Carbon Footprint Calculator Methodology

1 | Purpose

This document explains the assumptions, formulas and emission factors used in the UAE carbon footprint calculator. It is designed to make the calculator transparent and easy to understand for users, partners and web developers.

This calculator provides an estimated annual carbon footprint for an individual living in the UAE. The result is expressed in **tonnes of CO_2e per year**.

Important disclaimer
The calculator provides an estimate based on user inputs and standard emission factors. It is intended for public awareness and education. It should not be treated as a certified greenhouse gas inventory, audited carbon assessment or regulatory emissions report.

CO_2e means carbon dioxide equivalent. It is a standard unit used to express the climate impact of different greenhouse gases in terms of the equivalent amount of carbon dioxide.

The calculator is designed as an awareness and education tool. It provides an approximation based on user inputs and standard emission factors. It should not be treated as a formal greenhouse gas inventory or third-party verified carbon assessment

2 | General Calculation Approach

The calculator estimates emissions from the following categories:

1. Electricity usage
2. Chiller consumption
3. Cooking gas
4. Cooking oil
5. Tap water
6. Vehicle travel
7. Flights
8. Food and diet pattern
9. Lifestyle spending

The total annual carbon footprint is calculated as:

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Total annual CO₂e = electricity emissions + chiller emissions + cooking gas emissions + cooking oil emissions + tap water usage + vehicle emissions + flights + food & diet emissions  + lifestyle spending emissions
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All category results are converted into tonnes of CO_2e per year.

3 | Household Size Adjustment

Some household emissions are shared between people living in the same home. For this reason, the following categories are divided by the number of people in the household:

- Electricity
- Chiller
- Cooking gas
- Cooking oil
- Tap water

The following categories are treated as individual lifestyle choices and are not divided by household size:

- Driving
- Flights
- Food and diet
- Lifestyle spending

4 | Electricity Usage

User Input	Monthly electricity consumption in kWh
Emission Factor	0.4045 kg CO_2e per kWh
Formula	Annual electricity emissions = (monthly electricity kWh ÷ household size) × 12 × 0.4045 ÷ 1000

Emission factor is based on DEWA's 2024 electricity carbon intensity of 0.4045 tCO_2e/MWh, converted to 0.4045 kg CO_2e/kWh.

5 | Chiller Consumption

User Input	Monthly chiller consumption in kWh
Emission Factor	0.4045 kg CO_2e per kWh
Formula	Annual chiller emissions = (monthly electricity kWh ÷ household size) × 12 × 0.4045 ÷ 1000

The same electricity factor is used because chiller consumption is entered as electricity consumption in kWh

6 | Cooking Gas

The calculator allows two methods for cooking gas input:

- No. of cylinders used per month
- Central gas volume in m^3

Option A : Gas Cylinders

User Input	No. of cylinder used per month
Emission Factor	46 kg CO_2 per cylinder
Formula	Annual cylinder gas emissions = (monthly cylinders × 46 × 12 ÷ household size) ÷ 1000

Eg. : If one cylinder is used every two months, user should enter 0.5.

Option B : Central Gas Line

User Input	Monthly central gas consumption in m^3
Emission Factor	1.94 kg CO_2 per m^3
Formula	Annual central gas emissions = (monthly gas m^3 × 1.94 × 12 ÷ household size) ÷ 1000

Emission factor is derived from EPA's natural gas coefficient of 0.0550 kg CO_2 per cubic foot, converted to cubic metres.

7 | Cooking Oil

User Input	Monthly cooking oil consumption in litres
Emission Factor	2.6 kg CO_2/kg
Formula	Annual cooking oil emissions = (monthly litres × 0.92 × 2.6 × 12 ÷ household size) ÷ 1000

Users can estimate comsumption by multiplying the number of bottles or cans used per month by the volume of each bottle or can.
Eg. : 2 bottles × 1.5 litres = 3 litres per month

Assumptions :
Cooking oil density = 0.92 kg/L
Cooking oil emission factor = 2.6 kg CO_2/kg

8 | Tap Water

User Input	Monthly water consumption in: Cubic metres (m^3) Litres Imperial gallons
Unit Conversion	1,000 litres = 1 m^3 1 imperial gallon = 0.00454609 m^3
Emission Factor	2.988 kg CO_2 per m^3
Formula	Annual tap water emissions = (monthly water m^3 × 2.988 × 12 ÷ household size) ÷ 1000

This is used as an estimated UAE water emissions factor. Actual emissions can vary depending on the water source, desalination technology, utility provider, and distribution system.

