WWF-UK Carbon Footprint Calculator

Methodology

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About/Summary

The WWF-UK ecological footprint calculator at http://footprint.wwf.org.uk/ (and is now part of the WWF My Footprint app) was originally prepared in 2007, and updated in 2012, 2015, and 2018 using data supplied by SEI York. WWF-UK approached SEI York in 2020 to discuss a further data update to the calculator. This methodology document is relevant to the current version of the calculator, as of June 2021.

In the most recent update, the emissions associated with certain questions have been recalculated, and an additional question has been added. These updates were undertaken to better reflect current options available to users (e.g. using a heat pump as a source to heat your home), and to improve the accuracy of the emissions calculations. For example, the food footprint was recalculated to bring the average food footprint more in line with other published estimates, and to better differentiate between diets.

Main changes from the previous version of the WWF calculator include:

- The food footprint has been recalculated, using emissions factors for food products taken from Hoolohan et al. 2013, with calorie proportions updated by scaling the average calorie contribution of different food products to the average diet based on the National Diet and Nutrition Survey dataset.
- Footprint conversion factors updated to 2018 figures in line with the latest consumption based account reported by Defra and the 2018 version of the Living Costs and Food Survey.
- Direct energy conversion factors for home heating, electricity use and travel taken from the 2020 version of Defra's conversion factors for greenhouse gas reporting.
- Assignment of a Transmission and Distribution of grid electricity emissions factor to electricity use used by respondents that selected that they had either a 100% renewable energy tariff or a renewable energy tariff that wasn't 100%.
- Addition of a heat pump as an option to the 'How do you heat your home?' question.
- Assignment of an emissions factor to the option of using wood to heat your home, as it was previously assumed to be carbon neutral.
- Minor adjustments to indirect emissions included in allocations under each section of the tool reflecting updates to UK MRIO models on which emissions calculations are based.
- An additional question on spending on entertainment and hobbies was added to the 'Stuff' section of the calculator.

Calculator Layout

The calculator is divided into four sets of questions covering common areas of individual consumption. 'Food' covers diet, food waste and buying habits. 'Home' covers energy type and usage in the house and the presence of energy-saving measures. 'Travel' covers personal and public transport usage for leisure and work, and flights. 'Stuff' covers the purchases of consumable items.

The questions have been designed to cover a cross-section of consumption behaviour, providing opportunities for users to explore options for reducing their carbon footprints. Questions are usually presented as multiple-choice options, with responses leading to an adjustment of the footprint from 'UK average' levels (see 'Calculations and Assumptions' for more details of the calculations used).

Key data sources

Data from a variety of sources is used in this generation of the WWF-UK Carbon Footprint Calculator. The calculation is consistent with the consumption-based emissions account published annually by the Department for Environment, Food and Rural Affairs (Defra). Alongside this data, additional sources of information are needed to break down the consumption-based account into sub categories that are useful for the WWF-UK calculator.

UK Household Expenditure Data (ONS):

The Living Costs and Food Survey is an annual survey conducted by the Office of National Statistics (ONS). The survey collects information on spending patterns and the cost of living across the UK. Expenditure items are defined according to the COICOP classification system (Classification of Individual Consumption According to Purpose). The calculator uses this survey in two ways. Firstly, average spends are used to inform the question wording in the 'food' and 'stuff' sections of the calculator where users are asked to select the spend that reflects their individual behaviour. Secondly, total annual UK household expenditures are calculated by taking the weekly household spend by category and multiplying by the number of weeks in a year and the number of households in the UK. These figures are then combined with emissions by COICOP category to generate carbon conversion factors.

