

Estimates of Food Surplus and Waste Arisings in the UK

1.0 UK Food and Drink Waste Arisings

Three major WRAP studies published in 2013 and 2016 estimated annual food¹ waste² arisings within UK households, hospitality and food service, food manufacture, retail and wholesale sectors at around 10 million tonnes, 60% of which could have been avoided. This has a value of over £17 billion a year, and is associated with around 20 million tonnes of greenhouse gas (GHG) emissions. Around 85% (by weight) of the avoidable food waste arises in households and food manufacture, although waste arising in one part of the supply chain is certainly influenced by other parts of the chain.

Figure 1 shows the breakdown of the food waste arising in the UK. In comparison, around 41 million tonnes of food are purchased in the UK³ (the majority for in home use), meaning that the amount of food wasted post-farm-gate in the UK is equivalent to around a quarter of that purchased⁴.

By weight, household food waste makes up 70% of the UK post-farm-gate total, manufacturing 17%, hospitality and food service 9% and retail 2%.

In addition to food ending up as waste, 710,000 tonnes of food surplus from manufacturing and retail is either being redistributed via charitable and commercial routes (47,000 tonnes in 2015), or being diverted to produce animal feed (660,000 tonnes in 2015). Both of these are classed as waste prevention according to food material hierarchy (Figure 2).

There are also 2.2 million tonnes of food by-products from food manufacturing used as animal feed, and up to another 2 million tonnes of animal by-products sent to rendering plants.

WRAP has previously published an estimate for food waste at primary production (on-farm) of around 3 million tonnes, but stressed that this was indicative, and based on a 2004 Environment Agency synthesis of evidence available at that time. Based on a

¹ Food is used throughout as shorthand for both food and drink.

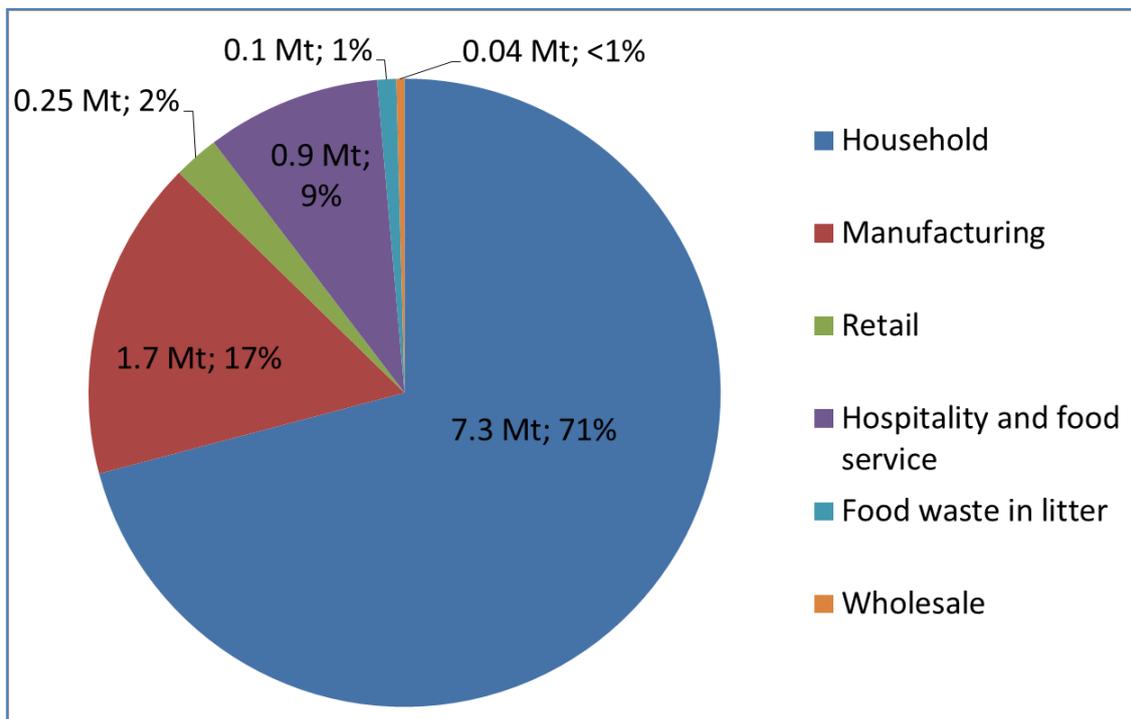
² The food waste definition is aligned with that developed by the European Commission funded FUSIONS project. A [Food Waste Definitional Framework](#) was published by the FUSIONS project in 2014. Food surplus used as animal feed is not considered to be waste because it does not leave the human food supply chain.

