



The Carbon Footprint of Scotland's Household Waste

2021 Household Carbon Metric Brief



EUROPE & SCOTLAND
European Regional Development Fund
Investing in a Smart, Sustainable and Inclusive Future

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.

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Key findings

This report describes the key findings from the 2021 household waste Carbon Metric update:

- **Household waste carbon impacts increased to 5.9 million tonnes CO₂e, an increase of 0.9% (~50,000 tonnes CO₂e) from 2020 figures.**
- Household waste carbon impacts have increased by 4% (~230,000 tonnes CO₂e) since the historic low of 2019.
- An overall increase in waste generated, and particularly in textile wastes generated, is the main contributor to the increase in carbon impacts of waste in 2021.
- The carbon impact of household waste in 2021 was 12.8% below the 2011 baseline (approximately 870,000 tonnes).
- The top five most carbon intensive materials accounted for 46% of all household waste tonnage in 2021, but 83% of the carbon impacts.
 - Textile waste made up just 4% of waste arisings, but 32% of the carbon impacts.
 - Food waste accounted for 18% of household waste by weight, but 30% of household waste carbon impacts.

About the Carbon Metric

The Scottish Carbon Metric measures the whole-life carbon impacts¹ 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. This report summarises the carbon impacts of Scotland's 2021 household waste using the latest Scottish Environment Protection Agency (SEPA) published waste data². For more information about the Carbon Metric and its methodology, see the latest Carbon Metric Technical Report on the Zero Waste Scotland website³.

Scotland's Household Waste and its Carbon Impacts in 2021

In 2021, Scotland's household waste increased by 2.2% in 2021 compared to 2020, from 2.43 to 2.48 million tonnes (Figure 1). Out of a total increase of 54,000 tonnes (54kt), there was an increase in Wood Waste and Mineral Waste from Construction of 33kt. SEPA suggest these increases could reflect an increase in home improvement projects, following the easing of COVID restrictions⁴.

In 2021, the household waste recycling rate was 42.7%, reflecting a change of 0.7% from the 2020 household recycling rate. The increase in household waste recycled between 2020 and 2021 is likely due to a bounce back from the impact of the COVID-19 lockdown and other restrictions in 2020, when the amount of waste recycled and the waste recycling rate was the lowest recorded since 2013.⁴ Alongside this the amount of waste landfilled increased by 0.6% from 2020 – the first time in ten years the amount of waste landfilled has not decreased.

¹ Shorthand term for the emissions of any of the greenhouse gases that affect climate change. Carbon emissions are usually expressed as tonnes of CO₂ eq. (equivalent), which is a unit of measurement based on the relative impact of a given gas on global warming.

² SEPA (2021) [SEPA Household Waste Data Portal](https://www.sepa.org.uk) [Online]. Available at: <https://www.sepa.org.uk>

³ Zero Waste Scotland [Carbon Metric – Publications](https://www.zerowastescotland.org.uk) [Online]. Available at: [zerowastescotland.org.uk](https://www.zerowastescotland.org.uk)

⁴ SEPA (2021) [Scottish Household waste – summary data 2021](https://www.sepa.org.uk/) [Online]. Available at: <https://www.sepa.org.uk/>

