CO_2 reduction potential by the European waste management sector

Study Partners and Project Team

Work conducted jointly by research organisations Prognos and CE Delft, on behalf of the following European Waste Management Associations: FEAD, CEWEP, the RDF Industry Group, and the Dutch Waste Management Association.

Objective

This study, building on a previous study conducted by Prognos in 2008, highlights the important contributions by the waste management sector to the EU climate objectives, accounting for avoided emissions for 10 selected waste streams for EU27+UK, based on available statistical data.

Scope

Potential CO_2 emission reductions are examined against the background of recent revisions of the EU waste legislation. The study explores the potential contribution this legislation and the waste management industry could have to reaching the ambition of climate neutrality by 2050 set out in the European Green Deal, as well as the effect of more ambitious targets.

10 Waste Streams selected

- 9 material waste streams (**Paper, Glass, Plastics, Ferrous metals, Aluminium, Wood, Textiles, Waste tyres, Biowaste**) + **Residual waste/WDF** (non-separately collected waste and rejects from waste treatment/Waste Derived Fuels)
- accounting in total **505 Mt in 2018** (~19 % of the total waste generated in EU27+UK)

Methodology

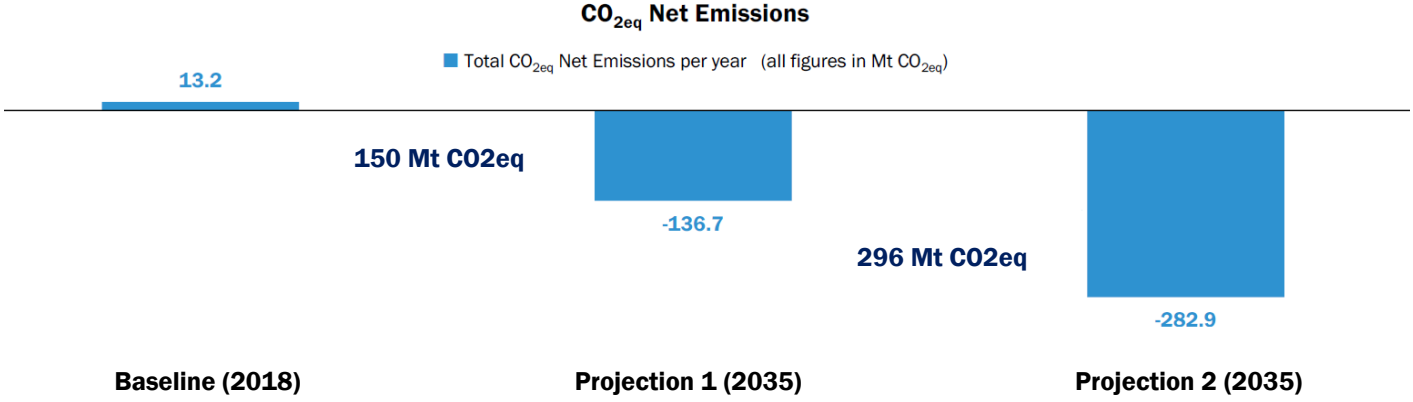
The volume of the 9 selected material waste streams and the one of residual wastes/WDF are calculated by waste treatment route, such as material or energy recovery by modelling country specific waste volumes, harmonized waste streams, and treatment specific CO_2 factors. While the waste volumes are kept constant at the 2018 level to allow a proper comparison between the 3 scenarios defined, different treatment routes are modelled to reflect the designated targets in the projections and the resulting CO_2 emissions.

3 Scenarios

I. **Baseline - 2018 "Status Quo"**: net CO_{2eq} emissions from current waste processing in the EU27+ UK in 2018.
II. **Projection 1 - 2035 (2040) "Implementation of current legislation"**: current waste regulation and recycling targets + municipal waste targets extended to Commercial & Industrial waste.
III. **Projection 2 - 2035 "Potentials"**: some even more ambitious recycling performance + waste that can be recycled or recovered for energy purposes not allocated to landfills.

Results of the combined totals of Material waste streams and Residual wastes/WDF

To provide a holistic picture, net CO_2 emissions are shown, as the sum of the direct emissions generated by the waste treatment route and the avoided ones, including from the use of recyclates in the manufacturing sector.



January 2022,
main contact: info@fead.be | www.fead.be

Main Results

- **Key result - Status Quo**: Adopting a 20-year time horizon, the waste industry is for the selected waste streams almost CO_2 net neutral today (13 Mt CO2eq). Considering only the selected 9 material waste streams (i.e. excluding residual waste/WDF), the waste industry already allows avoiding 96 Mt CO_{2eq} more than it is producing.

- **Key result - Projections**: By successfully applying current waste legislation (Projection 1) by 2035 across the EU27+UK, the CO_2 emission avoidance potential is significantly improved to -137 Mt CO_{2eq}, delivering a **saving of 150 Mt CO_{2eq}**. The **savings potential would almost double in the more ambitious projection 2**. The current baseline CO_2 net emission burden of 13 Mt CO_{2eq} in the 20-year perspective could drop to -283 Mt CO_{2eq} net emission avoidance which results in **savings of 296 Mt CO_{2eq}.**

- **Metals Recycling**: The current largest net emission savings are achieved by the recycling of the ferrous metal and aluminium waste streams by avoiding significant emissions by the substitution of primary material production.

- **Landfill Diversion**: The study shows how the largest gains are made by reducing landfilling of particularly organic waste materials, such as paper & cardboard and biowastes, achieving a reduction of up to 120 Mt CO_{2eq}. Additional significant potential reductions are provided by energy recovery of residual wastes/WDF.

Sensitivity analysis

- **20 vs 100-year time horizon**: The default time horizon for GHG effects in the atmosphere in this study is **20-years** to better reflect the short-term climate impacts of methane emissions from landfills and given the recent IPCC report's emphasis on the urgency to reduce GHG-emissions. A sensitivity with a 100-years perspective was also applied. The comparison 20 vs 100-year time horizon highlights the huge impact of **methane emissions from landfills**.

- **Energy Substitution by energy recovery**: the average electricity and heat mix of the European grid (and its evolution with a higher penetration of renewables in the future) is considered as default assumption. A sensitivity analysis with a marginal approach has also been developed which means that processes which recover energy from waste avoid the most carbon intensive conventional power generation technologies – fossil fuel sources.

- **Transport Sensitivity**: Transport has only a small effect on the net CO_2 emissions. A sensitivity analysis considering only residual waste/WDF has been conducted, showing that energy recovery is preferable to landfilling even if the waste would be transported for a large distance (9000 km) in a medium-sized truck.

General Remarks

- The measurement point for recycling is after sorting, which means that the CO_2 factors are applicable to 1 tonne of sorted material.

- Energy recovery covers not only Waste-to-Energy incineration of residual waste treatment, but also other types of thermal treatment such as co-incineration (e.g. in cement kilns), combustion of wood (hazardous and non-hazardous) in dedicated bio-energy plants for heat and/or power production, etc.

Key Observations

- The waste management industry has cross-industrial interlinkages by making valuable waste derived content available to the whole economy as secondary resources for material and energy uses.

- For more ambitious projections, the municipal waste targets need to be extended to commercial and industrial wastes, and waste suitable for recycling and energy recovery should be diverted from landfills. This would deliver savings of 296 Mt CO_{2eq}.

- To achieve maximum CO_2 avoidance, policy makers are advised to make optimal use of all available capacity for recycling and waste-to-energy within EU27+UK.

January 2022,
main contact: info@fead.be | www.fead.be