COICOP (2018) The Classification of Individual Consumption by Purpose (COICOP) https://circabc.europa.eu/d/d/workspace/SpacesStore/aaf77193-7c1c-45da-bd10-fcd7c6d9c4b0/SWG_2018_5.1.docx

ONS. (2018). Living Costs and Food Survey. Retrieved from https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/methodologies/livingcostsandfoodsurvey

Food footprint calculation:

The Defra Family Food dataset contains the average quantity of food purchased per person per week for each food and drink category. This dataset is used to inform the bespoke calculations of the emissions factors for the food categories used in the model. Firstly, an emissions factor in the form of gCO_2/calorie is calculated for the relevant foods using emissions factors from Hoolohan et al (2013) and data on calorie content from the NHS website. The weight (in grams) of food consumed by an average UK adult is converted into its calorie equivalent. Proportional

contributions of different food products (e.g. milk, cheese, cream) to the overall food category (e.g dairy) are calculated by summing the total calories consumed in a food category and dividing accordingly. This is done using data on the average quantity of different food products consumed in a week, taken from the Family Food dataset (Defra, 2019), combined with their calorie content. This proportional contribution (for example, the contribution of milk to the dairy category is 29%), along with the gCO_2/calorie emissions factor, are used to calculate the overall gCO_2/calorie for each food category (see food categories under 'Calculations and Assumptions – Food').

Defra. (2020) Family Food dataset – Household purchases. Family food datasets - GOV.UK (www.gov.uk)

NHS Calorie Checker. 2019. Calorie checker - NHS (www.nhs.uk)

Hoolohan, C. Berners-Lee, M. McKinstry-West, J. Hewitt, C.N. 2013. Mitigating the greenhouse gas emissions embodied in food through realistic consumer choices. Energy Policy, 63, 1065-1074.

Calorific data

Additional data is used from the National Diet and Nutrition Survey (NDNS) from 2015/2016 to calculate the number of calories consumed in each food category for each diet type.

UK National Consumption-Based Emissions (Defra/UoL):

Defra publishes the greenhouse gas emissions that can be associated with the UK's consumption on an annual basis. The most recent figures were released in 2021 and calculate the consumption-based account for the year 2018. From this account, the calculator takes the total household emissions by 112 product types and reassigns these to the COICOP system. These figures can then be divided by total household expenditure to provide the carbon conversion factors used in the calculator. The emissions total associated with government expenditure is divided by the population in the UK to give the 'government spend' figure that is added to each individual's footprint.

Defra. (2021). UK's Carbon Footprint 1997-2018. from https://www.gov.uk/government/statistics/uks-carbon-footprint

UK National Travel, Fuels and Electricity Emissions (Defra):

Defra also provides greenhouse gas conversion factors that are used for company reporting. The calculator takes the emissions factors for electricity, oil and gas in kilograms of carbon dioxide equivalent per kilowatt-hour ($kgCO_2e$ per kWh) for use in the 'home' section of the calculator. Emissions factors ($kgCO_2e$ per km) for electric, hybrid and other car types, motorbikes, buses, trains, domestic, short haul and international planes are also used in the 'travel' section of the tool.

Defra. (2020). Greenhouse gas reporting: conversion factors 2020. Retrieved from https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

EXIOBASE - IO Model Data:

The consumption-based emissions reported by Defra use a multi-regional input-output (MRIO) database developed by the University of Leeds (UoL) and based on data supplied by the ONS. The data reflects the 112 sector standard industrial classification (SIC) reported by the ONS. This data is mapped to the COICOP sectors to match the Living Costs and Food Survey.
EXIOBASE. (2018). EXIOBASE3 Data Download. Retrieved from https://www.exiobase.eu/index.php/data-download/exiobase3mon

Tukker, A., de Koning, A., Wood, R., Hawkins, T. R., Lutter, S., Acosta, J., Kuenen, J. (2013). Exiopol – Development and Illustrative Analyses of a Detailed Global MR EE SUT/IOT. Economic Systems Research, 25(1), 50–70. http://doi.org/10.1080/09535314.2012.761952

Energy Use and Energy Saving Data (Energy Savings Trust):

Historical data from the Energy Savings Trust (EST) provided the kWh used by detached houses of 2 to 4 bedrooms, semi-detached houses of 2 to 4 bedrooms, terraced houses of 2 to 3 bedrooms and flats of 1 to 3 bedrooms for heating, hot water, cooking, and lighting and appliances. Different figures are provided if the heating and hot water is by electricity or gas.

