

# Shout about climate solutions

Activity pack for Key Stage 3: 11-13 year-olds



**Friends of  
the Earth**

# Shout about climate solutions

## Activity week

Shout about is Friends of the Earth's annual activity week for 11-13 year-olds. It invites young people, through their school or youth group, to learn more by getting active on environmental issues. 6-10 November 2006 is Shout about climate solutions week.

### Why climate change?

Climate change is our generation's biggest challenge with potentially catastrophic impacts for the environment and millions of people worldwide. Most scientists agree that global warming is being caused by human activity – chiefly the amount of greenhouse gases being released into the atmosphere since the Industrial Revolution. In order to stop climate change spiralling out of control, scientists warn that we need to make big cuts in greenhouse gases, especially carbon dioxide – and that will require shifting economies away from dependence on fossil fuels like oil, coal and gas. Such changes to the way we power industry, travel and keep our homes warm, will involve everyone, from governments to businesses to organisations and individuals.

### Why are we focusing on young people?

The people who will be most affected by climate change are today's children. They therefore need to understand the issues and their own potential to contribute to the solutions through active citizenship and the positive choices they can make. Friends of the Earth's Youth and Education Programme provides ways for young people to explore sustainable development, citizenship (global citizenship in Wales) and environmental issues, either via teachers and youth workers or on their own.

### About this resource

The *Shout about* activity pack has been developed with input from teachers and climate change experts. This pack looks at climate change and explores its main causes: carbon dioxide (CO<sub>2</sub>) emitted from transport, heating and electricity generation. The information and activities enable young people to make the connection between their own lives and the wider problem; to look at the solutions that already exist and how the Government, business and they themselves can be part of bringing these solutions to life.

### Solutions to climate change

Tackling climate change by reducing carbon emissions means burning less fossil fuels. We can do this by saving energy and using cleaner, safer fuel – from renewable sources like wind, solar and hydro power. Focusing on how this can be done in their own schools, communities and homes is a useful starting point for young people to develop their understanding and ideas. To find out more about climate change and Friends of the Earth's analysis of the solutions visit [www.foe.co.uk/campaigns/climate](http://www.foe.co.uk/campaigns/climate) or see the useful resources section of this booklet.

### Contents:

- Educators' notes including a list of useful resources
- Four booklets with information and activities on the following topics:
  - Booklet 01 Climate change: causes and effects
  - Booklet 02 Electricity: problems and solutions
  - Booklet 03 Heating: problems and solutions
  - Booklet 04 Transport: problems and solutions
- Competition details and entry form
- DVD containing extra visual aids on climate change and solutions

### Let us know how you get on

Whether you run a whole week of activities or just a day, we'd love to hear about it. Tell us what you are planning in advance and we might visit you with a film crew or professional photographer. Last year your stories featured in our *Shout about* review magazine and on our website [www.foe.co.uk/learning](http://www.foe.co.uk/learning).

Feedback from 2005 participants was invaluable in developing this year's pack, so please spare a few minutes to tell us what you think about Shout about 2006

shouts from last year

“

*The most important thing is to run a Shout about activity week, because without it the children won't know what is going on in the world*

Neil Crumpton Science Teacher,  
Mountfitchet High School

*The project has helped to boost interest in our Environment Club*

Shauni O'Neill, 12 Loreto College

”

#### Shouts to...

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Friends of the Earth inspires solutions to environmental problems, which make life better for people

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June 2006



## Pull out and pin up

Friends of the Earth  
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 Tel: 020 7490 1555

Contact us for further information on Shout about and climate change or to ask about our other campaigns and education resources.

Friends of the Earth Cymru  
[www.foe.co.uk/cymru/](http://www.foe.co.uk/cymru/)

## Climate change

Intergovernmental Panel on Climate Change (IPCC)  
[www.ipcc.ch/pub/un/syrenng/spm.pdf](http://www.ipcc.ch/pub/un/syrenng/spm.pdf)

Good for teachers, if you want to find out more about climate change from the leading authority. This report was written in 2001. The next one is due in 2007 but you can also read an interim report by the International Scientific Steering Committee in 2005 available at [www.stabilisation2005.com/Steering\\_Committee\\_Report.pdf](http://www.stabilisation2005.com/Steering_Committee_Report.pdf)

BBC Weather Centre  
[www.bbc.co.uk/climate/](http://www.bbc.co.uk/climate/)  
 Presents the evidence on climate change and talks about impacts, adaptation and policies. The links and chats section lets you listen to interviews with some key people in the climate change debate.

Department for Environment, Food and Rural Affairs  
[www.defra.gov.uk/environment/climatechange/schools/](http://www.defra.gov.uk/environment/climatechange/schools/)  
 Includes ideas for discussions and debates about climate change with sections for 7-11 year-olds, 12-16 year-olds and parents/teachers.

Science Museum  
[www.sciencemuseum.org.uk/antenna/climatechange/](http://www.sciencemuseum.org.uk/antenna/climatechange/)  
 Presents the facts about climate change in an easy-to-follow format, from breaking down the jargon to explaining the local and global impacts of climate change. Includes an interactive game to show how our daily living affects the planet and some great information about future technologies.

## Useful resources

### Renewable energy

British Wind Energy Association  
[www.bwea.com/edu/](http://www.bwea.com/edu/)  
 Extensive information about wind energy and wave and tidal. Includes resources for Key Stages 1-4 and a section for students/educators where you can learn how to calculate the energy in wind, how to extract this energy and discover where wind farms are in the UK.

Energy Saving Trust  
[www.est.org.uk/](http://www.est.org.uk/)  
 Information, practical advice and help with curriculum resources on energy efficiency. Find out about its Energy Certification for Schools programme and funding opportunities, and read some interesting case studies from community groups and schools.

Department of Trade and Industry's renewable energy education site  
[www.dti.gov.uk/renewables/schools/](http://www.dti.gov.uk/renewables/schools/)  
 Designed for educators and young people, with cross-curricular resources for 5-11 year-olds, science materials for 11-16 year-olds and geography materials for 11-18 year-olds. Includes information and case studies for the eight major types of renewable energy.

### Nuclear power

Nuclear Industry Association – Energy Choices  
[www.energy-choices.com/](http://www.energy-choices.com/)  
 Established by the NIA in response to developments on the energy debate in the UK, this site provides facts, figures and reference material, setting nuclear energy in the context of other energy sources.

Campaign for Nuclear Disarmament  
[www.cnduk.org/](http://www.cnduk.org/)  
 CND's report *Nuclear power: not worth the risk!* provides facts about nuclear energy.

National Energy Foundation  
[www.nef.org.uk/powered/](http://www.nef.org.uk/powered/)  
 For teachers and children who want to know more about alternative sources of energy. It offers three renewable energy kits for schools/groups, with activity sheets for Key Stages 2-4.

Community Renewables Initiative  
[www.countryside.gov.uk/newenterprise/economies/CRI.asp](http://www.countryside.gov.uk/newenterprise/economies/CRI.asp)  
 The CRI helps schools, businesses and whole communities devise renewable energy projects. Also offers help with funding.

