



Greenr

Methodology

This document outlines the key concepts and data used in Greenr carbon calculators.

May 2022



Key Concepts

What is a carbon footprint?

Every activity that you do will potentially emit some Green House Gasses which are normalized to Carbon Dioxide based on each gas' Global Warming Potential (GWP) and written as CO_{2e} (or carbon for short). Here are some examples:

1. If you drive to work in a normal car you are burning fossil fuel to power the engine. The exhaust gas coming for your car has CO₂ in it (and other GHGs) which go straight into the atmosphere.
 2. The burger meat in your beef burger had to come from a cow which had to be raised on a field for a couple of years, fed some grain and given some water. The cow had to convert food into muscle to grow and emitted some GHGs such as methane. The water and grain it used it also accounted for in the carbon footprint using "equivalence"
 3. The electricity you use in your home will have been generated using different methods. Some methods are green such as solar and wind and therefore don't have much carbon footprint. But other methods use fossil fuels such as coal, gas and oil which, like your car, emit CO₂ and other gasses when they are burnt to generate electricity.
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What is global warming?

Carbon Dioxide is a gas, just like oxygen or nitrogen which can be found in our atmosphere. The air we breathe is made up mostly of nitrogen and oxygen with a tiny bit of CO₂, only 0.04% in fact. CO₂ is very important for earth because it's what keeps it warm and liveable! CO₂ is what we call a greenhouse gas. It's different to Oxygen and Nitrogen in that regard. A greenhouse gas (GHG) like CO₂ absorbs heat during the day and then releases it gradually over time. There are other greenhouse gasses in our atmosphere, like methane and nitrous oxide. CO₂ is less good at trapping heat than those two other gasses but there's a lot more CO₂ in our atmosphere and it also stays in our atmosphere for longer. This results in CO₂ being responsible for about 2/3rd of all global warming effects.

The burning of fossil fuels has increased the amount of CO₂ in the atmosphere by too much which has tipped the balance. The Earth is supposed to warm during the day and cool at night on a stable cycle but now the amount of CO₂ in the atmosphere stops it from cooling down properly and so year on year it gets a tiny bit hotter. This has detrimental effects on both people and the planet. For example, oceans evaporate quicker causing more rainfall which can result in extreme weather events like floods, landslides, snowstorms etc. Additionally, warmer climates also mean more heatwaves which can overpower the human body.

Key Concepts

What is CO₂e and GWP?

As mentioned, carbon dioxide (CO₂) is an extremely prevalent greenhouse gas (GHG), however there are other GHG's such as methane and nitrous oxide, these gases all have differing global warming potential (GWP). Global Warming Potential refers to the amount of energy the emissions of 1 tonne of a gas will absorb over a given period relative to the emissions of 1 tonne of CO₂. The larger the GWP the more that gas warms the Earth compared to CO₂. This is useful as it allows comparisons of emissions as well as estimations of total emissions across different gases. Therefore, we express our emissions calculations using CO₂e, meaning 'carbon dioxide equivalent' as this allows us to express the equivalent impact of all greenhouse gases which have differing GWP in one value.

What are carbon offsets?

A certified carbon offset project is a project that is removing CO₂e from the atmosphere or avoiding CO₂e emissions from being added to the atmosphere. These kinds of projects can come in a variety of forms such as forest conservation or renewable energy projects and work in the following ways:

1. Forest conservation: Trees are a great carbon sink; they need carbon for photosynthesis and convert it into oxygen. However, if you cut down the tree and burn it you release all that carbon which is stored in the bark, back into the atmosphere. A forest conservation project allows trees that otherwise would have been cut down to be saved due to carbon offset revenues. Farmers receive money and can afford to keep the forest on their land without cutting them down.
2. Renewable energy projects: Generating electricity using renewable methods (i.e., energy that is not depletable) such as wind, solar and hydropower is a great way to remove potential carbon from the atmosphere. For example, the revenue generated from carbon offsets allows small wind farms to be built. Such a wind farm will generate electricity for a neighboring town which otherwise would have received electricity generated by burning natural gas or coal. This is an example of a carbon offset project which avoids future carbon from entering our atmosphere

What are scope 1, 2 and 3 emissions?

Scope 1 covers direct emissions (any fossil fuels burnt on premises for example), scope 2 covers indirect emissions including electricity. Whilst scope 3 includes all other indirect emissions, including those of the employees which is often the biggest factor in an organisations carbon footprint.



Carbon Calculator Data

Greenr Carbon Calculators

1. Onboarding quiz [in-app]
A personal carbon footprint calculator, considers CO₂e emissions across aspects of lifestyle, personal activities, habits, and behaviours.
2. Travel calculator [in-app]
Calculates the CO₂e emissions of specific journeys across all transport modes
3. Food calculator [in-app]
Calculates the CO₂e emissions of specific ingredients, food groups and meals.
4. SME business calculator [web based]
Calculates business-related emissions across scope 1, 2 and 3.

What user data do these calculators rely on?

