



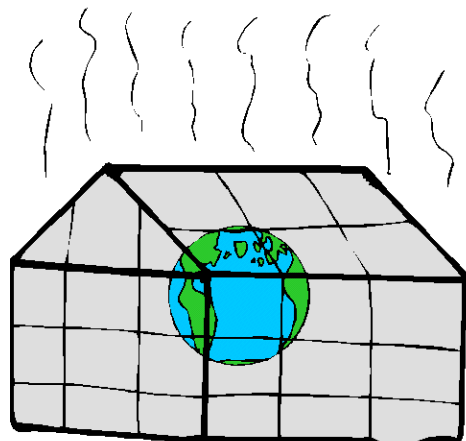
Atmosphere, Climate & Environment
Information Programme, **aric**
Manchester Metropolitan University
Chester Street, Manchester M1 5GD
Tel: 0161 247 1590
Fax: 0161 247 6332
E-Mail: aric@mmu.ac.uk
Internet: <http://www.ace.mmu.ac.uk/>

GLOBAL WARMING

Activity Pack for Key Stages 2 & 3

Emma Rowe & Joe Buchdahl

1999 (updated 2002)



Introduction

This activity pack has been designed for teachers, and is intended for use by top juniors (aged 9-13 years) taking Key Stages 2 or 3 of the National Curriculum. The aim of the pack is to raise pupils' awareness of global warming (or global climate change). The pack is flexible in that it can be tailored to meet the individual wishes of the class and the level of ability. It can be used by itself or in addition to other materials the class may have on the issue.

The pack consists of a set of factual information sheets which introduce pupils to the subject and issue of global warming, and various activities to help reinforce knowledge and understanding of the issue.

The information sheets cover the following topics:

- what is the greenhouse effect?
- what causes the greenhouse effect?
- where do the greenhouse gases come from?
- what is global warming?
- the effects of global warming

- what is at risk from global warming?
- what can we do to slow down global warming?

The information sheets introduce in a simple way the concept and science of global warming, its causes, its possible effects and how we can slow down global warming. There are a number of points that can be raised from the information sheets for class discussion, for example how the class thinks the UK will be affected by global warming. The text in the information sheets can be simplified by the teacher to suit the age and ability of the class.

There are seven activities for the class to complete and these can be undertaken over a series of lessons or all together. They include:

- word match
- word puzzle
- word search
- greenhouse riddle
- energy inefficient kitchen
- questions
- energy savers game

The word match, word puzzle and word search are intended to test pupils' memory of the key words which are used in the information sheets, and to once again reiterate them.

The greenhouse riddle contains some words which are often used when talking about the issue of global climate change, and if the riddle is completed correctly it will spell a phrase which is a common word to describe the problem.

The picture of the energy inefficient kitchen is an ideal illustration for pupils to see how wasteful a kitchen can be and for them to suggest ways in which it could be made more efficient and save energy.

The purpose of the questions activity is to see how well the class has grasped the concepts used in the information sheets, and should therefore be used at the end of the series of lessons on this topic.

Finally, the energy savers game is intended to make pupils more aware of how they waste energy and what they can do to save energy, thereby reducing emissions of carbon dioxide, the main greenhouse gas. The game is basic and can be modified by the children if they so wish. For

example they can design their own game board in the shape of a lightbulb, or they could suggest further ideas for game cards.

It is hoped that you find this activity pack both useful and informative. If you have any criticisms, comments or ideas on how to improve the pack we would be interested to hear them. You can contact us at the address below:

Atmosphere, Climate & Environment Information Programme
Atmospheric Research and Information Centre
Manchester Metropolitan University
Chester Street, Manchester, M1 5GD

Tel: 0161 247 1593

Fax: 0161 247 6332

e-mail: aric@mmu.ac.uk

Internet: <http://www.doc.mmu.ac.uk/aric/arichome.html>

© ARIC 1999

Information Sheets

The Greenhouse Effect

The Earth is surrounded by a layer of gases called the atmosphere. The Sun is much hotter than the Earth and it gives off rays (radiation) that travel through the atmosphere and reach the Earth. The rays



of the Sun warm the Earth and heat from the Earth then travels back into the atmosphere. This is the same as on bonfire night when the warmth of the bonfire warms your face. Your face will give off heat to the cold air. There are some gases in the atmosphere which trap the heat escaping from the Earth and stop it from travelling back into space. These gases are called greenhouse gases.

