



MUNICIPAL SOLID WASTE DATA

R4R Project Scope

August 2013



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2. INTRODUCTION

Cities and regions collect Municipal Solid Waste (MSW) data on a regular basis with various purposes, be it to assess their waste management policies, to compare their performances with other territories or to answer to reporting obligations (for example for Eurostat). However, they often use different definitions and methodologies, which makes it difficult to have consistent comparisons, which is why it is important to know the source of the data.

This document defines the scope of the R4R project, the waste fractions that are included in MSW and the waste fractions that are considered as “recycled” depending on their destination. Two new terms are introduced: ‘DREC’ (see chapter 4 Definition DREC for R4R) and ‘sorting stage’ (see chapter 5 Data reporting). In chapter 6 the selected indicators are presented.

3. DEFINITION MUNICIPAL SOLID WASTE (MSW) FOR R4R

For the R4R project MSW is defined as: all the waste generated by households (regardless who collects it) plus the non-household waste collected by or on behalf of the municipalities plus similar non-household WEEE and batteries collected by or on behalf of accredited bodies (see 3.3 for further explanation).

Separate data on household waste and non-household waste per waste stream are not required for this reporting. The percentage of non-household waste as fraction of the total MSW will be required.

3.1 Waste generated by households

All the household waste:

- Collected by or on behalf of the municipalities
- Collected by or on behalf of accredited bodies (e.g. by retail) and social organizations (e.g.: WEEE, batteries, textiles)

Also included is waste from street litter bins, street and market sweepings.

3.2 Non-household waste collected by or on behalf of the municipalities

- Commercial waste only if it is collected by or on behalf of the municipalities
- Waste from schools, hospitals, institutions,... only if it is collected by or on behalf of the municipalities
- Waste from the municipality itself only if it is collected together with household waste

3.3 Similar non-household WEEE and batteries collected by accredited bodies

Waste Electrical and Electronic Equipment (WEEE) and batteries similar in nature and composition to WEEE and batteries generated by households, collected by or on behalf of

accredited bodies (WEEE, batteries). E.g.: a PC used by a company or school collected on behalf of the accredited body.

3.4 Excluded waste streams

- Construction and demolition waste (C&D waste)
- End-of-life vehicles (ELV)
- Water treatment and waste water treatment sludges
- Sewage sludge

3.5 Included waste streams

For the R4R project we distinguish the following selective waste streams:

- paper and cardboard (P&C)
 - packaging
 - non-packaging
- metal
 - packaging
 - non-packaging
- glass
 - packaging
 - non-packaging
- plastic
 - packaging
 - non-packaging
- multilayer packaging
 - beverage cartons
 - other
- bio-waste
 - green waste (including pruning wood)
 - kitchen waste
- wood (excluding pruning wood which is considered as green waste)
- textiles
- tyres
- used cooking oils
- mineral oils
- WEEE
- batteries
 - from cars
 - from households and similar

- medicines
- (other) hazardous waste
- digestate (coming from Mechanical Biological Treatment - MBT)

Data on the subcategories (e.g.: packaging/non-packaging, green waste/kitchen waste) can be reported if available. If one chooses to split up into subcategories, all categories have to be filled in. Otherwise just the total amount has to be reported.

4. DEFINITION DREC FOR R4R

Previous discussions during R4R's Expert group meetings have highlighted difficulties linked to the definition of "sorting rates" and "recycling rates". One difficulty was the fact that local and regional authorities generally have limited information on the outcomes of sorted material (e.g. what fractions of the material bills going out of sorting facilities are effectively used as recycled material in industrial processes?). Therefore, R4R partners have agreed on a new term, "DREC", explained below.

DREC = Destination RECYcling

- In some regions/municipalities the municipal solid waste meant to be recycled is separated at the source & collected separately (door to door, civic amenity site,...). In other regions/municipalities it is collected all together and sorted out afterwards, leading to a certain fraction of residues due to contamination by inhabitants and the limitations of the mechanical sorting processes.
- Data about recycling (the part effectively recycled without residues) is not always available because recycling is done abroad or recycling companies do not necessarily report data to local authorities.

Therefore, and to take into account these difficulties it is essential to use the DREC definition so that these different situations become comparable.

DREC includes:

- Municipal waste streams separated at source & collected separately (one homogeneous waste stream¹ not mixed with other waste streams) with the purpose of recycling.
- The output from sorting facilities (including bulky waste sorting centres) going directly to facilities for recycling.
- The output from MBT installation going directly to facilities for recycling.

Biological treatment (including composting and anaerobic digestion) may be classified as recycling when compost (or digestate) is used on land or for the production of growing media².

¹ One of the waste streams in the list under 3.5 Included waste streams: P&C, metal, glass, plastic, multilayer packaging, bio-waste, wood, textiles, tyres, used cooking oils, mineral oils, WEEE, batteries, medicines, (other) hazardous waste.

More explanation is given below under 4.1, 4.2 and 4.3. How the data about these different situations have to be reported exactly is explained in chapter 5 Data reporting.

The naming DREC (Destination RECYcling) will be used instead of recycling to indicate we are looking at the amounts of waste going to facilities for recycling and not to the amounts effectively recycled, which are generally more difficult to assess and involve processes outside of the scope of local/regional authorities. The amount effectively recycled would be the output of the recycling facility without recycling residues.

Important: waste going to energy recovery is not considered as DREC.

So we distinguish the following treatments:

- DREC
- Incineration with energy recovery (R1)
- Incineration without energy recovery (D10)
- Landfilling.

4.1 Streams collected separately (one waste stream not mixed with other waste streams) with the purpose of recycling

Waste streams collected separately (one waste stream not mixed with other waste streams) with negligible contamination going to a recycling facility, can be counted as DREC. The collection method can be door-to-door, bring banks, civic amenity site (CAS), etc. ...

If the collected stream is strongly contaminated, a sorting process before the recycling will be necessary. In this case the outputs of the sorting facilities have to be reported (see 4.2 below).

4.2 The output from sorting facilities going directly to facilities for recycling

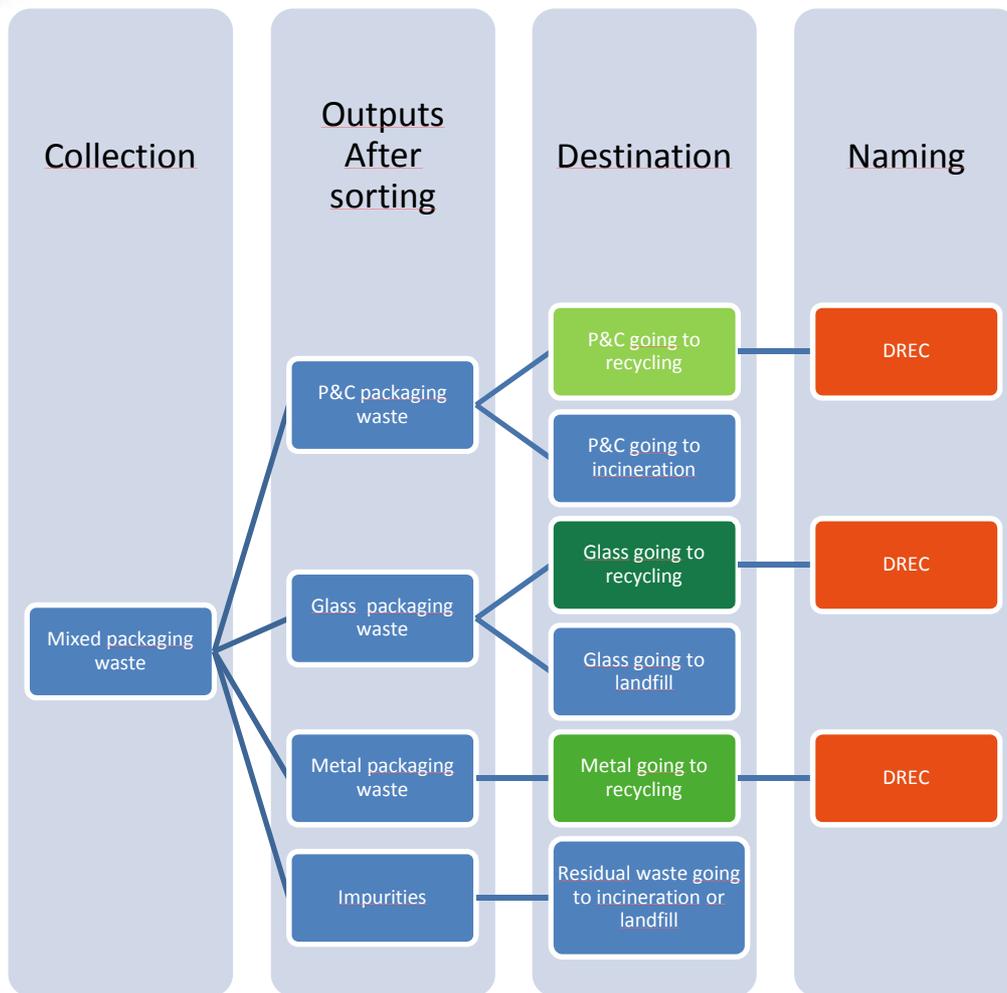
If several streams are collected together and sorted out afterwards, the output going to recycling can be counted as DREC.

When the sorted fraction cannot be recycled (e.g. still too contaminated) or is collected to be sent to incineration (e.g. wood) and these waste fractions are disposed of in an incinerator or on a landfill site, this amount has to be reported under the corresponding stream as going to incineration or landfill.

The sorting residue (impurities) is seen as “residual waste” coming from a sorting facility going to incineration or landfill.

