2021 Scottish Food Waste Estimate

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ZERO WASTE SCOTLAND

Contents

1 Introduction

In 2016, the Scottish Government introduced a Scottish food waste reduction target in Making Things Last: a circular economy strategy for Scotland.[1] The target committed to reducing food waste by 33% per capita by 2025. The Food Waste Reduction Action Plan (FWRAP) was launched in 2019 and described the actions required to achieve the 33% target.

Zero Waste Scotland has previously published reports estimating the amount of food wasted in Scotland[2], and this work formed the basis of a baseline that could be used to measure progress towards the 2025 target[3]. 2013 was selected as the baseline year, and as we approach 2025 it is important to review our progress towards the target.

This report describes how much food we estimate was wasted in 2021, and then compares this to the baseline and to an intermediate point in 2018. The methods used to derive the estimate follow the methodology used to derive the baseline, allowing us to make a direct comparison against the baseline. The method has been described in detail in other documents[3] so only an overview of the methodology will be provided here.

We have always committed to improving the baseline and methodology as evidence and our understanding of how to measure food waste improves. With that in mind, we also assess the limitations of the estimate, and how the methodology can be improved as we consider how to move beyond the 2025 target and align with UN Sustainable Development Goal 12.3 in 2030[4].

We estimate that 1.038 million tonnes of food waste was disposed of in 2021, with 59% coming from households, 27% from food & drink manufacturing and 14% from other sectors. Per capita, this is equivalent to 189 kg per person per year, an increase of 2% from the baseline of 185 kg per person per year. In absolute terms, 1.038 million tonnes of food waste was a 5% increase against the 2013 baseline.

At a household level, per capita food waste decreased by 1% to 111 kg per person per year due to a 3% increase in population since 2013. However, the weight of household food waste increased by 2%. The 2023 waste composition analysis[5] also reported an increase in household food waste, revealing that the amount of food waste present in the residual waste was roughly the same as the previous 2013-15 waste composition study, while the amount of food waste being recycled increased.

[1] https://www.gov.scot/publications/making-things-last-circular-economy-strategy-scotland/pages/5/
[2] For example, https://cdn.zerowastescotland.org.uk/managed-downloads/mf-jgqw0f1-1677582668d
[3] https://www.zerowastescotland.org.uk/resources/how-much-food-wasted-scotland
[4] https://sdg12hub.org/sdg-12-hub/see-progress-on-sdg-12-by-target/123-food-loss-waste
[5] https://www.zerowastescotland.org.uk/resources/waste-composition-analysis-programme-2021-2024

2 How much food was wasted in 2021?

2.1 Per capita food waste

The 2025 target was defined in the FWRAP as a per capita reduction in food waste, which allows for the projected growth in population by 2025.

Per capita waste is calculated by dividing the annual tonnage of waste (described in section 2.2) for each sector by the total population of Scotland for the same year and summing this to get a total per capita estimate.

In 2021, the per capita food waste was 189 kg per person per year. Figure 2.1 gives a breakdown of the 2021 per capita waste by sector.

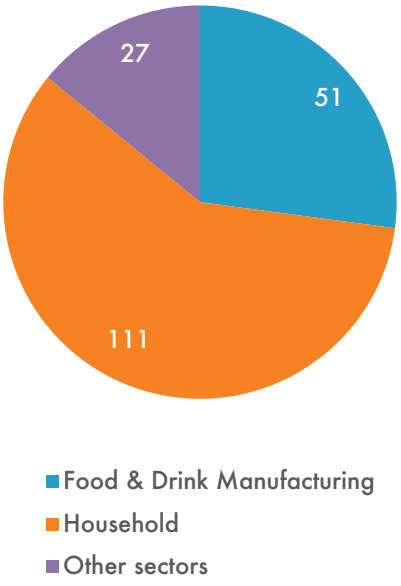

Figure 2.1: 2021 per capita food waste by sector in kg per year per person

2.2 Food waste by weight

We estimate that a total of 1.038 million tonnes of food was disposed of in Scotland in 2021. 59% of the total, or 610,167 tonnes, was disposed of by households. Food & drink manufacturing disposed of 27% (281,396 tonnes), while other sectors[6] disposed of 14% (146,109 tonnes), as shown in Figure 2.2 below.

