Department for Environment Food & Rural Affairs

Government Statistical Service

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Experimental Statistics on the carbon impact of waste from households managed by local authorities in England

These statistics are a new release estimating the impact, in terms of carbon emissions, from different waste management options for waste from households managed by local authorities in England.

The figures are estimates of the impact of different materials contained within waste following treatment by recycling, incineration for energy from waste, and landfill.

These figures are very much a work in progress and methodology and outputs and will be updated in future editions of this notice.

The figures are consumption based estimates.

What data is contained in this release?

Measure	Time Period
Waste from households This is the official recycling measure that is used as the basis for reporting at a harmonised UK level.	2017 to 2020 (already published)
Waste from household's net carbon emissions by material type	Publication of provisional figures for 2016 to 2020

For more information about what data is included in the two measures listed in the table above, please refer to the Data & Methodology section of this statistical notice.

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Provisional estimates of the impact of carbon emissions from management of local authority collected waste from households, in England

The figures in this statistical notice are based on the Waste from Household measure published within the latest annual statistical release and datasets for local authority waste.

These estimates of carbon emissions have been produced using factors produced for Defra by WRAP and are presented in the Carbon Waste and Resources Metric (Carbon WARM) report published in 2021. The Carbon WARM factors are a set of conversion factors designed to enable users to express waste management tonnage data in terms of their Greenhouse Gas emissions relative to landfill.

The Carbon WARM report should be used as the main reference document for understanding the concepts and calculations behind the carbon factors used to produce the estimates of carbon impacts in this notice and accompanying dataset.

Carbon WARM factors have been compiled from a range of sources. They are not time specific, having been produced from the latest information available at the time. Therefore a single set of factors has been applied across each of the years presented in these statistics. The factors can be seen in Table 1 of this notice.

The Carbon WARM factors used to calculate the figures in this statistical release have various elements built into them to account for transport at collection, management, and allowances for losses such as sorting rejects, and subsequent disposal treatments those rejects receive. Because the factors include these allowances these statistics are calculated from tonnages of waste collected. Exceptions to this include metals from Incinerator bottom ash and recycling of objects comprised of multiple material types, such as Waste Electronic and Electrical Equipment (WEEE), furniture, mattresses and tyres where average Carbon WARM factors are not available.

The statistics contain estimates for larger complex waste items based on average material composition, which are then allocated to carbon WARM material categories. The data & methodology section at the back of this notice contains more detail on composition and assumptions made.

Carbon WARM factors (Table 1) are on a material type basis and as such can be applied directly to around 87% of waste from household recycling. In order to apply the factors to all waste from households recycling and residual waste some estimation has been done to split comingled recycling and residual waste streams.

Data for local authority collections for recycling, reuse composting and anaerobic digestion are reported by material or recyclate type. However, this level of detail is not available for residual waste. Studies on residual waste composition are by their nature expensive and carried out relatively infrequently. The material split for residual waste used in these statistics are based on a study of waste composition carried out by Eunomia for 2017 and published by WRAP in 2019.

The data and methodology section of this notice contains a table showing how WasteDataFlow reported recycling categories, and Eunomia waste composition categories map to the material types shown in the emission tables.

The methodology used to calculate the Carbon WARM factors and how they have been applied in these statistics differs to carbon accounting approaches taken by other UK government departments and direct comparisons of statistics between countries is not appropriate.

Importantly these statistics are not directly comparable to data presented within the United Kingdom National Inventory Report (NIR), the underpinning Greenhouse Gas Inventory (GHGI), or National Atmospheric Emissions Inventory (NAEI).

These statistics have been produced with help from WRAP and Zero Waste Scotland. Because of data gaps around selected waste items or waste composition we consider these statistics to be experimental, and the reader should take this into account when referring to them.

The figures presented in this statistical notice are on a “collected” waste basis. While the “Total waste from households” tonnage will match that in the annual local authority waste National statistics publication, the tonnages shown here for recycling and residual waste will not, because those statistics present recycling and residual waste net of rejected material.

When looking at figures for 2020 it should be remembered that the COVID-19 pandemic had a widespread effect on tonnages of residual waste generated and waste collected at household waste recycling centres (HWRC), the latter was much lower due to temporary site closures, and restricted re-openings.

These statistics are experimental. They are a work in progress and will be subject to revision as more up to date composition data becomes available and methodologies are improved.

Key points

England waste from households – experimental statistics on Carbon emissions 2016 to 2020

Total or overall emissions from waste from households are the sum of emissions from waste management by landfill, EfW, composting or Anaerobic digestion of organics and recycling. In these statistics changes are driven by the weight of waste collected and changes in waste treatments. Negative emission figures indicate that overall, there is a net carbon equivalent saving from waste management processes over use of virgin material or fuels.

- Total waste from households was 22.8 million tonnes in 2016, decreasing over the years to 22.1 million tonnes in 2019.

- In 2020 the COVID-19 pandemic disrupted waste collections and increased time at home and waste from households increased to 22.6 million tonnes. Residual waste from households increased by 0.5 to 2.7 million tonnes, slightly higher than in 2016.

- Total emissions from waste from households in England (Table 3) were at their highest in 2016 at -0.4 million tonnes carbon dioxide equivalent (CO_2e) and at their lowest in 2019 at -1.1 million tonnes CO_2e.

- Emissions in 2020 increased by 0.5 million tonnes CO_2e to -0.5 million tonnes CO_2e. This increase was due to the COVID-19 pandemic disrupting waste collections at kerbside and HWRC's and increasing tonnages of residual waste generated in the home.

- Residual waste emissions from landfill have decreased from 1.8 million tonnes CO_2e in 2016 (from 3.7 million tonnes of waste) to 0.9 million tonnes in 2020 (from 1.7 million tonnes of waste).

- Residual waste emissions from EfW have increased from 2.2 million tonnes in 2016 (from 9 million tonnes of waste) to 2.7 million tonnes CO_2e (from 11.0 million tonnes of waste).

- Emissions from separately collected food waste have decreased from -23 thousand tonnes CO_2e in 2016 to -33 thousand tonnes in 2020.

- Emissions from other organics (garden and mixed garden and food waste) over the years are steady at around 240 thousand tonnes CO_2e. Changes between years are a result of climate and growing conditions. They were at their lowest point in 2020 as the COVID-19 pandemic affected collections.

- Dry recycling emissions across the years are steady at around -4.6 to -4.8 million tonnes CO_2e. They decreased to -4.2 million tonnes in 2020 as the COVID-19 pandemic disrupted waste collections.

Contents

1 Carbon WARM factors used to calculate these statistics

The Carbon WARM emission factors are a set of conversion factors produced to enable users to express waste management tonnage data in terms of their Greenhouse Gas emissions relative to use of virgin materials or fuel or disposal to landfill. The factors are calculated on a carbon dioxide equivalent (kg.CO2e / tonne) basis. The factors were produced for Defra by WRAP in the Carbon Waste and Resources Metric (Carbon WARM) report published in 2021.

The estimates of emissions used in this statistical notice have been produced using the Carbon WARM factors shown in Table 1. Some of the factors have been updated from those in the original report, and for the purpose of producing these statistics additional factors for “Copper” and “Other Waste & Recycling” have been added.

Carbon WARM factors are consumption based. That is to say they are calculated on the basis of all emissions associated with a product allocated to the country where products are consumed. This is different to a territorial approach where emissions are calculated based on the country where emissions are produced. See section 2.3 of the Carbon WARM report for more detail.

