PSLifestyle Test Calculation Criteria - Türkiye

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Abstract

The following document lists the data sources and the calculation logic and assumptions behind the PSLifestyle Test. This document focuses on the PSLifestyle Test for Turkiye.

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Methodology in general

Lifestyle test examines carbon footprints using consumption-based accounting. Consumption-based accounting covers the embedded and indirect emissions of consumption during production induced by household final demand and excludes direct and indirect emissions and footprints of exported goods, the public sector, and capital investment. In a nutshell, to calculate a carbon footprint of a consumption category, the amount of consumption (kg, euros, kWh, km etc.) is multiplied by the carbon emission factor (kgCO2e * kg, euros, kWh, km etc.).

Compared to production-based accounting, which covers only direct emissions generated from the domestic production of goods and services irrespective of whether they are consumed domestically or are exported, consumption-based accounting can be considered a better measure of the global climate impacts associated with individuals' consumption and lifestyles.

More about the methodology of consumption-based accounting can be found for example in the report "1.5-Degree Lifestyles: Towards a fair consumption space for all" by Akenji et al. 2021, pages 32 to 35.

General list of references

If country not specified, the reference is in use in all countries

Mobility, consumption

OECD, year 2020	
Odyssee-Mure, year 2019	
Eurostat, year 2021	
Akenji et al. 2021 (1,5 report)	
ICAO 2019 and Maertens et al 2020	
Statistic Estonia, year 2019	EE
Izmir city, 2019	TR
Izmir Raylı Sistem Documents	TR
Mobilty data excel by partner	DE
Raser et al. 2018	IT
MOL_MOB_PKM_2017	SI
Statistical office of Slovenia, 2018,	SI

Mobility, emission factors

Cut-off Cumulative LCIA v3.8	
Ecoinvent LCIA v3.8	
Akenji et al. 2021 (1,5 report)	

Housing, consumption

Odyssee-Mure, year 2019	
Eurostat, 2020	
IEA, year 2019	
IEA year 2020	
Ministry of Economics and affairs of Estonia, 2013	EE
Statistics Estonia	EE

ICESD 2010	PT

Housing, emission factors

Cut-off Cumulative LCIA v3.8	
Ecoinvent LCIA v3.8	
Akenji et al. 2021 (1,5 report)	
Statistics Finland, 2019, polttoaineluokitus	EE, FI
Salo et al 2019	EE, FI
SYKE 2019	FI
Motiva 2020	FI
Schüppler et al., (2019)	DE

Food, consumption

FAOStat, 2019	
Andmebaasist, Health Statistics, year 2017	EE
Tilastokeskus 2020	FI
Finnish national Findiet survey 2017	FI
National Nutrition Survey II	DE
National sources from partner	GR
Italian National Food Consumption Survey 2005-06	IT
Statista, Portugal, year 2020	PT
Tarımsal Ekonomi ve Politika Geliştirme Enstitüs…	TR
Eurostat, Slovenia, year 2019	SI
Statistical Office of the Republic of Slovenia, year 2018	SI

Food, emission factors

Ecoinvent LCIA v3.8	
Kim et al 2013	
Pulkkinen ym. 2016	
Pulkkinen ym. 2016	
Clune et al 2017	
Hartikainen and Pulkkinen 2016	
Hartikainen and Pulkkinen 2016	
Bryngelsson et al 2016	

Consumption, consumption

Eurostat, year 2021	
Eurostat, year 2019	
Fediaf fact-sheet 2020	
Statistical Office of the Republic of Slovenia, year 2018	SI
TurkStat	TR
Dunyea, 2018	TR

Consumption, emission factors

Exiobase 3.8.2	
Fediaf fact-sheet 2020	
Koivula & Tuominen 2019	EE, FI, SI
Seppälä et al. 2009	FI

Calculation criteria used in the PSL questions and answer options in Turkiye

Living

The environmental impacts of living taken into account in the PSLifestyle tool include construction, the heating of dwellings, and the use of electricity and water and heating the water to bathing temperature at home. The test always begins with a question on household members because the emissions of living are divided between the residents.

Household members

More people per m2 means less emissions per person. We proportion the energy consumption of your home to all household members. The average household size for Turkiye is expected to be 3.3 persons according to Turkish Statistical Institute for the year 2020.