The EST also gives the average savings that you would expect from installing energy saving light bulbs; loft insulation; cavity-wall insulation; a condensing boiler; and double glazing. The savings are in pounds saved from your energy or lighting bill. We also know from the EST the proportion of homes that have each different energy saving measure.

Data sourced from EST. (2014). Improving my home
http://www.energysavingtrust.org.uk/domestic/improving-my-home-0 (link no longer live)

Calculations and Assumptions

Food:

As explained above, the calculator uses the breakdown of food categories, and the calorie contribution of each category to an individual's diet, to calculate the footprint of the average UK diet. The emissions associated with locally produced food was calculated by using scaling factors derived from the previous model on the impact of sourcing 60% or 75% local in comparison to the 'default' sourcing. The food categories are aggregated to nine categories:

1. Drinks
2. Snacks
3. Oils and fats
4. Fruit
5. Vegetables

6. Cereals
7. Dairy
8. Other meat
9. Beef, lamb

Data from the NDNS dataset is used to split 2600 calories (the average food supply including waste) by the above categories into six diet types:

1. Meat in every meal
2. Meat in some meals
3. No beef
4. Meat very rarely
5. Vegetarian
6. Vegan

The average diet is assumed to be 'meat in some meals' and combining these calorie levels with the calculated gCO_2e/calorie gives the CO_2e/calorie for each food type assuming this default UK based diet. This is because the emissions factors are based on Hoolohan et al (2013), where emissions factors are calculated based on the UK average diet.

Question 1 determines the diet type of the user, this information is combined with **Question 4** which finds out what proportion of the food bought is imported. If the user selects 'A lot', we assume 75% of food is locally sourced, with the gCO_2e/calorie for each food category calculated by applying the scaling factor derived from the difference between emissions from 45% locally sourced diet (default UK) and 75% locally sourced diet from the previous model. If the user selects 'some' we assume 60% is locally sourced and 'I don't worry about where my food comes from' assumes the default emissions from the average UK diet.

The data used to generate the impact from questions 1 and 3 is for food bought from food shops and prepared at home. **Question 2** deals with the impact of catered food from restaurants, canteens and takeaways. The user selects their weekly spend on this type of purchase. This figure is multiplied up to a yearly figure and then multiplied by the 'catering services' conversion factor calculated using the UK consumption emissions data.

Question 3 deals with food waste. We estimate that around 30% (http://wrap.s3.amazonaws.com/the-food-we-waste-executive-summary.pdf of the food bought in the UK is thrown away and this question reduces the impact of users who consciously try to reduce their food waste. If the user selects 'none', their total food impact is reduced by 30%, 0-10% reduces their impact by 20%, 10-30% keeps the figure as it is because this is the UK average and more than 30% increases the impact by 10%.

The largest footprint is generated by eating a lot of meat, spending the most on catering, wasting food and buying imported products. Being vegan, not buying catered food, wasting nothing and buying local gives the lowest footprint.

Maximum food impact (tCO_2e)	Minimum food impact (tCO_2e)
4.77	0.86

For comparison, in the previous version of the model the minimum impact of food footprint was 0.85 tCO_2e and the maximum was 3.66 tCO_2e.

Changes from the previous model:

The methodology for calculating the food footprint has entirely changed. The model still calculates the dietary food footprint using emissions factor per calorie of food product (gCO_2e/calorie), but the calculation underlying this emissions factor has changed. It previously was based on MRIO model outputs, and is now based on emissions factors per gram of food product (gCO_2e/g) taken from Hoolohan et al (2013). These are then converted to their calorie equivalents, using data on calorie content from the NHS website. Proportional contributions of different food products (e.g milk, cheese, cream) to the overall food category (e.g. dairy) were calculated by summing the total calories consumed in a food category, using data on the average quantity of different food products consumed in a week, taken from the Family Food dataset (Defra, 2019), and dividing accordingly.