For example:

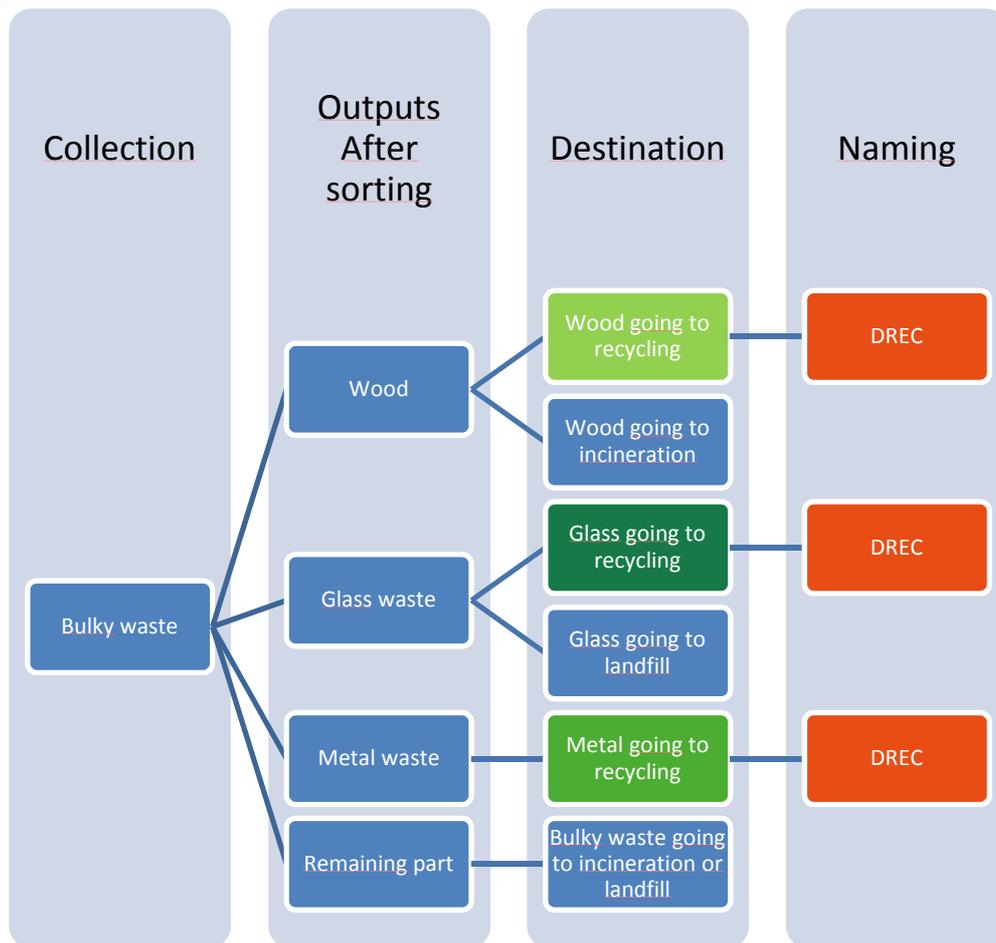
² Green Paper on the management of bio-waste in the European Union (COM/2008/0811 final)



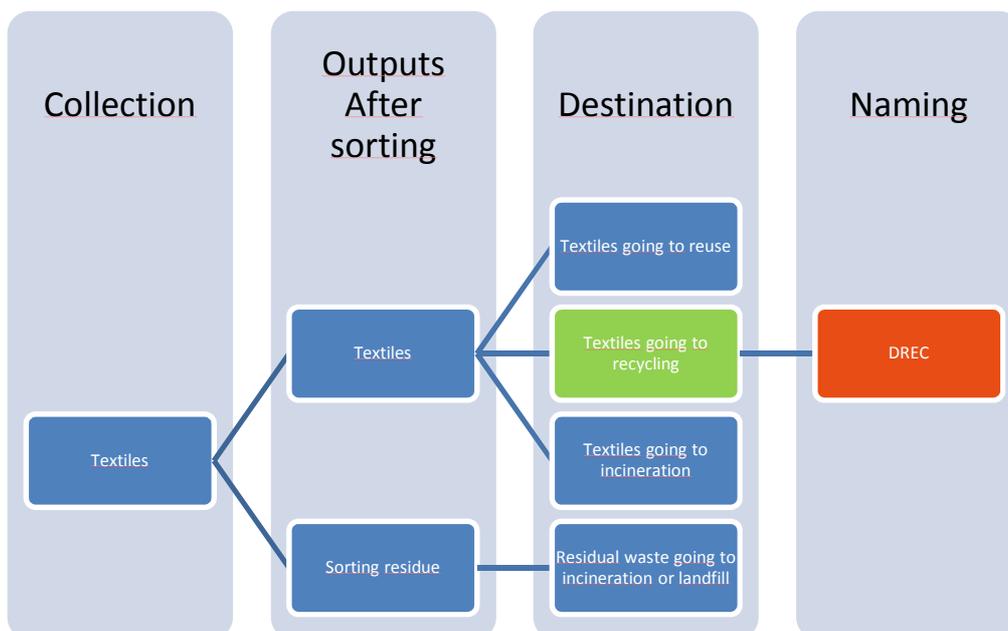
4.2.1 Specific case: bulky waste

Bulky waste may contain a lot of recyclable fractions. In some regions, bulky waste is collected as one mixed fraction and sent to sorting facilities. Mostly the waste fractions sorted out will go directly to recycling and can be counted as DREC. When the sorted fraction cannot be recycled (e.g. still too contaminated) or is collected to be sent to incineration (e.g. wood) and these waste fractions are disposed of in an incinerator or on a landfill site, this amount has to be reported under the corresponding stream as going to incineration or landfill. The remaining part is seen as bulky waste coming from a sorting facility for bulky waste going to incineration or landfill.

Explanation about the data reporting is given in paragraph 5.2.2 Residual waste/bulky waste is sorted out, under chapter 5 Data reporting.



4.2.2 Specific caste: textiles



Textiles may be sorted out in a sorting facility. The best part will go to reuse and is not considered as waste (see further under 4.5 Excluded: reuse). Another part may be sent to recycling, this amount can be counted as DREC. Beside a part of the textiles may be sent to incineration. The sorting residue is seen as residual waste coming from a sorting facility going to incineration or landfill.

4.2.3 Problem: input from different regions

When MSW from different regions is sorted out (and maybe the sorting facility is located in another region), be aware to only use the outputs coming from waste generated in your own region. When the distinction between regions at the output side cannot be made, a calculation based on the input from your region and percentages of the sorting facility can be used.

For example: MSW mixed packaging waste from region A and region B are treated together in the same sorting facility to sort out paper and cardboard (P&C).

Input mixed packaging waste from region A: 300 tonne (=30%).

Input mixed packaging waste from region B: 700 tonne (=70%).

Total input: 1000 tonne.

Output P&C for recycling: 200 tonne (=20%).

Calculation: output P&C going to recycling coming from region A: $300 \text{ tonne} * 20\% = 60 \text{ tonne}$ (or $30\% * 200 \text{ tonne} = 60 \text{ tonne}$).

By using this calculation one assumes that the composition of the waste coming from region A going to the sorting facility is the same as the composition of the waste coming from region B going to the sorting facility. Only make this assumption when exact information is not available and when this assumption seems reasonable in your situation.

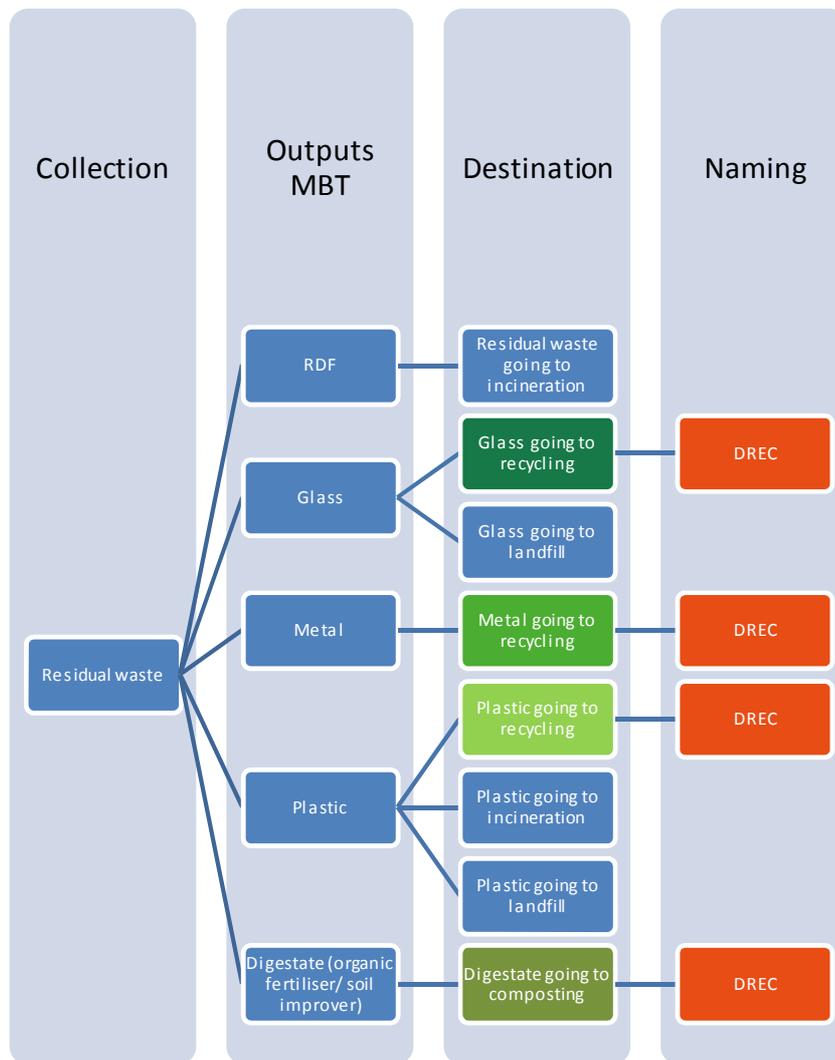
4.3 The output from MBT installation going directly to facilities for recycling

The fractions coming out of an MBT-installation and going to recycling can be counted as DREC. They have to be reported under the corresponding waste stream. When a stream goes not to recycling but to incineration/landfill, this amount has to be reported under the corresponding stream as going to incineration/landfill.

