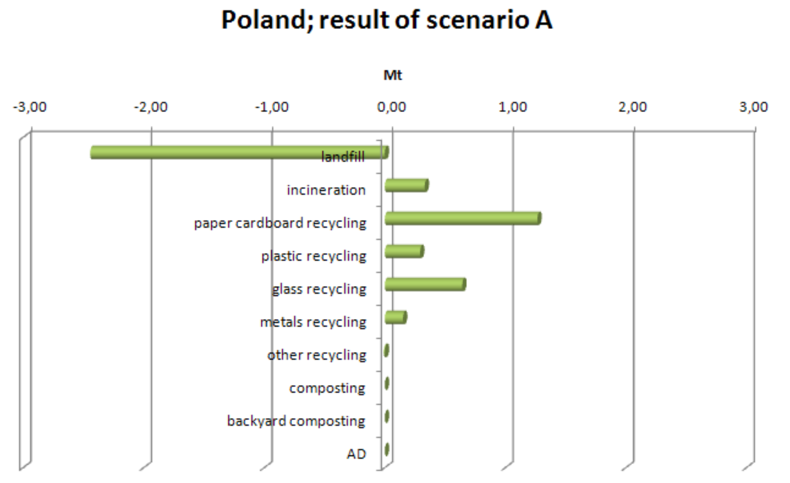
Malta; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	0,38	0,26	-0,12
incineration	0,00	0,00	0,00
paper cardboard recycling	0,00	0,00	0,00
plastic recycling	0,00	0,00	0,00
glass recycling	0,00	0,00	0,00
metals recycling	0,00	0,00	0,00
other recycling	0,06	0,19	0,13
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.16 Poland



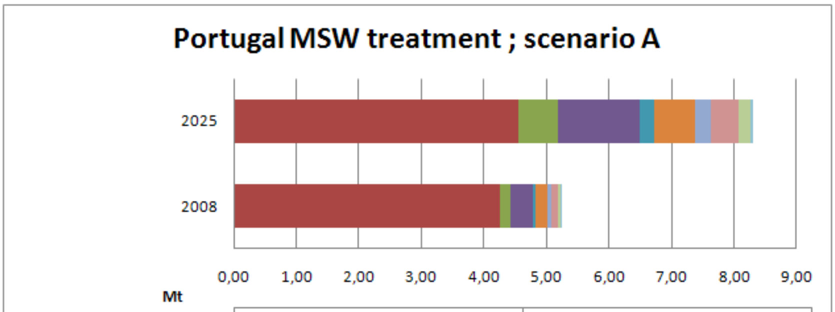
	2008	2025
landfilled	6,38	3,90
incinerated	0,07	0,40
paper cardboard recycling	0,25	1,52
plastic recycling	0,06	0,35
glass recycling	0,13	0,77
metals recycling	0,03	0,18
other recycling	0,00	0,00
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



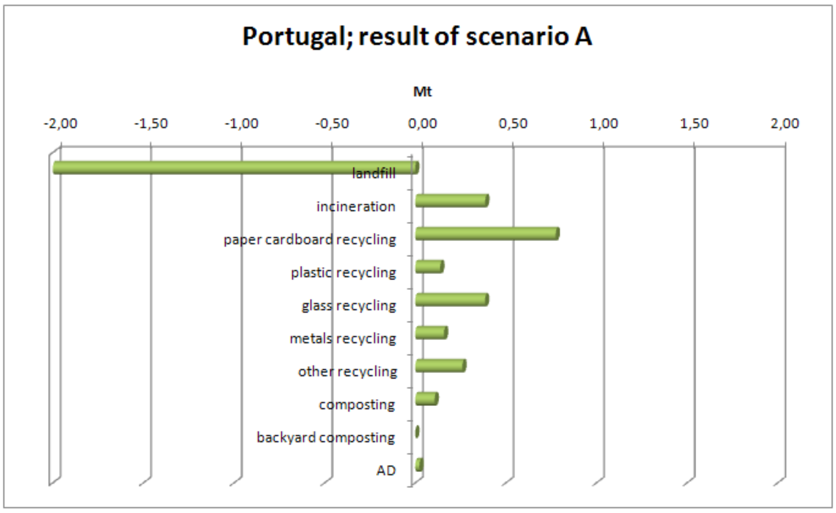
Poland; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	6,34	3,90	-2,44
incineration	0,07	0,40	0,33
paper cardboard recycling	0,25	1,52	1,27
plastic recycling	0,06	0,35	0,29
glass recycling	0,13	0,77	0,64
metals recycling	0,03	0,18	0,15
other recycling	0,01	0,00	-0,01
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.17 Portugal



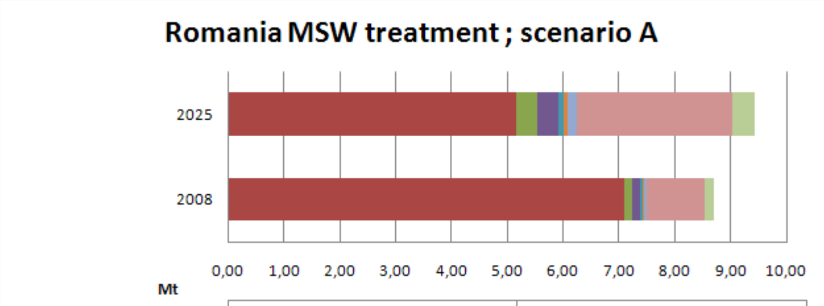
	2008	2025
landfilled	4,27	4,55
incinerated	0,17	0,65
paper cardboard recycling	0,34	1,30
plastic recycling	0,06	0,23
glass recycling	0,17	0,65
metals recycling	0,07	0,27
other recycling	0,11	0,44
composting	0,05	0,18
backyard composting	0,00	0,00
AD	0,01	0,04



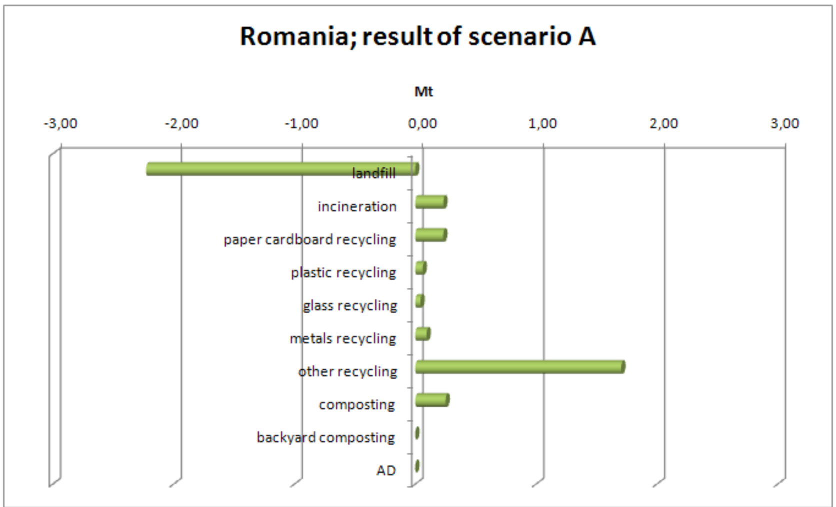
Portugal; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	6,58	4,55	-2,04
incineration	0,26	0,65	0,39
paper cardboard recycling	0,53	1,30	0,78
plastic recycling	0,09	0,23	0,14
glass recycling	0,26	0,65	0,39
metals recycling	0,11	0,27	0,16
other recycling	0,18	0,44	0,26
composting	0,07	0,18	0,11
backyard composting	0,00	0,00	0,00
AD	0,02	0,04	0,02

5.18 Romania



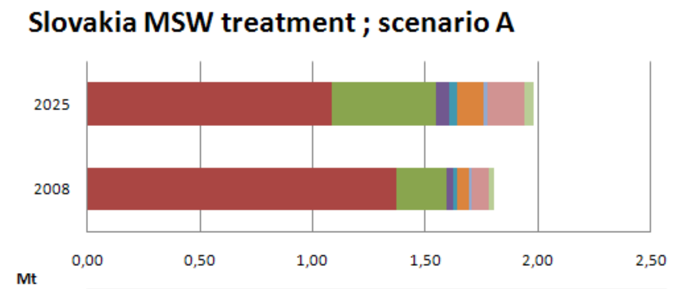
	2008	2025
landfilled	7,11	5,16
incinerated	0,14	0,38
paper cardboard recycling	0,14	0,38
plastic recycling	0,04	0,10
glass recycling	0,03	0,07
metals recycling	0,06	0,15
other recycling	1,04	2,78
composting	0,15	0,41
backyard composting	0,00	0,00
AD	0,00	0,00



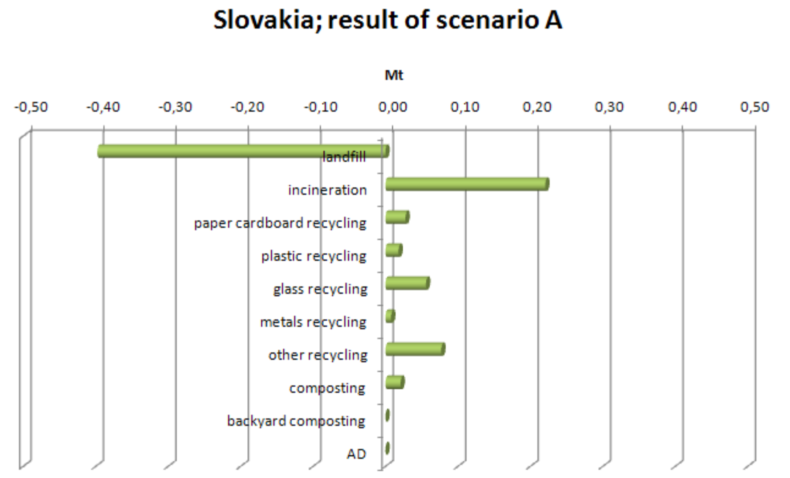
Romania; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	7,39	5,16	-2,23
incineration	0,15	0,38	0,23
paper cardboard recycling	0,15	0,38	0,23
plastic recycling	0,04	0,10	0,06
glass recycling	0,03	0,07	0,04
metals recycling	0,06	0,15	0,09
other recycling	1,08	2,78	1,71
composting	0,16	0,41	0,25
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.19 Slovakia

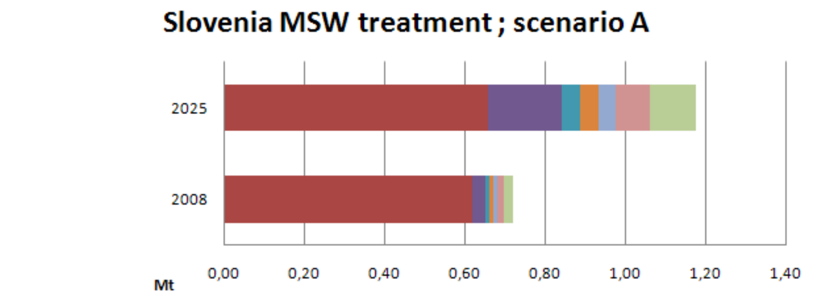


	2008	2025
landfilled	1,37	1,09
incinerated	0,22	0,46
paper cardboard recycling	0,03	0,06
plastic recycling	0,02	0,04
glass recycling	0,06	0,12
metals recycling	0,01	0,02
other recycling	0,08	0,16
composting	0,02	0,04
backyard composting	0,00	0,00
AD	0,00	0,00

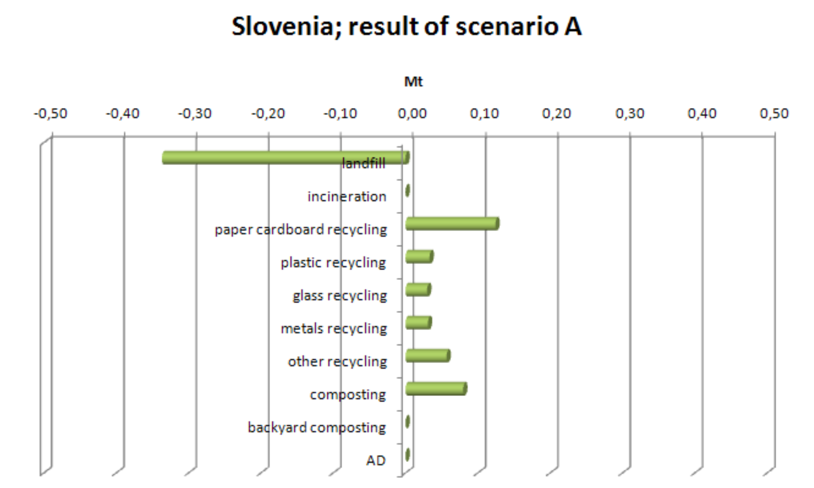


Slovakia; result of scenario A			
Mt	**Baseline scenario 2025**	**Scenario A 2025**	**Result of scenario A**
landfill	1,48	1,09	-0,40
incineration	0,24	0,46	0,22
paper cardboard recycling	0,03	0,06	0,03
plastic recycling	0,02	0,04	0,02
glass recycling	0,06	0,12	0,06
metals recycling	0,01	0,02	0,01
other recycling	0,08	0,16	0,08
composting	0,02	0,04	0,02
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.20 Slovenia



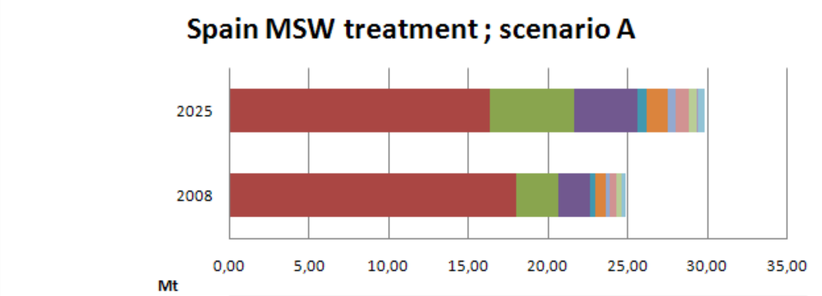
	2008	2025
landfilled	0,62	0,66
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,18
plastic recycling	0,01	0,05
glass recycling	0,01	0,04
metals recycling	0,01	0,05
other recycling	0,02	0,08
composting	0,02	0,12
backyard composting	0,00	0,00
AD	0,00	0,00



