Final Report

Courtauld Commitment 2025 food waste baseline for 2015

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Executive summary

Courtauld 2025 is a voluntary agreement with an ambition to achieve by 2025, relative to 2015, a 20% per person reduction in food waste[1] associated with production and consumption of food and drink in the UK.

This report establishes the baseline for 2015, against which progress will be measured. This baseline covers:

- Household food waste, comprising:
    - Waste collected by local authorities.
    - Waste disposed of to the sewer.
    - Waste composted at home.
- Food waste from the supply chain, comprising:
    - Retail.
    - Manufacturing.
    - Hospitality and Food Service (HaFS).

Pre-farm gate waste (i.e. waste from primary production) has been excluded as the scope of the Courtauld target for food waste agreed in 2015 covers the supply chain post-farm gate[2].

This report is based on updated estimates of the quantity of food waste arising in 2015, and estimates differ from figures reported previously. The main changes relative to previous estimates are as follows:

- Previously published 2015 household food waste data[3] have been restated to bring the estimates into line with the Food Loss and Waste Accounting and Reporting Standard (FLWS). While the underlying data remain the same, changes to the definition of food waste (in particular the distinction between wasted food [edible parts] and associated inedible parts and the exclusion of food fed to animals) have affected the baseline estimates.
- The retail food waste estimate is now based on data submitted by retailers for the year 2015 under Courtauld 2025. This represents a significant improvement in data quality and granularity[4].
- The estimate for food waste from the manufacturing sector has been updated based on 2015 Environment Agency data submissions and Interdepartmental Business Register (IDBR) data[5].

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[1] *'Food waste' is used as shorthand for 'food and drink waste' in this report*

[2] *Third party logistics and food waste from wholesale markets and litter have also been excluded, due to their modest contribution to UK food waste, and limited data availability*

[3] *http://www.wrap.org.uk/content/household-food-and-drink-waste-uk-0*

[4] *The previous estimates, published by BRC, can be found at https://brc.org.uk/media/105811/10105-brc-food-waste-report-final.pdf*

[5] *The previously published estimate was for 2014 and is available at http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain*

- The estimate for food waste from the HaFS sector has been updated based on 2015 IDBR data and more recent data sources on the size of the "cost sector" in the UK foodservice market[6].

These changes are discussed in more detail in the main body of the report, and a comparison of the updated estimates with previous values is provided in Appendix 5.

The baseline food waste arising the UK for 2015 is shown below, split by sector to mirror how the updated figures will be calculated during the agreement reporting years.

UK food waste 2015

Food waste source	UK arising (tonnes)	Arising per person (kg)
Household waste, of which:	**7,050,000[7]**	**108**
LA collected food waste, of which:	4,900,000	75
Residual waste	*4,120,000*	*63*
Organics collection	*639,000*	*10*
Other	*140,000*	*2*
Disposed to sewer	1,640,000	25
Home composted	518,000	8
Supply chain waste, of which:	**3,140,000**	**48**
Retail	261,000	4
Manufacturing	1,850,000	28
HaFS	1,020,000	16
Total	**10,200,000**	**156**

The total value of food wasted in the UK in 2015 is estimated at £20 billion, or £307 per person per year.

Data limitations mean that it has only been possible to provide a reliable estimate for the split of wasted food (edible parts) and inedible parts for household food waste[8]; there is no data currently available for the supply chain to allow this distinction to be made. Previous WRAP estimates of the extent to which food waste could be theoretically avoided have been used as a proxy to provide an estimate of the proportion of food waste that is wasted food (edible parts) and the proportion that is inedible parts, as shown below. WRAP is working with industry and the World Resources Institute (WRI) on guidance to help obtain more reliable data on wasted food vs inedible parts from the supply chain.

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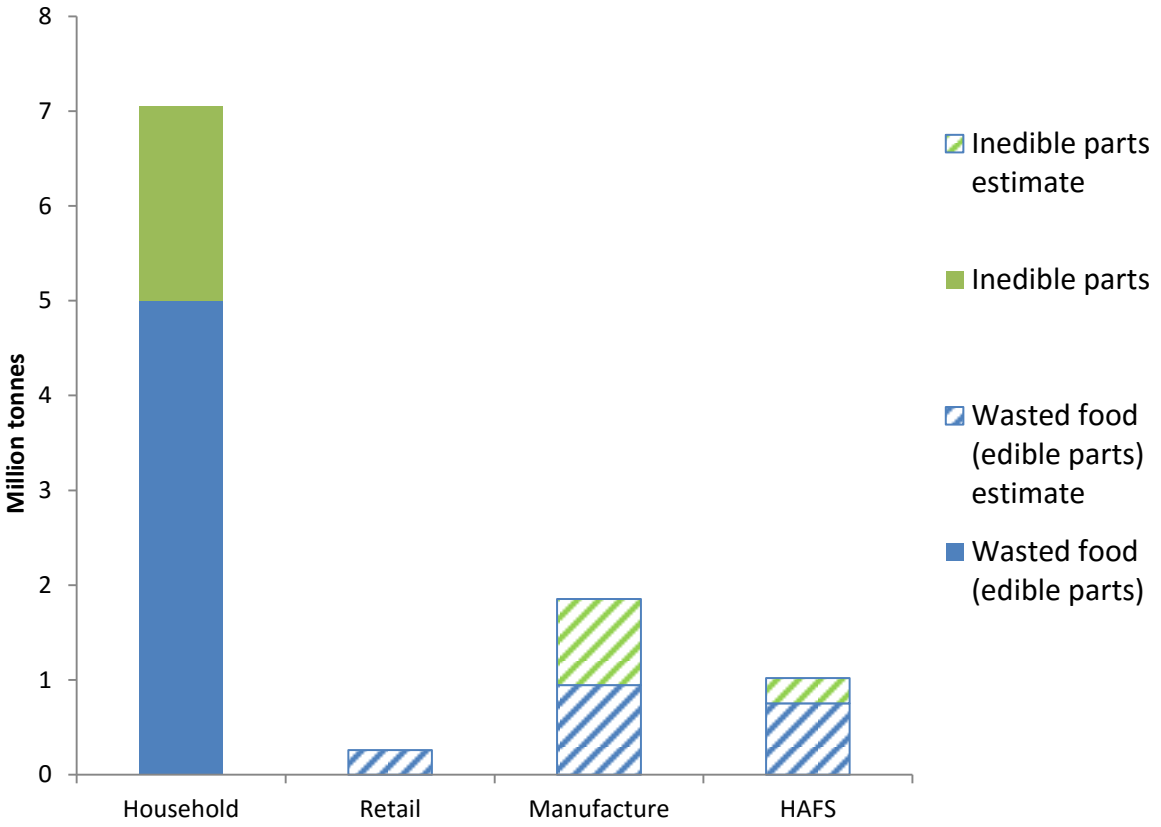
[6] The previously published estimate was for 2011. www.wrap.org.uk/sites/files/wrap/Overview%20of%20Waste%20in%20the%20UK%20Hospitality%20and%20Food%20Service%20Sector%20FINAL.pdf

[7] WRAP's standard published figure is 7,100,000 tonnes, rounded to two significant figures. Tables in this report are rounded to three significant figures to allow measurement of smaller changes relative to the baseline.