1.1 The carbon cycle – Biogenic carbon

Climate scientists distinguish two types of carbon cycle, the long (geological/fossil) and the short (biogenic) cycles.

The long cycle takes place over millions of years. Carbon is sequestered in the earth through geological processes (such as weathering of silicate rocks) and emitted into the atmosphere through volcanic activity. Carbon is also sequestered through the production of fossil fuels (coal, gas and oil) from organic matter, and burning fossil fuels releases this back into the atmosphere, increasing the atmospheric concentration of carbon dioxide in a way that is effectively permanent.

The biogenic (or short) carbon cycle is the cycle by which plants and animals take up carbon from the soil and atmosphere and release it back into the soil and atmosphere. This is assumed to be an ongoing process, with the carbon released by respiring and decaying organisms being effectively offset by the carbon take up from photosynthesising and growing organisms.

Emissions of biogenic carbon dioxide have a value of zero within the Carbon WARM factors and the emission tonnages CO_2e presented in this notice.

1.2 Carbon WARM factors by material type and waste management method

Table 1: Carbon WARM Emission factors by material type and management method (kg.CO_2e / tonne) – All years

Negative values: Factors with a negative value indicate that, for a given waste management method, there is a net carbon equivalent saving from that process over the use of virgin material or fuel. This takes into account emissions from extraction, and energy used in transport and production of virgin materials.

Positive values (e.g. for energy from waste) indicate that a particular management method releases more carbon into the atmosphere relative to using virgin materials or fuels.

The factors shown in this table have been updated to include some revised data and so may not match those in the original Carbon WARM report.

kg.CO_2e / tonne

	Closed loop recycling	Open Loop recycling	Anaerobic digestion	Composting	Energy from Waste	Landfill
Food	0	0	-78	6	-37	627
Garden	0	0	-78	72	-77	579
Food and garden	0	0	-78	54	-70	592
Paper	-129	0	0	0	-214	1,042
Cardboard	-96	0	0	0	-219	1,042
Paper and board	-104	0	0	0	-218	1,042
Steel	-1,062	0	0	0	19	9
Aluminium	-7,469	0	0	0	24	9
Mixed (cans)	-3,368	0	0	0	21	9
Glass	-326	33	0	0	8	9
Textiles	-14,315	0	0	0	438	445
PET	-654	205	0	0	1,579	9
HDPE	-485	205	0	0	2,241	9
Dense plastics	-590	205	0	0	1,691	9
Film	-532	205	0	0	1,475	9
Wood	-477	0	0	0	-268	828
Copper	-6,022	0	0	0	19	9
OTHER Waste & Recycling	-512	33	0	0	229	419

Notes:

a) Carbon WARM factors have specific system boundaries (figure 1 and section 1.3 below). They include allowances for fuel emissions for collection and processing of waste and recycling. This can be seen in the table where materials that are inert when managed by a certain method have an associated positive emission factor, e.g. glass, plastics and metals in landfill, and glass and metals in EfW.

b) The Carbon WARM factors are not time specific and use the most up-to-date information from research and studies that could be found at the time the factors were produced. Section 2.10 of the Carbon

WARM report contains important detail on data quality with a RAG rating for data not fulfilling certain criteria.

c) When considering the factors and waste management routes it is important to remember that the lowest emission factors do not necessarily reflect the “best” waste management process, or other considerations such as a need to reduce waste volumes and increase recycling.

1.3 Carbon WARM system boundaries for calculation of factors.

Figure 1: System boundaries for Carbon WARM factors

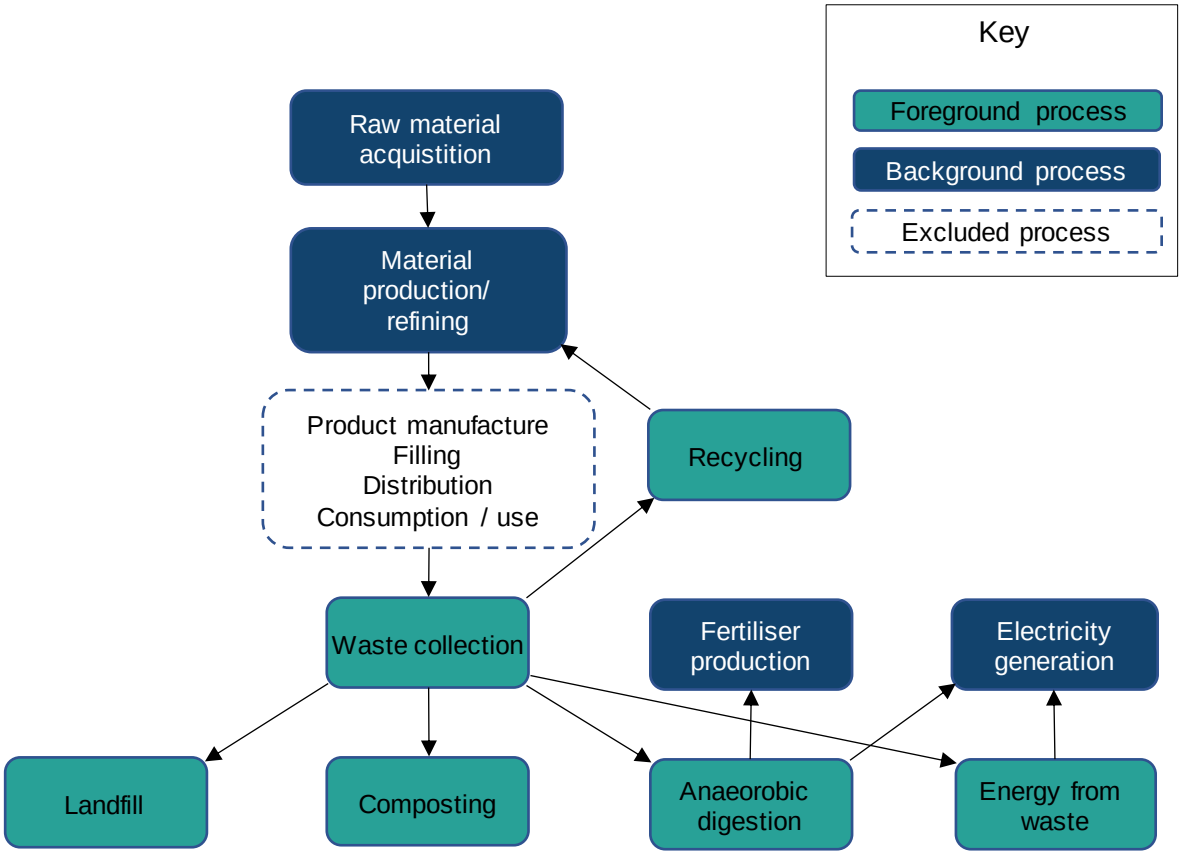


Figure 1 shows the scope and system boundaries of the Carbon WARM factor calculations. The factors take account of foreground and background processes.

- Foreground process relates to emissions from the collection and treatment of waste and recycling, and emissions from the waste itself.

- Background processes relate to emissions from the acquisition of raw materials, production, refining, energy use and energy generation. These are offset by recycling or the use of waste to produce energy.

- Excluded process - Process outside the scope of the carbon / warm factors these include, the manufacture of a particular item or product, and its subsequent emissions from distribution or use.

For example, the collection and sorting of plastic bottles for recycling, shredding, and washing of these bottles to produce plastic feed stock for recycling into new plastic bottles are all foreground processes.

The production of virgin plastic material from petro chemicals for moulding into bottles is a background process.

