By Christiane Dorion in collaboration with WWF-UK and Templar Publishing

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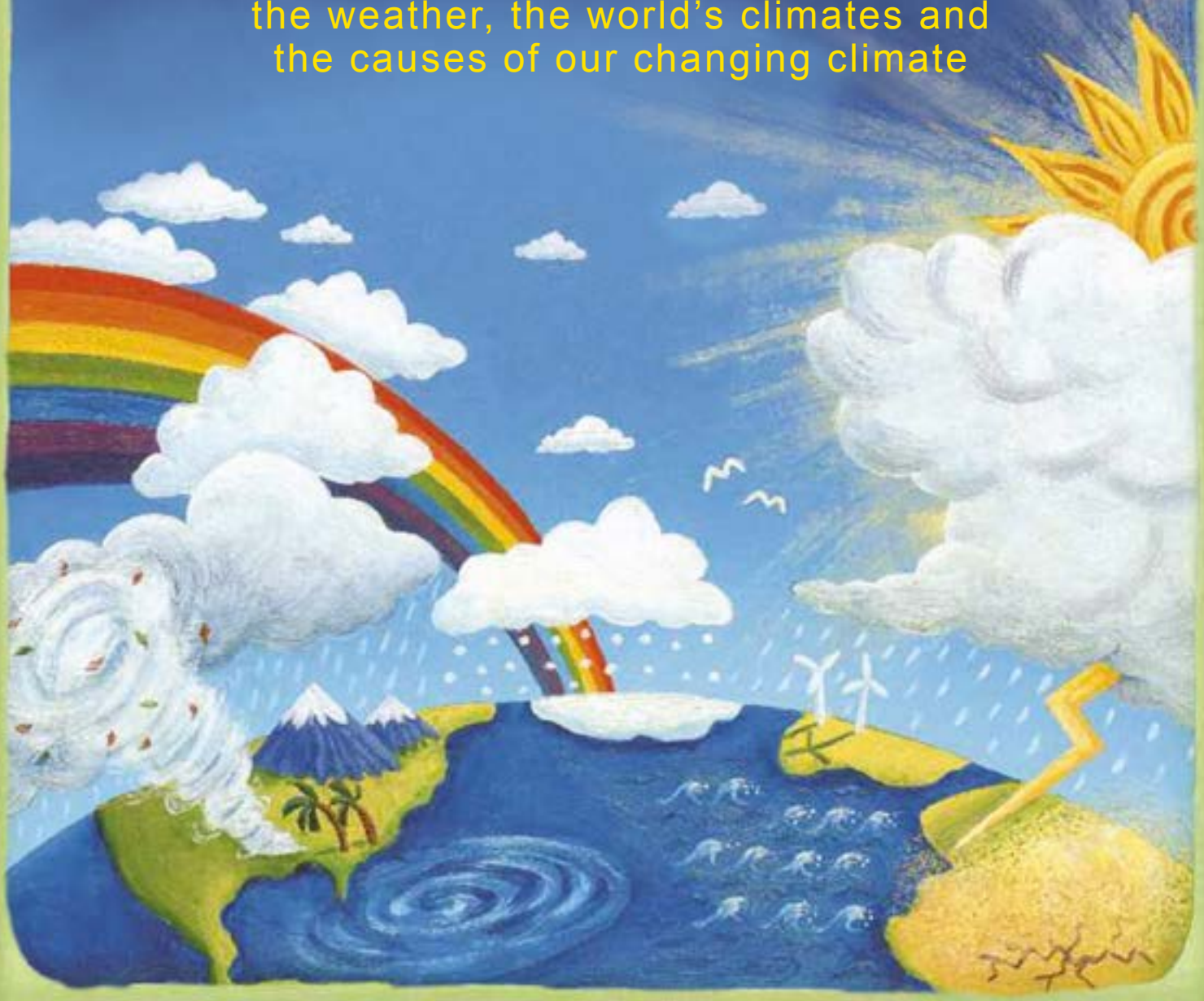
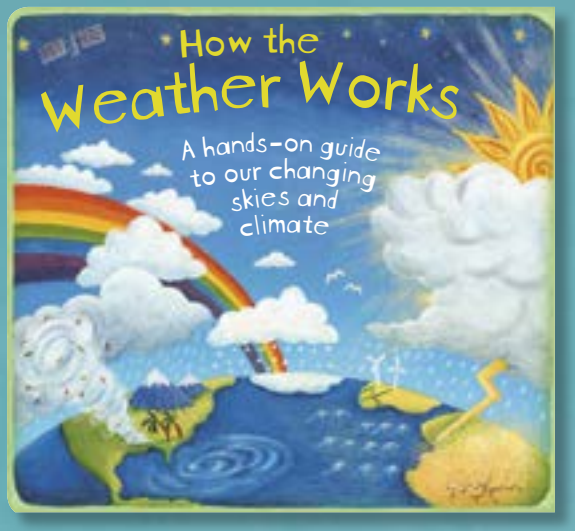
DO IT FOR YOUR PLANET

How the Weather Works

Resource for primary schools

A series of fun activities to explore the weather, the world's climates and the causes of our changing climate





Based on *How The Weather Works*, by Christiane Dorion, Illustrated by Beverley Young, Templar Publishing, 2011

How to use this resource

Children are fascinated by questions such as 'What causes the weather?', 'Where does rain come from?' or 'Why does the wind blow?'. They are also bombarded with information about the negative impact of human activities on the earth's climate. This pack is aimed at teachers of 7–11 year olds and is designed to help them introduce pupils to key aspects of the weather, the difference between weather and climate and the main causes of climate change. Simple activities based on the content of the book *How the Weather Works* and the animation 'Penguins and Polar Bears' (Vimeo, WWF) aim to encourage pupils to understand better the natural world around them and to reflect on how their own actions can help shape the future.

