MORE CIRCULARITY
LESS CARBON
-25% BY 2025

THE CARBON FOOTPRINT OF WASTE

PAYS DE LA LOIRE

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: Carbon Metric International – ZWS & ACR+ partnership

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Disclaimer:

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ACR+ 'MORE CIRCULARITY LESS CARBON' CAMPAIGN

The ACR+ has partnered with its member Zero Waste Scotland to launch the 'More Circularity Less Carbon' 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.

Pays de la Loire is the first ACR+ member to use the CMI to quantify the whole-life carbon impacts of its municipal waste, along with the Brussels Region and the city of Genova. The results are summarised in this report, which has three main objectives:

1. Enable Pays de la Loire 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 Pays de la Loire 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."

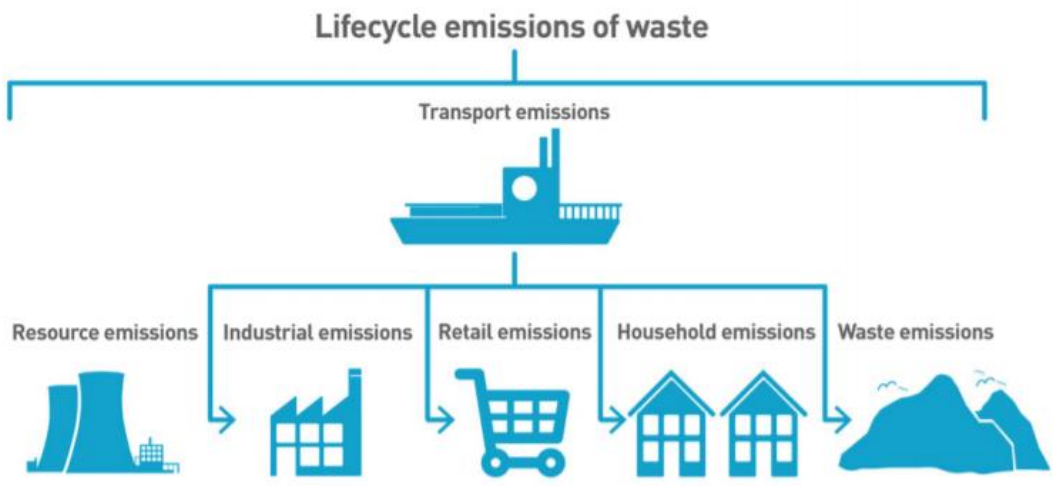


Figure 1 **Schematic diagram presenting the lifecycle emissions of waste.**

The Carbon Metric provides policy makers 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 could be adapted to Pays de la Loire's data thanks to the collaborative work between Zero waste Scotland and ACR+.

METHOD & DATA SOURCE

The whole-life carbon impacts of **municipal waste** in Pays de la Loire were quantified in this report, based on 2015 data Commercial and industrial waste could not be included due to a time constraint and a lower availability of data.

Stages covered in the analysis as follow:

- **Waste generated:** all waste that directly arises from households in Pays de la Loire during the reporting year (i.e., 2015). 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 recycled (or reused) materials 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.

More information on waste data used in the analysis, assumptions with regards to waste management operations in Pays de la Loire, and its limitations can be found in Appendix 1.

ABOUT PAYS DE LA LOIRE

Pays de la Loire is one of the 13 metropolitan French regions, located in the western part of the country. It encompasses about 3.76 million inhabitants, in 1,238 communes, and has a density of 117 in./km². There are several medium to big cities, such as Nantes, Angers, or Le Mans.

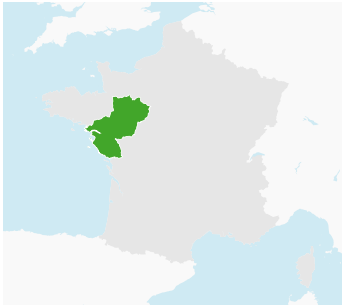


Figure 2 Location of Pays de la Loire

[1] Scottish Government (2016) Making Things Last
[2] https://www.zerowastescotland.org.uk/our-work/carbon-metric-publications

Figure 3 Logo of Pays de la Loire

The Region approved a new waste strategy in 2019, which included a state-of-the-art of the waste situation based on the year 2015. About 2,2 million tonnes of municipal waste was collected, about half of it via door-to-door and bring bank schemes, and the other half in civic amenity sites or specific collection schemes.

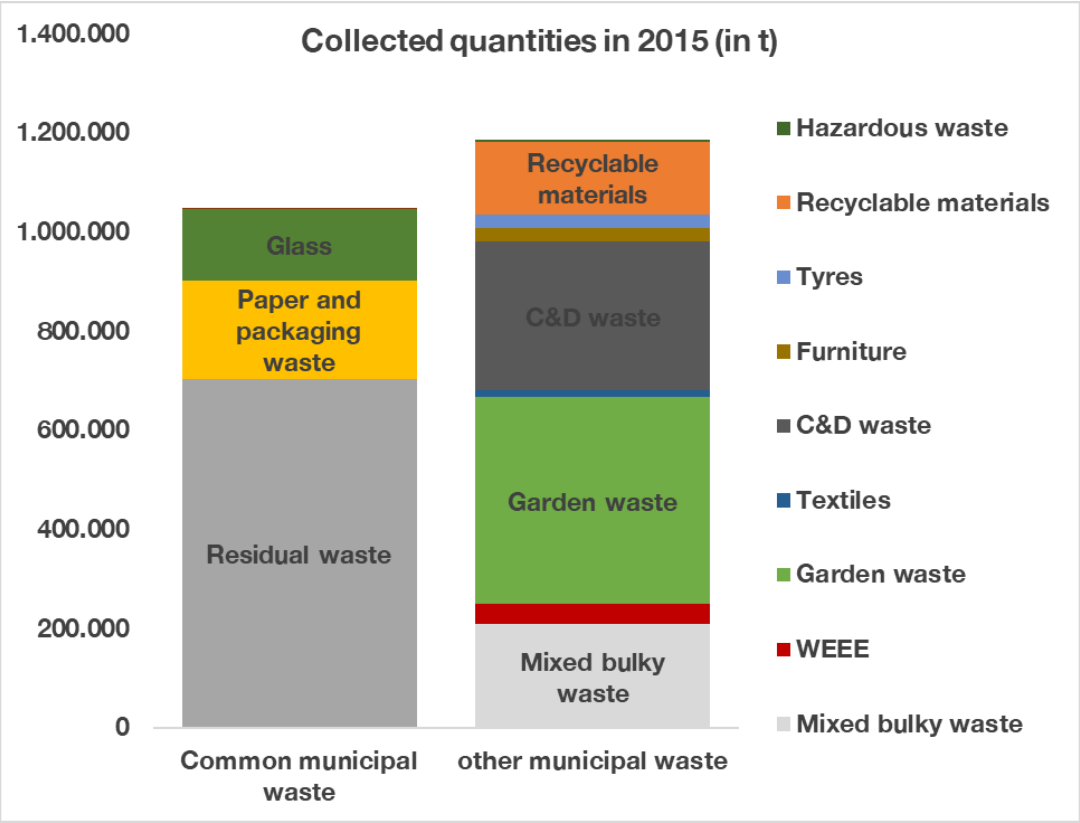


Figure 4 Collected quantities in Pays de la Loire in 2015 (in tonnes)

