Key Question: *How is climate change affecting the world?*

Learning objectives

During the enquiry pupils will have opportunities through the application and analysis of a wide range of geographical skills and resources to:

- ***Identify**, **describe** and **explain** why communities in The Gambia are being affected by changes in weather patterns associated with climate change and **evaluate** the impact on people;*
- ***Evaluate** a range of evidence, reach a **conclusion** and make **judgements** as to the impact on people of changing weather patterns in Victoria in Southeast Australia;*
- ***Understand** why some coastal communities are having to make flood resilience plans in order to cope better with changes that are occurring in weather patterns and to sea levels and make **judgements** about what should be included in them;*
- ***Reflect** upon and **evaluate** different viewpoints and reach a personal **judgement** about the implications of changing weather patterns on the people of Greenland;*
- ***Identify**, **describe**, **compare and contrast** and **explain** how global warming is affecting weather patterns around the world and evaluate its impact in different places;*

Purpose of the enquiry

The challenge of changing patterns of weather that contribute to longer-term climate change trends across the globe, will undoubtedly be one of the greatest issues to confront primary school pupils during the remainder of the century. This enquiry gives pupils an insight into how changing patterns of weather at different locations around the world are impacting on the lives of real people with whom they can relate. Through the experiences of these individuals and communities, pupils are able to reflect upon how changes to normal and usual weather conditions can have to serious implications for these people.

They are also able to appreciate that, generally speaking, the poorer the people and communities are that experience changes in weather patterns, the more serious the impact often is. From these specific case studies the pupils are encouraged to look at the concept of global warming, what is contributing to it on a global scale and to generalise about climate change in the longer term. The enquiry culminates in pupils understanding the action that is being taken during this century across the world to reduce fossil fuel consumption (and therefore carbon dioxide emissions) through the development of renewable sources of energy.

Context

This investigation focuses initially on the personal stories of real people around the world who are being impacted upon by changes in the usual weather patterns. As such they are easier for young geographers to relate to because their circumstances are very much like their own and of their families and the communities in which they live. The scale of study is therefore local, whether the location is in The Gambia, Australia, the United Kingdom or Greenland.

The pupils are encouraged to see these apparently unconnected examples in the broader context of the concept of global warming on a global scale. They investigate the main manifestations of global warming and also spend time understanding its causes, particularly in relation to greenhouse gas emissions from the increased burning of fossil fuels. The enquiry culminates in pupils reflecting upon international agreements to reduce global warming, phase out the burning of fossil fuels and to develop renewable and carbon neutral sources of energy.

National Curriculum coverage Geography

Pupils should be taught to:

Locational knowledge

- Locate the world's countries, using maps to focus on Europe (including the location of Russia) and North and South America, concentrating on their environmental regions, key physical and human characteristics, countries and major cities.
- Name and locate counties and cities of the United Kingdom, geographical regions and their identifying human and physical characteristics, key topographical features (including hills, mountains, coasts and rivers), and land-use patterns; and understand how some of these aspects have changed over time.
- Identify the position and significance of latitude, longitude, Equator, Northern Hemisphere, Southern Hemisphere, the Tropics of Cancer and Capricorn, Arctic and Antarctic Circle, the Prime/Greenwich Meridian and time zones (including day and night).

Human and physical geography

Describe and understand key aspects of:

- Physical geography, including: climate zones, biomes and vegetation belts, rivers, mountains, volcanoes and earthquakes, and the water cycle.
- Human geography, including: types of settlement and land use, economic activity including trade links, and the distribution of natural resources including energy, food, minerals and water.

Geographical skills

- Use maps, atlases, globes and digital/computer mapping to locate countries and describe features studied.
- Use the eight points of a compass, four and six-figure grid references, symbols and key (including the use of Ordnance Survey maps) to build their knowledge of the United Kingdom and the wider world.