All the activities are linked to the National Curriculum in England (Geography, Science, English, Design & Technology and Art & Design). We hope that teachers in Scotland, Wales and other countries will also find it useful to support their curriculum. The material can be adapted for use with different ages and abilities.

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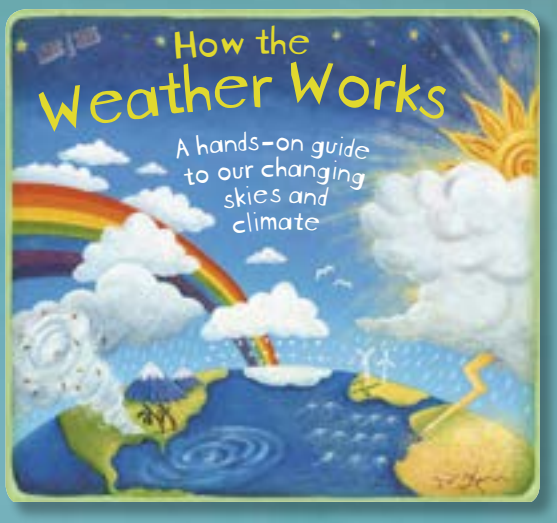
About this resource

This resource was produced by Christiane Dorion in collaboration with WWF-UK and Templar Publishing. It is based on the book *How the Weather Works* by Christiane Dorion and illustrated by Beverley Young (Templar Publishing, 2011).



About *How the Weather Works*

How the Weather Works is a pop-up book tackling both normal and extreme scenarios of the world's weather and climate. It explores the world's scorching, stormy, sensational weather and encourages children to think about whether human activities can influence the earth's climate. The book has been translated into eight languages and is the second in a series authored by Christiane Dorion and published by Templar Publishing, an imprint of Bonnier Publishing Ltd.

About WWF

WWF is the world's leading independent conservation organisation. With over 50 years' experience of working across the globe, their aim is to build a future in which people live in harmony with nature. And, to do that, they have set themselves three big challenges:

1. To safeguard the natural world
2. To tackle climate change
3. To help change the way we live, so people can live within the planet's limited natural resources

WWF works with governments, businesses, schools and communities in the UK and throughout the world to inspire positive change. You can find out more about the work of WWF at **www.wwf.org.uk**.

WWF's work with schools

WWF has been working with schools for over 30 years, encouraging young people to learn about environmental issues, explore their connections to nature, and develop their skills in order to take positive actions towards the environment. The programme includes the Green Ambassadors (**www.wwf.org.uk/greenambassadors**), a scheme to inspire and engage pupils in environmental projects in their schools. WWF also offers a range of inspiring and creative workshops for primary schools at their award-winning sustainable building, the Living Planet Centre in Woking, where their highly experienced education team will inspire and support your pupils to explore, discover and learn. You can find more information at **www.wwf.org.uk/schools**.

Penguins and Polar Bears workshop

In this workshop, pupils become polar explorers, having fun with practical experiments to find out how penguins and polar bears are perfectly adapted to where they live. They embark on a journey of discovery through the WWF interactive exhibition where they can test their knowledge and research skills with the Animal Adaptation quiz. Using iPads and fun props, they produce their own news reports from the frozen poles on the dangers facing these animals and their habitats.

What causes the weather?

Activity 1: Weather watch

Children are fascinated by different aspects of the weather. In this activity, they explore what causes the weather, make careful observations and produce a daily chart to describe the weather using pictures or words.

Curriculum subjects

Geography and Science

What you need

Activity sheet 1

What to do

As a group, discuss what makes up the weather (e.g. sun, rain, humidity, wind) using the book *How the Weather Works.* Encourage children to explore the link between the sun's warming rays and aspects of the weather (temperature, wind and rain). Using the chart on Activity sheet 1, pupils can observe the weather every day for a week and record their observations with drawings or words.

Activity sheet 1

What's the weather like today?

	Picture	Words
Monday		
Tuesday		
Wednesday		
Thursday		
Friday		

Sunny 

Rainy 

Cloudy 

Stormy 

Windy 

Snowy 

Activity 2: Build a weather station

Having a weather station in the school grounds is a useful resource to help children understand how the weather changes every day and throughout the seasons through observations and scientific investigations. In this activity, pupils make their own instruments to record aspects of the weather in their local area.

Curriculum subjects

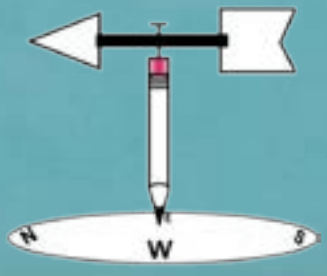
Geography, Science, Design & Technology

What you need

- Activity sheet 2 (all three parts)
- Outdoor thermometer
- Materials to create weather instruments for each group:
    - Rain gauge: A 2 litre clear plastic bottle, scissors, ruler and marker pen
    - Wind vane : Thick cardboard, a pin, scissors, glue, pencil with an eraser, a drinking straw, modelling clay and paper plate
    - Anemometer: Sharp pencil with an eraser, 5 foam cups, 2 long straws, a pin, a coloured marker and tape

What to do

Working in groups, children can create different instruments to record the weather every day. They can take measurements and present their data in a variety of ways. They can also investigate fun questions such as: Where is the warmest/coldest spot in the school grounds? Where is the driest/wettest area? Where is the windiest spot? Where would they put a picnic bench? Where would they put a washing line?



Activity sheet 2

How to make a rain gauge

A rain gauge is an instrument used to collect and measure the amount of rain over a period of time.

Make your own rain gauge to find out how much rain falls each day around your school.

What you need

- A 2 litre clear plastic bottle
- Scissors
- Ruler
- Marker pen

What to do

- Cut the top off an empty plastic bottle. Ask an adult to help you.
- Place the top upside down in the bottle, making a funnel.
- With a pen and ruler, mark a scale in centimetres up the side, starting from the bottom.
- Place your gauge outside and take measurements at the same time every day for a week.