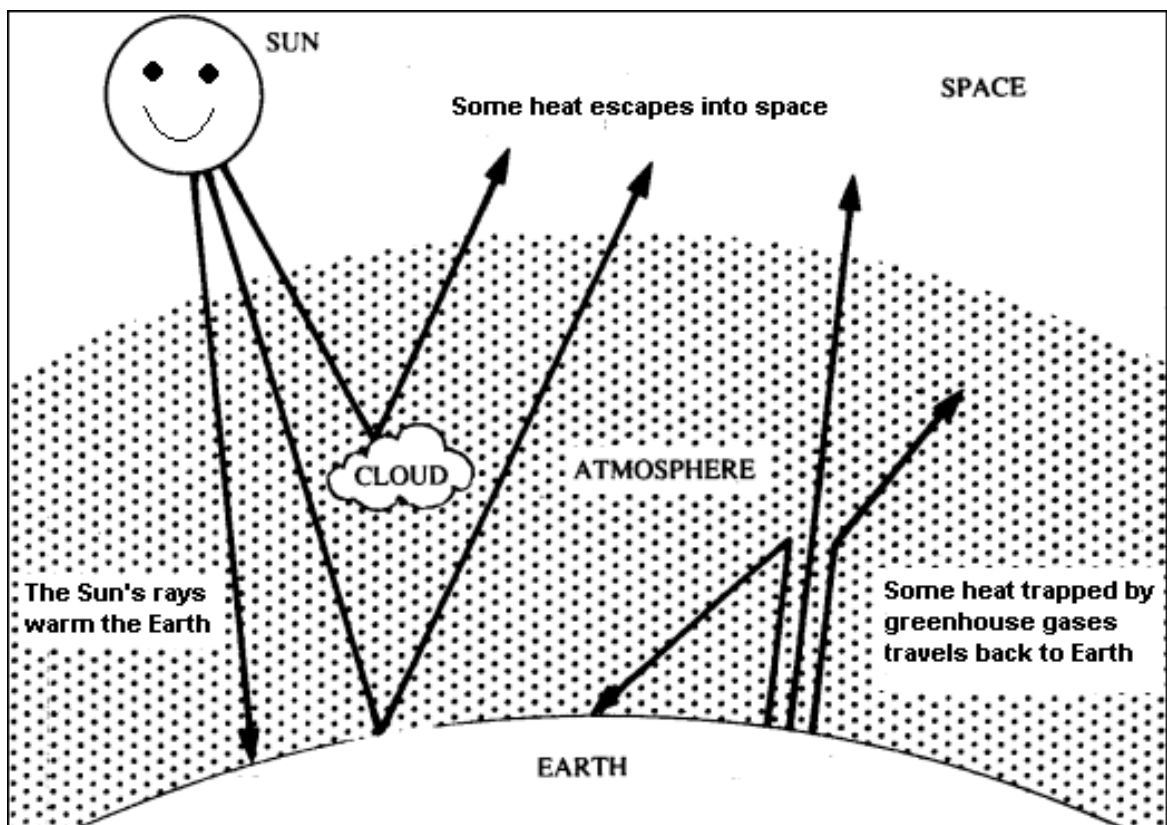
The glass in a greenhouse has a similar effect on the Sun's rays and so it is called the **Greenhouse Effect**.

The greenhouse effect is a natural process and it warms the Earth. Without the greenhouse effect the Earth

would be very cold, too cold for living things, such as plants and animals.

The diagram below shows how the Sun's rays are trapped by the greenhouse gases in the atmosphere.

The Greenhouse Effect



The Greenhouse Gases?

The atmosphere which surrounds the Earth contains the greenhouse gases, sometimes in very small amounts. The list of gases below shows the greenhouse gases which are produced naturally on Earth.

- **carbon dioxide**
- **water vapour**
- **methane**
- **ozone**

These gases are very important in keeping the Earth's temperature at the correct level so that we can live. To do this, the amount of greenhouse gases in the atmosphere must be kept at the right balance.

Natural sources

Carbon dioxide is produced naturally when people and animals breathe. Plants and trees take in and use carbon dioxide to live. Volcanoes also produce carbon dioxide.