For example: Metals, glass and plastic are outputs of an MBT installation and are sent to recycling. These amounts can be counted as DREC. If the digestate goes to composting, it can also be counted as DREC. The Refuse Derived Fuel (RDF) is seen as 'residual waste' sent to incineration.

Explanation about the data reporting is given in paragraph 5.2.3 Residual waste sent to MBT, under chapter 5 Data reporting.

Inert, non-packaging waste coming out of an MBT-installation is considered as construction and demolition waste and is not within the scope of the R4R project and therefore should not be reported.



4.3.1 Problem: input from different regions

When MSW from different regions is treated (and maybe the MBT installation is located in another region), be aware to use only the outputs coming from waste generated in your own region. When the distinction between regions at the output side cannot be made anymore, a calculation based on the input side from your region and percentages of the MBT installation can be used.³

³Similar to 4.2.3 Problem: input from different regions

4.4 Excluded: output from incineration

As incineration is seen as a final treatment by Eurostat, outputs from incineration are not considered as DREC (even if they go to recycling).

4.5 Excluded: reuse

Amounts going to reuse should not be reported as they are not considered as waste. Indeed, the Waste Framework Directive defines reuse in its article 3.13 as “any operation by which products or components that are not waste are used again for the same purpose for which they were conceived”.

Reuse is extensively discussed in the Pre-waste project (more information on: www.prewaste.eu).

4.6 Extra information about specific waste streams

4.6.1 WEEE

WEEE going to pre-treatment or treatment units (such as dismantlement) can be reported as DREC.

5. DATA REPORTING

5.1 Selective waste streams

For the R4R project we distinguish the following selective waste streams:

- paper and cardboard (P&C)
- metal
- glass
- plastic
- multilayer packaging
- bio-waste
- wood
- textiles
- tyres
- used cooking oils
- mineral oils
- WEEE
- batteries
- medicines
- (other) hazardous waste
- digestate (coming from MBT)

As an output of MBT, digestate is considered as a separate waste stream.

For several waste streams, the whole stream can be reported or can be reported split up into subcategories (e.g.: packaging/non-packaging, green waste/kitchen waste). If one chooses to split up into subcategories, all categories have to be filled in. The total will be calculated as the sum of the subcategories.

For each waste stream or subcategory it can be indicated where it is coming from:

- separated at source & selectively collected (one waste stream not mixed with other waste streams),
- output sorting facility (e.g.: for mixed packaging waste),
- output sorting facility for bulky waste,
- output sorting facility for residual waste,
- output MBT installation.

These different options are the different “sorting stages”. So the term “sorting stage” is introduced to indicate where a waste stream is coming from.

For each applicable sorting stage data per treatment can be reported (DREC, incineration with energy recovery (R1⁴), incineration without energy recovery (D10⁵), landfill).

E.g.: Plastic

waste stream	Subcategory	sorting stage	treatment	Amount (tonnes)
Plastic	Packaging	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC incineration with energy recovery (R1) incineration without energy recovery(D10) landfill	
		output sorting facility	DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
		output sorting facility for bulky waste	DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
		output sorting facility for residual waste	DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
		output MBT	DREC incineration with energy recovery (R1)	

⁴ Recovery operation R1 ‘Use principally as a fuel or other means to generate energy’ as defined in annex II of the Waste Framework Directive

⁵ Disposal operation D10 ‘Incineration on land’ as mentioned in annex I of the Waste Framework Directive

			incineration without energy recovery (D10) landfill	
Non-packaging	separated at source & selectively collected (one waste stream not mixed with other waste streams)		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility for bulky waste		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility for residual waste		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output MBT		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
Total	separated at source & selectively collected (one waste stream not mixed with other waste streams)		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility for bulky waste		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility for residual waste		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output MBT		DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	

If one chooses to report data for the whole stream and indicates this stream is separated at source & selectively collected (one waste stream not mixed with other waste streams) but also comes from a sorting facility for bulky waste, the following table has to be filled in:

waste stream	Subcategory	sorting stage	treatment	Amount (tonnes)
Plastic	Total	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
		output sorting facility for bulky waste	DREC incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	

In the R4R online tool the data from the different sorting stages with treatment DREC will be added up to get a DREC indicator. Besides it can be possible to obtain an indicator with only the amounts separated at source & selectively collected (one waste stream not mixed with other waste streams). (See 6.1 Indicators 1-7.)

5.2 Residual waste & bulky waste

To avoid double counting it is necessary to make a distinction whether the residual waste/bulky waste undergoes a kind of sorting process, MBT treatment or not.

Flow charts linked with the reporting tables are presented in paragraph 5.2.6 Flow charts residual & bulky waste.

For residual waste, following sorting stages are possible:

- residual waste going directly to landfill/incineration
- output sorting facility going to landfill/incineration (sorting residue)
- output sorting facility for residual waste going to landfill/incineration
- output from MBT going to landfill/incineration (RDF/treatment residue).

For bulky waste, following sorting stages are possible:

- bulky waste going directly to landfill/incineration
- output sorting facility for bulky waste going to landfill/incineration

5.2.1 Residual waste/bulky waste going directly to landfill/incineration

If the collected residual/bulky waste is directly sent to incineration or landfill (with or without transfer station), the amount has to be reported:

- under the waste stream 'residual waste'/'bulky waste',

- with sorting stage 'residual waste going directly to landfill/incineration' / 'bulky waste going directly to landfill/incineration',
- with the corresponding treatment (incineration with or without energy recovery or landfill).

5.2.2 Residual waste/bulky waste is sorted out

Residual waste and bulky waste may contain recyclable parts. When the recyclable fractions are sorted out and sent to recycling, these fractions have to be reported:

- under the corresponding stream,
- with sorting stage 'output sorting facility for residual waste' / 'output sorting facility for bulky waste'
- with treatment 'DREC'.

E.g.: if wood is sorted out from the bulky waste and sent to recycling → this amount has to be reported

- under the waste stream 'wood',
- with sorting stage 'output sorting facility for bulky waste',
- with treatment 'DREC'.

Caution: This can only be done when fractions are really sorted out. Do not confuse this with composition analysis of bulky waste. Based on a composition analysis one can see where the potential improvement in the selective collection rate or the sorting of bulky waste is possible in the future.

The remaining part of the residual waste/bulky waste (= the residual waste/bulky waste from which recyclable fractions have been removed) has to be reported

- under the waste stream 'residual waste' / 'bulky waste',
- with sorting stage 'output sorting facility for residual waste going to landfill/incineration' / 'output sorting facility for bulky waste going to landfill/incineration',
- with the corresponding treatment (incineration with or without energy recovery or landfill).

5.2.3 Residual waste sent to MBT

The outputs of an MBT-installation going to recycling have to be reported:

- under the corresponding waste stream,
- with sorting stage 'output MBT',
- with treatment 'DREC'.

E.g.: the amount of metals coming out of an MBT installation and going to recycling has to be reported:

- under the waste stream 'metals',
- with sorting stage 'output MBT',

- with treatment 'DREC'.

For the digestate a separate waste fraction 'digestate' is made. If this digestate goes to composting, it has to be reported:

- under the waste stream 'digestate',
- with sorting stage 'output MBT',
- with treatment 'DREC'.

The remaining part (including RDF) has to be reported:

- under the waste stream 'residual waste'
- with sorting stage 'output MBT going to landfill/incineration'
- with the corresponding treatment (incineration with or without energy recovery or landfill).

5.2.4 Combination

If for example part of the residual waste is sent to MBT, where recyclable fractions are removed, and another part is sent directly to incineration without energy recovery, the latter has to be reported under the waste stream 'residual waste' with sorting stage 'residual waste going directly to landfill/incineration' and treatment 'incineration without energy recovery' whereas from the part going to MBT, the remaining part (from which recyclable fractions are removed) has to be reported under the waste stream 'residual waste' with sorting stage 'output MBT'.

5.2.5 Reporting table

waste stream	sorting stage	treatment	Amount (tonnes)
residual waste	residual waste going directly to landfill/incineration	incineration with energy recovery (R1)	
		incineration without energy recovery (D10)	
		landfill	
	output sorting facility going to landfill/incineration	incineration with energy recovery (R1)	
incineration without energy recovery (D10)			
landfill			
output sorting facility for residual waste going to landfill/incineration	incineration with energy recovery (R1)		
	incineration without energy recovery (D10)		
	landfill		
output from MBT going to landfill/incineration	incineration with energy recovery (R1)		
	incineration without energy recovery (D10)		
	landfill		
Bulky waste			

	bulky waste going directly to landfill/incineration	incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	
	output sorting facility for bulky waste going to landfill/incineration	incineration with energy recovery (R1) incineration without energy recovery (D10) landfill	

5.2.6 Flow charts residual & bulky waste

The figures on the next pages make the data reporting about residual & bulky waste more clear.