[8] This report defines food waste in line with the FLWS as comprising wasted food (i.e. material that is or was food intended for human consumption regardless of its current state) and inedible parts (i.e. parts that were not intended for consumption, such as banana skins, tea bags or bones).

Estimated breakdown of food waste



Overall, the total estimate for food waste across all sectors comprises 6,960,000 tonnes of wasted food (edible parts) and 3,220,000 tonnes of inedible parts.

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1.0 Introduction

Courtauld 2025 is a sector-wide voluntary agreement targeting the UK food supply chain. Courtauld 2025 has a collective ambition to achieve by 2025, relative to 2015:

- 20% per person reduction in food and drink waste associated with production and consumption of food and drink in the UK.
- 20% per person reduction in the greenhouse gas (GHG) emissions associated with production and consumption of food and drink in the UK.
- A reduction in impact associated with water use and water stress in the supply chain.

This report sets out the estimated food waste arising for the UK in 2015, and constitutes the baseline against which the first of the targets above will be measured. It presents the methods used for calculating each part of the baseline and the following results:

- Total food waste arising in the UK, as total tonnage and per capita.
- A breakdown of the above for the household and supply chain sectors.
- A breakdown of household food waste into wasted food (edible parts) and inedible parts, and a similar breakdown (based on a proxy measure) for the supply chain.

The report also includes discussion of the work that has been carried out on updating the estimates from previous published values. The main focus of this work has been to harmonise WRAP's approach to quantifying and reporting food waste with the FLWS and to update the supply chain estimates with the latest Environment Agency and Interdepartmental Business Register data.

2.0 Method

2.1 Household food waste

The methodology used to calculate the 2015 household food waste baseline is based on the approach described in WRAP (2013) *Methods used for Household Food and Drink Waste in the UK 2012.* Some differences have arisen from the work to harmonise WRAP's food waste measurement and reporting with the FLWS, and particularly the reclassification of food waste categories from avoidable / potentially avoidable / unavoidable to wasted food (edible parts) and inedible parts and the omission of food fed to animals. Key points both on the specific parts of the overall methodology and on the differences from previous reports are drawn out below.

2.1.1 Methodology for calculating household food waste arisings

For the purposes of this report, the following are classified as disposal routes for household food waste:

- Waste streams collected by (or on behalf of) local authorities from households;
- residual waste collected at the kerbside (i.e. the general bin);
- collections by local authorities that target food waste (either separate food waste collections or mixed garden and food waste collections);
- contamination of 'dry' kerbside recycling collections (e.g. glass, paper);
- residual waste collected at household waste recycling centres;
- the sewer (mostly down the kitchen sink); and
- home composting.

Food (originally intended for human consumption) that is fed to animals is no longer considered as food waste.

The amount of household food waste collected by local authorities was estimated by combining local authority waste compositional analyses from the period with WasteDataFlow information on the quantities collected in each waste stream. This approach is outlined in detail in WRAP (2017) *Synthesis of Food Waste Compositional Data 2014 & 2015.*

There is less information for other disposal routes, namely sewer disposal and home composting. For sewer waste, data for 2015 have been calculated using the method outlined in WRAP (2013) *Methods used for Household Food and Drink Waste in the UK 2012*. The original data source was kitchen diaries, in which participants (319 households) recorded the amount of food and drink disposed of down the drain. It was assumed that the amount of food waste going down the sewer changed in line with the trends seen in food waste within waste streams collected by local authorities (residual and collections targeting food waste). This assumes that the trends in the amount of food waste are similar for foods commonly being collected by local authorities compared to foods that are usually disposed of down the sewer. It also assumes that there has been no substantial shift favouring one form of disposal over the other.

Home composting is a relatively minor route for discarding food waste. For 2015 it was assumed that the same amount per person of food waste went to home composting as in 2012 (8.0 kg / person / year). The 2012 estimate is based on kitchen diaries from that year, research that involved 948 households. As discussed in WRAP (2017), there has been no evidence of change in the amount going to home composting.

There are no data for 2015 on the proportion of household food waste (HHFW) that is food (as opposed to inedible parts). The 2015 estimate of HHFW is based on the detailed compositional analysis undertaken as part of WRAP's (2013) *Household Food and Drink Waste in the UK 2012*[9]. It has been assumed that the amount of inedible parts per person has remained constant (at 32 kg / person / year), leading to an increasing total amount of inedible parts reflecting population growth.

2.1.2 Adapting to the Food Loss and Waste Standard (FLWS)

Adopting FLWS required adjustments to the way WRAP defines and reports on household food waste in the UK. There were three primary changes necessitated by the FLWS:

1) Food fed to animals – pets, wild animals such as birds, or animals kept for food-related purposes (e.g. chickens for eggs) – is no longer classified as household food waste, aligning with other stages in the supply chain. This change requires the removal from the estimate of food waste associated with this destination.
2) A move from WRAP's previous approach of classifying food waste as avoidable, potentially avoidable or unavoidable (see *Household Food and Drink Waste in the UK 2012* for definitions) to just two categories – food and the associated inedible parts. This requires reclassification of the food waste to conform to the new system.
3) Whole items are treated differently under the FLWS than under the previous approach. In the past, a whole item thrown away (e.g. a banana) was classified in its entirety as avoidable. The new approach distinguishes between the food

[9] http://www.wrap.org.uk/content/household-food-and-drink-waste-uk-2012

(flesh) and inedible (skin) parts of the item. This requires an estimate of the food / inedible proportion for the range of whole items.

Removal of food fed to animals from household food waste is straightforward, as this material was already recorded separately. The approach to classifying material as food or inedible, and of determining the food proportion of whole items, is set out below.

2.1.3 Method for classifying inedible parts

As the FLWS acknowledges, the boundary between wasted food (edible parts) and inedible parts is a cultural as well as a biological construct. There is a spectrum of what people consider edible (and thus food) or inedible, ranging from items that nearly the whole population would not eat to items that some people consider as edible, while others do not. These latter also contrast with items that almost everyone would regard as edible, despite many people choosing not to eat them – these were defined as "potentially avoidable" under the previous classification, but are clearly "food" under the FLWS.

In order to draw a reproducible and defensible distinction between wasted food (edible parts) and inedible parts a survey was conducted to assess the view of the UK population on whether a range of items were thought to be edible. Two questions were asked to assess:

1) Which items / parts of items respondents ate; and
2) which items / parts of items respondents considered to be edible, whether or not they ate these items themselves.

