

Chapter 4 Right here, right now?

Activity guidelines

Chapter aims and learning intentions

- To enable the students to challenge what is accepted as normal in everyday activities.
- To consider the idea that there is a hidden price stored up for the future in every unsustainable product.
- To build an understanding of each of the greenhouse gasses and their contribution to climate change.
- To understand some of the global consequences of climate change.

Activity 1 Poem interpretation

A poem by John Donne 'No man is an island'

The poem relates to our relationship with everyone else on the planet and our responsibility to the collective good. The aim is to show that using the worlds resources will not isolate you from the consequences.

- The poem can be read as a class or individually, and discussed as a brief introduction to the following activities.

Activity 2 Sustainability mysteries: The hidden cost beyond the price tag

This activity comprises four different card sorts for small groups of pupils. The cards will need cutting up and placing into envelopes.

- Each group receives an envelope with cards and a question. The questions are given below with the paragraph relating to each of the four mysteries. The group discusses the question and then sorts the cards into two piles. Each group can then feed back to the class describing their question and the two options they had, and explaining which they chose and why.
- A discussion about choices and the bigger picture could follow. Further internet research activities could investigate some of these ideas in more depth. For example the debate about whether organic or non organic food production methods contribute more or less to climate change is not a straightforward one.
- A selection of images have been included for each mystery. These have been presented on a power point document which may be useful when the groups are feeding back to the class.

Key points

1. What seem like cheap products have hidden costs.
2. Simple choices have implications on a larger scale in many ways.
3. What is considered normal can actually be wasteful.
4. Products use energy from fossil fuels in their production and use, resulting in emissions of carbon dioxide.

5. A small shift in choices can bring about beneficial effects, socially as well as environmentally.

The School Run (Mystery 4) is easier to access, both in terms of language and the level of difficulty in sorting the ideas. This may be an appropriate option for pupils who need more support with their learning.

The \$2 T-shirt Mystery (number 2) is necessarily simplified in terms of its discussion of international trade. The t-shirt made in China is representing one set of production circumstances, to provide contrast and stimulate discussion. It is not intended to imply that all factories in less developed countries involve poor working conditions, or to ignore the benefits to these countries of this international trade.

1 The cheap chicken mystery

Question: Which chicken would you eat?

The aim of this activity is to compare an organic locally sourced chicken and an industrially manufactured chicken. Pupils sort the different statements relating to the life cycle of the two chickens into two groups (one for each chicken). They can then begin to speculate on the merits of the two systems, and make observations about energy and fuel usage related to the two processes. Having discussed and evaluated the two options, pupils are asked to choose which they prefer, giving reasons to justify their choice. They may conclude that both options have merit depending on your point of view, but hopefully will begin to understand the idea of 'hidden costs'.

2 The \$2 T-shirt mystery

Question: Which T- shirt would you buy?

The aim of this activity is to make a comparison between the manufacture of two different T shirts. One shirt is made in China from Kazakhstan cotton in an entirely non sustainable way which keeps the costs for the consumer down. One shirt is made in Manchester from local organic hemp in a sustainable process. Pupils sort the different statements relating to the lifecycle of the shirts into two groups (one for each shirt). They can then begin to speculate on the merits of the two options, and make observations about energy and fuel usage related to the two processes. Having discussed and evaluated the two options, pupils are asked to choose which they prefer, giving reasons to justify their choice. They may conclude that both options have merit depending on your point of view, but hopefully will begin to understand the idea of 'hidden costs'.

3 Bags of fun mystery

Question: Which bag would you use?

The aim of this activity is to make a comparison between the use of a disposable non biodegradable plastic bag, and a reusable, biodegradable sisal bag. Pupils sort the different statements relating to the lifecycle of the bags into two groups (one for each bag). They can then begin to speculate on the merits of the two options, and make observations about energy and fuel usage related to the two processes. Having discussed and evaluated the two options, pupils are asked to choose which they prefer, giving reasons to

justify their choice. They may conclude that both options have merit depending on your point of view, but hopefully will begin to understand the idea of 'hidden costs'.

4 School run!

Question: Which method of getting to school would you choose?

