MORE CIRCULARITY
LESS CARBON
-25% BY 2025

THE CARBON FOOTPRINT OF WASTE

ODENSE

ACR+
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ZERO WASTE SCOTLAND

ACR+ is an international network of cities and regions sharing the aim of promoting a sustainable resource management and accelerating the transition towards a circular economy on their territories and beyond.

Circular economy calling for cooperation between all actors, ACR+ is open to other key players in the field of material resource management such as NGOs, academic institutions, consultancy or private organisations.

Find out more at www.acrplus.org

Zero Waste Scotland exists to lead Scotland to use products and resources responsibly, focusing on where we can have the greatest impact on climate change.

Using evidence and insight, our goal is to inform policy, and motivate individuals and businesses to embrace the environmental, economic, and social benefits of a circular economy.

We are a not-for-profit environmental organisation, funded by the Scottish Government and European Regional Development Fund.

Find out more at www.zerowastescotland.org.uk/

Project name: More Circularity, Less Carbon – ZWS & ACR+ partnership

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Contents

ACR+ 'More Circularity Less Carbon' campaign

The ACR+ has partnered with its member Zero Waste Scotland to launch the 'More Circularity Less Carbon' (MCLC) campaign in November 2019 to reduce the carbon impact of municipal waste among its members by 25 per cent by 2025.

Zero Waste Scotland's Carbon Metric International (CMI) tool, developed from Scotland's ground-breaking Carbon Metric, will enable ACR+ members to measure the carbon impact of their municipal waste, take effective actions to reduce it, and track their progress towards the 2025 target. A first cohort was organised in 2020, in which three ACR+ members collected data and analysed the carbon footprint of their municipal waste: the Brussels Region (BE), Pays de la Loire region (FR), and the city of Genoa (IT). This first cohort led to the publication of a cross-analysis that highlights similarities, differences, and potential improvements for the follow-up activities.

Odense is one of the ACR+ members who joined cohort 2 to benefit from this project and received support to use the CMI to quantify the whole-life carbon impacts of its municipal waste. The results are summarised in this report, which has three main objectives:

1. Enable Odense to establish its 2025 carbon reduction target;
2. Provide a detailed breakdown of waste carbon impacts by materials and management process; and
3. Assess several carbon reduction scenarios that can help Odense achieve its target.

Zero Waste Scotland's Carbon Metric International

Zero Waste Scotland has developed a ground-breaking tool in the fight against global climate change. The Carbon Metric measures the whole-life carbon impacts of Scotland's waste, from resource extraction and manufacturing emissions right through to waste management emissions, regardless of where in the world these impacts occur (Figure 1).

"The Carbon Metric shows how reducing our waste, and managing what remains in a more sustainable way, is critical to the global fight against climate change."

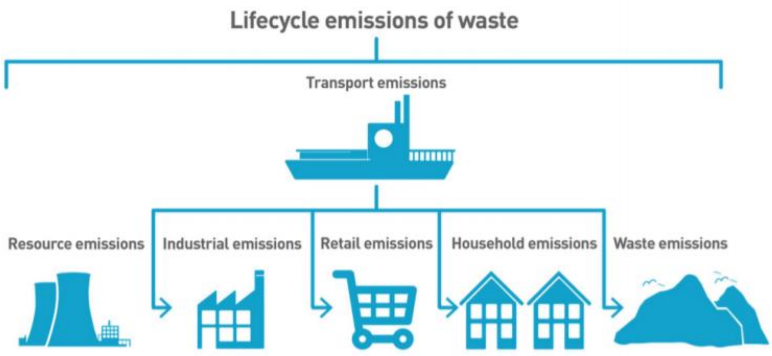


Figure 1 Schematic diagram presenting the lifecycle emissions of waste.

The Carbon Metric provides policymakers and business leaders with an alternative to weight-based waste measurement, allowing them to identify and focus specifically on those waste materials with the highest carbon impacts and greatest potential carbon savings. Scotland's 33% per capita food waste reduction target is an example of a policy informed by the Carbon Metric[1].

Further details on the Carbon Metric methodology can be found on Zero Waste Scotland's website[2].

The Carbon Metric has been utilised to estimate Odense's bespoke carbon analysis thanks to the collaborative work between Zero waste Scotland and ACR+. Extensive data on municipal waste generation, composition, and management were provided by ACR+ member Odense Renovation, the company managing municipal waste for the city of Odense.

Figure 2 Logo of Odense Renovation.

Method & Data source

The whole-life carbon impacts of **household and household-like[3] waste** in Odense were quantified in this report, based on 2018 data.

The stages covered in the analysis are as follow:

- **Waste generated:** all waste generated by households in Odense during the reporting year (i.e., 2018). Embodied carbon impacts linked to the production of material (resource extraction, manufacturing and transport emissions) are included in this category. Impacts associated with the product's use are excluded.
- **Waste recycled:** all materials sent to recycling or re-use including biodegradable materials that have been composted or anaerobically digested. The analysis covers all activities linked to recycling waste, namely waste collection, sorting, recycling, and displacement benefits as recycled content substitutes virgin materials.
- **Waste incineration:** all incinerated waste. The analysis covers waste collection and treatment (including carbon benefits of energy recovery when applicable).
- **Waste landfilled:** all landfilled waste, including incinerator ash and any recycling and composting rejects that occur during collection, sorting or further treatment that are landfilled. The analysis covers the carbon impacts of waste collection and disposal.

[1] Scottish Government (2016) Making Things Last
[2] Zero Waste Scotland (2020) Carbon Metric Publications.
[3] This covers waste collected in civic amenity sites. It is expected that a portion of the waste collected here is coming from non-household sources.

- **Other diversion:** this category covers waste tonnages that have been diverted for re-use, e.g., construction bricks and textile.

More details on waste data used in the analysis, assumptions with regards to waste management operations in Odense, and its limitations can be found in Appendix 1.

About Odense

Odense is the third-largest city in Denmark. The municipality of Odense has a population[4] of 202,348 in 2018 and Odense is the main city of the island of Funen. The total amount of household waste generated in Odense in 2018 is 139,126 tonnes, representing 690 kg/inh. This is rather high compared to the other territories that participated in the MCLC campaign and can be explained by the presence of non-household waste collected in the different civic amenity sites, especially construction and demolition waste or soils.

Figure 3 Location of Odense.

Table 1 Breakdown of waste generated in Odense in 2018.

Waste Category	Waste generation (tonnes)
Garden wastes	22,026
Food waste	19,855
Household and similar wastes[5]	18,179
Mineral waste from C&D	16,309
Paper and cardboard wastes	14,147
Soils	9,920
Plastic wastes	9,275
Wood wastes	7,621
Glass wastes	5,829
Mixed ferrous and non-ferrous wastes	5,163
Other mineral wastes	3,929
Discarded electronic equipment	2,119
Textile wastes	2,048
Mixed and undifferentiated materials	1,828
Chemical wastes	472
Rubber wastes	110
Used oils	96
Batteries wastes	86
Spent solvents	76
Acid, alkaline or saline wastes	38
Grand Total	**139,126**

[4] www.statistikbanken.dk
[5] Household & Similar wastes include unsorted residual waste and reject (17,815 tonnes) that can't be allocated to specific material categories & bulky waste (365 tonnes).

