



Key Stage 2

Climate Change

Resource Pack



About this resource ...

"The effects of a changing climate can already be seen. Temperatures and sea levels are rising, ice and snow cover are declining, and the consequences could be catastrophic for the natural world and society. Scientific evidence points to the release of greenhouse gases, such as carbon dioxide and methane, into the atmosphere by human activity as the primary cause of climate change. We need a profound change in the way we generate and use energy, and in other activities that release these gases. At the same time we must prepare for the climate change that cannot now be avoided. The North West Regional Assembly funded this Regional Climate Change & Sustainable Energy Teaching Resource in response to our responsibility to lead on such an action arising from "Rising to the Challenge - A Climate Change Action Plan for England's North West 2007-09". Visit www.climatechangenorthwest.co.uk for further information on our (and partner) activities in the on-line version of our region's Climate Change Action Plan."

This resource is not designed to just to impart facts about climate change, or to make you feel guilty. We know the climate is changing and the current prognosis for our communities is not good.

This resource is about stimulating 'big picture thinking' and how we manage our lives and use resources in the context of a changing climate. It is about how we encourage young people to engage with change, recognising that change will happen whether we like it or not, and envisioning change as a positive force for the good, and in this case towards a low carbon high quality future.

We strongly urge you to read the brief introduction by Ken Webster and share our inspiration that shaped the creation of this resource. Today we will influence our changing future, the question is how?

Explore and be world changing!

This resource has been written by the Field Studies Council, with funding from the North West Regional Assembly. The FSC is an independent educational charity formed in 1943 to help people discover, explore, understand and be inspired by the natural environment ... 'bringing environmental understanding to all'. The FSC has become internationally respected for its national network of 17 educational centres, international outreach training projects, research programmes, information and publication services and wide range of professional training and leisure courses. FSC goes beyond conventional thinking to challenge the underlying assumption about how education can lead to a sustainable future. We ask what really brings about change and how can our learning achieve this? Our inspiration is always to deliver capacity building for sustainable change.

The resources are based on original ideas by Ken Webster (independent consultant), Andrew Turney (Head of Centre, FSC, Brockhole) and Richard Dawson (Project Manager, FSC EE), with activities written by Annie Duckworth, Eve Jakeways, Ruth Suddaby, Jayne Buchanan, Tracey Chaplin, Sam Carter, Jocelyn Riley, Alison Stott and Ben O'Donovan.

This project is a collaboration between FSC Brockhole and FSC Environmental Education. The project was managed by Andrew Turney.

Introduction to the KS2 Climate Change Resource Pack

This KS2 “Climate Change” pack has been developed on behalf of the North West Regional Assembly by the Field Studies Council at Brockhole.

It has been commissioned due to a demand from teachers for “ready to use” resources which explore the causes and consequences of global warming and climate change in a way that is engaging to students and has a relevance to their own lives in the North West of England. There are 7 chapters which collectively explore the theme of “changes over time” in a chronological order (distant past, recent past, present and future).

A conscious effort has been made when writing this publication to ensure that all activities are informative and thought provoking and positive, rather than being overly gloomy or pessimistic. This has been a deliberate and conscious decision, the aspiration being to encourage young people to feel empowered, willing and able to make a difference.

There is a strong regional focus to many of the activities and case study materials which reinforces this.

The pack has been written in line with current National Curriculum programmes of study and incorporates activities that are offer cross curricular options. The curriculum links section of the 7 chapters include references to the science, geography, history, design technology and PE, QCA schemes of work, along with numeracy and literacy links, where appropriate. Chapter 1 is suitable for lower Key Stage 2, the other chapters involve concepts more appropriate for Years 5 and 6. Differentiation has been left to the discretion of the teacher.

Chapter contents

Chapter 1 – Change is all around us

This chapter introduces children to the concept that change is happening all around them and is caused by many different things. Seasonal changes are something that children are familiar with and can explore easily. The activities investigate the changes that occur in deciduous woodland during a year, children will use photographs, data and their own observations to identify changes and establish why they happen.

Chapter 2 – The North West – a history full of change

This chapter investigates the changes that have occurred in the North West region during the past 500 years. The triggers that led to some of the major changes will be explored, as will the link between the industrial revolution and it’s legacy and the increases in carbon dioxide emissions over time.