The production of new plastic bottles, filling, distribution and consumption are all outside the scope of the Carbon WARM factors.

1.4 Definitions of the waste management methods in table 1, and notes on application in these statistics.

Closed loop recycling is the recycling of materials back into a raw product that the recyclate was originally produced from, e.g. glass cullet for melting, steel ingots for producing new cans. All the factors in this category have a negative emission factor. It should be noted that closed loop recycling includes allowances for materials sent for reuse, such as furniture, WEEE, tyres and textiles. The textiles emission factor is specifically weighted towards reuse and is very low because of this. See notes on materials below.

Open Loop recycling is where materials are used to make different products to their original purpose. Emission factors for open loop tend to be positive as carbon savings from substituting for the same virgin material are not reached. A couple of examples are glass used as aggregates, and plastic used to make panels where this material is assumed to offset wood particle board.

Anaerobic digestion (AD) is the controlled process by which microorganisms break down biodegradable material in the absence of oxygen. In these statistics AD relates to the processing of food and garden waste. Processing the waste in this way produces biogas (a mixture of carbon dioxide and methane) which can be used to produce energy, and digestate which is used as fertiliser. Methane produced from AD is generally burnt to generate energy and this results in emissions of carbon dioxide. This carbon dioxide is biogenic and so has a value of zero within the factor. Losses of methane (fugitive emissions) from the processing plant are estimated to be around 1.95% of methane produced and are accounted for in these factors. Food and garden waste processed by AD have negative carbon WARM emission factors. The factors take account of AD digestate used to replace nitrogen based fertilisers.

Composting is the controlled decomposition of biodegradable material. In these statistics it relates to the processing of food and garden waste generally via IVC (In vessel container) or Windrow Heaps. Treatment in this way ensures the material decomposes at a temperature which produces a sterilised and safe product. The composting process releases some greenhouse gases (GHGs). These are methane and nitrous oxide which are accounted for within the factor and carbon dioxide which is biogenic having a value of zero.

The compost factors in table 1 assume a mix of end markets such as horticulture, agriculture and landscaping. Compost sold to horticulture is assumed to offset peat use and consequently has a low (negative) emission factor (see Table 14 of Carbon WARM report). Compost sold to agriculture offsets nitrogen, potash and phosphate fertilisers. However because the levels of nutrients in composted material are low (relative to concentrated fertiliser product) compost used in this way carries a higher (positive) emission factor than for material going solely to horticulture (See Carbon WARM report table).

Factors for compost may seem high but it is important to note that benefits from composting such as improving soil structure and sequestration of carbon are outside of the scope and boundaries of the carbon WARM factors.

Energy from Waste (EfW) is the process of recovering energy from waste. This is most commonly through incineration, using heat to power steam turbines to generate electricity. Carbon released by management of organic materials in this way is biogenic and so has no impact on emission factors. Plastics and textiles managed by EfW have high positive emission factors reflecting high emissions of fossil fuel carbon dioxide.

Landfill is the deposition of residual waste into landfill. Once at maximum capacity landfill sites are sealed with a clay cap to prevent further unregulated deposition of waste, foraging by animals, the ingress of water and the uncontrolled release of GHG.

In landfill the biodegradable elements of residual waste (such as food, garden waste, paper cardboard, textiles and wood) decompose. Initially the decomposition is aerobic producing biogenic carbon dioxide. As the waste becomes buried and the landfill site is sealed, decomposition by microorganisms takes place anaerobically, producing a biogas mixture of carbon dioxide and methane. Landfilled waste produces GHG over a long period of time. Methane from landfill sites can be harvested to produce energy, or flared off. In both cases this combustion produces biogenic carbon dioxide. GHG emissions from landfill are difficult to manage and may release methane into the atmosphere for many years.

The factors include offsetting allowances for methane from landfill used to generate electricity.

Landfill factors do not include an allowance for replacing the landfilled material with virgin material. e.g. paper & card waste substituted for soil, sand or rock.

Environmental damage and emissions due to possible leaking of leachates from landfill sites are outside the scope of these factors.

The Carbon WARM report should be used as the main reference document for understanding the concepts and calculations behind the carbon factors used to produce these estimates of carbon impacts.

1.5 Materials and their emission factors

The factors shown in Table 1 and used to produce emission statistics in this publication are calculated as a footprint for a given material and management method. They are "un-normalised". That is to say they have not been calculated or "normalised" relative to landfill.

The original Carbon WARM report contains further background to the concepts behind the emission factors, references to research reports and the source data used to compile them. When considering the factors, it is important to note that the factors include allowances for transport and fuel processing energy, as well as losses. This can be seen in the table for materials which are largely inert in landfill for example glass, metal and plastics which have a low landfill factor.

Emission factors for material sent to landfill or EfW relate to that material within the unsorted mixed residual waste stream. In calculations these are applied to individual material types using compositional splits taken from a Eunomia waste composition study.

It is important to remember that release of carbon dioxide from organic material, either directly or from the combustion of methane is biogenic and has a value of zero within these factors.

Food

Around 87% of separately collected food waste is sent for AD providing energy source for electricity generation and outputs of digestate for use as fertiliser. The process has a net carbon WARM emission of -78 kg.CO_2e / tonne. AD is the best Carbon WARM treatment scenario for managing food waste. Some separately collected food waste is composted. This process has an emission factor of 6.

Food accounts for over 30 per cent by weight of waste in the residual waste stream. When sent to landfill the food element produces emissions of 627 kg.CO_2e / tonne. Management of this waste using EfW produces emissions of -37 kg.CO_2e / tonne.

Garden, and mixed food and garden

The majority of this waste is collected separately and managed by In-vessel or windrow composting. The emission factors in these tables relate to the compost product being used by a mix of end markets such as horticulture, agriculture and landscaping. (see 1.1 waste management methods above). The emission factor for composting of garden waste is 72 kg.CO_2e / tonne and food and garden 54 kg.CO_2e / tonne.

When sent to landfill this waste produces large amounts of greenhouse gas. Garden waste carries an emission factor of 579 kg.CO_2e / tonne, mixed food and garden waste 592 kg.CO_2e / tonne.

Garden waste within the residual waste stream sent to EfW has a factor of -77 kg.CO_2e / tonne and food and garden -70 kg.CO_2e / tonne. However, this is not a preferred disposal option as benefits noted above from composting such as improving soil structure and

sequestration of carbon are lost. These benefits are not currently reflected within calculations as they are outside of the scope of the carbon WARM factors.

Paper, cardboard, mixed paper and board
In landfill these wastes produce large amounts of methane and carry the highest emissions factor of all material types at 1,042 kg.CO_2e / tonne. Paper and card account for around 12 per cent of residual waste.

This material is a good energy source in EfW and because the carbon dioxide produced from burning is biogenic the factors for EfW are low at -214 kg.CO_2e / tonne for paper and -219 kg.CO_2e / tonne for cardboard.

Emission factors for recycling are -129 kg.CO_2e / tonne for paper and -96 kg.CO_2e / tonne for cardboard. Whilst these are higher than management of waste by EfW they reflect the high energy use of paper recycling and reliance on fossil fuel power generation from the grid. As the grid becomes greener with more renewable power feeding in, the recycling emission factor will fall while the factor for EfW will increase.

Steel, aluminium, mixed cans and copper
These materials are largely inert in EfW and landfill, meaning that emission factors are low reflecting fuel for transport and waste processing. Steel has a factor of 19 for EfW, and 9 for landfill kg.CO_2e / tonne. Factors for Aluminium and copper are similar.

