GHG Footprint Calculator for Individuals
Methodology

The Lifestyle Calculator is the result of a collaboration between Doconomy and the UNFCCC secretariat.

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Introductory notes

1. Overarching principles

The Lifestyle calculator aims to follow the Greenhouse Gas (GHG) Protocol as an overarching framework. However, it's recognized that the GHG Protocol standards were not developed to be an accounting standard for individuals and that all principles might not be applicable to lifestyle calculations. In some instances, deviations from the GHG protocol calculation methods have been made for illustrative purposes to showcase the impact of a particular desired behaviour. In those cases it has clearly been stated under the question's assumptions when such deviations have occurred.

In calculations, emissions from all greenhouse gases covered by the Kyoto protocol have been covered. Values for the non-carbon dioxide greenhouse gases are expressed as CO_2-equivalents (CO_2e) using Global Warming Potential (GWP) factors from the Intergovernmental Panel on Climate Change (IPCC).

In order to avoid double counting of emissions, sources with a cradle-to-gate perspective for purchased products have been used. For example in the case of electronic products, the emissions from the use phase and the disposal of the products are accounted for by the electricity usage questions and the waste disposal questions.

2. Selection of sources

The sources of data used to perform the calculations were selected based on the following criteria:

A. Publicly available: public availability helps to ensure full transparency of the calculations.
B. Belonging to recognized, specialized organizations: provides credibility and robustness.
C. Possibility to be updated regularly, ideally annually: maintains calculator current, relevant and credible.

The third criterion could not be fulfilled for a few categories (i.e. food), where some of the data may not have regular updates. In these cases, suitable updates will be identified in the future.

3. Emissions from electricity

According to the GHG protocol, emissions from electricity can be accounted for in two ways: the market-based method and the location-based method. In the

market-based method contractual agreements are considered, and emissions allocated thereafter. A purchase of green energy with guarantee of origin is allocated zero emissions in scope 2, while a purchase of non-green electricity is allocated emissions from a residual mix. The location-based method uses the grid average emission factor for your location and contractual agreements are not taken into account. The GHG Protocol Corporate Accounting Standard requires that companies report scope 2 emissions using both methods.

European agencies have already published residual mixes and other markets are expected to develop similar mixes in the upcoming years. Read more regarding this, and the methodology for electricity accounting, at the GHG protocol website and the guidance documents published[1]. Until the residual mixes are available for all countries, the Lifestyle Carbon Calculator uses the grid average emission factors for consistency reasons but allocates zero emissions to green electricity purchased with guarantees of origin (or similar contractual agreements).

4. Omitted emissions

The total carbon footprint of a country is caused by the sum of emissions from its citizens, the state and the private sector. Typical state and public emissions are caused by, for example, development of infrastructure, administration and the provision of several public services such as education or health. These emissions are usually distributed equally across all citizens when calculating the country's "per capita emissions" and form an emission "base load" that is unique for every country. These services are an important part of the welfare state, however, as they are controlled by the state there is little an individual can do to directly affect these emissions. As the purpose of the Lifestyle Calculator's is to address and capture emissions that the individual can control and influence through behavioral change, it was decided that the calculator will not take into account these so called "base load emissions".

Other emissions that the Lifestyle calculator will not account for, for the same reasons stated above, are emissions resulting from land use, land-use change and forestry (LULUCF) in the country. It will neither address the overall national emissions resulting from industry and agriculture, but will rather focus on the typical emissions associated with products and services bought by individuals.

5. Comparison of the result

Given the chosen structure of the calculator, comparisons of the result from the Lifestyle Calculator with other sources is difficult. Such an example is, for instance, the comparison with officially reported GHG emissions per capita per country. The reason for this is that the calculation of per capita emissions is based on the aggregated emissions of a nation (from all industries, agriculture, state services etc.) which is then divided equally across the population. Part of these emissions

[1] https://ghgprotocol.org/blog/top-ten-questions-about-scope-2-guidance

are therefore not at all associated with the chosen lifestyle of the individual inhabitants, but rather depends on the nature of the national industries and state policies. As the Lifestyle Calculator aims to capture the emissions resulting from individual behaviour the comparison therefore becomes inadequate.

Similarly, comparisons with the results of other carbon calculators should be made with care. The reason here is that the scope and underlying assumptions of the calculators are likely to differ. Unless these differences can be established and accounted for, comparisons of the results can be misleading and should therefore be avoided.