Bulky waste

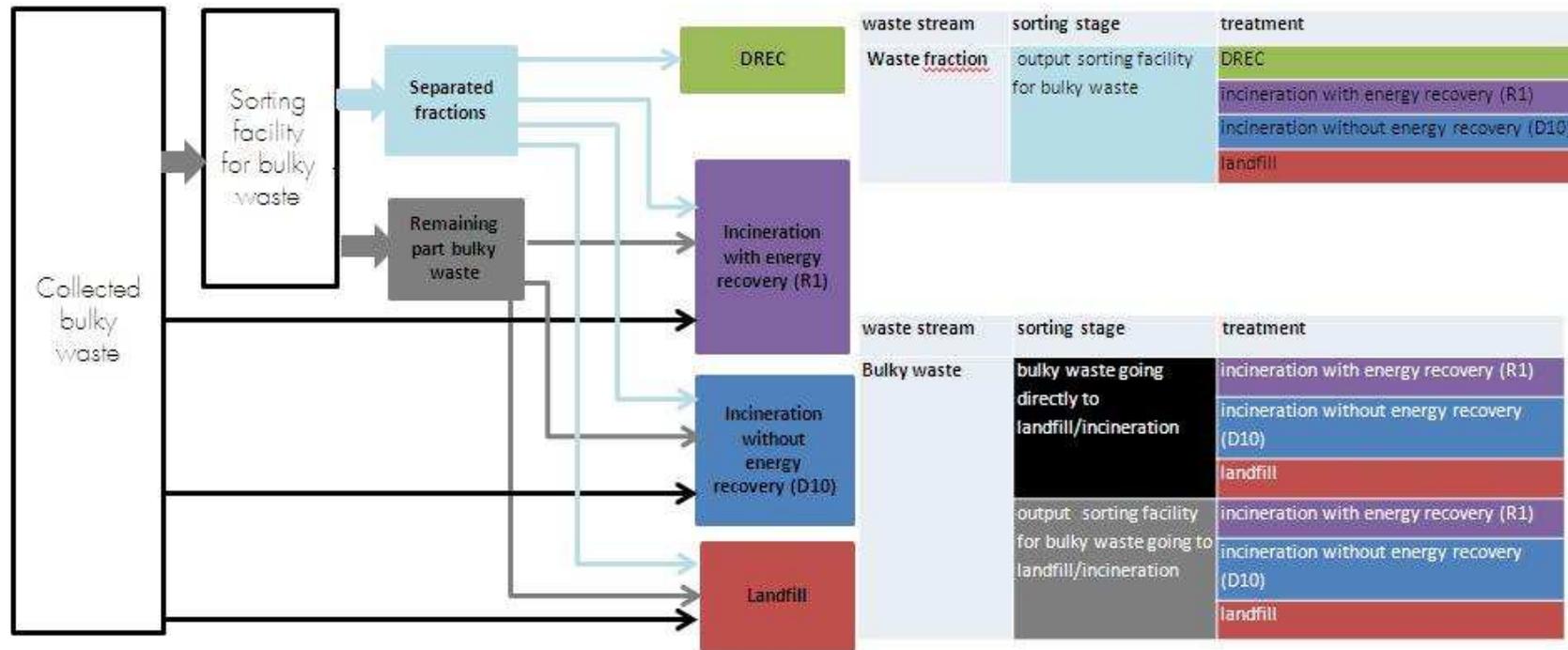
Part of the collected bulky waste may be sent immediately to incineration or landfill, another part may be sent to a sorting facility for bulky waste. The specific fractions that are sorted out have to be reported under the corresponding waste stream (e.g. wood, metal,...) and not under the waste stream 'bulky waste'. The remaining part has to be reported under the waste stream 'bulky waste' with sorting stage 'output sorting facility for bulky waste going to landfill/incineration'.

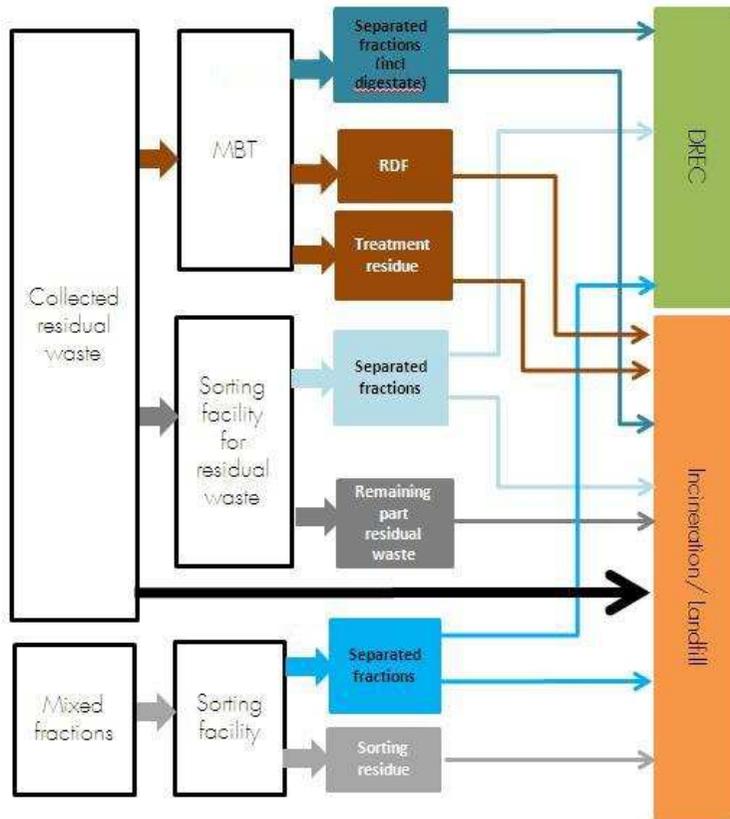
Residual waste

Part of the collected residual waste may be sent immediately to incineration or landfill, another part may be sent to a sorting facility for residual waste. The fractions that are sorted out have to be reported under the corresponding waste stream (e.g. wood, metal,...) and not under the waste stream 'residual waste'. The remaining part of the residual waste has to be reported under the waste stream 'residual waste' with sorting stage 'output sorting facility for residual waste going to landfill/incineration'. Part of the residual waste may also be sent to an MBT installation. Here also the specific fractions that are an output of the MBT process (e.g. glass, metal,...) have to be reported under the corresponding waste stream and not under the waste stream 'residual waste'. The Refuse Derived Fuel (RDF)/treatment residue have to be reported under the waste stream 'residual waste' with sorting stage 'output MBT going to landfill/incineration'.

Next to residual waste that is collected, sorting residues from for example a sorting facility for mixed packaging waste have to be reported under the waste stream 'residual waste'. The sorting stage is here 'output sorting facility going to landfill/incineration'.

In the flow chart about residual waste, no distinction is made between incineration and landfill because it would make the figure too complicated. Anyway, data have to be reported per treatment (DREC, incineration with energy recovery (R1), incineration without energy recovery (D10), landfill).





waste stream	sorting stage	treatment
Waste fraction	output Sorting facility	DREC
		incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill
	output sorting facility for residual waste	DREC
		incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill
	output MBT	DREC
		incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill

waste stream	sorting stage	treatment
Residual waste	residual waste going directly to landfill/incineration	incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill
	output sorting facility going to landfill/incineration	incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill
	output sorting facility for residual waste going to landfill/incineration	incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill
	output from MBT going to landfill/incineration	incineration with energy recovery (R1)
		incineration without energy recovery (D10)
		landfill

5.3 Composition analysis

To identify potential improvement in selective collection/recycling it is interesting to know which fractions are present in the residual waste. A composition analysis gives the answer.

A sample of the residual waste is sorted out in different waste fractions e.g. plastics, paper & cardboard, textile, etc. ... By this process the percentages for each fraction present in the residual waste can be calculated. There will be a remaining part that cannot be sorted out. The level of detail of this sorting may differ between regions. If one fraction is not sorted out, it is important to mark this fraction with unknown instead of 0. Zero means that this fraction is not present in the residual waste.

The same analysis can be done for bulky waste.

Fraction	%
P&C	
Packaging	
Non-packaging	
Metal	
Packaging	
Non-packaging	
Glass	
Packaging	
Non-packaging	
Plastic	
Packaging	
Non-packaging	
Multilayer packaging	
Beverage cartons	
Other	
Bio-waste	
Green waste	
Kitchen waste	
Wood	
Textiles	
Tyres	
Used cooking oils	
Mineral oils	
WEEE	
Batteries	
From cars	
From households and similar	
Medicines	
(Other) hazardous waste	
Remaining part	

Data about composition analysis will be used in the online tool to assess the potential for improvement for each fraction. It should also allow to compare recycling rates for each material fraction.

5.4 Guidance on data reporting

5.4.1 Sorting facility and MBT installation => report outputs

MSW from your region is treated in an MBT installation

- ⇒ Report the outputs under the corresponding waste stream with sorting stage 'output MBT'

Bulky waste from your region goes to a sorting facility for bulky waste

- ⇒ Report the outputs under the corresponding waste stream with sorting stage 'output sorting facility for bulky waste'

Residual waste from your region goes to a sorting facility for residual waste

- ⇒ Report the outputs under the corresponding waste stream with sorting stage 'output sorting facility for residual waste'

(Mixed) waste streams from your region go to a sorting facility

- ⇒ Report the outputs under the corresponding waste stream with sorting stage 'output sorting facility'

5.4.2 Separation at source

Waste streams are separated at source & selectively collected (one waste stream not mixed with other waste streams)

- ⇒ Report the collected amounts under the corresponding waste stream with sorting stage 'separated at source & selectively collected (one waste stream not mixed with other waste streams)'

5.5 Examples

5.5.1 Example 1: Selective collection of P&C and plastics + residual waste sent to MBT and landfill

In region 1 paper and cardboard (P&C) and plastics are separated at source & selectively collected. These waste fractions are sent to recycling. Residual waste is collected, one part is landfilled and the other part is sent to an MBT installation. After MBT treatment, the RDF is incinerated with energy recovery, metals are recycled, the digestate is sent to composting and plastics are sent to recycling.

Data:

Selectively collected:

- P&C: 300 tonne
- Plastic: 100 tonne

Residual waste: 1000 tonne collected, of which 500 tonne is sent to an MBT-installation and 500 tonne is landfilled.

Outputs MBT:

- Plastic: 50 tonne
- Metal: 50 tonne
- Digestate: 100 tonne
- RDF: 100 tonne

Note: Input MBT is not necessarily the sum of the outputs because a part is evaporated. The evaporated part doesn't have to be reported.

Reporting table:

waste stream	Subcategory	sorting stage	treatment	Amount (tonnes)
Plastic	Total	separated at source & selectively collected (one waste stream not mixed with other waste streams) output MBT	DREC	100
			DREC	50
P&C	Total	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	300
Metals	Total	Output MBT	DREC	50
Digestate	Total	Output MBT	DREC	100
Residual waste		Residual waste going directly to landfill/incineration	landfill	500
		Output MBT going to landfill/incineration	Incineration with energy recovery (R1)	100

5.5.2 Example 2: Collection mixed packaging fraction sent to sorting facility + residual waste sent to incineration

In region 2 metal, glass and plastic packaging waste are collected together and sent to a sorting facility. The sorted fractions are sent to recycling. The residue is sent to a landfill site. Residual waste is collected and sent to an incineration plant with energy recovery.