Recycling of metals yields significant emission savings. The emission factors for Steel are -1,062, Aluminium -7,469 and Copper -6,022 kg.CO_2e / tonne. Metals recovered from incinerator bottom ash (steel and aluminium) are included in total emissions figures using factors adjusted for initial waste management by EfW.

Glass
Glass is inert in EfW and landfill, with factors of 8 for EfW and 9kg.CO_2e / tonne for landfill. These factors reflect collection and waste transport fuels.

Closed loop recycling of glass into “cullet” for melting and producing new containers has an emission factor of -326 kg.CO_2e / tonne. Open loop recycling of glass for example where it is used in aggregate carries a positive emission factor of 33.

Textiles
Organic materials within textiles produce large amounts of greenhouse gases when they decompose in landfill, consequently textiles have an emission factor of 445 kg.CO_2e / tonne.

Textiles contain high volumes of fossil carbon and so when textiles in the residual waste stream are managed by EfW they have a relatively high emission factor of 438 kg.CO_2e / tonne. Textiles in the residual stream account for around 9 per cent of the total residual tonnage.

Textiles have the lowest recycling emission factor of all the materials in table 1 at -14,315 kg.CO_2e / tonne. This factor is very low because the bulk of textile recycling is the reuse

of clothing. The factor is weighted to around 70% reuse and 30% recycling. Textile production is energy intensive, and manmade fibres contain high levels of fossil carbon. Reuse of textiles requires minimal preparation. Consequently, carbon savings are much greater than for other “material” types.

While this factor is very low only around 23% of clothing & footwear waste from households is sent for reuse or recycling.

Plastics: PET (polyethylene terephthalate), HDPE (High Density Polyethylene), dense plastics and film.

Plastics contain high amounts of fossil carbon and rely on energy from fossil fuels for their production. They are inert in landfill having similar emission factors as those for glass and metals at 9 kg.CO_2e / tonne. When managed by EfW plastic wastes release large amounts of long cycle CO_2, and as a consequence have high emission factors; Film at 1,475, PET at 1,579, Dense plastics at 1,691 and HDPE at 2,241 kg.CO_2e / tonne.

Closed loop recycling of plastics, e.g. where material is formed into pellets for moulding into a new product, requires a high amount of processing; despite this recycled plastics have low emission factors: HDPE -485, Film -532 Dense plastics -590 and PET -654 kg.CO_2e / tonne. These factors reflect significant fossil carbon savings compared to the production of virgin material.

Open loop recycling of plastics generally uses lower specification material for products where colour and product specification are less important. Open loop recycling is assumed to mainly displace wood for the production of garden furniture or fence materials. There is a standard emission factor across plastics of 205 kg.CO_2e / tonne for open loop recycling.

Wood

Wood produces large amounts of greenhouse gas in landfill and has the second highest emission factor after paper and card of 828 kg.CO_2e / tonne. Wood produces high amounts of energy when burnt releasing biogenic carbon dioxide. Consequently, it has a low EfW emission factor of -268 kg.CO_2e / tonne. Recycling of wood has a factor of -477 kg.CO2e / tonne.

Other waste & recycling

This comprises miscellaneous recyclate and unidentified (reported as “other”) material types. See data and methodology chapter Table 8 for more detail on what is included.

For recycling a factor for “Other waste & recycling” has been calculated as a straight average of open loop recycling factors for paper & board, steel, glass, dense plastics and wood to give a factor of -512kg.CO2e / tonne.

For residual waste the factor is calculated as a straight average of paper & board, steel, glass, dense plastics, wood, food and garden and textiles. This gives a factor of 229 kg.CO_2e / tonne for EfW and 419 kg.CO2e / tonne for landfill.

2 Waste from households

2.1 Waste management methods (Table 2)

'Waste from households' was the measure introduced by the UK in 2014 to provide a harmonised UK indicator for reporting recycling rates at a UK level. It excludes local authority collected waste not considered to have come directly from households, such as street bins, street sweepings, parks and grounds waste, and compost-like output.

For more information, refer to the data and methodology section of this notice**.**

Table 2: 'Waste from households' in England, by management method 2016 to 2020, (thousand tonnes)

Waste type	2016	2017	2018	2019	2020	% change 2020 over 2019
Total Recycling *of which:-*	**10,094**	**10,017**	**9,740**	**9,892**	**9,856**	**-0.4%**
Dry Recycling *of which*:-	**5,995**	**5,890**	**5,880**	**5,843**	**5,938**	**1.6%**
Closed Loop	4,718	4,630	4,598	4,550	4,529	-0.5%
Open Loop	1,276	1,260	1,282	1,294	1,409	8.9%
Separately collected food waste *of which:*	**363**	**398**	**421**	**441**	**491**	**11.4%**
Anaerobic digestion	300	339	362	384	426	11.0%
Composting	63	59	59	57	65	14.4%
Other organics recycling *of which:*	**3,737**	**3,729**	**3,439**	**3,608**	**3,427**	**-5.0%**
Anaerobic digestion	55	50	21	24	39	63.5%
Composting	3,681	3,678	3,418	3,584	3,387	-5.5%
Total Residual *of which:*	**12,676**	**12,420**	**12,294**	**12,182**	**12,730**	**4.5%**
Energy from waste b)	9,016	9,583	9,868	10,268	10,959	6.7%
Landfill	3,660	2,837	2,426	1,914	1,771	-7.4%
Total waste from households	**22,770**	**22,437**	**22,033**	**22,074**	**22,586**	**2.3%**

Notes

a) The waste & recycling tonnages shown in table 2 and this statistical notice have been calculated on a "collected" waste basis. While the "Total waste from households" tonnage matches that in the annual Local authority waste statistics publication, the tonnages shown here for recycling and residual waste do not.

b) Energy from waste includes a small amount of waste incinerated without energy recovery. This amounted to 1% of the total in 2020,

c) Numbers may not add to exact totals. This is due to rounding.

- In 2020 the total weight of 'waste from households' in England was 22.6 million tonnes, up from 22.1million tonnes in 2019. This increase was due the effect of the COVID-19 pandemic.

- The weight of waste collected for recycling was 9.9 million tonnes in 2020, decreasing very slightly from 2019.

- Dry recycling was 5.9 million tonnes in 2020 and made up 60 per cent of total recycling. Around 76 per cent of dry material processing was sent for closed loop" recycling and 24 per cent to "open loop".

- Separately collected food waste was 491 thousand tonnes in 2020, 5 per cent of total recycling. 87 percent of food waste was sent to anaerobic digestion (AD) plants, with the remainder sent for In-vessel composting.

- Other organics was 3.4 million tonnes in 2020. This waste comprising mixed garden and food, and green garden waste was 35 per cent of recycling total. The majority of this material (per cent) was reported as being sent for composting, with the remainder going to AD.

- Residual waste collected was 12.7 million tonnes in 2020, up from 12.2 million tonnes in 2019. This was an increase of 4.5 per cent.

- In 2020 around 11.0 million tonnes or 86 per cent of residual waste was sent for incineration with energy recovery (EfW). 1.8 million tonnes or 14 per cent of residual waste was sent to landfill in 2020.

3 Waste from Household Emissions, carbon dioxide equivalent (CO_2e)

The data & methodology section of this release contains detail on data and calculations, while more detail and background can be found in the Carbon WARM report.

The carbon emissions shown in tables (1,3,5,7) include not only emissions from waste management processes, but also savings from the use of recycled materials or generated energy compared against emissions from the production of virgin materials or energy generation using UK average grid emissions.