The aim of the activity is to look at the relative merits of two ways of getting to school. One involves a large vehicle, and the other walking or cycling. Pupils sort the different statements relating to this journey into two groups (one for each method of transport). They can then begin to speculate on the merits of the two options, and make observations about energy and fuel usage related to the two choices. Having discussed and evaluated the two options, pupils are asked to choose which they prefer, giving reasons to justify their choice. They may conclude that both options have merit depending on your point of view, but hopefully will begin to understand the idea of 'hidden costs'.

Activity 3 Where do the green house gases come from?

This activity examines greenhouse gasses, their production through human activity, what percentage of the whole they make up and what can be done about them.

- Pupils study the table on the Greenhouse gases sheet and answer the following questions in pairs. The answers can then be debated with other members of the class. Several valid answers can be given to each question. Pupils are asked to justify their answers.
1. Which gas or gases do the most to contribute to climate change?
 2. Looking at how humans produce these gases, which one do you think is the hardest to reduce?
 3. Why is climate change a difficult problem to tackle? How many reasons can you think of?

Activity 4 What on Earth will an increase in Greenhouse gasses do?

This final activity is a true or false card sort exploring the issue of climate change. The statements cover some of the main causes, impacts and ideas surrounding climate change. The statements will need cutting up and mixing up before beginning.

- Pupils read the mixed up statements and consider which is true and which is false. The idea is to show the gravity of climate change and dispel some misconceptions. This activity can be done in pairs or small groups initially, to allow discussion and a sharing of prior knowledge.
- The correct answers are established and follow up activities may include a vote on whether action should be taken now or later. (Chapter 5 examines the impact of doing nothing about climate change on the North West.)

Chapter 4 Right here Right Now?

Teacher notes and background information

- **Aims**
- **Background information**
- **Web links**

The aims behind this chapter

This chapter aims to explore some of the issues connected to sustainability and the personal choices which we make. The students are invited to challenge the waste culture and identify where hidden costs are being deferred, to be paid for by future generations who will have to fund massive cleanup programmes. It enables pupils to examine some of their own decision making and understand more about the hidden cost of commercial and retail commodities, (seeing beyond the price tag).

It also aims to investigate the causes of climate change and to begin to make the links between this, consumer culture and peak oil. Some of the global effects of climate change are identified, and some key pupil misconceptions explored and dispelled. This understanding forms an important foundation for chapters 5, 6 and 7.

Background information

Where do greenhouse gases come from?

A Natural Greenhouse

The greenhouse effect describes the atmosphere's natural ability to store the heat radiated from the earth on its way to space. If it wasn't for greenhouse gasses the average surface temperature would be approximately -18 degrees Celsius, too cold for life to exist on earth. A natural balance of greenhouse gases therefore plays an essential role in maintaining the world we live in today. Water vapour is the most significant greenhouse gas in terms of the total contribution it makes to the greenhouse effect. The other greenhouse gases are carbon dioxide, methane, nitrous oxide, ozone and halocarbons (which occur naturally only rarely).

Natural systems produce greenhouse gases from a wide range of sources. Examples include:

- Volcanoes contribute massive amounts of sulphur dioxide and nitrous oxides along with carbon dioxide and water vapour.
- Lightening produces small quantities of nitrous oxides.
- Combustion of vegetation emits carbon dioxide.
- Biological action such as decomposition and breathing contribute both carbon dioxide and methane.
- Oceans are natural sources of carbon dioxide and methane.

- Water vapour has its own natural cycle.

B Human Greenhouse

Human activities have also contributed to the presence in the atmosphere of these gases. Some of the most significant sources of these emissions are listed below:

| | |
|----------------|---|
| Carbon dioxide | Fossil fuel combustion for industry, transportation, space heating, electricity generation and cooking. Deforestation and the conversion of prairie, woodland, and forested ecosystems into agricultural systems. |
| Methane | Livestock farming, rice growing, fossil fuel extraction, landfill, burning of biomass, melting of permafrost landscapes. |
| Nitrous oxide | Use of nitrogen based fertilizers, burning fossil fuels, deforestation and the conversion of forest, savanna and grassland ecosystems into agricultural fields and rangeland. |
| Ozone | Air pollution such as photochemical smog reacting with sunlight. |
| Halocarbons | CFCs and their replacement HFCs used within spray cans, solvents, cleaners and coolants. |
| Water vapour | Human influences on this gas are still being debated, with regard to feedback loops within the natural water cycle. |

What are the implications of the Human greenhouse?

