

Peer Review

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# CEWEP Calculation Tool for potential impacts on waste amounts for thermal treatment

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## **1** Background and objectives

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CEWEP has developed a calculation tool that is supposed to allow for an indicative calculation of potential impacts of the EU Circular Economy Package targets on the availability of municipal and commercial/industrial waste for thermal treatment.

The aim of the tool is to allow for a rough orientation on volume shifts between recycling/composting, landfilling and thermal treatment for further political discussions. The tool does not claim to be a comprehensive model.

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## **2** Calculation tool design

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The calculation tool developed by CEWEP is based on a data analysis of both municipal waste and commercial and industrial waste statistics, and provides results aggregating and visualising the respective key findings regarding thermal treatment.

### 2.1 Municipal waste data

The data on municipal waste are based on Eurostat at the EU 28 Member State level. 2016 being the base year, as giving the latest available figures. Considered data refer to municipal waste generation and treatment as published by Eurostat with the latter differentiated between recycling (aggregating material recycling and composting/digestion), incineration and landfilling. The statistical differences between generation and treatment data was allocated according to the country's specific shift of municipal waste to recycling, thermal treatment and landfilling.

The tool is calculating in general with the same amount of municipal waste generated in 2035 as in 2016, as it was assumed that population growth will be compensated by waste prevention efforts by Member States. Due to the lack of literature and reliable figures for the impact of prevention measures on waste generation this simplified approach was chosen. The model by itself was designed to be able to allow for flexibility by selecting one of three population development scenarios: Status quo as of 2016, EUROSTAT baseline and EUROSTAT higher migration scenario and assuming an additional yearly waste prevention rate, if official assumption will be available.

The potential impact of the Circular Economy Package target can be analysed for the years 2025, 2030 and 2035. The calculation of future shares for recycling is based on the EU Circular Economy Package targets with an applicable recycling share of 55 % until 2025, 60 % until 2030 and 65 % until 2035, respectively. Besides, the tool is flexible to handle exceptions regarding countries with a high landfill rate in 2013 (they have 5 years more time to achieve the target, i.e. 2040 rather than 2035). Settings 'consider / do not consider exceptions' can be made and in case the

first option is selected, the share on municipal waste recycled would be reduced for the respective year by 5 %. Recycling targets are considered as output-based targets (corresponding to the new monitoring of recycling that refers to the amount that is finally recycled, notwithstanding the derogation option). Rough estimated assumption for the share of sorting, pre-treatment and recycling residues can be adapted, thus allowing for flexibility in order to be able to cover various ranges. The share of sorting, pre-treatment and recycling residues sent to landfills is assumed to be 20 % but can also be adjusted, whereas the remaining amount is assumed to be thermally treated. Additionally, the allocation of sorting, pre-treatment and recycling residues can be selected either as part of municipal waste treatment or commercial and industrial waste treatment. Furthermore, for 2035 the tool incorporates a landfilling target of max. 10 % - or in case of applicable exceptions of 25 %. In case a Member State has already achieved lower landfilling shares, the respective Member State values are considered.

For 2035 the remaining share for thermal treatment is calculated as a difference between the targeted amount of municipal waste to be recycled and the maximum targeted amount allowed to be landfilled.

Within the tool due to missing interim targets for the share of municipal waste allowed to be landfilled in 2025 and 2030 the following assumptions are embedded:

- general assumption:  
80 % of additional amounts recycled originate from amounts landfilled, the remaining 20 % from thermal treatment (compared to 2016),
- adjustments to the assumed shares shown above depend on the availability of respective remaining volumes landfilled and/or thermally treated.

Finally, potential crediting of home composting and metals from bottom ashes to the recycling rate of municipal waste are not considered.

## 2.2 Commercial and industrial waste data

Data for the commercial and industrial waste are equally based on Eurostat. For the purpose of the tool, only aggregated data on EU 28 Member State level (top down approach) were considered. Data refer to non-hazardous commercial and industrial waste treated only whereas major mineral waste fractions are excluded.

Due to data availability – and thus contrary to municipal waste – the reference for commercial and industrial waste are waste amounts treated (waste generated minus exports plus imports) instead of generated. The total amount treated generally being significantly lower than generated. The reason for this lies in the data availability on the background of reporting obligations according to the Waste Statistic Regulation. According to the manual on Waste Statistics the disposal and treatment options D8, D9, D11, D13, D14, D15, R12 and R13 are excluded from reporting obligations. As the aim of the tool developed by CEWEP is to calculate potential impacts on thermal treatment – the respective data situation is thus of less importance.