These two questions were asked about different parts of items (e.g. apple skin / peel, parsnip skin / peel) chosen because a) they represented a substantial amount of waste as previously determined from waste compositional analysis and diary research, b) they were judged to be 'borderline' by the authors as to whether they should be classified as food or inedible parts, c) they could be used as proxies for other items.

It was found that including bones (e.g. chicken bones) in these questions led to confusion. People found it hard to categorise bones if they usually made stock (e.g. for soups and stews) with them, a process in which a fraction of the material gets incorporated into the stock. For this reason, the questionnaire did not ask about bones in these two questions; instead, two additional questions were developed focusing on whether people used bones to make stock and the degree to which they did this.

The survey was conducted by Populus using an on-line poll. The questionnaire was answered by a sample of 1,092 adults, representative of UK adults.

Information from the two questions was used to determine whether these sixteen items were considered "food" or "inedible parts"[10]. The classification reflects what people state that they eat as well as what they would generally consider is edible. The results are shown in Table 1

[10] *A score was assigned to the answers given to each question based on the response (e.g. 1 for "always", 1/3 for "occasionally") and average taken across the respondents' answers for each item to obtain a score for each item for each question. For a given item, the average score was calculated for the two questions, providing a single value to reflect its perceived edibility from the UK population. Items that scored above 0.5 were classified as 'edible' (i.e. food); items scoring below 0.5 were classified as 'inedible parts'. For details, see WRAP (2018)* Household food waste: restated data for 2007-2015

Table 1: Results of edibility survey

Edible	Inedible
■ Crusts of bread slice ■ End slices of loaf ■ Apple skin ■ Cooked chicken skin ■ Potato skin ■ Bacon rind ■ Broccoli stalk ■ Cauliflower stalk ■ Outer cabbage leaves ■ Carrot skin	■ Apple core ■ Orange peel (including the zest) ■ Cabbage - stem & hard centre ■ Parsnip skin ■ Oil drained from fish tin

The question on bones revealed that the majority of people (72%) did not make stock from bones. Of those who did make stock, not all bones coming into the household were used for stock – probably around half given the responses to the questions. Given that the overwhelming majority of bones were not used for making stock (and only a small fraction of their weight was incorporated into the stock), bones have been classified as inedible parts.

For items of food where there was a measure of uncertainty about the edibility of the item and no direct comparison to the survey, a proxy was selected from the list. For example, swede peel is not covered in the survey but is considered similar in nature (peel of a root vegetable often roasted) to parsnip peel.

2.1.4 Breakdown of items containing food and inedible parts

When an item of waste is whole or consists of some food (edible parts) and inedible parts, it is necessary to determine the proportion of the item that is food. This was estimated based on the following resources:

1) Food Standards Agency (2002) McCance and Widdowson's The Composition of Foods, Sixth summary edition. Cambridge: Royal Society of Chemistry.
2) Lynch, F.T. (2011) The Book of Yields: Accuracy in Food Costing and Purchasing, Eighth edition. Hobeken, New Jersey: Wiley.
3) US Department of Agriculture, Agricultural Research Service, Nutrient Data Laboratory (2015) USDA National Nutrient Database for Standard Reference. Release 28. Slightly revised May 2016[11].

Where a meat or fish carcass was cited in the waste compositional analysis data, there was often accompanying data on roughly how much meat was still on that carcass. We applied a calculation based on the percentage of meat on the bone, the full weight of the animal pre-cooking and the weight of the bones of that animal. We did not correct for cooking weight changes.

A more detailed methodology and full results for the 2015 estimates of household food waste is published alongside this report. Previous estimates for 2015 (using a similar

[11] *Available from: https://www.ars.usda.gov/northeast-area/beltsville-md/beltsville-human-nutrition-research-center/nutrient-data-laboratory/docs/usda-national-nutrient-database-for-standard-reference/*

approach but not aligned with the FLWS) can be found in WRAP (2017) *Household Food Waste in the UK, 2015* [12].

2.2 Supply chain

2.2.1 Retail sector

Courtauld 2025 signatories comprise approximately 95% of the UK grocery retail sector by value of sales[13]. Signatories provide data on their total food waste arising each calendar year. While not all retail signatories were able to provide a data return for 2015, those that were accounted for 85% of retail sector sales value. Given this high level of coverage, the retail baseline has been calculated by simply grossing up the signatory food waste data to account for the whole sector (i.e. dividing by 0.85).

The estimate for 2015 used in this report has been updated, and is now based on Courtauld 2025 data; previous estimates for 2015 were based on data from Courtauld 3. This represents an improvement in data accuracy and granularity, as Courtauld 2025 requires signatories to report their food waste separately from other waste streams whereas Courtauld 3 allowed reporting of mixed food and packaging waste under a single value.

2.2.2 Manufacturing sector

Courtauld 2025 coverage of the manufacturing sector is estimated at approximately 20% (based on signatory sales of £12 billion against estimated sector sales of £60 billion for 2015). The current level of sign up means that it is not possible to apply the approach outlined above for retail to the manufacturing sector[14].

The approach to calculating food waste from the manufacturing sector is taken from WRAP (2016) *Quantification of food surplus, waste and related materials in the grocery supply chain*.[15] Food waste has been estimated as follows:

1) Total waste arisings from manufacture were obtained from the Environment Agency IPPC data.[16] These data include all waste arisings by EWC[17] Code. While there are a number of relevant EWC codes that cover waste generated in food production, there are no codes that cover food waste specifically. All the relevant codes contain a mix of food waste and other organic wastes[18]. All data from food

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[12] *http://www.wrap.org.uk/sites/files/wrap/Household_food_waste_in_the_UK_2015_Report.pdf*

[13] *Kantar World Panel data.*

[14] *This is partly due to sampling error, but more importantly because the sample comprising Courtauld signatories cannot be taken as representative of the population as a whole. This is not an issue with the retail data, as the majority of the sector is signed to Courtauld 2025.*

[15] *http://www.wrap.org.uk/system/files/private/WRAP%20Quantification%20of%20food%20surplus%20and%20waste%20-%20May%202016%20Final%20Report%20v2.pdf*

[16] *Integrated Pollution Prevention and Control (IPPC) data are used to monitor environmental performance and compliance with regulations. The data are collected by companies and submitted to the Environment Agency annually, and cover a range of emissions, including solid waste. Data must be submitted by all business premises over a certain size threshold – the thresholds are different for different types of premises, and are based on risk. https://www.gov.uk/government/collections/pollution-inventory-reporting. This data covers England only (and there is no comparable data set available for other UK nations), but was grossed up by number of premises in the UK to produce a UK estimate.*

[17] *The European Waste Catalogue (EWC) is a hierarchical list of wastes established for the purpose of categorising and reporting on wastes. https://www.gov.uk/government/publications/waste-classification-technical-guidance*

[18] *Waste streams from food production contain a wide range of non-food materials, including animal excrement, bedding and stomach contents, soil, stones and plant matter not intended for human consumption.*

production in the IPPC dataset were manually coded by manufacturing subsector[19] (this includes subsectors that currently have no representation among Courtauld 2025 signatories, as the scope of the Courtauld 2025 targets is the whole UK food supply chain).