However, in order to put the emissions into context (and for the user to be able to relate their own emissions to some other relevant number), there is an option to compare the result to a benchmark. The current benchmark is the level of emissions we need to be at if we want to limit global warming below 1.5° by 2050 stipulated in the Paris Agreement. This benchmark is based on the 1,5 degree lifestyle report[2] and is displayed as the maximum carbon emissions each person is allowed to emit per year by 2030 - 2,5 tonnes. The milestone for 2030, rather than the target for 2050, was chosen as the user is believed to connect better to a near time target.

6. High level categories

Below is a list of the high level categories included in the Lifestyle Calculator. They have been selected because they represent the biggest emission hotspots related to an individual's lifestyle. Under each of these areas the user will find a number of questions that will help to pinpoint which activities that generate emissions and how they are sustained over time. The categories are:

1. Home
2. Transportation
3. Shopping
4. Food

7. Fast track - a layered question battery

The Lifestyle Calculator include a ”fast track”, a subset of the full question battery, developed to achieve a faster result that still hold a high accuracy. Note that there will be a trade-off between accuracy and fewer questions, a fast track will contain more approximations.

[2] Institute for Global Environmental Strategies, Aalto University, and D-mat ltd. 2019. 1.5-Degree Lifestyles: Targets and Options for Reducing Lifestyle Carbon Footprints. Technical Report.Institute for Global Environmental Strategies, Hayama, Japan.

Through the Lifestyle Calculator, Doconomy and the UNFCCC secretariat want to empower people to understand and reduce their footprint. With this fast track, Doconomy and the UNFCCC secretariat aim at creating a more engaging and intuitive experience. An experience where the user do not have to stop and think to get a first quick understanding of their footprint, but do have the possibility to dig deeper into their footprint if they would like to.

The question battery is built in layers. A fast track where the questions are selected to represent big and often common emission sources for many people. This is to create a general understanding of the users footprint and how it is generated. In the second layer the user is invited to add further details that will improve the accuracy of the carbon footprint estimation and showcase additional sources of emissions that the user might not have thought about.

The full question battery consists of approximately 35 questions depending on how you answer. In the fast track, the user will answer 11-12 of those questions, while assumptions are made on the rest. In this document, you can see the assumptions made under the subheading ”fast track assumptions and sources” under each question. The user can, after finishing the fast track, go into the second layer of questions and replace the assumptions with their actual data.

The questions included in the fast track have been chosen on the following basis:

- Material emission source
- No reasonable assumptions could be made
- Cover all four high level lifestyle categories (home, transport, shopping and food)

Questions included in the fast track battery:

1.1 What is your country of residence?

1.4.1 Does your household use renewable electricity?

1.5.1 What is the primary heating source in your home?

1.6.1 Do you use gas for cooking in your home?

2.1.1 Do you have a car?

2.1.2 What kind of car is it?

2.2.1 How many return flights in these categories have you taken within the past 12 months? (Only include private flying, not work related)

1. Short distance flights (0-4h)
2. Medium distance flights (5-8h)

3. Long distance flights (9h or more)

   Include the RFI-factor in the calculation?

2.3.1 How much time per day do you use public transportation?

3.1.1 How much have you spent in the following categories these past 12 months? (in Euros)

1. New furniture for your home
2. Sport and cultural events for yourself
3. Beauty salons, hairdresser or spa for yourself

3.2.1 How many items in these categories have you bought for yourself or your home these past 12 months?

1. Large appliances (eg. Refrigerator or washing machine)
2. Medium appliances (eg. Tv, computer)
3. Small appliances (eg. Toaster or headphones)

3.3.1 Within the past 6 months, how many items in these categories have you bought? *(a shirt would be an item. A pair of socks, maybe not)*

1. Clothes for yourself, new
2. Clothes for yourself, second hand
3. Shoes for yourself, new
4. Shoes for yourself, second hand

4.1.1 What best describes how you eat?

8. The Lifestyle Calculator's full question battery

In the following sections the full outline of the question battery is presented. Each question will be presented along with its answering options, formula, underlying assumptions, sources where the data has been collected and any relevant fast track assumptions.