Chapter 3 – Power Stations, People and Climate Change – What are the links?

This chapter makes children aware of how electricity is generated and that currently nearly 75% of the UK’s electricity is produced using coal, gas and oil, all of which are non renewable resources that when burnt release carbon dioxide and other gases into the atmosphere. Children will also consider that the vast amounts of appliances and gadgets that they use every day are powered by electricity, and that increasing demand for electricity is leading to increased carbon dioxide emissions and therefore is directly related to global warming and climate change.

Chapter 4 - An invisible blanket

This chapter introduces children to the science behind global warming and what it is that links carbon dioxide being released into the atmosphere and a world that is warming up. In this chapter children learn about the greenhouse effect, what it is and the impacts it will have on the world and its climate.

Chapter 5 - On Our Doorstep

This chapter allows children to explore what the local and regional impacts of climate change will be. It will develop children's understanding of the cultural impacts of climate change may be in their local area

Chapter 6 – Change is happening, how will we cope?

This chapter focuses on adapting to change. Children are encouraged to look at examples of adaptations to local environments/climates around the world. Then, using their knowledge about the likely impacts of climate change in their own area (See Chapter 3), children consider the adaptations that may be necessary in their lives.

Chapter 7 – Can we design a better future?

This chapter looks at applying what has been learnt in the previous chapters to design a sustainable 'product'. The example given is that of a sustainable packed lunch. However, the choice of 'product' is open and could include redesigning a school building or community building. Examples of current eco-design within buildings are used for information and inspiration. Activities include references to the DCFS Sustainable Doorways, and involve a piece of creative work (which can be tailored to preferred learning styles). Hopefully students will take some of these ideas forward into their own lives, within both the school and home environment.

Contents

Each chapter contains

i) **An introduction** (containing learning intentions, background information and relevant web links)

ii) **Activity guidelines and answer sheets**

iii) **Student resources (worksheets, card sort activities etc)**

The materials provided in each chapter have been designed to use "straight off the shelf" in order to reduce preparation time, but alternatively could provide a springboard for teachers to deliver their own materials.

Use of this resource within school

The teacher notes within each chapter aim to provide enough background information for a teacher of any subject to feel confident delivering this material, and engaging in the resultant conversations or debates with pupils.

This resource could be used in a variety of ways within school, within Key Stage 2. Some possible approaches are suggested below:

- Chapters and activities related to particular subject areas could be integrated into current schemes of work to allow the resource to be use flexibly in an integrated way.
- The resource could be used as a whole by one year group (e.g. Year 6) as a topic resource. The chapters would be taught in sequence over a half term.
- The resources and activities could be used to enhance teaching already done on sustainability and climate change in school

Chapters 1 – 5 can be used in isolation and the activities undertaken successfully within this context. Chapters 6 and 7 do rely on some prior understanding and can be undertaken most effectively with this in mind. All chapters contain activities which can be used out of context to supplement existing teacher schemes of work.

Poster

A poster template is included in the resource pack. Its intended use is as a “climate change knowledge bank”, where pupils can post questions, ideas, facts or thoughts about climate change and its impacts during their studies.

Chapter 1 - Change is all around us

Activity guidance

Starter activity

Ask children to talk to a partner about what they would wear if they were going to play in the local park at the weekend, ask them to think of the reasons why they would choose those items of clothes – are any of the reasons influenced by the weather or season? Choose a month in a different season – would the choice of clothes they wear change – why?

Activity 1 – What happens in each season?

Resources List

- Season picture sheet
- Instruction slip
- Pencils
- Paper

Children to be split into small groups

Each group will:

- Receive a season picture sheet and a slip of paper with their instructions on
- Look at the picture of the woodland in spring, summer, autumn or winter
- Talk in their groups about what is happening in the woodland
- Write their ideas and observations around the picture

Groups to feedback about what they have written about each season.

Stand / sit children in a circle with the seasons in the correct order, to illustrate that seasons are cyclical, children to discuss in pairs what causes the changes to happen in the woodland through the different seasons, remind them of the starter activity discussion.

Activity 2 – Why do the trees change?