9 | Vehicle Travel

User Input	• Average weekly driving distance in kilometres • Vehicle type
Emission Factor	Small car: 0.179 kg CO_2e/km Medium car: 0.268 kg CO_2e/km Large car/SUV: 0.572 kg CO_2e/km Electric car: 0.073 kg CO_2e/km
Formula	Annual vehicle emissions = weekly kilometres × 52 × vehicle emission factor ÷ 1000

The electric car factor is calculated using:
0.18 kWh/km × 0.4045 kg CO_2e/kWh = 0.073 kg CO_2e/km

Electric cars are not treated as zero-emission because electricity used for charging still has an associated carbon footprint.

Assumptions :
Small car : 15-18 kmpl
Medium car : 10-12 kmpl
Large car/SUV : 4-6 kmpl

10 | Flights

User Input	The user enters the number of return trips taken per year.
Emission Factor	Short-haul return trip: 0.5 tonnes CO_2e Medium-haul return trip: 1.0 tonnes CO_2e Long-haul return trip: 2.5 tonnes CO_2e
Formula	Annual flight emissions = (short-haul return trips × 0.5) + (medium-haul return trips × 1.0) + (long-haul return trips × 2.5)

Flights are entered as return trips per year, not one-way trips. The examples are written from a UAE perspective.

Assumptions :
Short-haul: under 2 hours (GCC countries)
Medium-haul: 2-4 hours (India, Egypt, Turkey)
Long-haul: over 4 hours (UK, Europe, Southeast Asia, Americas)

11 | Food and Diet Pattern

User Input	The user selects one of four food and diet patterns.
Emission Factor	Mostly veg, low meat = 5.1 tonnes CO_2e/year Meat 2-3 times a week = 5.3 tonnes CO_2e/year Meat 4-5 times a week = 7.6 tonnes CO_2e/year Meat daily = 10.0 tonnes CO_2e/year
Formula	Annual food and diet emissions = selected fixed annual value

Food and diet uses a fixed annual value based on the selected option.
These values are broad lifestyle estimates and may vary based on food type, sourcing, food waste and consumption patterns.

12 | Lifestyle Spending

User Input	Monthly lifestyle spending in AED
Emission Factor	AED 1,000 per month = 50 kg CO_2e per month
Formula	Annual lifestyle spending emissions = (monthly spending ÷ 1000) × 50 × 12 ÷ 1000

This should include general goods and services such as shopping, dining, personal care, and household purchases.
It should not include: Rent, Loans, School fees or utility bills already entered separately

13 | Final Result

The final result is shown as:

> Your Carbon Footprint is
> [X]
> tonnes of CO_2e per year

The calculator also shows a category-wise breakdown so users can see which lifestyle areas contribute most to their estimated footprint.

14 | Limitations

This calculator provides an estimate, not a certified carbon footprint.

Actual emissions may vary depending on:

- Electricity provider
- Fuel type
- Vehicle model
- Driving behaviour
- Flight routes and aircraft type
- Water source and desalination technology
- Food sourcing and food waste
- Consumption habits
- Data accuracy entered by the user

The calculator should be used for awareness, education, and behaviour change, not formal emissions reporting or compliance purposes.

15 | Disclaimer

The results provided by this calculator are estimates based on user inputs and standard emission factors. Actual carbon footprints may vary.
The methodology is simplified to make the calculator accessible for everyday users in the UAE.

16 | References and Source Notes

DEWA electricity carbon intensity. DEWA PJSC Integrated Report 2024 / DEWA Integrated Reports page. Used value: 0.4045 tCO_2e/MWh, converted to 0.4045 kg CO_2e/kWh.

Source: https://www.dewa.gov.ae/en/investor-relations/integrated-reports

Natural gas factor. US EPA Greenhouse Gas Equivalencies Calculator calculations and references. Used value: 0.0550 kg CO_2 per cubic foot, converted to approximately 1.94 kg CO_2/m^3.

Source: https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator-calculations-and-references

Imperial gallon conversion. Used value: 1 imperial gallon = 0.00454609 cubic metre.
Source: https://www.convertunits.com/from/Imperial%2Bgallon/to/cubic%2Bmeter

Cooking oil density. kg-m3.com material density reference. Used value: cooking oil = 920 kg/m^3 = 0.92 kg/L.
Source: https://kg-m3.com/material/cooking-oil

Other simplified factors. Water, flight, diet, vehicle and spending values are simplified public-education assumptions and should be reviewed as better UAE-specific data becomes available.