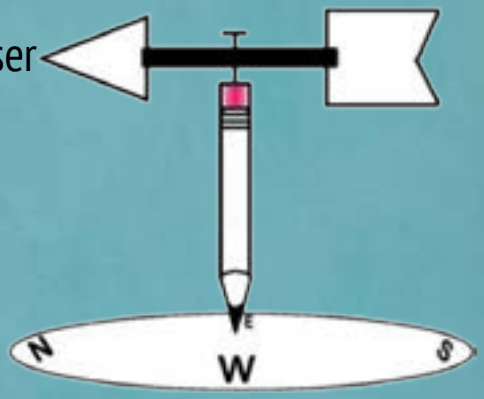
Activity sheet 2

How to make a wind vane

A wind vane, also called a weather vane, is a tool for measuring wind direction or where the wind is blowing from. It was probably one of the first weather instruments ever used.

What you need

- Thick cardboard
- Straight pin
- Scissors
- Glue
- Pencil with an eraser
- Drinking straw
- Modelling clay
- Paper plate



What to do

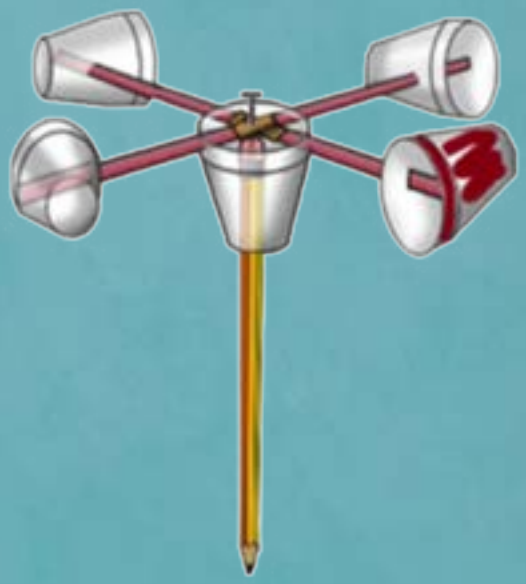
- Cut out the shapes of an arrow point 5cm long and an arrow tail 7cm long in cardboard.
- Make 1cm cuts at each end of the straw.
- Slide the arrow point and the arrow tail into the cuts in the straw.
- Ask an adult to help you to push the pin through the middle of the straw and into the eraser end of the pencil.
- On the paper plate, indicate north, south, east and west.
- Put a lump of modelling clay on the paper plate and stick the sharp end of the pencil into the clay.
- Blow on the vane and make sure that the arrow can spin freely.
- Identify where the north is in the school grounds and test out your wind vane in different areas around the school.

Amazing fact

The first recorded weather vane was built by the Ancient Greeks about 100-50BC on the Tower of Winds in Athens. This small building was used for measuring time, based on the position of the sun and had carvings on the walls illustrating different winds.

How to make an anemometer

An anemometer is an instrument used for measuring wind speed.
Create your own anemometer to measure how windy it is around your school.



What you need

- Sharp pencil with an eraser
- 5 foam cups
- 2 long straws
- 1 pin
- 1 coloured marker
- Tape

What to do

- Colour one of the cups with the coloured marker so you can use it as your starting point when measuring the wind speed.
- Use one cup for your centre piece and push the straws through the top of the cup to make a cross shape. Tape the straws together to hold.
- Push the pencil through the bottom of the cup so the eraser end is up under the cross section of the straws.
- Ask an adult to help you to place the pin through the straws and eraser to hold. Make sure the pin is not too tight to allow your anemometer to turn.
- Take the remaining 3 cups and the coloured cup and push the other ends of the straws through the side of the cups. Make sure they are all facing the same direction.
- Place your anemometer in the ground with the pencil end.
- When the wind blows, start counting how many times thecoloured cup goes by in one minute. That's the speed of the wind. You can compare the number of turns in one minute in different locations around the school.

Where does rain come from?

Activity 3: Create a water cycle

Discuss with the class where rain comes from, using *How the Weather Works*. With a simple experiment, you can reproduce the water cycle in a bowl. This activity illustrates how the sun's heat turns the water into vapour, which rises into the air and then becomes rain.

Curriculum subjects

Geography and Science

What you need

- Activity sheet 3
- A large clear bowl
- A small glass container
- Cling film
- A pebble
- A large rubber band or piece of string
- Water

What to do

Explain how you are going to create a water cycle in a bowl. The water cycle is powered by the sun so you will need to choose a sunny position in the classroom to carry out the experiment. Follow the procedure on Activity sheet 3 and discuss the results.

Activity sheet 3

The water cycle experiment

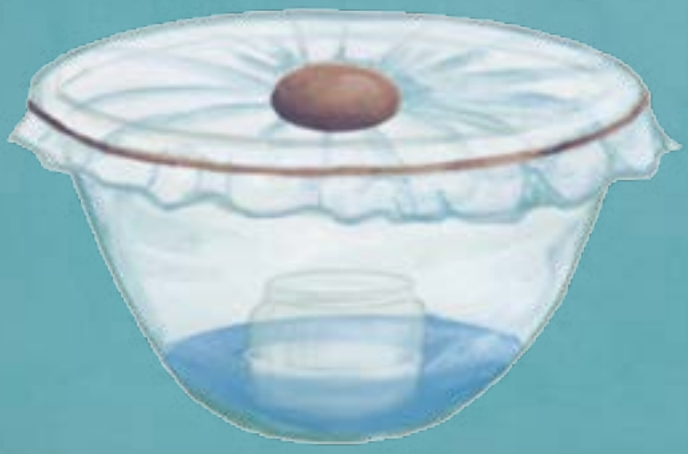
You can create a water cycle in a bowl.