No. of rooms in the home

A bigger living area would typically mean higher emissions but would also need to be proportioned with the number of people in the household. According to the Organisation for Economic Cooperation and Development's Better Life Index, an average Turkish home consists of 1 room per person and according to the Turkish construction code, minimum allowed size for a house is at 28,5m^2 (Turk.estate, 2020). When you answer for the number of rooms in the home, we use the above average statistics to assume a size for your home.

Building type

The environmental impacts of a building are taken into account by using a factor calculated per living area. The age of the building has an impact on the insulation characteristics of the building (lower energy class) which impacts heat energy usage. As an assumption for this test, we assume older houses have lower insulation and thus a lower energy class and use more heat energy. The factor takes account of the land-use change, the manufacturing of materials and the construction, maintenance and demolition of the building.

The kind of house you live in - single family detached house or block of flats impacts on the footprint based on construction of the house - detached houses have a construction and maintenance footprint of 6,9 kg CO2e /y/m2 and flats have a construction and maintenance footprint of 8 kgCO2e /y/m2 (Salo et al., 2016). Additionally, for electricity consumption it uses the value derived from the weighted average of the electricity mix of the country 0.52 kgCO_2e/kWh (International Energy Agency; Wernet et al., 2016) and proportions it to the number of people in your home based on its size.

What is the energy class/When the house is built

The question is based on the assumption that buildings of certain era to belong into different energy classes and would thus have different levels of insulation, etc. impacting the energy consumption in the home. Houses built after 2019 are typically houses with excellent insulation and assumed to be Energy Class A (100 kWh/m2). Houses build between 2007 and 2019 are still assumed new housing

stock which are typically Energy Class B/C (200 kWh/m2) and houses built between 1990 and 2017 typically represent the energy class D/E (350 kWh/m2). Further, houses built before 1990 are expected to have higher heat energy consumption and represent energy class F/G (450 kWh/m2) (European Datawarehouse). In case the data for the particular country was not available, country with the most similar system was selected from the available data.

Electricity

The default value for electricity consumption (excluding electricity used for heating) is based on a on the average electricity mix of your country with the average electricity consumption based on data from International Energy Agency. Default emissions of from electricity production are calculated by proportioning the electricity mix of the country with different sources of electricity production with the total energy consumption per capita obtained from the International Energy Agency and emission intensity from the EcoInvent 3.8 database and stands at 0.52 $kgCO_2e/kWh$ (Wernet et al., 2016). For emission intensity associated with solar panels, please refer to EcoInvent 3.8 directly (Wernet et al., 2016).

The greenhouse gas emissions of electricity production take into account the direct emissions of electricity production, or the emissions caused by burning of fuels and the fuel production chain. The coefficient takes account of the land-use changes related to electricity production and is a weighted average of all the electricity production sources used in the country.

Primary heating method

The question concerning the primary heating method of the respondent's home takes into account the most commonly used heating methods the date for which is compiled with the support of Zeytince and Akenji et al., 2021. The emission factors can be accessed by reaching out to EcoInvent database directly (Wernet et al., 2016).

The response to the earlier question on the kind of electricity the respondent uses is taken into account in the calculations concerning the electricity consumption of electric heating, a groundsource heat pump or an air-source heat pump. An air-source heat pump is usually used as a complementary heating system, but when used us a primary heating method, there are probably more air-source heat pumps in use than one, and the efficiency of an air-source heat pump was assumed to be about the same as the efficiency of ground-source heating.

Heating

Keeping your home at a warmer temperature in winter typically also consumes more energy. As per calculation, a 2 degree rise in temperature means 10% more heat energy used and 2 degrees fall in temperature means 10% less heat energy used (Kotakorpi et al., 2008).

Showering

The time spent in a shower affects water consumption and therefore also the amount of heating energy used for heating the water. This question takes into account the amount of water consumed in a shower and the amount of heat required to raise the temperature of water to showering temperature. For more information on calculations please contact D-Mat Oy directly.

Mobility

The average kilometer estimates on the use of different means of transport are based on Organisation for Economic Co-Operation and Development (OECD) statistics on Transportation.

Driving

The carbon footprint of driving is calculated based on the annual number of kilometres driven, type of fuel and the average number of people driving a car. The climate emissions consist of the fuel consumption, the manufacturing of the car and the emissions from building the road infrastructure.

The generated emissions are divided between the number of people typically driving a car, and therefore it is asked how many people usually travel with you in a car. The emission factors for different fuel types are based on data from EcoInvent who should be contacted directly for more information (Wernet et al., 2016).