Centre for Alternative Technology (CAT) [www.cat.org.uk/education/](http://www.cat.org.uk/education/)  
 Organise a school/group visit to the centre or make use of CAT's information service and online resources. Covers everything from renewable energy, environmental building and energy efficiency to organic growing and alternative sewage systems.

### National Curriculum /education

Teachernet  
[www.teachernet.gov.uk/wholeschool/sd/](http://www.teachernet.gov.uk/wholeschool/sd/)  
 Developed by the Department for Education and Skills as a resource to support the education profession, the website provides information about sustainable development in the National Curriculum. Includes energy focus pages which talk about solutions in schools and provide case studies.

Create  
[www.create.org.uk/schools/default.asp](http://www.create.org.uk/schools/default.asp)  
 With a dedicated area for teachers, and a kids' zone, this website offers information about energy and climate change. Includes downloadable lesson plans, newsletters, an energy monitoring chart and information on how energy education relates to the National Curriculum.

## Booklet 01

# Climate change: Causes and effects

## What is climate change?

Our planet's climate is changing. Temperatures are increasing, water levels are rising and the ice-caps and glaciers are melting. Scientists now agree this is mainly a result of the increasing amounts of carbon dioxide (CO<sub>2</sub>) released into the Earth's atmosphere from human activity – principally the burning of fossil fuels to provide energy. Almost 26 billion tonnes of CO<sub>2</sub> are released globally each year. CO<sub>2</sub> can stay in the atmosphere for up to 200 years, heating up the planet. If we continue to release CO<sub>2</sub> into the atmosphere at the current rate the effects will be catastrophic.

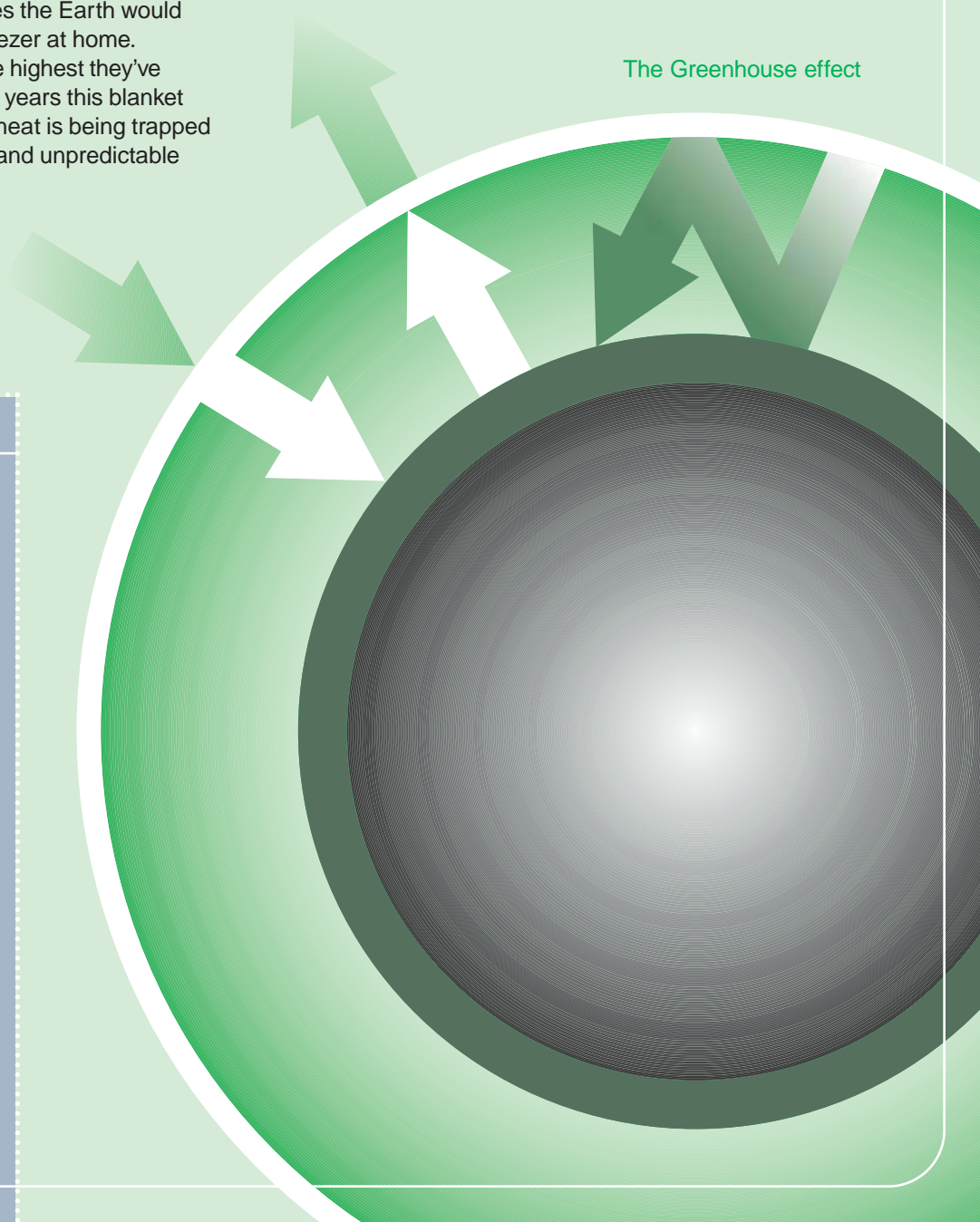
## The greenhouse effect

The greenhouse effect is the term used to describe the process by which the Earth's atmosphere keeps our planet warm. The gases in the atmosphere, including carbon dioxide, act like a blanket. This allows sunlight in but does not let all the heat produced by the sunlight back out. Without this layer of gases the Earth would be -18°C, that's as cold as your freezer at home. However, with carbon emissions the highest they've been for hundreds of thousands of years this blanket has become thicker and too much heat is being trapped inside, resulting in global warming and unpredictable weather patterns.

## Where do our emissions come from?

In 2005 the UK emitted around 587million tonnes of CO<sub>2</sub> into the atmosphere. Most of our emissions come from transport, heating and electricity generation. Every time we drive a car or hop on a plane we are contributing to the increase in CO<sub>2</sub> in our atmosphere. In our homes we use energy to keep our houses warm and to heat water for our baths and showers. We also use lots of electricity in our homes: to power light bulbs, televisions, toasters and fridges. Finding ways to reduce our energy use, as well as alternatives to burning fossil fuels, is going to be vital if we are to reduce the effects of climate change.

The Greenhouse effect



### Glossary

**Climate** – the pattern of weather.

**CO<sub>2</sub>** – chemical symbol for the gas carbon dioxide, made up of one carbon and two oxygen molecules.

**Fossil fuels** – oil, coal and natural gas, are all types of fossil fuel formed over millions of years from plant and animal matter that has been trapped and compressed underground. Petrol and diesel are produced by refining oil.