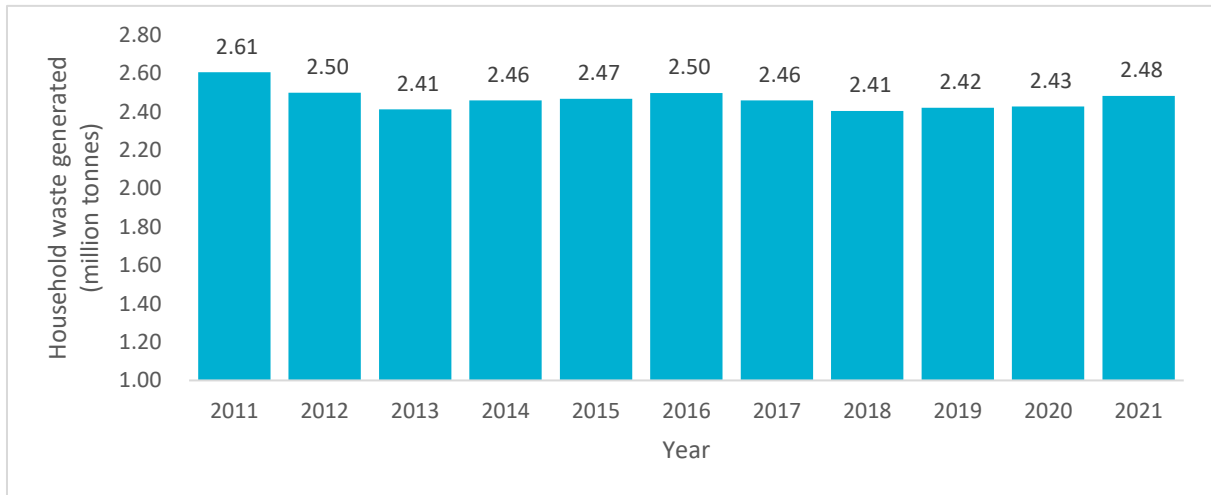


Figure 1 Scottish Household waste generated, 2011 to 2021. Note: the vertical axis does not start at 0.

The whole lifecycle carbon impacts of Scotland’s household waste generated and managed in 2021 was 5.9 million tonnes of carbon dioxide equivalent (Mt CO₂e), an increase of 0.9% (~ 50,000 tCO₂e) from 2020 (Figure 2).

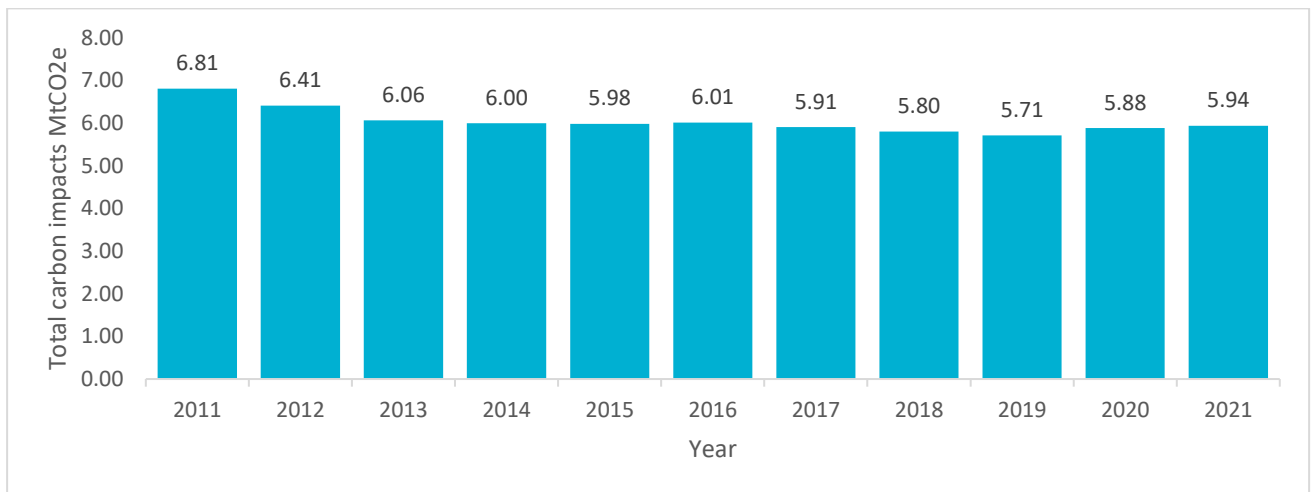


Figure 2 Carbon impact of Scottish Household waste generated and managed 2011-2021.

The total carbon impacts per tonne of household waste decreased in 2021 by 1.3% when compared to the previous year’s intensity. The net carbon intensity (tonne CO₂e/tonne of waste) of Scottish Household waste is 8.5% below the 2011 net carbon intensity, when the analysis began (Figure 3). The overall decrease in the net carbon intensity can be attributed largely to increased recycling rates - particularly for high impact waste materials - as well as reduced landfilling of household waste since 2011. The amount of waste recycled in 2021 increased by 4% compared to 2020, resulting in an additional carbon reduction of ~60,000 tCO₂e.

