

The Resurgence Carbon Dioxide Calculator

An on-line version of this calculator can be used at www.resurgence.org/carboncalculator/

This calculator is designed to make it easy to work out your personal annual carbon-dioxide emissions. You can print out this document, and fill in the tables using a pocket calculator, which is quite easy.

What we are going to do is use your domestic fuel bills for a year, get your annual car mileage from your MOT certificate, and sum up your train and air travel in a way which is easy to estimate. You can then enter these pieces of information into the tables, which will calculate the CO₂ emissions produced by each activity, and give you a sum total.

In the following tables fill in the white boxes with your numbers. The boxes which contain a “0” need to be calculated using a pocket calculator. Simply follow the instructions in the title for that box, e.g. $a \times b = c$. “/” means “divide-by”.

Electricity

On your electricity bills you will find the number of “units” you have used for each quarter, measured in kilo-Watt-hours (kWh). Enter these into the table below. If you have an electricity meter, enter the amount of money you put into it each week, on average. The table will multiply by 52 to get the cost per year, and then divide this by the cost per unit, currently 8.8p, to end up with the number of units used per year.

<u>Electricity bills</u>	<u>Units</u>	<u>Electricity meter</u>	<u>£</u>
1st Quarter	<input type="text"/> kWh	Average cost per week	<input type="text"/>
2nd Quarter	<input type="text"/> kWh	x Weeks per year	52
3rd Quarter	<input type="text"/> kWh	= Cost per year	<input type="text"/> 0
4th Quarter	<input type="text"/> kWh	/ cost per unit	0.09 kWh
Total units per year	<input type="text"/> 0 kWh	= Total units per year	<input type="text"/> 0 kWh
x Conversion Factor	0.43	x Conversion Factor	0.43
= CO2 Emissions	<input type="text"/> 0 kg	= CO2 Emissions	<input type="text"/> 0 kg

Gas

Piped gas is normally “natural gas”. Gas bills tell you how much gas you have used in kWh, therms, or cubic metres. Enter one of these into the table below. Gas delivered to a bulk storage tank is normally liquid propane gas, which is a type of liquid petroleum gas or LPG. The bill should quantify your use in litres. Enter this into the table.

<u>Billed Gas</u>	<u>Natural Gas</u>			<u>LPG</u>
	<u>kWh</u>	<u>Therms</u>	<u>Cubic m</u>	<u>litres</u>
Bill 1	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 2	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 3	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 4	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 5	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 6	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Total per year	<input type="text"/> 0	<input type="text"/> 0	<input type="text"/> 0	<input type="text"/> 0
x Conversion factor	0.19	5.5	1.77	1.51
= CO2 emissions	<input type="text"/> 0	<input type="text"/> 0	<input type="text"/> 0	<input type="text"/> 0

Bottled Gas

Bottled gas comes in two different types: Butane, in blue bottles, and Propane, in red bottles. (These are both types of liquid petroleum gas or LPG.) The contents of the bottles are quantified by weight. Butane comes in 4.5kg, 7.0kg and 15kg bottles. Propane comes in 3.9kg, 6.0kg, 13kg and 19.5kg bottles. Enter the bottle size and the number of bottles you use per year into the relevant column of the table below.

<u>Bottled Gas</u>	<u>Butane</u>	<u>Propane</u>
Bottle weight	<input type="text"/>	<input type="text"/>
No. bottles per year	<input type="text"/>	<input type="text"/>
Total weight	0	0
x litres per kg	1.74	1.95
= total no. litres	<input type="text"/>	<input type="text"/>
x Conversion factor	1.51	1.51
= CO2 emissions	<input type="text"/>	<input type="text"/>

Oil & Coal

Oil is billed per litre. Coal is either billed per kg or per bag, bags usually being 25kg. Enter the number of bags per order and the number of kg per bag.