**Greenhouse gases** – carbon dioxide, methane, nitrous oxides and some other gases that wrap around the Earth like a blanket trapping heat in.

**Malaria** – serious, sometimes fatal, disease mainly confined to Africa, Asia and Latin America, transmitted by female mosquitoes.

## Booklet 01

# Climate change: Causes and effects

## Effects

Climate change and the resulting erratic weather patterns are not just affecting the environment: they are affecting people all over the world. Just 2-3 degrees centigrade of warming could mean up to 300 million more people will be at risk of malaria, 3 billion people will face water shortages and 100 million people will be more at risk from coastal flooding. But people are already facing the consequences of climate change both locally and globally. If climate change continues on its current path we will see more events like the flooding in Boscastle, Cornwall, where many people were left homeless, and Hurricane Catarina in southern Brazil which killed people.

In August 2004 devastating flash floods hit Boscastle, Cornwall. Michael Henderson's home was flooded. She told the BBC:

*I was so shocked to see the floodwaters arrive, we had to evacuate from our house just five minutes before the big wave hit the side of the wall. It was terrifying to see such powerful waves, the first thing that came to my mind was The Day After Tomorrow it was as if this freak weather system is something of our doing.*

In March 2004 Hurricane Catarina the first hurricane in the history of the South Atlantic hit southern Brazil. The gusts of wind were terrifying, the roofs were torn off, the river submerged entire towns, and in the sea the waves grew up to 5 metres high. Terezinha, who lost her husband, says:

*We had no idea what was going on... Two trees fell on our house, and we went running to the neighbour's house. When the wind stopped [the eye of the hurricane], we returned home to get blankets and sweaters. The tree that was on top of the house, when the wind came up again, fell on top of the car and killed my husband. From then on I didn't see anything else because I fainted.*

Terezinha da Rocha Quirino, Araranguá/SC

## Tipping point

There may be a point beyond which climate change cannot be halted. Imagine pushing a car towards the edge of a cliff. You reach a point when the car is so far over the edge that even if you stopped pushing it would still fall. It's the same with climate change – scientists are concerned that there may be a tipping point where the changes we make to the climate will become irreversible and could be catastrophic. Some scientists predict that a temperature increase of just 1 degree could cause extensive coral bleaching. Others think a rise of 2-3 degrees could cause the melting of the entire Greenland ice sheet which would cause the world sea level to rise by 7 metres.

No one knows exactly where the tipping point is and because CO<sub>2</sub> stays in the atmosphere for up to 200 years, we can't wait for the crisis point to take action; by then it'll be too late. We have to take action now.



Hurricane Catarina left many people without homes and shelter.

**Booklet 01****Climate change: Causes and effects****Activities****Activity 1: How is our climate changing?****Time:** 45 minutes**What you need:** temperature records, graph paper, and stationery**Curriculum links:** Geography, Maths, ICT.**Learning aim:** to understand how the climate is changing, to produce graphs.

Plot graphs either on paper or on a computer of the mean temperature in the UK/globally over the last 200 years. How have temperatures changed?

England temperature records can be found at:

[www.met-office.gov.uk/research/hadleycentre/CR\\_data/Daily/HadCET\\_act.txt](http://www.met-office.gov.uk/research/hadleycentre/CR_data/Daily/HadCET_act.txt)

UK/global temperature graphs can be found at:

[www.ukcip.org.uk/climate\\_change/](http://www.ukcip.org.uk/climate_change/)

You can then research and plot predicted climate change for next 100 years in the UK/for different countries around the world. Look at mean temperature.

**Activity 2: Where does your electricity come from?****Time:** 45 minutes**What you need:** internet access/information about local power station.**Curriculum links:** Geography, Citizenship (PSE in Wales), English, Science.**Learning aim:** for children to investigate where the electricity they use comes from.

Children to generate a list of all the items they use that are powered by electricity. Discuss how big this list is and asks if anyone knows where the electricity they all use daily comes from. Children to then find their nearest power station and investigate:

- Whether it is gas fired or coal fired
- What size area it supplies
- How old it is
- Whether they have an emissions statement.

**Discussion:** Re-examine list of items used that are powered by electricity. Which objects could be powered by alternative methods, such as using a solar charger for a mobile phone?

**Activity 3: Effects of climate change: guesstimates****Time:** 20 minutes**What you need:** questions (overleaf) and answers (below).**Curriculum links:** Science, Geography.**Learning aim:** to understand the scale of the effects of climate change.

In small groups children to guess the answer to the questions below (all answers are numbers). Mark each group's answer on a line. For each question place a numeric value at each end of the line (the scale needed for each question is indicated below).

Alternatively run a piece of string along the length of the room, marking the relevant scale at each end. Children can answer individually by standing on the line.

**Answers**

1. 100 per cent (Scale 0-100)
2. 50 per cent (Scale 0-100)
3. 6°C (Scale 0-10)
4. 1 million (Scale 0 – 1 million)
5. 100 million (Scale 0-100 million)
6. More than 150 million (Scale 0-200 million)
7. 150,000 people (Scale 0-200,000)
8. 2 million (Scale 0-5 million)
9. 500 years (Scale 0-1,000)

**1: Extension activity**

Discussion about what else might be indicators for how the climate is changing. Prompt: sea levels, rainfall etc... Set up a weather station that monitors temperatures in your local area.

**2: Extension activity**

Go on a field trip to your local power station or alternatively invite an employee from the local power station to come and give a talk.

**3: Extension activity**

Research can be done on the web to find out what the impacts of climate change are in your area. You can find out what the effects of climate change will be on different parts of the UK using the interactive map at: [www.ukcip.org.uk/climate\\_impacts/location/.asp](http://www.ukcip.org.uk/climate_impacts/location/.asp) Indicators of climate change in the UK (including a set of graphs mapping recent changes) can be found at: [www.ecn.ac.uk/CCI/cci.asp](http://www.ecn.ac.uk/CCI/cci.asp)

## Climate change: Causes and effects

Effects of climate change Guesstimate 

1

If temperatures rise as little as 2 degrees by the end of the 21st century what percentage of summer sea ice is predicted to have melted away?

2

By 2025 what percentage of the world's population will be living in areas at risk from storms and other weather extremes?

3

If emissions are left unchecked between 1990 and 2100 up to how many degrees Celsius is the temperature predicted to rise?

4

By as early as 2050, how many species could be extinct?

5

By the 2050s how many more people could be living in countries with extreme water stress due to climate change alone?

6

By 2050 how many people could become environmental refugees?

7

In the year 2000 how many people are estimated to have died as a result of climate change?

8

How many homes in England and Wales are currently at risk from flooding?

9

During August 2003, between 22,000 and 35,000 people died due to a heat wave across Europe. The summer of 2003 was Europe's hottest for how many years?

# Electricity: problems and solutions

## How is electricity produced?

Energy is something which cannot be created or destroyed but is transferred or transformed from one form to another. These forms of energy include heat energy, kinetic or movement energy, light energy, sound energy and electricity.