Data:

Residual waste: 500 tonne collected

Mixed packaging waste collected: 500 tonne

Output sorting facility for mixed packaging waste:

- Plastic: 200 tonne
- Glass: 100 tonne
- Metal: 100 tonne
- Impurities: 100 tonne

Reporting table:

waste stream	Subcategory	sorting stage	treatment	Amount (tonnes)
Plastic	Packaging	output sorting facility	DREC	200
Glass	Packaging	output sorting facility	DREC	100
Metals	Packaging	output sorting facility	DREC	100
Residual waste		Residual waste going directly to landfill/incineration	Incineration with energy recovery (R1)	500
		Output sorting facility going to landfill/incineration	Landfill	100

5.5.3 Example 3: Selective collection of P&C, metals, wood and batteries + bulky waste sent to sorting facility + residual waste sent to incineration

In region 3 P&C, metals, wood and batteries are selectively collected and sent to recycling. Bio-waste is also selectively collected but sent to anaerobic digestion. Bulky waste is collected, sent to a sorting facility where metals are removed for recycling and wood is removed for recycling and incineration with energy recovery. The remaining part of the bulky waste is landfilled. Residual waste is collected and sent to incineration with energy recovery.

Data:

Selectively collected:

- P&C: 300 tonne
- Metals: 100 tonne
- Wood: 200 tonne
- Batteries: 10 tonne
- Green waste: 150 tonne
- Kitchen waste: 100 tonne

Bulky waste: 500 tonne collected

Output sorting facility for bulky waste:

- Metals: 150 tonne
- Wood: 100 tonne
- Remaining part: 250 tonne

Residual waste: 200 tonne collected

Reporting table:

waste stream	Subcategory	sorting stage	treatment	Amount (tonnes)
P&C	Total	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	300
Metals	Total	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	100

Wood	Total	output sorting facility for bulky waste	DREC	150
		separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	200
Batteries		output sorting facility for bulky waste	DREC	50
		output sorting facility for bulky waste	Incineration with energy recovery (R1)	50
Bio-waste	Green waste	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	150
	Kitchen waste	separated at source & selectively collected (one waste stream not mixed with other waste streams)	DREC	100
Residual waste		Residual waste going directly to landfill/incineration	Incineration with energy recovery (R1)	200
Bulky waste		output sorting facility for bulky waste	landfill	250

6. INDICATORS

In the above chapter it is explained which data have to be reported. This leads to a reporting table with a lot of interesting information. To compare performances between regions or years, indicators based on the reported data can be calculated and can be displayed graphically.

For the R4R project the following indicators are selected:

Indicator 1: Waste stream by sorting stages (kg/inhabitant)

Indicator 2: Waste stream by treatments (kg/inhabitant)

Indicator 3: Waste stream to DREC by sorting stages (kg/inhabitant)

Indicator 4: Recycling potential (kg/inhabitant)

Indicator 4b: Extensive recycling potential (kg/inhabitant)

Indicator 5: DREC rate (%)

Indicator 5b: Extensive DREC rate (%)

Indicator 6: Waste stream separated at source (one waste stream not mixed with other waste streams) by treatments (kg/inhabitant)

Indicator 7: Waste stream in the total MSW (%)

Indicator 8: Residual/bulky waste by sorting stages (kg/inhabitant)

Indicator 9: Residual/bulky waste by treatments (kg/inhabitant)

Indicator 10: Composition analysis (%)

Indicator 11: Contamination rate sorting facilities

Indicator 12: Contamination rate sorting facilities for bulky waste

Indicator 13: Contamination rate sorting facilities for residual waste

Indicator 14: Contamination rate MBT installations

In this chapter these indicators are presented and explained.

The first seven indicators can be calculated for each waste stream and subcategory, for packaging waste and for the sum of all selective waste streams. The indicators 8 -10 can be calculated for residual waste or for bulky waste. Indicators 11-14 show the contamination rates of the different sorting facilities and MBT installations.

To compare recycling performances between regions, it is preferable to use the indicators 1 to 5 as they are a sum of the different sorting stages (separated at source & selectively collected, output sorting facilities, output MBT).

6.1 Indicators 1-7

In this subchapter indicators that can be calculated for **each waste stream and subcategory** are presented. As an example graphs about plastic packaging are shown. For a list of all the waste streams and subcategories see 3.5 Included waste streams. (Residual waste and bulky waste are not included here. Indicators for these are presented in 6.2 Indicators for residual and bulky waste going to landfill/incineration.)

These indicators can also be calculated for the **sum of all these waste streams**.

Different regions have different consumption patterns and different packaging methods. For example in one region glass packaging can prevail, while in another region they use more multilayer packaging. That's why it is also useful to look at all packaging waste together. **Packaging waste** is the sum of the following waste streams and subcategories:

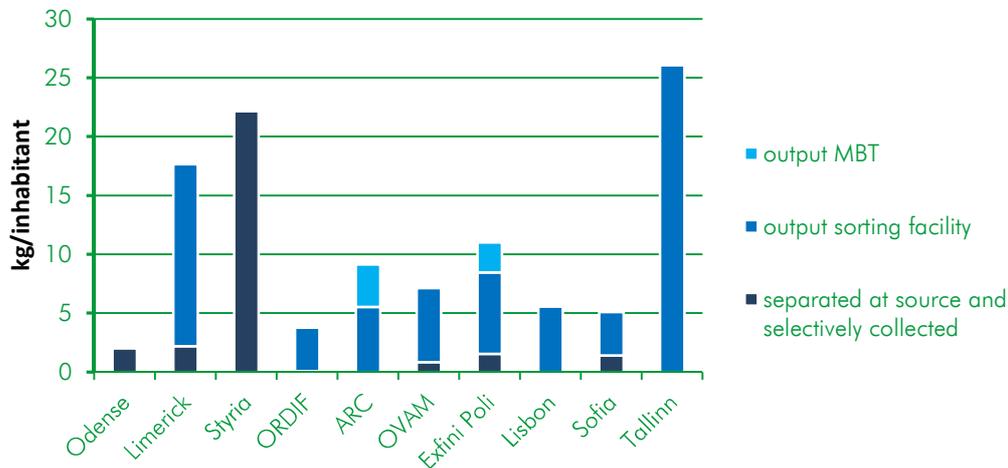
- P&C, metal, glass, plastic: subcategory packaging
- Multilayer packaging: subcategories beverage cartons & other

Indicator 1: Waste stream by sorting stages (kg/inhabitant)

For one waste stream and subcategory (e.g. plastic packaging) the different sorting stages are presented in a graph one above the other in different colours. All treatments are included (DREC, incineration with and without energy recovery and landfill).

E.g.: Plastic packaging

Plastic packaging by sorting stages, 2010

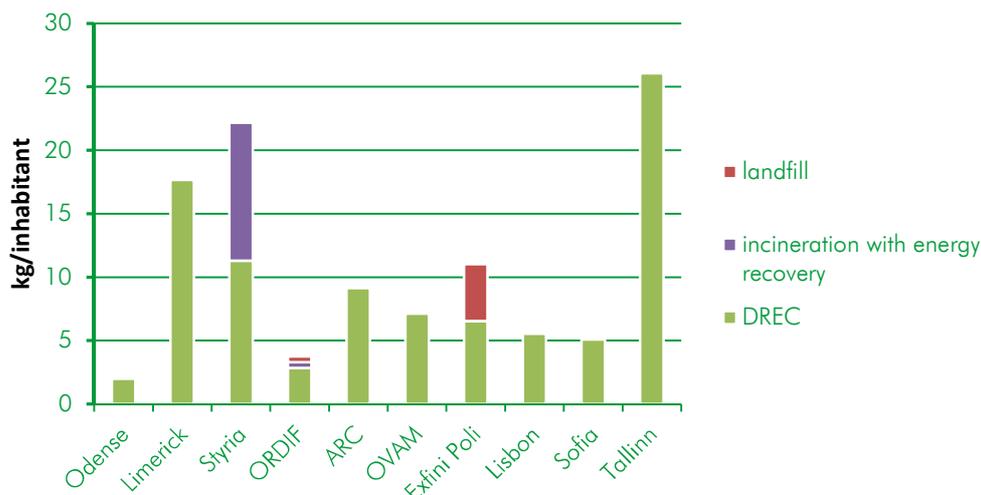


Indicator 2: Waste stream by treatments (kg/inhabitant)

For one waste stream and subcategory (e.g. plastic packaging) the different treatments are presented in a graph one above the other in different colours. All sorting stages are included (separated at source & selectively collected, output sorting facility, output sorting facility for bulky waste, output MBT).

E.g.: Plastic packaging

Plastic packaging by treatments, 2010



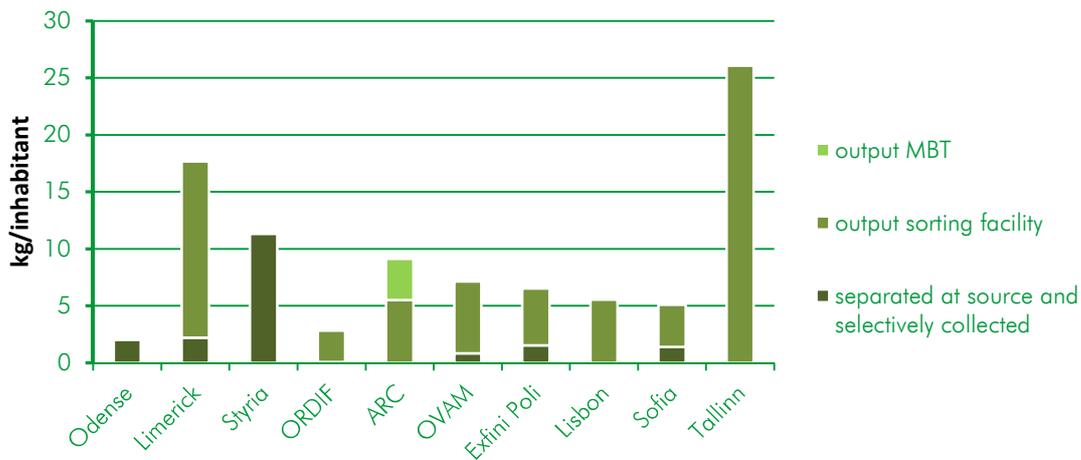
Indicator 3: Waste stream to DREC by sorting stages (kg/inhabitant)

For one waste stream and subcategory (e.g. plastic packaging) the different sorting stages are presented in a graph one above the other in different colours. In contrast to indicator 1 where all

treatments are added up, here only the amounts that effectively end up in recycling i.e. with treatment DREC are included.