Common municipal waste	Waste collected in tonnes	Other municipal waste	Waste collected in tonnes (% of total)
Residual waste	704,570	Mixed bulky waste	209,790
Paper and packaging waste	196,970	Garden waste	418,090
Glass	146,340	C&D waste	299,630
Food waste	1,180	Recyclable materials	146,255
		WEEE	39,790
		Furniture	28,330
		Textiles	13,380
		Hazardous waste	4,890
		Tyres	27,640

Tableau 1 Collected quantities in Pays de la Loire, 2015 (in tonnes)

The region encompasses several sorting and treatment plants processing municipal waste:

- 5 mechanical-biological treatment plants where the sorted organic fraction is composted
- 20 landfilling sites, among which 8 received municipal residual waste;
- 5 incinerators with energy recovery;
- 14 sorting centres for paper and packaging waste;
- 39 composting units (mostly for garden waste).

There are other waste treatment units (e.g. anaerobic digestion plants treating non-municipal waste, and hazardous waste treatment plants).

The final destination of municipal waste is presented on the following graph:

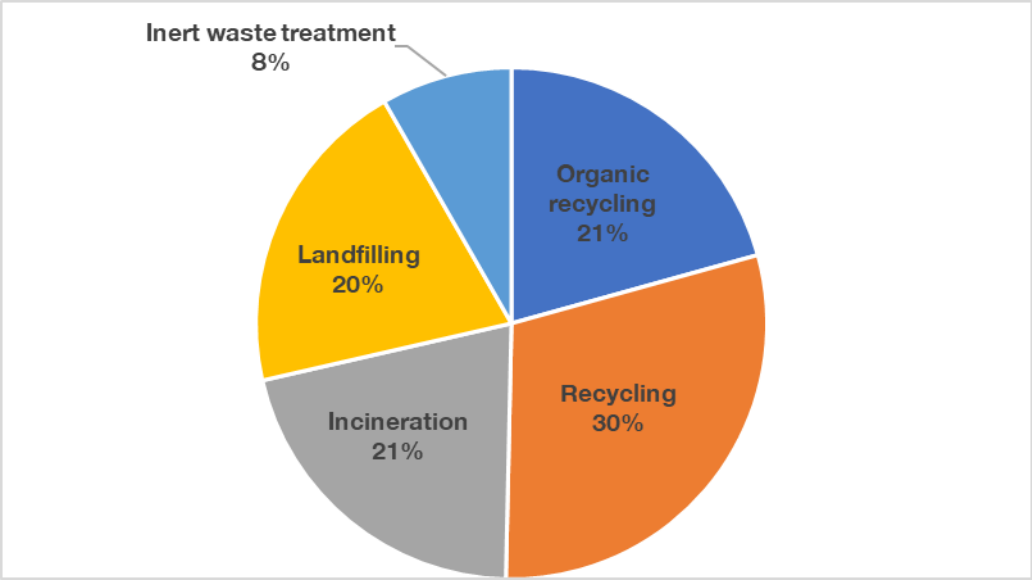


Figure 5 Final destination of municipal waste in 2015

RESULTS

5.1 Key findings

The carbon impacts of municipal waste in Pays de la Loire in 2015 were 4 million tonnes of carbon dioxide equivalent (Mt CO_2eq.), or 1.1 tonnes CO_2eq./capita. Figure 6 shows that carbon saved through recycling was higher than carbon impacts of waste disposal (landfilling and incineration), meaning waste management activities (i.e., collection, treatment, and disposal) in Pays de la Loire is carbon negative. 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 6) are deemed to be the highest contributor to the net carbon impacts of waste generated in Pays de la Loire which results in a waste carbon intensity of 2.28 tCO_2eq./tonne of waste. This observation confirms the importance of waste prevention and moving up the waste hierarchy to prevent materials from being classified as waste in the first place.