Public transport

Public transport includes travel by bus, train, tram, and metro. The relative shares of the different means of public transport are based on Organisation for Economic Co-Operation and Development (OECD) statistics on Transportation. The shares were used as a basis for calculating a weighted average emission factor for public transport (0.09 $KgCO_2e$/passenger-km). The emission factors of different means of transport are based on the emission factors reported by EcoInvent 3.8 database (Wernet et al., 2016).

Air travel

The emission factor per hour for air travel is based on the average greenhouse gas emissions per kilometre based on Akenji et al., 2021. The emissions of individual flights depend on such factors as the air fleet, aircraft occupancy rate, allocation of emissions between passengers and cargo, as well as taking account of the impact of clouds in the higher atmosphere. At the moment, the calculations include fuel consumption, and the CO2e-emissions from the energy and materials used for building aircraft and airports.

In addition to direct CO_2 emissions, air traffic increases atmospheric radiative forcing, as a result of fine particles released high in the atmosphere and changes in cloud cover, for example. There is considerable uncertainty associated with these estimates; however, the latest research paper, published in 2020, estimates that 66 per cent of the total climate impact of aviation comes from sources other than the direct impact of the carbon dioxide in fuel (Lee et al., 2020). Consequently, it is justified to multiply the carbon footprint based on fuel consumption by three to account for other causes of radiative forcing that are known in the light of current knowledge (Lee et al., 2020). We further take into account the average speed of a commercial aircraft based on statistics reported by airline companies (Schiphol.nl, n.d.).

Walking or biking

Walking and biking are considered to be carbon-free alternative means of transport and not part of the footprint calculation. This question is asked to be able to offer more precise 100 smart actions after taking the test.

Food

Eating habits

The carbon footprint of the person taking the lifestyle test is affected by the amount of food they eat and the amount of waste this generates as well as the relative amounts of different ingredients used.

In the lifestyle test, the respondent's diet is further calculated based on the ingredients they consume at mealtimes. The consumption of various products either reduces or increases the footprint, depending on whether the respondent eats less or more of such products compared to the average consumption habits in Turkiye. The reducing/increasing effect of the choices is deducted from/added to the carbon footprint of an average Turkish person and based on our calculations it is approximately 1.8 tons a year. For more information on calculations please contact Sitra.

The ingredients with significant climate impact have been classified into separate questions per food category. An average portion size was calculated for each category and a portion-specific weighted emission factor was calculated based on the percentage of the various ingredients in the portion.

In the beginning the type of diet is asked. If person is omnivore or pescatarian, it takes into consideration the carbon footprint of all the remaining food categories that are not specifically asked about in a separate question. If person is vegetarian, the carbon footprint of these other foods is multiplied by 1.15 kg. If person is vegan, the carbon footprint of these other foods is multiplied by 1.15. This is because the vegetarians and vegans do not eat less in absolute terms but would have to consume more of these other food categories to have a sufficient intake of nutrients. The multipliers are based on Sitra's calculations.

How many portions you eat

It is assumed that a respondent who eats less/more compared to other people at a mealtime, eats 15% smaller/larger portions per meal. This question takes into consideration the answer on previous question of the diet. For more information on calculations please contact Sitra.

Food categories

Meat

Meat was classified under its own category due to having higher emission factors than other foods. Since the consumption amount of meat is not live weight that is available in stores, the emission factor from Ecoinvent is converted using factors for live weight to bone free weight (Clune et al., 2017; Wernet et al., 2016). For exact figures on emission factors, please contact Ecoinvent directly (Wernet et al., 2016).

Cheese

This category includes soft and hard cheese made from cow's milk. For exact figures on emission factors for hard cheese, please contact Ecoinvent directly (Wernet et al., 2016). An emission factor of 7.3 kg CO_2e per kg has been assigned to soft cheeses (Kim et al., 2013). The average of emission intensities of soft and hard cheese is based on how much are they consumed.

Chicken, fish or eggs

Different foods in this question are proportioned based on how these are consumed on average. Since the consumption amount of chicken is not live weight that is available in stores, the emission factor from Ecoinvent is converted using factors for live weight to bone free weight (Clune et al., 2017; Wernet et al., 2016). An emission factor of 3.39 kg CO_2e per kg has been assigned to eggs (Clune et al., 2017). For exact figures on emission factors for poultry and fish, please contact Ecoinvent directly (Wernet et al., 2016).