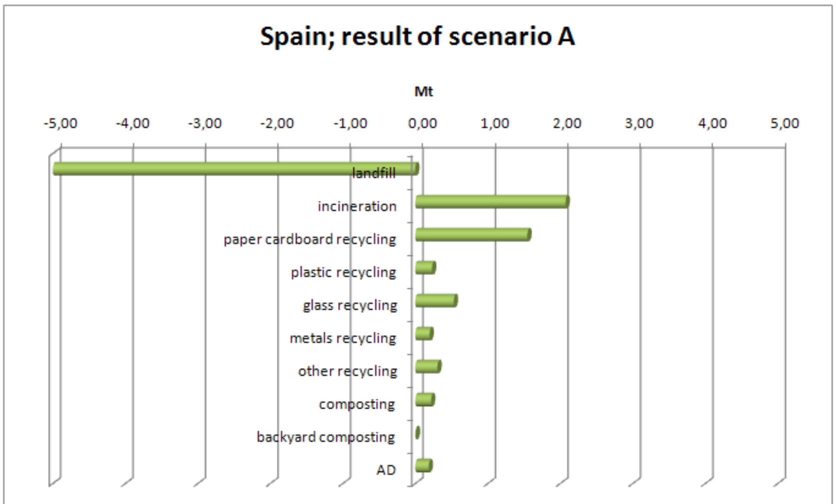
Slovenia; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	1,00	0,66	-0,34
incineration	0,00	0,00	0,00
paper cardboard recycling	0,06	0,18	0,12
plastic recycling	0,02	0,05	0,03
glass recycling	0,01	0,04	0,03
metals recycling	0,01	0,05	0,03
other recycling	0,03	0,08	0,06
composting	0,04	0,12	0,08
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

5.21 Spain

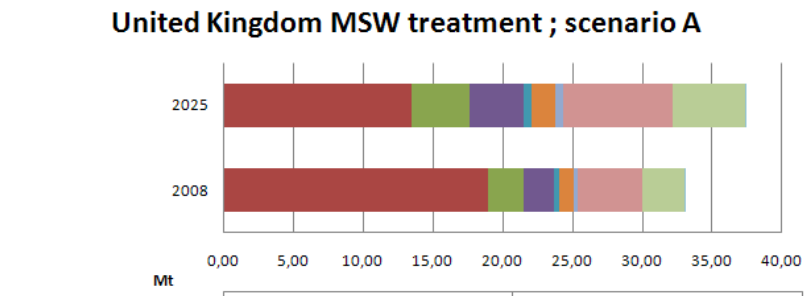


	2008	2025
landfilled	17,98	16,38
incinerated	2,69	5,27
paper cardboard recycling	2,00	3,93
plastic recycling	0,30	0,59
glass recycling	0,69	1,35
metals recycling	0,26	0,50
other recycling	0,40	0,78
composting	0,28	0,56
backyard composting	0,01	0,02
AD	0,24	0,47

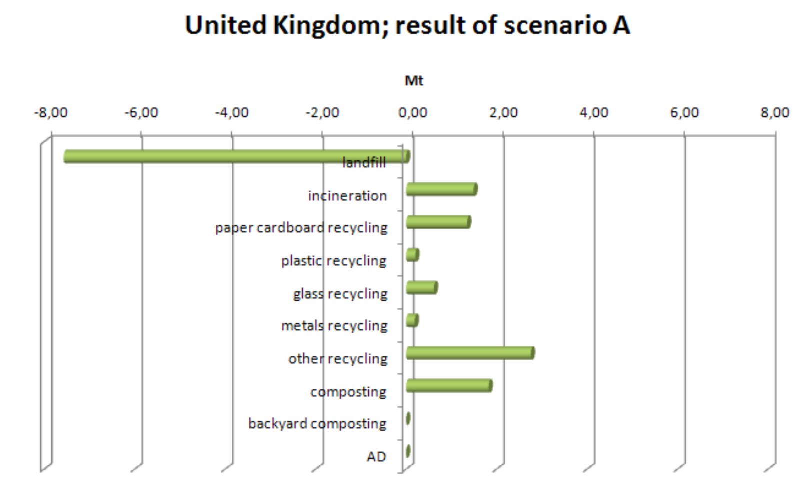


Spain; result of scenario A			
Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	21,38	16,38	-5,00
incineration	3,20	5,27	2,08
paper cardboard recycling	2,38	3,93	1,55
plastic recycling	0,36	0,59	0,23
glass recycling	0,82	1,35	0,53
metals recycling	0,30	0,50	0,20
other recycling	0,47	0,78	0,31
composting	0,34	0,56	0,22
backyard composting	0,01	0,02	0,01
AD	0,29	0,47	0,19

5.22 United Kingdom



	2008	2025
landfilled	18,99	13,43
incinerated	2,47	4,23
paper cardboard recycling	2,24	3,82
plastic recycling	0,34	0,57
glass recycling	1,02	1,74
metals recycling	0,32	0,54
other recycling	4,57	7,82
composting	3,03	5,17
backyard composting	0,00	0,00
AD	0,00	0,00

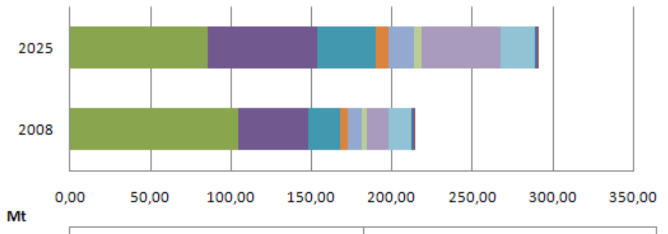


United Kingdom; result of scenario A

Mt	Baseline scenario 2025	Scenario A 2025	Result of scenario A
landfill	21,00	13,43	-7,57
incineration	2,74	4,23	1,49
paper cardboard recycling	2,47	3,82	1,35
plastic recycling	0,37	0,57	0,20
glass recycling	1,13	1,74	0,61
metals recycling	0,35	0,54	0,19
other recycling	5,06	7,82	2,76
composting	3,35	5,17	1,82
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

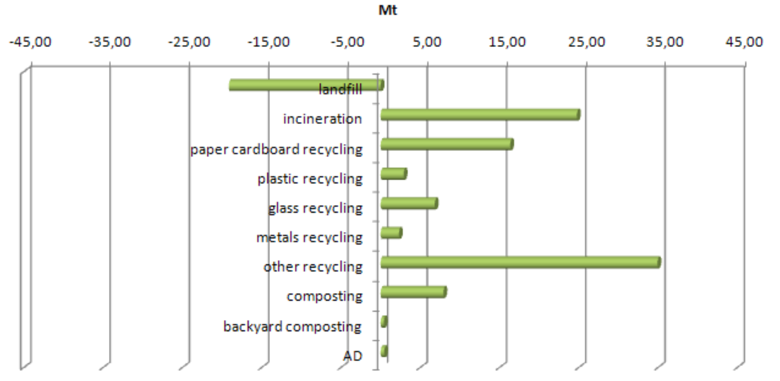
5.23 EU-27 summary

EU overview MSW treatment ; scenario A

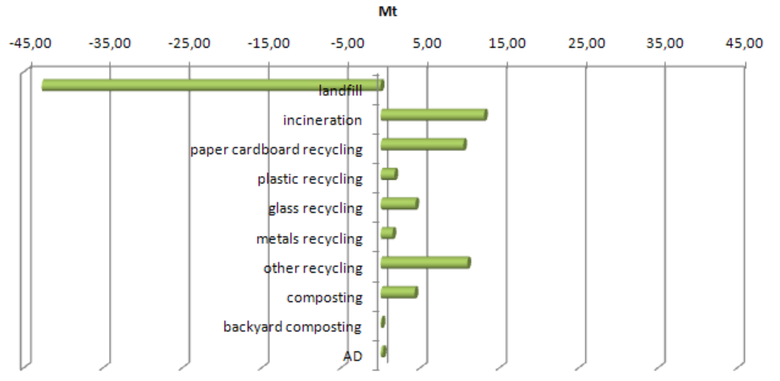


	2008	2025
landfill	104,93	85,79
incineration	42,98	67,74
paper cardboard recycling	20,27	36,61
plastic recycling	4,76	7,66
glass recycling	8,73	15,56
metals recycling	2,63	4,94
other recycling	13,97	48,89
composting	13,97	21,89
backyard composting	1,10	1,50
AD	0,57	1,01

EU; result of scenario A measures in 2025 compared to 2008



EU; result of scenario A measures in 2025 compared to baseline scenario 2025



	EU : result of scenario A				
Mt	**2008**	**baseline 2025**	**scenario A 2025**	**Δ 2008**	**Δ baseline 2025**
landfill	104,93	128,55	85,79	-19,15	-42,76
incineration	42,98	54,70	67,74	24,76	13,04
paper cardboard recycling	20,27	26,19	36,61	16,34	10,42
plastic recycling	4,76	5,92	7,66	2,90	1,74
glass recycling	8,73	11,18	15,56	6,83	4,38
metals recycling	2,63	3,46	4,94	2,31	1,48
other recycling	13,97	37,97	48,89	34,92	10,93
composting	13,97	17,61	21,89	7,91	4,28
backyard composting	1,10	1,39	1,50	0,40	0,11
AD	0,57	0,73	1,01	0,44	0,27

5.24 Overview of numeric data per Member State

2025 (Mt)	landfilled	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	**TOTAL**
Austria	0,76	1,82	0,49	0,10	0,15	0,10	0,88	0,45	0,24	0,14	**5,13**
Belgium	0,78	1,64	0,58	0,10	0,36	0,11	1,51	0,82	0,08	0,06	**6,03**
Bulgaria	1,46	0,14	0,17	0,01	0,04	0,00	0,77	0,06	0,01	0,00	**2,67**
Cyprus	0,53	0,04	0,05	0,02	0,01	0,03	0,29	0,00	0,00	0,00	**0,96**
Czech	1,25	0,47	0,72	0,17	0,22	0,03	0,55	0,07	0,00	0,00	**3,47**
Denmark	0,00	1,42	0,82	0,05	0,17	0,22	1,11	0,84	0,01	0,00	**4,63**
Estonia	0,27	0,00	0,07	0,01	0,03	0,01	0,02	0,04	0,03	0,00	**0,48**
Finland	0,88	0,21	0,50	0,02	0,16	0,03	0,39	0,24	0,00	0,02	**2,44**
France	7,43	17,86	5,49	0,61	2,98	0,62	7,89	0,78	0,00	0,00	**43,66**
Germany	2,14	14,27	6,11	3,06	2,80	0,59	11,49	6,01	0,67	0,00	**47,14**
Greece	2,76	0,00	0,98	0,09	0,17	0,16	0,75	0,00	0,00	0,00	**4,90**
Hungary	1,90	0,39	0,23	0,03	0,02	0,04	0,33	0,40	0,12	0,00	**3,46**
Ireland	1,59	0,00	0,90	0,12	0,20	0,09	0,93	0,31	0,12	0,00	**4,26**
Italy	16,02	10,49	5,69	1,08	2,40	0,76	5,25	3,02	0,00	0,16	**44,86**
Latvia	0,23	0,00	0,06	0,02	0,04	0,03	0,03	0,00	0,00	0,00	**0,40**
Lithuania	0,73	0,00	0,13	0,03	0,20	0,01	0,00	0,21	0,00	0,00	**1,31**
Luxembourg	0,00	0,00	0,08	0,02	0,07	0,01	0,17	0,16	0,00	0,03	**0,55**
Malta	0,26	0,00	0,00	0,00	0,00	0,00	0,19	0,00	0,00	0,00	**0,46**
Netherlands	1,24	4,82	1,08	0,13	0,43	0,18	3,52	1,44	0,08	0,00	**12,92**
Poland	3,90	0,40	1,52	0,35	0,77	0,18	0,00	0,00	0,00	0,00	**7,11**
Portugal	4,55	0,65	1,30	0,23	0,65	0,27	0,44	0,18	0,00	0,04	**8,30**
Romania	5,16	0,38	0,38	0,10	0,07	0,15	2,78	0,41	0,00	0,00	**9,44**
Slovakia	1,09	0,46	0,06	0,04	0,12	0,02	0,16	0,04	0,00	0,00	**1,98**
Slovenia	0,66	0,00	0,18	0,05	0,04	0,05	0,08	0,12	0,00	0,00	**1,18**
Spain	16,38	5,27	3,93	0,59	1,35	0,50	0,78	0,56	0,02	0,47	**29,85**
Sweden	0,42	2,78	1,27	0,07	0,38	0,21	0,77	0,57	0,12	0,08	**6,66**
UK	13,43	4,23	3,82	0,57	1,74	0,54	7,82	5,17	0,00	0,00	**37,33**
EU-27	**85,79**	**67,74**	**36,61**	**7,66**	**15,56**	**4,94**	**48,89**	**21,89**	**1,50**	**1,01**	**291,59**

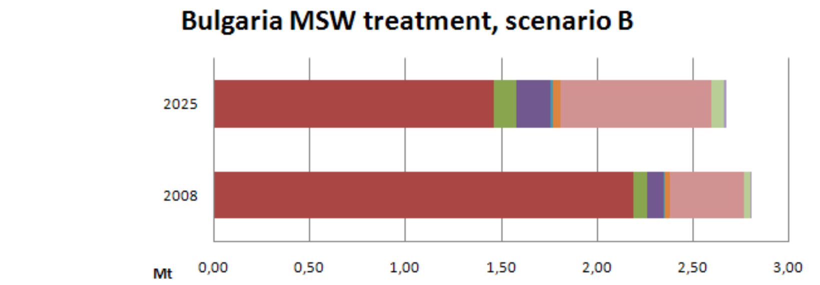
Table 29 : Overview table waste treatment 2025 in scenario A

6 Annex with results : scenario B

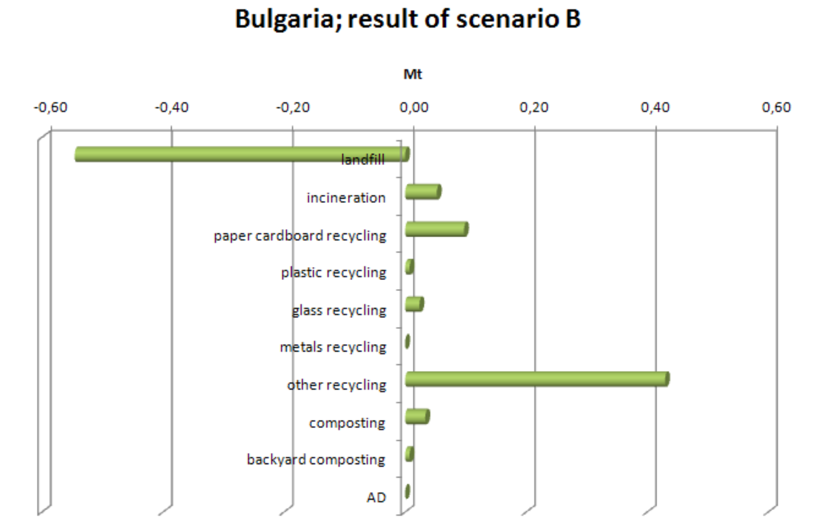
6.1 How to read the figures

- All the remarks made at the head of the annex on the baseline results are equally valid for this exercise.
- The shifts in waste treatment operations is a conservative estimate on what would shift if landfill taxes are imposed, and all other policy measures, traditions or preferences remain the same as in 2008. The distribution over waste treatment options is based on the data available for 2008.
- The figures represent a redistribution of waste being diverted from landfills over only recycling and composting, No increase or decrease on incineration is assumed compared to the baseline, except for some minor changes due to the treatment of supplementary recycling residues.
- As in scenario A, possible shifts like a real shift from composting towards anaerobic digestion with energy recovery, or between recycling and incineration, or due to better data collection an apparent shift between other waste recycling to the more specified waste recycling, are not taken into account.

