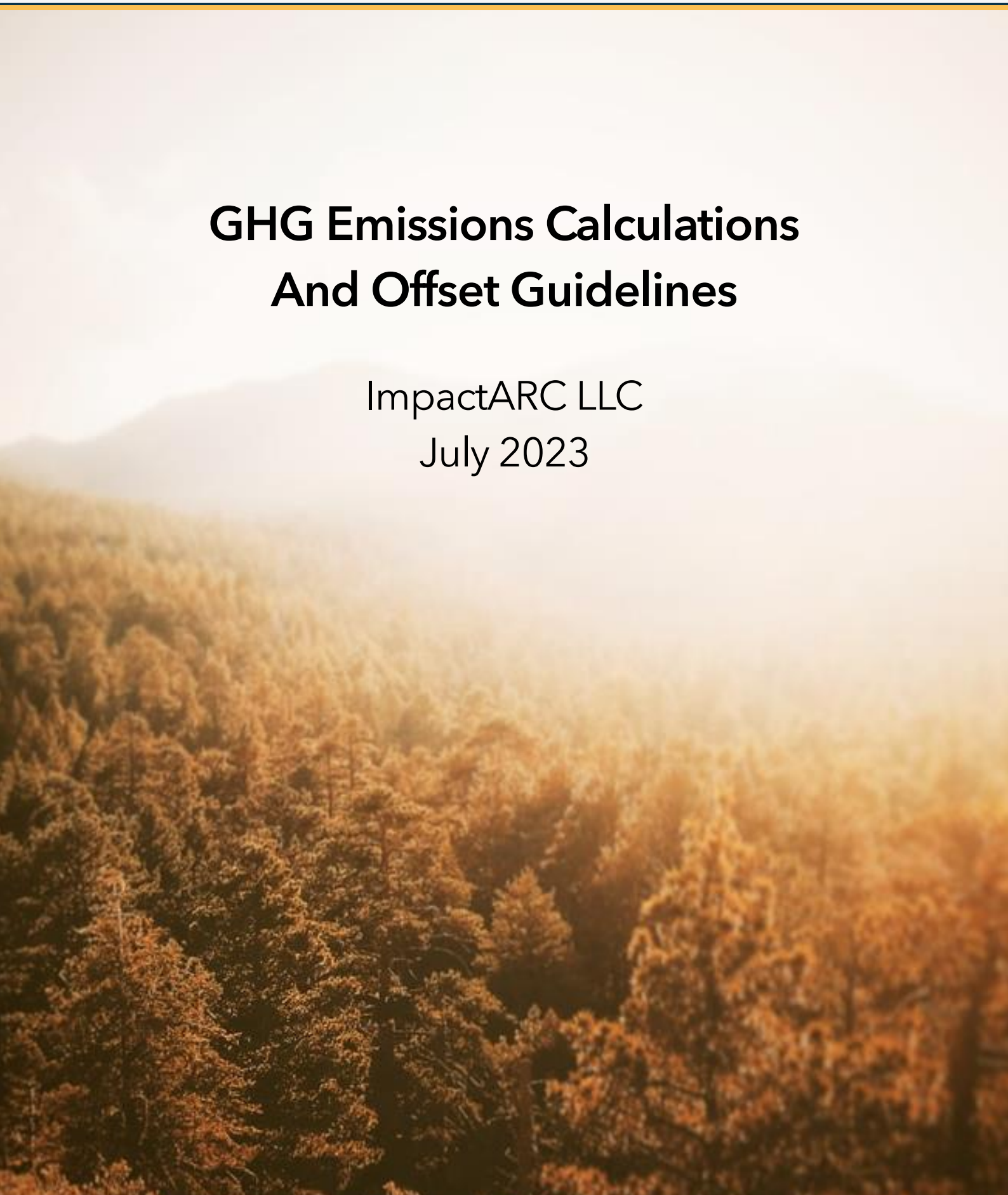
GHG Emissions Calculations And Offset Guidelines

ImpactARC LLC

July 2023



These Guidelines were drafted and adopted by the team in July 2023. ImpactARC team members will recalculate their greenhouse gas (GHG) footprints annually and update the carbon offsets purchased accordingly. These Guidelines will be reviewed at least every two years to ensure alignment with ImpactARC business priorities and emission-reduction-offset market trends.