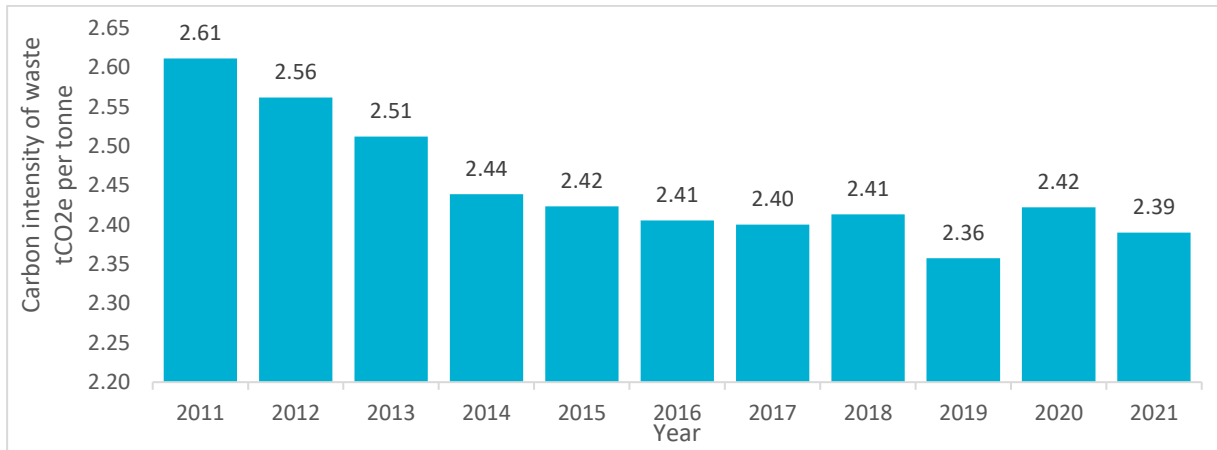


Figure 3 Net carbon intensity of Scottish Household waste 2011-2021. Note: the vertical axis does not start at 0.

Embodied carbon impacts from material production (i.e. impacts of producing the material in the first place before they become waste) are the greatest contributor to Scotland's whole-life waste carbon impacts, amounting to 6.13 Mt CO₂ eq. in 2021 as shown in Figure 4. In 2021, carbon impacts from landfilling household wastes remained the second largest carbon contributor at 247,504 tCO₂e. Impacts from incineration were 180,672 tCO₂e, an increase of 3,323 tCO₂e since 2020, a much smaller increase than has been seen in recent years. From 2017-2020 the average annual increase in carbon impacts from incineration was 47,000 tCO₂e. Carbon benefits associated with recycling offset Scotland's household waste carbon impacts by 601,326 tCO₂e, increasing by 12% (63,205 tCO₂e) compared to an average annual increase of 1% 2011-2020.