4.1 Waste collection

The main collection streams are presented on the graph below:

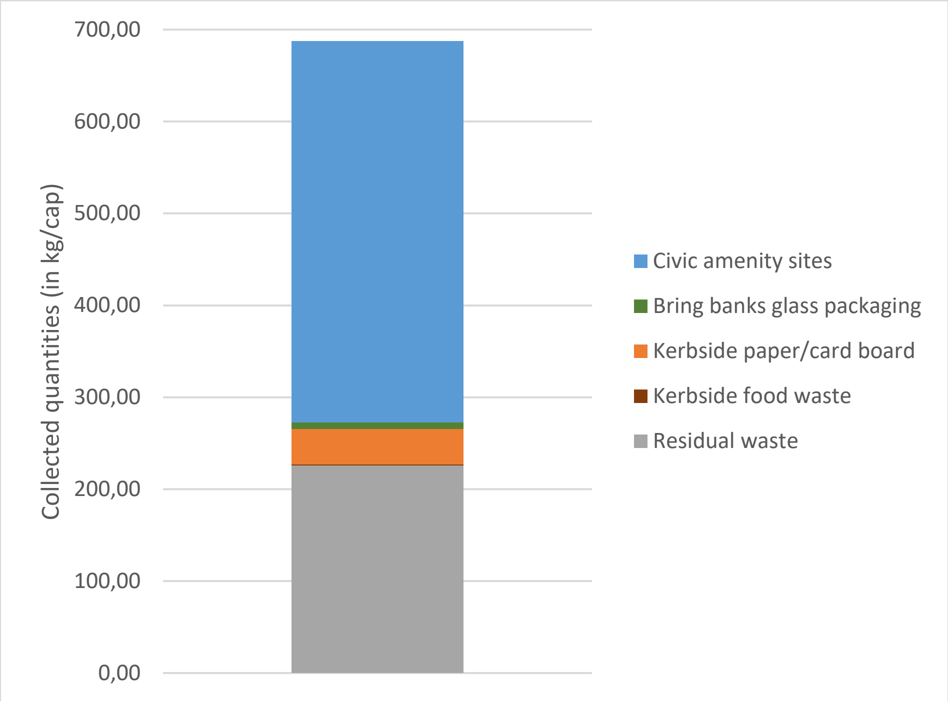


Figure 4 Main collection streams in kg/cap.

The main specificity of the collection in Odense is the civic amenity sites that collect about 60% of the total municipal waste.

Besides, packaging waste is collected via a deposit-refund system and the associated quantities are not presented on the following graph. In 2018, these quantities represented 8.9 kg/cap/year: 4.4 kg of glass packaging, 2.9 kg of plastic packaging, and 1.5 of metal packaging. These quantities are not included in this analysis and their carbon footprint is not assessed.

This impacts other figures, such as the composition of plastic waste generated, with a share of PET that is lower than for other MCLC participants.

Residual waste represents about 30% of the total collected waste.

How several key waste fractions are collected and how much is sorted or mixed with residual waste are presented on the following graph:

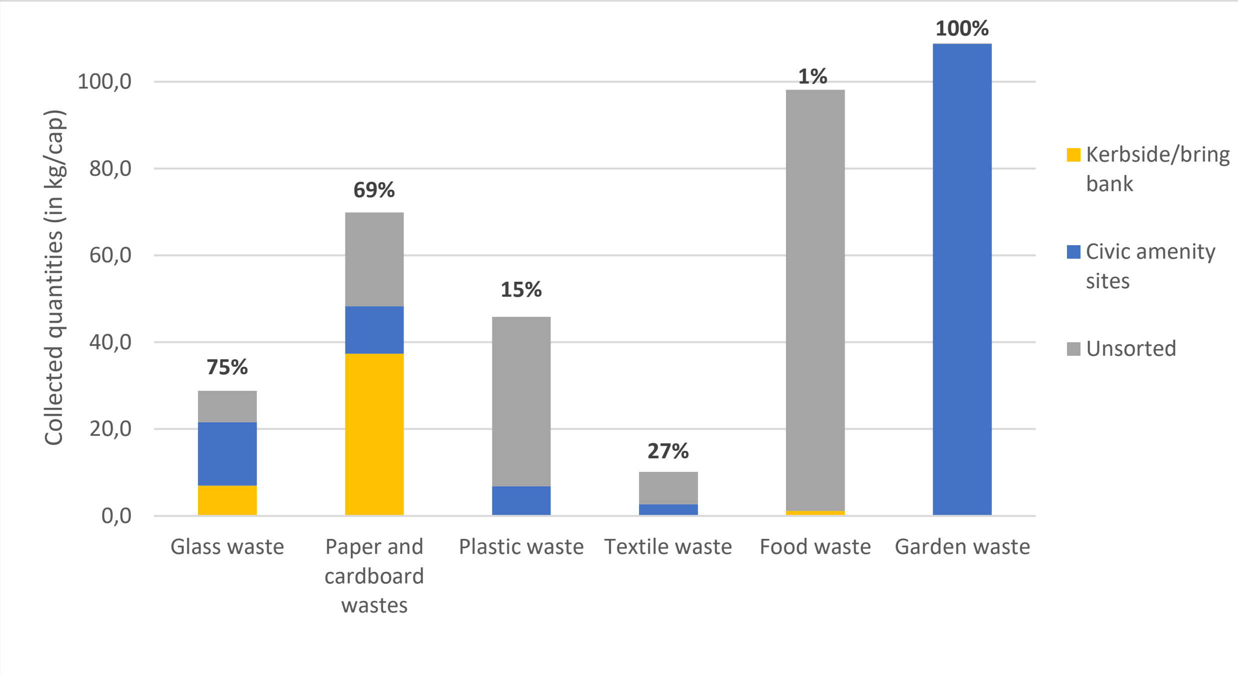


Figure 5 Collected quantities for several waste fractions according to the different collection schemes, in kg/cap, and sorting rates in % (calculated as the selectively sorted quantities compared to total arisings).

Sorting rates are high for glass and paper/cardboard waste, but quite low for plastic, and textile waste. Besides, food waste collection was only implemented at pilot scale in 2018, with a very limited number of households participating. However, and as mentioned above, part of glass and plastic packaging waste is collected via a deposit-refund system and the associated quantities are not reported here.

4.2 Waste treatment

A breakdown of waste treatment and disposal route is shown in Figure 6. Half of the municipal waste is sent to recycling, while landfilling is quite limited.