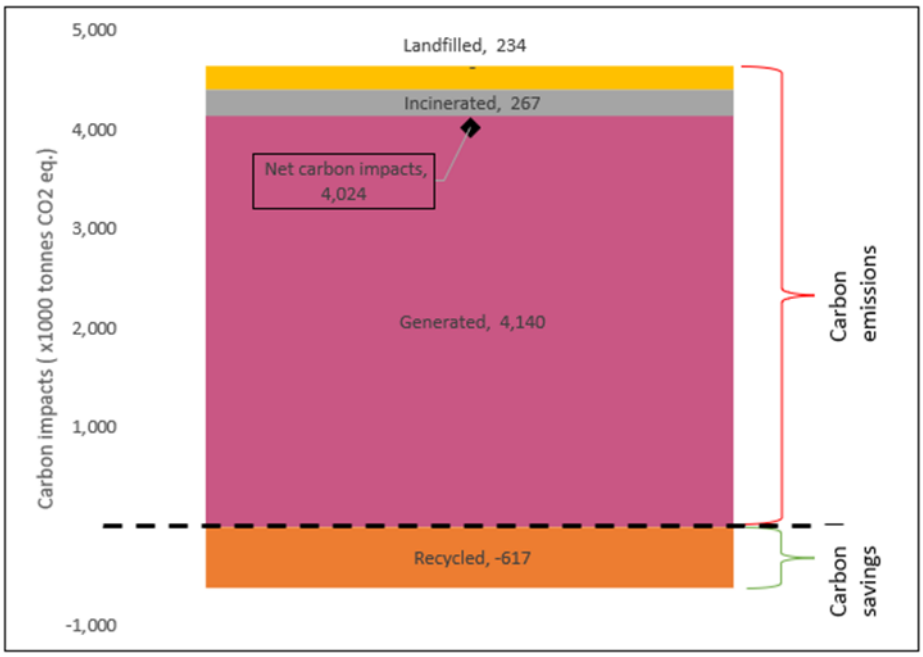


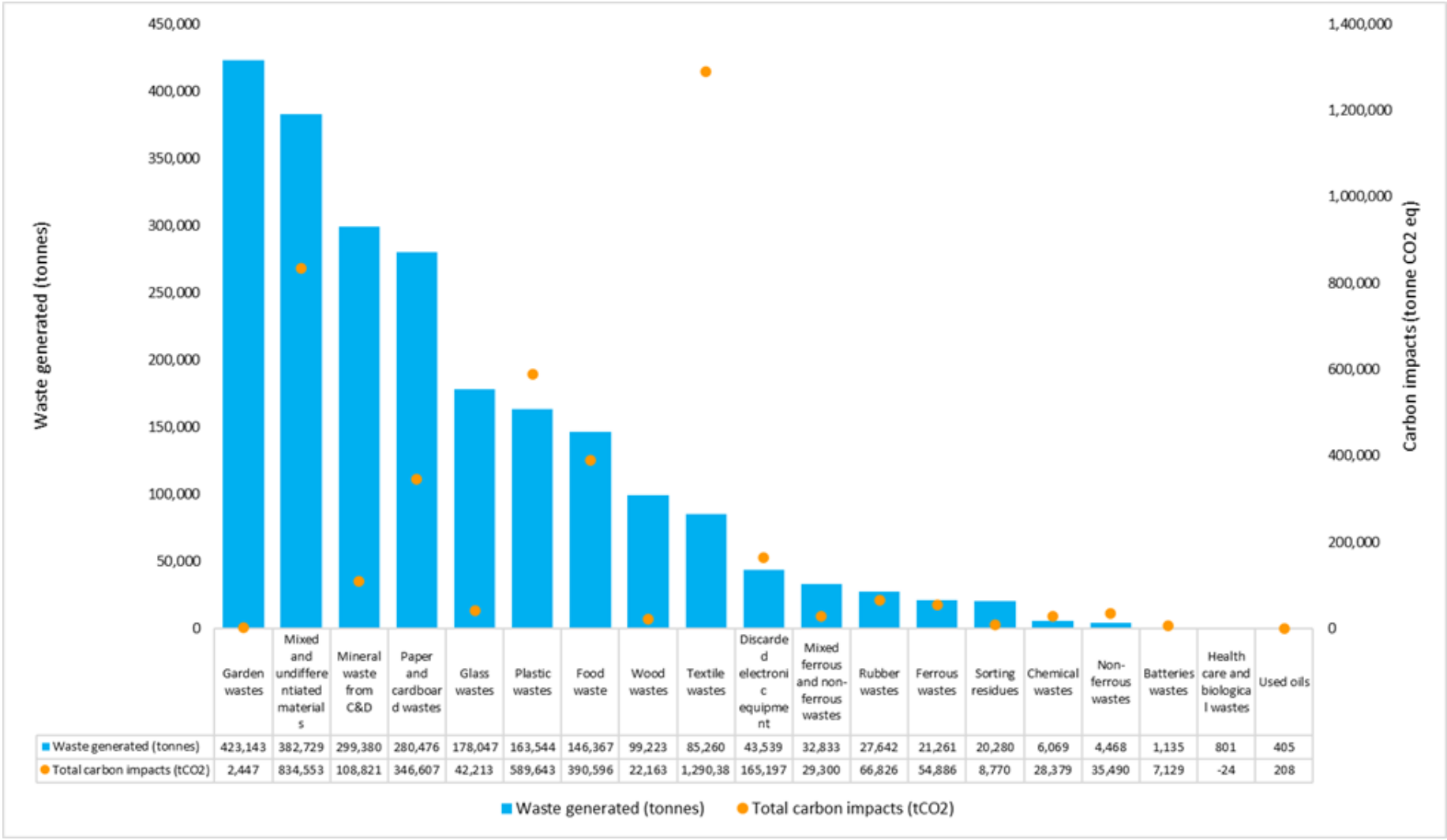
Figure 6 Breakdown of whole-life carbon impacts of waste by stage.

Figure 7 shows that the amount of waste generated by each waste category and their associated carbon impacts. Each different category does not refer to one single stream, but rather to a given waste fraction that can be managed via different collection schemes and encompassed in multiple waste streams (e.g. garden waste collected in civic amenity sites, collected door-to-door, or improperly discarded in residual waste and sent to disposal).

The waste “mixed and undifferentiated materials” mostly refers to mixed bulky waste (either collected in civic amenity sites or on the kerbside), as well as undifferentiated materials included in residual waste. It includes most likely several mixed materials such as cardboard, plastics, etc. that are sent to disposal.

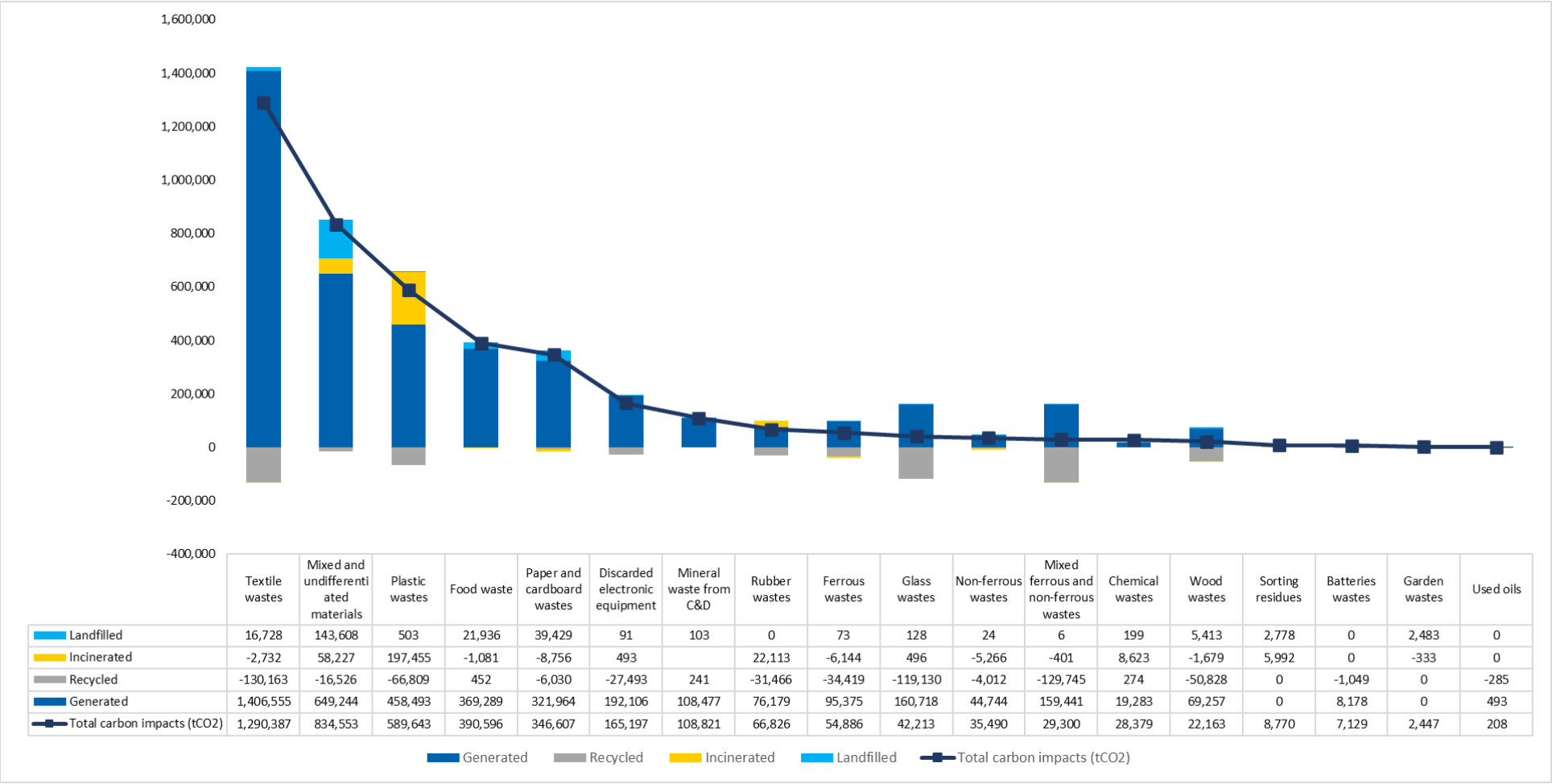
The chart shows that textile waste is responsible for substantially high carbon burden when compared to the amount of waste generated. The majority of these impacts is attributed to the production of materials (i.e., embodied impacts) in the first place (Figure 8). On the other hand, other waste categories, such as plastics, report high carbon impacts because the majority of waste captured is either incinerated or landfilled as shown in Figure 9.