In the last few centuries, since the industrial revolution, human activities have directly or indirectly increased the concentration of greenhouse gases in the atmosphere. The Intergovernmental Panel on Climate Change believes that this is enhancing the greenhouse effect, which will result in an increase in global temperature of between 1.4 and 5.8 degrees Celsius by the end of this century. This enhanced greenhouse effect (or anthropogenically forced effect) is generally what is referred to now as climate change.

Carbon dioxide is the most significant contributor, responsible for 60% of the enhanced effect, mainly because it is being emitted in the largest volumes. Methane accounts for 20%, and its lower concentrations are countered by the fact that proportionally it produces 21 times as much warming as carbon dioxide. Nitrous oxide accounts for another 10%. It is present in far smaller concentrations but is 200 – 300 times more powerful than carbon dioxide at trapping heat, and remains in the atmosphere for 150 years (compared with 100 years for carbon dioxide and 11-12 years for methane).

One example of the impact of this warming on the climate is that higher temperatures increase evaporation from the oceans and increase the atmosphere's capacity to hold water. This means that the air is getting wetter in some areas, which combined with a hotter and therefore more energetic atmosphere produces stronger storms and other extreme weather events.

The BBC website <http://www.bbc.co.uk/climate> gives the following examples of predicted global impacts of climate change:

- By the second half of the 21st century, wintertime precipitation in the northern mid to high latitudes and Antarctica will rise
- By the same time, Australasia, Central America and southern Africa is likely to see decreases in winter precipitation
- In the tropics, it's thought some land areas will see more rainfall and others will see less
- It is thought the West Antarctic ice sheet is unlikely to collapse this century. If it does fall apart, sea level rises would be enormous
- Global average temperatures are predicted to rise by between 1.4C and 5.8C by 2100
- Maximum and minimum temperatures are expected to rise
- More hot days over land areas and fewer cold days and frost
- More intense precipitation events

Information about the evidence for climate change across the globe to date, and further details about predicted global impacts can also be found on this website.

North West Emissions

The following website provides a link to a plain guide report produced by the NWRA about the greenhouse gas emissions from the North West region and targets for reducing these.

http://www.nwra.gov.uk/downloads/documents/jan_08/nwra_1199706222_NWRA_Emissions_guide_3_1_08.pdf

Acknowledgements

Images sourced from www.flickr.com

Chapter 4 Greenhouse gases

| | |
|---------------|---------------|
| Deforestation | by crustmania |
| Cows | by henico |
| Fertiliser | by anataman |
| Spray cans | by .nutter |

Chapter 4 Activity 2 Mystery images

| | |
|---------------------|----------------------|
| Cotton t shirt | by red5standingby |
| Hemp clothing | by chickenscrawl |
| Cotton | by Brian Hathcock |
| Hemp | by Edward the Bonobo |
| School run | by ebeth |
| Walk to school | by Kelly Sims |
| Carrier bags | by jeffedoe |
| Cotton shopping bag | by cityhippy |
| Chicks | by Dizzy Girl |
| Chicks (2) | by Tim Somero |
| Chicken | by Neil101 |
| Battery farm | by eprescott |

Chapter 4 Right here, right now

Activity 1 Poem interpretation

John Donne (1572-1631)

*'No man is an island entire of itself;
Everyman is a piece of the continent, a part of the main;
if a clod be washed away by the sea,
Europe is the less, as if a promontory were,
As well as any manor of thy friends or of thine own were;
Any man's death diminishes me, because I am involved in
mankind.
And therefore never send to know for whom the bell tolls;
It tolls for thee.'*

How does this meditation (poem) relate to Climate Change?

Cotton T-shirt



Hemp T-shirt



Cotton



Hemp



The school Run



Walk to school







reduce...
reuse...
recycle...