The table below shows a comparison of the food footprints of different diets, assuming 0-£10 spent on eating out, 0-10% of food is wasted and 'some' food is locally sourced. This highlights how the new model is more aligned with the literature on food footprints, such as the 1.88 tCO_2e average annual food footprint found in a 2017 WWF report[1].

	New model	Old model
Meat lover	2.43 tCO_2e/year	1.68 tCO_2e/year
Average	1.82 tCO_2e/year	1.45 tCO_2e/year
No beef	1.80 tCO_2e/year	1.46 tCO_2e/year
Veggie	1.41 tCO_2e/year	1.25 tCO_2e/year
Vegan	1.15 tCO_2e/year	1.21 tCO_2e/year

Calories

The footprint of diets depends on the calorie consumption of different food categories, and the calorie proportions were updated to be more in-line with the most recent data. The calorie contribution of each food category to the overall daily calorie intake was calculated for the average diet from the NDNS Survey for the year 2015/16, and scaled for a daily calorie intake of 2600. The calorie proportions for the other diets were then calculated based on this. Calorie

[1] WWF. 2017. Eating for 2 degrees. WWF_Livewell_Plates_Full_Report_Sept2017_Web.pdf

consumption of drinks, snacks and oils was taken to be the same across the diets, and consumption of other categories were proportioned accordingly.

Scaling of emissions based on locality:

The ‘default’/UK based diet emissions as the emissions associated with the response ‘I don't worry about where my food comes from’. The emissions for each diet associated with the response ‘All my food is locally sourced’ and ‘some of my food is locally sourced’ were found by calculating the scaling factor used in the previous model between locality proportion (60% local or 75% local) and emissions. For example, fruit emissions associated with the 45% local option were found to be 1.39 times greater than fruit emissions associated with the 75% local option (across all diets). These scaling factors were applied to the emissions from each diet for the scenarios where 60% of food is local and 75% of food is local.

Eating out:
The emissions associated with ‘eating out’ have been updated to use the UK’s consumption based account data from 2018 in comparison to 2015.

Home:

As explained above, the home section of the calculator uses data from the EST on house type, combined with information on the types of reductions that can be achieved by different energy saving measures and carbon conversion factors from Defra by fuel type to calculate the impact of heating and powering your home. However, there are a number of assumptions and steps required to do this. Firstly, there is some missing data from the EST required for the calculator. We assume, based on expert judgement:

- A one-bed detached home uses the same energy as a two bed detached
- A one-bed semi-detached home uses the same energy as a two-bed semi detached
- A one-bed terraced home uses the same energy as a two-bed terrace
- A four-bed terraced home uses the same energy as a three-bed terrace
- A four-bed flat uses the same energy as a three-bed flat
- The kWh of oil used is the same as the kWh of gas used (but conversion rates are different)
- The average home is heated to 18-21 °C
- A home heated to over 21 °C uses around 40% more energy to heat than average
- A home heated to 14-17 °C uses around 40% less energy to heat than average
- A home heated to less than 14 °C uses half the energy of an average home

The next step is to take each of the average kWh figures by house type, fuel use, level of heating and purpose and estimate what these average figures would be in a home with no energy efficiency measures. To do this we use the data on the effectiveness of energy efficiency measures combined with their uptake from the EST. This means that once the user has answered questions 1, 2, 4 and 7 we have an estimate of their home’s kWh usage which we can start to reduce if they have additional energy saving measures.