Electricity is a useful form of energy and we use it to power many things in our lives such as kettles, fridges and televisions. Most electricity is generated in power stations and then transported to people's homes along cables. In power stations heat energy is used to boil water and is transferred into kinetic energy as steam is produced. This steam turns a turbine and the kinetic energy is then transferred into electricity.

## What's the problem?

The problem we face is that power stations use the heat energy from burning fossil fuels like coal, oil or gas. When fossil fuels are burnt, they release CO<sub>2</sub> into the atmosphere. In the UK generating electricity accounts for 29.7 per cent of CO<sub>2</sub> emissions producing a huge 174 million tonnes of CO<sub>2</sub> per year. We need to find alternative ways of generating electricity that do not produce as much CO<sub>2</sub>.

## What needs to be done?

Some commentators and politicians suggest a solution is to build nuclear power stations, because they don't produce CO<sub>2</sub> as they make electricity. However, nuclear power produces radioactive waste and we do not yet know how this waste will be safely disposed of or what the impacts of climate change and land erosion will be on waste that remains radioactive for thousands of years.

There is a more significant reason why more nuclear power stations will not help much in combating climate change. Research suggests that even doubling nuclear capacity would only result in an 8 per cent cut in CO<sub>2</sub> emissions from 1990 levels although we need to cut emissions by 60-80 per cent. The UK Government's independent watchdog on sustainable development, the Sustainable Development Commission, has concluded that the contribution that nuclear power could make to CO<sub>2</sub> reduction targets would be limited.

There are other ways to generate electricity without producing CO<sub>2</sub> – by using renewable energy sources such as the sun, wind and waves. Plus we can reduce our emissions by simply using less energy, which can be as easy as remembering to turn off the light when we leave a room.

### Glossary

**Energy transfer** – energy changing from one form to another, eg. from heat energy to kinetic energy.

**Fossil fuels** – oil, coal and natural gas, are all types of fossil fuel formed over millions of years from plant and animal matter that has been trapped and compressed underground. Petrol and diesel are produced by refining oil.

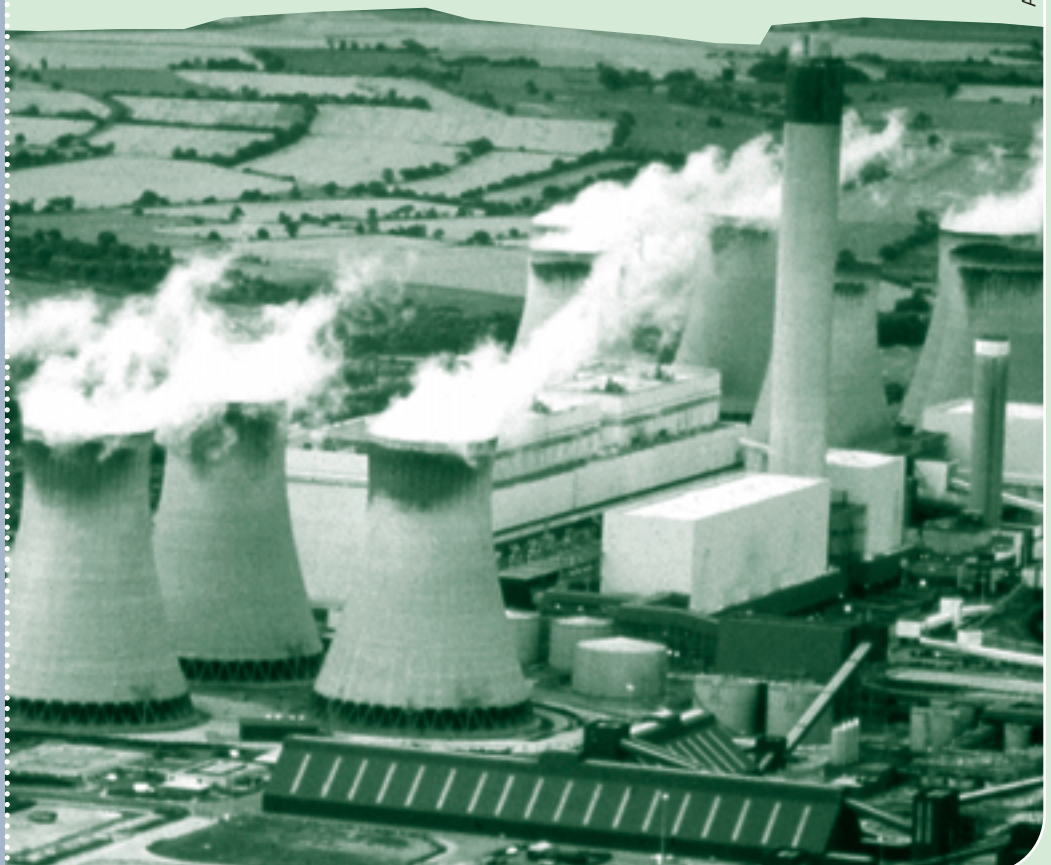
**Kinetic energy** – the energy of an object due to its motion.

**Tidal lagoon** – renewable energy source that harnesses the potential energy of the tides

**Uranium** – a naturally occurring heavy metal, the main fuel used to create nuclear energy.

**Decommissioning** – the process of closing down and removing a nuclear reactor after its useful life has come to an end.

**Carbon dinosaur:** around 33 per cent of our electricity is still produced from coal burnt in old, inefficient power stations which make a massive contribution to climate change.



## Booklet 02

# Electricity: problems and solutions

## What are the solutions?

Government advisers say Britain could generate up to 87 per cent of our electricity from renewable sources.

Britain is Europe's windiest country and the wind blows hardest when we need energy the most – during peak daytime periods and throughout winter. We already use around 1,300 wind turbines in the UK to generate electricity. That's not many compared to Germany's 16,000. Building more both on land and offshore would help reduce CO<sub>2</sub> emissions significantly.

Tidal lagoons have the potential to provide 6 per cent of UK electricity by harnessing the power of the tides. The lagoon is an area of water cut off from the rest of the sea. When the tide goes out the lagoon remains filled with sea water creating a difference in water levels between the sea and the lagoon. The water inside the lagoon is then released through turbines, generating electricity as it flows back to the sea. The lagoon is shut again until the tide has risen, when there is a large difference in water levels it is opened and this time the sea water rushes into the lagoon, again generating electricity.

Tidal lagoons work best where there is a big difference between high and low tide. The UK has the second highest tidal range in the world.

But it's not just about Government utilising renewable energy sources. Each of us can do things now to use less energy.

Most of us use electricity without even realising it. When we leave our televisions or stereos on standby they are still using electricity. In fact, we waste around seven per cent of the electricity in our homes in this way. We need to make sure off really means off. You save energy every time you turn the television off from the mains rather than by using the remote control.

There are lots of energy-saving products around. Energy-efficient light bulbs – compact fluorescent bulbs – last 10 times longer than a standard bulb and use a third of the electricity. If every household in the UK installed just three, we'd save enough energy in a year to light the UK's streets.