Contents

MEASURE: ImpactARC commits to calculating the GHG emissions stemming from delivering our mission.

As a small team, working mostly from home and traveling to meetings using various modes of transport, accounting for our individual GHG footprints was deemed the most appropriate approach to best capture our impact. The UNFCCC Lifestyle Calculator was chosen to calculate our individual GHG footprints, due to its UNFCCC-verified, reputable sources and its use of country-specific information.

The Calculator estimates GHG emissions in the following categories:

Home Transport Shopping Food

The complete methodology for this Calculator can be found here and included in this document's Annex.

MANAGE: ImpactARC team members commit to a sustainable lifestyle.

ImpactARC team members are conscious of the impact of our decisions from the type and amount of electricity we use to the mode and frequency of transportation we opt for. Each of us strives to make the more sustainable choice, if possible. We aspire to:

Make our homes as efficient as possible, opting for renewable energy where possible.

Travel by foot, bike or metro, avoiding fossil fuel-based transport where possible.

Purchase only when necessary, opting for the most sustainable option available.

Reduce the impact of our food by opting for seasonal and local foods.

OFFSET: ImpactARC commits to purchase carbon offsets to cover our unavoidable lifestyle emissions.

As above, we each strive to minimize the carbon emissions associated with our daily lives. However, where emissions are unavoidable, we commit to offset these emissions.

ImpactARC purchases and retires a diversity of offsets to achieve carbon neutrality for the team's lifestyle emissions. We purchase offsets supporting a portfolio of high-quality, high-value projects based on the following criteria:

Sourcing: Preference will be given to UNFCCC-certified climate-friendly projects that reduce, avoid or remove greenhouse gas emissions from the atmosphere.

About UNFCCC projects: These projects are implemented in developing countries around the world and are rewarded with Certified Emission Reductions (CERs) for each tonne of greenhouse gas they help reduce, avoid or remove. CERs are units (carbon credits) issued by UNFCCC, measured in tonnes of CO_2 equivalent. The prices per unit are set by project developers, who also receive the full profits from the sale of the units directly: UN Climate Change is not a party to the CER cancellation contract between purchaser and provider. The platform is free of charge, for both buyers and sellers. Such contributions also encourage the development of additional ones. They also support sustainable development in the communities where these projects are implemented, ensuring job creation and continuity, health improvements and many more co-benefits. This is why one can consider investing in these projects not only as climate action to address one's footprint, but also as a contribution to sustainable development.

Time-based Requirements: To ensure relevance, preference is given to credits from the second commitment period of the Kyoto Protocol.

Location: Preference will be given to credits from the Least Developed Countries. Middle Income Countries will also be considered.

Project Types: Understanding the need to move toward a Net-Zero climate, ImpactARC prefers high-quality projects that sequester carbon from the atmosphere. Projects that reduce emissions are also being considered, with the aim of supporting a diversity of projects that are in line with our mission.

Sequestration projects include:	**Reductions projects include:**
• Afforestation • Reforestation • Soil carbon sequestration • Blue carbon (e.g., mangroves) activities	• Improving clean energy access projects, such as solar home systems, solar lanterns, mini-grids, biodigesters, clean cooking • Clean water projects • Solar energy projects with battery storage • Off-shore wind projects

Preference is given to projects that clearly demonstrate additional positive benefits and support achieving the UN Sustainable Development Goals. These may include:

- Community, social and economic benefits
- Biodiversity benefits
- Projects that add renewable energy to the grid
- Other benefits that advance the Sustainable Development Goals (SDGs)

Offset Retirement Requirements: ImpactARC will ensure offsets will be retired in the registry of issuance.