³ WRAP analysis of data from [Family Food 2014](#) and [The True Cost of Waste in Hospitality and Food Service](#)

⁴ This also excludes food that may be wasted outside of the UK in the production of food imported in to the UK.

recent FUSIONS report on food waste across the EU-28⁵, it would seem that this could be a significant over-estimate. It should be borne in mind that monitoring food waste in primary production is a new area across the whole of the EU and WRAP will be working with key organisations in the sector to develop, for 2018, a more robust estimate of food waste at this stage of the supply chain⁶, as announced at the launch of Courtauld 2025⁷. Given the high level of uncertainty over the amount of waste pre-farm gate, the earlier estimate has been withdrawn.

Figure 1: Amounts of food waste arising in the UK by sector (total post-farm-gate = ca. 10 Mt)*



* Based on various sector-specific WRAP reports (household, 2015 data; grocery wholesale, 2015 data; manufacturing, 2014 data; hospitality and foodservice, 2011 data; food waste in litter, 2012 data) and additional WRAP analysis of retail food waste based on 2015 British Retail Consortium (BRC) reported data⁸. NB data for household also includes waste to sewer, which is not currently available for other sectors.

⁵ [Estimates of European food waste levels](#)

⁶ In February 2016, the BRC, NFU and AHDB hosted a round table discussion on food surplus and food waste linked to primary production of fresh produce. The session was chaired by WRAP. The round table agreed to use a definition of food waste in line with that proposed by the EU FUSIONS project. It was evident that there is a joined up aspiration to address food surplus and waste wherever it arises, including at these earliest parts of production, even though there are issues on the table which are difficult. The group agreed that it would work on how to reduce waste in primary production and to do that through a whole chain approach involving the establishment of working groups looking at data, communications and practical projects and tools – aligned with the ambitions of Courtauld 2025'

⁷ [The Courtauld Commitment 2025](#)

⁸ [The Retail Industry's Contribution to Reducing Food Waste, Autumn 2016](#)

Figure 2: Food material hierarchy

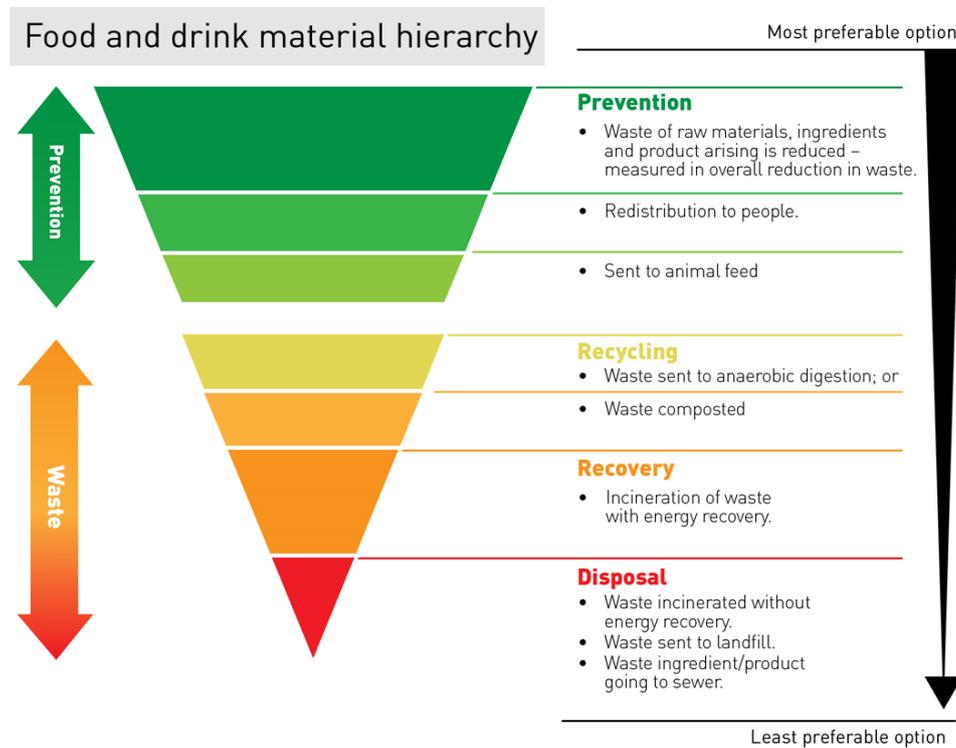


Figure 3 illustrates the ‘food loop’ in the UK. Table 1 presents a summary of what is known about food waste and related material arisings in the UK, and the treatment and disposal routes of these. Further detail is given in Appendix 1.