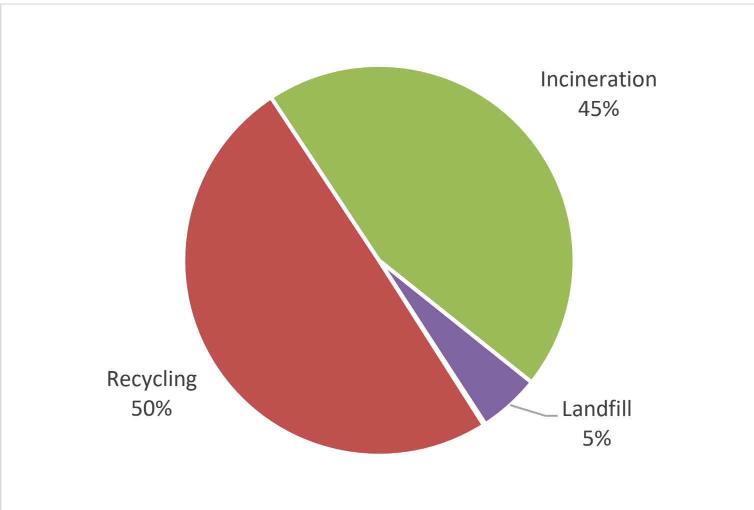


Figure 6 Final destination of household waste in 2018.

The final treatment destination for the main waste fractions is presented on the graph below (food waste quantities are too small to be visible, so not displayed on the graph):

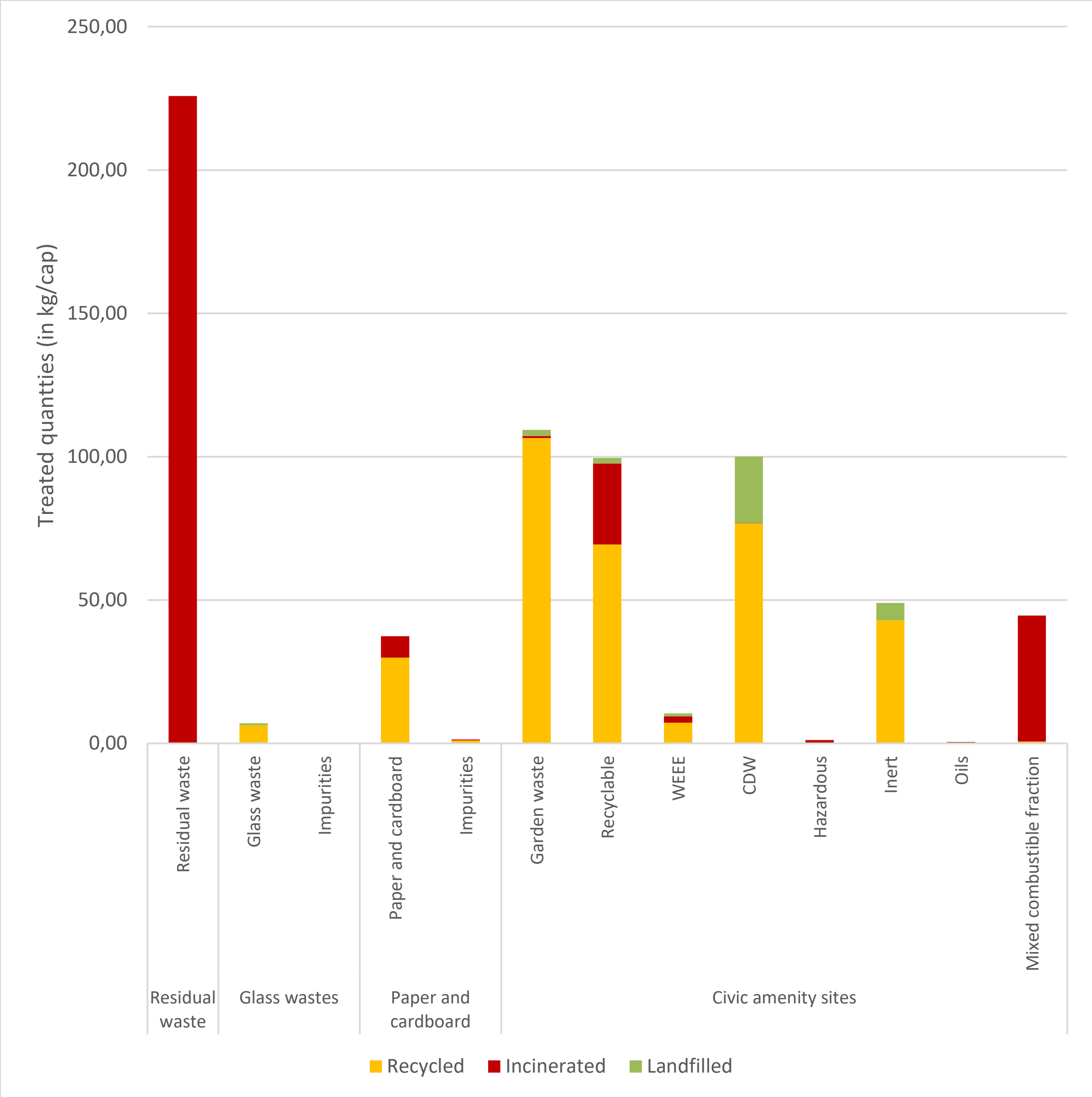


Figure 7 Final treatment of the main waste streams and fraction in Odense (in kg/cap).

Quite detailed data could be obtained when it comes to the final treatment of the different waste streams, including the impurities of glass and paper/cardboard selectively collected, as well as for the different waste streams collected in civic amenity sites. It is interesting to note that landfilling is mostly used for inert/construction and demolition waste, while most unsorted fractions or sorting residues are sent to incineration.

More details on the treatment routes for the key waste streams are presented in the following table:

Table 2 Collection and treatment routes for several key fractions.

Waste stream	Treatment route
Residual waste	All residual waste is sent to incineration with energy recovery, where heat and electricity is produced. The net efficiency of the incinerator is 97% for heat and 11% for electricity.
Food waste	Food waste collection is still marginal in 2018, and 15% of impurities has been reported. Food waste is sent to anaerobic digestion, where methane is recovered as biomethane, and the digestate is used as soil conditioner.
Glass waste	One third of glass waste is collected in bring banks while the rest is collected in civic amenity sites. About 10% of the selectively collected glass is sent to landfilling. For the rest, 68% of glass waste (i.e., packaging glass) is sent to close-loop recycling ("bottle-to-bottle"), and 32% (i.e., flat glass) to open-loop recycling.
Paper and cardboard	77% of the paper and cardboard waste selectively collected is collected via a kerbside collection, 23% is collected in civic amenity sites. The kerbside collection includes 3.5% impurities. About one third of the generated paper and cardboard waste is collected within residual waste and mixed combustible waste in civic amenity sites sent to incineration, and the rest is selectively collected and recycled.
Textiles	20% of the selectively collected textile is sent to re-use, 50% to recycling, and 30% to incineration.
Construction and demolition waste	Bricks is one of the selectively collected streams of construction and demolition waste, with 60% of it being sent to re-use as bricks, and 40% being recycled as road filling.