Methane comes from cattle as they digest their food. The gas also comes from fields where rice is grown: paddy fields.

Ozone occurs naturally in the atmosphere.

Man-made sources

Some of the activities of man also produce greenhouse gases.



Carbon dioxide comes from the burning of fuel such as coal, oil and gas. These are called fossil fuels. We burn fossil fuels to make energy, which gives us heat and light in buildings. The cutting down and burning of trees also releases carbon dioxide.

Methane can be released from buried waste. For example, the rubbish that is collected from our homes by the dustmen is buried in large rubbish dumps. This



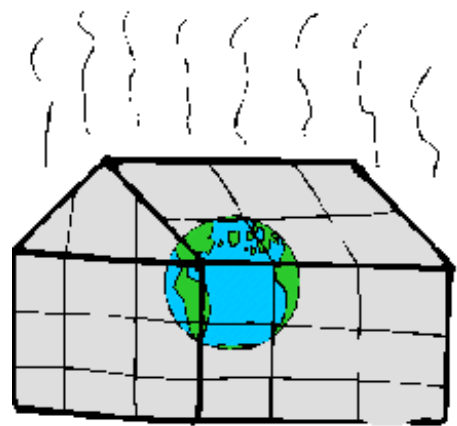
buried waste will produce methane. Coal mining and stored gas also produces methane.



Another group of greenhouse gases includes the chlorofluorocarbons. The name for these gases is rather long so they are called CFCs for short. CFCs have been used in aerosols, such as hairspray cans, fridges and in making foam plastics. They become dangerous when released into the atmosphere, depleting the ozone layer. For this reason, their use has been banned around the world.

Global Warming

Since the Industrial Revolution 200 years ago, these activities have increased, releasing more greenhouse gases into the atmosphere and upsetting the balance. More gases mean that



more of the heat trying to escape from the Earth back into space is trapped. When more heat is trapped by the greenhouse gases the Earth becomes warmer, this is known as global warming.

Many scientists now agree that our activities are making the natural greenhouse effect stronger. If we carry on polluting the atmosphere with greenhouse gases scientists believe that it will have a dangerous effect on the Earth.

The Effects

A warmer Earth might lead to a change in the weather, including hotter summers. This may seem like a good idea, but a rise of a few degrees in temperature could change the conditions on Earth which are at present just right for life.

At the moment it is difficult for scientists to say how great the changes on Earth will be and where the changes will happen.

The Weather



Scientists agree that in Britain our winter and summer temperatures will increase and the weather will be warmer. In winter it may also rain more but in summer it may become drier. In other

parts of the world the effect will be different; some countries will become much hotter whilst others become cooler. There may be more storms, floods and drought, but we do not know which areas of the world will be affected.



Sea Levels



Higher temperatures will make the water of the seas and oceans expand. Some of the ice from ice caps and mountain glaciers will melt, and this melted ice will also cause the seas to rise.

Higher sea levels will threaten the low-lying coastal areas of the world, such as the Netherlands and Bangladesh. Throughout the world millions of people and areas of land will be at danger from flooding. Many people will have to leave their homes and large areas of farmland will be ruined because of floodwater. In Britain, East Anglia and the Thames estuary will be at risk from the rising sea.

Farming

The changes in the weather will affect the type of crops grown. Some crops, such as wheat and rice grow better when it is warmer, but other plants, such as maize and sugarcane do not. Changes in the amount of rainfall will also affect plant growth.

The effect of a change in the weather on plant growth may lead to food shortages in some countries of the world. Brazil, parts of Africa, southeast Asia and China will be affected most and many people could suffer from hunger.

Water

Throughout the world there is a great demand for water, and in many regions, such as the Sahel in Africa, there is not enough water for the people. Changes in the weather will bring more rainfall in some countries, but others will have less rainfall. In Britain the southeast will be at risk from drought.

At Risk!

Plants and Animals

It has taken millions of years for life to adapt to the conditions on Earth. A climate that changes too quickly will alter these conditions and affect the homes of plants and animals throughout the world. For example, the polar bears and seals will have to find new feeding grounds as the ice melts.



Many animals and plants may not be able to cope with these changes and could die. This could lead to local, or world-wide extinction of certain species.

