

Carbon footprints UK average

The average UK citizen's carbon footprint in tons of CO₂*

Recreation	1.95	Holidays (except flying), leisure activities, trips out
Heating	1.49	Heating of homes and businesses
Food	1.39	Food and drink, including transportation within the UK
Household	1.47	Making, transporting and running things like fridges and cookers
Hygiene	1.34	Water heating for baths and showers
Clothing	1.00	Producing, transporting and cleaning clothes and shoes
Commuting	0.81	Travelling to and from work, by car, bus, tram or train
Aviation	0.68	Flights for pleasure and for transporting food and other goods
Education	0.49	Heating of school buildings, travel to and from school etc
Other government	0.30	Public administration and defence

The government and campaigning organisations try to present numerical information in ways that people can understand.



Produce a suitable statistical chart to display the average UK citizen's carbon footprint.

Consumption figures are per year.

* Data from Carbon Trust, 2006



Carbon footprints Cutting down

Produce a poster to show how the average UK citizen could reduce their carbon footprint.

Which activities produce the most CO₂?

Does changing your fridge, or TV, or washing machine make much difference?

Where does our food come from?

How much difference can I make by not taking my holiday abroad?

Is it better to bath or shower?

Which are the most efficient ways to travel?

Find some useful facts:

CO₂ emitted by different cars: <http://www.vcacarfueldata.org.uk/search/search.asp>

Flight CO₂ calculator: <http://www.carbonfootprint.com/>
OR <http://www.carbonneutral.com/cncalculators/flightcalculator.asp>

Energy and CO₂ cost of domestic appliances: <http://www.sust-it.net/home.php>

Being more energy efficient: <http://www.co2balance.uk.com/carbon-emission-reduction/reduce-your-co2-emissions/>



Carbon footprints How many planet earths?

The best scientific information tells us:

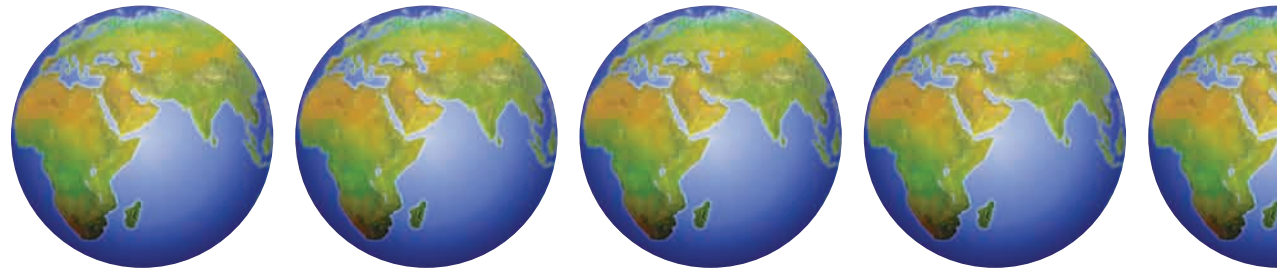
...if the world produces more than **14.5 gigatons*** of CO₂ per year there will be catastrophic global warming.

The UK average is **9.8 tons** per person.

The population of the world is about **6.7 billion****.

If everyone used as much as us, about **9.8 x 6.7 billion tons = 65.66 gigatons** would be produced.

This is about 4½ times more than is safe for our planet:



But not all countries use as much.


How many planet earths would be needed if everyone created as much CO₂ as people living in the countries shown on the worksheet?

* A gigaton is 1,000,000,000 tons

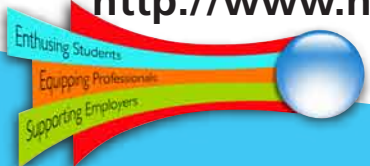
** A billion is 1,000,000,000



Carbon footprints How many planet earths worksheet

	CO ₂ emissions per person	Equivalent global CO ₂ emissions	Number of earths needed if everyone used this amount of energy	Rounded to the nearest half														
Region	tons of CO ₂	gigatons of CO ₂																
United States	19.4																	
Canada	15.9																	
Russia	10.7																	
United Kingdom	9.8	65.66	4.528	4.5														
Japan	9.6																	
South Africa	7.7																	
France	6.0																	
Turkey	3.2																	
China	2.7																	
India	0.9																	

CO₂ values from: Nationmaster (2003) CO₂ Emissions (per capita) at http://www.nationmaster.com/red/graph/env_co2_emi_percap-environment-co2-emissions-per-capita



Carbon footprints

Topic

In this topic, pupils work with statistical information to communicate key ideas connected to reducing climate change. Links are made with those who work in government and campaigning organisations to present complex numerical information to the public.