1. Home

1.1 What is your country of residence?

This calculator is available for countries and regions recognized by the UN.[3]

When country-specific emission factors are available they will be used in the calculations. Grid emission factors are country-specific. The rest of the emission factors are based on UK DEFRA's "Government conversion factors for company

[3] https://unstats.un.org/unsd/methodology/m49/overview/

reporting of greenhouse gas emissions”4m, ADEME’s “Modélisation et évaluation du poids carbone de produits de consommation et biens d'équipement” 5 or other suitable databases. See below for specific information on the factors used in each calculation.

The goal is that the database of emission factors for the calculator will grow over time as more country-specific data becomes available. We also aim to include city-specific emission factors when they become available.

1.2 How many people live in your household?

The calculator aims to provide the individual with an estimation of personal GHG footprint, therefore, when the user has specified their exact consumption (for electricity, heating and water) the input will be divided by the number of household occupants. This approach is chosen in order to divide the total household-related emissions between the total number of residents in it.

Fast track assumptions and sources:
Assume one (1) resident.

1.3 Electricity consumption

1.3.1 Does your household use renewable electricity?

Options:

A. Yes
B. Yes, we produce our own
C. No
D. I don't know

1.3.2 How would you rate your household's level of electricity usage?

Options:

A. Low
B. Medium
C. High
D. Specify exactly (kWh)

Formula:

[4] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[5] https://librairie.ademe.fr/consommer-autrement/1190-modelisation-et-evaluation-du-poids-carbone-de-produits-de-consommation-et-biens-d-equipement.html

Consumption amount (kWh) x country-specific grid emission factor

Assumptions:
Low: multiply average consumption of electricity per capita in the country times 0.7.

Medium: use average consumption of electricity per capita in the country.

High: multiply average consumption of electricity per capita in the country times 1.3.

The Lifestyle Carbon Calculator allocates zero emissions to renewable electricity produced at home or purchased with guarantees of origin (or similar contractual agreements).

When the electricity consumption for a country was unknown: All countries were divided into three categories, based on UN "World Economic Situation and Prospects (WESP)"[6] And UNDS[7]. The averages for each category were used when data was not available.

When the total electricity consumption in a country was known, but the share allocated to the residential sector was unknown: The average share (residential electricity consumption/total country electricity consumption) per geographical region was used for the country, according to its region. See Annex I for the list of geographical regions used.

Sources:
- IEA's World Energy Balances and Statistics, 2019[8]
- UNFCCC's Harmonized Grid Emission factor data set, 2019[9]
- CIA, The World Factbook/Electricity Consumption[10]
- World Bank, Data/Population Total[11]

Fast track assumptions and sources:
Assume option B, Medium (average consumption of electricity per capita in the country).

1.4 Heating

1.4.1 What is the primary heating source in your home?

Options:

[6] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf
[7] https://unstats.un.org/unsd/methodology/m49/overview/
[8] https://www.iea.org/subscribe-to-data-services/world-energy-balances-and-statistics
[9] https://unfccc.int/sites/default/files/resource/Harmonized_Grid_Emission_factor_data_set.xlsx
[10] https://www.cia.gov/the-world-factbook/field/electricity-consumption/
[11] https://data.worldbank.org/indicator/SP.POP.TOTL

A. Electricity: more information needed
    a. If the user has entered total electricity consumption in the previous question, the emissions here are zero (they are already included in the previous calculation).
    b. If the user chose the option "I don't know" for the amount of electricity consumed in the electricity consumption question, then:

Formula:
Average heating consumption per capita for households for your country x grid emission factor per country

B. Heating oil: oil more information needed
C. District heating: more information needed
D. Natural gas: more information needed
E. Solar energy: emissions are zero
F. No heating: emissions are zero
G. Other: more information needed
H. I don't know which heating my home has: more information needed

Assumptions:
The average heating consumption is based primarily on information from Eurostat and IEA. It includes energy consumption for space heating and water heating and the total energy consumption for each country is divided by the country's population to obtain the average energy per capita.

Average heating consumption for countries with no data: All countries were divided into three categories, based on UN "World Economic Situation and Prospects (WESP)"[12] And UNDS[13]. The averages for each category were used when data was not available.