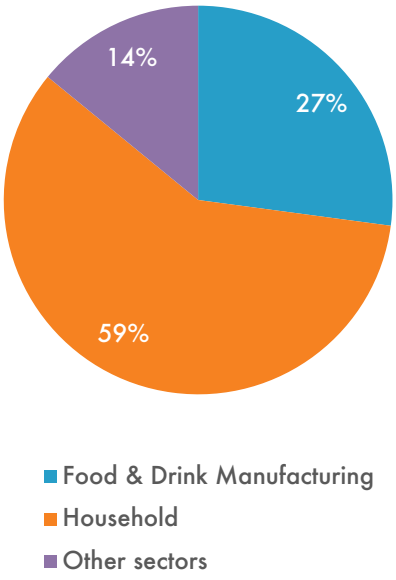

Figure 2.2: 2021 estimate by sector in tonnes

[6] This includes hospitality, public sector, and retail.

2.3 Carbon impacts

In 2021 we estimate that the food waste in Scotland was responsible for 4.74 million tonnes of carbon dioxide equivalents (CO_2eq). Figure **2.3** breaks down the carbon impacts by sector.

We estimated the carbon impacts of the food wasted in 2021 by applying the appropriate factor from the Zero Waste Scotland carbon metric[7]. The carbon metric captures the full lifecycle impacts of waste, with different factors depending on whether waste was generated at the household level or before the household.

It is difficult to directly estimate how much the carbon impact of this estimate contributes to the overall carbon footprint for Scotland due to methodological differences between how we have calculated carbon impacts and how Scotland's carbon footprint is calculated, and because the most recent data on Scotland's carbon footprint was for 2019[8]. Both the carbon metric and Scotland's carbon footprint include greenhouse gas emissions in other countries.

Comparing the carbon impacts of 2021 food waste with the overall 2019 carbon footprint for Scotland would give a rough indication that food waste is responsible for approximately 6% of Scotland's carbon footprint. This would be consistent with the global estimate that 6% of global greenhouse gas emissions come from food losses and waste[9].

We can update this when the 2021 carbon footprint data is available, but this estimate should only be considered as a rough guide to illustrate the potential impact of Scotland's food waste until a better methodology can be established.

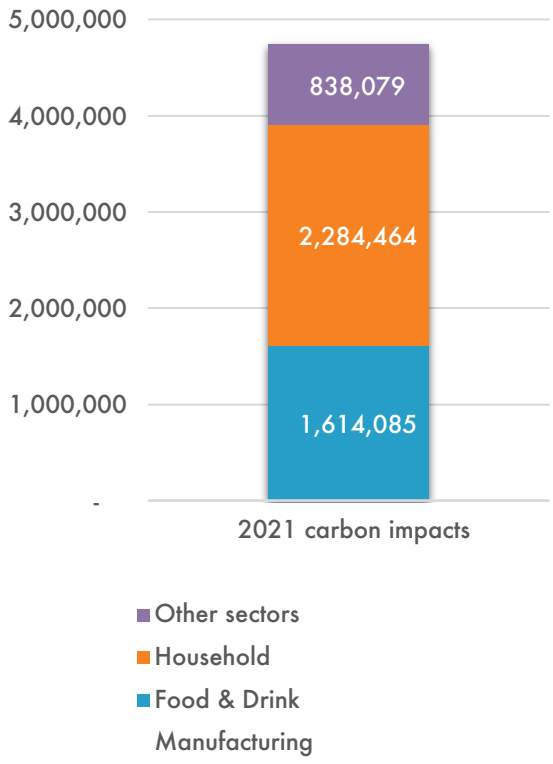

Figure 2.3: 2021 food waste carbon impacts in tonnes of CO_2eq

[7] https://www.zerowastescotland.org.uk/resources/carbon-metric-publications
[8] https://www.gov.scot/publications/scotlands-carbon-footprint-1998-2019/
[9] https://ourworldindata.org/food-waste-emissions

3 How does this compare with other years?

3.1 Per capita food waste

The total per capita food waste for the baseline year was 185 kg per person per year. This increased by 2% to 189 kg per person per year in 2018 and 2021. The per capita baseline is used to calculate the per capita target we need to achieve by 2025, by applying the 33% reduction to each sector in the 2013 baseline in Table 3.1. The total 2025 target per capita figure is 124 kg per person per year, a reduction of 61kg per person per year against the 2013 baseline.

The total per capita figure includes the food waste generated by the manufacturing and other sectors. Individuals in the households sector do not have a direct influence on the waste produced by these other sectors, so the target per capita figure of 75 kg per year for the households sector shown in Table 3.1 can help quantify the scale of the challenge facing households.

The difference between the 2025 households per capita target of 75kg per person per year and the 2021 households per capita estimate of 111 kg per person per year means that each person in Scotland would need to reduce their food waste by 36 kg per year by 2025.