Our carbon footprinting tools rely on user inputted data to make accurate calculations. Our quizzes and tracking features prompt users to input information related to personal and work activities in order to calculate the consequential CO₂e emissions of these activities.

How does this inform carbon footprint calculations?

The user inputted data act as responses within our answer matrix which has been built to incorporate a range of emissions factors and assumptions relating to the carbon consumption associated with the activities that we track. The total carbon emissions of the activities recorded in our various quizzes and calculators provides an approximation of personal or business carbon footprints.

Where do the emissions factors come from?

We have compiled data from several sources to ensure that we have accurate emissions factors to base our calculations on. These sources range from government bodies to research institutions.

How accurate are Greenr carbon calculators?

As with all scientific calculations some assumptions are made. This means that the personal and business carbon footprints displayed in the Greenr dashboards are approximations. But we strive on bringing our users the most in-depth and useful data so as to allow them to make educated sustainable choices to suit their own lifestyles and company policies



Carbon Calculator Data

Type	Calculator	Themes	User Data	Secondary Data
Personal	Onboarding quiz	General	<ul style="list-style-type: none"> Region of residence Current offsetting commitments 	<ul style="list-style-type: none"> Governmental footprints data
		Diet	<ul style="list-style-type: none"> General diet habits Spending on takeaways Food waste Considerations of locality, seasonality, organic produce, and packaging Recycling habits 	<ul style="list-style-type: none"> Diet footprints data Takeaways emissions data Food waste emissions data Diet considerations emissions data Recycling emissions data
		Personal travel	<ul style="list-style-type: none"> General transport habits Type of vehicle Flight distances, frequency, and class Travel offsets 	<ul style="list-style-type: none"> Land transport emissions factors Air transport emissions factors
		Work travel	<ul style="list-style-type: none"> Types of work travel Frequency of work travel Type of vehicle Flight distances, frequency, and class Work travel offsets 	<ul style="list-style-type: none"> Land transport emissions factors Air transport emissions factors
		Home	<ul style="list-style-type: none"> Homeworking habits Heating type Heating temperature Renewable tariffs Type of home Gas and electricity bills Electricity saving habits 	<ul style="list-style-type: none"> Energy use data Energy efficiency data Energy emissions factors
		Purchases	<ul style="list-style-type: none"> Frequency of new purchases Frequency of second-hand purchases Frequency of donation/selling goods Spending on goods and services e.g. pets, internet, video streaming, electrical devices 	<ul style="list-style-type: none"> Consumption emissions factors



Carbon Calculator Data

	Calculator	Themes	User Data	Secondary Data
Personal	Travel calculator	Walking and biking	<ul style="list-style-type: none"> Distance Transport avoided 	<ul style="list-style-type: none"> Land transport emissions factors
		Car	<ul style="list-style-type: none"> Car details/number plate Number of passengers Distance 	<ul style="list-style-type: none"> Land transport emissions factors Vehicle emissions data
		Public transport	<ul style="list-style-type: none"> Transport type Distance 	<ul style="list-style-type: none"> Land transport emissions factors
		Plane	<ul style="list-style-type: none"> Departure and arrival airport Class 	<ul style="list-style-type: none"> Air transport emissions factors Airports database
	Food calculator	Quick calculator	<ul style="list-style-type: none"> Food group portions consumed 	<ul style="list-style-type: none"> Food emissions databases
		Ingredient calculator	<ul style="list-style-type: none"> Specific ingredients and meals consumed 	<ul style="list-style-type: none"> Food emissions databases
Business	SME Calculator	General	<ul style="list-style-type: none"> Country of operations Average time spent working from home 	<ul style="list-style-type: none"> National grid intensities data
		Scope 1	<ul style="list-style-type: none"> Office gas consumption 	<ul style="list-style-type: none"> Energy emissions factors
		Scope 2	<ul style="list-style-type: none"> Office electricity consumption 	<ul style="list-style-type: none"> Energy emissions factors
		Scope 3	<ul style="list-style-type: none"> Homeworker heating and electricity tariffs Staff commuting In-work travel Hotel use Additional goods and services On-site and off-site computer servers Cloud-computer capabilities 	<ul style="list-style-type: none"> Energy emissions factors Homeworker energy use data Land transport emissions factors Air transport emissions factors Hotel emissions factors Consumption emissions factors Computer server emissions and power data



Concluding Remarks

Our personal/business emissions calculators and trackers form an ecosystem. The calculations based on user inputted data in the onboarding quiz and food/travel calculators are used to refine the accuracy of the business calculator. The business emissions report will form the basis for carbon reduction company policies, then staff participation can be determined through the personal apps onboarding quiz and carbon calculators and again is fed back to the business calculations via the Greenr dashboard.

Whilst we ask users about their offsetting activities and encourage them to offset their footprint, we still report their total carbon footprint without deducting the value of offsets. This is because we believe it is important to fully understand the impact of personal and business emissions, the sources of these emissions and where reductions can be made.

The emissions factors used to calculate all personal and business carbon footprints are dependent on the data available and will therefore be adjusted over time, this means that the emissions value calculated using our products may change accordingly.