6.2 Bulgaria



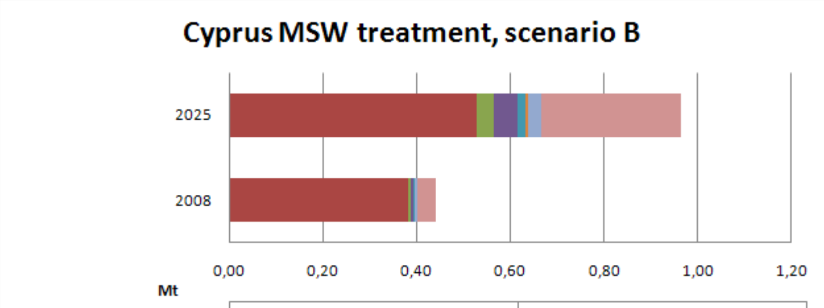
	2008	2025
landfilled	2,19	1,46
incinerated	0,07	0,12
paper cardboard recycling	0,09	0,18
plastic recycling	0,01	0,01
glass recycling	0,02	0,04
metals recycling	0,00	0,00
other recycling	0,39	0,79
composting	0,03	0,06
backyard composting	0,01	0,01
AD	0,00	0,00



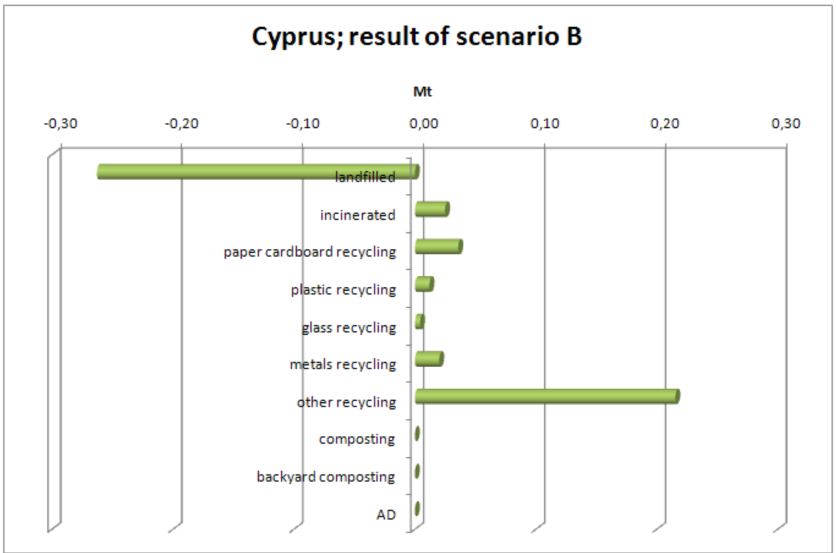
Bulgaria; result of scenario B

Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	2,01	1,46	-0,55
incineration	0,06	0,12	0,05
paper cardboard recycling	0,08	0,18	0,10
plastic recycling	0,01	0,01	0,01
glass recycling	0,02	0,04	0,02
metals recycling	0,00	0,00	0,00
other recycling	0,36	0,79	0,43
composting	0,03	0,06	0,03
backyard composting	0,01	0,01	0,01
AD	0,00	0,00	0,00

6.3 Cyprus



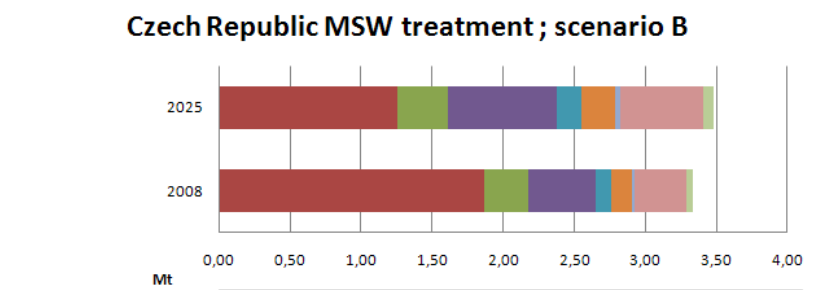
	2008	2025
landfilled	0,38	0,53
incinerated	0,01	0,04
paper cardboard recycling	0,01	0,05
plastic recycling	0,00	0,02
glass recycling	0,00	0,01
metals recycling	0,00	0,03
other recycling	0,04	0,30
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



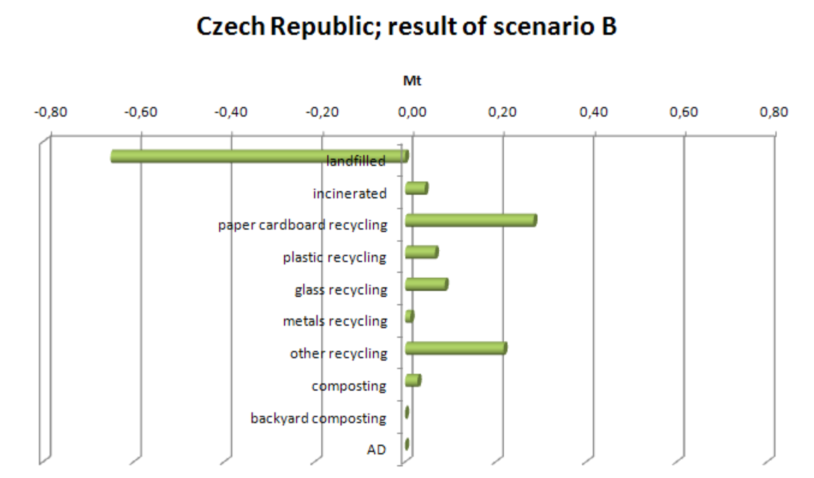
Cyprus; result of scenario B

Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	0,79	0,53	-0,26
incineration	0,01	0,04	0,02
paper cardboard recycling	0,01	0,05	0,04
plastic recycling	0,00	0,02	0,01
glass recycling	0,00	0,01	0,00
metals recycling	0,01	0,03	0,02
other recycling	0,08	0,30	0,22
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.4 Czech Republic

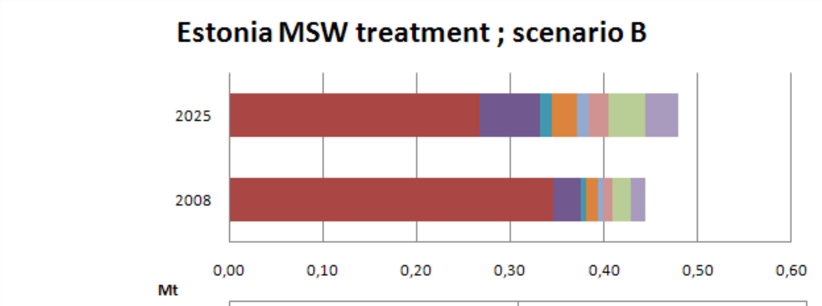


	2008	2025
landfilled	1,87	1,25
incinerated	0,31	0,36
paper cardboard recycling	0,47	0,76
plastic recycling	0,11	0,18
glass recycling	0,15	0,24
metals recycling	0,02	0,03
other recycling	0,36	0,59
composting	0,05	0,07
backyard composting	0,00	0,00
AD	0,00	0,00

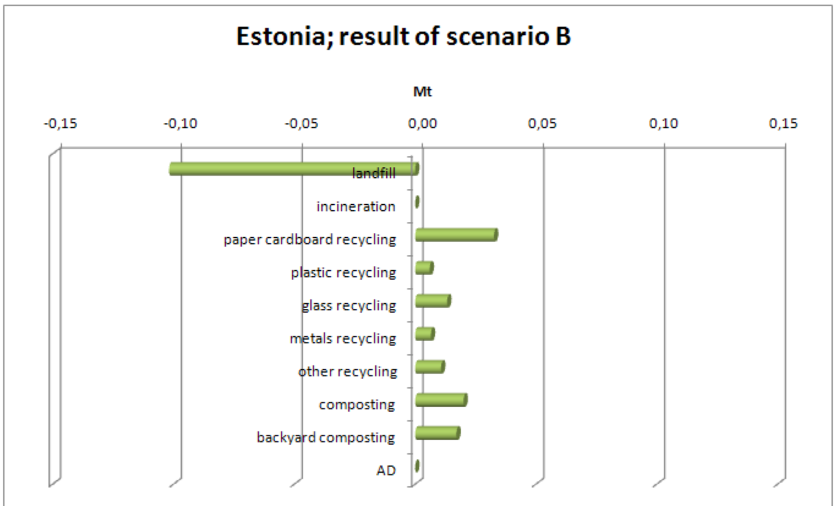


Czech Republic; result of scenario B			
Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	1,90	1,25	-0,65
incineration	0,31	0,36	0,04
paper cardboard recycling	0,48	0,76	0,28
plastic recycling	0,11	0,18	0,07
glass recycling	0,15	0,24	0,09
metals recycling	0,02	0,03	0,01
other recycling	0,37	0,59	0,22
composting	0,05	0,07	0,03
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.5 Estonia



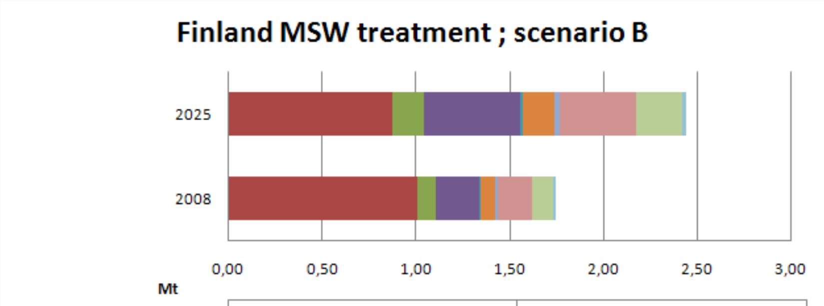
	2008	2025
landfilled	0,35	0,27
incinerated	0,00	0,00
paper cardboard recycling	0,03	0,07
plastic recycling	0,01	0,01
glass recycling	0,01	0,03
metals recycling	0,01	0,01
other recycling	0,01	0,02
composting	0,02	0,04
backyard composting	0,02	0,03
AD	0,00	0,00



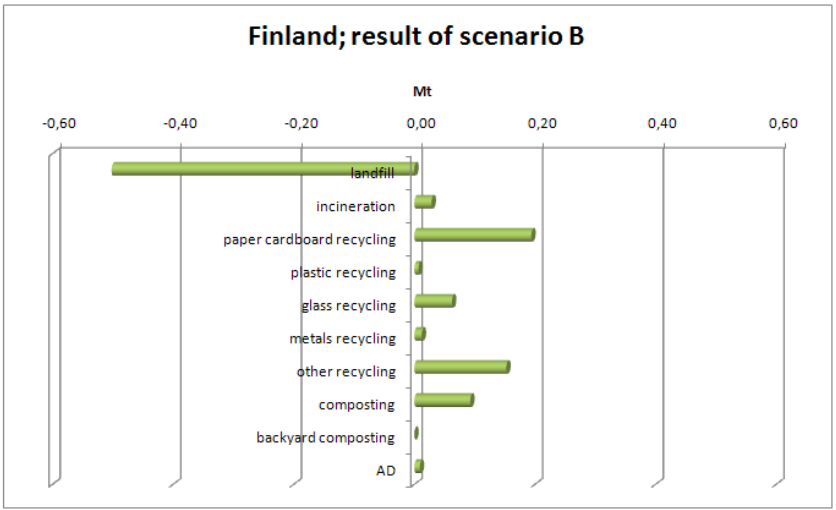
Estonia; result of scenario B

Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	0,37	0,27	-0,10
incineration	0,00	0,00	0,00
paper cardboard recycling	0,03	0,07	0,03
plastic recycling	0,01	0,01	0,01
glass recycling	0,01	0,03	0,01
metals recycling	0,01	0,01	0,01
other recycling	0,01	0,02	0,01
composting	0,02	0,04	0,02
backyard composting	0,02	0,03	0,02
AD	0,00	0,00	0,00

6.6 Finland



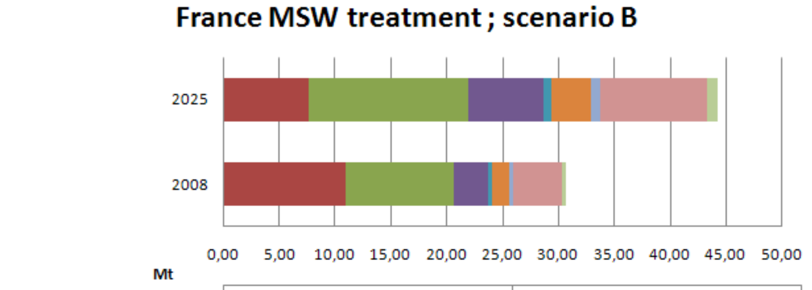
	2008	2025
landfilled	1,01	0,88
incinerated	0,10	0,16
paper cardboard recycling	0,23	0,51
plastic recycling	0,01	0,02
glass recycling	0,08	0,17
metals recycling	0,01	0,03
other recycling	0,18	0,40
composting	0,11	0,25
backyard composting	0,00	0,00
AD	0,01	0,02