Another way to look at this is at the household level. The average household size in Scotland in 2021 was 2.12 people, so each household produced around 235kg of food waste in 2021. Each household would need to reduce the amount of food disposed of by 76kg per year to achieve the 2025 target, which is the equivalent of around 1.5 kg per week.

Table 3.1: Comparison of per capita food waste in 2013, 2018, and 2021

Sector	2013 per capita (kg/year)	2018 per capita (kg/year)	2021 per capita (kg/year)	2025 target per capita (kg/year)
Food & drink Manufacturing	47	52	51	31
Households	112	110	111	75
Other sectors	26	26	27	18
Total	185	189	189	124

3.2 Food waste by weight

In 2019, we published an update to the 2013 baseline, adjusting it to 988,000 tonnes[10]. 'Baseline' in this report refers to the adjusted 2013 baseline.

The 2021 estimate is a 5% increase on the baseline. Food & drink manufacturing saw the biggest increase (13%), from 248,229 to 281,396 tonnes. Households increased by 2% from 598,890 to 610,167 tonnes, and other sectors increased by 4% from 140,964 to 146,109 tonnes.

With 2025 only a few years away, any increase in food waste against the baseline indicates that achieving the 33% per capita reduction is going to be difficult.

2021 was during the COVID-19 pandemic, and changes in food-related behaviours were well documented[11].

We constructed an estimate for 2018 to investigate whether the increase in 2021 was an anomaly due to COVID-19. We were unable to follow the full baseline methodology to construct the 2018 estimate as some data was lost in the cyber-attack on SEPA[12]. This mostly affected food & drink manufacturing, but we were able to model the 2018 manufacturing waste based on data from the previous 5 years (see section 4.1 below).

A more detailed description of how the 2018 and 2021 estimates were constructed can be found in section 4.1. The 2018 estimate indicated a 4% increase against the baseline and was only 11,000 tonnes less than the 2021 estimate. This suggests that the 2021 increase was not solely due to the pandemic. Table 3.2 compares the 2018 and 2021 tonnages for each of the sectors against the baseline year of 2013.

Table 3.2: Comparison of food waste estimates in 2013, 2018, and 2021

Sector	2013 baseline (tonnes)	2018 estimate (tonnes)	2021 estimate (tonnes)	2025 target (tonnes)[13]
Food & drink Manufacturing	248,229	282,682	281,396	171,032
Households	598,890	600,312	610,167	412,640
Other sectors	140,964	144,107	146,109	97,125
Total	988,083	1,027,102	1,037,671	680,797

[10] https://cdn.zerowastescotland.org.uk/managed-downloads/mf-pfhfg8zc-1677582653d
[11] https://wrap.org.uk/resources/report/uk-household-food-waste-tracking-survey-winter-2021
[12] https://www.sepa.org.uk/about-us/cyber-attack/
[13] Based on current population estimates for 2025.

3.3 Carbon Impacts

The carbon factors applied to 2013, 2018 and 2021 are the same, at 5,736 kgCO_2eq per tonne of food waste for food & drink manufacturing and other sectors, and 3,744 kgCO_2eq per tonne of food waste for households[14].

Figure 3.1 compares the carbon impacts for 2018 and 2021 against the baseline and indicates the potential carbon impacts if the 33% reduction in food waste is achieved in 2025, assuming no changes to the carbon factors. The same pattern of an increase against the baseline is present.

WRAP estimate that 70% of food waste is edible[15]. If we also assume that 70% of the Scottish food waste estimate could be edible, then 3.3 million tonnes of CO_2eq could have been prevented from entering the atmosphere if the edible component of food waste was avoided in 2021.

The remaining 1.4 million tonnes of CO_2eq could have been mitigated if all household food waste was recycled, and businesses and organisations ensured their food waste was manged according to the food waste hierarchy.