People

Climate change will affect everyone but some populations will be at greater risk. For example, countries whose coastal regions have a large population, such as Egypt and China, may see whole populations move inland to avoid flood. The effect on people will depend on

how well we can adapt to the changes and how much we can do to reduce global climate change.

What can we do to slow down global warming?

Governments throughout the world have already taken action to start reducing global warming. In their plan they hope to reduce the amount of man-made emissions of greenhouse gases. Everyone can help in some way to slow down global warming.

About half of the enhanced greenhouse effect is caused by our use of energy, especially from fossil fuels. Other sources of energy could be used which do not emit carbon dioxide, for example wind power, solar (power from the Sun's rays) and wave power. In the home and at school we must learn to use energy efficiently and not waste it. We can make buildings more efficient, for example by putting in loft insulation and double-glazing.

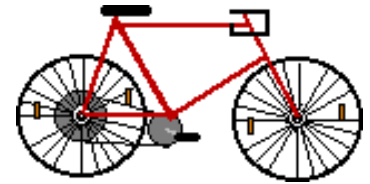


Much of the rubbish we throw away can be recycled, such as glass bottles and jars, steel and aluminium cans, plastic

bottles and waste paper. Recycling used materials uses less energy than making new ones. Composting fruit and vegetable waste reduces the amount of rubbish buried at rubbish dumps.



We should try and reduce our use of the car by travelling on public transport, cycling and walking.



If more forests were planted they could take in more of the carbon dioxide from the atmosphere.

Industries that produce and use CFCs have already agreed to stop by 1996.

Glossary

Atmosphere: a layer of gases which surrounds the Earth.

Fossil fuels: fuels formed over a long time from material containing carbon. The main fossil fuels are coal, oil and natural gas.

Greenhouse effect: the Sun's radiation is trapped in the atmosphere and leads to a warming of the Earth.

Greenhouse gas: a gas in the atmosphere which can trap the heat escaping from Earth.

Global warming: a continued warming of the atmosphere as a result of mankind's activities.

Industrial Revolution: the rapid growth of industry which started in the late 18th century, made possible by the harnessing of energy from fuels such as coal.

Radiation: energy that passes from a warmer object to a cooler one.

Word Match

The fourteen words printed below can be matched up to make seven new phrases. Match a word from the left hand column with a word from the right hand column, (choose a word from the left-hand column first) and see if you can do it!