2) The total IPPC-reported arising of each relevant EWC code was calculated by each sector for each premises employee size bracket (usually 100+ employees only; for some sectors 100-249 employees and 250+).
3) Fieldwork (conducted in 2015[20]) was used to estimate the proportion of food waste in each subsector | EWC code intersect, also to inform the interpretation of EWC codes that contain food waste arisings.
4) The results of steps 2 and 3 were multiplied to calculate the estimated food waste arising for each subsector | EWC code | size band intersect.
5) Data were then scaled to the UK level using 2015 IDBR[21] data (number of premises by employment band for each subsector). This was done in two steps:
    a. Each size bracket food waste arising was multiplied by a scaling factor (IDBR premises count divided by IPPC premises count) and the results added together.
    b. The result was then multiplied by a further factor to account for the likely arisings from premises smaller than 100 employees. This scaling (based on the 2015 IDBR) is needed, since the IPPC data only contains data from premises with 100 or more employees.

The 2016 study made use of IDBR and IPPC data from 2014 (the latest data available at the time of publication). The baseline presented in this report is an update of this work using data sets from 2015.

2.2.3 Hospitality and food service sector (HaFS)

As with manufacturing, there are insufficient HaFS organisations signed up to Courtauld 2025 to allow direct estimation of national arisings from signatory results (signatory sales value is around £9 billion; the estimated sales value of the HaFS sector is approximately £118 billion[22], with estimated coverage around 8%).

For estimation of baseline UK food waste arisings from the HaFS sector, WRAP has remodelled food waste arisings based on WRAP's 2013 report *Overview of Waste in the UK Hospitality and Food Service Sector*.[23] This research was based on interviews and fieldwork that collected data from 690 individual HaFS outlets across the nine major HaFS subsectors[24]. The baseline has been calculated using the following approach:

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[19] *Food subsectors: Meat, poultry and fish, Dairy products, Ambient products, Alcoholic drinks, Fresh fruit and vegetable processing, Bakery, cake and cereals, Pre-prepared meals, Soft drinks and fruit juices, Confectionery, Milling.*

[20] http://www.wrap.org.uk/system/files/private/WRAP%20Quantification%20of%20food%20surplus%20and%20waste%20-%20May%202016%20Final%20Report%20v2.pdf

[21] *Inter-Departmental Business Register;* https://www.ons.gov.uk/aboutus/whatwedo/paidservices/interdepartmentalbusinessregisteridbr

[22] *Oxford Economics (2015) The economic contribution of the UK hospitality industry*

[23] www.wrap.org.uk/sites/files/wrap/Overview%20of%20Waste%20in%20the%20UK%20Hospitality%20and%20Food%20Service%20Sector%20FINAL.pdf

[24] *HaFS subsectors: Restaurants, Pubs, Education, Healthcare, Hotels, Quick Service Restaurants, Services, Leisure, Staff catering.*

1) Reweight the data used in the 2013 report to account for the change in number and size of premises, as set out in the 2015 IDBR, number of pupils served by school catering etc.
2) Subtract the estimated food waste avoided in 2015 as a result of WRAP's Hospitality and Food Service Agreement (the HaFSA achieved an estimated saving of 12,000 tonnes in 2015). This is needed in order to take into account reductions in the amounts of food waste achieved by HaFSA signatories which otherwise would not be reflected in the analysis.

2.2.4 Limitations of each element of the baseline

The retail baseline is estimated to be relatively robust, as it is extrapolated from signatory data covering 85% of the sector (by sales).

The manufacturing baseline has the following major limitations:

- Only premises over a certain threshold size (which varies by sector) are required to submit IPPC data. Estimates are extrapolated from samples that, in some cases, may be relatively small. In addition, the data set has no direct coverage of SMEs. While the data are grossed up to cover all UK businesses in a sector, it is not possible to account for performance characteristics that might be unique to SMEs.
- The proportion of some EWC codes (in particular sludges) made up of food has been estimated, and these estimates potentially have a wide margin of error. Sludges account for more than 50% of the estimated waste from the food supply chain, so the estimates of overall food waste are sensitive to the assumptions made.

The primary limitation of the HaFS baseline is that, for budgetary reasons, it was not possible to repeat the fieldwork to gather new data on the composition of each EWC code for each sector. As a result, it has been necessary to model the food waste arising from the HaFS sector based on aging data from 2013 (cost sector) and 2011 (profit sector)[25].

[25] *In the context of this report, the term "cost sector" is used to describe mostly contract catering activities (e.g. school dinners, hospital catering, workplace staff canteens) while "profit sector" is used to describe operations such as pubs, restaurants and quick service restaurants.*

3.0 Results

The Courtauld 2025 baseline food waste estimate for 2015 is 10,200,000 tonnes, which is composed of 7,100,000 tonnes of household food waste[26] and 3,140,000 tonnes of food waste from the supply chain (retail, manufacture and HaFS). This figure includes waste to sewer from household but excludes waste to sewer from the supply chain due to lack of data.

These results equate to a per capita food waste arising of 156kg per person per year[27].

The breakdown of household food waste is shown in Table 2 (by disposal route) and Table 3 (by food vs inedible parts).

Table 2: Household food waste (2015) by disposal route

Disposal route	UK arising (tonnes)	Arising per person (kg)
LA collected food waste, of which:	4,900,000	75
Residual waste	*4,120,000*	*63*
Organics collection	*639,000*	*10*
Other	*140,000*	*2*
Disposed to sewer	1,640,000	25
Home composted	518,000	8
Total	**7,050,000**	**108**

Table 3: Household food waste (2015) by wasted food vs inedible parts

Food waste type	UK arising (tonnes)	Arising per person (kg)
Food	4,995,000	77
Inedible parts	2,055,000	32
Total	**7,050,000**	**108**

Based on the estimated value of the wasted food (edible parts) component of household food waste by food type (see 'Household food waste: restated data for 2007-2015'; WRAP 2018, published alongside this document, for details) the estimated value of food thrown away from households is £14.9 billion, or £229 per person per year.

The combined 2015 supply chain baseline for Courtauld 2025 is just over three million tonnes. The breakdown of supply chain waste is shown in Table 4, by sector of origin.

Table 4: Supply chain food waste, 2015

Sector	UK arising (tonnes)	Arising per person (kg)
Retail	261,000	4
Manufacturing	1,850,000	28
HaFS	1,020,000	16
Total	**3,160,000**	**48**

[26] This is the new published WRAP figure for household waste. Tables in this report are rounded to three significant figures to allow smaller levels of change to be measured against the baseline.