Figure 3 Illustration of the UK 'food loop'

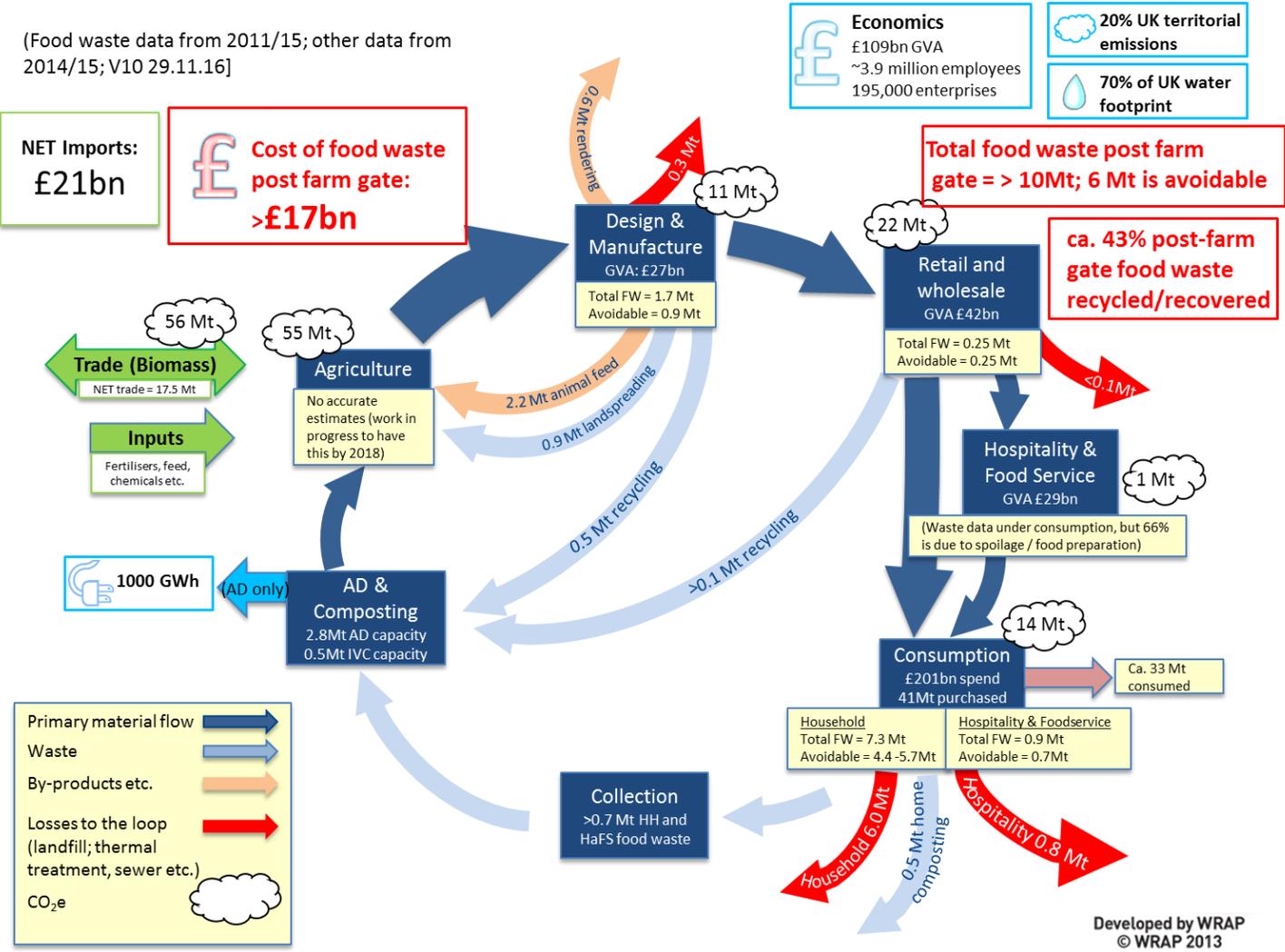


Table 1 Summary of what is known about food waste and related material arisings in the UK, and the treatment and disposal routes of these (See notes for further detail; food waste data from 2011/15; food surplus data from 2015; table updated January 2017)