Sources:
- Eurostat, Disaggregated final energy consumption in households[14]
- IEA, Energy efficiency indicators[15]

1.4.2 What is your yearly heating usage?

Options:

A. I don't know

[12] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf
[13] https://unstats.un.org/unsd/methodology/m49/overview/
[14] https://ec.europa.eu/eurostat/databrowser/view/nrg_d_hhq/default/table?lang=en
[15] https://www.iea.org/reports/energy-efficiency-indicators-overview

Formula:
Average heating consumption per capita for your country x emission factor for your selected heating source

Assumptions:
The average heating consumption is based primarily on information from Eurostat and IEA. It includes energy consumption for space heating and water heating and the total energy consumption for each country is divided by the country's population to obtain the average energy per capita.

Average heating consumption for countries with no data: All countries were divided into three categories, based on UN "World Economic Situation and Prospects (WESP)"[A] And UNDS[B]. The averages for each category were used when data was not available.

Sources:
- Eurostat, Disaggregated final energy consumption in households[16]
- IEA, Energy efficiency indicators[17]
- UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[18]
- IPCC, Special Report on renewable energy sources and climate change mitigation[19]

B. Specify exactly (kWh) : user enters value

Formula:
Yearly consumption value x emission factor for your selected heating source

Assumptions:
If fuel is unknown, use diesel as a conservative approach.

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[20]

Fast track assumptions and sources:
Assume option A. I don't know. Average heating consumption per capita for your country is applied.

[16] https://ec.europa.eu/eurostat/databrowser/view/nrg_d_hhq/default/table?lang=en
[17] https://www.iea.org/reports/energy-efficiency-indicators-overview
[18] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[19] https://www.ipcc.ch/site/assets/uploads/2018/03/Chapter-4-Geothermal-Energy-1.pdf
[20] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

1.5 Gas for cooking

1.5.1 Do you use gas for cooking in your home?

Options:

A. Yes: more information needed

B. No: emissions are zero

1.5.2 Do you use the gas for cooking almost every day?

Options:

A. Yes

Formula:
Energy consumption for household cooking / capita for your country x emission factor for LPG

B. No

Assumptions:
The average energy consumption for cooking in households is largely based on data from Eurostat. If the user uses gas regularly, the average consumption per capita and country is used according to the above formula. If the user uses gas irregularly, zero emissions are allocated as it is very difficult to make an assumption around the usage. Since users of the calculator might receive their gas either through the grid or via tanks, the emission factor for LPG is used rather than natural gas as a conservative approach.

Average energy consumption for cooking in households for countries with no data: The average consumption of the 90th percentile in the Eurostat dataset is used as a conservative assumption.

Sources:
- UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[21]
- Eurostat, Disaggregated final energy consumption in households[22]

C. I can specify exactly (liter)

Formula:
Amount of gas x emission factor for LPG

[21] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[22] https://ec.europa.eu/eurostat/databrowser/view/nrg_d_hhq/default/table?lang=en

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[23]

Fast track assumptions and sources:
Assume option A. Yes. Gas used regularly. The average consumption per capita and country is used according to the above formula.

1.6 Water

1.6.1 How would you rate your household's level of water usage?

Options:

A. Low

B. Medium

C. High

Formula:
Municipal water withdrawal / country's population x level of usage (multiply by 0.7 for low, 1 for medium. 1.3 for high) x (Emission factor of water consumed + Emission factor of wastewater treatment)

D. Specify exactly (m3)

Formula:
Amount of water consumed x (Emission factor of water consumed + Emission factor of wastewater treatment)

Assumptions:
All water consumed is sent to treatment. For the following territories FAO had no data, therefore Our World in Data was used: Grenada, State of Palestine, Côte d'Ivoire

Average water consumption for countries with no data: All countries were divided into three categories, based on UN "World Economic Situation and Prospects (WESP)"[24] And UNDS[25]. The averages for each category were used when data was not available.

Sources:
- UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[26]

[23] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[24] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf
[25] https://unstats.un.org/unsd/methodology/m49/overview/
[26] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

- Our World in Data/Water-use-stress/Total water withdrawal per capita[27]
- FAO, Aquastat Dissemination Portal/Total water withdrawal and Water withdrawal by sector[28]
- World Bank, Data/Population Total[29]

Fast track assumptions and sources:
Assume option B. Medium. Average water consumption per capita for your country.