Results

5.1 Key findings

The carbon impacts of household waste in Odense in 2018 were nearly 140,000 tonnes of carbon dioxide equivalent (tCO_2eq.), or 0.7 tCO_2eq./capita. Figure 8 shows that both the recycling and incineration of household waste in Odense is carbon negative thanks to the 50% recycling rate and the utilisation of high efficiency combined heat and energy disposal route for the remaining of waste. However, embodied carbon impacts of waste material (i.e. the emissions generated by the extraction of resources, production, manufacturing, etc. of the corresponding products, labelled as "Generated" in Figure 8) are always the highest contributor to the net carbon impacts of waste however, which is why waste prevention, in accordance with the waste hierarchy, always offers the greatest carbon savings.

Accounting for the full lifecycle impacts, Odense's waste carbon intensity of 1.0 tCO_2eq./tonne of waste. This low carbon intensity is attributed primarily to the diversion of all residual waste from landfill to incineration with high energy recovery rate (11% electricity and 97% heat[6]).

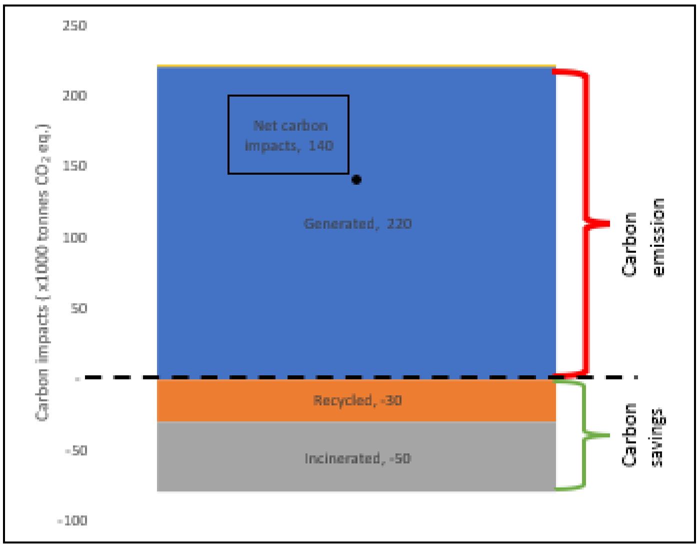


Figure 8 Breakdown of whole-life carbon impacts of waste by stage.

Figure 9 shows the amount of waste tonnages under key waste categories[7] and their associated carbon impacts. The "Household and Similar Wastes", includes the following categories: residual waste which could not be disaggregated[8] to specific material categories, reject materials from recycling waste streams, and bulky waste.

Figure 9 also shows that textile waste is responsible for substantially higher carbon burdens when compared to the amount of textile waste generated. Further carbon savings can be achieved by sending more plastic and food waste to recycling instead of incineration and collecting more textile for reuse (Figure 10). Overall, the majority of carbon impacts is attributed to the production of materials (i.e., embodied impacts) in the first place as shown in Figure 11 & Figure 9.

The embodied impact of waste generation is slightly lower than most of the other previous participants of the MCLC campaign, which is mostly due to a rather low generation of textiles (about 10 kg/cap, when several other participants reported above 20 kg/cap). The impact of food waste generated is also lower when compared to the tonnes of food waste produced, due to the lower content of proteins compared to the one reported by other participants(10%).

Recycling allows to save emissions that amount to about 14% of the embodied emission of municipal waste. Most savings can be attributed to the recycling of metal

[6] Heat utilised from EfW sites will offset natural gas-based heat (central and small scale) using average figures for Europe without Swizerland (eco-invent).

[7] Each category does not refer to waste tonnages in a single stream (e.g. "garden waste collected in civic amenity sites"), but rather to the total waste fraction that encompassed in multiple waste streams (e.g. garden waste collected in civic amenity sites, garden waste collected door-to-door, and garden waste improperly discarded in residual waste

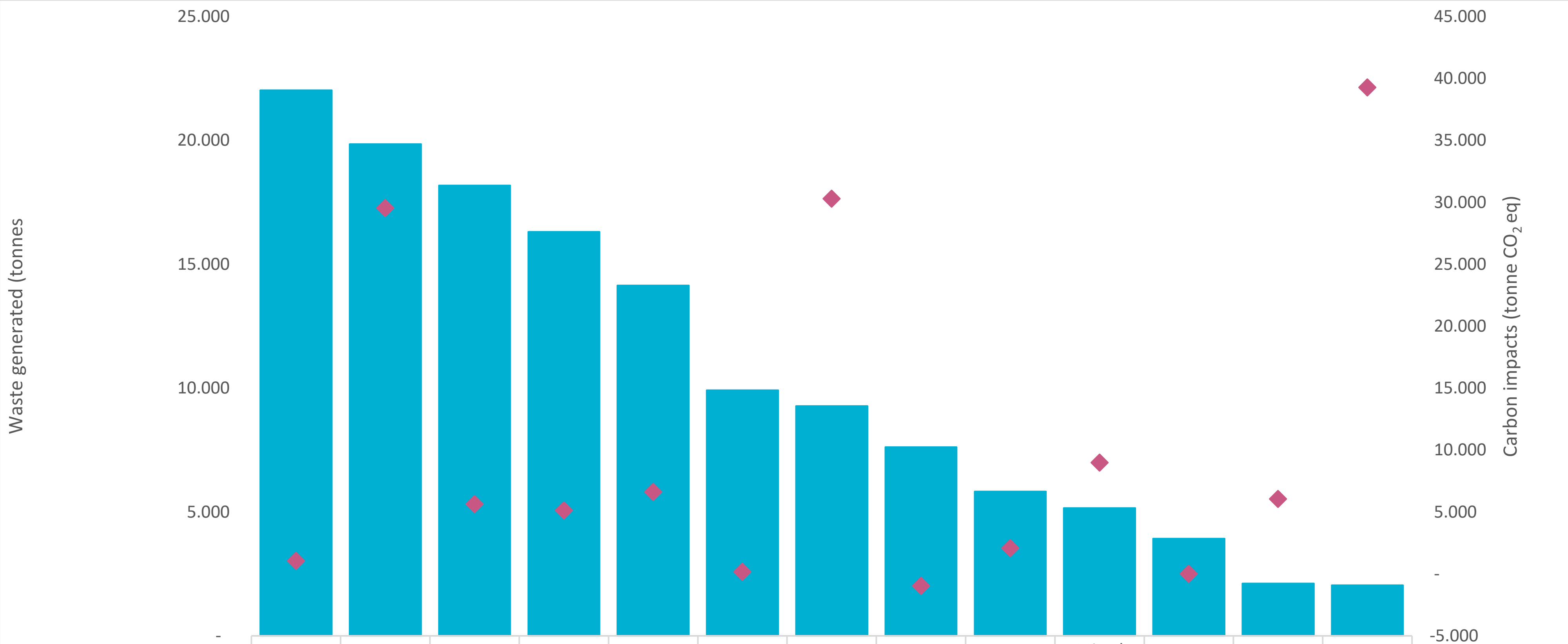
[8] We used an average carbon factor of 0.79 tonne per tonne of uncategorised residual waste. Uncertainty associated with this assumption has not been examined in this report. Nevertheless, we discussed how this limitation can be addressed in Section 5.3.

waste, followed by WEEE re-use and recycling, and glass recycling. However, it is interesting to note that plastic recycling yields little benefits compared to the embodied impact of plastic waste, which might be attributed to the low sorting rate; yet it must be noted that a large share of PET bottles (approximately 595 tonnes) is not included in the reported data since it is collected via the national deposit-refund system.