Resources List

- Season picture sheet
- Activity 2 Worksheet 1 Why do trees change? – 1 per child
- Activity 2 Worksheet 2 – Fill in the blanks – 1 per child
- Scissors
- Glue sticks

Activity 2 revisits the ideas discussed in Activity 1 particularly those relating to the reasons why trees change through the year. Discuss with the children that changes have one or many triggers, this will help them to understand the concept that, changes happening around us are caused by something.

Give out the season picture sheet used in Activity 1 for the children to refer to.

Display the table containing data for each season:

Season	Average temperature celsius	Sunshine hours	Rainfall millimeters
Winter	4	171	237
Spring	8	428	373
Summer	16	598	210
Autumn	12	309	428

This data could be used to make graphs to illustrate the changes.

Activity 2 asks children to interpret the data and cut and paste the correct information into their own table. By doing this, the children should gain a better understanding of the environmental changes that occur in each season and what impact these have on the woodland.

Extension Activity

Resources list

- Where do the leaves go? sheets – 1 per group
- Pencils
- Paper

Children are asked to consider what happens to leaves after they have fallen from the trees. In groups the children can discuss what they think happens to all the fallen leaves in autumn.

For Example: “ They all blow away” “ The council men sweep them up” “They melt into the soil”

Groups could then design an investigation to test their idea.