E.g.: Plastic packaging

Plastic packaging to DREC by sorting stages, 2010



Indicator 4: Recycling potential (kg/inhabitant)

Indicator 2: Waste stream by treatments (kg/inhabitant) shows the different treatments of a waste stream, e.g. from plastic packaging. The sorting stages can be 'separated at source & selectively collected', 'output sorting facility' or 'output MBT'.

Next to this there can be a fraction of plastic packaging in the residual waste that is going to landfill/incineration. A composition analysis gives the fraction plastic packaging in the residual waste. By multiplying this fraction (%) with the amount of residual waste going directly to landfill/incineration (kg/inhabitant), one knows the amount of plastic packaging in residual waste (kg/inhabitant). This amount can be added to the graph.

To be noted: This indicator can only be calculated for regions where data on composition analysis of residual waste are available.

E.g. Plastic packaging

The 'sum of the sorting stages, treatment DREC' (green in graph below) shows the amount of plastic packaging that already goes to recycling. The 'sum of the sorting stages, treatment incineration/landfill' (orange in graph below) shows the amount of plastic packaging that goes to incineration or landfill. The part 'in residual waste' (red in graph below) shows the amount of plastic packaging present in residual waste. This residual waste is also sent to an incineration plant or landfill site. The orange and red areas show thus the potential for recycling.

There may also be a potential for recycling in bulky waste not included in this indicator because data availability/comparability about (composition analysis of) bulky waste is not optimal yet. Once these data become better, it would be better to include this. This is done in the next indicator: Indicator 4b: Extensive recycling potential (kg/inhabitant)

Plastic packaging, recycling potential, 2010



Indicator 4b: Extensive recycling potential (kg/inhabitant)

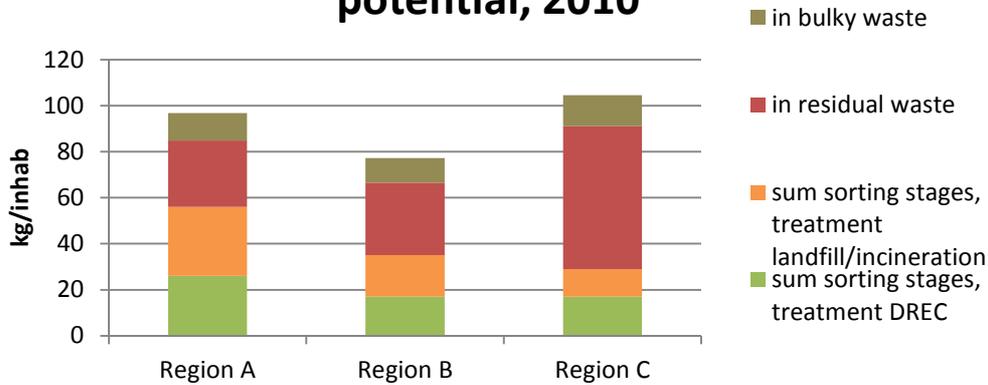
Bulky waste sent to landfill/incineration may also contain recyclable fractions that are not sorted out yet. A composition analysis of bulky waste sent to landfill/incineration may identify these fractions. Analogous as the calculation of the potential in residual waste, this can be done for bulky waste: A composition analysis of bulky waste gives the fraction plastic packaging in the bulky waste. By multiplying this fraction (%) with the amount of bulky waste going directly to landfill/incineration (kg/inhabitant), one knows the amount of plastic packaging in bulky waste (kg/inhabitant). This amount can be added to the graph.

To be noted: this indicator can only be calculated for regions where data on composition analysis of bulky waste are available.

E.g. Plastic packaging

The 'sum of the sorting stages, treatment DREC' (green in graph below) shows the amount of plastic packaging that already goes to recycling. The 'sum of the sorting stages, treatment incineration/landfill' (orange in graph below) shows the amount of plastic packaging that goes to incineration or landfill. The part 'in residual waste' (red in graph below) shows the amount of plastic packaging present in residual waste. This residual waste is also sent to an incineration plant or landfill site. The part 'in bulky waste' (brown in graph below) shows the amount of plastic packaging present in bulky waste. This bulky waste is also sent to an incineration plant or landfill site. The orange, red and brown areas show thus the potential for recycling.

Plastic packaging, extensive recycling potential, 2010

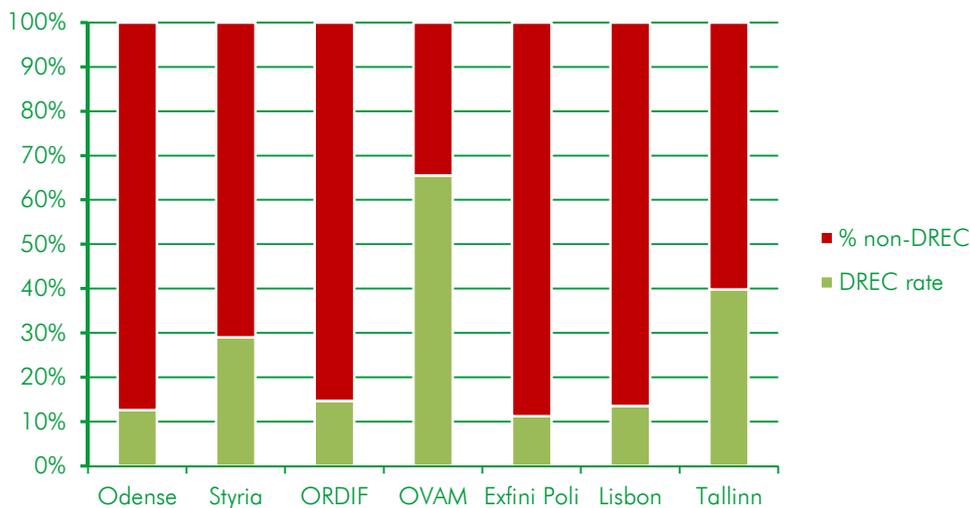


Indicator 5: DREC rate (%)

In the Indicator 4: Recycling potential (kg/inhabitant) the percentages of the part going to recycling ('sum sorting stages, treatment DREC') and the part going to incineration/landfill ('sum sorting stages, treatment incineration/landfill' + 'in residual waste') are calculated for each region and presented in a graph. The percentage of the part going to recycling is called the DREC rate.

E.g. Plastic packaging

Plastic packaging, DREC rate, 2010



Bulky waste going to incineration/landfill may also contain some plastic packaging. This is not included in this indicator because data availability/comparability about (composition analysis of) bulky waste is not optimal yet. So in reality the % non-recycled (red part in graph) may be bigger. Once the data about composition analysis of bulky waste become better, it would be better to include this. This is done in the next indicator: Indicator 5b: Extensive DREC rate (%)

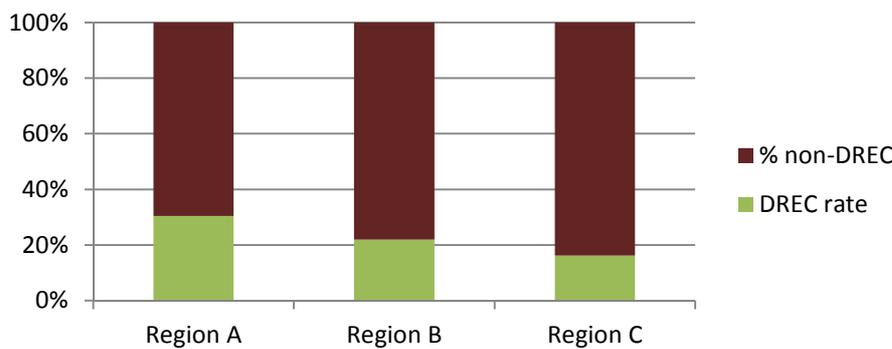
Indicator 5b: Extensive DREC rate (%)

In the Indicator 4b: Extensive recycling potential (kg/inhabitant) the percentages of the part going to recycling ('sum sorting stages, treatment DREC') and the part going to incineration/landfill ('sum sorting stages, treatment incineration/landfill' + 'in residual waste' + 'in bulky waste') are calculated for each region and presented in a graph.

To be noted: This indicator can only be calculated for regions where data on composition analysis of bulky waste are available.