One of the specificities of the carbon footprint of municipal waste management in Odense is the very significant savings associated with incineration, which can be attributed to the high energy efficiency of the incineration plants that mostly recovers energy as heat. The saved emissions are assessed by offsetting the heat generated by the incineration of waste to natural gas-based heat (both central and small-scale). Overall, the emissions saved thanks to energy recovery represent about 25% of the embodied impact of municipal waste, and most savings are achieved thanks to the incineration of “household waste and similar” (unsorted residual waste and sorting residues). The incineration of paper and cardboard, food waste, and wood waste also leads to relevant savings, as a biogenic/carbon neutral carbon source replacing fossil energy production. Plastics on the other hand has a small net burden of emissions when incinerated, because of the high content of fossil carbon in the material. Nevertheless, thanks to the high energy recovery rate in Odense, the carbon impacts of incinerating plastics is lower than impacts reported in other regions and cities investigated in this project.

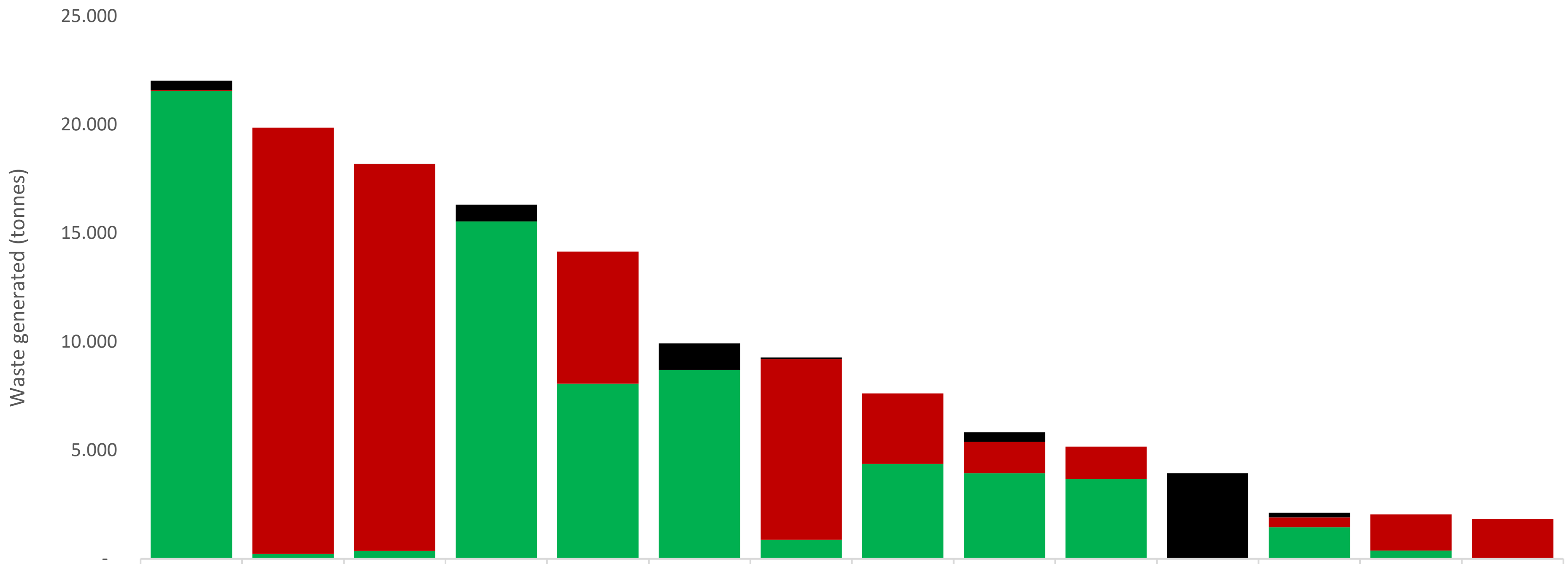
Landfilling has a very low impact, mostly due to the fact that the quantities sent to landfilling are quite limited, and that most waste sent to landfilling is inert waste (such as construction and demolition waste).

A detailed breakdown of waste tonnages and their impacts is available in Appendix 2 and 3 and can be used to identify areas for improvements in terms of both recycling rates and waste reduction.



	Garden wastes	Food waste	Household and similar wastes	Mineral waste from C&D	Paper and cardboard wastes	Soils	Plastic wastes	Wood wastes	Glass wastes	Mixed ferrous and non-ferrous wastes	Other mineral wastes	Discarded electronic equipmen t	Textile wastes
Waste generated (tonnes)	22.026	19.855	18.179	16.309	14.147	9.920	9.275	7.621	5.829	5.163	3.929	2.119	2.048
Carbon impacts (tCO2eq.)	1.041	29.548	5.621	5.120	6.608	154	30.286	-968	2.090	8.987	-	6.055	39.270

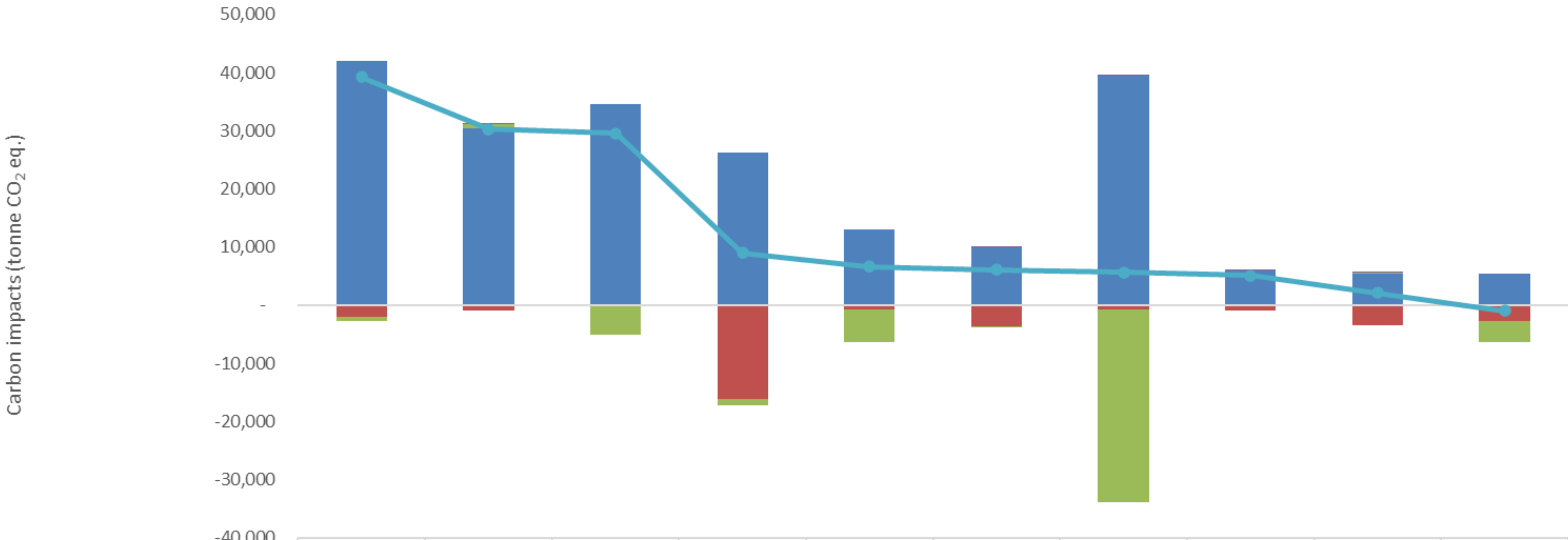
Figure 9 Weight vs carbon impacts of key waste categories in Odense.