What you need

- A small glass container
- A large clear bowl
- Cling film
- A pebble
- A rubber band or piece of string
- Water

What to do

- Place the small container upright in the middle of the large, clear bowl.
- Pour 3cm of water into the large bowl being careful not to fill the small container inside.
- Cover the large bowl with cling film so it is airtight and fasten it with your rubber band or string.
- Put the pebble on top of the cling film in the centre.
- Place the bowl in a sunny spot for a few days. What happens?



Amazing fact

A total of 70% of the earth's surface is covered in water but only 3% is freshwater!

Activity 4: The story of a raindrop

Stories can be a good way of introducing complex concepts such as the water cycle. In this activity, children imagine the journey of a raindrop over a long period of time and develop their understanding of how water can change from gas to liquid to solid, depending on the temperature. The activity also raises children's awareness that the earth has a fixed amount of water that keeps going round and round in a cycle between the ocean, the air and the ground. So it is important to use water wisely and keep it clean.

Curriculum subjects

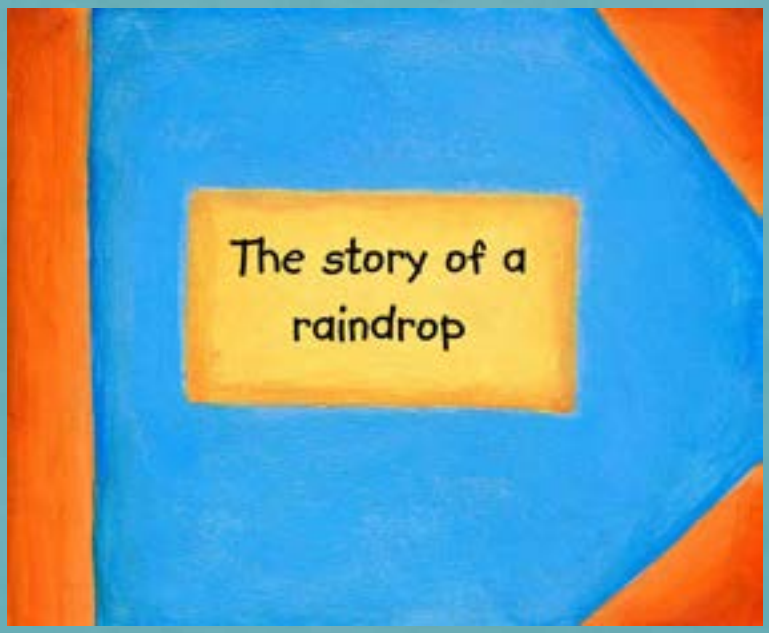
English, Geography and Science

Amazing fact

Every minute of the day, about 900 million tonnes of rain falls on the earth!

What to do

In pairs, ask pupils to imagine the journey of a raindrop over a long period of time. They can think about the different places where their raindrop ends up (e.g. drifting in the ocean, licked up by a cow from a puddle, in a cloud or landing on the nose of a gorilla) and the different forms it takes (gas, liquid or solid). Ask them to write down their ideas as well as words and phrases to describe the raindrop and its adventure. The first paragraph of 'The story of a raindrop' from '*How the Weather Works*' can be used as a starting point for them to write their own story.



How can we predict the weather?

Activity 5: Weather report

Weather maps tell us what the current weather is and what is expected over the hours and days ahead. In this activity, the children familiarize themselves with the symbols on a weather map and what they mean. They take a look at the map of an imaginary place where cold air is meeting warm air to tell what the weather is like. They then produce their own weather reports.

Curriculum subjects

Geography and Science

What you need

- Activity sheet 4
- *How the Weather Works* - 'How can we predict the weather?'