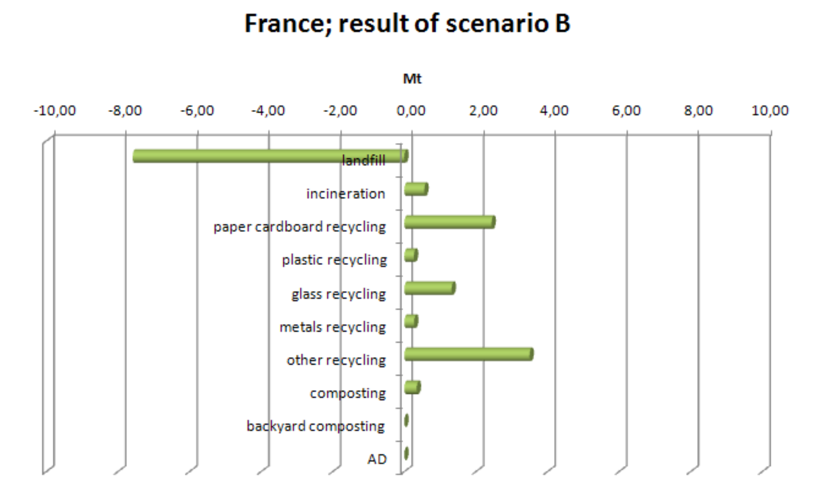
Finland; result of scenario B

Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	1,38	0,88	-0,50
incineration	0,13	0,16	0,03
paper cardboard recycling	0,32	0,51	0,19
plastic recycling	0,01	0,02	0,01
glass recycling	0,10	0,17	0,06
metals recycling	0,02	0,03	0,01
other recycling	0,25	0,40	0,15
composting	0,15	0,25	0,09
backyard composting	0,00	0,00	0,00
AD	0,02	0,02	0,01

6.7 France



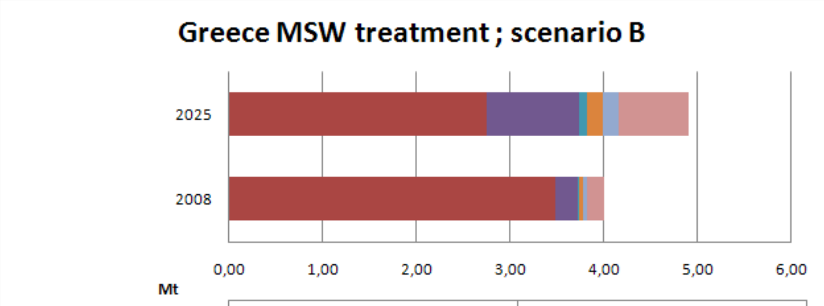
	2008	2025
landfilled	10,90	7,70
incinerated	9,77	14,26
paper cardboard recycling	3,00	6,65
plastic recycling	0,33	0,73
glass recycling	1,63	3,61
metals recycling	0,34	0,75
other recycling	4,31	9,55
composting	0,43	0,94
backyard composting	0,00	0,00
AD	0,00	0,00



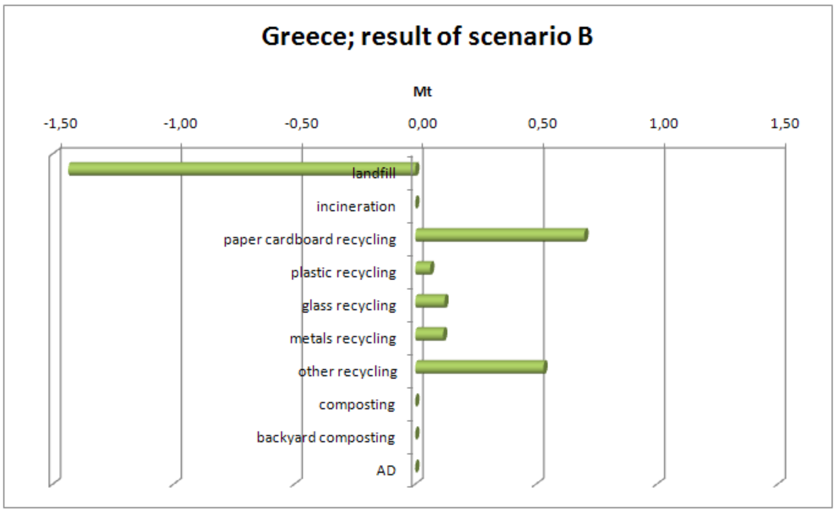
France; result of scenario B

Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	15,29	7,70	-7,59
incineration	13,70	14,26	0,56
paper cardboard recycling	4,21	6,65	2,44
plastic recycling	0,46	0,73	0,27
glass recycling	2,29	3,61	1,32
metals recycling	0,47	0,75	0,27
other recycling	6,05	9,55	3,50
composting	0,60	0,94	0,35
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.8 Greece



	2008	2025
landfilled	3,48	2,76
incinerated	0,00	0,00
paper cardboard recycling	0,24	0,98
plastic recycling	0,02	0,09
glass recycling	0,04	0,17
metals recycling	0,04	0,16
other recycling	0,18	0,75
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

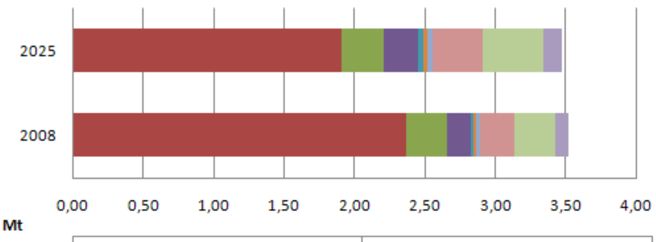


Greece; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	4,19	2,76	-1,44
incineration	0,00	0,00	0,00
paper cardboard recycling	0,28	0,98	0,70
plastic recycling	0,03	0,09	0,06
glass recycling	0,05	0,17	0,12
metals recycling	0,05	0,16	0,12
other recycling	0,22	0,75	0,53
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

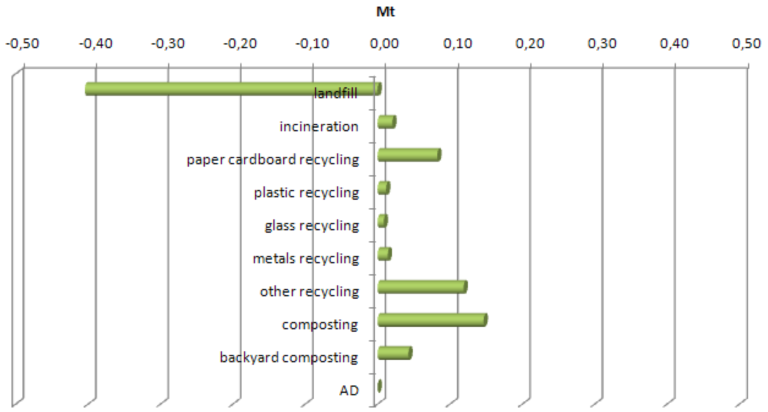
6.9 Hungary

Hungary MSW treatment ; scenario B



	2008	2025
landfilled	2,37	1,90
incinerated	0,29	0,30
paper cardboard recycling	0,17	0,25
plastic recycling	0,02	0,04
glass recycling	0,02	0,03
metals recycling	0,03	0,04
other recycling	0,24	0,35
composting	0,30	0,44
backyard composting	0,09	0,13
AD	0,00	0,00

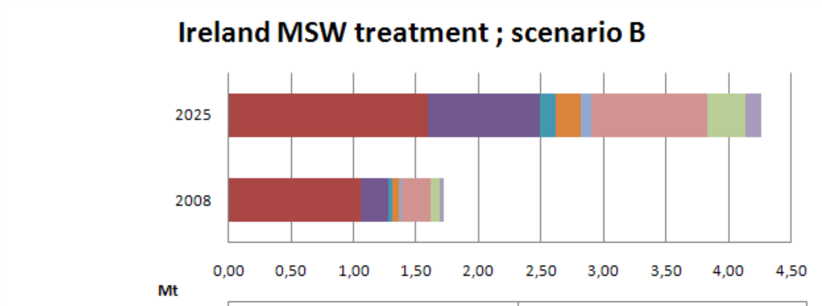
Hungary; result of scenario B



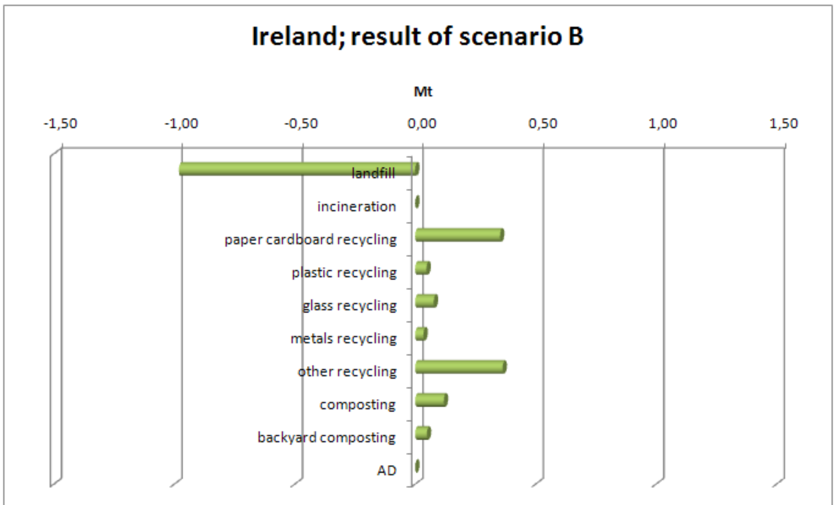
Hungary; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	2,31	1,90	-0,40
incineration	0,28	0,30	0,02
paper cardboard recycling	0,16	0,25	0,08
plastic recycling	0,02	0,04	0,01
glass recycling	0,02	0,03	0,01
metals recycling	0,03	0,04	0,01
other recycling	0,23	0,35	0,12
composting	0,29	0,44	0,15
backyard composting	0,08	0,13	0,04
AD	0,00	0,00	0,00

6.10 Ireland



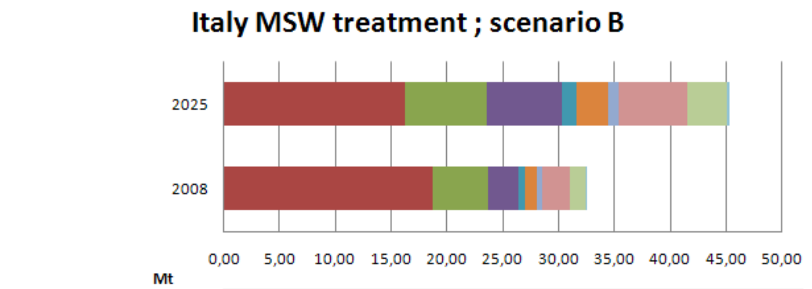
	2008	2025
landfilled	1,05	1,59
incinerated	0,00	0,00
paper cardboard recycling	0,23	0,90
plastic recycling	0,03	0,12
glass recycling	0,05	0,20
metals recycling	0,02	0,09
other recycling	0,23	0,93
composting	0,08	0,31
backyard composting	0,03	0,12
AD	0,00	0,00



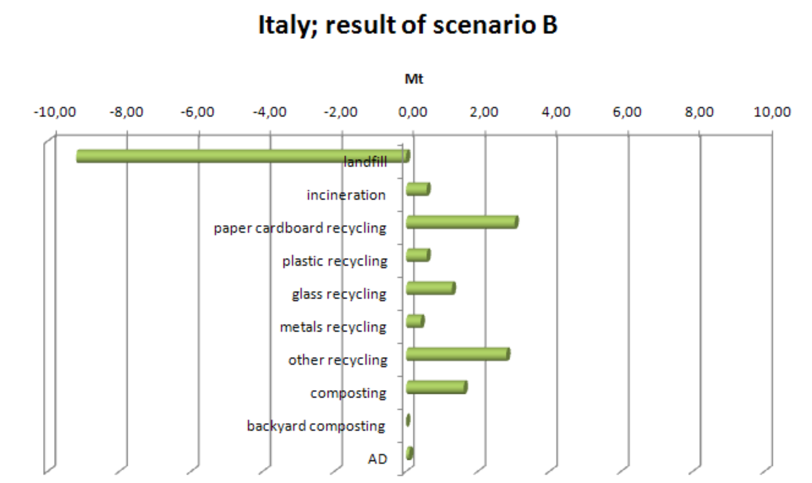
Ireland; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	2,57	1,59	-0,98
incineration	0,00	0,00	0,00
paper cardboard recycling	0,55	0,90	0,35
plastic recycling	0,07	0,12	0,05
glass recycling	0,12	0,20	0,08
metals recycling	0,05	0,09	0,03
other recycling	0,57	0,93	0,36
composting	0,19	0,31	0,12
backyard composting	0,08	0,12	0,05
AD	0,00	0,00	0,00

6.11 Italy



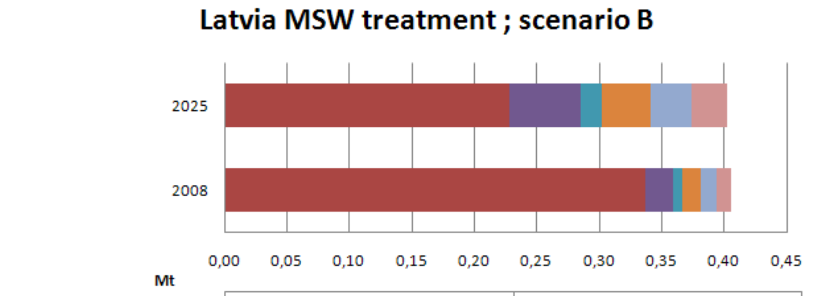
	2008	2025
landfilled	18,72	16,22
incinerated	5,01	7,37
paper cardboard recycling	2,71	6,71
plastic recycling	0,51	1,27
glass recycling	1,14	2,83
metals recycling	0,36	0,90
other recycling	2,50	6,19
composting	1,44	3,56
backyard composting	0,00	0,00
AD	0,08	0,19