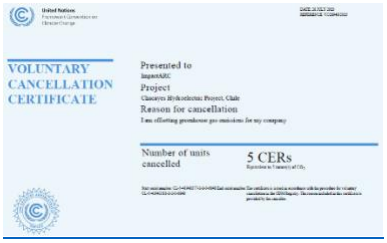
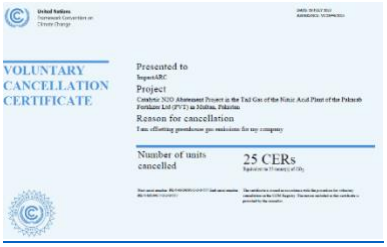
ANNEX

ImpactARC Team Carbon Emissions [July 1, 2022 – June 30, 2023]

Team Member	GHG Emissions (tonnes CO_2e)	Comments
Alya Kayal	9	I didn't purchase much this last year and only had one medium and one short flight, therefore my emissions are relatively low. **Home:** I live in a modest home with three other adults. While I do not have renewable energy fuel in my home, I minimize energy use, such as keeping air conditioning and heating off as much as possible and installing energy efficient windows, using natural light during daylight hours, consciously reducing dishwasher and washer/dryer use etc. **Shopping:** I have not shopped for clothes, cosmetics and household items for more than a year (new or used), and will consciously purchase used or second-hand items or support local businesses, where possible, to minimize my carbon footprint. I avoid purchasing additional furniture and home goods. I recycle paper/cardboard, plastic, glass, aluminum. **Transport:** I have not had any long haul flights in the past year and only had one medium and one short flight. I do own a car, however I rarely use it (likely twice a week). I tend to use public transport (bus/metro) where possible. **Food:** While I'm not a vegetarian, I prefer a vegetarian diet and supplement my diet heavily with vegetables. I consume fish and meat approximately three times a week. I support local and women-owned farmers markets.
Daisy Nicholls	8	**Home:** I have a 100% renewable electricity tariff for my home but as I rent, I am not able to make changes to the house insulation, heating systems etc. **Shopping:** I am a conscious shopper and I only purchase clothes, cosmetics, and household items when needed. I try to repair things before buying new items. I would like to try and find a cost-effective re-fill option for household items and kitchen staples to reduce my packaging usage. I recycle packaging (cardboard, plastic, glass, aluminum) with my council and soft plastics with a local supermarket. I use a bank with an ethical screening policy (including no exploration, extraction or production of fossil fuels). **Transport:** In the past year, I have had to travel twice to the US for in-person meetings – these flights were the largest contribution to my carbon footprint (almost half!) and as a result, I am trying to reduce the amount I fly. I don't have a car and living in London, I walk or take the tube everywhere. **Food:** I don't throw food away and take pride in making up new recipes with leftovers! I rarely eat meat (2-4 times a month) and I have recently

		signed up to a local veg scheme to increase the amount of organic, seasonal produce I eat. I am trying to reduce my dairy consumption based on my results from WWF's Diet Calculator.
Judith Moore	15	I moved this year and renovated parts of the new house, including installing LED lighting throughout, smart house controls, heat pumps and thick insulation. I'm conscious and relatively efficient but probably there are lots of pieces of my footprint omitted, thus it should be rounded up.
Monika Kumar	9	**Home:** I am part of a Sustainability Committee actively trying to reduce energy use and emissions from our condo building. We have implemented compost collection in the building to minimize the waste sent to landfill and have carried out an energy audit to identify the biggest energy drain and solar potential. **Shopping:** I try to purchase second hand where possible and support local businesses to minimize my carbon footprint. **Transport:** I took two long haul, two medium haul, five short haul flights this past year and so my transport emissions have been the bulk of my emissions. I do not own a car but ride in cars with others and have rounded up my emissions to account for those emissions not captured adequately in the calculator. **Food:** I am a vegetarian, support local and seasonal farmers markets, and supplement my diet with vegetables in my garden.
Total	**41**	