- ***Understand** how and why countries around the world have acted to reduce global warming and reach a **judgement** about how effective this might be;*
- ***Understand** how as individuals, members of families and communities such as schools they can make a contribution to reducing greenhouse gas emissions;*
- ***Describe** and **explain** how each of the main renewable sources of energy works, **evaluate** their advantages and disadvantages and make a **judgement** regarding which would be most suitable for the poorest countries in the world.*

Key Subject Vocabulary

Africa; The Gambia; City; Capital city; Market; Senegal; Atlantic Ocean; River Gambia; Rainfall; Dry season; Wet season; Weather; Climate; Drought; Crop; Trade winds; Desertification; Erosion; Life expectancy; Tourists; Desert; Aid; Village; Well; Subsistence; Commercial; Millet; Maize; Groundnuts; Vegetables; Rice; Tropical; Sub-tropical; Hunger; Insurance; Australia; Victoria; State; Territory; Oceania; Town; Risk; Hazard; Bushfire; Wildfire; Natural disaster; Decade; Heatwave; Consecutive; Pattern; Settlement; Site; Situation; Conurbation; Megalopolis; Residents; Transport; Commuter;

Connections to the subject content of other curriculum areas

Language and literacy

Teachers should develop pupils' spoken language, reading, writing and vocabulary as integral aspects of the teaching of every subject. English is both a subject in its own right and the medium for teaching; for pupils, understanding the language provides access to the whole curriculum. Fluency in the English language is an essential foundation for success in all subjects.

Spoken language

Pupils should be taught to speak clearly and convey ideas confidently using Standard English. They should learn to justify ideas with reasons; ask questions to check understanding; develop vocabulary and build knowledge; negotiate; evaluate and build on the ideas of others; and select the appropriate register for effective communication. They should be taught to give well-structured descriptions and explanations and develop their understanding through speculating, hypothesising and exploring ideas. This will enable them to clarify their thinking as well as organise their ideas for writing.

Reading and writing

Teachers should develop pupils' reading and writing in all subjects to support their acquisition of knowledge. Pupils should be taught to read fluently, understand extended prose (both fiction and non-fiction) and be encouraged to read for pleasure. Schools should do everything to promote wider reading. They should provide library facilities and set ambitious expectations for reading at home.

Pupils should develop the stamina and skills to write at length, with accurate spelling and punctuation. They should be taught the correct use of grammar. They should build on what they have been taught to expand the range of their writing and the variety of the grammar they use. The writing they do should include narratives, explanations, descriptions, comparisons, summaries and evaluations: such writing supports them in rehearsing, understanding and consolidating what they have heard or read.

Vocabulary development

Pupils' acquisition and command of vocabulary are key to their learning and progress across the whole curriculum. Teachers should therefore develop vocabulary actively, building systematically on pupils' current knowledge. They should increase pupils' store of words in general; simultaneously, they should also make links between known and new vocabulary and discuss the shades of meaning in similar words. In this way, pupils expand the vocabulary choices that are available to them when they write.

In addition, it is vital for pupils' comprehension that they understand the meanings of words they meet in their reading across all subjects, and older pupils should be taught the meaning of instruction verbs that they may meet in examination questions. It is particularly important to induct pupils into the language that defines each subject in its own right, such as accurate mathematical and scientific language.

Numeracy and Mathematics

Teachers should use every relevant subject to develop pupils' mathematical fluency. Confidence in numeracy and other mathematical skills is a precondition of success across the national curriculum.

Teachers should develop pupils' numeracy and mathematical reasoning in all subjects so that they understand and appreciate the importance of mathematics. Pupils should be taught to apply arithmetic fluently to problems, understand and use measures, make estimates and sense check their work.

Pupils should apply their geometric and algebraic understanding, and relate their understanding of probability to the notions of risk and uncertainty. They should also understand the cycle of collecting, presenting and analysing data. They should be taught to apply their mathematics to both routine and non-routine problems, including breaking down more complex problems into a series of simpler steps.