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. For example, the analysis shows that improving recycling rates for food and plastic waste will have result in significant carbon savings. Textile and paper wastes offer similar large-scale carbon saving opportunities.



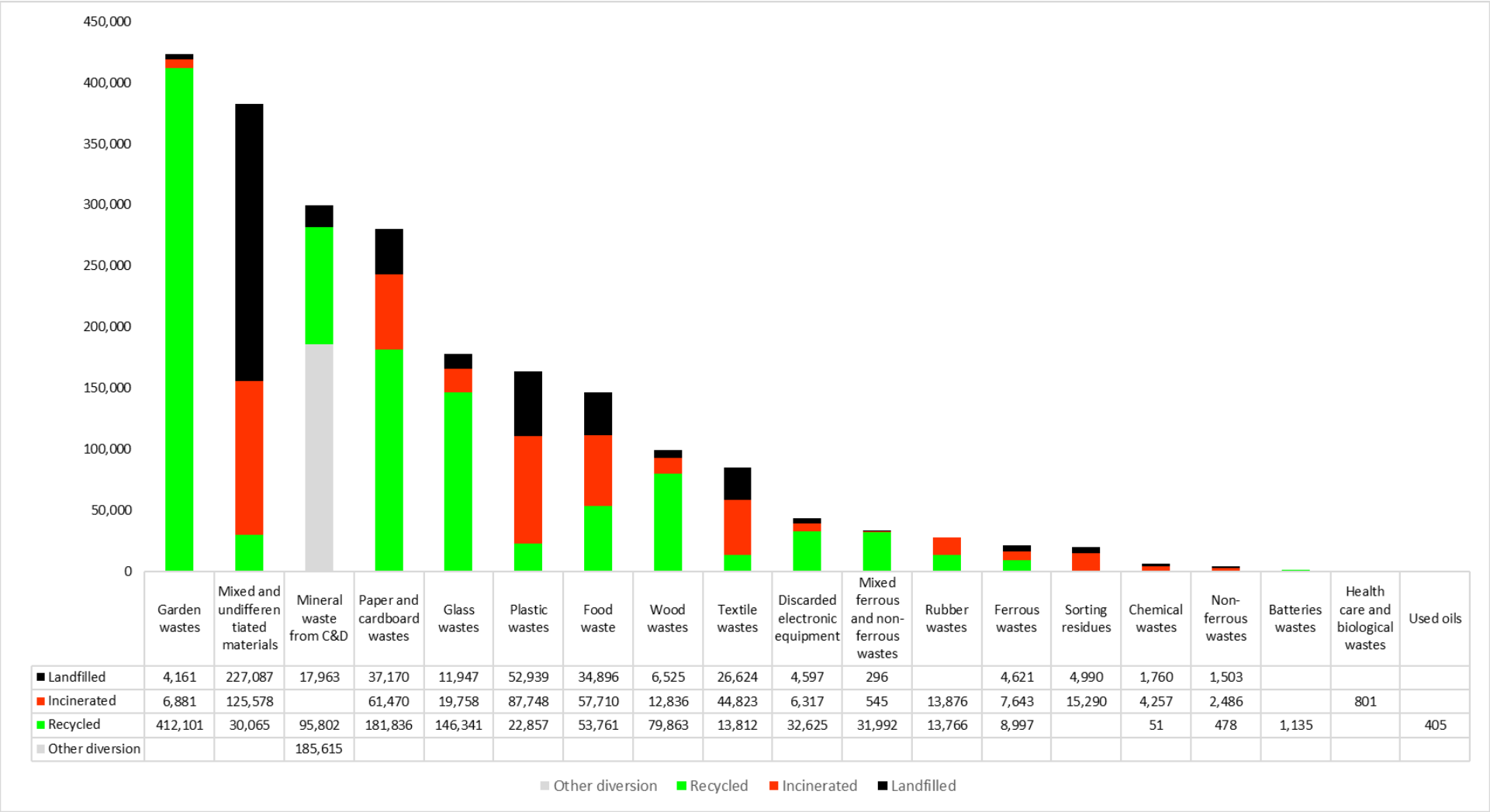
	Garden wastes	Mixed and undifferentiated materials	Mineral waste from C&D	Paper and cardboard wastes	Glass wastes	Plastic wastes	Food waste	Wood wastes	Textile wastes	Discarded electronic equipment	Mixed ferrous and non-ferrous wastes	Rubber wastes	Ferrous wastes	Sorting residues	Chemical wastes	Non-ferrous wastes	Batteries wastes	Health care and biological wastes	Used oils
Waste generated (tonnes)	423,143	382,729	299,380	280,476	178,047	163,544	146,367	99,223	85,260	43,539	32,833	27,642	21,261	20,280	6,069	4,468	1,135	801	405
Total carbon impacts (tCO2)	2,447	834,553	108,821	346,607	42,213	589,643	390,596	22,163	1,290,38	165,197	29,300	66,826	54,886	8,770	28,379	35,490	7,129	-24	208

Figure 7 Weight vs carbon impacts of waste in Pays De la Loire.



	Textile wastes	Mixed and undifferentiated materials	Plastic wastes	Food waste	Paper and cardboard wastes	Discarded electronic equipment	Mineral waste from C&D	Rubber wastes	Ferrous wastes	Glass wastes	Non-ferrous wastes	Mixed ferrous and non-ferrous wastes	Chemical wastes	Wood wastes	Sorting residues	Batteries wastes	Garden wastes	Used oils
Landfilled	16,728	143,608	503	21,936	39,429	91	103	0	73	128	24	6	199	5,413	2,778	0	2,483	0
Incinerated	-2,732	58,227	197,455	-1,081	-8,756	493		22,113	-6,144	496	-5,266	-401	8,623	-1,679	5,992	0	-333	0
Recycled	-130,163	-16,526	-66,809	452	-6,030	-27,493	241	-31,466	-34,419	-119,130	-4,012	-129,745	274	-50,828	0	-1,049	0	-285
Generated	1,406,555	649,244	458,493	369,289	321,964	192,106	108,477	76,179	95,375	160,718	44,744	159,441	19,283	69,257	0	8,178	0	493
Total carbon impacts (tCO2)	1,290,387	834,553	589,643	390,596	346,607	165,197	108,821	66,826	54,886	42,213	35,490	29,300	28,379	22,163	8,770	7,129	2,447	208

Figure 8 Whole-life carbon impacts of waste by management route. Mixed and undifferentiated materials = Mixed bulky waste collected on kerbside or in HWRC (58%), and Undefined in residual waste (combustible, incombustible, fine elements) (42%). Sorting residues = Sorting residues from MRFs.