## What can you do?

Start saving energy at home and at school by making sure you switch things off instead of leaving them on standby. Turn the lights off when you leave a room and ask your friends and teachers to do the same.

Some schools are going even further, applying energy-saving measures and installing their own renewable energy systems.



Brill CE Combined School

Brill school generates enough electricity to power the equivalent of five and a half homes.

shout about **real life stories**

When the lights at Brill Church of England Combined School in Buckinghamshire needed changing they chose to replace them with energy-saving light fittings and sensor switches. But the school didn't stop there. The greening of Brill School became a whole-community project involving the pupils, parents, teachers, governors and members of the local community. The school now has a wind turbine, solar panels, a ground-source heat pump and a meter that enables pupils to monitor the usage of electricity, water and oil every half hour. Head teacher Chris Hirst, says:

“ *The children have learnt a great deal about climate change and how to prevent it. They are very enthusiastic and are inspiring their friends and family to do their bit for energy saving.* ”

The school has saved over £1,000 on its electricity bill and reduced CO<sub>2</sub> emissions by 10.7 tonnes a year and generates enough to power the equivalent of five and half homes.

If you want your school/youth group to get involved Energy certification for schools offers lots of helpful information: [www.est.org.uk/schools/](http://www.est.org.uk/schools/)

# Electricity: problems and solutions

## Activities

### Activity 1: How is our climate changing

**Time:** 30 minutes

**What you need:** Pens and paper, collection of devices that work by transforming energy from one form to another (such as wind up toys, solar powered calculator, light up yo yo)

**Curriculum links:** Science

**Learning aim:** Children to understand how energy is transferred from one form to another.

Look at the objects and ask children to identify the original source of energy and what it is transferred into. For example a wind-up toy transfers potential energy into movement (kinetic) energy.

Create energy transfer diagrams for how electricity is produced.

### Activity 2: Renewable energy solutions

**Time:** 60 minutes

**What you need:** Internet access, library access, pens, paper, and junk modelling material.

**Curriculum links:** Art and Design, English, Citizenship (PSE in Wales), Science, Geography, ICT.

**Learning aim:** Children to research and discuss a current renewable energy source.

As a class list as many forms of renewable energy as possible, eg solar panels, wave and tidal energy, tidal lagoons, wind energy, micro-generation and biomass.

Split into small groups. Each group should use the internet and library to research a form of renewable energy and create an annotated diagram or 3D model and a list of pros and cons for each type of renewable energy source. You could also include how much it costs, jobs created, impact on area in which the energy source is based and the energy used in the construction phase for each.

### Activity 3: What can you do?

#### PR campaign: connecting the problem with individual actions

**Time:** 2 x 60 minute lessons

**What you need:** Background information provided overleaf, postcard pictures, art materials, if possible digital cameras, animation equipment, editing software (get advice from your local City Learning Centre)

**Curriculum links:** English, Citizenship (PSE), Science, Art, ICT.

**Learning aim:** Children to understand the link between their actions and climate change. Children to use imaginative language and images to communicate a complex scientific concept.

In groups, students are asked to act as a public relations company. The brief is to design a campaign to raise people's awareness of the link between their personal electricity use (behaviour and actions) and climate change.

The target age group is 11-16. The campaign could include ideas sheets for a poster or billboard image, a television advert and a leaflet.

Present the campaign concept to a panel of students and teachers to decide who wins the contract.

#### 1: Extension activity

Create simple electrical circuits using batteries, wires, buzzers and lights. Look at how the electricity is transformed into heat, light and sound energy in the circuit.

#### 2: Extension activity

Imagine you are government ministers responsible for setting next year's energy budget. Using the information collected in this activity, including the price of each energy resource, debate how to spend your £20 million energy budget. Don't forget other impacts of each energy source such as job creation and impact on people living nearby. This could be followed up with a real-life letter to the Energy Minister, a local MP or newspaper on the subject.

#### Extension activity

Build a small-scale wind turbine [www.re-energy.ca/t-i\\_windbuild-1.shtml](http://www.re-energy.ca/t-i_windbuild-1.shtml)

#### 3: Extension activity

Turn the ideas sheets into reality and run a public awareness campaign within your school / youth group or wider community through displays at the local library.

## Electricity: problems and solutions

### What can you do?

### PR campaign: connecting the problem with individual actions



#### Background information

Attitude surveys have pointed out that there is a growing awareness among people of climate change and its causes. In one survey 85 per cent of people asked said they were either fairly or very convinced that the Earth's climate and weather patterns were changing; whereas seven out of 10 thought climate change is a result of human activities. (Defra)

The problem is that some people don't see the link between their actions (ie switching a kettle on for a hot drink) and the environmental impact of this. And others do not believe that they can make a difference by taking individual action:

“

*6 out of 10 Britons think that global warming would best be tackled at a global level... compared to only one tenth of people (9 per cent) who think it would be best tackled by individual homes.*

*Barely half (52 per cent) of Britons think that changing their own behaviour would have any impact on climate change. However, a huge majority (85 per cent) claim that they would be prepared to change the way they live in order to lessen the impact of global warming.*

(BBC/ICM poll, July 2004)

This activity is an opportunity for you to explore the link between individual actions and climate change and to find ways of telling other people that what they do really can make a difference.

”

## Booklet 03

# Heating: problems and solutions

## How do heating systems work?

Many houses have either gas or electric central heating to keep the house warm and provide hot water for baths, showers and washing up. They work by heating water in a tank and pumping it into pipes. These pipes connect to radiators around the house and to taps. Eventually the water goes along the pipes and back into the boiler ready to be reheated. In a gas water heater the water is heated by a gas burner and in an electric water heater the water is heated by electric filaments. Both methods release carbon dioxide into the atmosphere. The gas water heater releases CO<sub>2</sub> when the gas is burned and the electric water heater releases CO<sub>2</sub> if fossil fuels are burnt at the power plant where the electricity is generated.

## What's the problem?

The average home in the UK generates just over 6 tonnes of CO<sub>2</sub> per year. Boilers account for around 60 per cent of these CO<sub>2</sub> emissions. We need to reduce this contribution our homes are making to climate change. Many UK homes have poor insulation, draughty single-glazed windows and doors and inefficient heating systems. This means we waste vast quantities of energy attempting to keep homes warm that are literally leaking heat.

## What needs to be done?

We need to reduce the CO<sub>2</sub> emissions produced from heating our homes, by using less heat, reducing the amount of heat we waste and creating more efficient heating systems. If we waste less, we will need less. Energy consumption and CO<sub>2</sub> emissions could be reduced by 80 per cent in new homes if we take into account energy efficiency when building them.

Around a third of heat escapes from houses when they are not properly insulated

### Glossary

**Cavity walls** – a wall built or arranged to provide an air space within the wall (with or without insulating material).