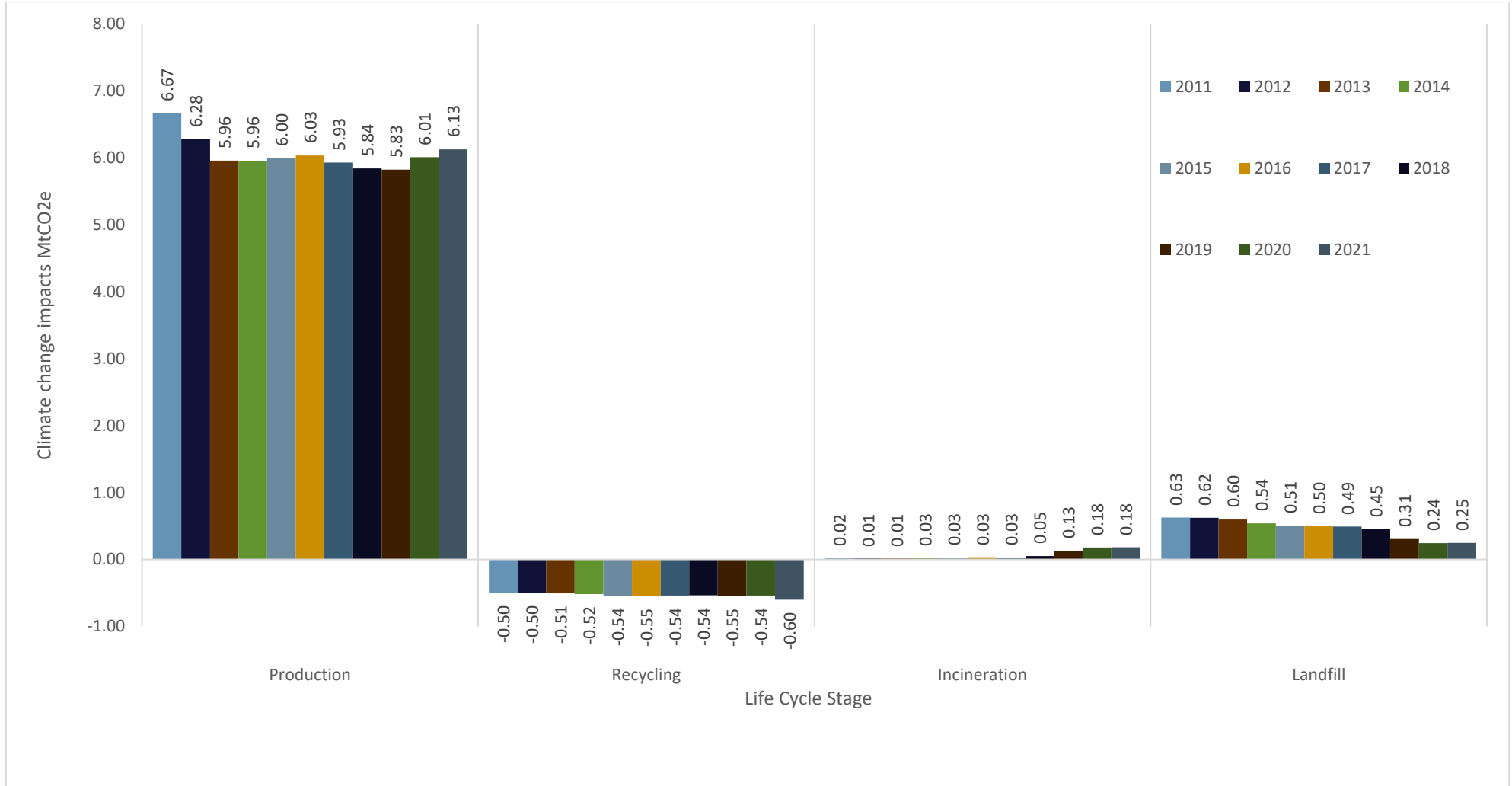


Figure 4: Carbon whole-life cycle impacts over time, 2011 - 2021

Figure 5 shows the contribution of the 10 individual waste categories with the largest absolute change in carbon impacts in 2021 vs. 2020. Figure 6 shows the changes in the tonnes of waste generated and managed between 2020 and 2021 for these same 10 waste categories (N.B. the change in waste generated will not necessarily be equal to the sum of changes in the waste treatment categories. This is because the 'generated' tonnes refer to waste as collected, before sorting, and the waste treatment tonnes refer to waste after this sorting process, during which waste can be moved between waste categories).

Almost all the increase in textile waste generated, totalling 3,100t, was matched by an increase in tonnes recycled of 2,800t. However, the carbon impacts from textile waste increased by 51,000 tCO₂e, compared to the total overall increase for all household waste of 53,000 tCO₂e. This is due to textile waste having relatively high embodied carbon per tonne.

Increases in the amount of, 'mixed metals', 'discarded equipment' and 'wood wastes' generated also contributed to the increase in overall carbon impacts. For 'mixed metals' and 'wood wastes' an increase in the amount of waste recycled offset increased carbon impacts from the amount of waste generated. For plastic waste, 66% of the increase in carbon impacts between 2020 and 2021 can be attributed to a 3% increase (2,173t) in the amount of plastic waste incinerated – with incineration of plastic having the largest carbon impact per tonne of any waste category. The amount of plastic recycled also increased by 3% (1,971t).