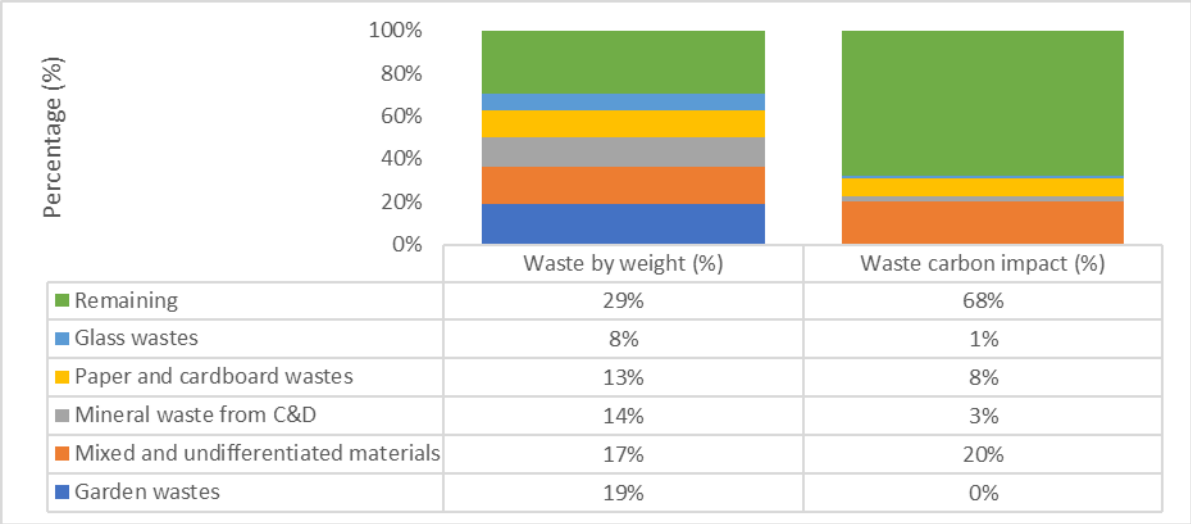
	Garden wastes	Mixed and undifferentiated materials	Mineral waste from C&D	Paper and cardboard wastes	Glass wastes	Plastic wastes	Food waste	Wood wastes	Textile wastes	Discarded electronic equipment	Mixed ferrous and non-ferrous wastes	Rubber wastes	Ferrous wastes	Sorting residues	Chemical wastes	Non-ferrous wastes	Batteries wastes	Health care and biological wastes	Used oils
Landfilled	4,161	227,087	17,963	37,170	11,947	52,939	34,896	6,525	26,624	4,597	296		4,621	4,990	1,760	1,503			
Incinerated	6,881	125,578		61,470	19,758	87,748	57,710	12,836	44,823	6,317	545	13,876	7,643	15,290	4,257	2,486		801	
Recycled	412,101	30,065	95,802	181,836	146,341	22,857	53,761	79,863	13,812	32,625	31,992	13,766	8,997		51	478	1,135		405
Other diversion			185,615																

Figure 9 Total tonnages of waste in Pays de la Loire in 2015 by management route. Mixed and undifferentiated materials = Mixed bulky waste collected on kerbside or in HWRC (58%), and Undefined in residual waste (combustible, incombustible, fine elements) (42%). Sorting residues = Sorting residues from MRFs.

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

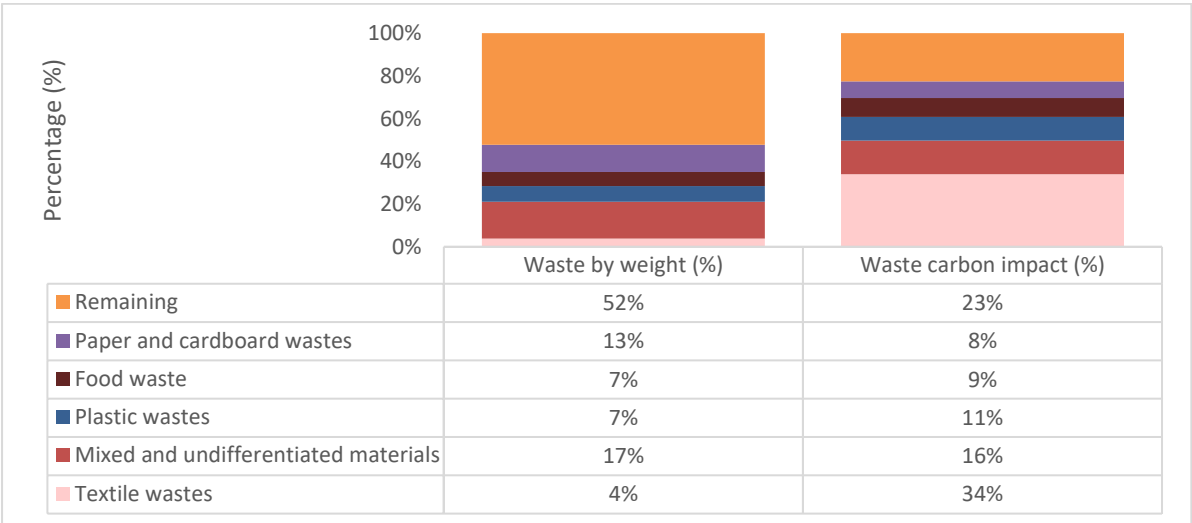
Many of the high tonnage materials in Pays de la Loire's waste stream have relatively low carbon impacts. To achieve the 2025 carbon savings target, focus should be placed on the most carbon intensive waste materials, such as food waste and textiles.

The top five waste materials by weight in 2015 accounted for 71% of Pays de la Loire's waste, but only 32% of its waste carbon impacts (Figure 10). On the other hand, the top five most carbon intensive waste materials accounted for just 48% of the total weight, but 77% of waste carbon impacts (Figure 11). The waste category with the single greatest carbon impact is textile waste, which accounted for 4% of waste by weight but 34% of waste carbon impacts. Other carbon-intensive materials identified are plastic wastes, food wastes, and paper & cardboard wastes.