It can be expected that data for thermal treatment are almost complete. Import-export impacts mostly offset one another, as total amounts for all EU Member States are considered. In case of analysing a specific Member State impacts would be relevant.

The last year with data fully available for all EU Member States is 2014. Data for commercial and industrial waste 2016 so far are not complete. For the purpose of the developed tool only non-hazardous waste amounts were selected. Also, major mineral waste fractions were excluded, even if minor shares (2 %) of non-hazardous mineral waste were also thermally treated. To avoid double counting, the amount of municipal waste thermally treated was subtracted.

Like Municipal waste generated, the amount of commercial and industrial waste was assumed to be as in 2014 in a simplified approach, mainly due to the lack of reliable figures for the impact of prevention measures. For any further development of the respective data basis the tool was designed flexibly to consider both GDP growth and impacts of waste reduction measures allowing for various scenario calculations.

As no specific targets for different treatment options of commercial and industrial waste do exist, a free entry field for assumptions of a recycling rate as well as for a maximum landfilling rate is incorporated. The share for thermal treatment is calculated as a difference.

Furthermore, for commercial and industrial waste assumptions for the share of recycling residues are considered. The share of recycling residues sent to landfilling are assumed similarly to municipal waste; the percentage can be selected flexibly.

## 2.3 Results

The results are combining the calculations for both, municipal and commercial and industrial waste. The interaction between both mainly refers to the allocation of recycling residues from municipal waste recycling activities as mentioned above.

Based on the results for the amount to be potentially thermally treated within the selected scenario additional calculations for heat and electricity production by waste-to-energy facilities are derived.

Assumptions for the following variables are considered:

- Average production of heat/tonne of waste
- Average production of electricity/tonne of waste
- Average export of heat/tonne of waste
- Average export of electricity/tonne of waste
- Average consumption of electricity/inhabitant
- Average consumption of heat/inhabitant

The assumptions are based on CEWEP data for the average production of heat-electricity/tonne of waste, and on EUROSTAT for the average consumption of heat-electricity/inhabitant and can be adjusted.

Additionally, a CO<sub>2</sub> Savings scenario is calculated (based on data published by the German Environmental Agency (UBA) - The Climate Change Mitigation potential of the waste sector – 2015) by considering:

- CO<sub>2</sub> directly emitted
- CO<sub>2</sub> saved by energy substitution
- CO<sub>2</sub> saved by landfill diversion

In the tool, the amount of waste co-incinerated (10.5 million tonnes) is subtracted from the result when calculating energy and CO<sub>2</sub>-Savings.

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### **3 Example Basic scenario 2035**

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The Basic scenario 2035 calculated by CEWEP with the developed calculation tool is based on the following assumptions:

#### **Assumptions for Municipal waste**

- CE targets are assumed to be fulfilled by all Member States
- Municipal waste generated as in 2016
- Recycling rate: 65 % (output-based)
- Derogation option: none
- Assumed share of sorting, pre-treatment\* and recycling residues: 15 %
- Sorting, pre-treatment\* and recycling residues considered as: municipal waste
- Share landfilling: up to max. 10 %
- Regional focus: EU 28