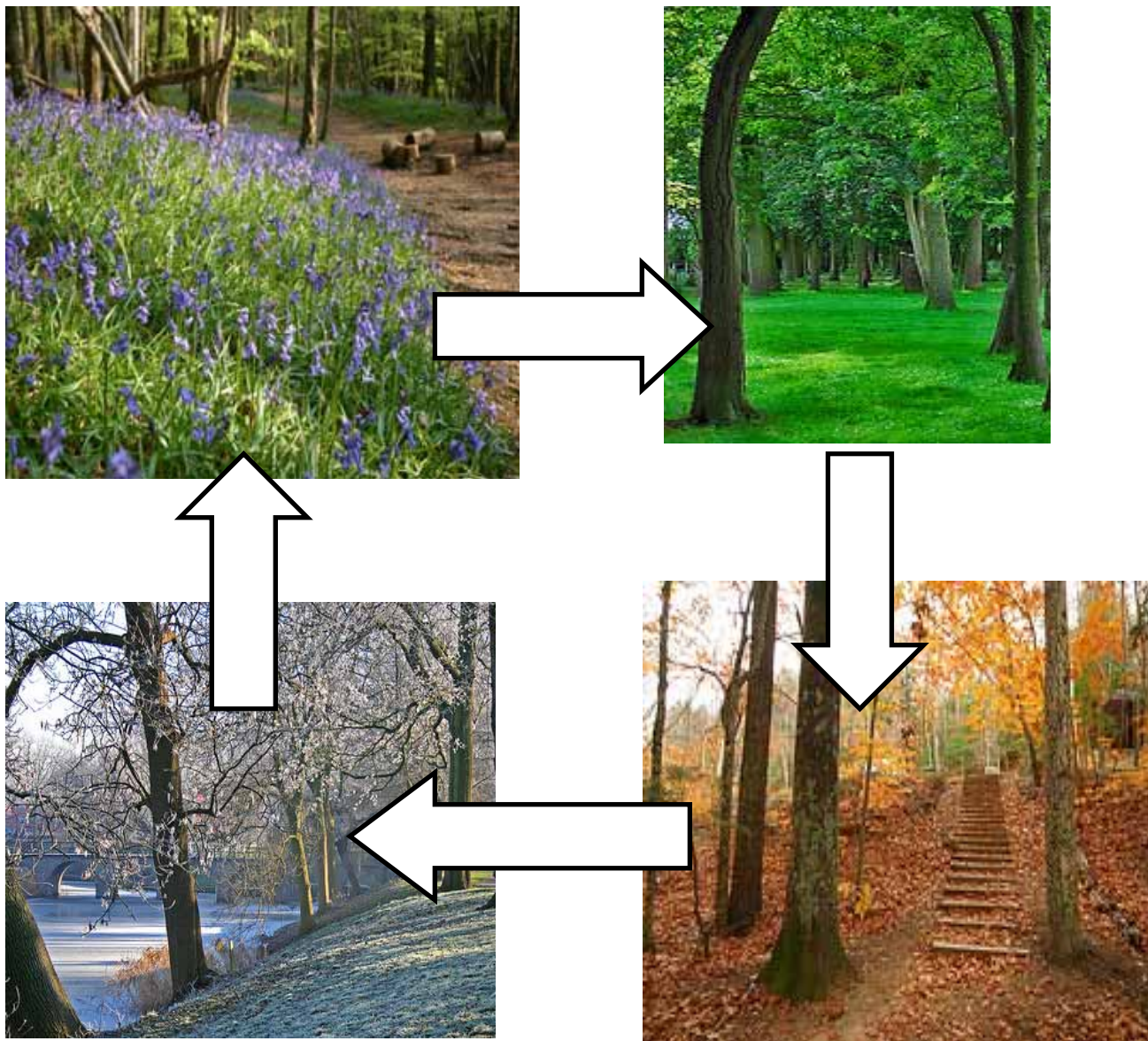
Plenary

Whole class activity – discussion

Read through the Telegraph newspaper article ‘Autumn comes early’. Discuss with the children what will happen if we get warmer temperatures in winter, wetter summers etc due to climate change. What impacts might there be on the woodland. Could climate change cause our seasons to change?

Chapter 1 - Change is all around us

Activity answer sheet



Why do trees change during the year?

- Light
- Temperature
- Water

Spring	Summer	Autumn	Winter
Days getting longer	Long days	Days getting shorter	Short days
Getting warmer	Warm	Getting colder	Cold
Lots of rain	Less rain	Lots of rain	Less rain
Buds opening, blossom flowering,	Many leaves – making food Fruit growing	Leaves dying and falling Fruit falling – seeds being dispersed	Dormant tree – no leaves

Chapter 1 - Change is all around us

Teacher notes and background information

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

The aim of this chapter is to introduce children to the concept that change is happening all around them and is caused by many different things. Seasonal changes are something that children are familiar with and can explore easily. The activities investigate the changes that occur in deciduous woodland during a year, children will use photographs, data and their own observations to identify changes and establish why they happen.

Learning Intentions

- To recognise that change is a process that is happening all the time.
- To illustrate change through exploring the seasonal changes in a woodland.
- To identify that change occurs due to triggers, for example a woodland responds to environmental change such as changes in light, water and temperature during the year.
- To recognise that long term changes in climate may impact on seasons in the North West.
- To understand that change can be cyclical or linear, that many natural changes are cyclical, such as in woodlands, but human changes are linear.
- You might like to link the natural changes in chapter 1 with the social changes in chapter 2, this will help to draw out the cyclical and linear changes that occur.

Background information

The scientific reason for the seasons

In the United Kingdom, our seasons include spring (beginning at the time of the spring equinox on about the 21st of March), summer (beginning at the time of the summer solstice on about the 21 June), autumn (beginning at the time of the autumnal equinox on about the 22 September) and winter (beginning at the time of the winter solstice on about the 21 December).

More scientific explanations of the seasons relate to the 23 degree tilt of the Earth upon its axis. The axis is the imaginary line that runs through the middle of the Earth from the North Pole to the South Pole.

The United Kingdom is found in the northern hemisphere.

Summer starts at the moment when the sun is farthest north: the "summer solstice". In the northern hemisphere the Earth's axis points most toward the sun in June. Because the Earth is leaning toward the sun, it receives direct rays of sunlight. This makes the northern hemisphere warmer with longer hours of daylight.

Winter starts at the moment when the sun is farthest south: the "winter solstice". In the northern hemisphere the Earth's axis points most away from the sun in December. While the Earth is leaning away from the sun, it receives the least amount of direct rays of sunlight and is cooler with shorter hours of daylight.

Countries in the southern hemisphere will, of course, experience exactly the opposite effects.

Seasonal observations

In **spring**, plants and trees start growing, producing shoots, leaves and blossom. Animals begin to produce young, birds build nests and lay eggs, and insects emerge from hibernation or hatch from over-wintering eggs. It is a time of regeneration and growth.