The cheap chicken mystery

| | | | |
|---|---|--|--|
| I am laid in a heated factory and roll along a tube to a heated incubator along with 5000 others. | I am laid in a nest in a small hutch with 4 others. My mother turns me and warms me with her body for 20 days. | The electricity powered incubator turns me every 20 minutes and keeps me at a constant temperature for 18 days | After one year of living on the farm. I was taken to town and sold to a local butcher who processed me into an Organic oven ready local chicken. |
| I hatch into a climate controlled environment. I am assessed by a human as healthy. 400 eggs didn't hatch and 100 chicks died | I hatch and learn to follow my mother around the farm eating a variety of foods in the open air which makes me healthy. One egg didn't hatch. | The tip of my beak is cut off to stop me injuring myself and other chickens in the cramped conditions. | Total fuel used from egg to oven is equal to 1 litre of fuel. This produced 2.75kg of carbon dioxide. |
| I am sold and then transported to an other factory for older chicks near Bolton in England. | I'm fed corn and given antibiotics and hormones so I grow fast. | I grow slowly with my family on the farm and am fed a little corn worth 1g of fuel, 4g of carbon dioxide | I almost got eaten by the fox which tried to get into the hutch last night. |
| Eggs 4 U is a large industrial egg producer in Belgium sending chicks all over Europe for the poultry trade. | Peter Pettigrew is a small scale organic beef farmer on the moors near Cursedpig in Lancashire. He also has 20 hens. | I live in a cage with 4 other hens and receive food and water at regular intervals. | Six hundred thousand Chickens live in the large air conditioned shed under artificial light. |
| I roam around the farm yard eating spilt wheat and insects and spend the night in a hutch in the old barn. | After laying eggs for 6 months I am transported to the abattoir to be processed into a oven ready chicken. | All the energy used in lighting, feeding, housing and transport used is equal to 500 grams of fuel which produced 1.375kg of CO ₂ | |
| As an oven ready chicken I am cleaned, chilled and packed and transported from Bolton to a supermarket in Carlisle | It requires another 500 grams of fuel to get me to the supermarket and keep me chilled. Another 1.375kg of CO ₂ is produced. | Total fuel used from egg to oven is equal to 90 grams of fuel in my life time. This produced 0.25kg of CO ₂ | |

The \$2 t shirt mystery





| | | | |
|---|--|---|---|
| Cotton is grown on the banks of the river Dariya that flows through the Kara Kum Desert in Kazakhstan central Asia | Hemp is a tall fibrous plant grows well in the mild climate of the Loire valley in France. It receives all the water it needs from rainfall. | The plant is a thirsty plant that requires irrigation by large quantities of water, artificial fertilizer and pesticides. | So much water is used in production that the river Syr and the Aral sea are drying up. |
| Harvesting is done by machines further processing is required to remove the seeds. The stalks are burnt. | The plant is machine harvested. The leaves are fed to cattle and the roots ploughed back into the soil as a natural fertilizer. | The soil is improved by the rotting plant matter and cow muck. | Irrigation increases salt levels of the soil and reduces soil fertility. |
| The cotton is transported to China 4000 miles away. | The hemp is transported to Manchester 500 miles away. | Using cheap labour the plant is processed into a long fibre. | Using machines the plant is processed into a long fibre. |
| To enable the fibre to be dyed it must be washed and bleached using hazardous chemicals. | Natural fertilizer is used and no pesticides are needed. | As environmental laws are weak all the chemicals and dirty water is put into the local river untreated. | As environmental laws are strong all chemicals and dirty water must be treated. This takes 10g of fuel producing 27g of carbon dioxide. |
| The fibre is woven into a cloth by human operated machines in a large noisy factory with a poor safety record. | The fibre is woven into a cloth by computer controlled machines in a small factory with a good safety record. | The cloth is sewn into a T-Shirt by a large workforce working 12 hours for little pay (below minimum wage) in poor conditions. | The cloth is sewn into a T-Shirt by a small workforce, working set hours with breaks. They earn the minimum wage and work in acceptable conditions. |
| T - shirt production uses 1 Kilo of fibre and 50 grams of fuel. Transport adds another 50 grams of fuel producing 270 grams of carbon dioxide in total. | The production of the T-shirt uses 1 Kilo of fibre and 70 grams of fuel. Transport uses 10 grams of fuel producing 216 grams of carbon dioxide in total. | The T-Shirt is transported 10 miles to be sold in a local shop in central Manchester. This uses 1 gram of fuel producing 2.7 g of carbon dioxide. | The shirt is transported 200 miles to the docks and 12,000 miles by ship to Manchester to be sold in a chain store. This uses 200 grams of fuel and 540g of carbon dioxide. |
| This shirt does not biodegrade well because it has chemical coatings. | This shirt can biodegrade and can be composted. | In a landfill this shirt will still be rotting in 50 years time. | After being composted this shirt can be used to grow other plants. |