<u>Oil</u>	<u>litres</u>	<u>Coal</u>	<u>No bags</u>	<u>x kg/bag</u>	<u>= kg</u>
Bill 1	<input type="text"/>	Bill 1	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 2	<input type="text"/>	Bill 2	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 3	<input type="text"/>	Bill 3	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 4	<input type="text"/>	Bill 4	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 5	<input type="text"/>	Bill 5	<input type="text"/>	<input type="text"/>	<input type="text"/>
Bill 6	<input type="text"/>	Bill 6	<input type="text"/>	<input type="text"/>	<input type="text"/>
Total per year	0	Total kg per year			0
x Conversion	2.68	x Conversion factor			2.41
= CO2	<input type="text"/>	= CO2 emissions			<input type="text"/>

Wood

Like all fuels, wood is essentially carbon. Burning it emits carbon dioxide, and growing it absorbs carbon dioxide. A new tree absorbs the carbon dioxide emitted by burning an old tree. But there is a time delay of around 25 years. This is nothing compared with fossil fuels, but may be significant in the current global climate change situation. Therefore in this calculator wood is not considered carbon neutral, but you are only “charged” for half the emissions produced by burning it.

If you procure wood by the tonne or kg, enter the figures in the table below. (1 tonne = 1,000 kg.) If you obtain wood by the “load” and the weight is not known, it is possible to estimate your usage. I would guess that an average stove or Rayburn uses 10kg of wood in an evening or half a day. If you run your stove every evening for half the year (180 evenings), you burn 1,800kg per year. Using this as a benchmark, estimate your wood use and fill in the table.

<u>Wood</u>	<u>kg</u>
kg used per day	
Days use per year	
Total kg used per year	0
x Conversion factor	1.035
= CO2 emissions	0
/2 = "Half charge"	0

Car transport

You can find the number of miles you drove last year from your last two MOT certificates. Enter the recorded mileage of these into the table below. The table will subtract the previous from the latest recorded mileage to give your last year's mileage. Make a guess at your "share" of the car's use, and enter this in the table below, as a decimal. For example if you are the sole user of the car, enter your "share" as 1. If your share is 50%, enter 0.5; for one third enter 0.33, for 25% enter 0.25, etc.

<u>Car</u>	<u>Mileage</u>
Latest MOT recorded mileage	
- Previous MOT recorded mileage	
= last year's mileage	0
x Share	
= Personal mileage	0
x Conversion factor	0.36
= CO2 emissions	0

If you prefer, rather than using your MOT certificates, you can list your car journeys on the Journey Table below.

Journey Table for Car, Taxi, Bus, Train and Aeroplane

You can use the following table to list your journeys made in the last year. Enter the distance (or journey-time for flights), the number of ways, i.e. "1" for 1-way or "2" for 2-way, your share of a car journey as a decimal (see under "Car" for explanation of decimal), and the times per year you make the journey (e.g. "50" for once per working week, "250" for 5 working days by 50 working weeks, etc.). The table on the next page has room for 10 journey listings under each section. If you need more space, simply list your journeys on a separate sheet of paper, add up the miles, and enter them into the table.

Car & Taxi Journeys		<u>a. Distance</u> (miles)	<u>b. 1 or</u> <u>2-way</u>	<u>c. Miles</u> c=axb	<u>d. Share</u>	<u>e. Times</u> a year	<u>f. Total</u> =cxdxe
E.g.	Hartland - Bideford	15	2	30	0.50	12	180
1				0			0
2				0			0
3				0			0
4				0			0
5				0			0
6				0			0
7				0			0
8				0			0
9				0			0
10				0			0
11				0			0
12				0			0
Total							0
x Conversion factor							0.36
CO2 emissions (kg)							0
Train & Bus Journeys		<u>a. Distance</u> (miles)	<u>b. 1 or</u> <u>2-way</u>	<u>c. Miles</u> c=axb		<u>e. Times</u> a year	<u>f. Total</u> =cxe
1				0			0
2				0			0
3				0			0
4				0			0
5				0			0
6				0			0
7				0			0
8				0			0
9				0			0
10				0			0
11				0			0
12				0			0
Total							0
x Conversion factor							0.1
CO2 emissions (kg)							0
Air Journeys		<u>a. Journey</u> <u>time</u>	<u>b. 1 or</u> <u>2-way</u>	<u>c. Hours</u> c=axb	<u>d. Miles</u> =cx500	<u>e. Times</u> a year	<u>f. Total</u> =dxe
1				0	0		0
2				0	0		0
3				0	0		0
4				0	0		0
5				0	0		0
6				0	0		0
7				0	0		0
8				0	0		0
Total							0
x Conversion factor							0.87
CO2 emissions (kg)							0
Grand total for the journey table							0

Fuel-intensive leisure activities

This table gives you a chance to estimate your carbon dioxide emissions specifically from leisure activities that use fossil fuels, such as motor-boating, jet-skiing, flying and motor racing. Columns are given for petrol, diesel and kerosene (aircraft fuel). As the possibilities and patterns of use are so variable, it is necessary for you to work out your rough fuel usage per month or year, then enter this into the table below.