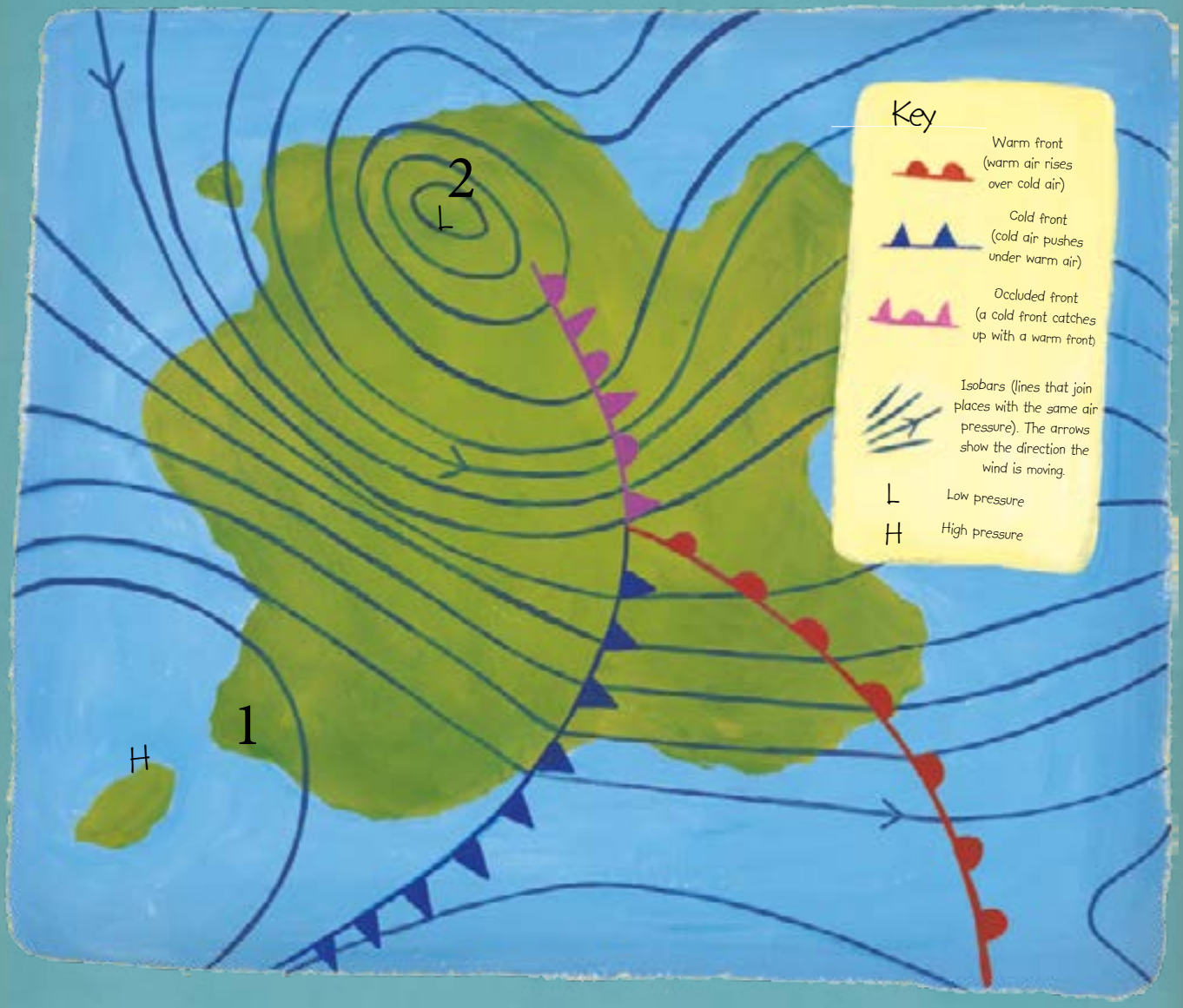
What to do

Using Activity sheet 4, pupils work in pairs and match each location on the map with one of the weather descriptions. They can also produce a weather report, using the map from the activity sheet or a real weather map of their local area and present it to the class.

If frogs croak louder, rain is on its way.

Activity sheet 4

Weather report



Match each description with one of the two locations on the map (1 and 2).

Calm weather and blue skies (High pressure). ☐

Rainy weather, grey skies and strong winds (Low pressure). ☐

Activity 6: Cloud spotting

Clouds come in all sorts of sizes and shapes and can appear near the ground or high in the sky. The way clouds change can tell us what kind of weather may be on the way. In this activity, children are encouraged to observe the clouds and find out what they tell us about the weather.

Curriculum subjects

Geography, Art & Design

What you need

Activity sheet 5

What to do

Discuss with the group how clouds form and why we see different kinds of clouds in the sky at different times. Using the cloud chart from *How the Weather Works,* encourage pupils to spot different types of clouds over time and deduct what they tell us about the weather. On a nice sunny day, when cumulus clouds float in the sky, they can use their imagination to spot animal shapes in the clouds and draw these.

Extreme weather

Activity 7: What's a hurricane?

Ask the children if they know the difference between a hurricane and a tornado. They are different in the way they form but they both contain strong rotating winds that can cause damage. You can see a large pop-up of a hurricane in *How The Weather Works*. The aim of this activity is to help pupils understand the different parts of the hurricane by creating a 3D model.

Curriculum subjects

Geography and Art & Design

What you need

- *How the Weather Works* – 'What is a hurricane?'
- Activity sheet 5
- Card

What to do

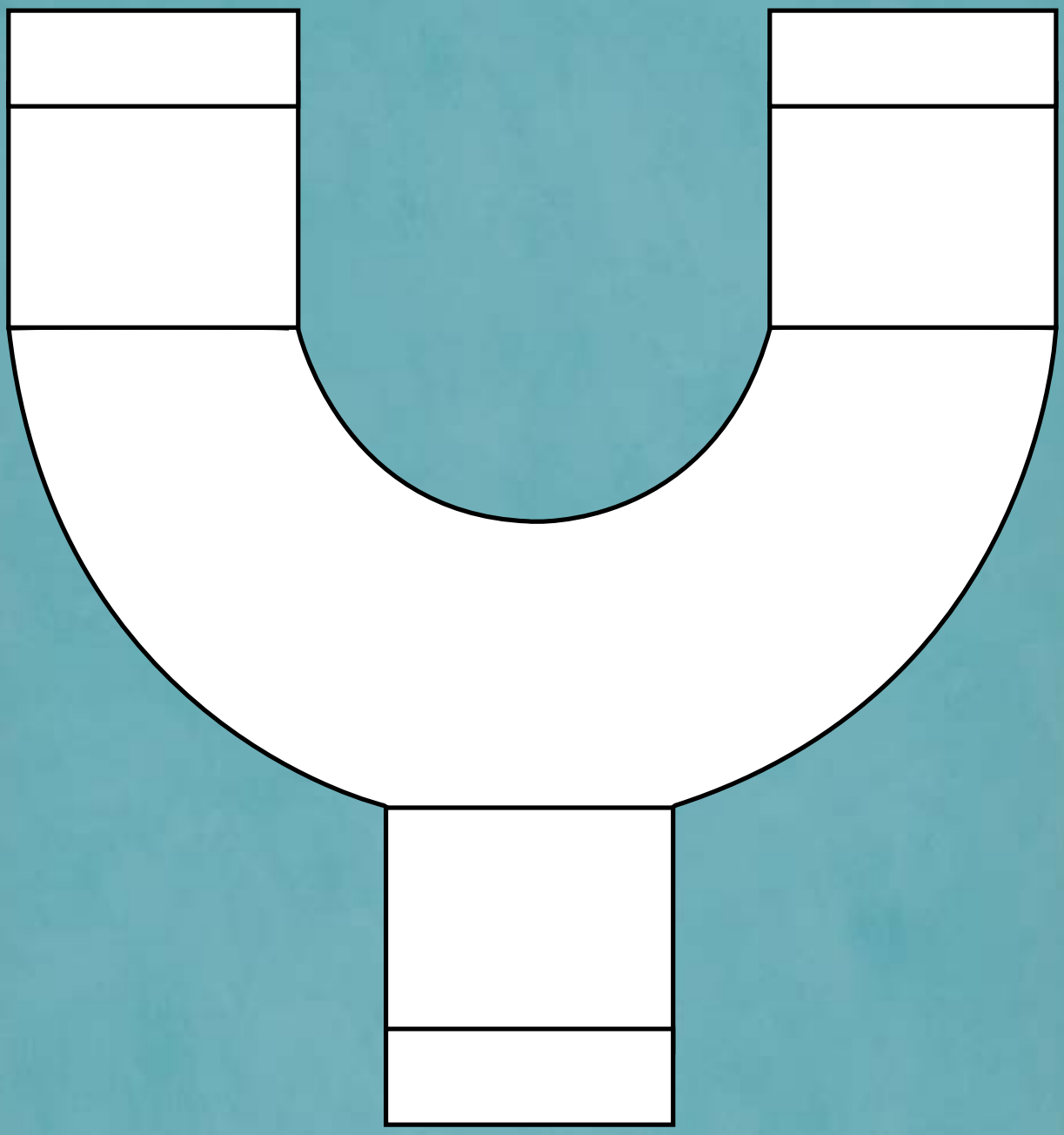
In pairs, children use Activity sheet 5 as a template to make a 3D pop-up of a hurricane. They colour in and cut out the outline of the pop-up and then label the different parts of the hurricane (the eye, eye wall, wind, clouds and rain bands). They then stick their pop-up on a piece of card. As a class discuss how the heavy rain, strong winds and giant waves they bring can cause terrible damage and can be deadly.