Infrastructure; Embankment; Rock armour; Tide; Storm; Flood plan; Resilient; Tidal surge; Flood defence; Management; Coast; North Pole; South Pole; Ice cap; Region; Climate graph; Weather station; Precipitation; Snow; Blizzard; Tundra; Glacier; Inuit; Migration; Indigenous; Economy; Culture; Global warming; Mountain range; Northern Hemisphere; Southern Hemisphere; Carbon dioxide; Disease; Season; Habitat; Coral; Observatory; Greenhouse gas; Climate change; Methane; Fossil fuel; Energy; Coal; Petroleum; Oil; Gas; Aerobic; Anaerobic; Pressure; Force; Rock; Sedimentary; Crust; Mantle; Core; Sustainability; Sustainable development; Renewable; Non-renewable; Wind power; Geothermal heat; Hydroelectric power; Solar power; Biofuel.

Computing

Pupils should be taught to:

- Understand computer networks including the internet; how they can provide multiple services, such as the World Wide Web; and the opportunities they offer for communication and collaboration.
- Use search technologies effectively, appreciate how results are selected and ranked, and be discerning in evaluating digital content.
- Use technology safely, respectfully and responsibly; recognise acceptable/unacceptable behaviour; identify a range of ways to report concerns about content and contact.

NOTES

Ancillary Question 1: Why is Elhaji cleaning shoes on the streets of Banjul?

Without any introduction or comment about the theme of the investigation, give each pupil a copy of **Resource 1** and ask them to draw what they think the rest of the photograph is showing. What do they think lies beyond the feet? Encourage them to reflect upon their own experience of perhaps seeing people sitting like this? What is the person wearing? What might they be doing or preparing to do? Allow plenty of time for speculation and discussion and for the pupils to explore possibilities.

Now invite pupils to present their drawing to the rest of the group and to explain the rationale behind what they have drawn. What assumptions did they make? How similar or different are the presentations of different pupils? Then distribute or project the complete picture of a nine-year-old boy called Elhaji in **Resource 2**. He works cleaning shoes and as a barrow boy (people buy goods in the central market and Elhaji delivers these goods to their homes on a trolley, which he pushes) in Banjul, the capital city of the West African country of The Gambia. (See photographs of several markets in Banjul in **Resource 3** and maps of the countries of West Africa in **Resource 4** and specifically of The Gambia in **Resource 5**.)

Allow plenty of time to look at the maps and images and to discuss with the pupils possible reasons why Elhaji is spending all day on the streets of Banjul and not at school or at home with his family. Extend the thinking of the pupils at this point by explaining that The Gambia is the smallest mainland African country by area and surrounded by Senegal on three sides with the Atlantic Ocean making up the fourth border. At its widest point it measures only 48 km from north to south. Elhaji's family live in the village of Njar on the north bank of the River Gambia close to the border with Senegal over 150 km from Banjul (see map in **Resource 6**, satellite image in **Resource 7** and the photographs of his sister and mother working in the fields in **Resources 8** and **9**).

Ask the pupils to generate as many ideas as they can that might explain why Elhaji is not at home with his family in Njar and summarise them on the board. Now divide the pupils into pairs and give each pair a set of cut-up cards in **Resource 10**. Explain that the Elhaji mystery can be solved by sorting and analysing the information on the cards they have been given. Read through each of the cards with the pupils and then support them to sort the information on the cards into the following categories:

- Information about Elhaji and the life that he now lives in Banjul;
- Information about the life of his mother and sisters in Njar;
- Information that provides background about the geography of The Gambia;
- Information that helps to explain why Elhaji is living and working in Banjul.

Allow plenty of time for speculation and debate whilst the pupils do this activity. Then discuss with pupils the outcome of their mystery sorting. Which cards were most difficult to place into a category? Could any of the cards be used in more than one group? Now ask the pupils to identify the 'top five' information cards that they feel explain the most about why Elhaji is working on the streets of Banjul and not at home with his family in Njau?