The figures shown in table 3 represent net emissions by management method. They are built up from material level tonnage data and emissions factors for a management method.

Table 3: Emissions by composition and treatment of 'waste from households' in England, 2016 to 2020, (thousand tonnes CO_2e basis).

Waste type	2016	2017	2018	2019	2020	% change 2020 over 2019
Total Recycling *of which:*	**-4,398**	**-4,410**	**-4,380**	**-4,516**	**-4,007**	**-11.3%**
Dry recycling *of which:*	**-4,618**	**-4,628**	**-4,582**	**-4,728**	**-4,199**	**-11.2%**
Closed Loop	-4,709	-4,718	-4,673	-4,821	-4,296	-10.9%
Open Loop	91	90	91	92	97	4.5%
Separately collected food waste *of which:*	**-23**	**-26**	**-28**	**-29**	**-33**	**11.0%**
Anaerobic digestion	-23	-26	-28	-30	-33	11.0%
Composting	0.4	0.3	0.3	0.3	0.4	14.4%
Other organics recycling *of which:*	**243**	**244**	**230**	**241**	**225**	**-6.7%**
Anaerobic digestion	-4	-4	-2	-2	-3	63.5%
Composting	247	248	231	243	228	-6.1%
Total Residual *of which:*	**3,972**	**3,711**	**3,581**	**3,431**	**3,530**	**2.9%**
Energy from waste	2,197	2,335	2,404	2,502	2,671	6.7%
Landfill	1,776	1,376	1,177	928	859	-7.4%
Total waste from households Emissions	**-426**	**-699**	**-799**	**-1,086**	**-477**	**-56.1%**

Note:- In this table metals in residual waste sent to EfW count towards emissions from EfW plants, whilst also contributing to carbon savings in recycling figures.

3.1 What is being shown in Table 3?

Negative values indicate that overall for all materials there is a net saving in emissions for a waste management method over use of virgin material or fuel. This takes into account emissions from extraction, and energy used in transport and production of virgin materials.

Positive values (e.g. for energy from waste) indicate that a given management method releases more emissions into the atmosphere relative to using virgin materials or fuels.

Section 1 above shows emission factors for waste management methods for each material type and comment on those factors. It is important to bear the factors in mind when reviewing the emission figures in table 3.

- Total net emissions from waste from households across the 5 years were at their lowest point in 2019 at -1.1 million tonnes CO_2e. This is a decrease of 0.7 million tonnes from 2016 when they were -0.4 million tonnes CO_2e.

- Total net emissions from waste from households were -0.5 million tonnes CO_2e in 2020, having increased by 0.7 million tonnes from -1.1 million tonnes CO_2e in 2019. This was due to the effects of the COVID-19 pandemic increasing residual waste generation and disrupting waste collection for recycling and composting.

- Estimated emissions from total recycling (dry recycling, composting and anaerobic digestion of organics) have remained steady between 2016 and 2019 at around -4.4 to -4.5 million tonnes CO_2e. They increased by 0.5 million tonnes to -4.0 million tonnes CO_2e in 2020 as the COVID-19 pandemic affected recycling collections and HWRC opening and in particular reducing the tonnage of other organics.

- Emissions from residual waste over the 5 years were highest in 2016 at 4.0 million tonnes CO_2e. They have fallen across the years as the tonnage of waste sent to landfill has reduced and were 3.5 million tonnes in in 2020. Emissions from landfill accounted for 45 percent of the residual waste total in 2016, decreasing to around 24 per cent in 2020.

4 Waste from households by material type

Table 4 shows estimated tonnages by material for all waste from households – recycling and residual waste. The five-year average proportion of total waste from households that each material comprises is shown in the last column of the table and can be used as a guide of the relative importance of each material or waste type.

A breakdown showing 2020 tonnages by disposal route for each material type can be seen in Table 6 of this publication.

Table 4: Total waste from households split by material type 2016 to 2020, (thousand tonnes)

	2016	2017	2018	2019	2020	Average percent of total
Food	4,457	4,410	4,392	4,376	4,603	19.9%
Garden	3,061	3,123	2,923	3,084	2,884	13.5%
Other organics - Mixed food and garden	1,541	1,454	1,356	1,356	1,412	6.4%
Paper	2,595	2,539	2,528	2,483	2,681	11.5%
Cardboard	1,181	1,167	1,160	1,150	1,209	5.2%
Mixed fibres (paper and board)	466	448	432	422	425	2.0%
Steel	787	754	734	718	662	3.3%
Aluminium	228	232	228	228	230	1.0%
Mixed cans	235	231	236	238	254	1.1%
Glass	1,679	1,653	1,672	1,679	1,856	7.6%
Textiles	1,241	1,214	1,201	1,200	1,217	5.4%
PET	93	91	90	89	93	0.4%
HDPE	59	57	57	57	59	0.3%
Dense plastics	1,486	1,463	1,460	1,460	1,514	6.6%
Film	786	771	763	761	790	3.5%
Wood	1,115	1,106	1,084	1,073	955	4.8%
Copper	24	23	23	22	21	0.1%
OTHER Waste & Recycling	1,737	1,700	1,696	1,678	1,720	7.6%
TOTAL	22,770	22,437	22,033	22,074	22,586	100.0%

Note:
The residual waste element of the tonnages shown in each year in this table are based on a waste composition study using 2017 data.

- Over the five years shown food and garden waste account for around 40 per cent of total waste from households. Paper, cardboard and mixed fibres around 19 per cent of the total, metals 5.5 per cent, plastics 11 per cent, textiles 5.4 per cent and wood 4.8 per cent.

- When looking at the figures for 2020 it should be noted that the COVID-19 pandemic had a widespread effect on tonnages of residual waste generated due to increased time at home. Waste collected at household waste recycling centres was much lower due to temporary site closures, and restricted re-openings.

5 **Waste** from **household Emissions carbon dioxide equivalent (CO_2e) by material type.**

Table 5 shows the estimated emissions thousand tonnes CO_2e by material for all waste from households. These figures take account of the different management methods of waste material to recycling, composting, anaerobic digestion (AD), Energy from Waste (EfW) and landfill. A breakdown showing 2020 emissions by disposal route for each material type is shown in Table 7 of this publication.

Table 5: Total emissions by material type for 'waste from households' in England, 2016 to 2020, (thousand tonnes CO_2e basis)

	2016	2017	2018	2019	2020
Food	610	433	345	234	194
Garden	228	219	202	204	182
Other organics (Mixed food and garden)	117	92	76	63	60
Paper	1	-88	-135	-190	-237
Cardboard	0	-36	-54	-76	-91
Mixed fibres (paper and board)	-49	-47	-45	-44	-44
Steel	-406	-378	-362	-349	-270
Aluminium	-468	-525	-502	-517	-474
Mixed cans	-790	-779	-795	-801	-857
Glass	-71	-70	-71	-72	-81
Textiles	-1,309	-1,260	-1,237	-1,363	-895
PET	104	111	114	118	126
HDPE	92	98	101	105	112
Dense plastics	1,059	1,130	1,165	1,214	1,297
Film	810	860	886	920	983
Wood	-312	-340	-345	-359	-304
Copper	-76	-71	-69	-66	-54
OTHER Waste & Recycling	283	265	250	240	259
IBA metals of which:	-247	-312	-322	-347	-384
Steel	-133	-168	-174	-187	-207
Aluminium	-114	-144	-149	-160	-177
TOTAL	-426	-699	-799	-1,086	-477

Notes:
The very low textile emissions figure is due to the weighting of the emission factor for textiles re-use. Textiles use large amounts of fossil carbon and energy to produce. Reuse of textiles requires minimal preparation and yields much larger emission savings than for other "material" types.