		Household	HaFS*	Retail & ** Wholesale	Manufac- turing	Farm	Total ⁷
Total food waste		7.3 Mt	0.9 Mt	0.3 Mt⁹	1.7 Mt	nk	>10 Mt
 Preventing food becoming waste	Preventable food waste	4.4 – 5.7 Mt ¹ (£13.0 bn)	0.7 Mt (£2.5 bn ²)	0.3 Mt (£0.8 bn)	0.9 Mt (£1.2 bn)	nk	> 6.3 Mt (>£17 bn)
	Redistribution & animal feed	0.3 Mt ³ [n/a humans 0.3 Mt pets/ other animals]	>0.001 Mt [>1kt to people [n/a to animals]	0.03 Mt [5kt to people] [27kt to animals]	0.7 Mt [42kt to people] [635kt to animals]	nk	> 0.7 Mt
 Waste management	Recycling (AD/composting)	1.1 Mt ⁴	0.1 Mt	0.1 Mt ⁵	0.5 Mt	nk	> 1.8 Mt
	Recovery (thermal, landspreading)	2.3 Mt ⁶	0.2 Mt ⁶	0.1 Mt	1.2 Mt	nk	> 3.8 Mt
	Disposal (sewer, landfill)	3.5 Mt [1.6 Mt sewer 1.9 Mt landfill]	0.65 Mt [0.14 Mt sewer 0.51 landfill]	nk ⁵	0.002 Mt [nk sewer 2,000t landfill]	nk	> 4.1 Mt
<u>In addition:</u>							
Rendering of animal by-products						nk	0.6 Mt
Other food by-products ⁸						nk	2.2 Mt

* HaFS = hospitality and food service; ** Retail includes wholesale; nk = not known; n/a = not applicable

Notes relating to Table 1:

Figures in black are the breakdown of the total food waste (figures in black and bold).

The fractions of the total food waste that could be prevented are shown in red, and are a fraction of the total food waste (and should not be added to the figures in black or blue).

Figures in blue are materials arising from food manufacture but not classed as food waste, and are therefore not included in the total food waste figures in black.

1- Includes both avoidable (4.4 Mt) and possibly avoidable (1.3 Mt) food waste (items which some people may eat, some of the time, including potato peelings, bread crusts), but the financial value is based on the avoidable fraction only.

2 – The value of food waste in the HaFS sector is based on both avoidable and unavoidable food waste (as this sector probably has the greatest scope to reduce unavoidable food waste through altered procurement or to make use of this fraction of food waste).

3 – This covers food waste fed to pets and other animals, most of which is likely to leave the ‘food chain’ and should therefore be considered as a waste rather than food surplus.

4 – This includes 0.6 Mt of food waste collected separately by local authorities and 0.5 Mt of food waste home composted.

5 – In WRAP’s research it was not possible to identify the disposal route for much of the food waste from retail, but information from Courtauld signatories suggests that about half is recycled (via AD or composting) and half sent for recovery (primarily via thermal treatment).

6 – Based on 2014/15 data for England (Statistics on waste managed by local authorities in England in 2014-2015), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/481771/Stats_Novice_Nov_2015.pdf which shows 55% of household mixed waste being incinerated and 44% going to landfill

7 – Estimates under the total column are minima, due to the absence of data from on farm.

8 – Examples include spent grain from brewing and dried sugar beet pulp

9 – Based on a 2015 estimate for retailers (0.2 Mt reported by BRC, based on Courtauld 3 reporting; scaled up to 0.24 Mt to include non-BRC members) and a 2015 estimate for wholesale (43,000 tonnes)

NB – For households, food waste fed to pets and other animals has been included in the overall estimate for waste; whilst commercial food and related by-products used as animal feed are not classed as waste (as this is defined as a waste prevention activity). Estimates have been rounded and may not therefore add up to the total estimate for any given sector.