During the past decade, places such as Njar along the north bank of The Gambia River have suffered from increasing unreliability of rainfall during the wet season. This unreliability causes long droughts, crop failures and great poverty and hardship in a country where most people rely on farming for their livelihoods. The wet southwesterly rain-bearing Trade Winds that blow over the Atlantic Ocean before reaching The Gambia can no longer be relied upon to give the country the rainfall it requires – **Resources 11** and **12** are provided here for teacher reference and background.

One option for a summative exercise to this line of enquiry is to ask the pupils to write up the mystery exercise, using the information in the sorted sets of cards, as a piece of explanatory writing. They can use the conventions in **Resource 13** and the model of explanatory writing in **Resource 14**.

NOTES

Ancillary Question 2: Why can't Olivia afford to insure her home?

Without any background information at all, show the pupils the photograph of Olivia and her daughters, Charlotte and Mia, outside their home in **Resource 15**. Discuss with the pupils what they understand by having 'insurance' e.g. for homes and property such as cars or life insurance or holiday insurance etc. The principle of paying an annual premium (the amount she has to pay the insurance company each year) to an insurance company, is that the company will compensate you for any financial losses incurred should, for example, your car be damaged in an accident or your home be burgled and items of value stolen. Having insurance to drive a car is a legal requirement. Explain that having insurance to cover damage to a home and the property within it is one of the most common types of insurance that is taken out. However, Olivia has found that the premium to insure her home is now five times what it was just three years ago. Each year the premium rises and now she has reached the point where she can no longer afford the cost. From now on she will have no insurance cover at all.

Explain to the pupils that they are going to discover why Olivia cannot afford to insure her home. Divide the pupils into small groups and ask them to come up with key questions, answers to which would help them to begin to discover the answer to the enquiry itself. At present they know nothing about Olivia and, in particular, where she lives in the world, so encourage the pupils to ask really perceptive questions. Is it something to do with the property in which she lives or maybe where it is located? What kind of property would an insurance company not want to cover? Perhaps a property that is too much of a risk? Encourage discussion and speculation. Allow plenty of time for feedback and identify the most searching and perceptive questions.

Tell the pupils that you are now going to give them a number of pieces of evidence, which will build up to provide the answer to the question. Firstly there is the map in **Resource 16**, which shows the country where Olivia and her children live. Australia is divided up into six states and two territories as shown on the outline map in **Resource 17** (the pupils can fill in their names onto a copy of this map). The state shown in red (Victoria) is the state in which Olivia lives and her home is in the small town of Kinglake (population 1347), situated just 50 km north of the state capital city Melbourne – see **Resource 18** for images of the town and surrounding area. So what evidence, if any, can we see in the images to explain why Olivia cannot afford to insure her house? Now give the pupils the maps in **Resource 19** and **Resource 20** (this shows incidence of bushfires in Victoria in 2009) and the photographs of the area around Kinglake in **Resource 21** on 'Black Saturday' February 7th 2009. Next give out the data sheets in **Resource 22** and **Resource 23** which the pupils can graph appropriately e.g. line graph, histogram or bar graph.

What do the graphs show happening to the number of heatwaves and bushfires? Why might this explain why insurance companies are raising insurance premiums so high that people like Olivia can no longer afford them? The insurance companies argue that it is clear that both heatwaves and bushfires are becoming more frequent and lasting longer, as a result of weather conditions in Victoria becoming warmer and drier and this will continue throughout the century. Average summer temperatures in Victoria are now 1 °C higher than they were 100 years ago and autumn and winter rainfall has decreased by between 10 and 20 per cent over most of the state during the same period. From the insurance companies' perspective this means that the risk of damage to property as a result of bushfires is becoming much greater and, as a result, they have no option but to increase their premiums to cover the possible costs of another natural disaster such as Black Saturday.

As a summative piece to this line of enquiry the pupils could be supported to write a letter to an insurance company on behalf of Olivia and her family, to try to persuade them to provide cover at a more reasonable rate.

NOTES

Ancillary Question 3: Why are people living in Starcross making flood plans?