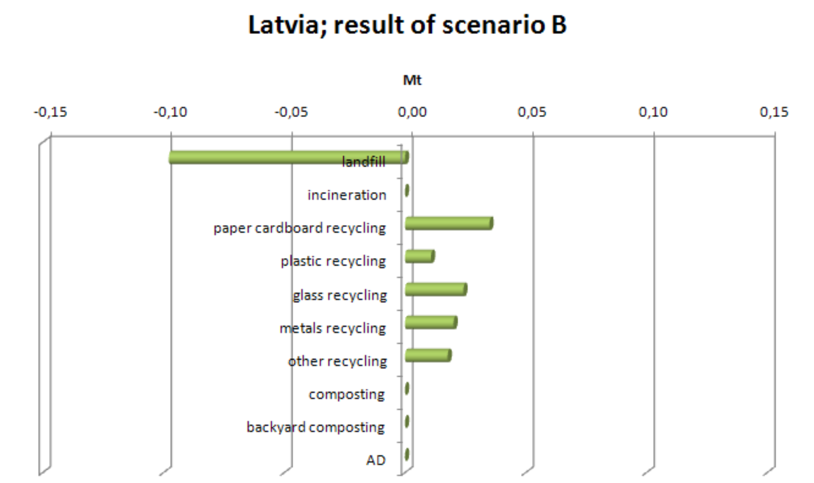
Italy; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	25,42	16,22	-9,21
incineration	6,80	7,37	0,57
paper cardboard recycling	3,68	6,71	3,03
plastic recycling	0,70	1,27	0,57
glass recycling	1,55	2,83	1,28
metals recycling	0,50	0,90	0,41
other recycling	3,40	6,19	2,80
composting	1,95	3,56	1,61
backyard composting	0,00	0,00	0,00
AD	0,10	0,19	0,08

6.12 Latvia



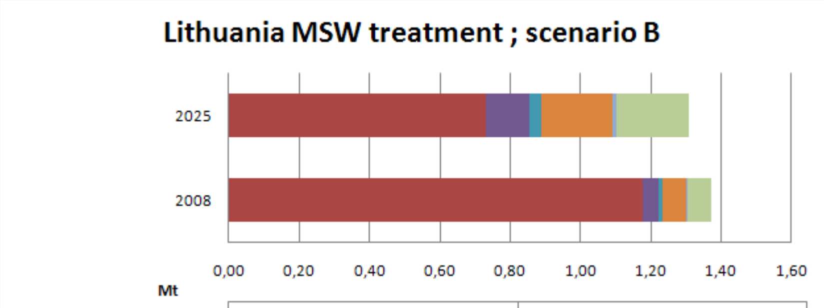
	2008	2025
landfilled	0,34	0,23
incinerated	0,00	0,00
paper cardboard recycling	0,02	0,06
plastic recycling	0,01	0,02
glass recycling	0,02	0,04
metals recycling	0,01	0,03
other recycling	0,01	0,03
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



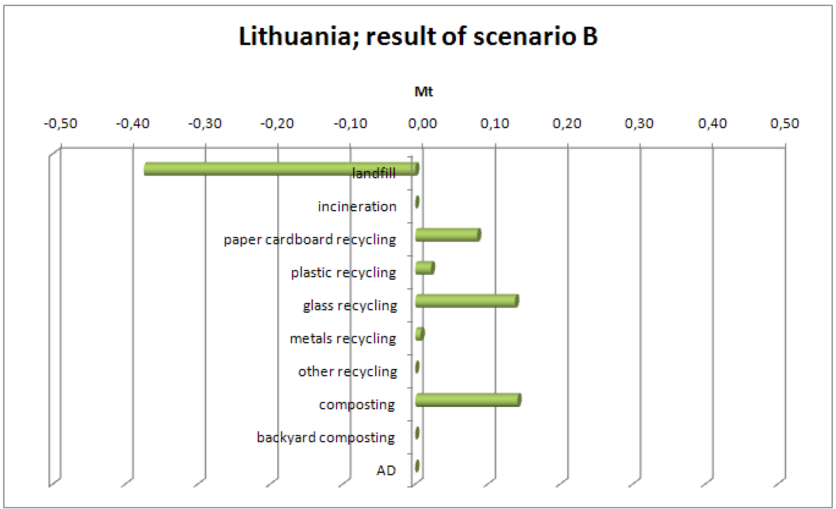
Latvia; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	0,33	0,23	-0,10
incineration	0,00	0,00	0,00
paper cardboard recycling	0,02	0,06	0,03
plastic recycling	0,01	0,02	0,01
glass recycling	0,01	0,04	0,02
metals recycling	0,01	0,03	0,02
other recycling	0,01	0,03	0,02
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.13 Lithuania

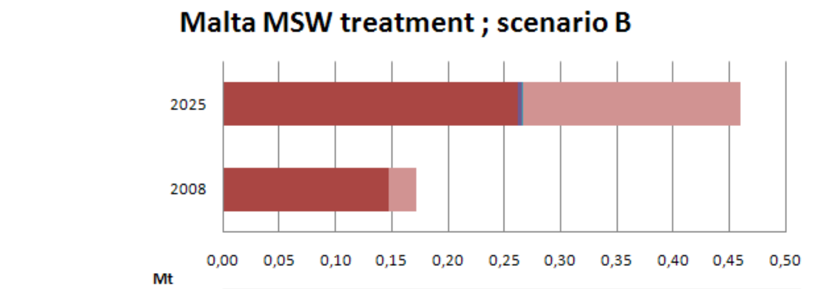


	2008	2025
landfilled	1,18	0,73
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,13
plastic recycling	0,01	0,03
glass recycling	0,07	0,20
metals recycling	0,00	0,01
other recycling	0,00	0,00
composting	0,07	0,21
backyard composting	0,00	0,00
AD	0,00	0,00

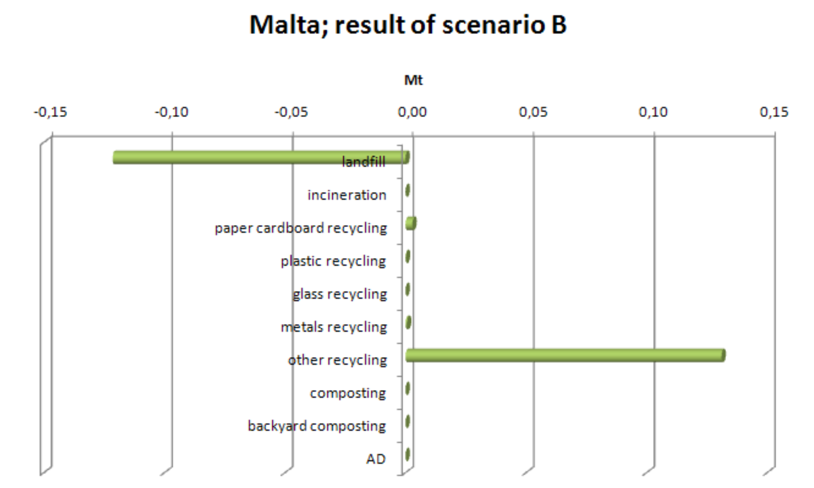


Lithuania; result of scenario B			
Mt	**Baseline scenario 2025**	**scenario B 2025**	**Result of scenario B**
landfill	1,11	0,73	-0,37
incineration	0,00	0,00	0,00
paper cardboard recycling	0,04	0,13	0,09
plastic recycling	0,01	0,03	0,02
glass recycling	0,06	0,20	0,14
metals recycling	0,00	0,01	0,01
other recycling	0,00	0,00	0,00
composting	0,07	0,21	0,14
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.14 Malta

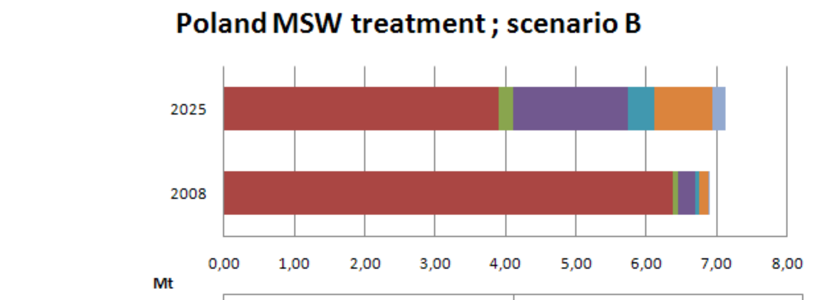


	2008	2025
landfilled	0,15	0,26
incinerated	0,00	0,00
paper cardboard recycling	0,00	0,00
plastic recycling	0,00	0,00
glass recycling	0,00	0,00
metals recycling	0,00	0,00
other recycling	0,02	0,19
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00

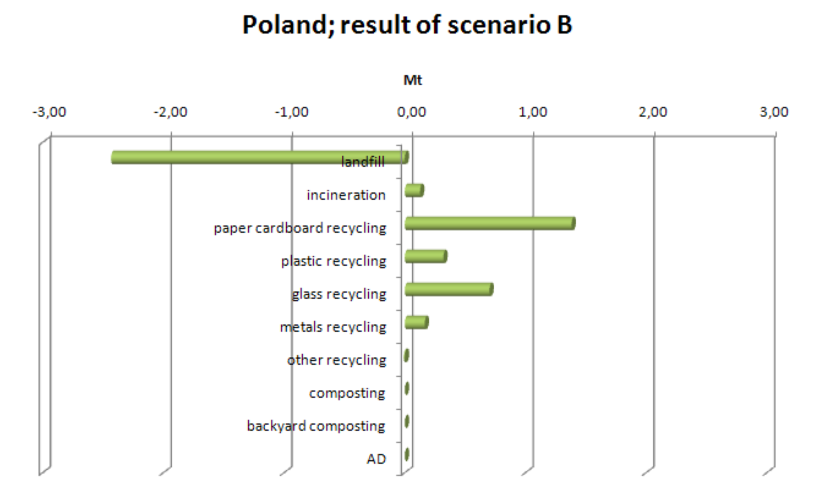


Malta; result of scenario B			
Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	0,38	0,26	-0,12
incineration	0,00	0,00	0,00
paper cardboard recycling	0,00	0,00	0,00
plastic recycling	0,00	0,00	0,00
glass recycling	0,00	0,00	0,00
metals recycling	0,00	0,00	0,00
other recycling	0,06	0,19	0,13
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.15 Poland



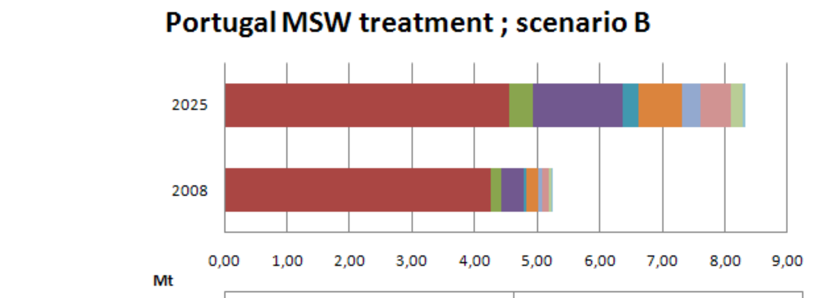
	2008	2025
landfilled	6,38	3,91
incinerated	0,07	0,19
paper cardboard recycling	0,25	1,63
plastic recycling	0,06	0,38
glass recycling	0,13	0,83
metals recycling	0,03	0,19
other recycling	0,00	0,00
composting	0,00	0,00
backyard composting	0,00	0,00
AD	0,00	0,00



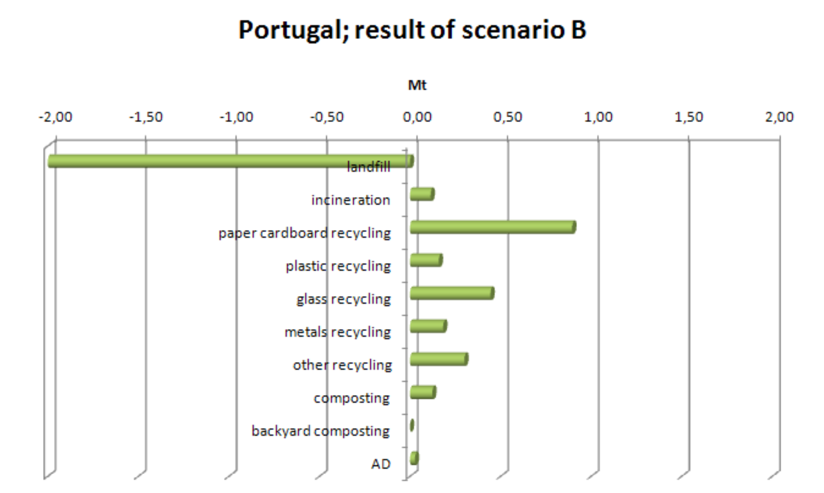
Poland; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	6,34	3,91	-2,43
incineration	0,07	0,19	0,13
paper cardboard recycling	0,25	1,63	1,38
plastic recycling	0,06	0,38	0,32
glass recycling	0,13	0,83	0,70
metals recycling	0,03	0,19	0,17
other recycling	0,01	0,00	-0,01
composting	0,00	0,00	0,00
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.16 Portugal



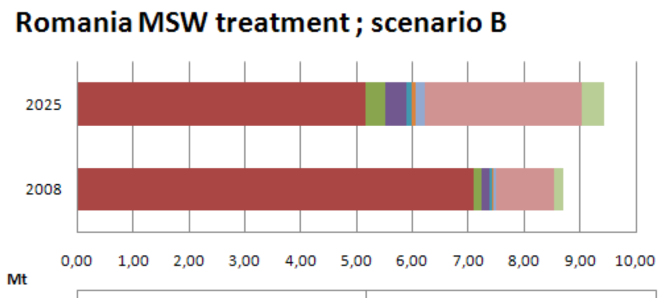
	2008	2025
landfilled	4,27	4,56
incinerated	0,17	0,38
paper cardboard recycling	0,34	1,42
plastic recycling	0,06	0,25
glass recycling	0,17	0,71
metals recycling	0,07	0,29
other recycling	0,11	0,48
composting	0,05	0,20
backyard composting	0,00	0,00
AD	0,01	0,04