Dairy products

Milk and dairy products were highlighted as a category since their high consumption has an effect on the carbon footprint. Turkish people consume annually approximately 40 kg of milk and approximately 51 kg of dairy products (excluding cheese) per person (IndexBox, 2020; Turkish Statistical Institute (TURKSTAT), 2023). For exact figures on emission factors, please contact Ecoinvent directly (Wernet et al., 2016).

Beverages

The emission factors for different drinks are based on the sources Bryngelsson et al. (2016), Hartikainen and Pulkkinen (2016) and Wernet et al. (2016). Coffee, tea, and juice are in their own category, since they have close emission factors. The emission factors used are the following: 0.9 kg CO_2e per kg for fruit and vegetable juices and 1.4 kg CO_2e per kg for alcoholic beverages (Bryngelsson et al., 2016). For exact figures on emission factors of tea and coffee, please contact Ecoinvent directly (Wernet et al., 2016).

Eating outside and food delivery

As concerns meals eaten outside the home, the energy consumption used for providing the service, or preparing the food (1 kWh/time eating out), was taken into account. A carbon footprint of a food delivery or a restaurant visit takes into consideration the average transport to or from the restaurant and the average energy consumption of restaurant service per customer. Question also takes into consideration the average carbon footprint of waste in take-away meals. (Crawford, 2021; Shopfood, 2020; Statista Research Department Frequency of dining at restaurants or other out-of-home dining establishments in Europe as of 3rd quarter 2015; United Nations Environment Programme, 2021)

Food waste

Turkish people throw away approximately 67 kg of edible food a year (United Nations Environment Programme, 2021), which increases the carbon footprint. The emission factor for food waste was calculated based on the biowaste of an average Turkish person eating a mixed diet (Wernet et al., 2016).

Consumption

Living, mobility and food are the most significant sub-sectors in the carbon footprint of an average consumer. It would require a number of questions to make a comprehensive estimate and analysis of the climate emissions of other sectors of personal consumption. In such a case, the effort it would require for a respondent to complete this section would no longer be in proportion to the significance of this sub-sector. However, in the PSLifestyle tool we wanted to highlight a few important matters, acknowledging that other choices (such as services and interests) have an impact as well. In this calculator, the sub-sectors included household goods, leisure, and pets.

Shopping habits

The question concerning shopping habits includes goods, household articles, clothes, and footwear, self-care, and beauty products. On average, the combined climate emissions of furnishings and home care products, clothes and footwear, goods related to spare time activities and hobbies, audiovisual devices, as well as books, magazines, newspapers, and paper products amount to approximately 1264,2 e/person/year (Eurostat Final consumption expenditure of households by consumption purpose (COICOP 3 digit), 2019; Turkish Statistical Institute (TURKSTAT), 2023).

Second-hand

The carbon footprint of a person buying recycled clothing or electronics is estimated to be smaller than that of an average consumer, because buying recycled products, does not generate the climate emissions caused by the manufacturing of new goods and clothes. This reduction in carbon footprint only applies to the share of clothes and electronics, which is 13 % of all consumption in Turkiye (Eurostat Final consumption expenditure of households by consumption purpose (COICOP 3 digit), 2019). If the person answers they do not shop secondhand, the carbon footprint of consumption is not affected. If they answer they seldom shop secondhand, they get 20% reduced, if 50% they get 50% reduced, if often they get 80% reduced of the carbon footprint of clothing and electronics.

Pets

Pets bring joy to people's lives and are often treated as members of the family. However, pets also consume natural resources in the form of food and different services and products. Pets can be of very different size, anything from tiny hamsters to horses. Therefore, we ask about the expenditure on pets to determine the emissions. The estimate about the average monetary value of the products and services Turkish people use for their pets is based on FEDIAF Annual Report (2021) and on a web article published by Dünya (2018). The estimates on the quantitative content of products and services are based on the price comparisons of various service providers and companies. The climate emissions of food consumed by pets were estimated by comparing the nutritional values of dog and cat foods and using the emission factors of the Ecoinvent database, since dogs and cats are the most common household pets. (Wernet et al., 2016).

Luxurious hotels

One night in a luxury hotel in Turkiye is estimated to be 70 euros per night (Tripadvisor, 2023). The estimate for GHG emissions of a hotel night is based on Exiobase v3.8 (Stadler et al., 2021).