Pupils look at the carbon footprint of the average UK citizen, consider how different spheres of activity contribute to this footprint and examine ways this might be reduced. They also look at the inequity and the unsustainability of the world's current energy usage and convey this information graphically. The work might form part of a cross curricular project on sustainability.

Mathematical activities

UK average

Cutting down

How many planet earths?

Careers link-up

The short film *The Role of Ecosystems in Climate Mitigation* to be found at <http://www.unep.org/newscentre/default.asp?ct=shortfilms> gives an introduction to the issue and shows that campaigners use mathematics in their understanding of the problems of climate change.

The Maths Careers website has an Environment Section <http://www.mathscareers.org.uk/environment.cfm> with a range of mathematics related articles and links to career profiles of people using mathematics and working in the environment.

The *STEM Choices Guide on Renewables* also makes the link between careers and climate change. Emailing info@careersinstem will give access to this and all the other STEM careers resources.

Planning for teaching

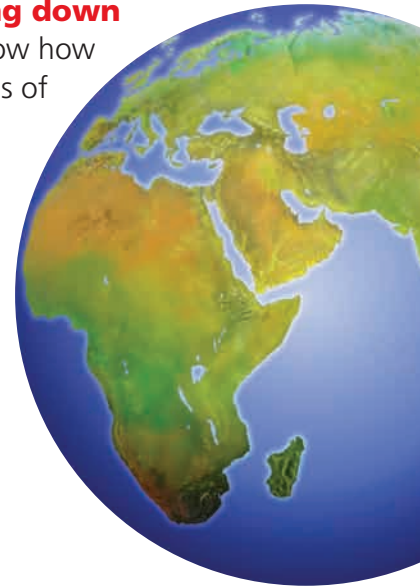
The activities are intended to be completed over a series of lessons and, for some of them, internet access is essential. A whole class discussion will introduce the pupils to the idea of carbon footprint, the amount of carbon dioxide released into the environment through human activity. Carbon footprints may relate to a particular activity, for example, flying to the United States or, as here, be concerned with an individual's total carbon dioxide generation in a year.

An excellent source for statistical data and its interpretation on the topic of climate change is a book by David MacKay *Sustainable Energy – without Hot Air* which is also available online at: <http://www.withouthotair.com/>

UK average asks the pupils to think about an effective way to display the data provided. Tons of CO₂ are used to measure the UK average footprint. To convey the idea to pupils, get them to work out how large an 8 meter cube is. This is illustrated on http://www.energyrace.com/commentary/what_does_a_ton_of_co2_look_like/ Alternatively, a ton of CO₂ would fill an average-sized house! After discussion in small groups, a plenary will help establish that a pie chart is an effective chart to use because the task involves displaying the data given as 'parts of a whole'.

Excel can be used to produce a suitable pie-chart – a more difficult task is for the pupils to draw a pie chart by hand.

Using this same data and relevant environmental websites, **Cutting down** invites the pupils to produce a campaigning poster designed to show how the average UK citizen might reduce their carbon footprint. A series of questions points to some possible areas for the pupils to consider. You may decide to use the short film *Climate heroes launch* at <http://www.unep.org/newscentre/default.asp?ct=shortfilms> for some ideas about how individuals can make a difference.



Interpreting the numerical information obtained in order to understand and use it will be challenging for many pupils and they will benefit from working in groups in order to accomplish this. Pupils can also try out and refine their poster ideas within these groups. They might present their posters in an assembly as part of a whole school discussion on climate change.

In **How many planet earths?**, pupils consider the current demands made on the earth's resources by different countries and consider what level of energy usage might be sustainable in the longer term. They may notice that the figure for the UK given here is different from the earlier one: this underlines how complex the thinking is behind any of these "headline" statistics. Pupils will need to use a calculator, round values to an appropriate number of decimal places, consider place value when dividing values in different units, and round decimal values to the nearest half unit. Large numbers are involved and you may want to adapt the activity to work with standard form. The use of a pictogram shows the potential power of a well-chosen statistical chart.

Want to know more?

Contact STEM Subject Choice and Careers
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or for more information on careers go to Maths careers at www.mathscareers.org.uk/
 or Future Morph at www.futuremorph.org/ <<http://www.futuremorph.org/>>

A Department for Children, Schools and Families initiative to promote subject choice and careers in Science, Technology, Engineering and Maths (STEM) delivered by the Centre for Science Education at Sheffield Hallam University and VT Enterprise.

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