In **summer**, plants are in full growth. There is plenty of leafy green foliage and many plants will flower. Animals are active, searching for food, and their young are feeding and growing. It is an important time for living things as this is the period when they need to grow and stock up for the rest of the year ahead.

Autumn is nature's preparation for the long, hard winter months. Deciduous trees need to lose waste products by shedding their leaves. Animals prepare to migrate, hibernate or adapt for the coming winter. The nuts and berries of many plants provide a final rich food source to feast on.

In **winter** many plants and animals lie dormant. Some evergreen shrubs and trees provide plant cover and a few adaptive animals, such as squirrels, robins and rabbits still hunt for food.

The changes that happen throughout the year are triggered by changes in temperature, day length, amount of light available and rainfall.

Weather data 2006 for **North West England & North Wales** (source Met Office)

Season	Average temperature Celsius	Sunshine hours	Rainfall millimeters
Winter	3.9	170.7	237.0
Spring	7.5	427.5	372.7
Summer	15.8	597.6	210.2
Autumn	11.5	309.3	428.3

Nutrient Cycle

Carbon and other nutrients are cycled round and round, from the air to the plants, during photosynthesis.

The carbon and other nutrients are released back into the soil when dead leaves fall to the ground and rot. The hot wet conditions are excellent for rotting or decomposing.

The carbon and other nutrients in the soil are taken up by the roots and pass up the trunk to be made into plant material, such as leaves or wood.

The dead leaves rot and the nutrients are taken back up by the roots of the trees. This process is called nutrient cycling.

Curriculum links

Science Key stage 2 (Year 5)

Unit 5E: Earth, Sun and Moon

Section 6: The Sun at different times of the year

Numeracy

Handling data Years 4,5,6

Web links

Interactive whiteboard activities related to seasonal changes:

<http://www.ngfl-cymru.org.uk/vtc/seasons/eng/Introduction/default.htm>

Weather and climate data

www.metoffice.gov.uk

Acknowledgements Chapter 1

Photographs supplied by <http://www.flickr.com>

Front cover

Mountain view	by spikewerx
Sailing boats	by hazler_06
Sailing	by zoer
Bridge house	by Jim Pritchett
Chester	by harrymoon
Tram	by Shantanu Bhar
Liverpool	by DeclanMcAleese
Peter Rabbit	by Simon Cobb

Activity 1

Summer trees	by Jezzebelle
Autumn Trees	by meantux
Winter Park	by Artist Wanabe

Chapter 1 Change is all around us

Activity 1

Spring

- 👁️ Look at the picture of the woodland in spring
 - 🗣️ Talk in your group about what is happening in the woodland in spring
 - ✍️ Write your ideas and observations around the picture
-

Summer

- 👁️ Look at the picture of the woodland in summer
 - 🗣️ Talk in your group about what is happening in the woodland in summer
 - ✍️ Write your ideas and observations around the picture
-

Autumn

- 👁️ Look at the picture of the woodland in autumn
 - 🗣️ Talk in your group about what is happening in the woodland in autumn
 - ✍️ Write your ideas and observations around the picture
-

Winter

- 👁️ Look at the picture of the woodland in spring
- 🗣️ Talk in your group about what is happening in the woodland in spring
- ✍️ Write your ideas and observations around the picture

Spring



Summer



Autumn



Winter





Why do the trees change?



Trees can look very different depending on which season you visit them in; there are reasons why the changes happen.

👁 Look at the data in the table below and see if you can link the changes in trees with what is happening in the environment around them. You can use the season pictures from Activity 1 to help you.

Season	Average temperature Celsius	Sunshine hours	Rainfall millimeters
Winter	4	171	237
Spring	8	428	373
Summer	16	598	210
Autumn	12	309	428

The season information below has got all mixed up. Cut out the rectangles and stick the information into the correct place in the blank table.