1.7 Waste

1.7.1 Do you recycle? (*Choose level among the following types of waste*).

Options for types of waste/waste streams:

E. Glass

F. Plastic

G. Metal

H. Paper and cardboard

I. Organic

Options for level of recycling: User select answer (0-100%)

Formula:
*Total Municipal Solid Waste per country / Country's total population x % composition of waste per type/waste stream x % level of recycling x emission factor for recycling **or** composting/anaerobic digestion*
+
Total Municipal Solid Waste per country / Country's total population x % composition of waste per type/waste stream x [1 - % level of recycling] x emission factor for household residual waste landfill

Assumptions:
The organic waste stream includes mixed food and yard/garden waste.
The paper and cardboard waste stream includes mixed paper and cardboard.
The metals waste stream includes metal and "other scrap metal".

Waste generation per waste stream (%) for countries with no data: All countries were divided into three categories, based on UN "World Economic Situation and Prospects (WESP)"[30] And UNDS[31]. The averages for each category were used when data was not available.

[27] https://ourworldindata.org/water-use-stress
[28] http://www.fao.org/aquastat/statistics/query/index.html
[29] https://data.worldbank.org/indicator/SP.POP.TOTL
[30] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf
[31] https://unstats.un.org/unsd/methodology/m49/overview/

If glass, paper and cardboard, metal or plastic are recycled, an emission factor for recycling is used. If organic material is composted, an emission factor for composting/anaerobic digestion is used. Waste that is not recycled gets an emission factor for household residual waste landfill.

Sources:

- World Bank/What-a-Waste-Database[32]
- World Bank, Data/Population Total[33]
- UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[34]

Fast track assumptions and sources:
Assume 0% recycling. Based on an emissions precautionary principle.

2. Transportation

2.1 Cars/Vehicles

2.1.1 Do you have a car?

Options:

A. Yes

B. No

2.1.2 What kind of car is it?

Options:

A. Petrol

B. Diesel

C. Biofuel/Gas

D. Hybrid

E. Plug-in hybrid

F. Electric

G. I don't know

2.1.3 How many cars do you have?

Options: User select answer (0-3)

[32] https://datacatalog.worldbank.org/dataset/what-waste-global-database
[33] https://data.worldbank.org/indicator/SP.POP.TOTL
[34] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Fast track assumptions and sources:
In the fast track we assume the user have one car (type: average).

2.1.4 Additional car details

Details on car 1, 2, 3 (depending on previous answer):

A. Average
B. Dual purpose 4×4
C. Executive
D. Large
E. Luxury
F. Medium
G. MPV
H. Small
I. Sports

Fuel

Same options available as in 2.1.2

Mileage

User selects yearly mileage in km

Formula:
Yearly mileage x fuel type x emission factor for the car type

Assumptions:
Should the user not select any specific details on car, ”average car” will be used as default car type for all calculations.

Sources:
UK DEFRA’s “Government conversion factors for company reporting of greenhouse gas emissions”[35]

Fast track assumptions and sources:
Assume one car (type: average) with a distance driven of 10 000 km/year. The assumption is based on desktop research on average milage per person and year, from sources like Statista and Odyssee, and the user data gathered from the Lifestyle Calculator to date.

[35] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

2.1.5 Do you have a motorcycle?

Options:

A. Yes

B. No

Fast track assumptions and sources:
Assume B. No. Here an economic precautionary principle is applied, backed up by the following arguments:

- No relevant research available to base an assumption on,
- large variation in user data, either you have a motorcycle (and in turn emissions) or you do not (and in turn zero emissions), and
- in the total user data, emissions from motorcycles represents a small part of the total emissions.

2.1.6 What kind of motorcycle is it?

Options:

A. Electric motorcycle

B. Small motorcycle

C. Medium motorcycle

D. Large motorcycle

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[36]

Fast track assumptions and sources:
Not applicable, assume no motorcycle.

2.1.7 How many kilometers do you drive per year?

Options:

A. 0-1 000

B. 1 001-5 000

C. 5 001-10 000

D. More than 10 000

E. Specify exactly (km)

[36] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Formula:
∑ Distance traveled per type of motorcycle x emission factor for that type of motorcycle

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[37]

Fast track assumptions and sources:
Not applicable, assume no motorcycle.

2.1.8 Do you own a second motorcycle?

Options:

A. Yes

B. No

If yes; user goes through the same questions as with the first motorcycle.

Fast track assumptions and sources:
Not applicable, assume no motorcycle.