As an additional element, they can track hurricanes on the Nasa website at **www.nasa.gov**.

A hurricane is a swirling storm that forms over the ocean near the equator.

Activity sheet 5

What's a hurricane?



Label the different parts of your hurricane

- Warm moist air rising
- Cool, dry air descending
- Eye wall: heavy rain and strong wind
- The eye: a calm area
- Rain bands: heavy rainfall and strong winds

Amazing fact:
Hurricanes produce heavy rain and can cause serious flooding. About 25 centimetres of rain can fall in one day!

Activity 8: What's a tornado?

Discuss with the class what tornadoes are and invite pupils to create a vortex to understand how tornadoes form.

Curriculum subjects

Geography and Science

What you need

- Activity sheet 6
- Materials for each group:
  A clear jam jar with lid, water, vinegar, washing-up liquid or liquid soap and food colouring.

What to do

In this experiment, pupils work in pairs to create a votex in water that looks like a real tornado in the air.

A tornado is a violent, twisting storm in the shape of a funnel that forms over land when a warm wind meets a cold wind.

Make a tornado in a jar

The spiralling winds of a tornado are called a vortex. In this experiment, you can create a vortex in water which looks like a real tornado in the air!

What you need

- A clear jam jar with lid
- Water
- Vinegar
- Washing-up liquid or liquid soap
- Food colouring

What to do

- Fill up the jar with water.
- Put in one teaspoon of vinegar and one teaspoon of soap.
- Add a few drops of food colouring.
- Close the lid and swirl the container around in a circle lots of times. Stop and have a look at what happens.
- Write down your observations.

What is climate?

Activity 9: We're all going on a holiday!

Discuss the difference between weather and climate using *How the Weather Works*.
This activity aims to develop pupils' knowledge about the different climates on the planet by planning a holiday abroad. It also encourages them to make links between climates and ways of life.

Curriculum subjects

Geography and English

What you need

- Activity sheet 7 & Activity sheet 8
- Access to the Internet
- *How the Weather Works* - 'What is climate?'

What to do

Divide the class into five groups and ask each group to imagine that they have won a holiday to one of the following destinations: Sahara desert, the Arctic, the Amazon rainforest, the Himalayas and the Mediterranean.

Explain that they will need to find out about the climate of their holiday destination or make a kit list for their trip. Using Activity sheet 7, pupils can write down or draw pictures of what they want to include in their backpack.

Using Activity sheet 8, they can write an imaginary postcard describing their holiday.

Bring pupils back as a class and discuss their ideas. How do climates vary around the earth? How do different climates influence the clothes we wear and the activities we do?

Activity sheet 7

We're all going on a holiday!