Explain to the pupils that a settlement is a place of any size where people live. A settlement may be as small as a single house in a remote area such as a farm, a village with a population of 1780 such as Starcross or a conurbation or megalopolis with 10 million or more residents. The piece of land upon which a settlement is built is the settlement's *site*. The *situation* of a settlement is its position relative to the surrounding physical features of the landscape. Divide the pupils into pairs and distribute copies of the Ordnance Survey map in **Resource 24** and the images in **Resources 25**, **26**, **27** and **28**. Encourage them to speculate about:

- The site of Starcross, i.e. why was this place chosen originally by people as somewhere to live? Encourage the pupils to think back before the railway arrived in the nineteenth century. The painting of Starcross will help here and also support them to consider the pedestrian ferry to Exmouth that is shown on the map.
- The situation of Starcross, i.e. where is Starcross located in relation to the surrounding area. Clearly the village stands on the east bank of the Exe Estuary but what is its position relative to the city of Exeter and the neighbouring communities of Dawlish and Exmouth? What is found to the west of Starcross?

Project the images in **Resource 29**. They show a First Great Western train passing through Starcross and also a stopping train running from Paignton via Starcross to Exeter and Exmouth. Working in groups of three or four, ask the pupils to discuss and list all of the ways in which the people in Starcross might depend on the railway. Encourage them to think about holiday-makers and day visitors who arrive in Starcross using the train. How is this link important for people in the village who might own and run hotels, restaurants, bed and breakfast establishments, boat trips, fishing and bird watching outings etc.? In addition, what about the accessibility that the train provides for local residents who may commute daily to Exeter? Take feedback and summarise on the board.

However, the residents of Starcross also depend on the railway line in another very important way. The images in **Resource 30** all provide clues for the pupils to work out the answer. What relationship do they feel between the raised sea wall on which the railway sits and protection from floods at high tide and during severe storms? The railway embankment protects over 600 properties and infrastructure (e.g. electricity, gas and water supplies, roads, sewerage pipes etc.) in Starcross. At its highest point the railway embankment reaches four metres and to the south of the village, the additional protective measure of adding rock armour along the wall has been taken.

Now show the pupils the photographs in **Resource 31**, which were taken at high tide on 4–5 February 2014. What do they show happening? The waves from the estuary are overtopping the four-metre sea wall to the north of Starcross. During the same high tide, water from the estuary also overtopped the village flood gates, which had been closed several hours before high tide.

The *Environment Agency* has told the Parish Council at Starcross that during the rest of this century, sea levels are going to increase by about one metre. Also that the village should expect more frequent, more severe and longer-lasting winter storms with wave heights at least 30 cm taller than they are now, which will at times cause powerful tidal surges and flooding as the railway embankment is overtopped.

In response the Starcross Parish Council is urging all residents to make sure they are:

> *aware of the risks of flooding, both from the high tide, and from surface water during exceptionally heavy rainfall, and the importance of our flood defences and water management systems in keeping us dry and safe …*

Extract from *Starcross Flood Resilience Plan – preliminary discussion paper* produced by Starcross Parish Council 2013.

NOTES

The Parish Council is urging all residents in Starcross to make sure they have their own flood plan so that the community is more *resilient*. Resilient means to be strong and unaffected when faced with something such as a difficult situation. If someone is resilient then they are not changed by anything unless they choose to be.

Now the pupils can imagine that they live at Starcross and need to make their own flood plan. Read through the guidance produced by the Environment Agency at www.gov.uk/government/uploads/system/uploads/attachment_data/file/292939/LIT_5286_b9ff43.pdf

Working in small groups the pupils can now use the template at www.gov.uk/government/publications/community-flood-plan-template to decide on the most important things they would need to do in a village such as Starcross before, during and after a flood.

Now ask the pupils how they think the community members of the village of Starcross could work together to respond quickly and be more resilient to the possibility of flooding.

Divide the pupils into groups and encourage them to discuss all of the things that people working together might decide to do. For example, elect a flood committee for the village with particular responsibilities such as getting messages to people quickly; monitoring pumps, sluices and flood gates and making sure that the most vulnerable people e.g. the disabled, or those living alone, are known about and taken care of.