2.2 Flights

2.2.1 How many return flights in these categories have you taken within the past 12 months? (Only include private flying, not work related)

- Short distance flights (0-4h)
- Medium distance flights (5-8h)
- Long distance flights (9h or more)

Option: user enter number of flights

Formula:
*Number of flights x average distance for flights x emission factor per km*passenger for economy flights*

Assumption:
Short flights are between 500 and 3000 km in total distance, with an average of 1750 km. All flights that are not business class are assumed to be economy class.

[37] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Medium flights are between 3000 and 6000 km in total distance, with an average of 4500 km. All flights that are not business class are assumed to be economy class.

Long flights are between 6000 and 12000 km in total distance, with an average of 9000 km. All flights that are not business class are assumed to be economy class.

Sources:
ICAO Aviation Carbon Emissions Calculator, with data derived by the UNFCCC secretariat[38]

Fast track assumptions and sources:
Assume only economy class. Assumption based on economy class being the most common seat in the airplane.

Include the RFI-factor in the calculation?

Options:

A. Yes

B. No

Assumptions:
The current calculation includes only CO_2 emissions, as recommended by the ICAO (
International Civil Aviation Organization)[39]. However, some scientific bodies argue that non-CO_2 emissions (calculated using RFI, or Radiative Forcing Index) can also be significant. By including this factor the result will be a more conservative assessment of the environmental impact of air travel. The RFI-factor is assumed to be 2,7 as per the IPCC report on Aviation[40].

2.2.2 Would you like to add details about your flights?

- Yes
- No

2.2.3 How many one-way flights have you taken within the past 12 months?

Option: User select number of flights

Comment:

[38] https://www.icao.int/environmental-protection/Carbonoffset/Pages/default.aspx
[39] https://www.icao.int/environmental-protection/CarbonOffset/Documents/Methodology%20ICAO%20Carbon%20Calculator_v11-2018.pdf
[40] https://archive.ipcc.ch/ipccreports/sres/aviation/index.php?idp=64

This question is asked in the second question layer in order to let the user provide additional detailed information about the flights in the next question.

2.2.4 What are your flight details?

Departure: User input their departure airport from a drop-down list

Arrival: User input their arrival airport from a drop-down list

Business class:

- Yes
- No

Formula:
*Flight Distance (calculated based on latitude and longitude of airports) x emission factor per km*passenger for business flights*

OR

*Flight Distance (calculated based on latitude and longitude of airports) x emission factor per km*passenger for economy flights*

Sources:
ICAO Aviation Carbon Emissions Calculator, with data derived by the UNFCCC secretariat[41]

Fast track assumptions and sources:
Not applicable since this is an alternative to question 2.2.1.

2.3 Public transportation

2.3.1 How much time per day do you use public transportation?

Option: user enters the estimated time traveled by public transportation

Formula:
Time spent travelling x emission factor for subway, light rail and tram and average local bus (50/50)

Assumptions:
Applicable emission factor for bus is average local bus, as it has the highest emission factor. Duration is assumed to be 5 days per week times 45 weeks per year. Subway is assumed to run at 40km/h and bus at 20km/h.

[41] https://www.icao.int/environmental-protection/Carbonoffset/Pages/default.aspx

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[42]

2.3.2 How many minutes per day do you typically travel by bus?

Option: user enters the estimated time traveled by bus

Formula:
Time spent travelling x emission factor for average local bus

Assumptions:
Applicable emission factor for bus is average local bus, as it has the highest emission factor. Duration is assumed to be 5 days per week times 45 weeks per year. Bus is assumed to run at 20km/h.

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[43]

Fast track assumptions and sources:
In the fast track the user only answer question 2.3.1 "How much time per day do you use public transportation?". In the second layer the user have the possibility to provide further details by answer how much of the public transportation is bus (question 2.3.2 "How many minutes per day do you typically travel by bus?") and how much is subway/tram (question 2.3.3 "How many minutes per day do you typically travel by subway/tram?").

2.3.3 How many minutes per day do you typically travel by subway/tram?

Option: user enters the estimated time traveled by subway/tram

Formula:
Time spent travelling x emission factor for subway, light rail and tram

Assumptions:
Duration is assumed to be 5 days per week times 45 weeks per year. Subway is assumed to run at 40km/h.

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[44]

[42] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[43] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[44] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Fast track assumptions and sources:
In the fast track the user only answer question 2.3.1 ”How much time per day do you use public transportation?”. In the second layer the user have the possibility to provide further details by answer how much of the public transportation is bus (question 2.3.2 ”How many minutes per day do you typically travel by bus?”) and how much is subway/tram (question 2.3.3 ”How many minutes per day do you typically travel by subway/tram?”).