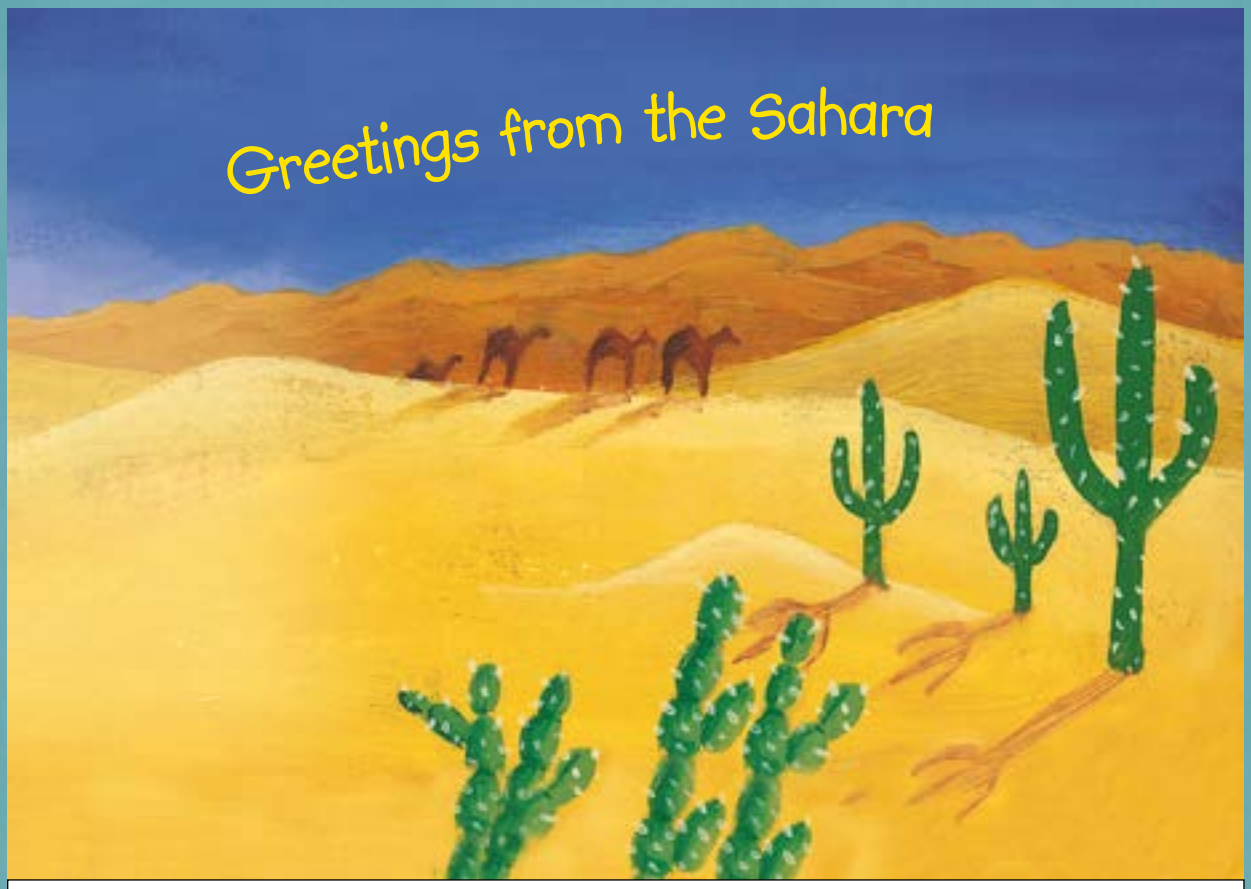
Time to pack your back pack! Write a list of things that you want to take on your holiday.

we are going to

we are taking :

Activity sheet 8

Imagine you are visiting the Sahara. What is the place like? Write a postcard to your family or a friend and design your own stamp!



Activity sheet 8

Imagine you are visiting the Arctic. What is the place like? Write a postcard to your family or a friend and design your own stamp!

Activity sheet 8

Imagine you are visiting the Amazon rainforest. What is the place like?
Write a postcard to your family or a friend and design your own stamp!

Activity sheet 8

Imagine you are climbing in the Himalayas. What is the place like? Write a postcard to your family or a friend and design your own stamp!

Activity sheet 8

Imagine you are on a cruise in the Mediterranean Sea. What is the place like? Write a postcard to your family or a friend and design your own stamp!

Activity 10: Polar poetry

In this activity pupils explore the harsh environments of the polar regions and how animals such as penguins and polar bears have adapted to live in these extreme conditions. They then use photographs as a starting point to write their own poems about penguins and polar bears.

Curriculum subjects

English and Geography

What you need

- Photographs of penguins and polar bears that can be projected on the white board
- One large sheet of paper per group to create a mind map

What to do

Show the class the photos of a penguin and a polar bear on the white board and explain that they are going to be writing their own poems about these animals and their environment.

Ask them to consider how they would describe the environment where these animals live. What words or phrases would they use to describe these animals? Encourage them to think about the animals' appearance, behaviour and the special features they have to live in a cold climate.

In pairs, ask pupils to select an animal that lives in the polar regions and to draw or stick an image of their animal on a large sheet of paper. They then produce a mind map with words and phrases to describe it. Encourage them to organise these into different headings: appearance, sound, movement and behaviour. They can also think of similes (e.g. a nose like a lump of wet coal), and note these all down. Ask them to write a poem to express the sense of wonder and respect for their animal and its habitat.

Are we changing the climate?

Background information

Most scientists agree that the planet is warming up and the cause is very likely to be the result of human activity. The average temperature around the world is rising due to increasing levels of carbon dioxide and other greenhouse gases in the atmosphere. These gases, which trap the sun's heat like a greenhouse, are released whenever we burn fossil fuels (oil, gas and coal) for energy, farm cattle intensively, cut down and burn forests and bury mountains of waste in landfill sites. We know the planet has warmed by an average of nearly 1° c in the past century. Although this may not sound much, it is creating big problems for people and wildlife.

Climate change is one of the biggest threats to the polar regions. For much of the year the Arctic region is covered in sea ice. Polar bears depend on the floating sea ice to breed and hunt seals, their main source of food. But today the sea ice is melting earlier and forming later each year.

Penguins are also affected by climate change. The Antarctic peninsula is warming five times faster than the average rate of global warming. Sea ice is forming later, receding earlier and covering a smaller area each winter. For some penguins, warmer winters mean that they have to raise their chicks on thinner sea ice. For others, food has become increasingly scarce because of warming seas.

What we can do

Climate change is a big issue that can seem scary for children and it is important to approach this topic in a way that is empowering. While climate change requires major changes by governments and businesses around the world in the way we produce energy, make products and grow our food, personal actions by individuals are also important. By making smart choices about what we buy, how we travel, what we eat and how we stay warm, we can all be part of the solution.

The animation 'Penguins and polar bears' (Vimeo, WWF) is a useful resource to help children understand the causes of climate change and the impact on penguins, polar bears and the whole planet. It also looks at positive actions we can all take in our own lives.

Activity 11: Penguins and polar bears

This activity aims to introduce the issue of climate change by focusing on the impact it has on penguins and polar bears, and their habitat.