Changes between years in the emission figures shown in Table 5 are driven by changes in tonnages of waste collected and changes in waste management methods.

5.1 Emissions by material type (CO_2e) – trends

There are several factors at play affecting changes in emissions between years – most notably the tonnage of waste generated, and the change in proportion of waste that is recycled over time. While the estimated compositional split for materials in the residual waste stream is a constant in these statistics the overall tonnage and changes in residual waste treatment will affect emissions. The latter is most marked for wastes that emit large amounts of greenhouse gases in landfill. Over the 5 years shown in table 5:

- Emissions from food waste have decreased from 610 in 2016 to 194 thousand tonnes CO_2e in 2020. This is mainly due to the reduction in the tonnage of residual waste sent to landfill.

- Garden waste emissions have remained fairly steady over the years at around 200 to 230 thousand tonnes CO_2e. The tonnage of garden waste collected for composting is affected mainly by growing conditions, however between 2019 and 2020 emissions reduced by 22 thousand tonnes CO_2e to 182 thousand tonnes CO_2e.This is thought to be mainly due to the COVID-19 pandemic disrupting kerbside collections and resulting in HWRC closures.

- Emissions from Paper & cardboard and mixed fibres have decreased by 325 thousand tonnes CO_2e between 2016 and 2020. This is mainly due to the decrease in residual waste sent to landfill.

- Overall emissions for metals (including metals recovered from IBA) have remained constant across the years at around -2.0 million tonnes CO_2e.

- The decrease in glass emissions in 2020, down by 9 to 81 thousand tonnes CO_2e is a result of higher tonnages of glass collected for recycling.

- The large increase in emissions from textiles in 2020 up 468 to -895 thousand tonnes CO_2e is as a result of less material collected for recycling and reuse, chiefly driven by charity shop closures during the COVID-19 pandemic.

- Despite increases in tonnages of material collected for recycling, emissions from plastics (PET, HDPE, Dense plastics and Film) have increased over the years from 2.1 million tonnes in 2016 to 2.5 million tonnes CO_2e in 2020. This reflects the increase in residual waste managed by EfW.

6 Waste from Household Emissions in 2020 by material type and management route.

Table 6 shows tonnages of waste by material type for 2020 and table 7 emissions tonnes CO_2e by material type for 2020.

Tonnages of materials split between recycling and residual waste and their associated total emissions are shown in figure 1.

Table 6: Waste from households split by material type and management method England 2020, (tonnes).

	Closed loop recycling	Open loop recycling	Anaerobic digestion (tonnes)	Composting (tonnes)	Energy from Waste (tonnes)	Landfill (tonnes)	Total Material (tonnes)
Food	0	0	426,173	65,196	3,539,575	572,454	4,603,398
Garden	0	0	39,435	2,491,052	303,994	49,165	2,883,647
Other organics (food & garden)	0	0	0	896,236	444,252	71,849	1,412,336
Paper	1,468,627	0	0	0	1,043,796	168,813	2,681,235
Cardboard	736,558	0	0	0	406,648	65,767	1,208,974
Mixed fibres (paper and board)	425,488	0	0	0	0	0	425,488
Steel	261,505	0	0	0	344,810	55,766	662,081
Aluminium	63,891	0	0	0	142,634	23,068	229,592
Mixed cans	254,430	0	0	0	0	0	254,430
Glass	367,136	1,096,884	0	0	337,141	54,526	1,855,685
Textiles	96,822	229	0	0	964,150	155,636	1,216,836
PET	106	106	0	0	80,000	12,938	93,150
HDPE	399	399	0	0	50,119	8,106	59,023
Dense plastics	268,346	287,398	0	0	825,111	133,161	1,514,016
Film	9,951	3,317	0	0	669,015	108,200	790,484
Wood	534,552	0	0	0	362,564	58,294	955,410
Copper	9,031	0	0	0	9,939	1,607	20,578
OTHER Waste & Recycling	32,382	20,373	0	0	1,435,137	231,986	1,719,878
IBA metals of which:	222,291	0	0	0	0	0	222,291
IBAm Steel	198,476	0	0	0	0	0	198,476
IBAm Aluminium	23,816	0	0	0	0	0	23,816
TOTAL	4,529,223	1,408,705	465,609	3,452,484	10,958,885	1,771,335	22,586,241

Notes:

a) Energy from Waste includes a small amount of waste incinerated without energy recovery. This amounted to 1% of the total in 2020.
b) IBA metals are not included in the Total for recycling or in Total Materials.

- The total tonnage of waste from households in 2020 was 22.6 million tonnes.

- This tonnage broken down by management method is:

    - Waste to EfW, 11.0 million tonnes.
    - Waste to landfill of 1.8 million tonnes.
    - Composting of organics, 3.5 million tonnes.
    - Material sent to closed loop recycling not including IBA metals was 4.5 million tonnes.
    - Organics sent to AD, 0.5 million tonnes.
    - Material sent to open loop recycling, 1.4 million tonnes.

Table 7 shows CO_2e emissions by material type and waste management method in 2020.

Table 7: Emissions by material type and management method for 'waste from households' in England, 2020, (tonnes CO_2e basis)

	Closed loop recycling	Open loop recycling	Anaerobic digestion (tonnes)	Composting (tonnes)	Energy from Waste (tonnes)	Landfill (tonnes)	Material total emission
Food	0	0	-33,096	375	-132,251	358,930	193,959
Garden	0	0	-3,084	180,307	-23,283	28,471	182,411
Other organics (food & garden)	0	0	0	47,970	-30,976	42,540	59,533
Paper	-188,924	0	0	0	-223,490	175,891	-236,524
Cardboard	-70,822	0	0	0	-88,958	68,525	-91,255
Mixed fibres (paper and board)	-44,368	0	0	0	0	0	-44,368
Steel	-277,596	0	0	0	6,700	504	-270,393
Aluminium	-477,224	0	0	0	3,404	208	-473,611
Mixed cans	-857,011	0	0	0	0	0	-857,011
Glass	-119,813	35,741	0	0	2,646	492	-80,933
Textiles	-1,385,970	0	0	0	422,119	69,269	-894,583
PET	-69	22	0	0	126,347	117	126,417
HDPE	-194	82	0	0	112,341	73	112,303
Dense plastics	-158,293	58,970	0	0	1,395,332	1,202	1,297,211
Film	-5,290	681	0	0	987,019	977	983,386
Wood	-255,208	0	0	0	-97,152	48,277	-304,083
Copper	-54,387	0	0	0	193	15	-54,179
OTHER Waste & Recycling	-16,590	1,085	0	0	210,777	63,966	259,237
IBA metals of which:	-384,151	0	0	0	0	0	-384,151
IBAm Steel	-206,832	0	0	0	0	0	-206,832
IBAm Aluminium	-177,320	0	0	0	0	0	-177,320
TOTAL	-4,295,910	96,581	-36,179	228,652	2,670,768	859,455	-476,634

Notes:
Landfill relates to total emissions expected over time from material managed by landfill in 2020.