	Waste by weight (%)	Waste carbon impact (%)
Remaining	29%	68%
Glass wastes	8%	1%
Paper and cardboard wastes	13%	8%
Mineral waste from C&D	14%	3%
Mixed and undifferentiated materials	17%	20%
Garden wastes	19%	0%

Figure 10 **Top five waste materials by weight and their associated carbon impacts.**



	Waste by weight (%)	Waste carbon impact (%)
Remaining	52%	23%
Paper and cardboard wastes	13%	8%
Food waste	7%	9%
Plastic wastes	7%	11%
Mixed and undifferentiated materials	17%	16%
Textile wastes	4%	34%

Figure 11 **Top five waste materials by carbon impacts and their associated weight.**

5.3 Scenario analysis

Pays de la Loire must reduce its waste carbon impacts by approximately 1 $MtCO_2eq.$, to a total 3 $MtCO_2e$ by 2025, in order to achieve the 25% ACR+ target. Analysis was carried out to investigate scenarios which Pays de la Loire might use to accomplish this.

Due to its high recycling rate, particularly for carbon intensive materials, the carbon impacts of waste management in Pays de la Loire are already low (see Figure 6), and thus offer limited additional carbon savings opportunities. When it comes to waste management, the main potentials seem to be on plastic waste and mixed and undifferentiated waste, for which it might be interesting to improve recycling and limit incineration and landfilling.

For this reason, scenarios considered in this analysis focus on reducing waste across the following carbon-intensive materials:

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

Table 1 lists scenarios considered in this analysis and their results, also presented in Figure 12.

Table 1 Summary of the scenario analysis results.

Scenario number	Description	Total carbon impacts (tonnes $CO_2eq.$)
Scenario 0	Business as usual	4,023,590
Scenario 1	Targeted materials - 20% reduction	3,327,400
Scenario 2	Textile (30%), food waste (30%), remaining target materials (20%)	3,159,300
Scenario 3	Textile (40%), food waste (40%), remaining target materials (20%)	2,991,200
Scenario 4	All materials (25%)	3,017,693

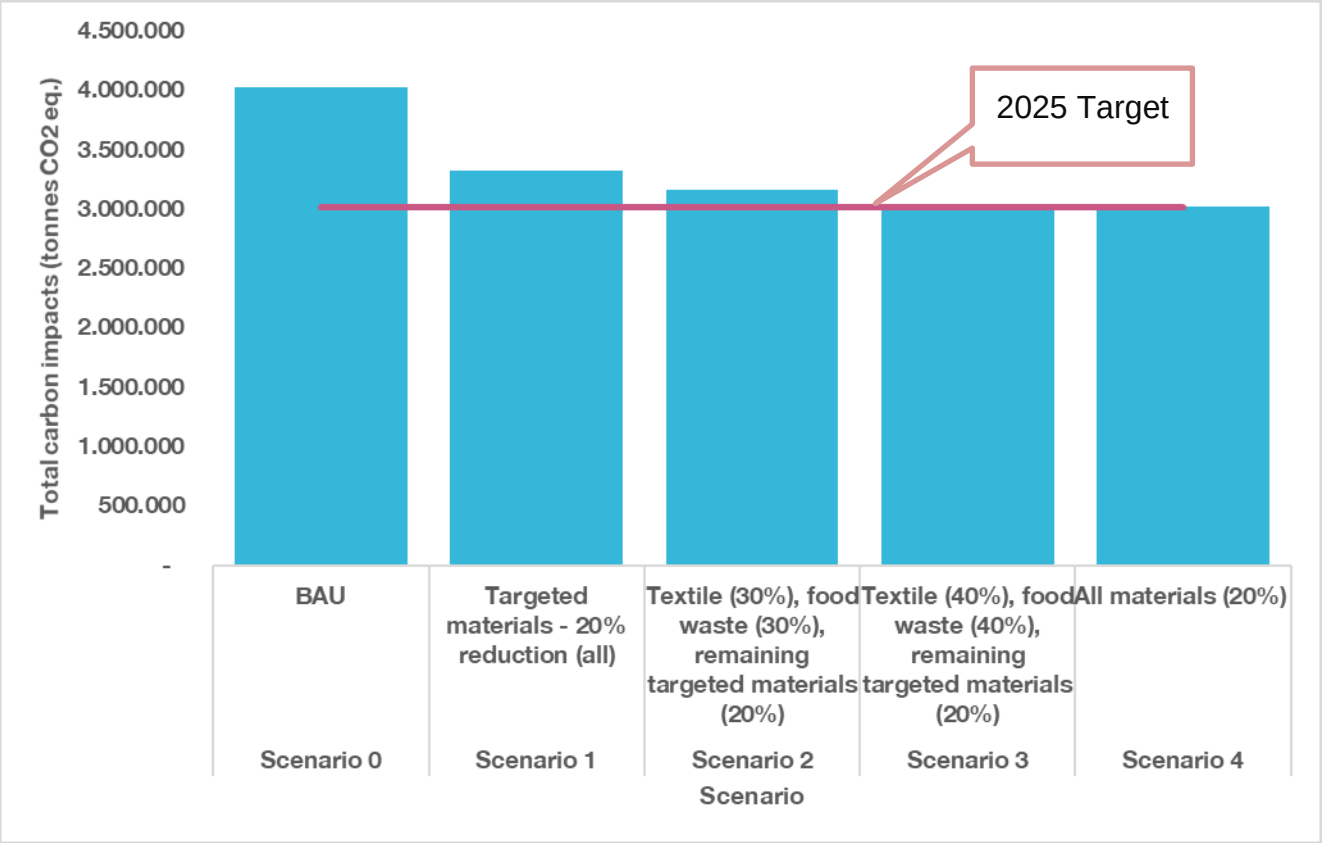


Figure 12 Results of the scenario analysis.

Results, presented in Figure 12, suggest that Pays de la Loire can meet the 2025 carbon reduction target by adopting one of the following strategies:

1. Commit to a number of waste reduction and re-use targets: 40% for textile and food wastes, and 20% for other targeted materials (i.e., plastics, paper and cardboard, mixed metals, and mixed and undifferentiated materials); or
2. Introduce a waste reduction target of 20% for **all** materials.

It worth mentioning that our analysis is based on waste reduction strategies without considering any improvements in recycling activities (diverting materials from landfilling and 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. For example, Pays de la Loire might consider investigating the benefits of capturing 90% of food, 80% plastic, and 80%paper waste for recycling. All data required to undertake such an analysis is provided in Appendix 2&3.

In any case, reducing the carbon impact by 25% require very significant efforts regarding waste prevention and re-use.

The paucity of data has led to a number of general assumptions to be used when estimating the carbon factors of high-carbon materials and hence we expect the level of uncertainty to be significant. There are some uncertainties on the composition of mixed waste fractions (e.g. residual waste, mixed bulky waste, etc.) or on the outcomes of sorted fractions, for

which further investigation and research could contribute to make the carbon impact assessment more accurate. It is also strongly recommended to undertake further work to gather granular data, in particular for high-carbon materials. For instance, it seems that the effort on plastic waste should focus on plastic packaging, considering that it is the most significant fraction. This should allow to identify more precise actions to reach the different actions.

Finally, identifying key actions and instruments focusing on the highlighted fractions, along with benchmarking information regarding the potential for waste reduction, seems to be a relevant next step to translate the 25% target into more operational, resource-related objectives.