	Garden wastes	Food waste	Household and similar wastes	Mineral waste from C&D	Paper and cardboard wastes	Soils	Plastic wastes	Wood wastes	Glass wastes	Mixed ferrous and non-ferrous wastes	Other mineral wastes	Discarded electronic equipment	Textile wastes	Mixed and undifferentiated materials
Landfilled	440	-	7	764	-	1.223	85	-	437	-	3.929	207	-	-
Incinerated	29	19.629	17.809	10	6.088	-	8.313	3.248	1.462	1.491	-	461	1.667	1.828
Recycled	21.557	226	364	15.535	8.059	8.698	877	4.373	3.930	3.672	-	1.451	381	-
Generated	22.026	19.855	18.179	16.309	14.147	9.920	9.275	7.621	5.829	5.163	3.929	2.119	2.048	1.828

Waste category

Figure 10 **Total tonnages of waste (key categories) in Odense in 2018 by management route.**



	Textile wastes	Plastic wastes	Food waste	Mixed ferrous and non-ferrous wastes	Paper and cardboard wastes	Discarded electronic equipment	Household and similar wastes	Mineral waste from C&D	Glass wastes	Wood wastes
Landfilled	-	1	-	-	-	7	4	6	6	-
Incinerated	-721	722	-5,003	-1,109	-5,683	-252	-33,089	0	41	-3,476
Recycled	-2,029	-937	-62	-16,196	-754	-3,580	-812	-851	-3,435	-2,812
Generated	42,019	30,500	34,614	26,292	13,046	9,880	39,518	5,965	5,478	5,319
Total carbon impacts (tCO2)	39,270	30,286	29,548	8,987	6,608	6,055	5,621	5,120	2,090	-968

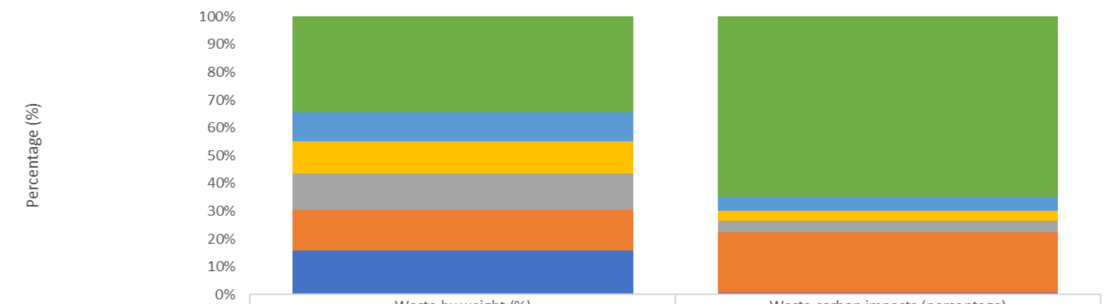
Waste category

Figure 11 **Whole-life carbon impacts of key waste categories by management route.**

5.2 The Top Five Waste Materials: Weight vs. Carbon Impacts

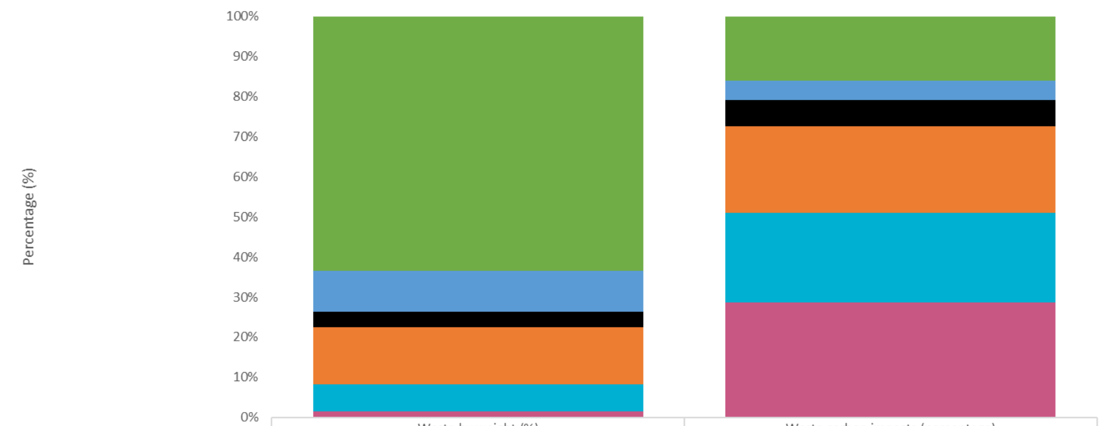
Many of the high tonnage materials in Odense's waste stream have relatively low carbon impacts (e.g. garden waste and construction and demolition waste accounts for respectively 16% and 12% of total waste generated, but just 1% and 4% of total carbon impacts). To achieve the 2025 carbon savings target, focus should be placed on the most carbon intensive waste materials, such as **textile, plastics, and food waste.**

The top five waste materials by weight in 2018 accounted for 65% of Odense's waste, but only 35% of its waste carbon impacts (Figure 12). On the other hand, the top five most carbon intensive waste materials accounted for 37% of the total weight, but 84% of waste carbon impacts (Figure 13). The waste category with the single greatest carbon impact is textile waste, which accounted for 1% of waste by weight but nearly 30% of waste carbon impacts. Other carbon-intensive materials identified are plastic wastes, food wastes, and metals.



	Waste by weight (%)	Waste carbon impacts (percentage)
Remaining	35%	65%
Paper and cardboard wastes	10%	5%
Mineral waste from C&D	12%	4%
Household and similar wastes	13%	4%
Food waste	14%	22%
Garden wastes	16%	1%

Figure 12 Top five waste materials by weight and their associated carbon impacts.



	Waste by weight (%)	Waste carbon impacts (percentage)
Remaining	63%	16%
Paper and cardboard wastes	10%	5%
Mixed ferrous and non-ferrous wastes	4%	7%
Food waste	14%	22%
Plastic wastes	7%	22%
Textile wastes	1%	29%

Figure 13 Top five waste materials by carbon impacts and their associated weight.