**Double glazing** – windows with two panes of glass and a space between them which reduce heat loss.

**Insulation** – providing a barrier for the flow of energy, in this case preventing heat energy from escaping.

**Energy efficiency** – wasting as little energy as possible

**Passive solar heating** – the use of the sun's energy to heat a house, through careful building design.



# Heating: problems and solutions

## What are the solutions?

We can all use less heat. Lots of us leave the heating on when we are out of the house to make sure it's warm when we return, but we could set the timer to turn it off 30 minutes before we leave the house and come on again 30 minutes before we are due back. Another way to use less heat is to turn down the thermostat. Did you know that if you turn your central heating thermostat down by one degree you could save up to £30 a year?

As well as using less heat we can make sure we waste less. Around a third of heat escapes from houses when they are not properly insulated. Have you ever noticed in winter in the same street, on some houses snow has settled on the roof but on others the snow has melted? One reason the snow may have melted is from poor insulation allowing lots of the house's heat to escape through the roof. By insulating lofts and cavity walls you can keep more heat inside the house. We can also use draft excluders to block gaps where heat might escape and replace old single-glazed windows with double glazing to help keep heat in.

But it's not just about making sure the houses we have keep in as much heat as possible: we also need to make sure new houses are more energy efficient. Authorities in Germany, Sweden, Switzerland and Canada are already planning ahead; from 2020 they expect to be providing mass housing that consumes no fossil fuel – at no extra building cost.

As well as well-insulated homes we can also keep houses warmer by designing houses that use alternative renewable energy sources such as the sun's energy. By making sure windows and conservatories are south-facing, and installing solar water heating, we can use passive solar heating – ie use the sun's energy to heat a house.

## What can you do?

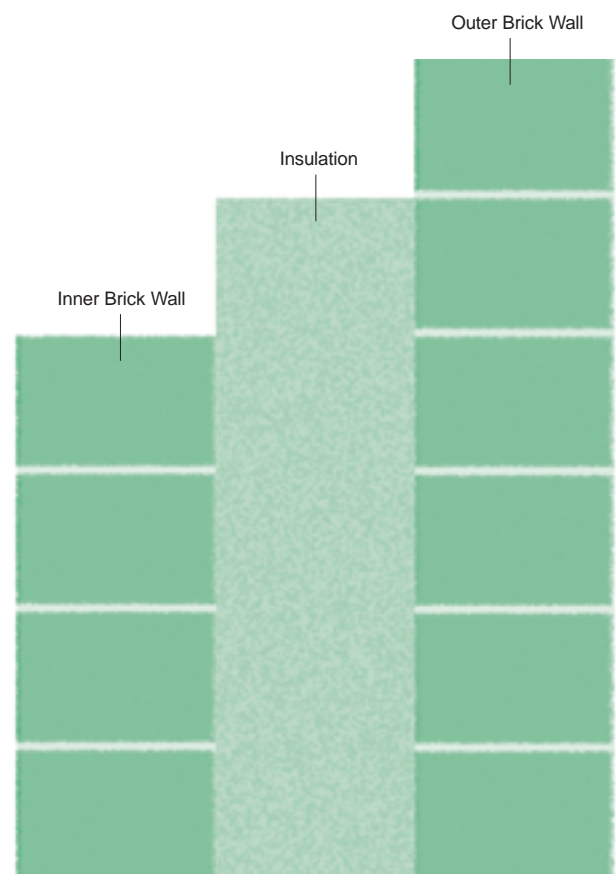
Every day there are small things you can do to make sure you are using or wasting less heat. If you're cold put a jumper on rather than turn the heating up. If you're hot turn the heating off before you decide to open the windows. Do you have any draughty windows or doors at home? Use draft excluders to keep the heat in.

Think about how much hot water you are using each day. Try taking showers instead of baths – (as long as it's not a power shower) they use less water. When you make a cup of tea or boil the kettle for cooking don't overfill it. By only heating the water you need you will not waste electricity.

By using and wasting less heat we can reduce our emissions and the effects of climate change.



Turning down the central heating could save up to £30 a year.



Cavity wall

# Heating: problems and solutions

## Activities

### Activity 1: What's the problem? / What makes a good insulator?

**Time:** 45 minutes

**What you need:** plastic bottles, thermometers, different insulators and conductors – eg silver foil, cotton wool.

**Curriculum links:** Science, Maths.

**Learning aim:** Children to understand how insulation can reduce unwanted energy transfer ie keep heat in (can be done individually or in small groups).

Discuss the concept of insulators and conductors.

Fill four plastic bottles with hot water. Wrap each bottle in either an insulator or conductor. (Good conductors include different metals and silver foil; good insulators include glass, wood and plastic.)

Take the temperature of the water every five minutes. Plot graphs showing the temperature of the water. Compare the results of each bottle. Which materials were better at keeping the water hot?

### Activity 2: What are the solutions? Design an energy-efficient house.

**Time:** 45 minutes

**What you need:** computers and internet access, stationary, information and activity sheet overleaf.

**Curriculum links:** Science, CDT, ICT, Art & Design.

**Learning aim:** Children to understand how we can be energy efficient when designing and building a house.

In small groups, design an energy-efficient house.

Try these websites for some handy hints

[www.greenbuilder.com/sourcebook/PassSolGuide1-2.html](http://www.greenbuilder.com/sourcebook/PassSolGuide1-2.html)

[www.esru.strath.ac.uk/EandE/Web\\_sites/01-02/RE\\_info/passive\\_solar.htm](http://www.esru.strath.ac.uk/EandE/Web_sites/01-02/RE_info/passive_solar.htm)

### Activity 3: What can you do?

**Time:** 60 minutes

**What you need:** art and craft materials including pieces of old material, pairs of tights.

**Curriculum links:** Art & Design, Citizenship (PSE in Wales).

**Learning aim:** Children to understand the purpose of and make draught excluders.

Children to use one leg of a pair of tights to make and decorate draught excluders.

Stuff the tights with old pieces of material, paint or sew on decorations. Can make them into snakes or dragons by adding faces and wings.

Explain that draught excluders can help make a house more energy efficient by blocking places such as the bottom of doors or window sills where heat usually escapes. In this activity you can do something practical to help make your home more energy efficient.

#### 1: Extension activity

Same exercise but task is to keep ice cubes from melting.

#### 2: Extension activity

Produce a brochure for these buildings, which highlight ways in which they are energy efficient. Visit a green building supplier.

#### 3: Extension activity

Find a draughty home for your draught excluder.



# Transport: problems and solutions

## How does transport contribute to climate change?

A car burns petrol or diesel inside its engine to provide the energy it needs to move – this is known as an internal combustion engine. In most cars the engine goes through four steps: intake, compression, combustion, exhaust. In the intake step the engine takes in some fuel and air. This mixture is then compressed and ignited by a spark. The fuel explodes and expands. The exhaust valve opens and the gases from the explosion, including carbon dioxide (CO<sub>2</sub>), leave the cylinder and the car through the exhaust pipe.

In the past 50 years the way we travel has changed dramatically. In 1961 only 30 per cent of households in Great Britain had a car but by 2004 that number had increased to 80 per cent, with 29 per cent owning two or more. People are also travelling a lot further than they used to. The average distance people travel annually has increased by about a half in the past 30 years from around 4,500 miles to about 6,800 miles.