In this version of the calculator we have made updated for some heat sources:

- Using wood as a heat source is now associated with well-to-tank emissions from extracting, refining, and transporting wood logs. This is taken from the 2020 Defra greenhouse gas conversion dataset.
- The updated model now allows the user to select whether they use a heat pump to heat their home. The emissions from using a heat pump as a heat source is based on a heat pump having a coefficient of performance of 3 over the year, meaning that for every 1 kWh of electricity, 3 kWh of heat is produced. Source: How efficient is a heat pump? | Viessmann

The reduction calculations and assumptions are as follows:

- For Q5, the previous model assigned an emissions factor of 0 for all electricity use if the user selects that they have a 100% renewable energy tariff. In this update, we include a more realistic assumption, so if the user selects that they use either a 100% renewable energy tariff or a tariff that isn't 100% from renewable energy sources, the model assigns an emissions factor per kWh of electricity which is associated with the transmission and distribution of grid electricity. Now if the user has 100% renewable electricity, the impact of all electricity use is equal to the emissions factor associated with transmission and distribution (T&D) of grid electricity (electricity losses) taken from Defra (2020). The impact from using grid electricity (+T&D) to using renewable electricity was calculated as a 92% reduction, as emissions per kWh change from 0.253 kg/kwh to 0.02 kg/kwh. Changing the impact of having a renewable energy tariff has affected the elements of the calculator which depend on this response.
- Tariffs of less than 100% renewables reduce the electricity impact by 27.6% (this represents a small change from the previous model where it was a 30% reduction, after taking into account the emissions from T&D).
- Turning off lights and appliances reduces the impact of lights and appliances by 15% (Q6)
- Energy saving light bulbs reduce the lighting and appliances impact by 2% (Q8)
- Loft insulation reduces the heating impact by 30% (Q8)
- Wall insulation reduces the heating impact by 15% (Q8)
- Double glazing reduces the heating impact by 8% (Q8)
- Low flow fittings reduces the hot water impact by 40% (Q8)
- Solar panels reduces the electricity use to zero (Q8)
- Solar water heaters reduce the hot water impact to zero (Q8)

The impact calculated in the ‘home’ section relates to the house rather than the individual. This is why Q3 is required. Impacts are divided by the number of people over the age of 16 who live in the house. The calculator does not include questions on every aspect of home expenditure. Each user has an additional 0.28 tCO_2e added to their impact to reflect the per person costs of insuring and maintaining a home. This value is the average from the UK consumption emissions.

The largest footprint is generated by living alone in a 4 bedroom detached house, heated over 21 degrees using regular grid electricity with no energy saving measures. Having solar panels or 100% renewable electricity and then heating using electricity gives the lowest footprint.

Maximum home impact (tCO_2e)	Minimum home impact (tCO_2e)
15.13	0.41

Changes from the previous model:

Key changes have already been discussed and include the addition of 'heat pump' as an option to heat your home, and assigning emissions to using wood as an option to heat your home.

Travel:

As explained above, the travel section of the tool uses data from the Defra emissions reporting site as conversion factors for a km travel by different types of car, motorbike, train, bus, domestic short-haul and long-haul plane. The electric car and plug-in hybrid car conversion figures are taken from Defra, if the user reports that their electricity is from renewables or that they have solar panels, they obtain an estimated emissions reduction for electric cars and a 50% reduction for plug-in hybrid cars to reflect the fact that charging will have lower-emissions. If the user says they have an electric car, this assumes that 20% of the time the car is charged using grid electricity/charging ports that aren't at their home, and 80% of charging is done at home. Therefore, if the respondent has said that they are on a renewable energy tariff at home, the emissions from charging the car at home are equal to transmission and distribution emissions from grid electricity (as these are the associated emissions from using renewable energy). This assumes a kWh/mile conversion of 0.24.

Source: Tesla Model 3 Standard Range price and specifications - EV Database (ev-database.uk).

Question 1 and 1a determine the type of car (if any that the user travels in), then questions 2, 3 and 4 determine the distance travelled per week by car, train and bus respectively. Distances are multiplied up to get a yearly figure. We assume

- In one hour you can travel 50 km in a car, 60 km in a train, 30 km in a bus
- If the user travels by car, they are also assigned the average UK impact of buying and maintaining a car
- We assume that the average car occupancy rate is 1.6 people per journey, and therefore emissions are divided by 1.6 to find the emissions that can be allocated for the individual filling out the carbon footprint calculator.