Curriculum subjects

Geography and Science

What you need

- Activity sheet 9
- Animation 'Penguins and polar bears' (Vimeo, WWF)
- *How the Weather Works* - 'Are we changing the climate?'

What to do

Show the animation 'Penguins and polar bears' and discuss the causes and impact of climate change with the whole class.

- What is climate change?
- What are the causes?
- How do scientists know?
- Why is it a problem for penguins and polar bears?
- Why is it a problem for people around the world?
- What can we do about it?

Explain that actions to reduce climate change will require some big changes in society and in our own daily lives. We need to rethink many things from the way we get energy and our food choices, to the way we build our houses and get around. Discuss actions we can take to help the planet.

Using activity sheet 9, children can make a pledge and identify five things they will do at home and in the classroom to save energy and reduce pollution.

Why not then launch a design competition with the whole school and invite the children to design a new product that uses renewable energy and would not end up as waste?

My pledge sheet

List five things you can do in your own life that will help save energy and reduce pollution.

1.

2.

3.

4.

5.

Activity 12: What the future holds

In this activity, pupils are encouraged to run a debate about the future of our planet based on three different scenarios from *How the Weather Works*.

Curriculum subjects

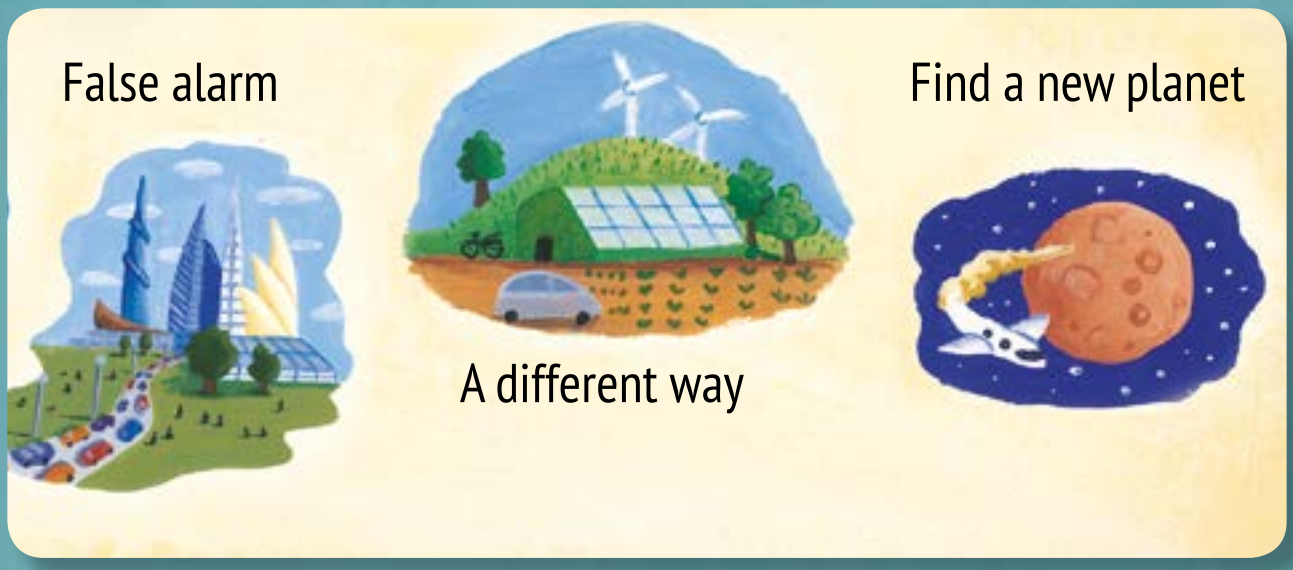
Geography, Science and English

What you need

- Activity sheet 10
- Animation 'Penguins and Polar Bears' (Vimeo, WWF)

What to do

After watching the film 'Penguins and polar bears' discuss the actions we can all take to help tackle climate change. The class is divided into three groups and each group is given a scenario. The groups spend 15 minutes to research and develop their arguments. One representative from each group then presents their viewpoint to the whole class for 5 minutes. At the end, the class votes on the best scenario for the future.



What the future holds

False alarm

You believe that climate change is all a big scare and nothing will change in the future. The earth is warming up naturally, as it did many times in the past and we can carry on burning fossil fuels to power our cars, homes, schools and factories.

A different way

You believe that we have to change the way we do things and find better ways of using the earth's resources.

Find a new planet

As the earth gets more polluted, you believe that we need to find a way to move to another planet.

key vocabulary

Use this section to enhance your pupils' vocabulary and understanding of weather terms.

Anemometer
A device that measures the speed and force of the wind.

Atmosphere
The thin layer of gas around the earth.

Climate
The average temperature and rainfall in a place over many years (for example, 'the Mediterranean climate').

Climate change
A term referring to change in the climate, which most scientists agree is the result of human activity.

Equator
An imaginary line drawn around the middle of the earth at an equal distance from the North Pole and the South Pole.

Fossil fuel
Fuels such as gas, coal and oil that were formed underground from plant and animal remains millions of years ago.

Gauge
A device for measuring the amount or size of something. For example, a rain gauge.

Glacier
A large mass of ice that moves slowly.

Meteorologist
Someone who studies meteorology – the scientific study of the processes that cause particular weather conditions.

Observatory
A room or building housing astronomical telescopes of other scientific equipment for the study of the planets, stars and the weather.

Pollution
The introduction of a substance into the natural environment which has harmful or poisonous effects to the air, water etc.

Recycle
To collect and treat waste in order to produce useful materials that can be used again.

Satellite
A device sent up into space to travel round the earth, used for collecting information or communicating by radio, television etc.

Vane
A flat, narrow part of a fan or propeller which turns because of the pressure of air or liquid against it. For example, a wind vane.

Vapour
A gas that results from the heating of a liquid or solid.

Vortex
A mass of air or water that spins around very fast and pulls objects into its empty centre.

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