NOTES

Ancillary Question 4: Why do Lars and Sofie disagree about how nice the weather is?

Show the pupils the photographs of Lars (**Resource 32**) and Sofie (**Resource 33**). Explain that they are always disagreeing about the weather. From just these two images encourage the pupils to speculate and reflect on what the weather is like. Where in the world would the pupils expect to find them living and why? What kind of climate? What do we call the climate in the far north and south where there is just ice? Ice cap climate. If the pupils had to guess a country where Lars and Sofie lived, which country would it be?

Now show the pupils the map in **Resource 34**. Which country is this? Greenland. What do the pupils know about Greenland? What are the landscape and the climate like? The images in **Resource 35** and in the film at www.youtube.com/watch?v=MXhTbGTOs_o are typical of Greenland. How can this type of ice cap environment be best described? What kind of climate would the pupils expect to produce the landscape that is in the images?

The following table shows the average climate conditions during the year in Greenland. The pupils could draw a climate graph to show this data and compare it with a climate graph for the nearest Met Office weather station to where they live, which can be found at www.metoffice.gov.uk/public/weather/climate-network/#?tab=climateNetwork

Month	Rainfall (mm)	Temperature (°C)
January	36	–25
February	40	–28
March	41	–29
April	30	–22
May	25	–12
June	42	–6
July	41	–3
August	47	–5
September	44	–12
October	35	–24
November	46	–25
December	40	–26

With an average monthly temperature of −18 °C and only 467 mm of precipitation (below 250 mm is officially designated as a desert), all falling as snow, Greenland is extremely cold and dry – a polar climate. The Greenland Ice Sheet covers 1 710 000 sq km – the second largest ice sheet on Earth, after the Antarctic Ice Sheet. It covers 80 per cent of Greenland and extends 2400 km north–south and 1100 km east–west . It has an average thickness of 2135 m. However, the weather is changing quickly and it is over this that Lars and Sofie disagree. Since the 1970s the average temperature in Greenland has increased by 2 °C. As a result, the ice sheet is melting. Have the pupils look carefully at the map in **Resource 36**. What is the pattern of melting taking place? The melting is quickest around the coastline where the ice is thinnest and slower inland where the ice is thicker as shown in the NASA image in **Resource 37** and in the film in **Resource 38**.

Each year since 1979 the number of days of melt across Greenland have increased as the weather has become warmer. Lars and Sofie disagree as to whether this is a good thing or not. What they feel about the changes in the weather and the melting of the ice appears in **Resources 39** and **40**. Divide the pupils into groups and get them to compare and contrast and evaluate the different viewpoints. Do they have a personal view? The pupils could produce a short piece of discursive writing to present and evaluate the different viewpoints of Lars and Sofie and reach a conclusion as to how they feel about the changing weather. How would the pupils feel if they lived in Greenland? Whose feelings would they share?

NOTES

Ancillary Question 5: Why are people all over the world noticing that the weather they are used to is changing?

Talk to the pupils about Elhaji, Olivia, Lars and Sofie and the people of the village of Starcross. In all these places in different parts of the world they are noticing that the weather they are used to is changing and that these changes are causing problems of one sort or another. But why is the weather changing in so many parts of the world?

Ask the pupils to look carefully at the map in **Resource 41**. What does it show? What is happening to the temperature of the land and oceans? Using this map in conjunction with the political map of the world in **Resource 42**, spend some time with the pupils identifying specific locations and countries that are likely to experience the greatest increases in land surface temperature. Which countries in the Southern Hemisphere are going to see the highest average temperature changes? How is Antarctica going to fair? What will be the consequences of temperature increases here? In the Northern Hemisphere what are the implications for the sea ice of the Arctic Ocean and the North Pole? Encourage them to cross reference the two maps especially for The Gambia (Elhaji), Australia (Olivia), the United Kingdom (the people of Starcross) and Greenland (Lars and Sofie). Do any of the pupils know what geographers are calling this warming of the earth?