CARBON

LEVEL

GREENHOUSE

EFFICIENCY

GLOBAL

VAPOUR

OZONE

EFFECT

WATER

DIOXIDE

ENERGY

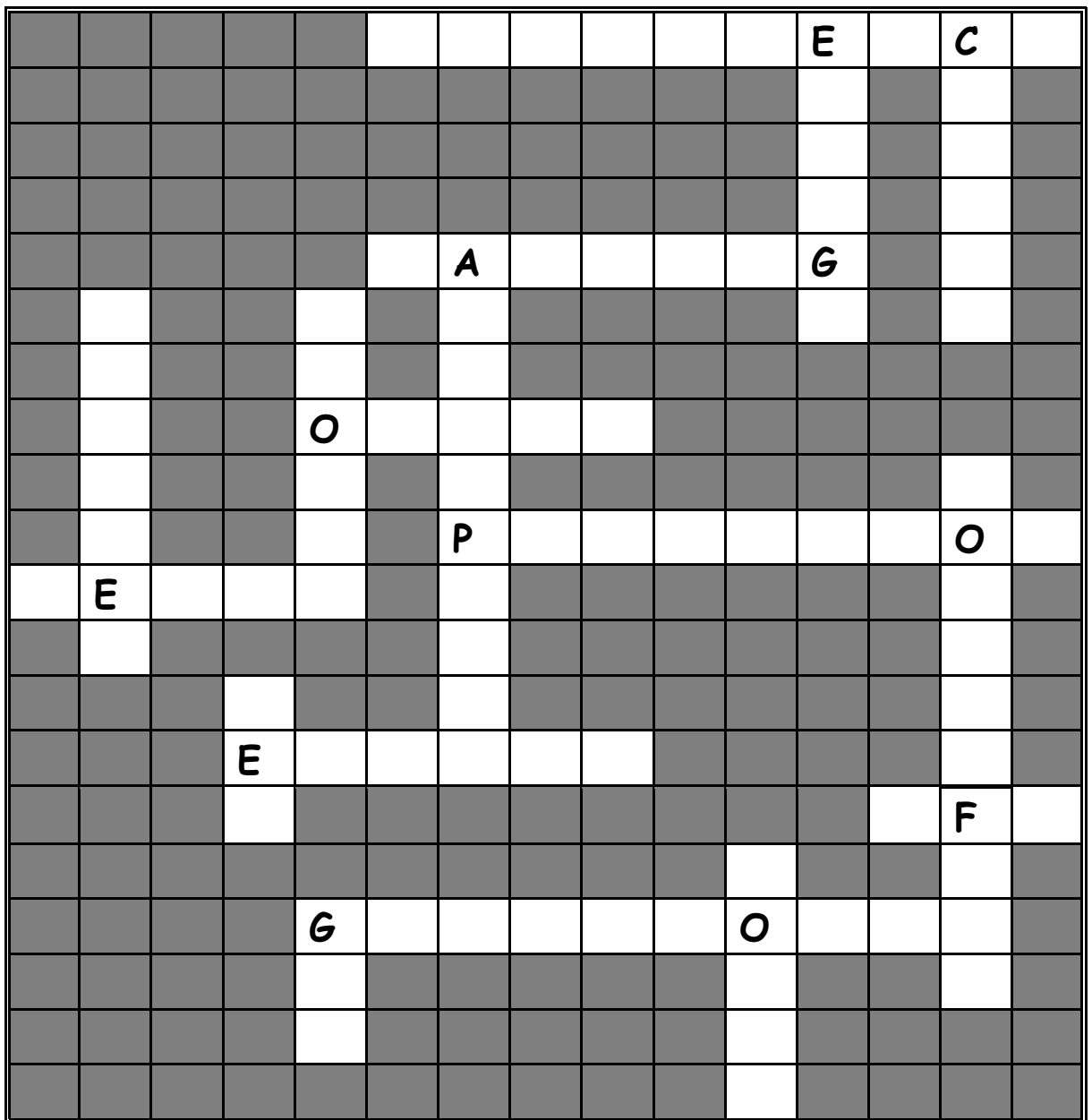
HOLE

SEA

WARMING

Word Puzzle

See if you can fit the words on the next page into the correct spaces in the puzzle below.



SEA

LEVEL

CARBON

GLOBAL

SOLAR

FOSSIL FUEL

OZONE

WEATHER

CFC

ENERGY

GREENHOUSE

ATMOSPHERE

WARMING

EFFECT

GAS

POLLUTION

A Teachers copy of the completed word puzzle is printed below.

					E	F	F	I	C	I	E	N	C	Y	
											N		A		
											E		R		
											R		B		
					W	A	R	M	I	N	G		O		
	W			G		T					Y		N		
	E			L		M									
	A			O	Z	O	N	E							
	T			B		S							F		
	H			A		P	O	L	L	U	T	I	O	N	
L	E	V	E	L		H							S		
	R					E							S		
			S			R							I		
			E	F	F	E	C	T					L		
			A										C	F	C
										S			U		
				G	R	E	E	N	H	O	U	S	E		
				A						L			L		
				S						A					
										R					

Wordsearch

The words printed at the bottom of the page are hidden in the wordsearch box. How many can you find?

Q	G	R	E	E	N	H	O	U	S	E	Z
S	A	L	D	R	H	J	F	N	B	Y	U
R	C	D	O	F	G	A	W	O	C	F	M
E	T	L	H	B	O	P	A	S	A	E	E
T	H	X	R	T	A	N	R	U	R	W	N
V	I	Z	E	K	V	L	M	A	B	N	E
M	E	T	H	A	N	E	I	L	O	S	R
D	A	N	L	H	T	I	N	P	N	A	G
U	P	J	Q	V	B	S	G	E	D	H	Y
G	B	C	K	U	R	S	M	A	I	A	C
J	X	I	F	Q	G	I	O	Z	O	N	E
L	L	P	N	C	A	O	F	G	X	R	M
S	G	A	D	T	S	N	H	Y	I	L	V
W	O	R	W	P	E	S	C	L	D	D	Y
R	Q	W	Z	G	C	C	I	P	E	N	I

Words to Look For:

GREENHOUSE

GAS

GLOBAL

WARMING

OZONE

CARBONDIOXIDE

CFCS

METHANE

ENERGY

Greenhouse Riddle

Can you solve this riddle to make two words connected with the greenhouse effect?