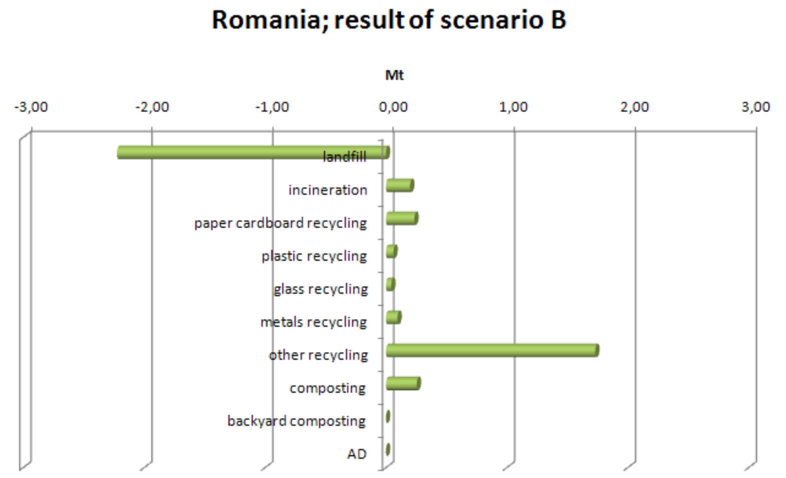
Portugal; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	6,58	4,56	-2,02
incineration	0,26	0,38	0,11
paper cardboard recycling	0,53	1,42	0,90
plastic recycling	0,09	0,25	0,16
glass recycling	0,26	0,71	0,44
metals recycling	0,11	0,29	0,18
other recycling	0,18	0,48	0,30
composting	0,07	0,20	0,12
backyard composting	0,00	0,00	0,00
AD	0,02	0,04	0,03

6.17 Romania



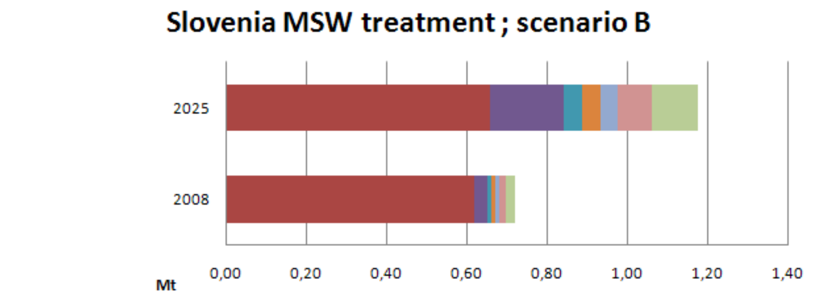
	2008	2025
landfilled	7,11	5,16
incinerated	0,14	0,35
paper cardboard recycling	0,14	0,38
plastic recycling	0,04	0,10
glass recycling	0,03	0,07
metals recycling	0,06	0,16
other recycling	1,04	2,81
composting	0,15	0,41
backyard composting	0,00	0,00
AD	0,00	0,00



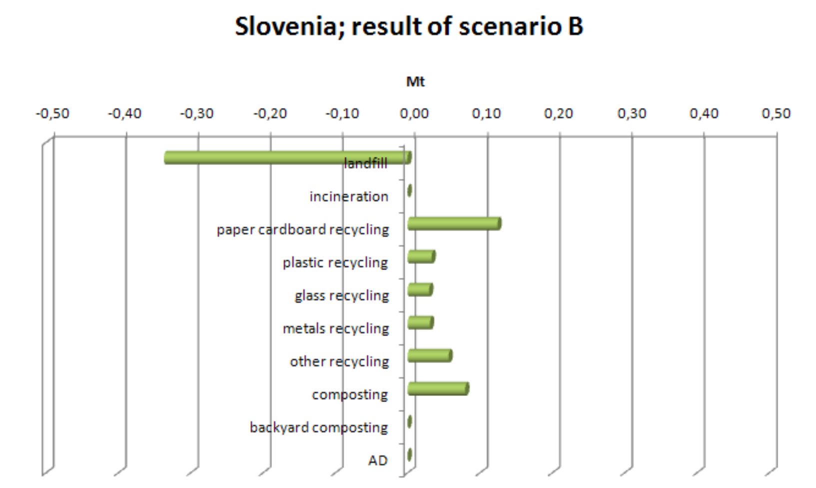
Romania; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	7,39	5,16	-2,22
incineration	0,15	0,35	0,20
paper cardboard recycling	0,15	0,38	0,24
plastic recycling	0,04	0,10	0,06
glass recycling	0,03	0,07	0,04
metals recycling	0,06	0,16	0,10
other recycling	1,08	2,81	1,73
composting	0,16	0,41	0,26
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.18 Slovenia



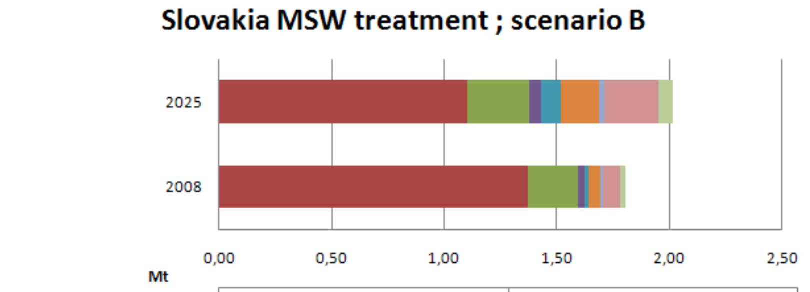
	2008	2025
landfilled	0,62	0,66
incinerated	0,00	0,00
paper cardboard recycling	0,04	0,18
plastic recycling	0,01	0,05
glass recycling	0,01	0,04
metals recycling	0,01	0,05
other recycling	0,02	0,08
composting	0,02	0,12
backyard composting	0,00	0,00
AD	0,00	0,00



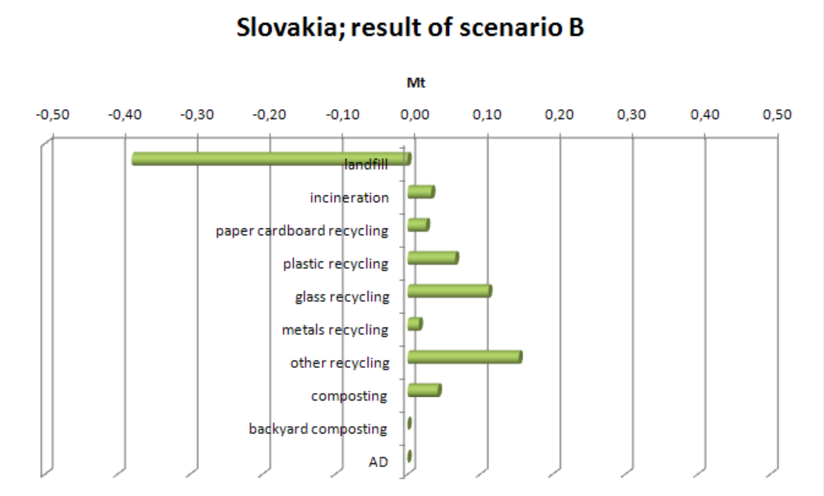
Slovenia; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	1,00	0,66	-0,34
incineration	0,00	0,00	0,00
paper cardboard recycling	0,06	0,18	0,12
plastic recycling	0,02	0,05	0,03
glass recycling	0,01	0,04	0,03
metals recycling	0,01	0,05	0,03
other recycling	0,03	0,08	0,06
composting	0,04	0,12	0,08
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.19 Slovakia



	2008	2025
landfilled	1,37	1,10
incinerated	0,22	0,27
paper cardboard recycling	0,03	0,06
plastic recycling	0,02	0,09
glass recycling	0,06	0,17
metals recycling	0,01	0,02
other recycling	0,08	0,24
composting	0,02	0,06
backyard composting	0,00	0,00
AD	0,00	0,00

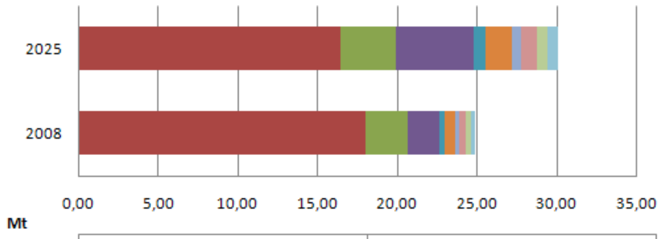


Slovakia; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	1,48	1,10	-0,38
incineration	0,24	0,27	0,03
paper cardboard recycling	0,03	0,06	0,03
plastic recycling	0,02	0,09	0,07
glass recycling	0,06	0,17	0,11
metals recycling	0,01	0,02	0,02
other recycling	0,08	0,24	0,15
composting	0,02	0,06	0,04
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

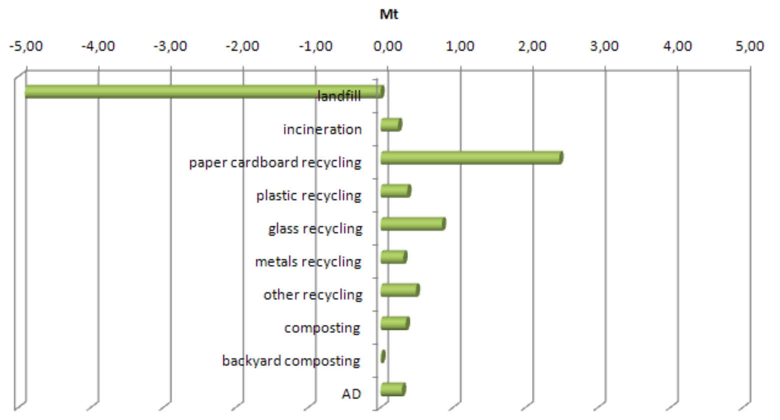
6.20 Spain

Spain MSW treatment ; scenario B



	2008	2025
landfilled	17,98	16,47
incinerated	2,69	3,44
paper cardboard recycling	2,00	4,85
plastic recycling	0,30	0,73
glass recycling	0,69	1,67
metals recycling	0,26	0,62
other recycling	0,40	0,96
composting	0,28	0,69
backyard composting	0,01	0,03
AD	0,24	0,58

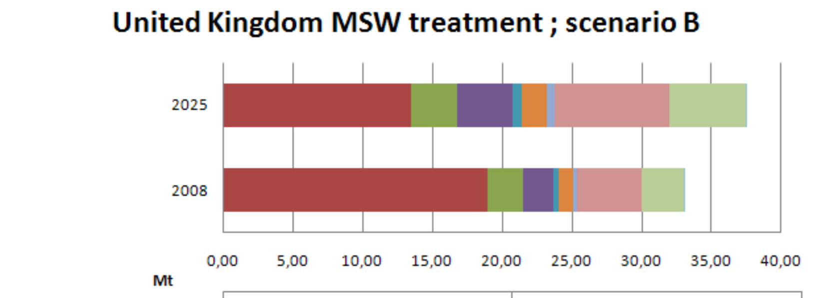
Spain; result of scenario B



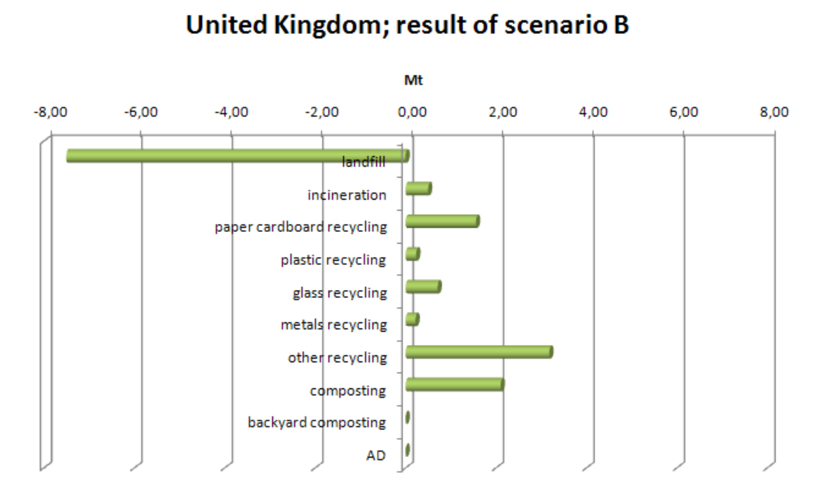
Spain; result of scenario B

Mt	Baseline scenario 2025	scenario B 2025	Result of scenario B
landfill	21,38	16,47	-4,91
incineration	3,20	3,44	0,24
paper cardboard recycling	2,38	4,85	2,47
plastic recycling	0,36	0,73	0,37
glass recycling	0,82	1,67	0,85
metals recycling	0,30	0,62	0,32
other recycling	0,47	0,96	0,49
composting	0,34	0,69	0,35
backyard composting	0,01	0,03	0,01
AD	0,29	0,58	0,30

6.21 United Kingdom

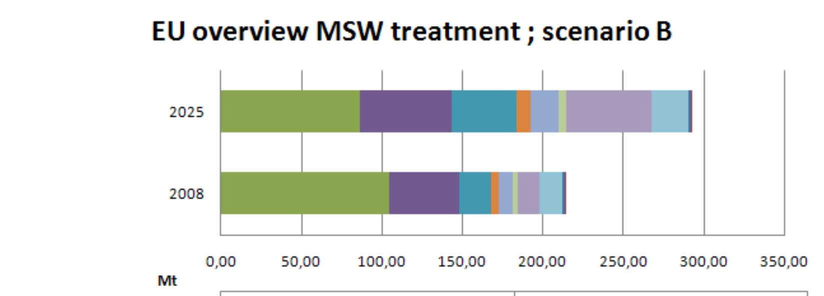


	2008	2025
landfilled	18,99	13,50
incinerated	2,47	3,23
paper cardboard recycling	2,24	4,03
plastic recycling	0,34	0,61
glass recycling	1,02	1,84
metals recycling	0,32	0,57
other recycling	4,57	8,24
composting	3,03	5,45
backyard composting	0,00	0,00
AD	0,00	0,00