The average temperature of the earth is rising, a process called *global warming*. Global warming is causing changes to normal weather conditions in places all over the world. As a result it is having serious effects on people's lives. Global warming is causing:

- Ice sheets, sea ice and glaciers around the North Pole and South Pole and in high mountain ranges to thaw.
- More extreme weather events around the world such as long heat waves and droughts in some places and short intense storms with very heavy rainfall and flooding elsewhere.
- Sea levels to rise.

Using the map and key in **Resource 43**, together with the political map of countries in **Resource 42**, encourage and support the pupils to identify specific countries in both the Northern and Southern Hemisphere where both evidence and signs of global warming have been identified. Use the table in **Resource 44** to record their answers.

So what is causing global warming? Show the pupils the photograph of the Mauna Loa Observatory in **Resource 45** high up in the mountains of Hawaii in the middle of the Pacific Ocean. Explain that since 1960 geographers here have been measuring how much carbon dioxide (CO_2) there is in the atmosphere. Their measurements are in the table in **Resource 46**. Distribute copies of this information for the pupils to present in the form of a line graph. When the pupils have completed their graphs take time to discuss the significance of what the graph shows.

Each year the amount of carbon dioxide in the atmosphere is increasing and this is contributing to causing global warming. Carbon dioxide is referred to as a *greenhouse gas* because, along with other gases such as methane, it stops heat bouncing back into space from the Earth's surface. It is very important at this point for pupils to understand that naturally occurring greenhouse gases in the atmosphere are vital for the Earth because, without some of these gases, temperatures on the planet would be 20–30 °C lower than they are today! Have the pupils look carefully at the diagram in **Resource 47** that illustrates this. It is really important for the Earth to have enough greenhouse gases in the atmosphere to ensure that some of the heat radiated from the Earth's surface is kept close to the surface to keep the planet warm enough for life to survive and thrive. Are the pupils aware of how more carbon dioxide gas in the atmosphere contributes to raising the surface temperature of the Earth? Have the pupils draw a copy of the diagram in **Resource 47** but this time, showing a thicker layer of greenhouse gases and more heat from the Earth returning to its surface and much less escaping back into the atmosphere. Their diagram can be called *Global Warming*.

NOTES

So why is the amount of carbon dioxide in the atmosphere increasing? The main reason is that 85 per cent of all the energy consumed in the world comes from burning *fossil fuels*, in particular petroleum (oil), gas and coal – see **Resource 48**. Because fossil fuels are made of the dead remains of plants and animals that lived millions of years ago, they contain a lot of carbon dioxide, which is released into the atmosphere when burnt. Show the pupils the film at www.youtube.com/watch?v=pvH-h7TzSsE which explains this. Fossil fuels are the main source of carbon dioxide emissions which, along with other greenhouse gases such as methane, are the principal cause of changes in weather patterns around the world.

NOTES

Ancillary Question 6: What have the countries of the world agreed to do about global warming?

In December 2015 in Paris, representatives of 200 countries agreed to ensure that the surface temperature of the earth would not increase by more than 2.5 °C by 2100 and that this would be achieved by decreasing carbon dioxide emissions (see graph in **Resource 49**). They also agreed that to make sure this happened, the use of fossil fuels to create energy in all of the countries of the world would be phased out by the end of the century. Much more effort and money would be spent on developing renewable and non-polluting sources such as solar, wind, geothermal, tidal and wave energy to replace the energy now produced by burning fossil fuels. They also agreed to find ways of reducing the demand for energy by living more sustainably in the future. The Lower Key Stage 2 enquiry: *How can we live more sustainably?* can be revisited at this time. In particular look at the investigation into why we are seeing more solar and wind farms in the UK's countryside. This is directly linked to the government's decision to reduce fossil fuel burning and to close all remaining coal fired power stations by 2025.
See www.bbc.com/news/business-34851718

NOTES

Assessment

This enquiry presents several opportunities to evaluate at different stages how the pupils are progressing in geography through the mastery of key geographical skills and outcomes. It is not necessarily intended that all of the following learning activities should be assessed. Rather the list can be used as a general guide for selecting perhaps one or two assessment opportunities relevant to individual pupils rather than on a whole group basis.