Question 5 addresses the impact of flights. The data from Defra includes the uplift factor and conversion factors are higher for domestic flights per km to reflect the fact that most emissions occur in takeoff and landing. The previous version of the model assumed six zones:

- Return flights in zone 1 cover 1,300km
- Return flights in zone 2 cover 2,500km
- Return flights in zone 3 cover 5,000km
- Return flights in zone 4 cover 11,000km
- Return flights in zone 5 cover 18,000km
- Return flights in zone 6 cover 35,000km

But the new version of the calculator has been simplified from six to just three ranges and the structure of the question designed to no longer need the map - this will improve question response rate. The question now reads: *'In the last year, how many return flights have you made in total to the following locations?'* and the approximated answer distances are:

- *Domestic (UK/ Ireland)* – Based on flight approximation of Newquay to Edinburgh
- *Europe* – Approx distance of London to Rome up to 2500km
- *Outside Europe* – Approx distance of London to LA up to 9000km

Simplifying the flight question will lead to a less precise carbon footprint for some users (indeed some online calculators require specific routes and plane types). However, the simplified question will still provide the right trends because for most respondents taking any flights will lead to an above average carbon footprint and so will still highlight that the *travel* section is an area that may need focus. As well as this the aim of the footprint calculator is not to provide a carbon footprint estimate to buy offsets so getting respondents through the calculator is more important than precision in this case.

Question 6 asks the user whether they offset any of their flights (this question was introduced to the online version since the last underlying model upgrade). Depending on the user's response, and the amount of flights they have taken, the emissions associated with their flying reduces by either 100%, 75%, 50%, 25% or nothing.

The largest footprint is generated by using a large car over 25 hours a week and travelling over 25 hours a week by train and over 10 hours a week by bus, and 10 flights in each of the zone distances given. Not using any powered transport at all gives the lowest footprint

Maximum travel impact (tCO_2e)	Minimum travel impact (tCO_2e)
153.92	0.005

Changes from the previous model:

The new version of the model includes updated emissions factors for driving in different car types, train, bus and flying, using Defra greenhouse gas conversion factors from 2020: https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020

Updated emissions from electric and hybrid cars to include proportion of emissions from Transmission and Distribution if they are on 100% renewable energy tariff, which was previously assigned zero emissions.

The emissions included in car travel, that include the emissions associated with buying a car, have been updated to 2018 figures which are the latest available (the previous model version used 2015 figures).

Stuff:

As explained above, the stuff section of the calculator uses conversion factors from the UK emissions account alongside user reported spends on consumable goods. Question 1 assumes the following:

- An average TV, laptop or PC costs £400
- An average large item of furniture costs £500
- An average washing machine, dishwasher, tumble dryer or fridge freezer costs £300
- An average mobile phone or tablet costs £300

These are from the original model and rough estimates of the amount people are likely to spend on average. For each of the four options, the following COICOP category conversion factor is used: ‘TV, video and computers’; ‘Furniture and furnishings’; ‘Household appliances’, and ‘Telephone & telefax equipment’.

Where question 1 uses a year as a time frame for large purchases, questions 2, 3, 4, 5 and 6 use a month as the time period of spend for clothes and footwear, pets and pet food, health, beauty and grooming products and phone, internet and TV contracts, and entertainment (cinema, gyms, books, sports, theatres). The following COICOP category conversion factors are used for each of these five questions: ‘Men's outer garments’, ‘Pets and pet food’, ‘Toiletries and soap’, ‘Telephone and telefax services’ and an average of ‘Sports subscriptions’, ‘cinema, theatre and museums’, ‘books’ and ‘newspapers’ (and other relevant categories).