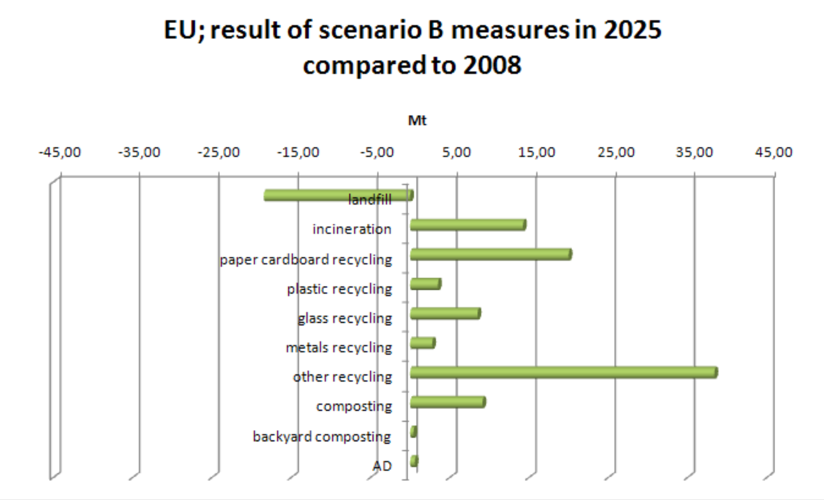


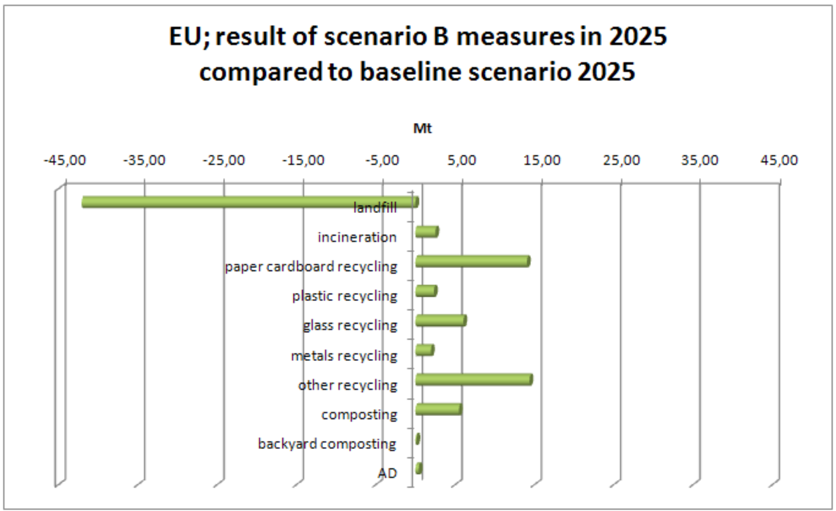
United Kingdom; result of scenario B			
Mt	Baseline scenario 2025	Scenario B 2025	Result of scenario B
landfill	21,00	13,50	-7,51
incineration	2,74	3,23	0,50
paper cardboard recycling	2,47	4,03	1,56
plastic recycling	0,37	0,61	0,23
glass recycling	1,13	1,84	0,71
metals recycling	0,35	0,57	0,22
other recycling	5,06	8,24	3,18
composting	3,35	5,45	2,10
backyard composting	0,00	0,00	0,00
AD	0,00	0,00	0,00

6.22 EU-27 conclusions



	2008	2025
landfill	104,93	86,47
incineration	42,98	57,21
paper cardboard recycling	20,27	40,25
plastic recycling	4,76	8,26
glass recycling	8,73	17,23
metals recycling	2,63	5,41
other recycling	13,97	52,35
composting	13,97	23,09
backyard composting	1,10	1,52
AD	0,57	1,15





6.23 Overview of numeric data per Member State

2025 (Mt)	landfilled	incinerated	paper cardboard recycled	plastic recycled	glass recycled	metals recycled	other recycled	composting	backyard composting	AD	**TOTAL**
Austria	0,76	1,82	0,49	0,10	0,15	0,10	0,88	0,45	0,24	0,14	**5,13**
Belgium	0,78	1,64	0,58	0,10	0,36	0,11	1,51	0,82	0,08	0,06	**6,03**
Bulgaria	1,46	0,12	0,18	0,01	0,04	0,00	0,79	0,06	0,01	0,00	**2,67**
Cyprus	0,53	0,04	0,05	0,02	0,01	0,03	0,30	0,00	0,00	0,00	**0,97**
Czech	1,25	0,36	0,76	0,18	0,24	0,03	0,59	0,07	0,00	0,00	**3,48**
Denmark	0,00	1,42	0,82	0,05	0,17	0,22	1,11	0,84	0,01	0,00	**4,63**
Estonia	0,27	0,00	0,07	0,01	0,03	0,01	0,02	0,04	0,03	0,00	**0,48**
Finland	0,88	0,16	0,51	0,02	0,17	0,03	0,40	0,25	0,00	0,02	**2,44**
France	7,70	14,26	6,65	0,73	3,61	0,75	9,55	0,94	0,00	0,00	**44,19**
Germany	2,14	14,27	6,11	3,06	2,80	0,59	11,49	6,01	0,67	0,00	**47,14**
Greece	2,76	0,00	0,98	0,09	0,17	0,16	0,75	0,00	0,00	0,00	**4,90**
Hungary	1,90	0,30	0,25	0,04	0,03	0,04	0,35	0,44	0,13	0,00	**3,47**
Ireland	1,59	0,00	0,90	0,12	0,20	0,09	0,93	0,31	0,12	0,00	**4,26**
Italy	16,22	7,37	6,71	1,27	2,83	0,90	6,19	3,56	0,00	0,19	**45,25**
Latvia	0,23	0,00	0,06	0,02	0,04	0,03	0,03	0,00	0,00	0,00	**0,40**
Lithuania	0,73	0,00	0,13	0,03	0,20	0,01	0,00	0,21	0,00	0,00	**1,31**
Luxembourg	0,00	0,00	0,08	0,02	0,07	0,01	0,17	0,16	0,00	0,03	**0,55**
Malta	0,26	0,00	0,00	0,00	0,00	0,00	0,19	0,00	0,00	0,00	**0,46**
Netherlands	1,24	4,82	1,08	0,13	0,43	0,18	3,52	1,44	0,08	0,00	**12,92**
Poland	3,91	0,19	1,63	0,38	0,83	0,19	0,00	0,00	0,00	0,00	**7,13**
Portugal	4,56	0,38	1,42	0,25	0,71	0,29	0,48	0,20	0,00	0,04	**8,33**
Romania	5,16	0,35	0,38	0,10	0,07	0,16	2,81	0,41	0,00	0,00	**9,44**
Slovakia	1,10	0,27	0,06	0,09	0,17	0,02	0,24	0,06	0,00	0,00	**2,02**
Slovenia	0,66	0,00	0,18	0,05	0,04	0,05	0,08	0,12	0,00	0,00	**1,18**
Spain	16,47	3,44	4,85	0,73	1,67	0,62	0,96	0,69	0,03	0,58	**30,04**
Sweden	0,42	2,78	1,27	0,07	0,38	0,21	0,77	0,57	0,12	0,08	**6,66**
UK	13,50	3,23	4,03	0,61	1,84	0,57	8,24	5,45	0,00	0,00	**37,46**
EU-27	**86,47**	**57,21**	**40,25**	**8,26**	**17,23**	**5,41**	**52,35**	**23,09**	**1,52**	**1,15**	**292,95**

7 Annex with environmental impact analysis results

Annex 1: Observed levels of decoupling for individual Member States

Future waste generation is calculated for all Member States taking into account the observed degree of decoupling. Member States can be divided in groups, according to their actual state of decoupling : reverse decoupling, coupling, relative or absolute decoupling.

Decoupling can be measured with a formula proposed in the study "Analysis of the evolution of waste reduction and the scope of waste prevention". The indicator is based upon the ratio between the growth rate of the environmental pressure (in casu average municipal waste generation per capita) and the growth rate of the economic driving force, for values of the five preceding years.

$$r_{y-5\rightarrow y} = 1 - \frac{b(EP)_{y-5\rightarrow y}}{b(DF)_{y-5\rightarrow y}}$$

Equation 1: Decoupling indicator

With

- $r_{y-5\rightarrow y}$ = the decoupling indicator for a time interval of five years from y-5 to y
- b(EP) $_{y-5\rightarrow y}$ = the slope of the linear regression of the environmental pressure (e.g. the average waste generation) over the last five years
- b(DF) $_{y-5\rightarrow y}$ = the slope of the linear regression of the economic driving force (e.g. expenditure of households) over the last five years

Because of easy access to basic data, we propose:

- EP is defined as average municipal waste generation, reported as a EUROSTAT structural indicator for time series from 1995 to 2008.
- DF is defined as final consumption expenditure of households (further referred to with FCA – final consumption aggregate), reported by EUROSTAT in the national accounts as a main component of Gross Domestic Product (GDP). This indicator is selected because it best reflects the cause-effect relationship with consumer behaviour. Time series are available from 1995 to 2008 for all the EU27 countries, except for Greece, Malta and Romania where some annual data are missing. The figures of Final Consumption by Households are taken at constant prices or in volume, more specifically figures are expressed in chain-linked volumes (millions of Euros, reference year 2000, at 2000 exchange rate). The calculation of chain-linked Euros implies that the growth of volume between two successive years t and t+1 is measured by using prices of year t. This means that the base is moved ahead with the observation period. In this manner the impact of inflation is avoided and the growth in volume is more accurate.

The decoupling indicator is a value above or below zero.

- A positive value indicates possible positive decoupling.
- A negative value indicates possible reverse decoupling
- The distance to zero indicates the distance from a situation of perfect coupling[14]
- If the value b(EP) $_{y-5 \rightarrow y}$ is negative itself, absolute decoupling can occur.

Applied on data for average municipal waste generation and average FCA per capita, for time series between 1995 and 2008, following degrees of decoupling can be observed:

Table 30 : Degrees of decoupling of average municipal solid waste generation for all Member States

		Absolute decoupling with decreasing waste generation	Absolute decoupling with stabilised waste generation	Relative decoupling	coupling	Negative decoupling
BE	relative decoupling with tendency to coupling			X		
BG	Absolute decoupling and decreasing average waste generation	X				
CZ	Relative decoupling evolving to stabilised average waste generation		X			
DK	Increasing negative decoupling					X
DE	Coupling tending to negative decoupling, unclear image due to instable data on average waste generation				X	
EE	Limited relative decoupling			X		
IE	Coupling with a tendency to decoupling				X	
GR	Relative decoupling (limited time series)			X		
SP	Stable decoupling, tending towards decreasing average waste generation		X			
FR	coupling				X	
IT	Although rather stable (high indicator values), the negative decoupling in Italy is rather limited. Coupling can be assumed as a working theory				X	
CY	Light relative decoupling, close to coupling			X		
LV	Relative decoupling			X		
LT	Absolute decoupling with a stabilising average waste generation		X			
LX	Absolute decoupling with a stabilising of slightly diminishing average waste generation				X	
HU	Absolute decoupling with a stabilising average waste generation		X			
MT	Clear negative decoupling (limited time series)					X

[14] Only if the coefficient of variation on the basic data for the individual years is known, a confidence interval for the indicator can be calculated and positive or negative decoupling can be statistically proved.

		Absolute decoupling with decreasing waste generation	Absolute decoupling with stabilised waste generation	Relative decoupling	coupling	Negative decoupling
NL	Limited relative decoupling, close to coupling			X		
AT	A tendency for negative decoupling has recently been broken ; coupling as a hypothesis				X	
PL	Absolute decoupling with a stabilising average waste generation		X			
PT	coupling				X	
RO	Relative decoupling, close to absolute decoupling			X		
SL	Negative decoupling being broken, Slovenia knows relative decoupling, close to coupling, coupling is assumed as future trend				X	
SK	Relative decoupling close to coupling			X		
SF	Evolved from relative decoupling to, coupling				X	
SV	Perfect coupling				X	
UK	A relative decoupling has been converted into absolute decoupling with a stabilised (or possibly decreasing) average waste generation		X			

- Coupling is assumed when the decoupling indicator is less than 0,5 and when a coupled trend is supported by the general trend-lines.
- Relative decoupling usually shows a growth of the waste generation of about 1/3 of the growth of the economic indicator. For relative decoupling in BE, CY, EE, GR, LV, NL, RO, SK the exact ratio between growth of the waste generation and of the economic indicator is applied in the exercise

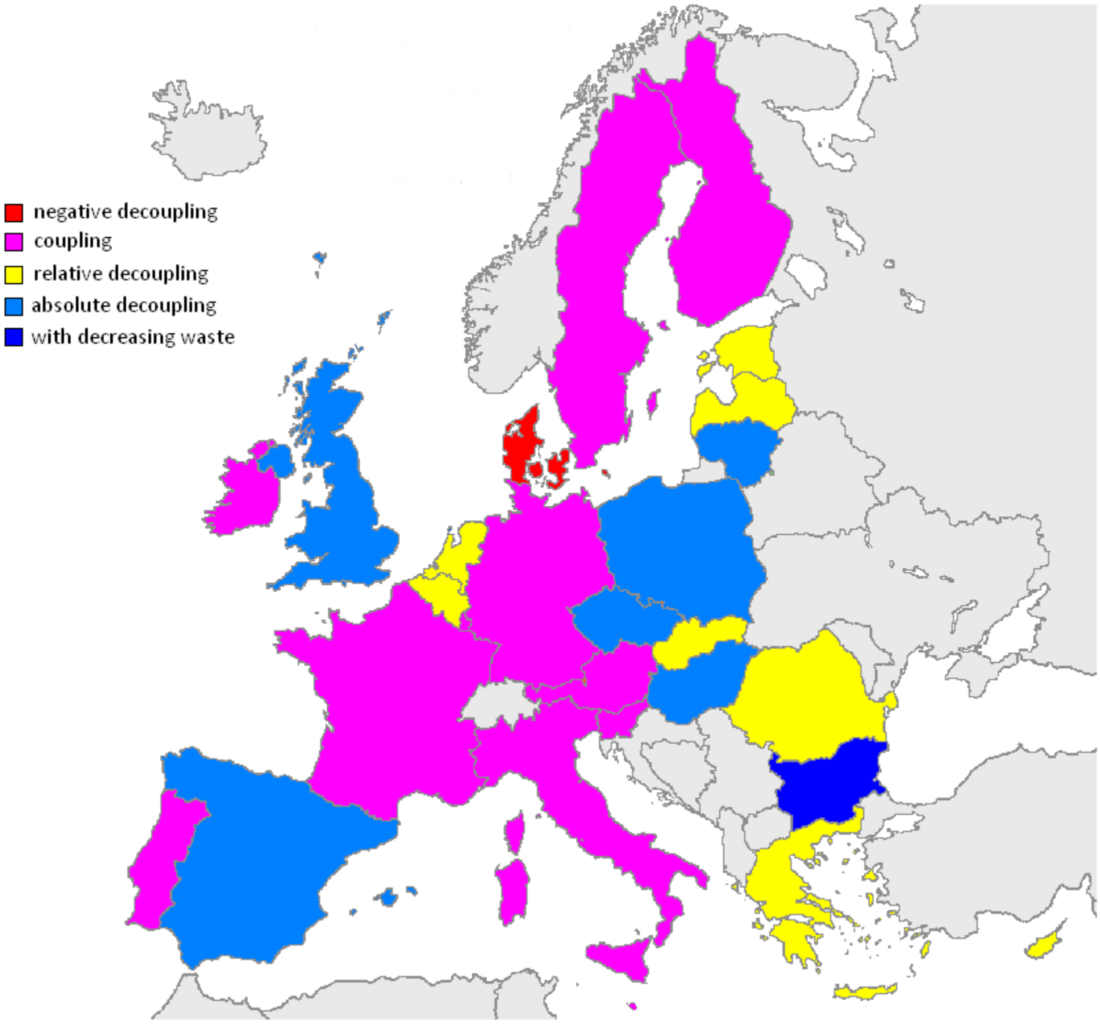
Member state	Waste increases at the speed of the x times the growth in private consumption expenditure
Belgium	0,56
Cyprus	0,63
Estonia	0,32
Greece	0,37
Latvia	0,21
Netherlands	0,57
Romania	0,16
Slovakia	0,17

Decoupling, especially absolute decoupling occurs predominantly in the new Member States. This can be explained by an increasing economic growth but not yet linked with increasing consumption, or by higher degrees of self treatment (more reuse, longer life phases of products, backyard treatment through animal feed or home composting, non registered disposal through backyard incineration or non-managed dumpsites…). Some Member States have evolved to relative decoupling.