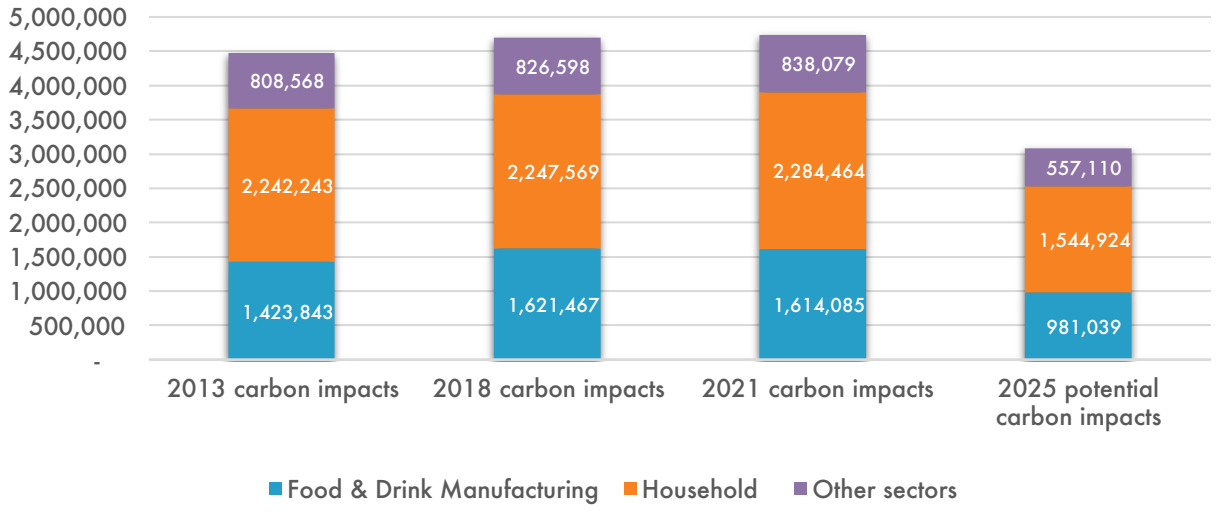

Figure 3.1: Food waste carbon impacts in tonnes of CO_2 equivalents

[14] We have used the carbon impacts associated with generating the waste, and not included any additional factors for how the waste was disposed of, as it was beyond the scope of this estimate to establish how the waste was disposed of.

[15] https://wrap.org.uk/sites/default/files/2023-01/Food%20Surplus%20and%20Waste%20in%20the%20UK%20Key%20Facts%20December%202022.pdf

4 How was the estimate calculated?

The overall estimate is a combination of estimates for the three sectors listed in Table 3.2. The estimate for each sector has a specific methodology based on the available data.

4.1 Food & drink manufacturing

SEPA receive aggregated waste data from permitted waste management sites on a quarterly basis. The waste is classified using the European Waste Catalogue (EWC) system[16], which attempts to classify waste based on what it is and the process that generated it.

Current mechanisms for collating waste data do not provide the ability to identify the origin of the waste or the nature of the business that generated it.

SEPA produce an annual bespoke Commercial & Industrial food waste by EWC report for Zero Waste Scotland. There are a range of EWC codes that are specific to food & drink manufacturing waste that are used to establish whether the content of the waste within the code is food that was fit for human consumption before being wasted.

Most of the EWC codes are also entirely composed of food waste. Those that have non-food waste content have relatively well understood compositions that do not vary much. This makes it possible to assign food waste reported to SEPA to food & drink manufacturing.

Each year, large waste operators are asked to review the data they reported to SEPA, and match the waste reported under each European Waste Classification code to a mixture of Standard Industrial Classification (SIC) sections and divisions[17], one of which is food & drink manufacturing.

As the request to review data returns is voluntary, not all large waste operators respond. In this case, the process for attributing waste from small waste operators is applied to large operators. The method for allocating the waste from both small and large waste operators to SIC sections is detailed in the annual Waste Data Quality report[18].

2013 and 2021 food & drink manufacturing estimates

The 2013 and 2021 food & drink manufacturing estimates were based on the SEPA Commercial & Industrial food waste by EWC report and the methodology described in the quality report, and are directly comparable.

2018 food & drink manufacturing estimates

The SEPA report for 2018 was lost in the cyber-attack, but the raw data was still available. We were able to use the SEPA reports from 2013 to 2017 to estimate the percentage of the raw data that could be attributed to food & drink manufacturing in 2018.

[16] https://www.sepa.org.uk/media/163421/ewc_guidance.pdf

[17] https://www.ons.gov.uk/methodology/classificationsandstandards ukstandardindustrialclassificationofe conomicactivities/uksic2007

[18] https://www.sepa.org.uk/media/594700/2021-wfas-quality-report.pdf

A mean estimate for 2018 was derived by multiplying the raw data for each EWC in 2018 by the ratio between the raw data and the attributed data in the SEPA report for each year between 2013 and 2017, then taking the average.

The EWC codes with the greatest variability between 2013 and 2017 did not account for enough of the total to have a major impact on the calculated 2018 mean. The total was most influenced by EWC codes which were very consistent between years. This, combined with the low overall variability between EWCs and years, gives a mean with a small overall standard deviation.