Question 7 asks about recycling habits. This question has been kept from the previous version of the calculator because it was felt that users want to demonstrate that they recycle. However, at present we do not have the capability to calculate the impact of recycling using input-output techniques. The impact of a product that is made from recycled materials has already happened and recycling it does not lessen that initial impact. Over time, the environmental impact of production may reduce as products are made using more and more recycled content but this cannot be allocated to individual consumers who recycle.

The largest footprint is generated by selecting every option in question 1 and the highest spends in each of questions 2 to 5. Not selecting any items in question 1 and spending the least on questions 2 to 5 gives the lowest footprint.

Maximum stuff impact	Minimum stuff impact

(tCO_2e)	(tCO_2e)
3.06	0.76

Changes from the previous model:

A new question has been added to the updated model. This question is focused on spending on 'entertainment and hobbies' - sports membership, books, newspapers, computer games, gardening and cinemas. This decreases the minimum possible footprint from 1.16 tCO_2e to 0.76 tCO_2e (as more activities are now included in the model and therefore the residual is lower if the person selects the lowest possible spend on these activities).

The emissions associated with spending on different 'stuff' categories have been updated to use the UK's consumption based account data from 2018 in comparison to 2015.

Other:

The UK's consumption-based account, or carbon footprint measures the greenhouse gas emissions of both household and government consumption. Government consumption covers spend on roads and other construction, education, defence, health and other expenses involved in running the country. This impact is shared by the 67,886,004 residents of the UK meaning that there is a portion of each individual's footprint that represents government spend. For the year 2018, this impact works out as 2.35 tCO_2e per person - the previous version of the model used the 2015 figure of 2.75, with the ~15% reduction is mainly due to decarbonisation of the UK energy supply.

Outputs from the calculator

Once the user has completed the questions from the food, home, travel and stuff sections of the calculation they can view their results. The results are displayed broken down by each of these themes and also shows the 2.35 tCO_2e from government spending. The result shown is an individual, not household footprint.

The user result can be compared with those of the world average and UK average footprints:

- 6.26 tCO_2e is the global average emissions per capita in 2018 (excluding LUCF as this aligns with our data and latest available, and emissions and footprint are the same at the global level). Data is from Climate Watch Data
- UK average is 9.45 tCO_2e for 2022 and is calculated as below:
    - Defra provides an annual historical UK carbon footprint to 2018
    - The ONS have UK population data
    - With these we calculate a historical footprint as 10.58 tCO_2e per capita in 2018
    - To project forward we can use the UK CCC's "Balanced Net Zero Pathway" which gives a trajectory for UK territorial emissions going to net zero in 2050.

- Using the assumption that the per capita footprint declines at the same rate as the territorial net zero projections, we can get a scaled reduction from the 2018 per capita footprint each year until 2050
- This gives the estimates of average UK carbon footprint per capita as 9.64 for 2021 and 9.45 tCO_2e for 2022.

Frequently Asked Questions

Q: Does the WWF Footprint Calculator display results for an individual or household?
The final result is an individual footprint, although household information is used to calculate home energy impacts. The impact of heating and powering the home is divided by the number of adult residents.

Q: Does the carbon footprint cover just CO_2 or other greenhouse gases as well?
The reported footprint covers the greenhouse gases required to be reported to the United Nations Framework Convention on Climate Change (UNFCCC). The main contribution to the footprint of the basket of gases is from carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).

Q: How reliable is the data that underpins the calculator?
UoL uses data from two sources to calculate the UK's consumption-based account (CBA). The majority of data is provided by the ONS. UoL uses:

- UK supply and use tables (SUTs) (http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Supply+and+Use+Tables#tab-data-tables)
- UK environmental accounts (http://www.ons.gov.uk/ons/taxonomy/index.html?nscl=Environmental+Accounts#tab-data-tables)

Data from the ONS are National Statistics and are produced to high professional standards set out in the Code of Practise for Official Statistics. They undergo regular assurance reviews to ensure that they meet customer needs.
(see http://www.ons.gov.uk/ons/rel/mro/news-release/national-accounts-changes--further-detail-of-the-impact-on-real-expenditure-components-of-gdp/bb-news-release-0814.html)