[27] Based on a UK population estimate of 65,110,000.

Details of the calculations used to derive the supply chain estimates are given in Appendices 1 (retail), 2 (manufacture) and 3 and 4 (HaFS).

There is no reliable breakdown for the supply chain by wasted food (edible parts) versus inedible parts due to a lack of data. Previous WRAP estimates of the extent to which food waste could be theoretically avoided have been used as a proxy to provide an estimate of the proportion of food waste that is wasted food (edible parts) and the proportion that is inedible parts, as follows.

- For retail, WRAP (2016)[28] estimated that 100% of retail food waste could theoretically be avoided (as it was all intended for sale[29]). The previous estimate of retail food waste for 2015 was 240,000 tonnes (from Courtauld 3 data, as previously discussed), having a value of £0.7 billion. The updated estimate for the value of wasted food from retail was based on scaling this figure up to 261,000 tonnes.
- The WRAP 2016 report estimated that, of 1.7 million tonnes of food waste produced by the manufacturing sector, 870,000 tonnes could be theoretically avoided with a value of approximately £1.2 billion. These figures were scaled to reflect the updated manufacturing food waste estimate of 1.85 million tonnes.
- For HaFS, WRAP (2012)[30] estimated that 680,000 tonnes of the 920,000 tonnes of food waste could have been eaten, and estimated its value at £2.5 billion. This figure was weighted by the increase in overall estimated waste (to 1,020,000 tonnes, assuming the proportion of food to inedible parts remains constant) and then adjusted to account for inflation from 2011 to 2015. Inflation adjustment was carried out using the Consumer Price Index for food and non-alcoholic drinks[31], which was the most relevant data set of the CPI time series.

When combined with the estimated cost of wasted food (edible parts) from households, the results suggest the value of wasted food (edible parts) across households, food manufacture, retail and HaFS was £20 billion in 2015, which equates to £307 per person.

Data limitations mean that it has only been possible to provide a reliable estimate for the split of wasted food (edible parts) and inedible parts for household food waste[32]; there is no data currently available for the supply chain to allow this distinction to be made. Previous WRAP estimates of the extent to which food waste could be theoretically

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[28] WRAP (2016) *Quantification of food surplus, waste and related materials in the grocery supply chain.*

[29] *Of course, certain items sold at retail will consist of both food and inedible parts, such as whole fresh chicken, meat joints and some fresh fruit and vegetables, but there is not yet the granularity of data available from retailers to quantify these separately. In addition, there may be some inedible parts arising from the preparation of food for fresh meat & fish and deli counters in some retail stores, but this is likely to make a small contribution to retail food waste overall, and there is currently no data available to estimate this.*

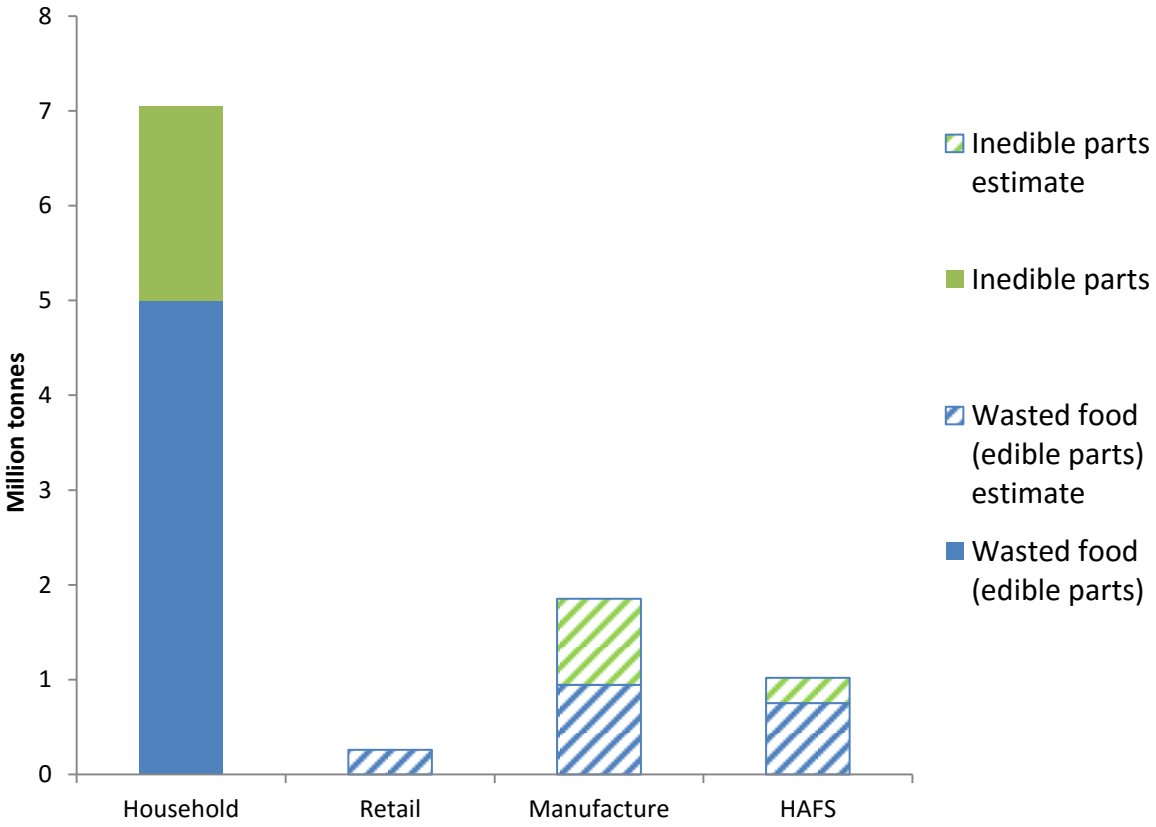
[30] http://www.wrap.org.uk/sites/files/wrap/Overview%20of%20Waste%20in%20the%20UK%20Hospitality%20and%20Food%20Service%20Sector%20FINAL.pdf

[31] https://www.ons.gov.uk/economy/inflationandpriceindices/timeseries/d7bu/mm23

[32] *This report defines food waste in line with the FLWS as comprising wasted food (i.e. material that is or was food intended for human consumption regardless of its current state) and inedible parts (i.e. parts that were not intended for consumption, such as banana skins, tea bags or bones).*

avoided have been used as a proxy to provide an estimate of the proportion of food waste that is wasted food (edible parts) and the proportion that is inedible parts, as shown in Figure 1. WRAP is working with industry and the World Resources Institute (WRI) on guidance to help obtain more reliable data on wasted food vs inedible parts from the supply chain.