4.2 Households

Estimates of food waste from households are based on the alternative methodology described in the appendix of the 2014 report Household food & drink waste in Scotland[19]. The report states that both methods are valid, but the alternative method was more representative of Scotland.

The preferred method combines data from waste composition analyses with data reported by local authorities to the WasteDataFlow platform[20]. Waste composition analysis involves collecting, sorting, and weighing waste from kerbside collections within a local authority. The results of the analysis give the proportion of materials found in the different waste streams, and in particular the residual waste.

The proportion of food waste found in the residual waste of the sampled local authorities can be scaled up to a national estimate. The analysis of the sampled local authorities produced an overall proportion of waste present in residual collections. For the baseline this was 29% from the 2013-15 waste composition study[21], which was also applied to the 2018 estimate. For 2021 it was 31% based on the most recent waste composition study.

The amount of residual waste reported by all local authorities on WasteDataFlow for the year being estimated was multiplied by the proportion of food waste in residual waste from the sample to generate an overall estimate of the amount of food waste present in kerbside residual waste collected by local authorities. Full details of the most recent Waste Composition Analysis study conducted in Scotland can be found on the Zero Waste Scotland website.[22]

Most local authorities also target food waste in separate recycling collections, or in mixed garden and food waste recycling. This is estimated by combining the tonnage of food waste separately collected, minus 2% for contamination[23], with the proportion of food waste present in any mixed collections. The estimate of the food waste present in mixed collections is based on work

[19] https://cdn.zerowastescotland.org.uk/managed-downloads/mf-zsnvdrgj-1677582741d
[20] https://www.wastedataflow.org/
[21] https://cdn.zerowastescotland.org.uk/managed-downloads/mf-jk1pxc2e-1677510625d
[22] https://www.zerowastescotland.org.uk/resources/waste-composition-analysis-programme-2021-2024
[23] Standard factor supplied by WRAP during calculation of 2013 baseline.

conducted by WRAP at a national level[24].

The total amount of food waste collected by local authorities in residual waste at the kerbside was combined with the amount collected in recycling collections and an estimate of the amount of food waste present in the residual waste at household waste recycling centres and as contamination in other dry recycling streams.

The final component of the household food waste estimate is an estimate of the amount of food waste disposed of through home composting and down the drain via the wastewater system. This is not something that is directly measured, so it is expressed as a percentage of the total amount of food waste collected by local authorities, which is then added to the local authority total. This is based on the WRAP kitchen[25] and sewer[26] diary studies from 2012.

2013 household estimate

When the 2013 baseline was being prepared, household waste composition data was available for 2009 and 2014[27]. To generate an estimate for 2013, the difference between the 2009 and 2014 estimates was divided by the number of years between the two estimates.

This was then divided by the total waste in 2014 to generate a scaling factor that was then applied to each of the sub-totals that contributed to the estimate of food waste collected by local authorities. Food waste disposed of down the drain was estimated by multiplying the estimate of food waste collected by local authorities by 36%. The amount of food waste composted at home was estimated by multiplying the estimate of food waste collected by local authorities by 16%. The update to the baseline in 2019 removed food fed to animals to align with international definitions[28].

2018 household estimate

The most recent waste composition data available for the 2018 household estimate was the 2013-15 study[21]. The waste composition of the residual and separate food waste collections was applied to the WasteDataFlow tonnages for 2018, after a process of matching the size, performance, and types of services offered by local authorities in 2018 to the profiles of the local authorities sampled in the 2013-15 waste composition study.

The proportion of waste disposed of by home composting and down the drain was calculated using percentages derived from WRAP's 2018 update to the amount of food waste disposed of via these routes[29], 33% for food waste disposed of down the drain, and 12% for home composted food waste.

2021 household estimate

The 2021 household estimate followed the same methodology used to generate the 2013 estimate. The amount of food waste in the residual kerbside collection produced per household per year

[24] See section 2.5.5 in https://wrap.org.uk/sites/default/files/2020-10/Synthesis-of-food-waste-compositional-data-2012.pdf
[25] https://wrap.org.uk/resources/report/household-food-and-drink-waste-united-kingdom-2012
[26] https://wrap.org.uk/resources/report/down-drain
[27] Based on the 2013-15 waste composition study, see footnote 21.
[28] https://www.flwprotocol.org/flw-standard/
[29] https://wrap.org.uk/sites/default/files/2020-09/UK-progress-against-Courtauld-2025-targets-and-UN-SDG-123.pdf

was calculated by multiplying the amount of residual waste reported by the local authority by the percentage of food waste present in the residual waste, as calculated by the waste composition analysis, and dividing it by the number of households in the local authority.