It's not just car use that has changed over the past 50 years. Cheap flights and the expansion of airports and runways have seen a huge increase in the number of people flying. Aviation is another major source of carbon dioxide emissions. Most jet planes have gas turbine engines. They work by taking in air and compressing it so it is under high pressure. Fuel is then added and burned causing an expansion in the air and a release of gases including carbon dioxide. This rush of gases and air are used to turn a turbine that powers the plane.

## What's the problem?

More cars being used more often spells bad news for climate change as petrol and diesel cars are a major source of CO<sub>2</sub>. In fact, road transport pumps out more than a fifth of UK emissions. Aviation is the fastest growing source of CO<sub>2</sub> both in the UK and worldwide and could account for a tenth of UK emissions by 2020. Flying creates much larger emissions than driving. A holidaymaker flying to Florida and back creates as much CO<sub>2</sub> as the average British motorist does in a year. Cheap flights are one of the main reasons for the rapid growth in air travel, and this is only made possible because airlines do not pay tax on the fuel they use. We need to do something about the contribution that aviation is making to climate change; if we don't reduce carbon emissions then our planet is under serious threat.

## What needs to be done?

We need to change the way we travel. We need to use cars and planes less, walk, cycle or use public transport more and find alternative modes of transport that create less CO<sub>2</sub> emissions. Six of the top 10 flight destinations from London can already or could potentially be reached by high-speed rail rather than air. And these destinations – Amsterdam, Edinburgh, Frankfurt, Glasgow, Manchester and Paris – account for one in seven of all plane passengers in and out of London. We also need to think about where we are travelling to. Holidaying in the UK rather than flying abroad, or working from home rather than travelling to an office every day are both ways in which we could reduce CO<sub>2</sub> emissions.

### Glossary

**Biomass** – plant and animal matter such as wood, straw and dung that releases energy when it is burned.

**CO<sub>2</sub> emissions** – carbon dioxide released into the air.

**Internal combustion engine** – engine that burns fuel inside it.

**Fuel** – something we burn for energy.

**Compression** – squeezing to reduce something in volume.

**Combustion** – burning.

**Fuel efficient** – wastes minimum amount of fuel.

**Hydrogen** – an abundant and lightweight gas that forms water when mixed with oxygen, can be used as a power source.



# Transport: problems and solutions

## What are the solutions?

The many solutions to reducing the impact of transport on climate change include changing the way we travel and changing the way we power our cars – making them more fuel efficient or running them on bio-fuels (petrol and diesel substitutes from renewable sources).

If we use cars less, and walk, cycle and take public transport more we can each reduce our carbon dioxide emissions. If we do need to use a car it's best to share rides. This is something we can all do. Safer, more efficient public transport would encourage lots of people to use their cars less. The UK could invest more in this area. For example, for the cost of widening the rest of the M25 to four lanes each way, Government could fund safe routes to school schemes for every school in England.

We could use biomass as an alternative fuel to power our cars. Biomass is the collective name for plant and animal matter, like wood, straw and dung that is used for fuel. Burning biomass produces carbon dioxide just as coal, oil and gas. But as long as the biomass burnt is replaced by an equivalent new growth of plants and animals and is not from a protected species or rainforest area, they are renewable and don't cause climate change. This is because the new plants absorb an equivalent amount of carbon dioxide as they grow (and animals ingest this carbon when they eat plants or other animals). Biomass can be used for heating and to generate electricity, as it is needed, in the same way as gas or coal. It can also be used to power vehicles when it is converted to a liquid.

As well as alternative fuels we can also make greener vehicles such as hybrid cars. Hybrid cars are powered by a combination of petrol or diesel and electricity. They work just like a normal car but when you drive at less than 30 MPH they are powered by an electric battery. When you drive faster than this the car switches to petrol/diesel. If the battery runs down, the petrol engine kicks in and the battery recharges on its own.

However, a big hybrid car such as a Lexus GS still pumps out more CO<sub>2</sub> (186g/km) with a combined engine than a smaller petrol / diesel car such as a Vauxhall Corsa (115g/km). There are also electric cars that run on electricity alone and in the future it's possible that our cars will be run on battery-like fuel cells that are powered by hydrogen.

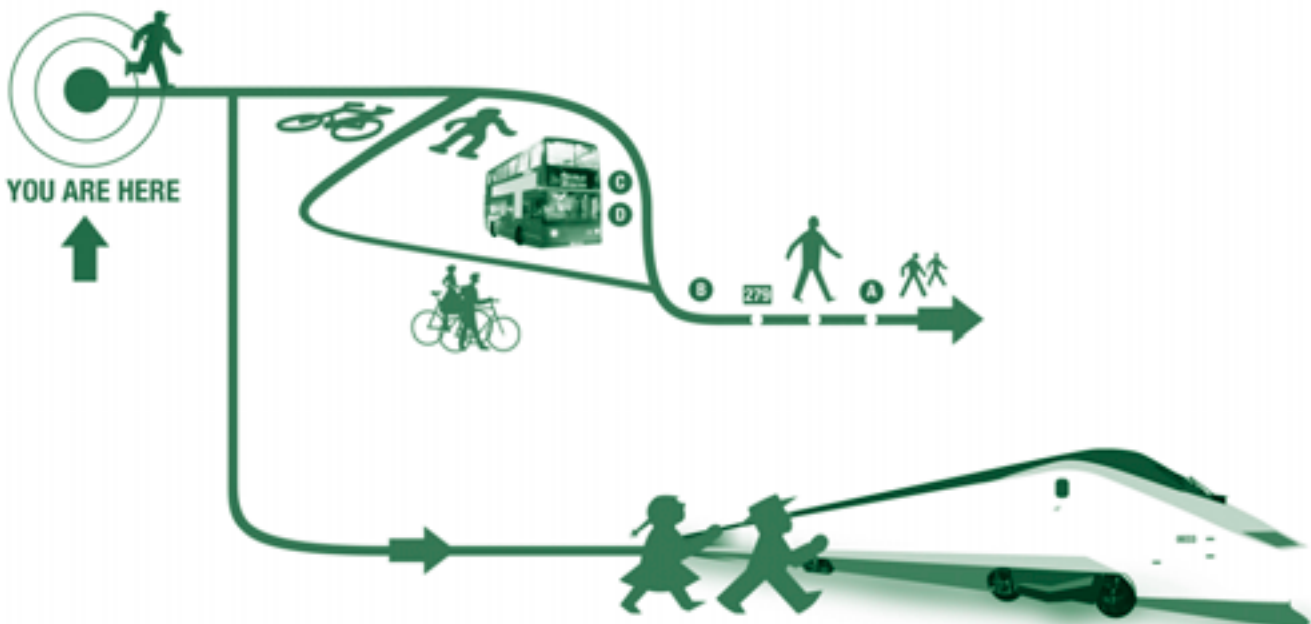
We need to change how we travel and develop greener technology in order to prevent catastrophic climate change.