CONCLUSION

The 2015 carbon impacts of municipal waste in Pays de la Loire are assessed by the Carbon Metric at 4 million tonnes of carbon dioxide equivalent, or 1.1 tCO_2eq./capita. To achieve a 25% reduction by 2025 as part of the ACR+ 'More Circularity Less Carbon' campaign, the region must reduce total waste carbon impacts by approximately 1 million tonnes CO_2eq..Although the carbon reduction target seems difficult to achieve, it worth mentioning that it is based on 2015 and it could be that good progress has been made already in reducing waste and consequently carbon impacts of waste. For example, France adopted Law n°2015-992 on Energy Transition for Green Growth (LTECV) that sets up transition towards a circular economy as a national objective, and as one of the pillars of sustainable development[3]. This law sets the following objectives:

- 10% decrease of household wastes produced by 2020;
- 55% recycling rate of non-hazardous waste by 2020 and 65% by 2025;
- 70% recovery of construction and public work wastes by 2020; and
- 50 % decrease in the quantities of wastes accepted for landfilling by 2025.

Achieving the LTECV's targets is highly likely to lead to substantial reduction in carbon impact. **If Pays de la Loire to introduce further measures to reduce the carbon impacts of waste, it is highly recommended to consider introducing upstream measures that focus on waste prevention and addressing consumption by inhabitants, but also by small commercial activities, particular in high-carbon materials, as well as downstream interventions to divert materials from conventional waste disposal routes and increase recycling.** Investigating measures allowing to address the impact of production (of products or food) at regional level could also be relevant.

A number of scenarios, that focus on waste prevention measures, have been investigated in this report to explore pathways for Pays de la Loire to achieve the 2025 target.

Another option Pays de la Loire could consider is to set their 2025 carbon target in per capita bases to avoid any unexpected consequences due to the rapid population growth.

[3] Pays de la Loire Regional Council (2015) PAYS DE LA LOIRE BIO-BASED CIRCULAR ECONOMY ACTION PLAN [Online]

APPENDICES

Appendix 1 Waste Data: sources and limitations

Waste data

The main source of information for Pays de la Loire municipal waste data is the 2019 « state of the art » report published for the new Regional Waste Strategy. It includes most available data on municipal, industrial and commercial, and construction and demolition waste in the Region, taking 2015 as the reference year. Considering the many uncertainties and gaps concerning non-municipal waste (which are quite common at regional level in France), it was decided to focus on municipal waste. The report includes most of the required data when it comes to collected quantities, as well as for treatment routes.

These data were completed with further information collected in SINOE, an online database managed by ADEME (the French Environmental Agency), including further information on treatment plants and data on sorted packaging waste from the EPR system. These data were used to break down the quantities of co-mingled paper and packaging waste into the different material fractions sorted in the different sorting centres (and assess the quantities of sorting impurities).

There is no available regional data when it comes to the composition of residual waste, therefore the data from the latest national composition analysis was used and applied to the residual waste quantities.

The same approach was used for the waste stream of “furniture”: data on the composition of materials reported by the national EPR organisation Eco-mobilier was used, and a standard composition for mattress was also used to break down the quantities into materials (e.g. textiles, foam, metal, etc.). The data reported by the EPR system were also used for the distribution of furniture waste into the different treatment categories (recycling, incineration, landfilling).

These different data were used to allocate these different waste streams into the categories used by the Carbon Metric tool. The following waste streams were used:

- Residual waste
- Dry residual waste collection
- Food waste collection
- Mixed bulky waste (in CAS and d2d)
- Civic amenity sites: sorted fractions (excl. EPR schemes)
- EPR schemes

Life cycle assessment – modelling data

This step consists in documenting various information to “convert” the quantities of waste into carbon impacts, for different aspects:

- The impacts linked with their “generation”, e.g. the impacts generated by the extraction of resource and manufacturing of the products that then became waste: it

includes the composition of the waste category, and the transport distances associated with these products;
- The impacts linked with the different collection routes: recycling, incineration, and landfilling. It includes the different treatment routes and associated allocations, the list of treatment units, and the recovered materials, and the associated distances.

This step proved to be more challenging as little regional data is available for several aspects:

- The composition of most waste fraction is not available at regional level. National data were mostly used;
- Transport distances of waste are not available at regional level. Again, national average distances were used for collection and transport from sorting centres or transfer stations to recycling units;
- The outcome and destination of sorted materials were not documented. Again, national figures were used.

Several sources of information were used to assess the data for the different waste fractions:

- National reports from various EPR schemes (WEEE, furniture, hazardous waste, healthcare waste, textiles, etc.): it provided data on composition and final destination;
- Several studies on environmental/carbon impact of e.g. recycling or food, for instance:
    - FEDEREC's 2017 report on the environmental impact of recycling in (French federation of recycling industry): it includes average data for transport, loss rates, and recycling routes for several material fractions;
    - ADEME's 2019 report on food carbon footprint, which provides data on the composition of food, its origins, and associated transport distances[5]

For several waste fractions, no data could be retrieved for either the composition and/or the transport distances. In this case, data compiled by Zero Waste Scotland to develop the Scottish Carbon Metric[6] was used. As economic activities in both regions are similar, we believe that adopting this approach will not have significant impact on overall results.

Limitations

As explained above, there are several limitations regarding data collection that might impact the accuracy of the results:

- For the waste data, it mainly concerns the composition of residual waste and mixed bulky waste. Regional data might differ from the national average;
- For the "carbon data", little regional data could be used. It could be relevant to review the proposed data for the 5 key waste fractions to determine whether more accurate, regional data are available.

[4] FEDEREC (2017), Évaluation environnementale du recyclage en France selon la méthodologie de l'analyse de cycle de vie
[55] ADEME (2019), L'EMPREINTE ENERGETIQUE ET CARBONE DE L'ALIMENTATION EN FRANCE
[6] Zero Waste Scotland (2020) The Carbon Footprint of Scotland's Waste: Carbon Metric Technical Report (2017 & 2018) [Online]. Available at: www.zerowastescotland.org.uk

Appendix 2 Total amount of waste generated in Pays de la Loire (2015). Unit: tonnes

