

## Teacher notes for activity: What is global warming?

### Resources for this activity

- Powerpoint slides to support activity, available on [www.ashdenawards.org/schools/activities](http://www.ashdenawards.org/schools/activities).
- 5-minute Ashden Awards films, available on [www.ashdenawards.org/schools/films](http://www.ashdenawards.org/schools/films):
  - **Nishant Bioenergy, India**: supplying school cooking stoves which run on crop-waste rather than liquefied petroleum gas.
  - **IDEI, India**: using cheap, human-powered treadle pumps, instead of diesel pumps, to supply water for irrigating crops.
  - **Ecotricity, UK**: increasing the supply of wind-powered electricity using small wind-farms on industrial sites.
  - **Nottinghamshire County Council, UK**: reducing carbon emissions by heating schools with sustainably-produced wood pellets instead of coal.
  - **Making a difference** (9 minutes) combining pupil ideas on global warming with visual illustrations of how this problem is affecting us and examples of some practical solutions.
- A sample Medium Term plan for Upper Key Stage 2 is available to help plan other activities around this key concept.

### Curriculum areas and topics

- Main activity: Geography, Science, English, Education for sustainable development (ESD).
- Further activities: Science, geography, English, Art, ICT, ESD.
- Links to topics: Climate, Weather, Energy, Light, Contrasting Localities.

### Suitability

- Upper Key Stage 2 – age approximately 9 to 11 years, although also suitable for more able 8-year-olds.
- Main activity needs one lesson.
- The detailed objectives and approach can be adapted for use with different age groups.

### Grouping

- This is best done with a whole class of older pupils or with small groups of more able younger children.

## Background

'Greenhouse gases', 'global warming' and 'climate change' are becoming everyday language, but the concepts are quite challenging, and often misunderstood. It is also possible, in emphasising the seriousness of the issues, to make the future look very bleak.

The introductory film 'Making a difference' was made for this activity, to highlight the causes and effects of global warming, but also emphasise the practical things which children, families and schools can do to make a difference. The material in it falls into three sections: first (2 minutes) – primary school children saying what they think about global warming; second – (5.5 minutes) explanation of greenhouse gases and global warming, what we can do and what is being done in a number of developing countries; third (1.5 minutes) primary school children discussing with teachers and parents what can be done at school and at home. The film can be shown as a whole, or else section by section.

The Powerpoint explains in fairly simple terms what we mean by global warming and greenhouse gases. This is still fairly complicated for young children and diagrams have been used to aid understanding. There is some quite difficult vocabulary in this and it may be useful to start with a familiarisation activity using some of this vocabulary (see the end of these notes for a vocabulary list).

Some key points for understanding and discussion are:

- The climate of our planet has always been changing. Some of the factors which have caused the climate to change in the past are changes in the output of the sun, and changes in the movement of the earth relative to the sun. Children may know about ice ages, which are evidence of much colder climates.
- The current concern is that the climate is probably changing **much more rapidly** than in the past. The main cause of this is an increase in 'greenhouse gases' in the atmosphere which are trapping more heat than in the past.
- The main greenhouse gas is carbon dioxide (CO<sub>2</sub>). It is a natural component of the earth's atmosphere and vital for plant life. When plants grow they absorb carbon dioxide from the atmosphere, and when plants and animals die and decay they release CO<sub>2</sub> again, so the atmosphere stays in balance. However, when fossil fuels are burnt there is an increase of CO<sub>2</sub> in the atmosphere. Also, if plants are cut down and not replaced (deforestation), there is an increase of CO<sub>2</sub> in the atmosphere.
- The current concern is about the **rapid** increase in the concentration of carbon dioxide in the atmosphere. This started around the time of the industrial revolution, when there was large-scale clearance of land for agriculture and rapid expansion in the use of fossil fuels.
- Methane is another greenhouse gas which is also increasing in the earth's atmosphere due to human activities. Although concentrations of methane are not as high as CO<sub>2</sub>, the warming effect of methane is much greater than that of an equivalent mass of CO<sub>2</sub>.
- The basic science of greenhouse gases and why they cause warming is now accepted by nearly all scientists, although the media still like to promote 'different views'. However, the effects of the warming on climate are extremely complex, and difficult to predict. It is certainly not just that everywhere will get a bit warmer

- One likely outcome is that extreme weather events (heat-waves, storms etc.) will become more common, but it is not possible to say that any specific event is caused by global warming. This is a difficult concept for adults as well as children.
- The amount of human-added CO<sub>2</sub> and other greenhouse gases which come from the UK is only about 1% of the global addition. Some people therefore argue that there is no point trying to reduce greenhouse gas emissions from the UK, because any reductions we make are insignificant. China and India are often highlighted as rapidly expanding economies, whose increase in CO<sub>2</sub> emission through industrial expansion is far greater than reductions which could be made in the UK. However, it is important to realise that the average greenhouse gas emission per person is far lower in China and India than in the UK. It is also relevant that much of the industrial expansion in these countries is to make products which are used in the developed world.
- The above point can link into further discussion about global inequality. Climate change has been caused largely by the energy-consuming and agricultural activities of rich countries, yet it will impact on the whole world - and the poorest people will find it hardest to adapt.