Source material:

- Households ('Household Food Waste in the UK, 2015'; WRAP 2016; <http://www.wrap.org.uk/hhfw2015>)
- Hospitality and Food Service ('Overview of Waste in the UK Hospitality and Food Service Sector'; WRAP 2013; data for 2011; www.wrap.org.uk/foodwastehafs)
- Wholesale ('Food surplus and waste in UK wholesale grocery, 2015'; WRAP 2016; <http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain>)
- Manufacturing ('Quantification of food surplus, waste and related materials in the grocery supply chain'; WRAP 2016; data on food waste for 2014, data for food surplus for 2015; <http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain>)
- Retail (Additional WRAP analysis of retail food waste based on 2015 BRC reported data; 'The Retail Industry's Contribution to Reducing Food Waste, Autumn 2016'; data for 2015 <http://brc.org.uk/making-a-difference/communities/tackling-food-waste>)

2.0 Further information

For information about WRAP's work to reduce food waste, please visit:

- <http://www.wrap.org.uk/food-waste-reduction>;
- <http://www.wrap.org.uk/content/courtauld-commitment-2025>

WRAP has also reported on how food waste levels have changed over time:

- Since 2007 the UK has had large-scale interventions aimed at reducing food waste across supply chains, and households. This contributed to a reduction in post-farm-gate food waste between 2007 and 2015 of around 11%, or 1.25 million tonnes⁹.
- Household food waste in the UK was 960,000 tonnes lower in 2015 compared to 2007, which equates to a 12% reduction. Avoidable HHFW levels were 17% lower in 2015 compared to 2007, equivalent to £2.7 billion less food being wasted in 2015 compared to 2007¹⁰.
- Food waste arising at manufacture reduced by around 200,000 tonnes between 2011 and 2014 (an approximate 10% reduction)¹¹, whilst levels of food waste at retail were around 15% lower in 2015 compared to estimates for 2009¹².
- Over the lifetime of the Courtauld 3 agreement (2012 to 2015) the estimated weight of food waste avoided by signatories was 100,000 tonnes, with a value of approximately £100 million. The amount of food waste reported by signatories was around 3.6% lower in 2015 compared to 2012¹³.
- Over the lifetime of the Courtauld 3 agreement the cumulative additional amount of surplus food redistributed was approximately 29,000 tonnes, with 18,000 tonnes being redistributed in 2015¹³.
- Under the Hospitality and Food Service Agreement there was a reduction in CO₂e emissions of 11% against the (2012) baseline over the three years of the Agreement. Food waste prevention activities saved an estimated 24,000 tonnes of food from being thrown away (£67 million worth). Redistribution of surplus food doubled to 760 tonnes¹⁴.

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⁹ [UK food waste – Historical changes and how amounts might be influenced in the future; Household Food Waste in the UK, 2015; Quantification of food surplus, waste and related materials in the grocery supply chain](#)

¹⁰ [Household Food Waste in the UK, 2015](#)

¹¹ [Quantification of food surplus, waste and related materials in the grocery supply chain](#)

¹² See [The Retail Industry's Contribution to Reducing Food Waste, Autumn 2016](#) for 2015 estimates and [UK food waste – Historical changes and how amounts might be influenced in the future](#) for historical data

¹³ [Courtauld Commitment 3: Delivering action on waste](#)

¹⁴ [The Hospitality and Food Service Agreement - Taking action on waste](#)

Appendix 1 Detailed Data

Household Food Waste

Latest data available from: <http://www.wrap.org.uk/hhfw2015> and <http://www.wrap.org.uk/content/household-food-and-drink-waste-uk-2012>

Waste Stream	Financial (p.a.)	Million tonnes (p.a.)	Environmental impact	Notes
TOTAL Household Food & Drink		7.3 Mt		Consumers throw away 7.3 Mt per year of food & drink – the majority of which (4.4 Mt) was avoidable 1/5th is truly unavoidable (bones, cores and peelings) Household food waste is around 70% of the total UK post-farm-gate food waste (~10Mt).
Avoidable food & drink	£13 bn	4.4 Mt	19 Mt CO₂e	4.4 Mt is equivalent to filling ca. 8,800 Olympic sized swimming pools Producing, storing and getting products to our homes uses a lot of energy. If we stopped wasting avoidable food and drink it would save ca. 19 Mt CO₂eq. – equivalent to the emissions from one quarter of private car journeys made in the UK Most discarded food reaches landfill sites where it emits methane, a powerful greenhouse gas 25 times more powerful than CO ₂ (Source: IPCC) http://www.ipcc.ch/publications_and_data/publications_and_data_reports.shtml#1 £470 - Average UK household spend on food that could have been eaten but is thrown away £700 - Average UK household with children spend on food that could have been eaten but is thrown away. The average family could save almost £60 a month
Possibly avoidable		1.3 Mt		Food that some but not all people would eat (e.g. bread crusts, potato skins).
Unavoidable		1.6 Mt		Elements of food and drink that are not suitable for consumption (e.g. egg shells, bones, banana skins, tea-bags).