For England in 2020:

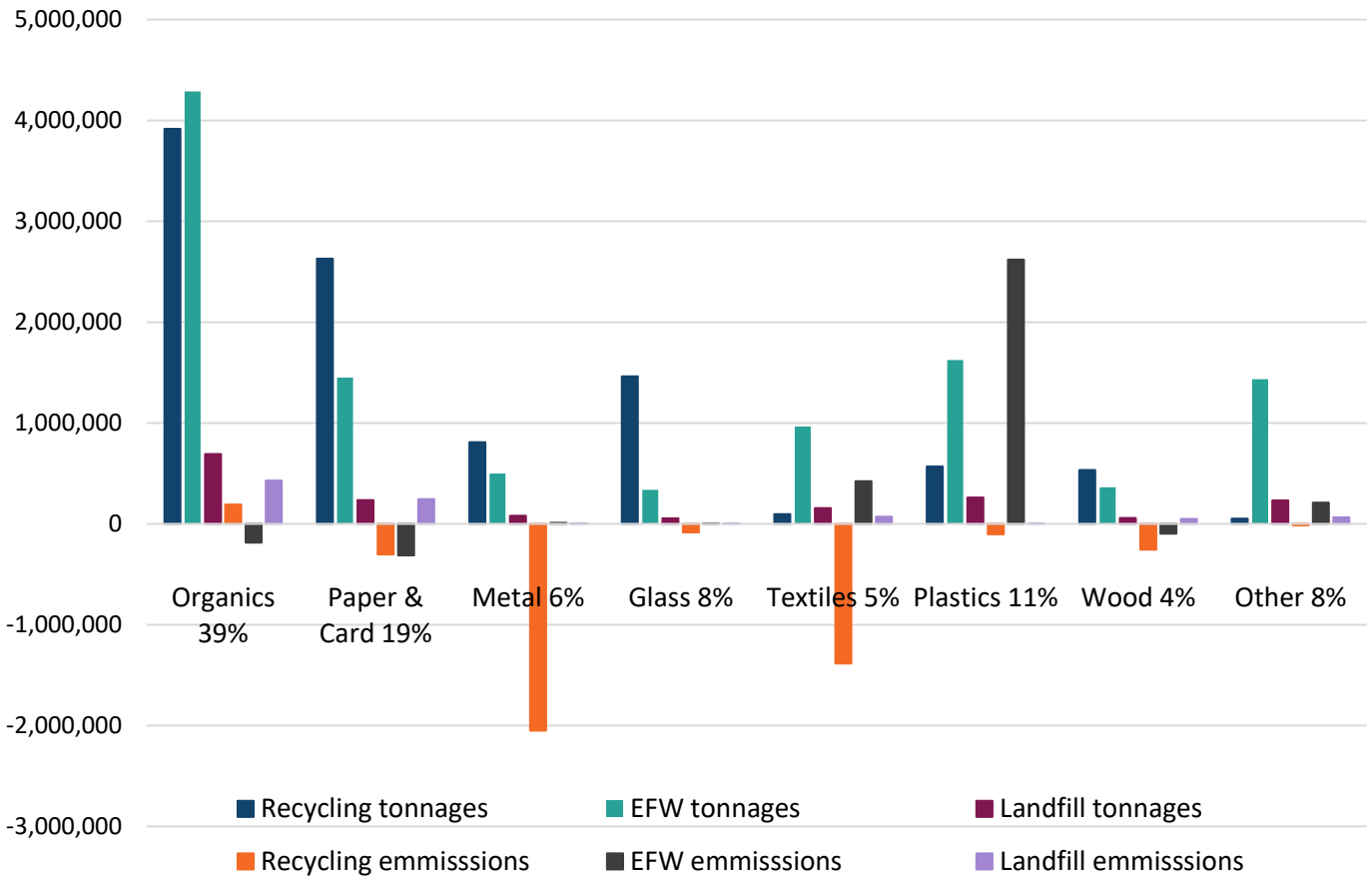
- Total net emissions from waste from households on a carbon WARM basis were -0.5 million tonnes CO_2e.

- This tonnage broken down by management method is:

    - EfW emissions of 2.7 million tonnes CO_2e
    - Emissions from landfill of 0.9 million tonnes CO_2e.
    - Composting emissions of 0.2 million tonnes CO_2e.
    - Emissions from open loop recycling of 97 thousand tonnes CO_2e.
    - Emissions from management of waste by AD of -36 thousand tonnes CO_2e.
    - Emissions from closed loop recycling including IBA metals was -4.3 million tonnes CO_2e.

Figure 1: Waste from households tonnes of waste & recycling and associated tonnes CO_2e emissions for residual waste & recycling 2020

Tonnes / Tonnes CO_2e



Note

In figure 1 “organics” is food, garden, and other organics.

7 Data and Methodology

7.1 COVID-19: The impact of the pandemic on these statistics.

The latest figures in this publication cover January to December 2020, a year in which there were 2 national lockdowns and various levels of COVID-19 restrictions on working practices and individuals in between.

During the first national lockdown which commenced 23rd March 2020, some local authorities were unable to maintain collections of dry recyclates, there was suspension of garden waste collections and widespread closure of HWRC. This was due to staff shortages and the introduction of changes to working practices. The national lockdown and rules for the operation of some commercial enterprises had a significant impact on the generation of waste during this period.

Further detail and analysis on the effect of the Pandemic can be found in Local authority waste statistics for 2020.

7.2 Waste from households

The "Waste from household" figures for recycling and residual waste come from the same dataset as those used to produce the annual national statistics release "Statistics on waste managed by local authorities in England in 2020/21" local authority data for that release comes from a snapshot of the WasteDataFlow database taken in October 2021. WasteDataFlow is a UK-wide system managed by Defra in collaboration with Devolved Administration partners that is used to record the collection, treatment and management of local authority waste.

'Waste from households' excludes local authority collected waste types not considered to have come directly from households, such as street bins, street sweepings, parks and grounds waste, and compost-like output (CLO) from Mechanical Biological Treatment (MBT) plants.

Waste from household collected basis

The figures presented in this statistical notice are on a "collected" waste basis, meaning the tonnage that was collected by local authorities prior to waste management processing and without deductions for sorting rejects at sorting facilities. While the "Total waste from households" tonnage will match that in the annual local authority waste statistics publication, the tonnages shown here for recycling and residual waste will not. This is because the local authority statistics relate to net disposal figures, meaning recycling excludes rejected material which is then included within residual waste tonnages.

There are a few exceptions to the collected basis calculations. Metals recovered from incineration bottom ash are an important contributor to carbon savings and have been included in recycling totals for carbon emissions.

Multiple material recyclates such as WEEE and Mattresses have been included in the calculations using compositional splits. Where it is not appropriate to include some of the material from these as recycling tonnages have been included in residual stream calculations.

A reference document giving an explanation of what recycling is and comparing measures across England, Wales, Scotland and N Ireland is available.

7.3 Mapping of WasteDataFlow reporting and Eunomia composition waste categories to Carbon WARM materials

Table 8 below shows how the WasteDataFlow categories that recycling is reported under, and Eunomia waste composition categories map to each material type in the emission tables of this release. For further detail on the Eunomia categories refer to the composition report.

Table 8 Mapping of reported recycling categories, and residual waste composition to material types.