Days getting longer More sunshine	Long days Lots of sunshine	Days getting shorter Less sunshine	Short days Less sunshine
Temperatures getting colder	Cold	Temperatures getting warmer	Warm / Hot
Lots of rain	Lots of rain	Less rain	Less rain
Buds opening, blossom flowering, new leaves	Dormant tree - no leaves	Leaves dying and falling Fruit falling - seeds being dispersed	Many leaves - making food Fruit growing



Why do the trees change? – Answer sheet



Season	Temperature	Sunshine Day Length	Rainfall	What's happening	Tree picture
Winter	Cold	Short days Less sunshine	Less rain / Water frozen	Dormant tree – no leaves	
Spring	Temperatures getting warmer	Days getting longer More sunshine	Lots of rain	Sap rising buds opening, blossom flowering	
Summer	Warm / Hot	Long days Lots of sunshine	Less Rain	Many leaves – making food Fruit growing	
Autumn	Temperatures getting colder	Days getting shorter Less sunshine	Lots of rain	Leaves dying and falling Fruit falling – seeds being dispersed	

Chapter 1 Change is all around us

Activity 2 Worksheet 2 – Fill in the blanks



Why do the trees change?



Season	Temperature	Sunshine Day Length	Rainfall	What's happening	Tree picture
Winter					
Spring					
Summer					
Autumn					

Chapter 1 Change is all around us

Autumn comes early

By Patrick Phelvin

Holly berries are appearing in the hedgerows, conkers and apples are falling from the trees and mushrooms are springing up in the fields.

All the signs are that the briefest of brief English summers is coming to an end and autumn is already upon us.

A growing number of experts believe that this year's unpredictable weather, which brought spring on early, then deluged Britain with record rainfall, has now taken us straight to autumn - bypassing summer altogether.

Ian Johnson, of the National Farmers' Union, said many of those working in agriculture had already noticed the signs of an early autumn.

There is concern that seasons are becoming a lot less predictable and that will clearly have an impact on British farmers."

The early onset of autumn can be explained in part by record high temperatures in spring, when average temperatures of 48F (9C) – the highest since records began in 1914 – led to plants and trees like the Hawthorn flowering early.

My mid-April, fields were filled with tulips and rhododendrons were making an early appearance.

Migrating birds have also been confused by this year's weather, with flocks of swifts arriving in April rather than May.

The soaring spring temperatures were followed by the wettest summer in more than 200 years. The recent downpours and relatively cool weather tricked some plants into thinking winter was on its way.

The freak conditions, which saw a month's worth of rain [fall in 24 hours over parts of Britain](#), have been blamed on a global phenomenon which brings cold, damp air from the south Atlantic to northern Europe in the channel of strong wind known as the Jet Stream.

Meteorologists say that for much of the summer the jet stream has been further south and stronger than in a typical summer.

This has resulted in many depressions crossing southern and central parts of Britain, interacting with very warm and moist air to the south and generating exceptionally heavy rain storms, while other parts of Europe are experiencing drought.

A spokesman for the Met Office's Hadley Centre for Climate Change said it was too early to say whether this year's conditions were [evidence of global warming](#) and they could be dismissed as an irregularity.

"We have just had the wettest summer since 1766 so it is unsurprising that this has affected crops," he said. "There is evidence to suggest that within a warmer climate we will see wetter winters and warmer summers. Having said that, there will also be an increased likelihood of the [extreme weather events like the rain](#) we have just seen."