The first one has been done for you!

My 1st is in recycling and also in gas

My 2nd is in invisible and also in laugh

My 3rd is in coal but not in chalk

My 4th is in carbon but not in carton

My 5th is in air and also in man-made

My 6th is in layer but not in yesterday

My 7th is in weather and also in wind

My 8th is in car and also in walking

My 9th is in water but not in wasteful

My 10th is in tram but not in train

My 11th is in air but not in Earth

My 12th is in radiation and also in Sun

My 13th is in energy and also in gas

Enter the letter from each riddle in the boxes below

g													
----------	--	--	--	--	--	--	--	--	--	--	--	--	--

An Energy Inefficient Kitchen

The picture below shows how a kitchen can be inefficient. Can you make a list of how it is wasting energy and suggest ways in which the kitchen could be made more efficient?



Have fun colouring in the kitchen above!

How Much Can You Remember?

Below are ten questions to test you on how much you remember about the greenhouse effect and global warming. If you do not know an answer read through your information sheets to help.

1. Is the Earth warmed by the Sun's heat?

Yes No

2. Is carbon dioxide a greenhouse gas?

Yes No

3. Does mankind cause global warming?

Yes No

4. Are carbon dioxide, methane, water vapour, and ozone natural greenhouse gases?

Yes No

5. Are chlorofluorocarbons (CFCs) a group of man-made greenhouse gases?

Yes No

6. Is the Earth cooled by the greenhouse effect?

Yes No

7. Is the temperature in Britain going to be cooler with global warming?

Yes No

8. Has the amount of greenhouse gases in the atmosphere fallen since the Industrial Revolution?

Yes

No

9. Is saving energy a good way to help reduce global warming?

Yes

No

10. Is the sea level going to rise as a result of global warming?

Yes

No

Energy Savers!

Introduction

A class game is an enjoyable way for pupils to learn about the link between their energy use and global warming. This activity aims to encourage pupils' individual literacy, numeracy and artistry skills whilst building their ability to work as part of a team.

There is a simple game board included, although the class may wish to design and make their own board. The instruction cards and energy saving stars are also included.

Game Rules

1. Pupils should form into small groups (the group number will depend on the class size) and work as separate teams.
2. Each team has a throw of the die; the team with the highest number starts first.

3. Teams throw the die and move the number of spaces the die shows.
4. When a team lands on a space with an instruction card a team member must read aloud to the class what his/her team has to do.
5. If a team is awarded energy saving stars they are collected from the teacher and kept until the end of the game.
6. All teams must complete the game. At the end of the game the energy stars of each team are collected and counted. The team with the most energy stars is the winner!

Instruction cards

4. You forget to switch the light off in your bedroom. Move back two spaces.

8. You recycle your aluminium drinks can. Move forward one space and collect two energy-saving stars!

12. You buy an aerosol. Move back ten spaces.

14. You leave the television on while you do your homework. Move back one space.

20. Persuade Dad to buy new energy-saving lightbulbs for your house. Move forward five spaces and collect five energy-saving stars!

25. You forget to shut the fridge door. Move back three spaces.

29. You tell Mum that if she turns the central heating down by 1°C the fuel bill will be cut by around ten percent! Move forward six spaces and collect five energy-saving stars.

33. You leave the hot tap running in the bathroom. Move back two spaces.

38. You ask your parent to walk to school with you instead of taking you in the car. Move forward three spaces. Collect three energy-saving stars.

41. You help Mum to recycle the old newspapers and glass jars. Move forward two spaces and collect three energy-saving stars.

46. You forget to turn the radio off before going to school. Move back two spaces.

END: Who has the most energy-saving stars?

Start 1	11	21	31	41
2	12	22	32	42
3	13	23	33	43
4	14	24	34	44
5	15	25	35	45
6	16	26	36	46
7	17	27	37	47
8	18	28	38	48
9	19	29	39	49
10	20	30	40	50 Finish