Figure 1: Estimated breakdown of food waste



In the figure above, while all retail waste is shown as wasted food it will contain a proportion of inedible parts that are not reflected here (i.e. items such as oranges and whole fresh chickens contain a proportion of inedible parts, which hasn't been separately estimated). Due to the relatively low level of retail food waste arisings, however, any inaccuracy arising from this will be minimal when taken in the context of overall UK food waste.

3.1.1 Comparison with previous estimates

Table 5 and The total 2015 UK food waste arising (expressed to two significant figures) has not changed from the previous estimate; the smaller estimate for household food waste has been almost exactly offset by the increase in the supply chain estimate.

Table 6 below show the changes resulting from the restating work and the revision of the supply chain food waste estimate in the light of updated data.

Table 5: Changes in updated food waste estimate for 2015

Sector	Previous estimate (t)	Year	Updated 2015 estimate (t)	% change
Households[a]	7,300,000	2015	7,050,000	-3%
Retail[b]	240,000	2015	261,000	+7%[33]
Manufacture[c]	1,700,000	2014	1,850,000	+9%
HaFS[d]	920,000	2011	1,020,000	+11%
Total	10,200,000		10,200,000	+0%

a. Biggest change is removal of food fed to animals

b. Based on Courtauld 2025 rather than Courtauld 3 data

c. Updated using 2015 IPPC/IDBR data

d. Updated using 2015 IDBR data and HaFS weighting factors (Appendix 4) and HaFSA impact

The total 2015 UK food waste arising (expressed to two significant figures) has not changed from the previous estimate; the smaller estimate for household food waste has been almost exactly offset by the increase in the supply chain estimate.

Table 6: Impact of restating on estimated food (edible parts) component of food waste and cost of food waste, 2015

Sector	Previous estimate (t)	Value (£bn)	Updated 2015 estimate (t)	Value (£bn)
Households	4,400,000	13	5,000,000	14.9
Retail	240,000	0.7	261,000	0.8
Manufacture	870,000	1.2	947,000	1.4
HaFS	680,000	2.5	754,000	2.9
Total	6,180,000	17.4	6,962,000	20.0

Overall, the estimates remain broadly consistent with previous years. The estimate for household food waste is slightly lower, due to the omission of food fed to animals from the definition of food waste. Food waste from retail is slightly higher, as a result of improved data quality resulting from the shift from Courtauld 3 to Courtauld 2025 data. The significance of the changes to the manufacture and HaFS estimates are less certain, as these changes may be within the error margins of the data; whether this is the case is dependent on the amount of noise in the IPPC data (see appendices for further discussion), which will become clearer as this estimate is updated in future years.

4.0 Conclusions

Overall, the Courtauld 2025 food waste baseline for 2015 was estimated at 10.2 million tonnes (156 kg / person / year). Of this, 7.1 million tonnes was household food waste, with the remaining 3.1 million tonnes originating in the (post farm gate) food supply chain. The estimated value of food wasted in the UK for 2015 was £20 billion.

[33] *7% figure is based on unrounded data (the unrounded previous estimate was 1.73 Mt).*

Appendix 1: Retail baseline detail

The retail baseline was calculated by weighting the Courtauld 2025 retailer data submission by market coverage, as discussed above. The results are shown in Table 7 below.

Table 7: Retail baseline 2015

Data	Value
Courtauld submissions (tonnes)	222,100
Market coverage of submissions	0.85
Estimated UK arising (tonnes)	261,000

The estimated baseline 2015 total food waste arising from the retail sector is 261,000 tonnes. While this is higher than the published 2015 estimate of approximately 240,000 tonnes, it should be borne in mind that this previous estimate was based on analysis of data from Courtauld 3[34]. Courtauld 3 did not require signatories to report their food waste separately, and the food waste was modelled based on conversations with signatories and analysis of disposal routes.

[34] http://www.wrap.org.uk/sites/files/wrap/Estimates_%20in_the_UK_Jan17.pdf

Appendix 2: Manufacture baseline detail

The manufacturing baseline (shown above) was derived using a five-step process. The steps and results at each stage are shown below.

STEP 1. Extract IPPC data

Table 8 shows the amount of waste reported within the IPPC data from each sector (headings are based on descriptive interpretations of EWC codes from the List of Wastes).

Table 8: Waste arisings by sector and EWC code type

Sub-sector	Total waste (tonnes)	Food sludges (tonnes)	Animal tissues excl. rendering (tonnes)	Unsuitable material (tonnes)	Effluent sludges (tonnes)	Edible oils (tonnes)
Sugar processing	3,500	1,977	0	1,538	0	0
Pre-prepared meals	31,700	0	0	18,175	13,476	0
Ambient	20,900	0	0	10,605	10,256	0
Alcoholic drinks	88,700	0	0	14,125	74,539	0
Soft drinks	14,200	208	0	12,087	1,876	0
Confectionery	22,900	0	0	7,609	15,329	0
Bakery	24,500	0	0	11,736	12,812	0
Milling	27,700	0	0	22,272	5,466	0
Dairy	254,400	0	0	32,498	218,372	3,496
Produce	64,200	24,224	0	11,201	28,744	0
Meat, fish, poultry	901,800	150,267	489,639	60,436	199,958	1,490
Total	**1,454,500**	**176,676**	**489,639**	**202,281**	**580,828**	**4,987**

STEP 2. Compare IPPC and IDBR data to derive weighting factors

Table 9 shows the derived weighting factors for each sector | premises-size intersect. These are derived by scaling the number of businesses reporting in the IPPC dataset to the number of businesses in the IDBR.

Table 9: National weighting factors

Sub-sector	Employees 100-250		Employees 250+		100-250	250+	Smaller firms[35]
	EP Data total (IPPC data)	UK total (IDBR)	EP Data total (IPPC data)	UK total (IDBR)	Factor	Factor	Factor
Sugar processing	4	5	0	0	1.25	1.00	1
Pre-prepared meals	13	55	0	0	4.23	1.00	1.111
Ambient	4	60	0	0	15.00	1.00	1.111
Alcoholic drinks	19	60	0	0	3.16	1.00	1.111
Soft drinks	10	25	0	0	2.50	1.00	1.111
Confectionery	8	45	0	0	5.63	1.00	1.111
Bakery	0	0	12	100	1.00	8.33	1.25
Milling	3	20	4	5	6.67	1.25	1.111
Dairy	5	55	20	15	11.00	0.75[36]	1.25
Produce	10	40	0	0	4.00	1.00	1.25
Meat, fish, poultry	26	95	56	110	3.65	1.96	1.25

[35] *Derived from IDBR data.*

[36] *Examination of the IPPC data suggests that it is more likely that this data set contains misclassified premises than the IDBR data.*

STEP 3: Apply weighting factors to IPPC data

The data from Table 9 were weighted to produce a UK estimate of UK waste arisings from the food sector, shown in Table 10.