The school run mystery

| | | | |
|--|---|---|---|
| The large SUV costs £43,000. | Walking to school costs nothing. | This method of getting to school requires petrol or diesel. | This method of getting to school needs oil. |
| This method of getting to school is easier if you have had breakfast and some water. | This method of getting to school can mean waiting in traffic surrounded by toxic fumes. | This method of getting to school requires healthy activity in the open air. | This method of getting to school involves paying road tax. |
| This method of getting to school can mean you are outside in all weathers. | This method of getting to school will help you become fitter and healthier. | This method of getting to school may involve less time to talk to friends. | This method of getting to school can be social if you meet and talk with people on the way. |
| This method of getting to school is not as healthy because you sit down all the way. | This method of getting to school needs water for cooling. | This method of getting to school sometimes needs a coat and warm clothes. | This method of getting to school is safer for the users but not for people around you. |
| This method of getting to school uses no fuel. | This method of getting to school can take 10 minutes to travel 3 miles. | This method of getting to school can take 40 minutes to travel 3 miles. | This method of getting to school uses 500g of fuel to travel 3 miles, which produces 1350g of carbon dioxide. |
| This method of getting to school helps to cause asthma and other illnesses. | This method of getting to school adds to traffic congestion. | This method of getting to school helps to cause climate change. | This method of getting to school uses up non renewable resources. |

How is human activity enhancing the greenhouse effect?

The table below contains information about the four main greenhouse gases which human activity is producing. These gases occur naturally, as do two other greenhouse gases ozone and the most important one water vapour. However, the extra emissions from human activity are increasing the natural greenhouse effect and beginning to affect the climate. This is what is known today as “climate change”.

| Gas | Photo | How much gas human activity produces per year | How long it stays in the atmosphere | How much heat it traps compared with carbon dioxide | The main human activities producing this gas |
|----------------|---|---|-------------------------------------|---|--|
| Carbon dioxide |  | 7,000 million tonnes | 100 years | - | Burning fossil fuels Deforestation |
| Methane |  | 500 million tonnes | 11-12 years | 21 times more | Livestock farming Rice farming Landfill Fossil fuel extraction. |
| Nitrous oxide |  | 25 million tonnes | 150 years | 200-300 times more | Nitrogen fertilisers Burning fossil fuels Deforestation |
| Halocarbons |  | 1 million tonnes | 60-100 years | 3,000-13,000 times more | Spray cans Solvents Cleaning products Coolents |

**What on Earth will an increase in Greenhouse gasses do?
True and false statements about climate change**

False cards

| | | | | |
|--|--|---|--|--|
| Manchester will have more sunny days | All plants and animals will have time to evolve to deal with climate change | There is no evidence to prove that it is happening | The UK isn't the biggest polluter so can't do anything | It is a natural cycle not caused by humans |
| Climate change will cause more earthquakes | Climate change will have only a small effect on the economy | Climate change will not affect me | Burning oil, gas and coal has no effect on the climate | It is impossible to reduce the effects climate change |
| Climate change is to do with the whole in the ozone layer | Climate change will cause more Volcanoes | The UK will have a climate like France | The sea defences in the UK are good enough to stop coastal flooding | Cows have got nothing to do with climate change |
| Its just a blip and nothing to worry about | We will not have to change how we live | It is OK because my car is a Toyota Prius | Climate change is caused by all forms of heating | It is not possible for it to rain more than it does in the UK |

**What on Earth will an increase in Greenhouse gasses do?
True and false statements about climate change**

True cards

| | | | | |
|---|---|--|---|---|
| The average temperature of the world will be increased | Sea levels will rise and cover areas of low lying land, submerging some countries completely | Some areas of the world that rely on warm ocean currents will be cooler | Some wildlife will become extinct | Tropical animals and plants will be able to live further north |
| The size of some deserts will be increased | Poor countries will be more severely affected than rich countries | The number and severity of droughts will increase | Changes in wildlife habitat will occur | There will be more river flooding in some places |
| Some ocean currents will change | Climate change will cause more extreme weather events such as hurricanes | More money will need to be spent on protecting people and property | Contribute to melting of glaciers, ice caps and ice sheets | There will be an increase in forest fires in some places |
| Rainfall patterns will change | Increasing greenhouse gases will trap more heat in the atmosphere | Farming patterns will change in response to changing weather | The number of people being forced to migrate will increase | Reversing climate change will take a long time |