Waste category	Generated	Recycled	Incinerated	Landfilled	Other diversion
Acid, alkaline or saline wastes	-	-	-	-	-
Animal faeces, urine and manure	-	-	-	-	-
Batteries wastes	1,135	1,135	-	-	-
Chemical wastes	6,069	51	4,257	1,760	-
Combustion wastes	-	-	-	-	-
Common sludges	-	-	-	-	-
Discarded electronic equipment	43,539	32,625	6,317	4,597	-
Discarded vehicles	-	-	-	-	-
Dredging spoils	-	-	-	-	-
Ferrous wastes	21,261	8,997	7,643	4,621	-
Food waste	146,367	53,761	57,710	34,896	-
Garden wastes	423,143	412,101	6,881	4,161	-
Glass wastes	178,047	146,341	19,758	11,947	-
Health care and biological wastes	801	-	801	-	-
Household and similar wastes	-	-	-	-	-
Industrial effluent sludges	-	-	-	-	-
Mineral waste from C&D	299,380	95,802	-	17,963	185,615
Mineral wastes from waste treatment and stabilised wastes	-	-	-	-	-
Mixed and undifferentiated materials	382,729	30,065	125,578	227,087	-
Mixed ferrous and non-ferrous wastes	32,833	31,992	545	296	-
Non-ferrous wastes	4,468	478	2,486	1,503	-
Other mineral wastes	-	-	-	-	-
Paper and cardboard wastes	280,476	181,836	61,470	37,170	-
Plastic wastes	163,544	22,857	87,748	52,939	-
Rubber wastes	27,642	13,766	13,876	-	-
Sludges and liquid wastes from waste treatment	-	-	-	-	-
Soils	-	-	-	-	-
Sorting residues	20,280	-	15,290	4,990	-
Spent solvents	-	-	-	-	-
Textile wastes	85,260	13,812	44,823	26,624	-
Used oils	405	405	-	-	-
Waste containing PCB	-	-	-	-	-
Wood wastes	99,223	79,863	12,836	6,525	-
Grand Total	**1,811,601**	**720,888**	**468,021**	**437,078**	**185,615**

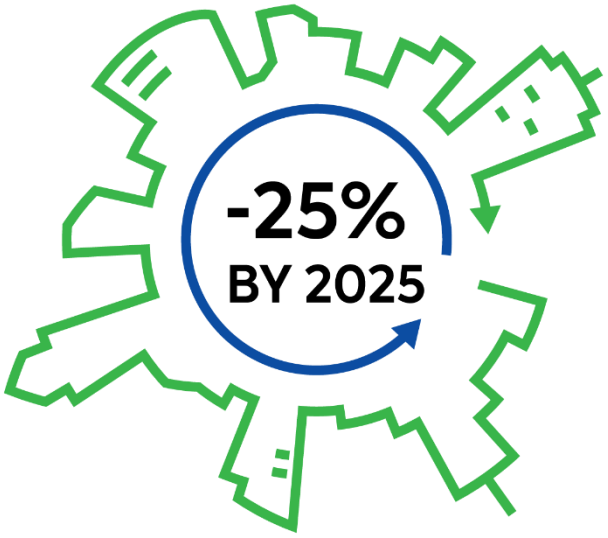
Appendix 3 Whole-life carbon impacts of waste generated in Pays de la Loire (2015). Unit: tonne CO_2 eq.

Waste category	Generated	Recycled	Incinerated	Landfilled	Total carbon impacts (tCO2)
Acid, alkaline or saline wastes	-	-	-	-	-
Animal faeces, urine and manure	-	-	-	-	-
Batteries wastes	8,178	-1,049	-	-	7,129
Chemical wastes	19,283	274	8,623	199	28,379
Combustion wastes	-	-	-	-	-
Common sludges	-	-	-	-	-
Discarded electronic equipment	192,106	-27,493	493	91	165,197
Discarded vehicles	-	-	-	-	-
Dredging spoils	-	-	-	-	-
Ferrous wastes	95,375	-34,419	-6,144	73	54,886
Food waste	369,289	452	-1,081	21,936	390,596
Garden wastes	-	16,484	-333	2,483	2,447
Glass wastes	160,718	-119,130	496	128	42,213
Health care and biological wastes	-	-	-24	-	-24
Household and similar wastes	-	-	-	-	-
Industrial effluent sludges	-	-	-	-	-
Mineral waste from C&D	108,477	241	-	103	108,821[7]
Mineral wastes from waste treatment and stabilised wastes	-	-	-	-	-
Mixed and undifferentiated materials	649,244	-16,526	58,227	143,608	834,553
Mixed ferrous and non-ferrous wastes	159,441	-129,745	-401	6	29,300
Non-ferrous wastes	44,744	-4,012	-5,266	24	35,490
Other mineral wastes	-	-	-	-	-
Paper and cardboard wastes	321,964	-6,030	-8,756	39,429	346,607
Plastic wastes	458,493	-66,809	197,455	503	589,643
Rubber wastes	76,179	-31,466	22,113	-	66,826
Sludges and liquid wastes from WT	-	-	-	-	-
Soils	-	-	-	-	-
Sorting residues	-	-	5,992	2,778	8,770
Spent solvents	-	-	-	-	-
Textile wastes	1,406,555	-130,163	-2,732	16,728	1,290,387
Used oils	493	-285	-	-	208
Waste containing PCB	-	-	-	-	-
Wood wastes	69,257	-50,828	-1,679	5,413	22,163
Grand Total	**4,139,797**	**-616,690**	**266,982**	**233,502**	**4,023,590**

[7] Tonnages here refer to inert waste sent to non-hazardous landfills. It is unclear if inert waste is recovered here (e.g. used as road or cover materials) or landfilled and hence excluded from the analysis.

Appendix 4 Carbon factors for of household waste generated in Pays de la Loire (2015). Unit: tonne CO_2 eq. per tonne of waste.

Waste category	Generated	Recycled	Incinerated	Landfilled	Other diversion
Acid, alkaline or saline wastes	2.01	-	2.20	-	-
Food waste	2.52	0.01	-0.02	0.63	-
Animal faeces, urine and manure	-	-	-	-	-
Batteries wastes	7.21	-0.92	0.40	0.09	-
Chemical wastes	3.18	5.36	2.03	0.11	-
Combustion wastes	-	-	-	0.01	-
Common sludges	-	-	-	-	-
Discarded electronic equipment	4.41	-0.84	0.08	0.02	-
Discarded vehicles	6.57	-2.38	-	-	-
Dredging spoils	-	-	-	-	-
Glass wastes	0.90	-0.81	0.03	0.01	-
Health care and biological wastes	-	-	-0.03	0.62	-
Household and similar wastes	2.03	-1.96	0.46	0.63	-
Industrial effluent sludges	-	-	-	-	-
Ferrous wastes	4.49	-3.83	-0.80	0.02	-
Mixed ferrous and non-ferrous wastes	4.86	-4.06	-0.74	0.02	-
Non-ferrous wastes	10.01	-8.39	-2.12	0.02	-
Mineral waste from C&D	0.36	-	0.02	0.01	-
Mineral wastes from waste treatment and stabilised wastes	-	-	-	-	-
Mixed and undifferentiated materials	1.70	-0.55	0.46	0.63	-
Other mineral wastes	-	-	-	-	-
Paper and cardboard wastes	1.15	-0.03	-0.14	1.06	-
Plastic wastes	2.80	-2.92	2.25	0.01	-
Rubber wastes	2.76	-2.29	1.59	0.01	-
Sludges and liquid wastes from waste treatment	-	-	-	-	-
Soils	0.01	-	-	0.02	-
Sorting residues	-	-	0.39	0.56	-
Spent solvents	0.97	-	1.92	-	-
Textile wastes	16.50	-9.42	-0.06	0.63	-
Used oils	1.22	-0.70	2.36	-	-
Garden wastes	-	0.04	-0.05	0.60	-
Waste containing PCB	-	-	-	-	-
Wood wastes	0.70	-0.64	-0.13	0.83	-



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