For local authorities not part of the waste composition study, the average percentage of food waste in the residual kerbside collection across all the sampled local authorities was used.

The per household per year amount of food waste collected separately and in mixed recycling collections was added to the residual food waste. If a local authority had a separate food waste collection, the tonnage was adjusted down by 2% to account for non-food material.

If a local authority had a mixed garden and food waste collection, the number of households served by the mixed collection was multiplied by an annual yield depending on the frequency of the mixed collection[24]. The total separately collected and in mixed collections was combined for those authorities that offered both services.

The amount of food waste in separate and mixed kerbside collections was then divided by the total number of households in the local authority and added to the per household per year estimate of the food waste in kerbside residual collections to give an overall food waste per household per year for each of the local authorities sampled in the waste composition study.

The average per household per year across all the sampled local authorities was then applied to the number of households in each of the unsampled local authorities and summed with the sampled ones to give a national estimate of the amount of food waste collected at the kerbside.

The estimate of the amount of food waste present in household waste recycling centres and as contamination in other separate recycling collections was calculated using an estimate by WRAP of 5 kg per household per year[30].

The amount of food waste disposed of by home composting and down the drain was calculated using the same percentages applied to the 2018 estimate.

4.3 Other sectors

The other sectors include healthcare, social care, education, wholesale, retail, and other public sector organisations. Unlike the food & drink manufacturing sector, the Commercial & Industrial food waste by EWC report from SEPA cannot differentiate between these sectors, as it asks waste operators to assign waste to a mixture of SIC sections and divisions that are several levels above the 4-digit SIC codes needed to identify these particular sectors. Most of the waste produced by these sectors is recorded against mixed waste EWCs (i.e., codes that contain food waste as well as other materials, similar to the household residual waste).

This requires an understanding of what proportion of the waste in each stream can be counted as food waste

[30] Adapted from table 19 in https://wrap.org.uk/sites/default/files/2020-10/Synthesis-of-food-waste-compositional-data-2012.pdf

through composition factors. Not being able to differentiate between sectors within the data assigned to 'Commerce' in the SEPA report makes it difficult to apply waste composition factors, which are likely to vary between sectors, to the waste recorded against these EWCs.

For the 2013 baseline, the results of a waste composition study from 2011 was used[31]. The composition study sampled businesses and organisations from across the motor trade, wholesale and retail, and human healthcare and social services SIC divisions and directly measured waste for the sample sites for a week, breaking the waste down into individual waste streams (i.e., plastic, carboard, food, etc).

The data was scaled up by the size of each division (i.e., number of business units in each SIC division as recorded by the Office of National Statistics) to produce national estimates of waste types for each SIC division. The waste was recorded in 2010 and assumed to be the same for 2013.

Estimates of the food waste generated by the hospitality sector were taken from a study conducted by WRAP in 2011, which gave direct estimates for Scotland[32].

2018 and 2021 other sectors estimates

Commercial and industrial waste composition data has not been updated since the 2011 study, so the 2013 baseline for each individual SIC section in the other sectors estimate was scaled to the size of the SIC section in 2018 and 2021. Scaling was achieved by comparing the size of the SIC section in 2013 with the size in 2018 and 2021 from Office of National Statistics data[33].

4.4 Carbon impacts

The carbon impacts for each sector followed the same methodology of multiplying the tonnage of food waste by the appropriate carbon factor from the carbon metric. For food & drink manufacturing and other sectors, this was the non-household animal and mixed food carbon factor. For households, the household animal and mixed food factor was applied.

This factor has remained constant since the baseline year, despite regular updates to the Carbon Metric, which allows for a direct comparison between 2013 and 2018, but which does not capture any changes in the emissions associated with the way food is produced or disposed of. Only the carbon impacts of generating the waste were applied, as insufficient detail was known about how the waste was disposed of to apply the waste management factors.

[31] See the appendix in https://cdn.zerowastescotland.org.uk/managed-downloads/mf-llkzku_f-1677582722d

[32] The report is no longer available on the WRAP website, but can be found via other online sources by searching for The Composition of Waste Disposed of by the UK Hospitality Industry 2011

[33] See table 17 in which lists the number of units in Scotland for each SIC division https://www.ons.gov.uk/businessindustryandtrade/business/activitysizeandlocation/datasets/ukbusinessactivitysizeandlocation

5 How accurate is the estimate?

We wanted to provide a direct comparison with the 2013 baseline to support the Circular Economy Route Map and review of the FWRAP which will be published later this year. However, we are aware of several aspects of the methodology that could be improved. We are not yet able to issue an update to the methodology, but we are committed to doing so when we are able.