The waste categories with the largest reduction in carbon impacts were non-ferrous metals, mixed and undifferentiated materials, paper and card, and ferrous metals. These reduced carbon impacts were largely due to increases in the amount recycled of each waste category, but for paper and card, decreases in the amount generated and landfilled also contributed to the reduction. In the case of non-ferrous metals an increase in the amount recycled of 1,950 tonnes resulted in the second largest change in emissions of -19,000 tCO₂e.

Despite the increase in 2021, the carbon impact of household waste in 2021 remains 12.8% (approximately 870,000t) below the 2011 baseline (Figure 2). However, 2021 is the second year in a row that the carbon impacts of waste in Scotland have increased from the historic low of 2019.

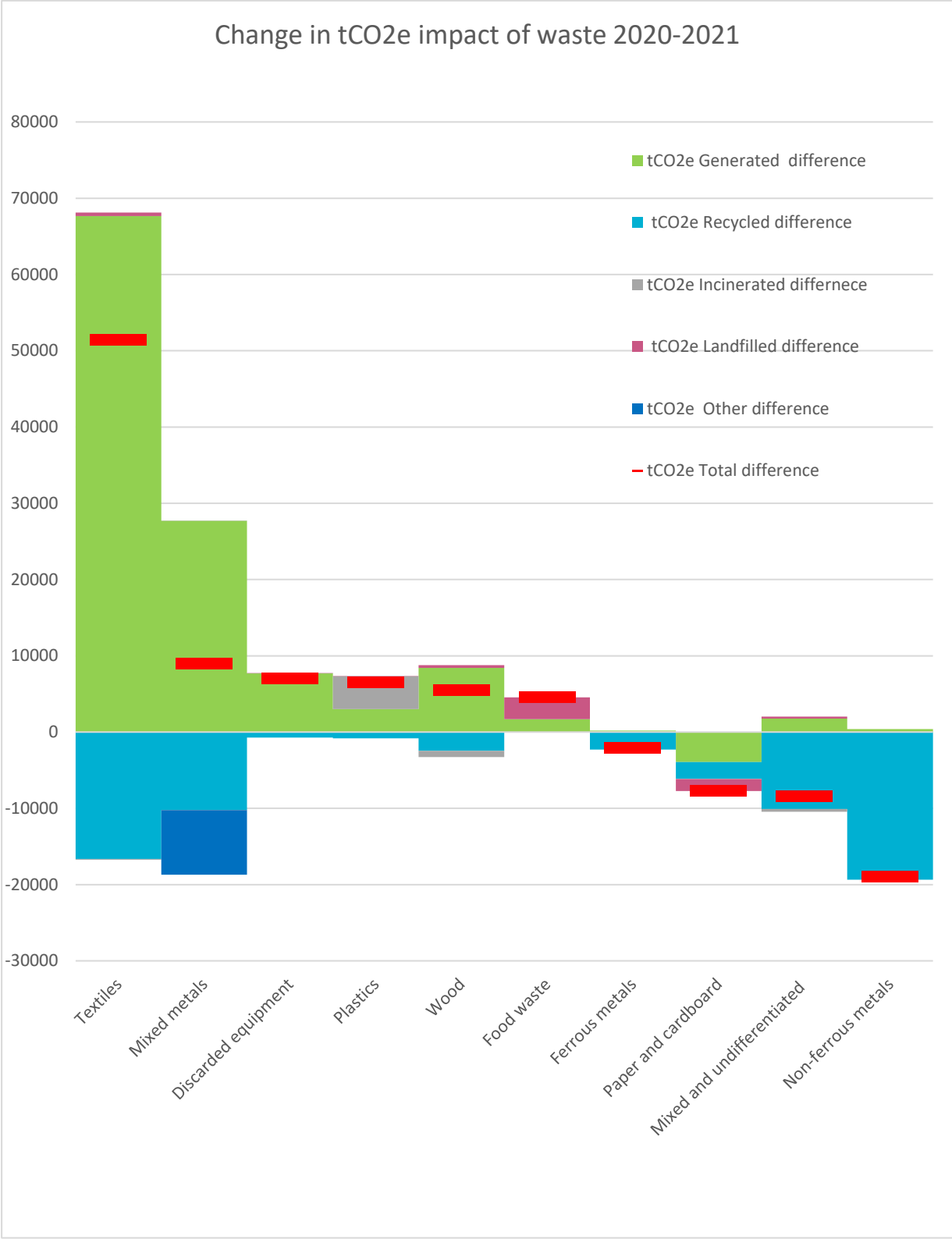


Figure 5: Change in carbon impacts of waste (tCO2e) in Scotland in 2021 compared to 2020