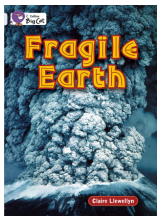
Ancillary Question	Learning Activity	Possible source of evidence of achievement
1	**Identify**, **describe** and **explain** why communities in The Gambia are being affected by changes in weather patterns associated with climate change and **evaluate** the impact on people	Explanatory writing
2	**Evaluate** a range of evidence, reach a **conclusion** and make **judgements** as to the impact on people of changing weather patterns in Victoria in Southeast Australia	Graphs and charts Persuasive letter
3	**Understand** why some coastal communities are having to make flood resilience plans in order to cope better with changes that are occurring in weather patterns and to sea levels and make **judgements** about what should be included in them	Simple Community Flood Resilience Plan
4	**Reflect** upon and **evaluate** different viewpoints and reach a personal **judgement** about the implications of changing weather patterns on the people of Greenland	Discursive writing piece
4	**Identify**, **describe**, **compare and contrast** and **explain** how global warming is affecting weather patterns around the world and evaluate its impact in different places	Map interpretation Line graph Annotated diagram Oral
5	**Understand** how and why countries around the world have acted to reduce global warming and reach a **judgement** about how effective this might be	Reflective writing
5	**Understand** how as individuals, members of families and communities such as schools they can make a contribution to reducing greenhouse gas emissions	Sustainability Action Plans (linked to enquiry: *How can I live more sustainably?)*
Homework	**Describe** and **explain** how each of the main renewable sources of energy works, **evaluate** their advantages and disadvantages and make a **judgement** regarding which would be most suitable for the poorest countries in the world	PowerPoint presentation

Homework possibilities

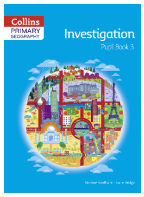
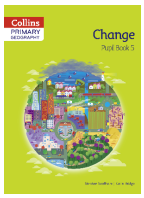
This enquiry provides an opportunity for pupils to investigate at home each of the main renewable sources of energy that need to be developed across the world during the next 30–50 years to replace fossil fuels. Each pupil could be given the following*: wind, hydroelectric power, solar, geothermal, tidal* or *wave energy a*nd be asked to create and present a short PowerPoint that explains what each renewable energy source is, how it works and its advantages and disadvantages. In addition the pupils could be asked to select which one they feel would be most appropriate for the poorest countries in the world to develop and why?

Further reading

Collins *Big Cat* has books for every child in the classroom with a wide variety of genres, top authors, relevant topics and a range of engaging formats and illustrative styles. Listed below is a selection of from the Big Cat list to support the enquiry topics in Connected Geography for KS1. Find out more at Collins *Big Cat* – www.collins.co.uk

ISBN: 978-0-00-723118-8	*Living with Climate Change*	Alison Sage	
ISBN: 978-0-00-723110-2	*Fragile Earth*	Claire Llewellyn	

Collins *Primary Geography* provides a progressive, skills based scheme for primary school pupils.

ISBN: 978-0-00-756359-3	*Primary Geography Pupil Book 3 Investigation*	Stephen Scoffham and Colin Bridge	
ISBN: 978-0-00-756360-9	*Primary Geography Pupil Book 4 Movement*	Stephen Scoffham and Colin Bridge	
ISBN: 978-0-00-756361-6	*Primary Geography Pupil Book 5 Change*	Stephen Scoffham and Colin Bridge	
ISBN: 978-0-00-756362-3	*Primary Geography Pupil Book 6 Issues*	Stephen Scoffham and Colin Bridge	
ISBN: 978-0-00-756369-2	*Primary Geography Interactive resources 3-6*