Carbon Saving: TEACHER'S NOTES

Curriculum links

Maths – Handling data
Science – Logical thought

The Department for Energy and Climate Change (DECC) has worked out some useful conversion factors to help you calculate energy consumption in common units and to work out the greenhouse gas emissions associated with today's energy use. They regularly update these figures so check the following website for updates http://www.carbontrust.co.uk/cut-carbon-reduce-costs.

If you would like your students to calculate their own carbon footprint, then this website is very good: http://carboncalculator.direct.gov.uk/index.html.

If you would like to calculate your school's carbon footprint, then go to http://www.carbondetectiveseurope.org.

The use of fuels leads to emissions of carbon dioxide (CO_2) and small quantities of other greenhouse gases including methane and nitrous oxide. It is generally accepted that CO_2 can be used as a measurement of any greenhouse gas and its likely impact on the environment. This quantity is quoted in units of kilograms carbon dioxide equivalent ($kgCO_2e$).

Aims

- To introduce students to the principles of carbon saving.
- To show them how small changes in decision making can make a big difference to the amount of CO_2 they generate and also the amount of carbon they can save.

Resources

Copies of the worksheet (p4 and 5), calculators, pencils.

Timing

40 mins – 1 hour

Outcome

Students will start to understand how carbon emissions are calculated.

Differentiation

Gifted and talented students will understand that for any given gas the equivalent quantity of CO_2 that would be needed to give the same greenhouse gas affect can be calculated.

Task

The introduction to the lesson could include asking the students how they came to school that morning. The students could rank their carbon footprint from zero carbon (walking/bike) to public transport, to car and even private jet! They could also subdivide the car section giving a heavier weighting to bigger engine, older cars and 4x4s.

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Using the energy conversion factor for the electricity in the national grid only, the students can do a simple calculation to work out how many kilograms of carbon dioxide equivalent.

Answers

Table 1. Electricity

Energy Conversion factor	UNITS	kgCO$_2$e per unit
Grid Electricity	kWh	0.545*

*Source: DUKES Digest of UK Energy Statistics 2011(DECC)

Use Table 1 to answer the following:
1. An average tumble drier uses 3.5kWh per cycle. The carbon output for one cycle would therefore be:
Answer: 3.5 x 0.545 = 1.91kg CO$_2$e per cycle

2a) If you put your jeans into the tumble drier 4 times a week how much CO$_2$ would you produce?
Answer: 1.9 1x 4 = 7.64kg CO$_2$e

2b) How much CO$_2$ would you produce in a year?
Answer: 7.64 x 52 = 397.28kg CO$_2$ e

3. An average hair drier uses 1400W or 1.4kW per hour.
If you wash and dry your hair every day how much CO$_2$ would you produce in one year?
Answer: 1.4 x 0.545 = 0.763 x 365 = 278.495kg CO$_2$e

Use Table 2 to answer the questions that follow. You can fill out **Table 2a** to help you.

Table 2. Transport

Passenger transport Conversion factor	UNITS	kgCO$_2$e per unit
Average petrol car	km	0.2119
Average diesel car	km	0.1967
Coach	km	0.0307
Rail	km	0.0565
Domestic flight	km	0.1889
Long haul flight	km	0.1246

Table 2a.

Passenger transport Conversion factor per person	UNITS	kgCO$_2$e per unit	Total amount of kgCO$_2$e
Average petrol car	854.56	0.2119	181.081
Average diesel car	854.56	0.1967	168.091
Coach	854.56	0.0307	26.235
Rail	854.56	0.0565	48.283
Domestic flight	629.97	0.1889	119.001

4. Imagine you are going to go to Aberdeen University and you live in Cardiff. The distance overland is 854.56km, by air the distance is 629.97k. Which mode of transport produces the least amount of carbon dioxide equivalent?
Answer: Coach travel uses the least amount of CO_2e

5. You are going on holiday, but you are worried about your carbon footprint. Do you decide to fly long haul to New York (5567.11km), go to Paris (465.91km) by train or go to Glasgow (647.12km) by petrol car?
Answer: Taking the train to Paris would be the lowest carbon choice.
New York: 5567.11 x 0.1246 = 693.662 kg CO_2e
Paris: 465.91 x 0.0565 = 26.324 kg CO_2e
Glasgow: 647.12 x 0.2119 = 137.125kg CO_2e

Carbon Saving: WORKSHEET

The Department for Energy and Climate Change (DECC) has worked out some useful conversion factors to help you calculate energy consumption in common units and to work out the greenhouse gas emissions associated with energy use.

Table 1. Transport

Energy Conversion factor	UNITS	kgCO$_2$e per unit
Grid Electricity	kWh	0.545

Use the information in Table 1 to answer the following questions:

1. An average tumble drier uses 3.5kWh per cycle. The carbon output for one cycle would therefore be:

2. a) If you put your jeans into the tumble drier 4 times a week, how much CO$_2$ would you produce?

   b) If you put your jeans into the tumble drier 4 times a week, how much CO$_2$ would you produce?

3. An average hair drier uses 1400W or 1.4kW per hour. If you wash and dry your hair every day, how much CO$_2$ would you produce in one year?

Use Table 2 to answer the questions that follow. You can fill out **Table 2a** to help you.

Table 2.

Passenger transport Conversion factor	UNITS	kgCO$_2$e per unit
Average petrol car	km	0.2119
Average diesel car	km	0.1967
Coach	km	0.0307
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Long haul flight	km	0.1246

Table 2a.

Passenger transport Conversion factor	UNITS	kgCO$_2$e per unit	Total amount of kgCO$_2$e
Average petrol car			
Average diesel car			
Coach			
Rail			
Domestic flight			

1. Imagine you are going to go to Aberdeen University and you live in Cardiff. The distance overland is 854.56km, by air the distance is 629.97km. Which mode of transport produces the least amount of carbon dioxide equivalent?

2. You are going on holiday, but you are worried about your carbon footprint. Do you decide to fly long haul to New York (5567.11km), go to Paris (465.91km) by train or go to Glasgow (647.12km) by petrol car?

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