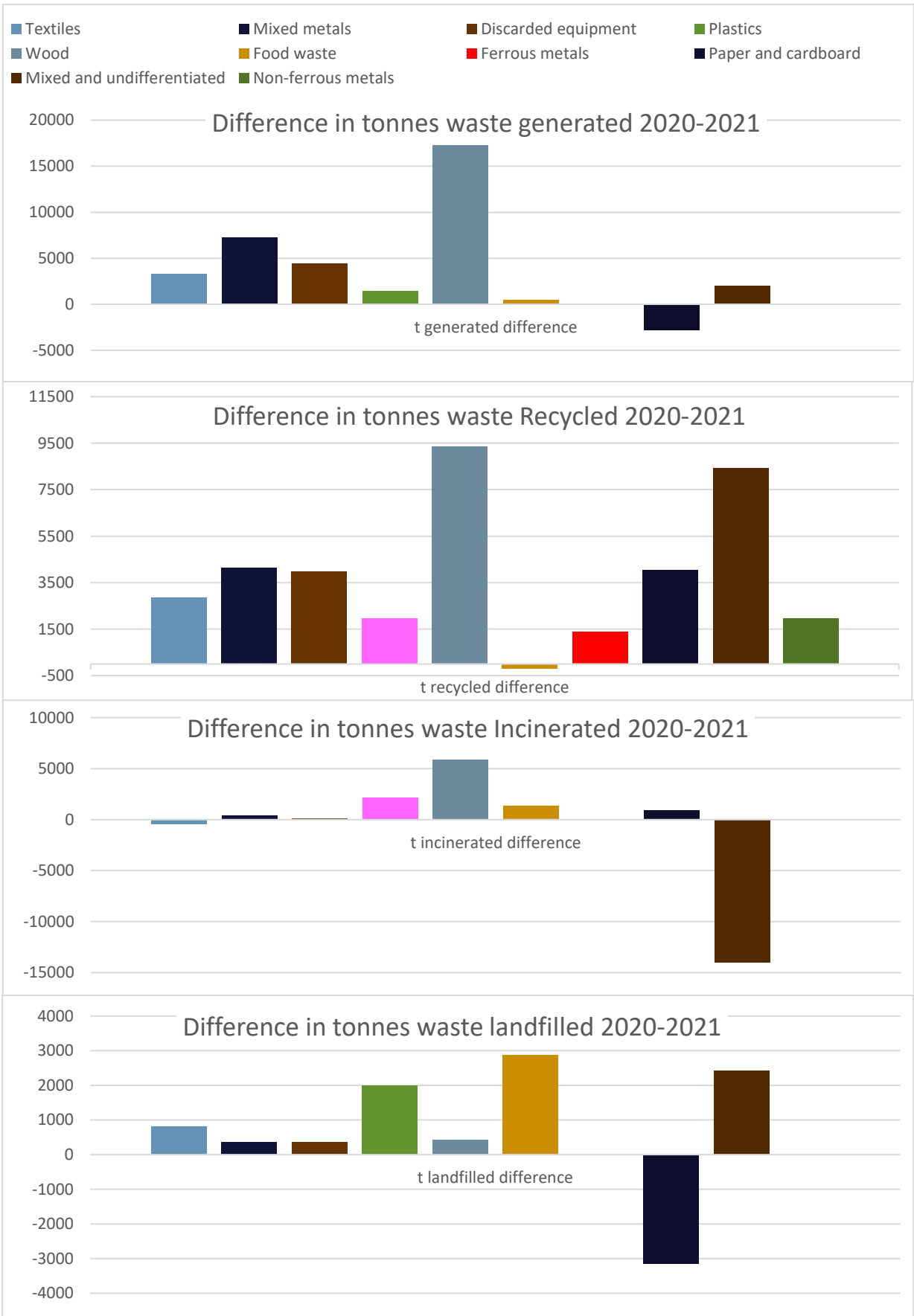


Figure 6: Changes in tonnes of waste generated and managed 2020-21

The Big Five Waste Materials: Weight vs. Carbon Impacts

Scotland's Carbon Metric shows that some materials in the household waste stream have a particularly high carbon impact relative to their tonnages. To maximise the climate change benefits of waste and resource management, focus should be placed on these carbon intensive waste materials.