2.3.4 How many kilometers do you typically travel by train per year?

Option: user enters the estimated distance (in km) traveled by train

Formula:
Distance traveled by train x emission factor for national rail

Assumption:
Applicable emission factor is national rail, as it has the highest emission factor.

Sources:
UK DEFRA’s “Government conversion factors for company reporting of greenhouse gas emissions”[45]

Fast track assumptions and sources:
Depending on the users country of residence, assume regional averages of distance travelled per capita. Regions used are Africa, Asia, Europe, Latin America, North America and Oceania.

Source: SLOCAT (2021), Tracking Trends in a Time of Change: The Need for Radical Action Towards Sustainable Transport Decarbonisation, Transport and Climate Change[46]

2.3.5 How often do you typically travel by taxi?

Options:

A. Never
B. Less than once a month
C. Once or twice a month
D. Once a week
E. Several times a week
F. Specify in km per year (km)

[45] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[46] https://tcc-gsr.com/wp-content/uploads/2021/06/All-Country-Fact-Sheets.pdf

Formula:
Distance traveled by taxi x emission factor for regular taxi

Assumption:
- Taxi type is “regular taxi” from the DEFRA database.
- A standard trip is assumed to be 10km.
- Less than once a month: 0.5 standard trips per month (60km/year).
- Once or twice a month: 1.5 standard trips per month (180km/year).
- Once a week: 1 standard trip per week (520km/year).
- Several times a week: 5 standard trips per week (2600km/year).

Sources:
- UK DEFRA’s “Government conversion factors for company reporting of greenhouse gas emissions”[47]
- UITP Taxi & Ride-hailing Committee “GLOBAL TAXI BENCHMARKING STUDY 2019”[48]
- Taxikurir - Average trip in Sweden[49]
- European Commission “Study on passenger transport by taxi, hire car with driver and ridesharing in the EU”[50]

Fast track assumptions and sources:
Assume option A. Never. Here an economic precautionary principle is applied, backed up by the following arguments:

- No relevant data available to base an assumption on,
- large variation in user data, either you travel by taxi (and in turn emissions) or you do not (and in turn zero emissions), and
- in the total user data, taxi represents a small part of the total emissions.

2.4 Accommodation

2.4.1 How many nights have you spent in hotels the past 12 months? (Only include private bookings, not work related)

Option: user enters the total number of hotel nights

Formula:
Number of hotel nights x emission factor for average hotel stay

[47] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting
[48] https://cms.uitp.org/wp/wp-content/uploads/2020/11/Statistics-Brief-TAxi-Benchmarking_NOV2020-web.pdf
[49] https://www.taxikurir.se/stockholm
[50] https://ec.europa.eu/transport/sites/default/files/2016-09-26-pax-transport-taxi-hirecar-w-driver-ridesharing-country-reports.pdf

Sources:
Cornell University, The Center for Hospitality Research ”Hotel Sustainability Benchmarking Index 2020: Carbon, Energy, and Water”[51], data for occupied rooms

Fast track assumptions and sources:
Assume zero (0) nights. Here an economic precautionary principle is applied, backed up by the following arguments:

- No relevant data available to base an assumption on,
- large variation in user data, either you stay at a hotel (and in turn have emissions in the category) or you do not (and in turn zero emissions), and

3. Shopping

3.1 Consumption of products and general services

3.1.1 How much have you spent in the following categories these past 12 months? (in Euros)

A. New furniture for your home
B. Sport and cultural events for yourself
C. Beauty salons, hairdresser or spa for yourself

Options: user enters the cost associated with the furniture or service purchase during the year

Formula:
∑ Cost of furniture x emission factor for furniture

Amount spent on the service x emission factor per unit money spent

Assumptions:
Different countries have the same emission factor.