Table 10: Weighted waste arising estimates

Sub-sector	Total waste (tonnes)	Food sludges (tonnes)	Animal tissues excl. rendering (tonnes)	Unsuitable material (tonnes)	Effluent sludges (tonnes)	Edible oils (tonnes)
Sugar processing	4,400	2,000	0	2,000	0	0
Pre-prepared meals	148,783	0	0	85,000	63,000	0
Ambient	347,672	0	0	177,000	171,000	0
Alcoholic drinks	311,000	0	0	50,000	262,000	0
Soft drinks	35,000	1,000	0	34,000	5,000	0
Confectionery	143,000	0	0	48,000	96,000	0
Bakery	256,000	0	0	122,000	133,000	0
Milling	40,000	0	0	34,000	6,000	0
Dairy	685,000	0	0	55,000	583,000	48,000
Produce	321,000	121,000	0	56,000	144,000	0
Meat, fish, poultry	1,158,000	375,000	97,000	164,000	517,000	6,000
Total	**3,455,000**	**499,000**	**97,000**	**826,000**	**1,980,000**	**53,000**

STEP 4: Determine food waste factors

Factors derived from fieldwork and interviews were applied to the EWC code waste arisings to produce an estimate of the quantity of food waste in this material. These factors are shown in Table 11.

Table 11 Food waste content of wastes by sector and type

Sub-sector	Food sludges[37]	Animal tissues excl. rendering	Material unsuitable for production	Effluent sludges	Edible oils
Sugar processing	0%	NA	100%	NA	NA
Pre-prepared meals	NA	NA	100%	10%	NA
Ambient	NA	NA	100%	10%	NA
Alcoholic drinks	NA	NA	100%	40%	NA
Soft drinks	0%	NA	100%	40%	NA
Confectionery	NA	NA	100%	10%	NA
Bakery	NA	NA	100%	10%	NA
Milling	NA	NA	100%	17%	NA
Dairy	NA	NA	100%	60%	100%
Produce	63%	NA	100%	20%	NA
Meat, fish, poultry	30%	100%	100%	30%	100%

[37] Food sludges comprise sludges that originate directly from food and drink manufacturing processes, including processes in which materials are washed, peeled, chopped or centrifuged, especially in the processing of fresh fruit and vegetables. They frequently contain material not intended for human consumption, such as soil or stones.

STEP 5

Multiplication of the UK weighted EWC code arisings (Table 10) and the food waste factors (Table 11 above) gives the estimated food waste arising for the UK manufacturing sector, shown in Table 12.

Table 12: Food waste arisings by sector and waste type

Sub-sector	Total waste (tonnes)	Food sludges (tonnes)	Animal tissues excl. rendering (tonnes)	Unsuitable material (tonnes)	Effluent sludges (tonnes)	Edible oils (tonnes)
Sugar processing	2,000	0	0	2,000	0	0
Pre-prepared meals	149,000	0	0	85,000	6,000	0
Ambient	194,000	0	0	177,000	17,000	0
Alcoholic drinks	154,000	0	0	50,000	105,000	0
Soft drinks	36,000	0	0	34,000	2,000	0
Confectionery	57,000	0	0	48,000	10,000	0
Bakery	136,000	0	0	122,000	13,000	0
Milling	35,000	0	0	34,000	1,000	0
Dairy	452,000	0	0	55,000	350,000	48,000
Produce	161,000	76,000	0	56,000	29,000	0
Meat, fish, poultry	534,000	113,000	97,000	164,000	155,000	6,000
Total	**1,850,000**	**190,000**	**97,000**	**826,000**	**687,000**	**53,000**

These figures differ, in some cases significantly, from the estimates produced in 2015. This is to be expected, as the data contain numerous sources of uncertainty. In addition to issues around accurately quantifying the material, the IPPC data set was found to contain some miscoding, both of material streams and of premises; some errors may have escaped the recoding and error correction process carried out during the analysis.

The overall estimate of food waste from manufacture has increased from 1,700,000, to 1,850,000 tonnes, based on the updated IPPC and IDBR figures. The most notable change from the previous estimates concerns the dairy sector, where the estimate for waste produced in 2014 rose from 340,000 tonnes to 452,000 tonnes in 2015. This was due to increases in the reported weight of sludges, materials unsuitable for production and edible oils and fats in the IPPC data (the number of sites reporting and scaling

factors remained similar). The cause of this reported increase is unknown; it may reflect changes in practice or sector size, or it may simply be noise due to fluctuations in the data. This will become clear in future years as this analysis is updated.

Appendix 3: HaFS baseline detail

The HaFS baseline was recalculated by weighting the previous results by a range of factors (for example, IDBR premises numbers in the case of the for-profit sector, pupil numbers in the case of schools etc.). The factors used for each sector are shown in Appendix 4. The estimated 2015 impact for the WRAP Hospitality and Food Service Agreement (HaFSA) (12,000 tonnes[38]) was then subtracted from the result to account for reductions already achieved though the agreement.

The headline results are shown in Table 13.

Table 13: Breakdown of HaFS baseline by subsector

Sector	Waste (tonnes)
Profit sector	
QSR	103,000
Restaurants	253,000
Pubs & clubs	202,000
Hotels	83,000
Leisure, transport & sport	60,000
Cost sector	
Education sector	125,000
Health	120,000
Services	65,000
Staff catering	22,000
Total HaFS food waste	**1,033,000**
Corrected for HaFSA	**1,021,000**

Overall, the estimate has increased relative to the 2011 estimate of 920,000 tonnes, due to growth in the sector relative to 2011. The workings of how the updated figure was derived are presented below.

[38] *WRAP (2016) The Hospitality and Food Service Agreement Taking action on waste*

http://www.wrap.org.uk/sites/files/wrap/Hospitality_and_Food_Service_Agreement_final_report_0.pdf

Tables 14 – 16 show the workings for the profit sector figures

Table 14: Number of premises by size band in IDBR 2015

Employee size band	0 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	Large (250+)
QSR	23,385	9,210	2,825	1,275	140	20	
Restaurants	18,485	17,160	11,520	7,280	1,520	440	25
Pubs and clubs	13,375	10,680	9,520	6,360	395	35	
Hotels	2,980	2,160	2,690	2,995	1,175	575	80
UK Leisure, transport & sport	2,259	1,106	1,197	1,527	905	637	6,804

Table 15: Estimated waste arising per premises, in tonnes (WRAP 2013)

Employee size band	0 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	Large (250+)
QSR	1.7	3.8	3.7	7.5	6.5	7.6	
Restaurants	2.3	2.3	4.1	11.0	13.5	13.5	13.5
Pubs and clubs	1.5	1.5	6.6	13.2	13.2	13.2	
Hotels	2.3	3.9	6.2	5.3	10.0	22.0	73.5
UK Leisure, transport & sport	0.5	1.2	1.8	3.2	4.0	4.0	6.0

Table 16: Estimated waste arising from profit sector HaFS sites (tonnes)

	0 to 4	5 to 9	10 to 19	20 to 49	50 to 99	100 to 249	Large (250+)	Sewer estimate (all sites)	Total
QSR	40,029	35,128	10,376	9,612	905	153	0	6,734	102,938
Restaurants	42,987	39,906	47,303	79,821	20,538	5,945	338	16,579	253,417
Pubs and clubs	20,063	16,020	62,832	83,952	5,214	462	0	13,198	201,740
Hotels	6,973	8,424	16,786	15,814	11,750	12,650	5,880	5,166	83,443
UK Leisure, transport & sport	1,129	1,328	2,154	4,886	3,619	2,548	40,824	3,728	60,216
Total	111,181	100,805	139,451	194,085	42,026	21,758	47,042	45,405	701,754

Table 17 shows the workings for the cost sector. All unreferenced values are taken from the original fieldwork for the cost sector research (WRAP 2013).