The methodology used for the household and food & drink manufacturing estimates is capable of tracking changes in environment and behaviour that might affect the amount of food waste disposed of. The other sectors estimate only tracks changes associated with the number of business units, and it assumes that the amount of waste disposed of by individual businesses is the same as it was in 2013.

5.1 Household estimate

The estimate of household food waste collected at the kerbside is based on a comprehensive and rigorous empirical study using a representative sampling frame within and between local authorities.

We are currently working on an updated estimate of the amount of food waste disposed of at household waste recycling centres, and the amount of food waste contamination found in dry recyclate waste streams. This is currently a small proportion of the total household estimate, but up-to-date Scottish-specific data would improve the accuracy of the estimate.

The other major component of the household estimate is the proportion of waste disposed of by home composting (approximately a seventh) or down the drain (approximately a third). Despite the update by WRAP in 2018, the data that supports this estimate is over 10 years old and unlikely to be representative of current behaviours by households.

The study that generated the data used in estimating these two factors was repeated in 2022/23 and we are currently analysing a Scottish-specific sample of households that completed a kitchen diary and a sewer diary. The analysis of this data will not only give an up-to-date and accurate estimate of the amount of food waste disposed of by home composting and down the drain, but also an indication of the types of food wasted and the reason it was wasted. It will also provide additional insight into how much of the food wasted was edible or inedible.

The waste composition analysis has indicated that while the amount of food waste present in the residual waste is roughly the same as the 2013-15 waste composition study, the amount of food waste being recycled has increased, meaning that the total amount of food waste has increased, as we have also indicated in this report.

There are differences in the methodologies used to estimate the amount of food waste targeted by recycling collections, but it is interesting to note that the waste composition analysis estimate is around 20,000 tonnes larger than the estimate generated for this report. This could indicate that the yields used to calculate the amount of food waste are no longer

representative of what is collected by Scottish local authorities. This could be due to changes in the number of local authorities that offer mixed garden and food waste collections, but this would only be established through more detailed analysis of the existing data and empirical studies to examine the contents of mixed collection services.

We have some evidence from recent work that the amount of packaging and contamination in food waste collections may be higher than previously thought, which could suggest that the 2% figure currently used is an underestimate. We will update our estimates once we are satisfied that the evidence we have is robust and a reflection of the current food waste being produced and disposed of by households.

We might have expected to see a reduction in food waste from households in 2021, with UK-wide awareness of food waste at a high level[34], and people reporting that they were actively trying to reduce their food waste[35]. This is also present in Scotland, with 78% of people in Scotland reporting that they actively try to reduce their food waste most or all of the time[36].

This self-reported evidence of changes in behaviour has not resulted in an observable reduction in household food waste in this estimate. 2021 was during the COVID-19 pandemic, which could have masked actual changes in behaviour that would have resulted in observable reductions in food waste in pre-pandemic years. Without further research and evidence, it is impossible to verify the impact of COVID-19 on food waste reduction behaviours.

This is speculation in the absence of further evidence. It is also difficult to predict what effect the changes in behaviour that have led to the increase in food waste might have on the amount of food home composted or disposed of down the drain.

The analysis of the kitchen and drain diaries will help us to understand if behaviours have significantly changed in a way that might affect the overall amount of food wasted by households. Other research we are conducting into the reasons why people waste food, and the barriers they face when attempting to adopt actions that lead to reducing their food waste will improve our understanding of household food waste.

Despite these limitations, the baseline and 2021 can be directly compared, and there is limited evidence to indicate that there have been large scale changes in behaviours which would undermine the assumptions behind home composting and drain estimates.

5.2 Food & drink manufacturing

The limitations of the food & drink manufacturing estimate have already been discussed. The introduction of Digital Waste Tracking[37] should resolve many

[34] See section 3.1 of https://wrap.org.uk/sites/default/files/2023-03/20230309%20Food%20Trends%202022.pdf
[35] https://wrap.org.uk/resources/report/uk-household-food-waste-tracking-survey-winter-2021
[36] See section 7.3 of https://www.foodstandards.gov.scot/downloads/Consumer_attitudes_towards_the_diet_and_food_environment_in_Scotland_research_report_-_June_2023.pdf
[37] https://www.gov.uk/government/publications/digital-waste-tracking-service

of the limitations and allow the allocation of food waste to the sectors that produced it at a much more granular level and much faster than is currently possible.