### **Prior knowledge**

Pupils need to have some familiarity with the vocabulary they will encounter and it is worth discussing definitions beforehand. Pupils should know that carbon dioxide is an important natural component of the atmosphere, but that burning fossil fuels and deforestation put extra carbon dioxide into the atmosphere. They should also know that nearly all our energy comes from the sun.

### **Purpose of the activity**

- To know that global warming is thought to be causing rapid climate change.
- To know that global warming is thought to be caused by human activity, especially the burning of fossil fuels.
- To know that carbon dioxide and methane are two gases whose increased presence in the atmosphere is a cause of global warming.
- To be able to share our views and ideas about the world with others.

### **How to use the resources**

This is intended to be used as a class discussion activity and should invoke a lot of ideas and talk. It could be used as a starter, or else as a midway activity in a unit of work on global warming and climate change. An example of a unit in which this can be used can be accessed from this section on [www.ashdenawards.org/schools/activities](http://www.ashdenawards.org/schools/activities).

### **Film 'Making a difference'**

The whole film can be shown at the start of the activity, but it may be more effective to show sections with the Powerpoint and discussion in between.

The first 2-minute section can be used to stimulate initial discussion. What do your pupils know about climate change, its causes, effects and possible remedies? The 5.5-minute visual summary of the causes, effects and some solutions could be shown after Slide 10, or else after Slide 7.

The final 1.5 minute section could be shown after slide 11, to stimulate discussion on what your pupils could do both at school and at home. The film also (gently) makes the point that children must take the lead on this and make sure that adults change their behaviour too – that their future is in their hands.

### **Powerpoint slides**

The Powerpoint then introduces the learning objectives, followed by a simple explanation of what we mean by global warming. Key points to bring out with the slides are:

Slide 3 – The sun is the source of nearly all our energy: note that this diagram is not to scale!

Slide 4 – Introduces the idea that the earth is all the time radiating heat out into space. This is quite a difficult idea to get across, and the idea ‘that’s why it gets cold at night’ may be helpful. The basic warming effect of the atmosphere is introduced here.

Slide 5 - Gives more detail on the warming effect of the atmosphere, the idea of ‘greenhouse gases’ and the concept that there is a **natural** greenhouse effect. It is important to mention the relative size of the atmosphere in relation to earth. If the earth was an egg then the thickness of the atmosphere would be equivalent to its shell. The diagrams give the impression that it is much thicker.

Slide 6 – Explains the enhanced greenhouse effect and global warming. One of the key ideas to get across is that there is a difference between the natural greenhouse effect (in which some heat is retained by the earth because of the natural greenhouse gases in the atmosphere), and the enhanced greenhouse effect’ (caused by human-added greenhouse gases which trap more heat).

Slide 7 – Goes through the information on Slides 5 and 6 in diagrams: the left-hand-side of the globe shows the natural greenhouse effect, and the right-hand-side shows the enhanced greenhouse effect. For simplicity, the energy coming in from the sun has not been shown in these diagrams.

Slide 8 – Explains which gases are greenhouse gases. Pupils may initially be surprised that the greenhouse gases are very minor constituents of the atmosphere, and that overall the atmosphere is not changing very much. The main atmospheric gases (nitrogen and oxygen) are not greenhouse gases.

Slides 9 and 10 – Explain the ways in which human activity adds carbon dioxide and methane, the main greenhouse gases, to the atmosphere.

Slide 11 – Emphasises that it is not too late to do something about global warming, that we can all make a difference.

### **A positive end**

It is important not to dwell too much on gloom and doom, but to emphasise the overall theme of these materials, that we can all ‘make a difference’ in the way we use energy. This need

**Making a difference – educational resources from the Ashden Awards for Sustainable Energy**  
Find out more: [www.ashdenawards.org/schools](http://www.ashdenawards.org/schools)

not be a great burden, and can bring other benefits (like cheaper bills). Both the film and the Powerpoint can lead to a class discussion on 'what we can do', and the further activities emphasise positive changes.

### **Key vocabulary**

Climate change, global warming, greenhouse effect, enhanced greenhouse effect, radiation, atmosphere, carbon dioxide, methane, deforestation.

### **Further activities**

1. Watch the suggested films which show how different energy sources and technologies are helping to reduce carbon emissions. In each case, discuss how a particular project is helping to reduce the amount of carbon dioxide being released into the atmosphere. It is important to have a follow up session which dwells on the very many positive things that are being done to combat climate change. The sample unit plan has some activities for pupils to carry out independently, using access to a computer to watch selected films.

**Science, Geography, English, ESD**

2. Maintaining a positive momentum, design a poster advertising some of the projects that are helping to combat global warming. Use some of the illustrative images of projects captured from the main Ashden web site (choose an image, right click and 'save picture as' – these will be small files and can be pasted into word documents).

**Art, ICT**

3. Find out how biogas is being used to reduce carbon dioxide emissions through the 'Biomass Energy' activity: the Powerpoint and Teacher notes are available on [www.ashdenawards.org/schools/activities](http://www.ashdenawards.org/schools/activities).

**Science, Geography, English, ESD**

4. Write a newspaper article about how using energy more sustainably can reduce the production of carbon dioxide and also bring other benefits. Encourage pupils to use the Ashden Awards film resources ([www.ashdenawards.org/schools/films](http://www.ashdenawards.org/schools/films)) to choose an international film and use this as the basis for their article.

**English, Science, Geography, ICT, ESD**

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