Recycling

The data on the total amount of waste per household is based on OECD (2023) indicator on municipal waste. The data on the volumes of different recyclable items (such as glass, and cardboard) is from Eurostat (Eurostat Waste generated by households by year and waste category, 2016). Emission factors for different kinds of waste treatment are based on data from Ecoinvent. (Wernet et al., 2016).

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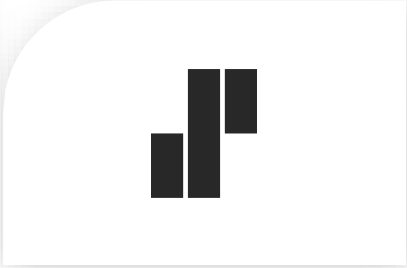
Project partners



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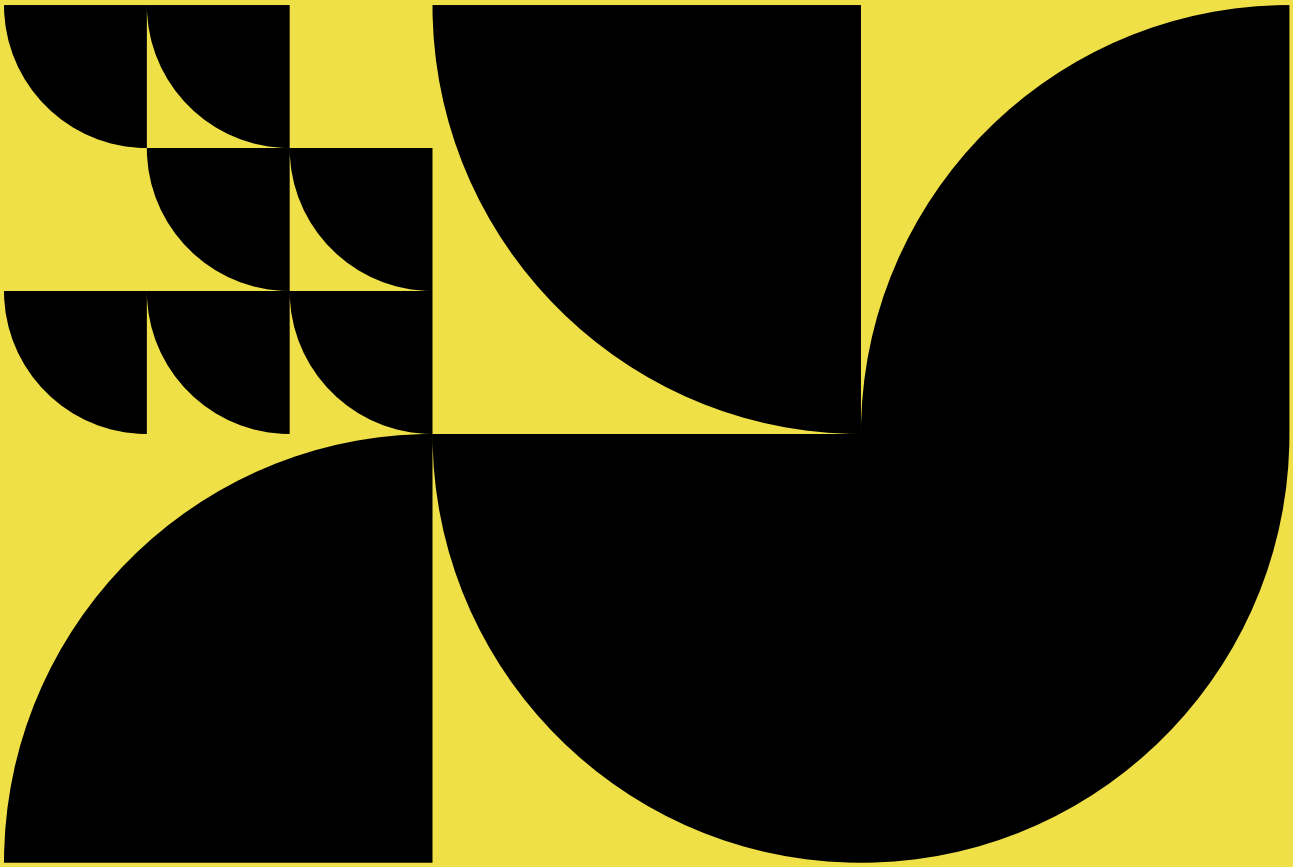

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