The top five most carbon intensive materials accounted for under half (46%) of all household waste in 2021, but 83% of household waste carbon impacts (Figure 37). Textile waste made up just 4% of waste arisings, but 32% of the carbon impacts. Food waste accounted for 18% of household waste by weight, but 30% of household waste carbon impacts.

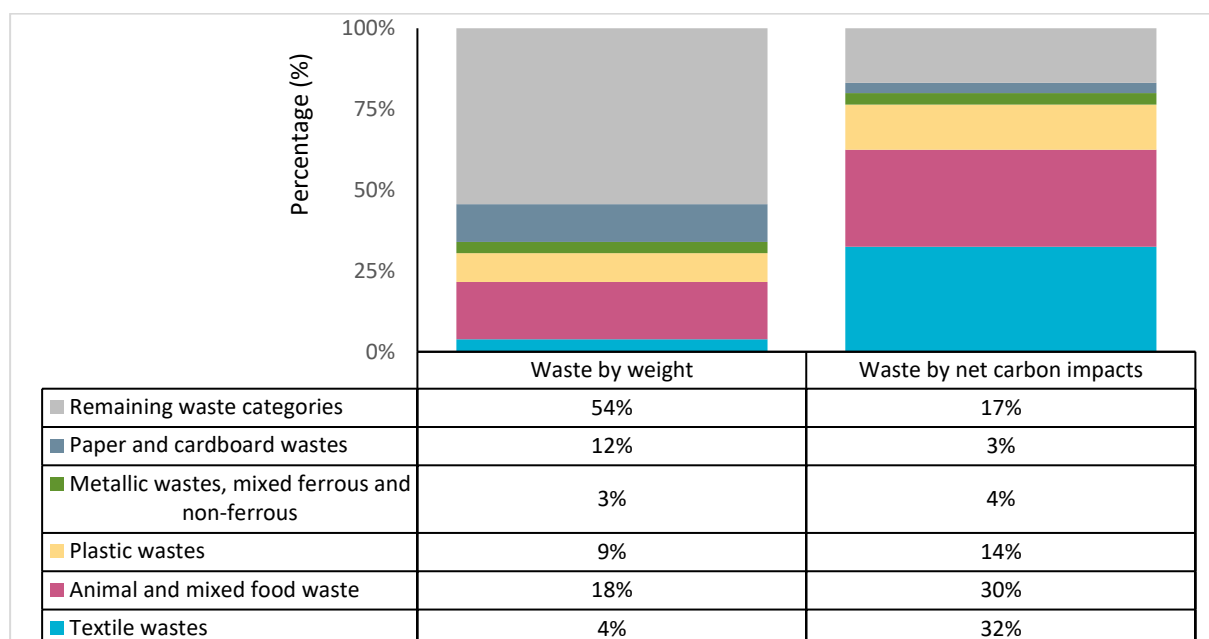


Figure 3 Relative weight vs. carbon impact of key waste materials in 2021 (following disaggregation of the Mixed Household and Similar Wastes category⁵).

Conclusion

This report describes the key findings from the 2021 household waste Carbon Metric update:

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 - Textile waste made up just 4% of waste arisings, but 32% of the carbon impacts.
 - Food waste accounted for 18% of household waste by weight, but 30% of household waste carbon impacts. Further information on the Carbon Metric and archived documents relating to its development can be found on the [Zero Waste Scotland website](#).

⁵ The methodology of the disaggregation of mixed Household and Similar Wastes is explained in the Carbon Metric Technical report, published annually on the [Zero Waste Scotland website](#).

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