Headline estimates for total household food waste, and different fractions of avoidability, were updated in 2016 (2015 data). For more granular data on food categories (e.g. bakery) and types (e.g. milk), and reasons for disposal, the most recent available data is for 2012.			
Reasons for disposal (avoidable)	£5.6 bn	2.0 Mt	Food and drink that is thrown away untouched or opened/started but not finished (e.g. whole apples, yoghurts, half loaves of bread, unused slices of bacon etc.)
	£4.1 bn	1.3 Mt	Food and drink we cook, prepare or serve too much of.
	£2.8 bn	0.9 Mt	Other (linked to accidents or personal preference).
Examples			<p>Examples of avoidable household food we throw away each year:</p> <ul style="list-style-type: none"> • Fresh fruit and vegetables: £2.6bn / 1,200,000 t. • Bakery: £860 m / 450,000 t. • Home-made and pre-prepared meals: £2.1 bn / 440,000 t. • Dairy and eggs. <i>Includes milk thrown away from the fridge and leftovers from serving too much (e.g. breakfast cereals): £780 m / 420,000 t. £290m worth of milk is thrown away and over 90% of this is in amounts of 50g or more = about quarter of a glass each time.</i> <p>Examples of avoidable household drink we throw away each year:</p> <ul style="list-style-type: none"> • £270 m of wine. • £200 m of carbonated soft drinks. • £150 m of fruit juices and smoothies.
<p>WRAP comment: We waste more food than packaging, and food waste has a significantly greater impact on the environment. Packaging has an important role to play in protecting and preserving food and a lot of work is being done to optimise packaging, see www.wrap.org.uk/fresherforlonger</p> <p>Estimates suggest that food waste has at least 10x the environmental impact of packaging waste and that's excluding the impact of methane from food in landfill. (Source: Advisory Committee on Packaging brochure 'Packaging in Perspective' (page 5)).</p>			

Manufacturing and Retail Sector

Scope: Waste arising in the supply of food and drink to UK households (from factory in-gate, through to point of purchase by consumers)

This specifically excludes material classified as by-products, agricultural and aquacultural wastes

Waste Stream	Financial (p.a.)	Million tonnes (p.a.)	Env. impact	Notes
Retail & Wholesale	£0.8 bn	0.3 Mt		Retail (including wholesale): 0.3 Mt (283,000t, of which 240,000t is retail, 43,000t wholesale); All of the food waste at retail is defined as avoidable, as all of this was at least originally intended to be sold. Retail estimate is based on 2015 data (0.2 Mt reported by BRC, based on Courtauld 3 reporting; scaled up to 0.24 Mt to include non-BRC members).
Manufacture	£1.2 bn	1.7 Mt		Around 51% of food waste at manufacture is avoidable (870,000 t): <ul style="list-style-type: none"> • Dairy products (200,000 tonnes) (23%) • Meat, poultry and fish (160,000 tonnes) (18%) • Ambient products (130,000 tonnes) (15%) • Fresh fruit and vegetable processing (100,000 tonnes) (11%) • Bakery, cake and cereals (90,000 tonnes) (10%) • Alcoholic drinks (60,000 tonnes) (7%) • Pre-prepared meals (60,000 tonnes) (7%) • Confectionery (30,000 tonnes) (3%) • Soft drinks and fruit juices (25,000 tonnes) (3%) • Milling (10,000 tonnes) (1%) • Sugar (2,000 tonnes) (<1%)
Retail and manufacture	£2.0 bn	2.0 Mt	<0.2 Mt CO ₂ eq. ¹⁵	Source: 'Quantification of food surplus, waste and related materials in the grocery supply chain' (2016); http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain and 'Food surplus and waste in UK wholesale grocery, 2015' (2016), http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain

¹⁵ WRAP allocate all emissions from agriculture, processing and retail of food and drink to the food purchased by households. Supply chain waste therefore arises 'free' of emissions. The emissions shown here are those associated with treatment of waste materials only.