Sources:
ADEME, France, “Modélisation et évaluation du poids carbone de produits de consommation et biens d’équipement”[52]

Exiobase, Input-output model[53]

[51] https://ecommons.cornell.edu/handle/1813/109990
[52] https://librairie.ademe.fr/consommer-autrement/1190-modelisation-et-evaluation-du-poids-carbone-de-produits-de-consommation-et-biens-d-equipement.html
[53] https://github.com/tmrowco/bloom-contrib/tree/master/CO_2eq/purchase/exiobase

3.2 Appliances

3.2.1 How many items in these categories have you bought for yourself or your home these past 12 months?

A. Large appliances (eg. refrigerator or washing machine)

B. Medium appliances (eg. tv, computer)

C. Small appliances (eg. toaster or headphones)

Options: user enters the number of appliances bought during the last year

Formula:
Number of large appliances x average emission factor for large appliances

Number of medium appliances x average emission factor for medium appliances

Number of small appliances x average emission factor for small appliances

Assumption:
The average emission factors for large, medium and small appliances are based on items from the source belonging to this category.

Sources:
ADEME, France, "Modélisation et évaluation du poids carbone de produits de consommation et biens d'équipement"[54]

3.3 Clothing

3.3.1 Within the past 6 months, how many items in these categories have you bought? *(a shirt would be an item. A pair of socks, maybe not)*

A. Clothes for yourself, new

B. Clothes for yourself, second hand

C. Shoes for yourself, new

D. Shoes for yourself, second hand

Option: user enters number of clothing items purchased in the year. More information needed

Formula:
Number of new clothing pieces purchased x average cradle-to-grave emission factor for clothes listed in ADEME

[54] https://librairie.ademe.fr/consommer-autrement/1190-modelisation-et-evaluation-du-poids-carbone-de-produits-de-consommation-et-biens-d-equipement.html

Number of new pairs of shoes purchased x emission factor for shoes listed in ADEME

Assumptions:
Emissions associated with second hand items are considered zero.

Sources:
ADEME, France, "Modélisation et évaluation du poids carbone de produits de consommation et biens d'équipement"[55]

3.4 Online shopping

3.4.1 Do you buy goods online to be delivered to your home?

Options:

A. Yes: more information needed
B. No: emissions are zero

Fast track assumptions and sources:
Assume option B. No. Here an economic precautionary principle is applied, backed up by the following arguments:

- No relevant data available to base an assumption on,
- large variation in user data, either you have goods delivered to your home (and in turn emissions) or you do not (and in turn zero emissions), and
- in the total user data, home deliveries representsa small part of the total emissions.

3.4.2 How many times per month do you receive these deliveries?

Option: user enter number of deliveries to the home

Formula:
Number of deliveries per month x 12 months x last mile delivery factor/0.50

Assumptions:
400 grams of CO_2 are emitted per home delivery on average. This is the highest value for emissions in last mile delivery considered in the UBA study: 400 g/1 package delivery. Last mile delivery corresponds to 50% of the total emissions (packaging, operation of the storage center, and shipping to the package

[55] https://librairie.ademe.fr/consommer-autrement/1190-modelisation-et-evaluation-du-poids-carbone-de-produits-de-consommation-et-biens-d-equipement.html

distribution center) as indicated in the UBA study. Emissions from delivered goods include returns.

Sources:
Umwelt Bundesamt (German Environmental Federal Agency) – The greening of online commerce (in German)[56]

Fast track assumptions and sources:
Not applicable, no home deliveries.

4. Food

4.1 Food

4.1.1 What best describes how you eat?

Options: user selects the diet type that comes closer to their own

A. I eat everything
B. I don't eat red meat
C. I try to avoid eating red meat
D. One meatless day a week
E. Pescetarian (fish)
F. Vegetarian
G. Vegan

Formula:
Based on the country of the user and the selected diet type, the calculator selects the corresponding emissions value

Sources:
Country-specific dietary shifts to mitigate climate and water crises, in Science Direct, 2019[57]

[56] https://www.umweltbundesamt.de/sites/default/files/medien/5750/publikationen/2020_12_03_texte_227-2020_online-handel.pdf
[57] https://www.sciencedirect.com/science/article/pii/S0959378018306101?via%3Dihub

Annex I

List of Geographical Regions

A. Northern Europe
B. Western Europe
C. Southern Europe
D. Eastern Europe
E. Northern Africa
F. Middle Africa
G. Southern Africa
H. Middle East
I. Western Asia
J. Eastern Asia
K. Southern Asia
L. South-Eastern Asia
M. Australia and New Zealand
N. Northern America
O. South America
P. Eastern Africa
Q. Western Africa
R. Caribbean
S. Central America
T. Central Asia
U. Melanessia
V. Micronesia
W. Polynesia