In addition to prioritising textile waste for waste prevention and recycling, our analysis reveals that a significant fraction of plastic waste is still incinerated. Diverting these tonnages to recycling will help Odense to reduce its carbon footprint associated with waste even further.

5.3 Scenario analysis

Odense must reduce its waste carbon impacts by approximately 35,000 tCO_2eq, to a total of 105,000 tCO_2eq by 2025, in order to achieve the 25% ACR+ target. A scenario analysis was carried out to investigate scenarios that Odense might use to accomplish this.

As part of this project, we looked into a number of waste-reduction scenarios that can help Odense in achieving the target. Scenarios considered focus on the following carbon-intensive materials:

1. Textile waste;
2. Plastic wastes;
3. Food waste;
4. Paper and cardboard wastes;
5. Mixed ferrous and non-ferrous wastes.

Table 3 lists scenarios considered in this analysis and their results, also presented in Figure 14.

Table 3 Summary of the scenario analysis results.

Scenario number	Description	Total carbon impacts (tonnes CO_2eq.)	Reduction rate (%)
Scenario 0	Business as usual	140,000	0%
Scenario 1	Targeted materials - 20% reduction (all)	113,700	-17%
Scenario 2	Textile (30%), plastic waste (30%), remaining targeted materials (20%)	106,800	-22%
Scenario 3	Textile (40%), plastic waste (40%), remaining targeted materials (20%)	99,800	-27%
Scenario 4	All materials (28%)	99,000	-28%

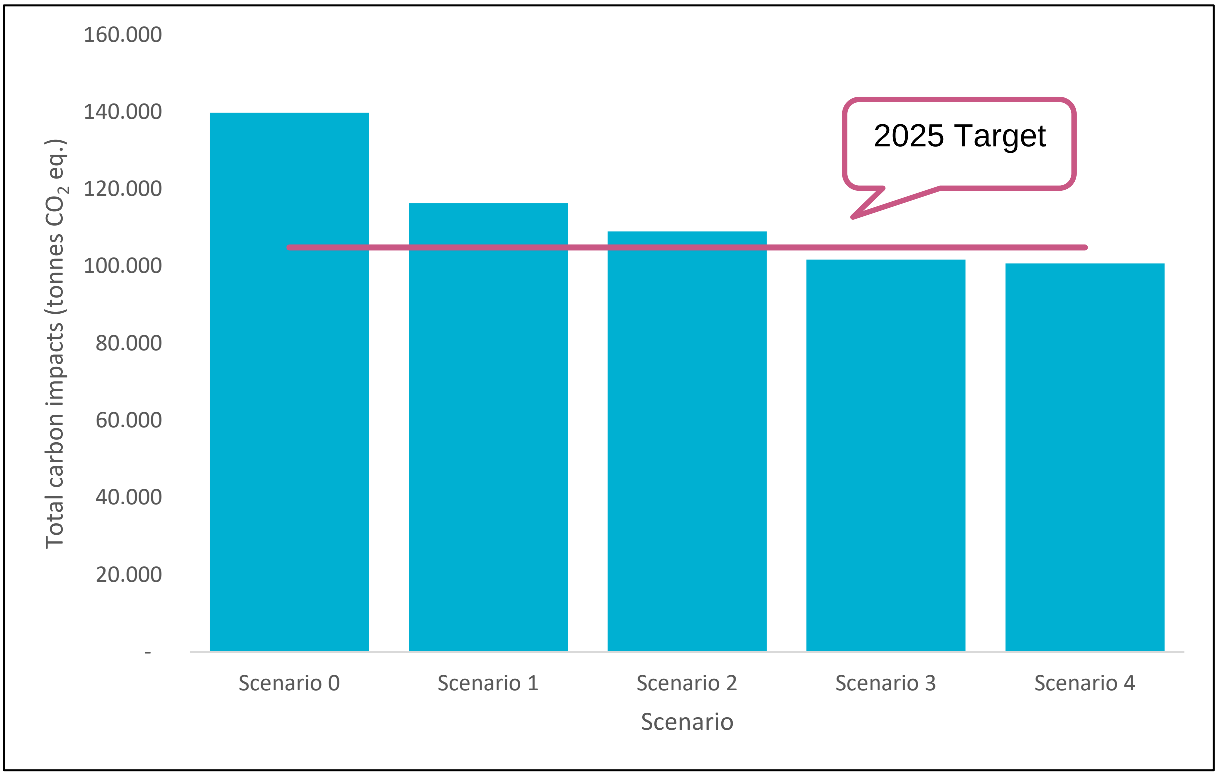


Figure 14 Results of the scenario analysis.

Results, presented in Figure 14, suggest Odense can meet the 2025 carbon reduction target by adopting one of the following strategies:

1. Reduce the amount of textile and plastic waste generated by 40%, and other targeted waste materials (i.e., food, paper and cardboard, and mixed metals) by 20%; or
2. Introduce a waste reduction target of 28% for **all** materials.

It is worth mentioning that our analysis is based on waste reduction strategies without considering any improvements in recycling activities (diverting materials from incineration to recycling). What's more, we only looked at a number of scenarios that prioritise waste reduction over improvements in waste disposal and treatment activities. Odense seems to have a great opportunity to increase re-use or recycling rates, in particular for food, plastics and textile. Our analysis shows that significant portions of residual waste are not fully categorised to specific waste categories. Understanding tonnages reported here and working on diverting them from incineration ultimately lead to high carbon savings.

It is also important to note that the benefits associated with incineration heavily depend on the energy substituted thanks to the energy recovered from waste. Should this energy mix be progressively decarbonised, the associated savings with energy recovery through waste incineration would also decrease. This has also to be taken into consideration when investigating reduction potentials.

The carbon analysis can be further refined and improved with the availability of more granular datasets, in particular the difficulty to allocate uncategorised household and similar waste (~ 18,000 tonnes) into material specific categories. Zero Waste Scotland analysis team used data provided by Odense team as a primary source to develop Odense's bespoke carbon factors. Data gaps are covered using default assumptions based on the Scottish Carbon Metric[9] and a similar analysis carried out for other ACR+ members.

It is also strongly recommended to undertake further work to gather Odense's specific granular data, in particular understanding the 19% of residual waste currently assigned to household and similar waste. This will help the analysis team to develop bespoke carbon factors to accurately quantify the carbon impacts of waste generated and managed in the city. Textile and food wastes are carbon intensive categories so it would be key to know the type of materials captured here (e.g., natural vs synthetic textile fibre and meat and vegetables). These subcategories vary largely when it comes to carbon, in particular difference between meat and plant-based food waste so it would be crucial to consider these differences when estimated embodied carbon impacts.

Conclusion

The 2018 carbon impacts of municipal waste in Odense are assessed by the Carbon Metric at **nearly 140,000 tonnes of carbon dioxide equivalent (tCO_2eq**.), **or 0.7 tCO_2eq./capita**.

To achieve a 25% reduction by 2025 as part of the ACR+ 'More Circularity Less Carbon' campaign, the city must reduce its waste carbon impacts by approximately 35,000 tCO_2eq, to a total of 105,000 tCO_2eq.