Carbon WARM emissions category	WasteDataFlow material types	Residual waste composition study category
Food	Waste food only Vegetable oil	Avoidable food waste Unavoidable food waste Consumable liquids, fats & oils
Garden	Green garden waste only Wood for composting	Garden waste
Food and garden	Mixed garden and food waste Other compostable waste	Other organic Pet excrement and bedding
Paper	Paper	Paper Recylable paper Packaging paper News, mags, brochures, catalogues & directories
Cardboard	Card	Thick and thin card and cartons
Paper and board	Mixed paper & card, Books, Yellow pages	
Steel	Steel cans Fire extinguishers Gas bottles	Ferrous metals cans Aerosols Packaging and non packaging
Aluminium	Aluminium cans Aluminium foil	Non-Ferrous metals cans Aerosols Aluminium foil Other non ferrous
Mixed (cans)	Aerosols Mixed cans	
Glass	Brown glass Clear glass Green glass Mixed glass	Glass Packaging and non packaging

Textiles	Carpets Footwear only Textiles & footwear Textiles only	Textiles Clothing, shoes, bags and belts Non Clothing, Carpet & Underlay
PET (Polyethylene terephthalate)	PET [1]	PET bottles
HDPE (High density Polyethylene)	HDPE [2]	HDPE bottles
Dense plastics	Ink & toner cartridges Mixed Plastic Bottles Mixed plastics Other plastics [7] PS [6] (Polystyrene) PVC [3] (Polyvinyl chloride) Video tapes, DVDs and CDs	Dense plastics Pots, tubs trays Other packaging non packaging
Film	LDPE [4] (Low-density polyethylene) PP [5] (Polypropylene)	Plastic film
Wood	Chipboard and MDF Composite wood materials Wood	Wood Treated non treated
Copper	Not separately reported in WasteDataFlow	No separate split
OTHER Waste & Recycling Note : residual waste figures includes urine contained in absorbant hygiene products (Nappies).	Automotive batteries Bric-a-brac Mineral oil Paint Other materials Post consumer, non automotive batteries	Miscellaneous combustible: Hazardous Fines Other Wastes
IBA metals (IBAm) of which:	Metals from Incinerator Bottom Ash	
IBAm Steel	Metals from Incinerator Bottom Ash	
IBAm Aluminium	Metals from Incinerator Bottom Ash	
These waste & recycling categories have been split according to composition across multiple Carbon WARM categories	Car tyres Large vehicle tyres Mixed tyres Van tyres	
	Waste electrical and electronic equipment: WEEE - Fluorescent tubes and other light bulbs WEEE - Fridges & Freezers WEEE - Large Domestic App WEEE - Small Domestic App WEEE - TVs & Monitors	WEEE large WEEE small
	Composite food and beverage cartons	
	Furniture	Misc combustible: Furniture
	Mattresses	Misc combustible Mattresses
		Other Misc non-combustible
		Absorbent hygiene products

7.4 Emissions for composite recyclates and other materials with no Carbon WARM factor

Copper

Copper production has a significant carbon footprint and it is important to take recycling of copper from WEEE into account. A factor for copper has been calculated using information from a report by the Swiss Centre for Life Cycle Inventories (the Ecoinvent centre).

Other materials

Other materials for recycling include separately collected items such as paint, mineral oil, batteries, bric a brac, and "other" materials – amounting to around 0.6% of the WFH collected recycling total. The factor used for recycling is an average based on emission factors for paper and board, steel, glass, dense plastics and wood.

Other materials in the residual stream are based on a Eunomia waste composition study report and include Miscellaneous combustible "Other", hazardous, fines, and other miscellaneous non-combustible waste. The factor used for these items for EfW and landfill are a straight average of the factors for food and garden, paper and board, steel, glass, textiles, dense plastics and wood.

The Carbon WARM factors were designed to focus primarily on distinct material types, and as such do not cover multiple material recyclate such as WEEE, Mattresses, tyres and Furniture. For the purpose of these statistics, estimates have been made of the material split and composition of these items using research reports, and advice from WRAP and Zero Waste Scotland. This enables a more reasonable assessment of emissions rather than just using an average which may favour or disadvantage a particular recyclate.

A summary of recyclates treated in this way, and data sources are shown below:

Waste electrical and electronic equipment - WEEE

Waste electrical covers a vast range of different household appliances, equipment toys and tools etc.

Material splits for WEEE were generated using data from the UN report "2008 Review of Directive 2002/96 on Waste Electrical and Electronic Equipment (WEEE)".

The UN report contains breakdowns of material weights for EU WEEE categories, and figures for the proportions of waste WEEE by EU category.

This detail allows WasteDataFlow tonnages to be apportioned to EU WEEE categories to calculate material tonnage splits. These were then grouped to the most appropriate Carbon WARM material factor groups.

Estimates have been made to apportion the tonnage of TV's between CRT and Flat screen displays to allow for the switch to Flat screen seen in the last 20 years. There is no data available for this, so it has been assumed that the tonnage of CRT's has reduced proportionally by 5% of the total each year from around 50% in 2016.

Composite Food cartons
These have been split between paper and plastics using a material split provided by Zero Waste Scotland.

Tyres
The tonnage for tyres has been split into material types using composition figures from a WRAP published report: “The Composition of a Tyre: Typical Components” from 2006.

A split of tyres between reuse and recycling has been provided by zero waste Scotland.

Currently there is no Carbon WARM emission factor for rubber. Tyre “rubber” contains many different materials including polymers, rubber, fillers and carbon black. The factor for dense plastics has been used as a reasonable proxy to calculate emissions for the “Rubber” part of tyres.

Mattresses

Information on the material compositional split on mattresses has been taken from a report by the National bed federation:- NBF-National-Mattress-End-of-Life-Report-2019.pdf (bedfed.org.uk).

The report contains information from different processing methods for different mattress materials. In these statistics it has been assumed that around 50 per cent of the soft materials in mattresses sent for recycling is sent to EFW.

Furniture
A compositional split of materials for furniture was provided by Zero Waste Scotland.

Absorbent hygiene products – Nappies
Nappies form a significant proportion of residual waste – estimated to be around 7.1 per cent of residual waste in 2017.

Estimates of the composition of new and used nappies from the EA report “An updated lifecycle assessment study for disposable and reusable nappies” have been used to calculate a material compositional split for used nappies. Table 2.2 relates to used nappies. Used nappies contain a few “materials” that required a slightly different approach:-

> **Urine** – 65% of the weight of used nappies is Urine, which is mostly water. This accounts for around 600 thousand tonnes of residual waste and so is significant in terms of transport fuel. Although this is inert in EfW and landfill this amount of moisture has an energy cost in EfW plants. For this reason, a factor for urine in EfW plants (not shown in table 1) was derived to account for the energy used to turn this moisture into steam.
>
> **Faeces** – account for around 14% of the weight used nappies, emissions for these were calculated using the factor for food.

Having calculated the additional material present in used nappies, table 1.1 of the report was used to derive weights of other materials present in nappies. A nappy contains an absorbent core composed of fluff pulp (cellulose fibre) and a water-absorbent polymer or "super absorbent polymer" (SAP), sodium polyacrylate.

SAP – is inert constituting around 32.4% of an unused nappy. Emissions for this material have been calculated using the average emissions factor for "Other" residual waste used elsewhere.

7.5 Feedback

We welcome feedback on the data from all users, including how and why the data is used. This helps us to understand the value of the statistics to external users. You can email the Waste Statistics team at WasteStatistics@defra.gov.uk.

7.6 Revisions Policy

These statistics are experimental. They should be regarded as provisional estimates. Figures for the years covered in this release may be subject to revision as more up to date composition data becomes available and methodologies improve.

7.7 Glossary of Terms and Measures

8 Useful links

England Local Authority Waste – National statistics
Scottish Government Statistics
Welsh Government Statistics
Northern Ireland Department of Agriculture, Environment and Rural Affairs Statistics
Eurostat
WasteDataFlow Portal