Leisure	Petrol, litres per		Diesel, litres per		Kerosene, litres per	
	month	year	month	year	month	year
Activity 1		0		0		0
Activity 2		0		0		0
Activity 3		0		0		0
Activity 4		0		0		0
Activity 5		0		0		0
Activity 6		0		0		0
Total		0		0		0
Conversion		2.31		2.68		2.52
CO2		0		0		0

Industry and commerce

The National Energy Foundation states that “around half UK CO₂ emissions come from industry and commerce supporting our everyday lifestyle” (www.natenergy.org.uk/co2mment.htm). This means producing our food, clothes, consumables, and maintaining our national infrastructure. National average annual CO₂ emissions per capita are 10 tonnes, so our average “industry and commerce emissions share” is 5 tonnes each.

Part of industry & commerce provides infrastructure and resources that benefit everyone, and part of it provides the goods of “consumerism”. We may all take a share of the CO₂ produced by the former, and the latter can be shared out according to consumption, which is largely linked to income. Public services and essential industries including health, education, defence, agriculture and construction produce 23% of industry & commerce CO₂ emissions. “Domestic consumption” including cars, recreation, electrical goods, clothing, and consumables account for 40% of industry & commerce emissions. “Trade” including wholesale, garages, showrooms and computer activities accounts for 7%. And heavy industry, including mining and the material production, accounts for 30%.

How should we estimate our personal share of industrial emissions? I would suggest a base of 1 tonne per person (20% of industry & commerce) towards the public and common amenities that nearly everyone benefits from. Further to this, the share may be proportional to income, being roughly one tonne for every £5,000 of income per person in the home. (I.e. if two people share an income of £40,000, this is £20,000 per person. This would represent 4 tonnes of CO₂.)

If you make a special effort to buy hand-made, second-hand, locally-produced, low-energy, un-mechanised products, and to repair rather than replace items, this will reduce emissions associated with manufacture. With considerable thought and effort you may reduce your income-related emissions by as much as half. (For example, I would say a car must be more than 10 years old before its manufacturing quota can be discounted). Make a guess at where you stand in this respect and enter your adjusted income-related emissions into the table. Add this to your base share of 1 tonne, to arrive at your total industry share.

This part of the Resurgence Carbon Dioxide Calculator is obviously approximate. Therefore please make the estimations you feel happy with. If you earn a lot of money but spend little of it, or live almost entirely from the land, adjust your quota accordingly. However, in a society where most products and services are provided with the help of fossil fuels, it may be surprising how close the correlation is between income (or

more accurately, expenditure) and CO₂ emissions. The aim of this calculator is to aid in reducing emissions. Simply being aware of CO₂ factors associated with industrial products should help toward this end.

<u>Industry Share</u>	<u>Tonnes CO2</u>
Base share	
Income-related share	
Adjusted income-related share	
Total = base+adjusted (tonnes)	0
Total (kg)	0

Grand total personal annual CO₂ emissions

Please take the totals from all the tables above and enter them in the final table below.

<u>Totals</u>	<u>CO2</u>
Electricity	
Billed Gas	
Bottled Gas	
Oil	
Coal	
Wood	
Car	
Travel	
Leisure	
Industry	
Total (kg)	0
Total (tonnes)	0.0

Here you have it. Your personal annual CO₂ emissions. Approximately. To put this in context, national average emissions are 10 tonnes per capita. The UK government has pledged to cut emissions by 20% before 2012, to around 8 tonnes per capita. This forms part of the Kyoto protocol to reduce global climate change. This reduction level makes a good initial target for individuals.

The UK government further aims to reduce national emissions by 60% before 2050, to around 4 tonnes per capita. If you are feeling enthusiastic, you may wish to approach this target.

It is estimated that the sustainable CO₂ emission quota per capita for each of 6 billion global inhabitants is 2 tonnes per annum. Until this target has been reached we continue to accelerate the rate of climate change, so anyone who attempts to reach this target is providing a great service and example. Good luck!

Mukti Kumar Mitchell, North Devon, November 2004

Sources include:

The National Energy Foundation (www.natenergy.org/)

The Department for the Environment, Food and Rural Affairs (www.defra.gov.uk/)

The National Office of Statistics (www.statistics.gov.uk/)