Western European economies have generally a coupled situation, with the exemption of the UK and Spain. Belgium and the Netherlands have evolved to relative decoupling due to their waste policy programmes. Denmark is an exemption showing negative decoupling[15].

Small countries depending much on international movements of consumption goods, like Malta, can show deviating trends.

[15] This can be caused by the Danish definition of municipal waste, which includes larger quantities of SME waste collected by municipal collections schemes, while also the strong preference for mixed waste collection and incineration may discourage waste prevention or reuse.



negative decoupling : MSW generation increases faster than final consumption expenditures of households
coupling : MSW generation increases in line with increasing final consumption expenditures of households
relative decoupling : MSW generation increases, but less than the final consumption expenditures of households
absolute decoupling: MSW generation remains stable even if final consumption expenditures of households increase
absolute decoupling can be combined with decreasing MSW generation

Map 4 : Degrees of decoupling of average MSW generation for EU-27 Member States

Negative decoupling with average municipal waste generation growing faster than consumption expenditures occurs in Denmark and possibly Malta.
Coupling between average MSW generation and consumption expenditures occurs in: Finland, Sweden, Germany, Austria, France, Italy, Luxembourg, Portugal, Slovenia and Ireland
Relative decoupling with continued growth of average municipal waste generation occurs in: Belgium, The Netherlands, Estonia, Latvia, Slovakia, Romania, Greece and Cyprus
Absolute decoupling with stabile average MSW generation occurs in: Spain, UK, Lithuania, Poland, Czech Republic, Hungary and in Bulgaria where average waste generation seems to decrease.

Annex 2: analysis of trends in landfill tax and landfill diversion

Data on landfill taxes and on percentages of MSW going to landfills have been collected for Austria, Denmark, Finland, France, Ireland, Latvia, Netherlands, Poland, Sweden, Slovakia and UK, for time series usually between 1995 and 2009.

The table below contains in the first row the landfill tax in euro/ton and in the second row the percentage of MSW going to landfills.

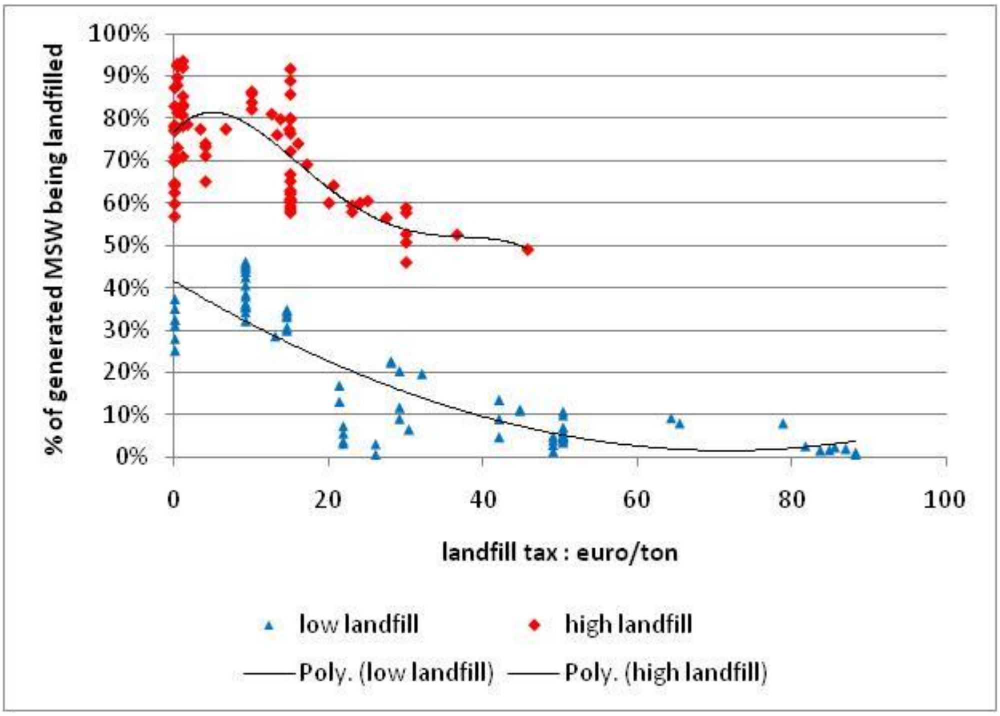
Table 31 : Landfill taxes and MSW landfill percentages for a set of Member States

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Austria					14,5	14,5	14,5	14,5	14,5	14,5	21,8	21,8	21,8	21,8	26	26
					35%	35%	34%	33%	31%	30%	7%	6%	4%	3%	3%	1%
Denmark		21,3	21,3	44,7	44,7	50,29	50,29	50,29	50,29	50,29	50,29	50,29	50,29	50,29	50,29	50,29
		17%	13%	11%	11%	11%	10%	7%	6%	5%	4%	5%	5%	5%	4%	4%
Finland	0	0	15	15	15	15	15	15	15	23	23	30	30	30	30	30
	65%	65%	67%	63%	63%	58%	61%	61%	62%	60%	58%	59%	58%	53%	51%	46%
France		9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15	9,15
		45%	46%	46%	45%	44%	43%	41%	39%	38%	36%	34%	36%	36%	36%	32%
Ireland		0	15	15	15	15	15	15	15	15	15	15	15	15	20	25
		77%	80%	80%	86%	89%	92%	77%	72%	65%	61%	60%	59%	59%	60%	61%
Latvia			0,36	0,36	0,36	0,36	0,36	0,36	1,07	1,07	1,07	1,07	1,07	1,07	1,07	1,07
			73%	82%	90%	92%	93%	88%	83%	83%	83%	78%	71%	85%	94%	92%
Netherlands		13	29,1	29,1	29,1	30,3	64,3	65,4	78,8	81,7	83,6	84,8	85,5	86,9	88,2	88,2
		29%	20%	12%	9%	7%	9%	8%	8%	3%	2%	2%	2%	2%	1%	1%
Poland													4	4	4	4
													73%	74%	71%	65%
Sweden	0	0	0	0	0	0	28	28	32	42	42	42	49	49	49	49
	38%	35%	33%	31%	28%	25%	23%	22%	20%	14%	9%	5%	5%	4%	3%	1%
Slovakia		0	0	0	0	0	0	0	0	0	1	1,66	3,34	6,64	13,28	
		57%	63%	64%	70%	71%	77%	87%	78%	79%	81%	79%	78%	78%	76%	
UK		0	10	10	10	10	12,58	13,73	14,87	16,01	17,16	20,59	24,02	27,45	36,6	45,76
		83%	86%	86%	84%	82%	81%	80%	78%	74%	69%	64%	60%	57%	53%	49%

When analysing these data in a spread diagram, two clouds appear. The upper cloud covers Member States with high average landfill percentages, typically above 50%: Finland, Ireland, Latvia, Poland, Slovakia and the UK. The lower cloud covers the Member States with low average landfill percentages, typically below 30%: Austria, Denmark, France, Netherlands and Sweden.

In general terms we can derive that :

- For both classes landfill taxes below 20 euro/ton do not have a significant effect on the percentages of MSW being landfilled. It can be presumed that low taxes do not succeed in bridging the gap of the costs between cheaper landfilling and more expensive incineration or recycling solutions.
- Augmenting the landfill tax above 40 euro/ton has little effect on Member States that already have reached low landfill percentages.
- No sufficient data is available to assess whet would be the effect of augmenting the landfill tax above 40 euro/ton for Member States with high landfill averages.



Graph 9 : Spread diagram on landfill taxes and landfill percentages

Based on this analysis we can define a scenario in which landfill taxes are increased to 40 euro/ton for these Member States that did not yet reached this level of tax. Following shifts in landfill percentages can be assumed:

- For high landfilling Member States: a decrease towards maximum 55% of the total generation of MSW.
- For low landfilling Member States: a decrease towards maximum 15% of the total generation of MSW.
- For intermediate landfilling Member States: a decrease towards an intermediate position of maximum 35% of the total generation of MSW.

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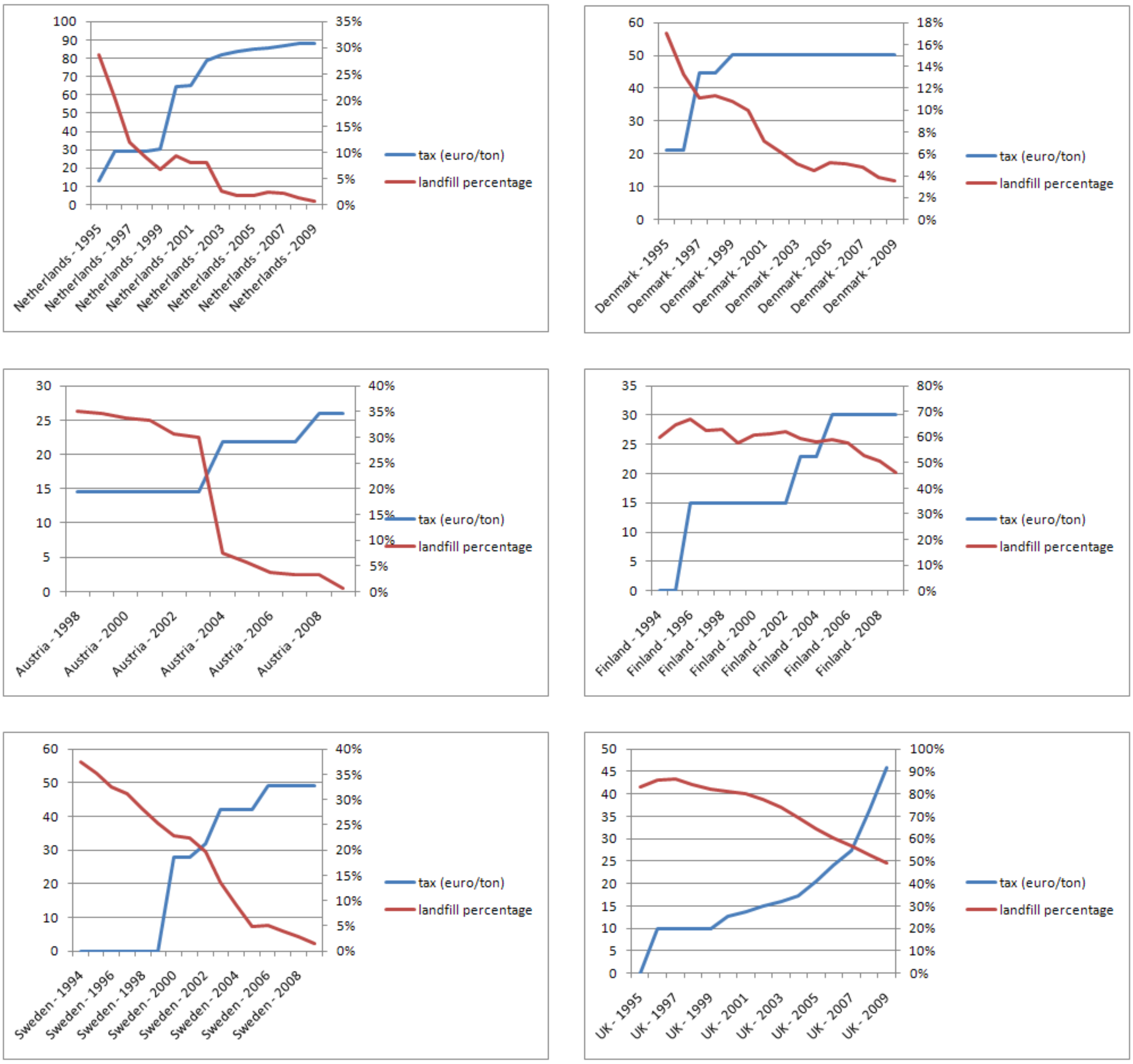
An analysis on Member States where landfill taxes increased shows following image:

- There is no large time-gap between the introduction of the landfill tax and the reduction of the landfilled percentages
- Sometimes landfill percentages were already decreasing, and the landfill tax only helped in consolidating this evolution.(NL, SV)
- In other cases increasing landfill taxes and decreasing percentages occur synchronously, what could be an indicator (but no proof) for a cause-effect relation. (AT, DK, SF, UK)

- Sudden jumps in the level of landfill tax correspond to sudden decreases in landfilled percentages (NL, DK, AT, SV). Gradual increases of landfill taxes correspond to gradual decreased s of landfilled percentages. (SF, UK)



Graph 10 : Relation between the timing of landfill tax increase and landfill percentage decrease

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