#### **Assumptions for Commercial and Industrial waste**

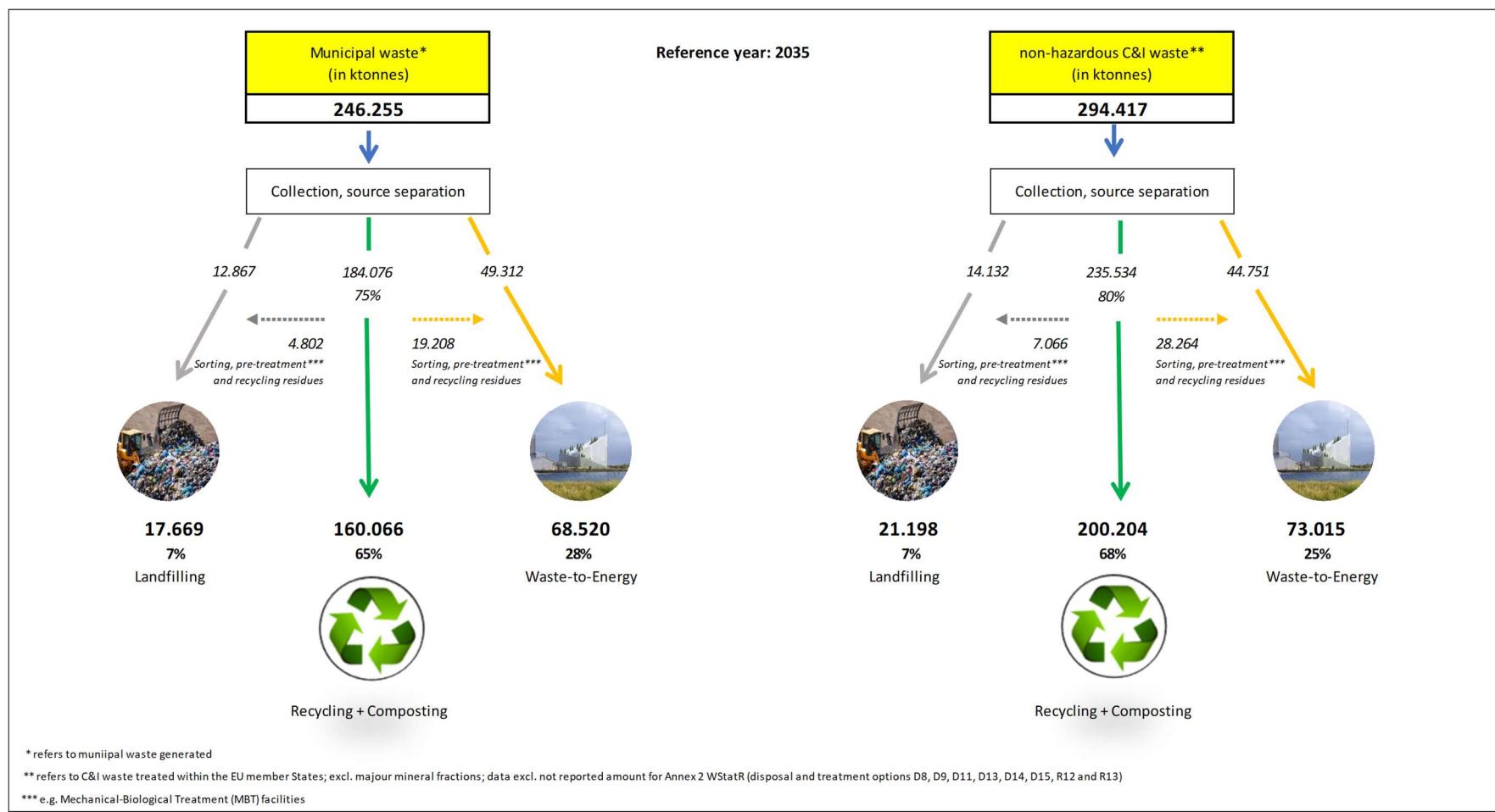
- Non-hazardous Commercial and Industrial waste treated, excl. major mineral waste, excl. disposal and treatment options D8, D9, D11, D13, D14, D15, R12 and R13, which are excluded from the reporting obligation according to Annex 2 Waste Statistics Regulation as generated in 2014
- Recycling rate: 80 % (input based)
- Landfill rate commercial waste: 7 % (output based)
- Assumed share of Sorting, pre-treatment\* and recycling residues: 15 %

\* e.g. Mechanical-Biological Treatment (MBT) facilities

#### **Results for thermal treatment**

As a result of the calculations the need for treatment capacity for municipal and non-hazardous commercial waste in EU28 in 2035 (in 2040 if all derogations are considered) after recycling and considering landfill reduction, was assumed to be 141,5 million tonnes. Based on this tool, it was calculated that if this amount of waste would be thermally treated in WtE plants to safely destroy the pollutants, 188 TWh of useful energy (heat and electricity) could be generated and 115 million tonnes of CO<sub>2eq</sub> saved.

**Figure 1:** The Basic Scenario 2035



Source: CEWEP calculation tool

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## **4** Summarizing assessment

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The calculation tool developed by CEWEP is focussed on the identification of potential impacts of the EU Circular Economy Package on the amount of municipal and non-hazardous commercial and industrial waste (excl. minor mineral waste fractions) on thermal treatment.

The selected methodological top down approach is suitable for indicative results on EU 28 average basis, giving evidence for a general trend. Key variables, like relevant targets, growth rates, assumptions for recycling residues and assumptions for directions are considered. While data on waste generation and treatment are based on Eurostat data, further tool relevant assumptions are based on publicly available information and CEWEP own experiences.

The tool was developed to be flexible enough to handle different assumptions, thus different scenarios can be derived.

It is recommended to further develop the tool, in order to allow for further flexibility and more precise results. This refers mainly to initiate discussions on EU level to come to agreed relevant assumptions on future forecast for waste generation regarding waste prevention, policies in place, GDP growth etc. and thus to overcome the simplified approach of calculating with the amount of the last available year and have a common basis for further strategic discussions.