E.g. Plastic packaging

Plastic packaging, extensive DREC rate, 2010



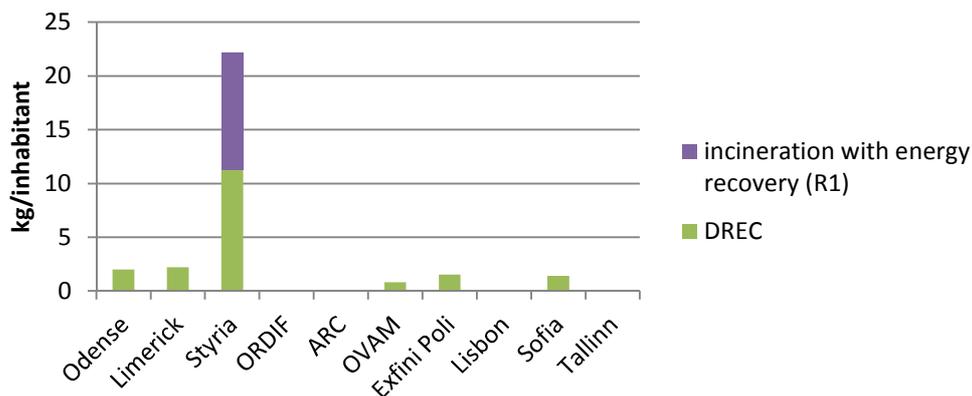
Indicator 6: Waste stream separated at source (one waste stream not mixed with other waste streams) by treatments (kg/inhabitant)

To keep an overview of the amounts separated at source & selectively collected (one waste stream not mixed with other waste streams) with their treatment method, this indicator is selected. Most regions however may send waste from other sorting stages (output sorting facilities or output MBT) to recycling and therefore to compare regions, it is more useful to use indicators that include all sorting stages.

For one waste stream and subcategory, the amounts per treatment (DREC, incineration with and without energy recovery and landfill) of the sorting stage 'separated at source & selectively collected (one waste stream not mixed with other waste streams)' are shown. In the graph, the different treatments are presented in different colours.

E.g.: Plastic packaging

Plastic packaging separated at source (one waste stream not mixed with other waste streams) by treatments, 2010



Indicator 7: Waste stream in the total MSW (%)

This indicator gives the proportion of one waste stream and subcategory with respect to the total amount of MSW (including residual & bulky waste) in one region.

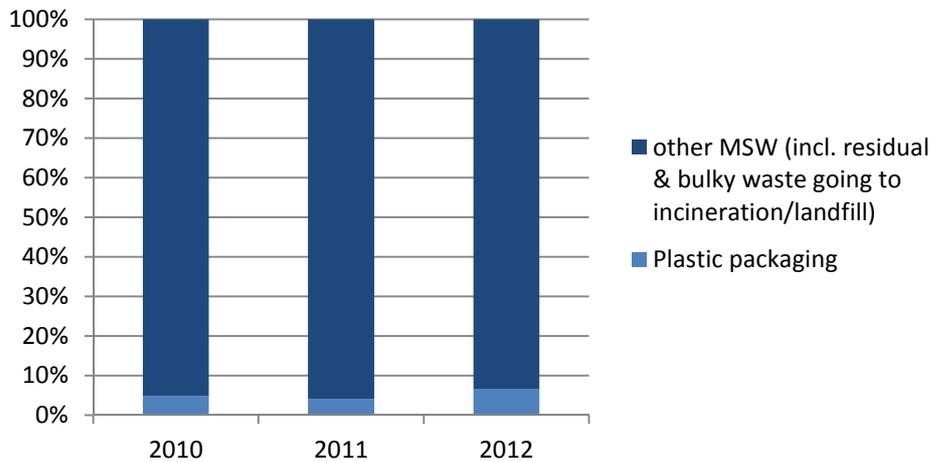
E.g.: plastic packaging/MSW = 6%

The amount of plastic packaging is the sum of all sorting stages (separated at source & selectively collected (one waste stream not mixed with other waste streams), output sorting facilities and output MBT) and all treatments of plastic packaging.

MSW is the sum of all sorting stages and all treatments of all included waste streams and subcategories (see 3.5 Included waste streams) plus the sum of all sorting stages and all treatments of residual waste and bulky waste. (Note that the residual and bulky waste may also contain plastic packaging that is not sorted out yet.)

This indicator is mainly useful to look at the evolution in one region.

Plastic packaging in the total MSW



The plastic packaging present in residual or bulky waste but not sorted out (and sent to incineration/landfill) is part of 'other MSW (incl. residual)'. The part 'plastic packaging' contains the selectively collected plastic packaging and the plastic packaging outputs of sorting facilities and MBT installations (which mostly goes to recycling but sometimes may also be sent to incineration or landfill).

6.2 Indicators for residual and bulky waste going to landfill/incineration

In the reporting tables about residual waste and bulky waste the amounts going to landfill and incineration have to be reported (see 5.2). Based on these data the following indicators can be calculated:

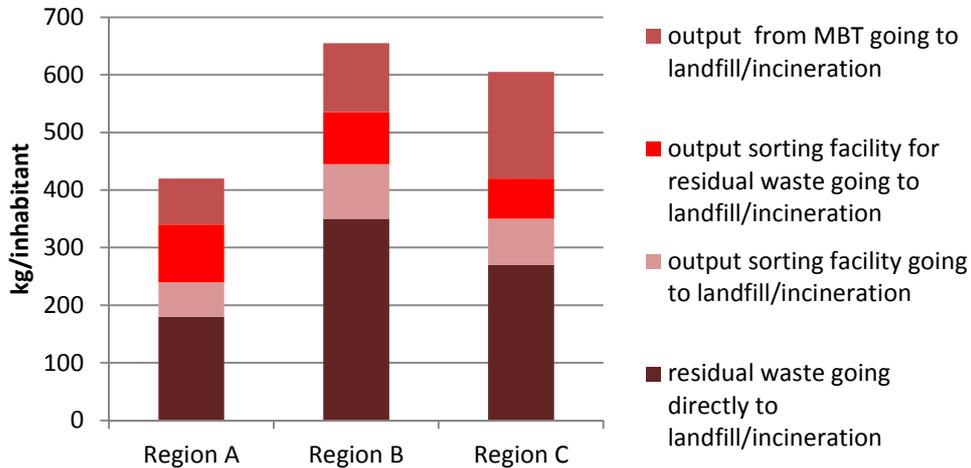
Indicator 8: Residual/bulky waste by sorting stages (kg/inhabitant)

Residual waste

Adding up the different treatments (incineration with and without energy recovery, landfill), the different sorting stages of residual waste (residual waste going directly to landfill/incineration, output sorting facility going to landfill/incineration, output sorting facility for residual waste going to landfill/incineration, output from MBT going to landfill/incineration) can be shown in different colours in a graph.

Fictitious example:

Residual waste by sorting stages, 2010

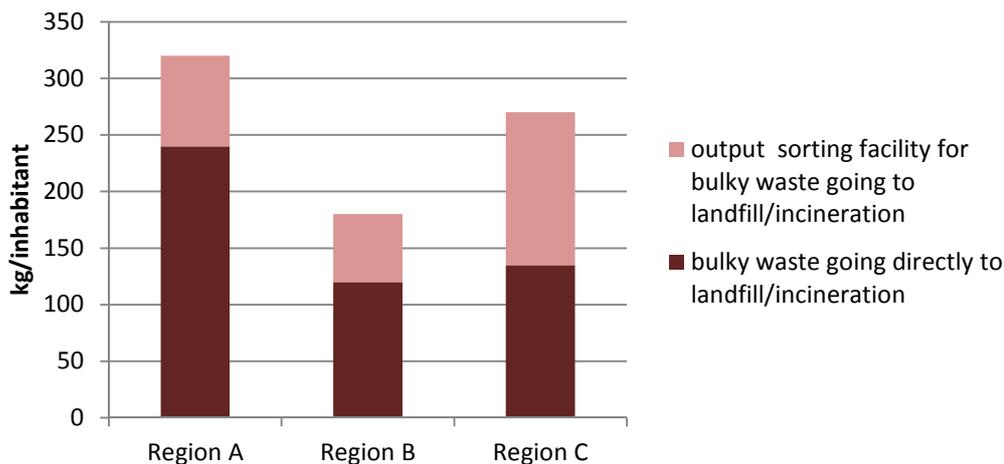


Bulky waste

Adding up the different treatments (incineration with and without energy recovery, landfill), the different sorting stages of bulky waste (bulky waste going directly to landfill/incineration, output sorting facility for bulky waste going to landfill/incineration) can be shown in different colours in a graph.

Fictitious example:

Bulky waste by sorting stages, 2010



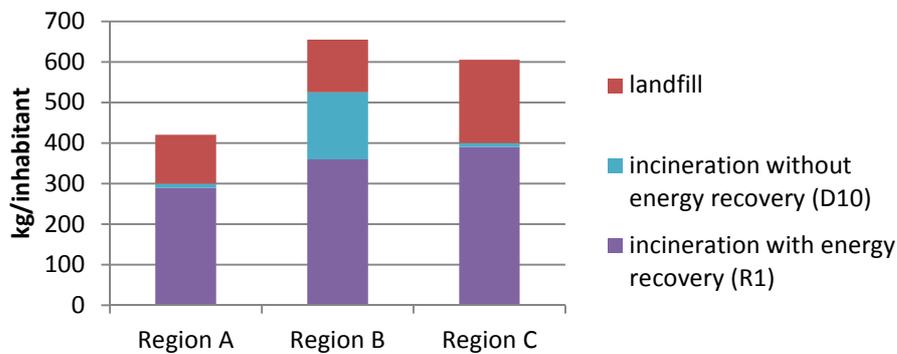
Indicator 9: Residual/bulky waste by treatments (kg/inhabitant)

Residual waste

Adding up the different sorting stages of residual waste (residual waste going directly to landfill/incineration, output sorting facility going to landfill/incineration, output sorting facility for residual waste going to landfill/incineration, output from MBT going to landfill/incineration), the different treatments (incineration with and without energy recovery, landfill) can be shown in different colours in a graph.