Carbon Offsets Purchased and Retired to Cover 2023 Emissions

Project Name	Project Description	Certificate
Chacayes Hydroelectric Project, Chile	Chacayes run of river hydro project is a 111 MW power plant located in the Cachapoal Valley of Chile. Operating since 2011, it has played an important role meeting country's increasing demand of electricity, reducing CO2 emissions and contributing to the economic growth and sustainable development of local communities. Due to the wide variety of measures undertaken and the innovative environmental initiatives implemented during construction of the Chacayes plant to minimize environmental impacts, Chacayes received, among others, the "Hydro Project of the Year Award" by the organizers of the POWER-GEN International and Renewable Energy World North America events, and the "Environmental Initiative of the Year" Award at the International Tunnelling Awards 2011 in Hong Kong, hosted by the UK's New Civil Engineer and Ground Engineering magazines. Pacific Hydro´s corporate community plan, engages with localities during construction and operation of our hydro power stations in the region. Local communities also benefit from our sustainable communities fund "Creciendo Juntos" (Growing Together), which aims to improve their quality life of the population. Since its creation, Creciendo Juntos has delivered more than 1 million dollars to the communities of the Alto Cachapoal Valley.	
Catalytic N2O Abatement Project in the Tail Gas of the Nitric Acid Plant of the Pakarab Fertilizer Ltd (PVT) in Multan, Pakistan	The aim of this project is to reduce nitrous oxide (N2O) emissions in the tail gas of the nitric acid plant of Pakarab Fertilizer Ltd. N2O is an undesired by-product in the production process of nitric acid, which was normally released to the atmosphere. To avoid this, the plant has been retrofitted with a tertiary N2O abatement unit in the tail gas stream. The unit reduces the vast majority of N2O at the source, before it would be released to the atmosphere. Other project benefits include the preservation of the ozone layer and helping spread green technology worldwide	
Upgradation, Operation and Maintenance of 200 TPD Composting facility at Okhla, Delhi	The Okhla Compost Plant is a part of the Integrated Scientific Waste Management Scheme of Delhi. In May 2007, IL&FS signed a concession agreement with the Municipal Corporation of Delhi (MCD) to rehabilitate the Okhla compost plant with carbon finance support. The plant has processed to date over 265,000 tons of municipal solid waste, and diverts, on daily basis, over 200 tons of waste from dumpsites. The compost produced in the plant is used by farmers to rejuvenate the soil productivity, that has been affected due to overuse of chemical fertilizers. According to a local study, 67% of the soil in the country is low in organic carbon.	

GHG Emissions Methodology

See GHG Footprint Calculator for Individuals – Methodology (attached).

GHG Footprint Calculator for Individuals
Methodology

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

United Nations
Climate Change 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 What's the size of your home?

Options:

A. Use average
B. Specify exactly (m2)

The size of the dwelling is useful to place an individual in a given economic level and to approximate emissions associated, for example, to heating or electricity consumption when concrete data is not provided by the user of the calculator. The user can choose to specify the area of dwelling exactly or opt for an average.

This question is included in the calculator for categorization purposes but does not influence the calculations in this version of the calculator.

Sources:
Technology options for earthquake resistant, eco-efficient buildings in Europe:

- Research needs; Negro, Paolo, 2014[6]
- CEIC, China Residential Area per Capita[7]

[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
[6] https://www.researchgate.net/figure/Average-useful-floor-area-per-dwelling-and-per-person-Dol-Haffner-OTB-2010_fig7_260434512
[7] https://www.ceicdata.com/en/china/residential-area-per-capita

- Nomura research, International Comparison of Living Space Per Capita[8]

Fast track assumptions and sources:
Not applicable, excluded.