In addition to National Statistics data, we use data from the EXIOBASE v3 MRIO database (http://www.exiobase.eu/index.php/data-download/exiobase3mon) The ONS SUTs provide information on the total imports to UK intermediate and final demand. However, to fully calculate the UK CBA we need to know the origin country and sector that is supplying UK demand. Data from the EXIOBASE v3 database is used to disaggregate these totals. This means that the totals are consistent with National Statistics but the share is generated using additional source

data. The EXIOBASE database has been described extensively in peer-reviewed academic literature (see http://www.exiobase.eu/index.php/publications/list-of-journal-papers-references).

We also take the CO_2, GHG and energy data from the rest of the world from the EXIOBASE database. Care is taken to ensure that this data is consistent with the UK data (i.e. the units are the same and for the emissions data we check it is consistent with the data reported to the UNFCCC).

The original calculator model has been examined by Professors Thomas Wiedmann and John Barrett, who are world leaders in the field of accounting for consumption-based emissions, and found to be accurate and useful.

Q: How up to date is the data that underpins the calculator?
MRIO-based/consumption-model data is from the year 2018 – the latest data available for the UK's consumption-based account. We utilise direct emissions information from Defra which is dated 2020.

Q: Who has created this calculator?
This calculator was developed by WWF-UK, the Stockholm Environment Institute based at the University of York and the Sustainability Research Institute at the University of Leeds.

Q: What is the footprint that I need to ensure we stay within a 1.5 or 2°C limit?
Analysis conducted by the University of Aalto and IGES (https://www.aalto.fi/sites/g/files/flghsv161/files/2019-02/15_degree_lifestyles_mainreport.pdf) suggests that – if we wish to stay with a 1.5°C warming limit – then in 2050 if we assume that each person on the planet is allocated a 'fair share' of the global emissions budget each person will be 'allowed' to have a footprint of around 1 tonne. This is significantly less than the average current UK footprint - and can only be achieved with a combination of behavioural and technological change. The WWF-UK footprint calculator assumes the use of current technologies in the production of goods and services, and therefore it is not likely that you will be able to achieve this target figure within the Calculator. However, reducing your footprint as much as possible via behavioural changes now will ensure that we have the best possible chance of staying within the 1.5°C limit, and future technological improvements will mean that your footprint will continue to fall in future years.

Q: What does the 'other'/'government spend' result show?
The UK's consumption-based account, or carbon footprint measures the greenhouse gas emissions of both household and government consumption. Government consumption covers spend on roads and other construction, education, defence, health and other expenses involved in running the country. This impact is shared by the 68 million residents of the UK meaning that there is a portion of each individual's footprint that represents government spend. For the year 2018, this impact works out as 2.35 tCO_2e per person.

Q: I have selected that I have an electric car but my travel footprint still seems high. Why is this?
The UK's electricity is not as green as that of other countries, so per km, electric cars perform similarly to hybrid cars. In the future, when a higher proportion of the UK's electricity is generated by solar or wind and less from coal and gas, the impact will reduce. If you select that you buy energy from green tariffs or that you have solar panels installed, the impact of your electric car reduces accordingly.

Q: What should I do if a question doesn't reflect my personal situation accurately?
In making the Calculator as user-friendly as possible we have had to simplify questions and we recognise that your personal situation may not match the questions fully. If this is the case, try to make a 'best guess' at how you think your personal situation fits into the Calculator. You can also contact us for further advice.

Q: Who should I contact for further information?
Contact us on https://www.wwf.org.uk/form/general-queries-form and we'll aim to answer your questions.

Q: Should I include my work travel activities?
You should include any travel for commuting to your regular place of work because it is the individual's decision as to where they decide to live in relation to their workplace. However, the impact of travel that is part of your job, such as making deliveries, travelling to a different office for a meeting or visiting a foreign country for a conference are assigned to your business' impact. This impact then gets assigned as part of the impact of the 'product' your business produces.