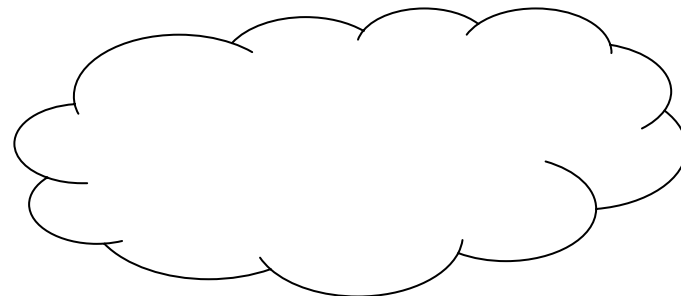
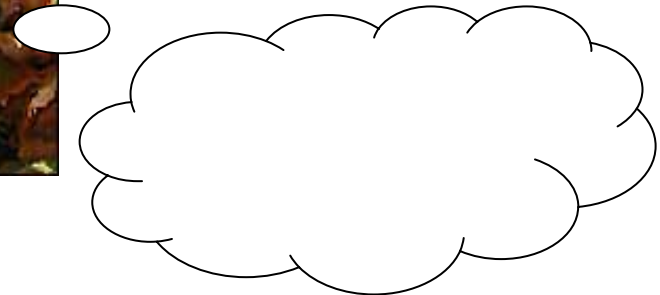
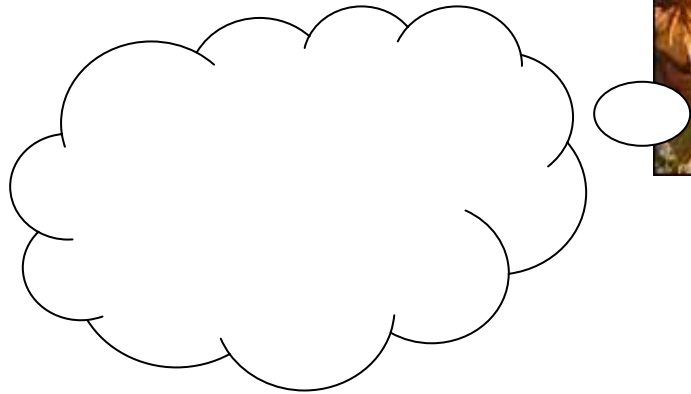
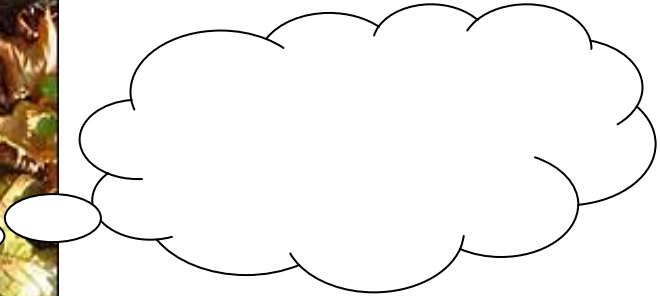
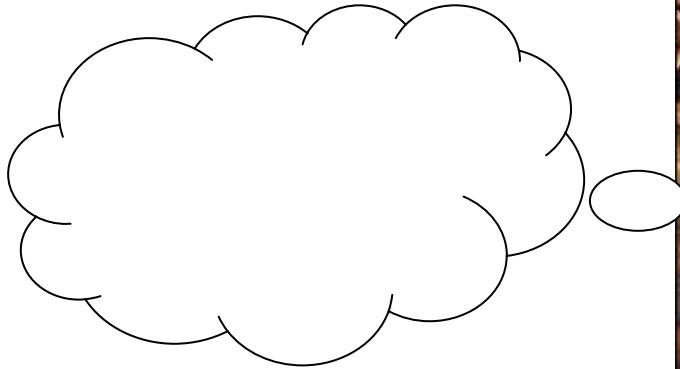
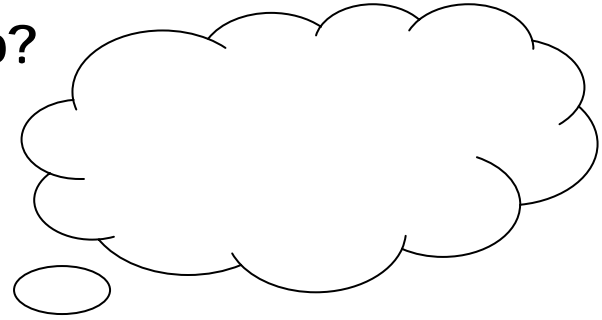
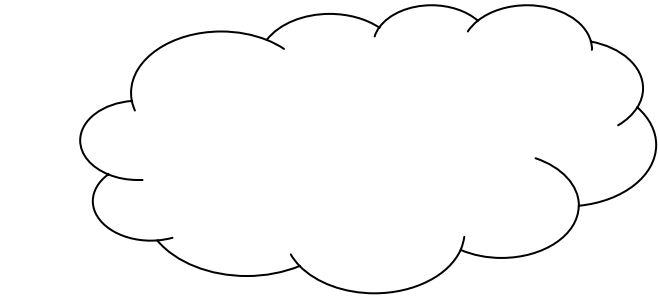
Daily Telegraph 31/7/2007

Chapter 1 Change is all around us

Extension Activity

Where do the leaves go?

When leaves fall in autumn where do they go?



Write your ideas in the thought bubbles