Hospitality and Food Service Sector (HaFS)

Scope: Waste arising in the supply of food and drink in the UK

Links to source reports and related materials are at www.wrap.org.uk/foodwastehafs

Waste Stream	Financial (p.a.)	Million tonnes (p.a.)	Env. impact	Notes
Food Waste	£2.5 bn	0.92 Mt	3.6 Mt CO ₂ eq.	The amount of food that is wasted each year in the UK is equivalent to 1.3 billion meals, or one in six of the 8 billion meals served each year. On average 21% of food waste arises from spoilage; 45% from food preparation and 34% from consumer plates. The total cost of food being wasted in the UK HaFS industry for 2011 is estimated at over £2.5 billion; three subsectors (restaurants, pubs and hotels) account for 54% of this financial cost.
Avoidable food waste		0.68 Mt	2.7 Mt CO ₂ eq.	75% of food waste in HaFS is avoidable. 40% of all food waste is associated with 'carbohydrate foods', including: potato and potato products (21%); bread and bakery (12%); and pasta/rice (7%).
Unavoidable Food Waste		0.24 Mt	0.9 Mt CO ₂ eq.	A quarter of all food waste that is unavoidable mainly consists of fruit and vegetable peelings.
WRAP comment – figures for food waste exclude any waste associated with drinks. In addition to the figures in the table above, a further 130,000 tonnes of food waste is generated from the preparation of ready to serve food items and meals for the HaFS sector, at food manufacturing sites (most of which will be counted within the estimates for the manufacturing & retail sector above).				

Total Food Waste (post-farm-gate)

Please note: Household data also includes drink, which is not included in data for the grocery supply chain or hospitality and foodservice.

Waste Stream	Financial (p.a.)	Million tonnes (p.a.)	Environmental impact	Notes
Total UK Food Waste (2011-2015)	>£17 bn	>10 Mt	>20 Mt	<p>Based on the available evidence WRAP estimates that around 10 Mt of food waste arises post-farm-gate in the UK every year:</p> <p>7.3 Mt from households (£13 bn). Household food waste is 70% of the total UK post-farm-gate food waste. Consumers throw away 7.3 Mt per year of food & drink – 60% of which (4.4 Mt) could have been consumed. NB – This estimate covers all food & drink waste disposed of in the home (collected, home composted, disposed of via the sewer, fed to animals).</p> <p>2.0 Mt from the grocery supply chain (£2.0 bn):</p> <ul style="list-style-type: none"> • Retail (including wholesale): 0.3 Mt (283,000t, of which 240,000t is retail, 43,000t wholesale). • Manufacturing: 1.7 Mt. In addition there are 2.2 Mt of food and co/by-product sent to animal feed from the manufacturing stage, and 0.6 Mt of animal by-products sent primarily to rendering derived from the slaughter of animals/fish. <p>0.92 Mt from the hospitality and foodservice sector (HaFS) (£2.5 bn), 75% of which is avoidable and could have been eaten. There are nine major HaFS subsectors: staff catering, healthcare, education, services, restaurants, QSRs, pubs, hotels and leisure. Around 40% of food waste arises within restaurants and pubs, and a further 26% from education and healthcare sectors. These estimates exclude drink waste.</p> <p>WRAP has previously published an estimate for food waste at primary production (on farm) of around 3 million tonnes, but stressed that this was indicative, and based on a 2004</p>

				<p>Environment Agency synthesis of evidence available at that time. Based on a recent FUSIONS report on food waste across the EU-28, it would seem that this could be a significant over-estimate. It should be borne in mind that monitoring food waste in primary production is a new area across the whole of the EU and WRAP will be working with key organisations in the sector to develop, for 2018, a more robust estimate of food waste at this stage of the supply chain, as announced at the launch of Courtauld 2025. Given the high level of uncertainty over the amount of waste pre-farm gate, the earlier estimate has been withdrawn.</p>
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Notes

All figures featured are estimates, rounded and referenced where possible.

Abbreviations: m=million / bn=billion / t=tonnes / Mt=million tonnes / p.a. =per annum / CO₂eq. =carbon dioxide emissions equivalent, B2B=business to business.

Further WRAP information can be found at: www.wrap.org.uk/food, www.wrap.org.uk/hospitality, www.lovefoodhatewaste.com and www.recyclenow.com.