A number of scenarios, that focus on waste prevention measures, have been investigated in this report to explore pathways for Odense to achieve the 2025 target. It is important to highlight that the -25% scenarios require very ambitious waste reduction targets, both on food waste (e.g. through the reduction of food losses and waste) and textiles (through prevention and re-use activities).

Follow-up activities might include further investigation on the actual composition of carbon intensive materials as discussed previously and current management routes of the five targeted materials, as well as the identification of actions and policies that could contribute to reach the aforementioned reduction targets. A comparison with the analysis carried out for the other participants to the MCLC campaign will help to put the figures obtained in perspective.

[9] Zero Waste Scotland (2020) The Carbon Footprint of Scotland's Waste Technical Report [Online]. Available at: www.zerowastescotland.org.uk/

Appendices

Appendix 1 Total amount of waste generated in Odense (2018). Unit: tonnes

Waste category	Generated	Recycled	Incinerated	Landfilled
Acid, alkaline or saline wastes	38	8	30	1
Food waste	19,855	226	19,629	0
Animal faeces, urine and manure	0	0	0	0
Batteries wastes	86	29	56	1
Chemical wastes	472	0	472	0
Combustion wastes	0	0	0	0
Common sludges	0	0	0	0
Discarded electronic equipment	2,119	1,451	461	207
Discarded vehicles	0	0	0	0
Dredging spoils	0	0	0	0
Glass wastes	5,829	3,930	1,462	437
Health care and biological wastes	0	0	0	0
Household and similar wastes	18,179	364	17,809	7
Industrial effluent sludges	0	0	0	0
Ferrous wastes	0	0	0	0
Mixed ferrous and non-ferrous wastes	5,163	3,672	1,491	0
Non-ferrous wastes	0	0	0	0
Mineral waste from C&D	16,309	15,535	10	764
Mineral wastes from waste treatment and stabilised wastes	0	0	0	0
Mixed and undifferentiated materials	1,828	0	1,828	0
Other mineral wastes	3,929	0	0	3,929
Paper and cardboard wastes	14,147	8,059	6,088	0
Plastic wastes	9,275	877	8,313	85
Rubber wastes	110	66	44	0
Sludges and liquid wastes from waste treatment	0	0	0	0
Soils	9,920	8,698	0	1,223
Sorting residues	0	0	0	0
Spent solvents	76	15	60	2
Textile wastes	2,048	381	1,667	0
Used oils	96	19	74	2
Garden wastes	22,026	21,557	29	440
Waste containing PCB	0	0	0	0
Wood wastes	7,621	4,373	3,248	0
Grand Total	**139,126**	**69,259**	**62,770**	**7,097**

Appendix 2 Whole-life carbon impacts of waste generated in Odense (2018). Unit: tonne CO_2 eq.

Waste category	Generated	Recycled	Incinerated	Landfilled
Acid, alkaline or saline wastes	77	-5	66	0
Food waste	34,614	-62	-5,003	0
Animal faeces, urine and manure	0	0	0	0
Batteries wastes	521	-65	21	0
Chemical wastes	547	0	-346	0
Combustion wastes	0	0	0	0
Common sludges	0	0	0	0
Discarded electronic equipment	9,880	-3,580	-252	7
Discarded vehicles	0	0	0	0
Dredging spoils	0	0	0	0
Glass wastes	5,478	-3,435	41	6
Health care and biological wastes	0	0	0	0
Household and similar wastes	39,518	-812	-33,089	4
Industrial effluent sludges	0	0	0	0
Ferrous wastes	0	0	0	0
Mixed ferrous and non-ferrous wastes	26,292	-16,196	-1,109	0
Non-ferrous wastes	0	0	0	0
Mineral waste from C&D	5,965	-851	0	6
Mineral wastes from waste treatment and stabilised wastes	0	0	0	0
Mixed and undifferentiated materials	4,922	0	-3,388	0
Other mineral wastes	0	0	0	0
Paper and cardboard wastes	13,046	-754	-5,683	0
Plastic wastes	30,500	-937	722	1
Rubber wastes	303	-85	-10	0
Sludges and liquid wastes from waste treatment	0	0	0	0
Soils	115	13	0	26
Sorting residues	0	0	0	0
Spent solvents	74	-11	115	0
Textile wastes	42,019	-2,029	-721	0
Used oils	116	-13	4	0
Garden wastes	0	785	-12	268
Waste containing PCB	0	0	0	0
Wood wastes	5,319	-2,812	-3,476	0
Grand Total	**219,305**	**-30,849**	**-52,121**	**318**

Appendix 3 Carbon factors for of household waste generated in Odense (2018). Unit: tonne CO_2 eq. per tonne of waste.

Waste category	Generated	Recycled	Incinerated	Landfilled
Acid, alkaline or saline wastes	2.01	-0.70	2.20	0.00
Food waste	1.74	-0.27	-0.25	0.64
Animal faeces, urine and manure	0.00	0.00	0.00	0.00
Batteries wastes	6.04	-2.27	0.36	0.09
Chemical wastes	1.16	4.20	-0.73	0.11
Combustion wastes	0.00	0.00	0.00	0.01
Common sludges	0.00	0.00	0.00	0.00
Discarded electronic equipment	4.66	-2.47	-0.55	0.03
Discarded vehicles	6.57	-2.24	0.00	0.00
Dredging spoils	0.00	0.00	0.00	0.00
Glass wastes	0.94	-0.87	0.03	0.01
Health care and biological wastes	2.03	0.00	-0.20	0.62
Household and similar wastes	2.17	-2.23	-1.86	0.63
Industrial effluent sludges	0.00	0.00	0.00	0.00
Ferrous wastes	4.49	-3.81	-0.73	0.02
Mixed ferrous and non-ferrous wastes	5.09	-4.41	-0.74	0.02
Non-ferrous wastes	10.01	-8.22	-2.32	0.02
Mineral waste from C&D	0.37	-0.05	0.03	0.01
Mineral wastes from waste treatment and stabilised wastes	0.00	0.00	0.00	0.00
Mixed and undifferentiated materials	2.69	0.46	-1.85	0.67
Other mineral wastes	0.00	0.00	0.00	0.00
Paper and cardboard wastes	0.92	-0.09	-0.93	1.06
Plastic wastes	3.29	-1.07	0.09	0.01
Rubber wastes	2.76	-1.28	-0.22	0.01
Sludges and liquid wastes from waste treatment	0.00	0.00	0.00	0.00
Soils	0.01	0.00	0.00	0.02
Sorting residues	0.00	0.00	-0.22	0.57
Spent solvents	0.97	-0.70	1.92	0.00
Textile wastes	20.52	-5.32	-0.43	0.63
Used oils	1.22	-0.70	0.05	0.00
Garden wastes	0.00	0.04	-0.40	0.61
Waste containing PCB	0.00	0.00	0.00	0.00
Wood wastes	0.70	-0.64	-1.07	0.83

-25%
BY 2025

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