Table 17 Workings for calculation of HaFS cost sector baseline

Primary Schools: UK	Pupil numbers[39]	Food waste (tonnes)/ pupil/ year[40]	Total food waste (tonnes) / year: UK
< 300 pupils	2,354,885	0.014	32,807
300 to 399	1,036,476	0.013	13,925
400 or more	1,964,796	0.010	19,358
Secondary Schools: UK	Pupil numbers[41]	Food waste (tonnes)/ pupil/ year	Total food waste/ year: UK
< 300 pupils	874,766	0.011	9,796
300 to 399	1,150,935	0.007	7,942

[39] *School Census, England; Scotland School Estate statistics and School Census, Summary Statistics for Scottish Schools, Pupil Census, Supplementary data; Northern Ireland Schools Census*

[40] *Food waste, pooled data from three studies combined: WRAP 2011 Schools waste, ZWS C&I survey 2011 and WRAP (2013)* Overview of Waste in the UK Hospitality and Food Service Sector

[41] *National statistics on pupil numbers within each school size band; all data sources the same as for primary schools*

Primary Schools: UK	Pupil numbers[39]	Food waste (tonnes)/ pupil/ year[40]	Total food waste (tonnes) / year: UK
400 or more	1,764,669	0.006	9,908
UK: Other education (independent schools, special needs, infant schools not already included) [42]			Total food waste/ year: UK
			23,636
UK Higher Education	Student numbers[43]	Food waste/ student/ year	Total food waste/ year: UK
	2,092,186	0.0011	2,309
UK Further Education	Student numbers[44]	Food waste/ student/ year	Total food waste/ year: UK
	1,362,258	0.0040	5,441
UK Nursing and residential care homes	Care homes[45]	Waste per care home place/ year	Total food waste/ year: UK
	535,303	0.108001643	58,883
UK Hospital (Primary Catering Units)	PCU count[46]	Food waste/ PCU/ year	total food waste/ year: UK
less than 250 high dependency beds	412	64.73337379	26,670
250 or more high dependency beds	215	159.8469767	34,367
UK Prison Service	UK prison population[47]	Waste/ prisoner / year	Total food waste/ year: UK

[42] Independent Schools Council (ISC) Census, Scotland Independent Schools Census; Welsh Independent Schools Census. National statistics on pupil numbers in infant schools/ state funded nursery, e.g. England 2012 Early Years Census, not split by size bands due to limited sample.

[43] National statistics on student numbers

44 National statistics on student numbers

45 National statistics on care homes + 2011 Census data

46 National statistics on high -dependency beds + commercial database used to define number of sites with Primary Catering Units.

47 National statistics on prison population

Primary Schools: UK	Pupil numbers[39]	Food waste (tonnes)/ pupil/ year[40]	Total food waste (tonnes) / year: UK
	95,248	0.1958	18,650
UK Military Bases	Number of bases + training centres on UK mainland[48]	Waste/ site/ year	Total food waste/ year: UK
	768	59.71	45,857
UK Staff Catering: commercial sector + public sector not covered elsewhere	Value calculated by assuming 5% reduction 2012-2015, following previously observed reductions since 2007.		Total food waste/ year: UK
			22,495

48 National statistics on number of UK bases and training camps

Appendix 4: Weighting factors for HaFS

Sector	Data used for weighting	Size split to reflect catering scalability
Profit sector	IDBR data on number of premises by sector and size band.	Split by size band, consistent with methodology applied to previously sampled sub-sectors: restaurants, pubs, hotels and QSR: see Section 3 of WRAP 2013
Primary schools	School Census, England; Scotland School Estate statistics and School Census, Summary Statistics for Scottish Schools, Pupil Census, Supplementary data; Northern Ireland Schools Census	Statistical analysis of break-points in waste per pupil with increasing school size: less than 200 pupils, 200 to 399, 400 or more
Secondary schools	National statistics on pupil numbers within each school size band; all data sources the same as for primary schools	Statistical analysis of break-points in waste per pupil with increasing school size: less than 800; 800 to 1199, more than 1200
Independent schools	Independent Schools Council (ISC) Census, Scotland Independent Schools Census; Welsh Independent Schools Census	Statistical analysis of break-points in waste per pupil with increasing school size: less than 800; 800 to 1199, more than 1200
Special schools	National stats on total pupil numbers based on a single per pupil factor, not split by size bands due to limited sample in ZWS data	Single factor
Infant schools	National statistics on pupil numbers in infant schools/ state funded nursery, e.g. England 2012 Early Years Census, not split by size bands due to limited sample	Single factor
Higher education	National statistics on student numbers	Single factor
Further education	National statistics on student numbers	Single factor
Residential and care homes	National statistics on care homes + 2011 Census data. https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland	Single factor as no national data across UK to arrange nursing and residential care homes into bands by number of residents
Hospitals	National statistics on high -dependency beds + commercial database used to define number of sites with Primary Catering Units. https://www.kingsfund.org.uk/publications/nhs-hospital-bed-numbers?utm_source=The+King%27s+Fund+newsletters&utm_medium=email&utm_campaign=8723301_NEWSL_The+Weekly+Update+2017-09-	Statistical analysis of break-points in waste per hospital bed with increasing size of hospital sites with PCUs

	29&utm_content=beds_briefing_title&dm_i=21A8%2C56YXX%2CFMB8HY%2CJYX8W%2C1#hospital-beds-in-england-and-abroad	
Prison sector	National statistics on prison population	Single factor as sample size limited and no evidence from the available data of economies of scale in larger prisons
UK Military bases	National statistics on number of UK bases and training camps	Single factor per base as sample size from primary fieldwork limited
UK staff catering and public sector not covered elsewhere	Commercial database used to define sites with full catering, using 2012 data; not available for 2015 update. 5% decline assumed 2012 to 2015, continuing on from decline since 2007.	Single factor per site that has catering