1.4 Electricity consumption

1.4.1 Does your household use renewable electricity?

Options:

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

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

Options:

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

Formula:
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).

[8] http://www.maoxian.com/thoughts/international-comparison-of-living-space-per-capita

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)"[9] And UNDS[10]. 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[11]
- UNFCCC's Harmonized Grid Emission factor data set, 2019[12]
- CIA, The World Factbook/Electricity Consumption[13]
- World Bank, Data/Population Total[14]

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

1.5 Heating

1.5.1 What is the primary heating source in your home?

Options:

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

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

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)"[15] And UNDS[16]. The averages for each category were used when data was not available.

Sources:
- Eurostat, Disaggregated final energy consumption in households[17]
- IEA, Energy efficiency indicators[18]

1.5.2 What is your yearly heating usage?

Options:

A. I don't know

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

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

(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[19]
- IEA, Energy efficiency indicators[20]
- UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[21]
- IPCC, Special Report on renewable energy sources and climate change mitigation[22]

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"[23]

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

1.6 Gas for cooking

1.6.1 Do you use gas for cooking in your home?

Options:

A. Yes: more information needed

B. No: emissions are zero

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

Options:

A. Yes

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

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"[24]
- Eurostat, Disaggregated final energy consumption in households[25]

C. I can specify exactly (liter)

Formula:
Amount of gas x emission factor for LPG

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

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.

1.7 Water

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

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

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)"[27] And UNDS[28]. 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"[29]
- Our World in Data/Water-use-stress/Total water withdrawal per capita[30]
- FAO, Aquastat Dissemination Portal/Total water withdrawal and Water withdrawal by sector[31]
- World Bank, Data/Population Total[32]

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

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

1.8 Waste

1.8.1 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)"[33] And UNDS[34]. The averages for each category were used when data was not available.

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[35]
- World Bank, Data/Population Total[36]

[33] https://www.un.org/development/desa/dpad/wp-content/uploads/sites/45/WESP2020_Annex.pdf
[34] https://unstats.un.org/unsd/methodology/m49/overview/
[35] https://datacatalog.worldbank.org/dataset/what-waste-global-database
[36] https://data.worldbank.org/indicator/SP.POP.TOTL

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

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)

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

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

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”[38]

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.

2.1.5 Do you have a motorcycle?

Options:

A. Yes
B. No

Fast track assumptions and sources:

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

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"[39]

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)

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

Sources:

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

UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[40]

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.

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.

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

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[41]

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)[42]. 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[43].

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:
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

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

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[44]

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.

Sources:
UK DEFRA's "Government conversion factors for company reporting of greenhouse gas emissions"[45]

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

[44] https://www.icao.int/environmental-protection/Carbonoffset/Pages/default.aspx
[45] https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

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"[46]

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"[47]

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

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

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”[48]

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[49]

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)

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

Assumption:

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

- 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”[50]
- UITP Taxi & Ride-hailing Committee “GLOBAL TAXI BENCHMARKING STUDY 2019”[51]
- Taxikurir - Average trip in Sweden[52]
- European Commission “Study on passenger transport by taxi, hire car with driver and ridesharing in the EU”[53]

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

Sources:

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

Cornell University, The Center for Hospitality Research ”Hotel Sustainability Benchmarking Index 2020: Carbon, Energy, and Water”[54], 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”[55]

Exiobase, Input-output model[56]

[54] https://ecommons.cornell.edu/handle/1813/109990
[55] https://librairie.ademe.fr/consommer-autrement/1190-modelisation-et-evaluation-du-poids-carbone-de-produits-de-consommation-et-biens-d-equipement.html
[56] 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"[57]

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

[57] 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”[58]

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

[58] 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)[59]

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[60]

[59] https://www.umweltbundesamt.de/sites/default/files/medien/5750/publikationen/2020_12_03_texte_227-2020_online-handel.pdf
[60] 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