Digital Waste Tracking may also help us understand if the EWC codes adequately capture the composition of the Scottish food & drink manufacturing sector, or whether there are some sectors disposing of waste through mixed waste streams that is not currently detected by the present methodology.

Digital Waste Tracking may improve the consistency and accuracy of how EWC codes are applied to waste, but as it is related to user understanding of the categorisation of waste, it is still possible that waste will be incorrectly identified as food waste, or other materials identified as food waste. This is not likely to have a large effect on the overall total, but it is still an area that can be improved.

Another area of uncertainty that we are aware of is the conversion factor applied to a waste stream with high non-food content. This is typically due to water, so the conversion factors are applied to the total reported tonnage to estimate the actual weight of food waste present in the waste stream.

The conversion factors currently applied are detailed in the SEPA quality report[18] and based on factors determined by WRAP, but factors determined at a UK level may not be as applicable to the Scottish food & drink manufacturing due to the composition of the sector.

Any update to the conversion factors would apply to the baseline as well as subsequent years. We suspect that the level of food waste varies year-on-year so we need to conduct more research to determine if standard conversion factors can be determined or if empirical studies are required for each year being measured.

Any variation in the conversion factors would not be significant enough to alter the direction of change between years, and the impact of applying new conversion factors is likely to reduce both the baseline and 2021 estimate.

This means that we are confident that the food & drink manufacturing estimates are broadly representative of the scale of change between years, even if the accuracy of the tonnages assigned to each EWC could be improved.

5.3 Other sectors

We are least confident in the other sectors estimate. Without updated commercial and industrial waste composition data, and the lack of granularity associated with the SEPA data, it is difficult to generate an accurate estimate that does not simply track changes in the size of the SIC sections that make up the estimate. Any changes in behaviour or the impacts of COVID-19 cannot be observed in the estimate.

Digital Waste Tracking should allow us to allocate food waste to the SIC sections that make up the other sector estimates in much greater detail, but if a lot of waste disposed of by these sectors is present in mixed waste streams, such as residual waste, we will still need updated commercial waste composition studies to accurately estimate the amount of food waste present.

Until Digital Waste Tracking is fully introduced, there are other methods of generating bottom-up estimates for each SIC section based on other data

sets. For example, the number of patient-stays per year combined with an estimate of waste per patient, or the number of pupils at each level of education combined with an estimate of the waste per pupil. This would at least allow ranges to be generated that could be compared with the waste composition data and the SEPA data.

5.4 Carbon Impacts

There is some methodological uncertainty associated with the Carbon Metric as a result of the lack of distinction between unavoidable and avoidable food waste in the data used to calculate the impact factors. The carbon factor for 'generated' food waste is based on a 'cradle to retail' analysis of food. Unavoidable food waste or by-product from food & drink manufacturing would already be accounted for in the household generated carbon factor.

There is a risk of double counting, where carbon impacts of food waste from households (or from retail/commercial catering) have already accounted for some of the associated unavoidable food waste arising from manufacturing in the non-household generated carbon factor. Improvements to the underlying data and the assumptions behind the data used to generate the generated carbon factors for non-household waste would remove this risk. The data used to calculate the generated carbon impacts was provided by WRAP.

In 2024, the carbon metric will be replaced by the Scottish Waste Environmental Footprint Tool (SWEFT), which has a wider scope than the carbon metric. Initially SWEFT will focus on household waste, so future updates to the carbon impacts could use the SWEFT carbon factor for household food waste.

6 Next steps

We will review the methodology used to generate the national food waste estimate when we have completed the analysis of the kitchen and food waste diaries and conducted further research into the conversion factors applied to food & drink manufacturing.

We will also decide if we have enough evidence to update the amount of food waste present in household waste recycling centres and the levels of contamination in food waste and in other recycling streams. If required, we will restate the baseline and 2021 estimate.

This will allow us to generate estimates between now and 2025, but we also need to consider how to adapt and update the methodology to align with the reporting requirements of UN SDG 12.3 for 2030.

This will also involve a decision on which EWC codes should be included in the food & drink manufacturing estimate and how to measure food losses from before the manufacturing stage.

We will work with SEPA, Scottish Government, the Waste Data Strategy Board and businesses, organisations, and communities to establish not only how we measure food waste but work to achieve the aims of the Circular Economy Route Map, the Circular Economy Bill, and the 2030 target.


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