Fictitious example:

Residual waste by treatments, 2010

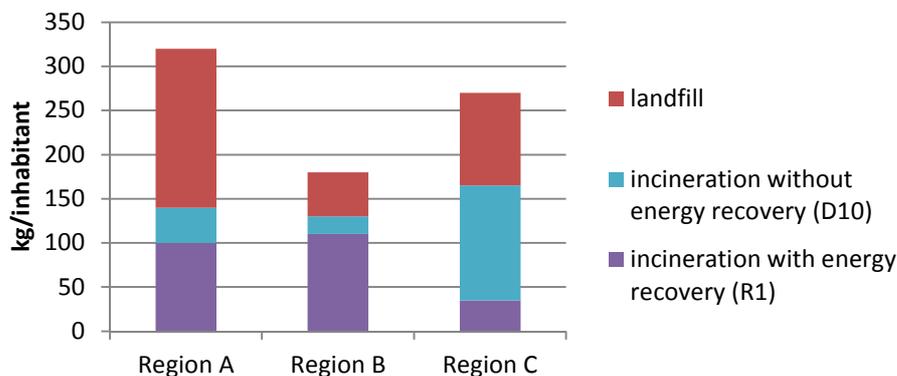


Bulky waste

Adding up the different sorting stages of bulky waste (bulky waste going directly to landfill/incineration, output sorting facility for bulky waste going to landfill/incineration), the different treatments (incineration with and without energy recovery, landfill) can be shown in different colours in a graph.

Fictitious example:

Bulky waste by treatments, 2010



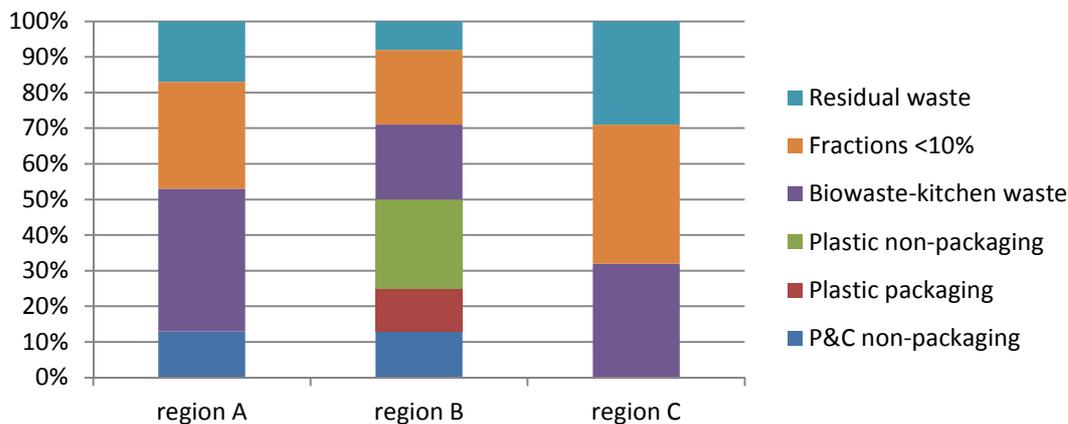
Indicator 10: Composition analysis (%)

Residual waste

The percentages of the different fractions in the residual waste based on a composition analysis can be presented in a graph. Showing all fractions separately would be unclear, so only those fractions who contribute more than 10% of the residual waste are shown separately. The other fractions are added up as one ('fractions < 10%'). The residual fraction (the remaining part that cannot be sorted out) is always shown independently of the percentage.

Fictitious example:

Composition analysis residual waste, 2010



Bulky waste

The percentages of the different fractions in bulky waste based on a composition analysis can be presented in a graph. Showing all fractions separately would be unclear, so only those fractions who contribute more than 10% of the bulky waste are shown separately. The other fractions are added up as one ('fractions < 10%'). The bulky fraction (the remaining part that cannot be sorted out) is always shown independently of the percentage.

6.3 Indicators about output sorting facilities & MBT installations (contamination rates)

To get an indication about the performance of a sorting facility or MBT installation, it is useful to see the share of the output going to recycling and the share going to incineration or landfill.

The R4R reporting tables don't give data per sorting facility or per MBT installation. It gives information about outputs of sorting facilities and MBT installations related to waste generated in a region. Nevertheless the following indicators are presented because when the sorting facilities or

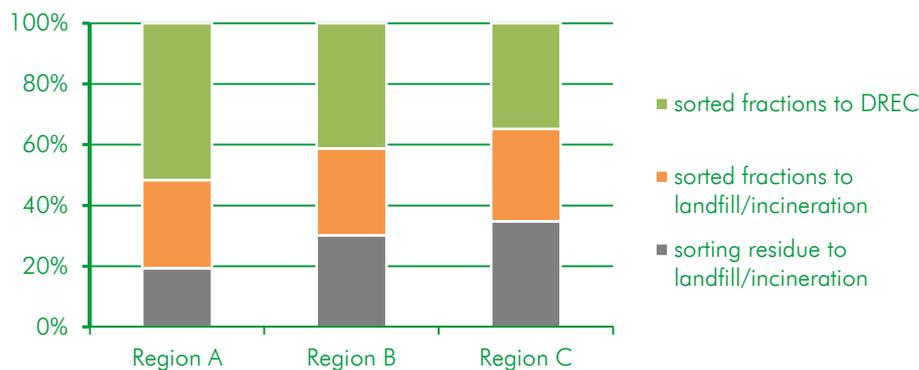
MBT installations only treat MSW from one region it gives correct information and otherwise it may give an approximation (but one has to be carefully with conclusions).

Graphs are showing fictitious examples.

Indicator 11: Contamination rate sorting facilities

In the reporting table about residual waste the amounts under the sorting stage 'output sorting facility going to landfill/incineration' give the sorting residues of the sorting facilities. On the other hand in the reporting tables about the selective waste streams the amounts under the sorting stage 'output sorting facility' give the sorted fractions either going to recycling or to landfill/incineration. These amounts of the different selective waste streams are added up.

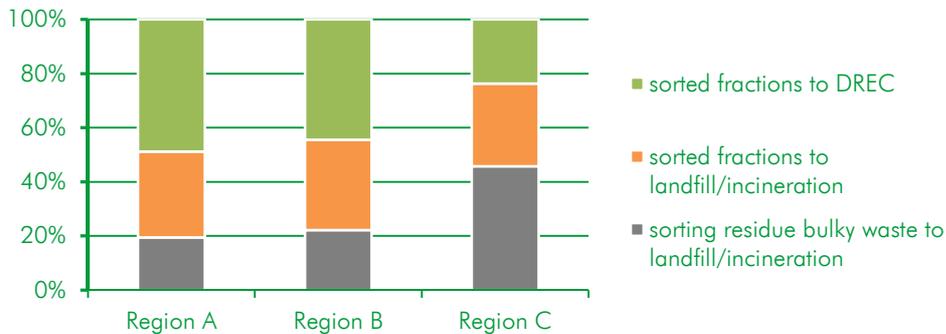
Contamination rate sorting facilities, 2010



Indicator 12: Contamination rate sorting facilities for bulky waste

In the reporting table about bulky waste the amounts under the sorting stage 'output sorting facility for bulky waste going to landfill/incineration' give the sorting residues of the sorting facilities for bulky waste. On the other hand in the reporting tables about the selective waste streams the amounts under the sorting stage 'output sorting facility for bulky waste' give the fractions sorted out from bulky waste (either going to recycling or to landfill/incineration). These amounts of the different selective waste streams are added up.

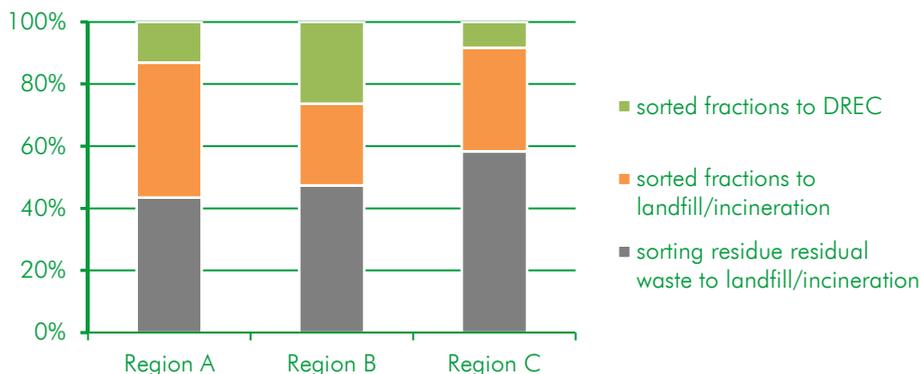
Contamination rate sorting facilities for bulky waste, 2010



Indicator 13: Contamination rate sorting facilities for residual waste

In the reporting table about residual waste the amounts under the sorting stage 'output sorting facility for residual waste going to landfill/incineration' give the sorting residues of the sorting facilities for residual waste. On the other hand in the reporting tables about the selective waste streams the amounts under the sorting stage 'output sorting facility for residual waste' give the fractions sorted out from residual waste (either going to recycling or to landfill/incineration). These amounts of the different selective waste streams are added up.

Contamination rate sorting facilities for residual waste, 2010

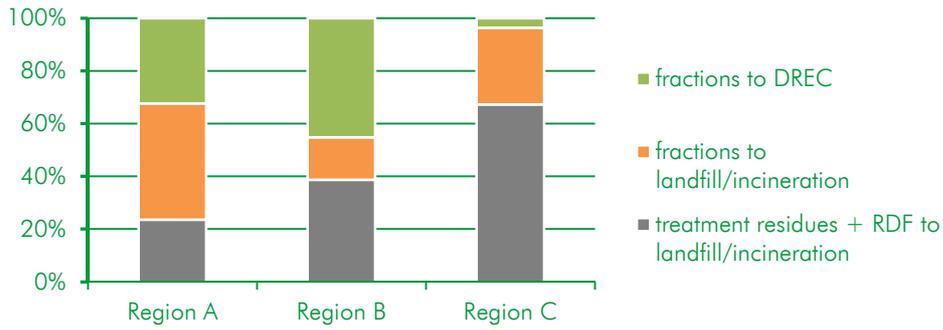


Indicator 14: Contamination rate MBT installations

In the reporting table about residual waste the amounts under the sorting stage 'output from MBT going to landfill/incineration' give the treatment residues and the RDF of the MBT installations. On the other hand in the reporting tables about the selective waste streams the amounts under the sorting stage 'output MBT' give the fractions coming out of the MBT installations (either going to

recycling or to landfill/incineration). These amounts of the different selective waste streams are added up.

Contamination rate MBT installations, 2010



REGIONS FOR RECYCLING