## What can you do?

Government research in 2000 found that 38 per cent of children aged 7-11 who are driven to school would prefer to walk or cycle. Many schools have addressed this by establishing a travel plan to allow pupils to use safer and greener routes to school.

*shout about real life stories*

Year 9s at Afon Taf High School set about preparing a bid to get funding from the Welsh Assembly's Safe Routes to Schools budget to build new cycle facilities, as part of their geography coursework. During the year pupils gave up spare time to work on the project creating a video and CDROM as well as printed materials. The class split into different groups each preparing a different part of the bid. One group surveyed pupils' and parents' opinions, one looked at the design of the new sheds, one looked at upgrading a riverside path to create a traffic-free route to school and another looked at how the cycle-to-school scheme would work. It worked: the school received £60,000 from the Welsh Assembly and is enjoying new benefits.



**Booklet 04****Transport: problems and solutions****Activities****Activity 1: What's the problem?****Time:** 45 minutes**What you need:** Stationery.**Curriculum links:** Citizenship (PSE in Wales), Geography, ICT.**Learning aim:** Children to think about how their travel affects climate change.**Travel survey:** Design a questionnaire to discover how people travel to your school or youth club. Carry out the survey.**Points to note:** How will you carry out your questionnaire? By a show of hands, or by asking individuals? What methods might people use to travel to school? Walk, cycle, bus, train, car, car share, taxi, coach? Are you going to ask how people would prefer to travel? If they would prefer to walk or cycle, find out some reasons why they don't (as a follow-up activity you could discuss ways to overcome these). Ask how far people travel to school.**Activity 2: What are the solutions?****Time:** 60 minutes**What you need:** Internet access.**Curriculum links:** ICT, Citizenship (PSE), Geography, Science.**Learning aim:** Children to investigate hybrid cars.

In small groups, research hybrid cars: How readily available are they? How much more environmentally friendly are they? How expensive? How are they being marketed? Do you know anyone who drives one? If so, find out why they bought a hybrid car and what they think of it. Present your findings to the rest of the class.

**Activity 3: What can you do?****Time:** 40 minutes**What you need:** results from travel survey (Activity 1).**Curriculum links:** Maths, Geography, Citizenship (PSE).**Learning aim:** Children to understand how they can reduce carbon emissions through their own actions.

Using the results from the travel survey in Activity 1 and the equation below, calculate how much CO<sub>2</sub> would be saved over a year if each pupil who used a car walked or cycled instead (remember to account for holidays and weekends).

Number of kilometres per day x CO<sub>2</sub> produced per km\* x number of days travelling = CO<sub>2</sub> emissions per year.

\*The average new car produces around 196 grams of CO<sub>2</sub> per kilometre.

**Activity 4: Find solutions in your local area and win a prize****Time:** 60 minutes**What you need:** Local newspapers, internet, telephone access, digital camera, arts and craft materials, video equipment, activity sheet overleaf.**Curriculum links:** Citizenship (PSE), ICT, English, DT, Art & Design**Learning aim:** Children to use research skills and understand that their actions make a difference to their future.

Then chose how you present the information. You could make a documentary, create a photo story, tape record an interview, or write a leaflet or a newspaper article (see if the local press will publish it). Don't forget to send your piece to us as part of the Shout about competition and you could win a 1,000 watt wind turbine for your school/youth group (check out the competition page for more details).

**1: Extension activity**

Plot the results on graphs and present your findings to the school in an assembly.

**2: Extension activity**

Design a car of the future: What will it run on, how will the engine work? Build a model of your design.

**3: Extension activity**

Research and implement safe routes to nearby schools. See [www.saferoutestoschools.org.uk/](http://www.saferoutestoschools.org.uk/) for help establishing safer routes to school.

**4: Extension activity**

Invite an inspirational person to school/youth club to give a talk.

**Booklet 04**

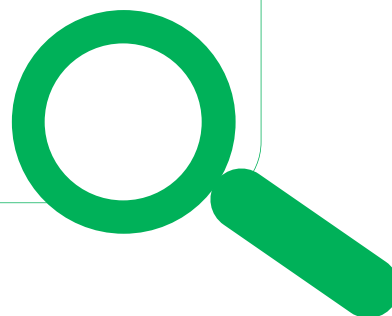
**Transport: problems and solutions**

**Find solutions in your local area and win a wind turbine for your school/youth group.**



Use the local media and the internet to find an inspirational person – local hero – in your area who has done something to tackle climate change. Maybe they drive a hybrid or an electric car. Perhaps they set up a walking bus for your school, maybe they cycle to work or have installed a solar panel or wind turbine at home. Be a detective and find out.

Use the table below to help you plan your case study:



What have you found out from the local media?

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What have you found out from researching on the internet?

---

Who's your local hero?

---

What have they done to tackle climate change?

---

What questions do you want to ask them?

---

How are you going to record the information?

---

How will you present this information? *You could make a documentary, create a photo story, tape record an interview, or write a leaflet or a newspaper article.*

# Shout about climate solutions



Please affix  
stamp here



**Friends of  
the Earth**

Shout about competition  
Friends of the Earth  
56-58 Alma Street  
Luton  
LU1 2PH

**Shout about**

**Shout about climate solutions competition**

**Take part in our 2006 Shout about climate solutions challenge and you could win a **wind turbine\*** for your school or youth group.**

Here's the task: Find an inspirational person in your local area who has done something to tackle climate change.

Present the information as a documentary or create a photo story, tape record an interview or write a leaflet/newspaper article. Then send us your case study (entries will be returned to you).

You may submit one entry per school or youth group. But why not encourage lots of students to get involved by running it as a group activity?

Entries must reach Friends of the Earth by Thursday 23 November. Entries will be short listed under the three multimedia categories below and one overall winner selected by a panel of judges. The winning school or youth group will receive a **wind turbine\*** as a prize and their entry will appear on our learning website and in the *Shout about climate solutions* review magazine.

To enter the competition fill in the form below and return it along with your entry to Shout about competition, Friends of the Earth, 56-58 Alma Street, Luton LU1 2PH

\* 1000 watt wind turbine includes installation, which will be arranged for January 2007 (this prize is not exchangeable for cash). The winning school/youth group will be asked to host a small presentation event and have their photograph taken as a condition of the prize.



Please fill in the following details to reach Friends of the Earth by 23 November 2006

Name of teacher/youth group contact: \_\_\_\_\_

Names and ages of student(s): \_\_\_\_\_  
\_\_\_\_\_

Name of school/youth group: \_\_\_\_\_

Address of school/youth group: \_\_\_\_\_

Postcode: \_\_\_\_\_ Telephone: \_\_\_\_\_

E-mail: \_\_\_\_\_

(Please provide us with an email address so that we can contact you regarding the competition and plans for the presentation event)

Please indicate which multimedia category you are submitting under

- Text & still images
- Audio
- Video

The Shout about competition is sponsored by **Windsave** "...your opportunity to create your own renewable energy"

[www.windsave.com](http://www.windsave.com)