

Geography: Key Stage 2 Years 3 and 4

Teachers Professional Development Programme

Enquiry 6: Why are jungles so wet and deserts so dry?



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Connecting the curriculum through enquiry based learning

Key Question: Why are jungles so wet and deserts so dry?

Learning objectives

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

- **Observe, describe and explain** in basic terms the pattern of climate in the United Kingdom;
- **Identify, describe and begin to offer reasons** for the distribution of different types of climate around the world;
- **Compare and contrast** the temperature and rainfall data in different climate graphs to **reach conclusions** about the climate in different locations in the world;
- **Construct** a climate graph from temperature and rainfall data for their home location and **compare and contrast** this with climate graphs of other locations to **reach conclusions and make judgements**;
- **Understand** how climate affects both the landscape of different biomes and the plants and animals that can live there;
- **Observe, describe and explain** why areas of tropical rainforest such as the Amazon Basin have so much convectional rainfall;
- **Describe** the natural environment of the Atacama Desert and **explain** why the city of Arica is the driest inhabited place in the world;

Purpose of the enquiry

In terms of continuity and progression this enquiry builds on and extends the pupils' understanding of the concept of weather, which was introduced and investigated at Key Stage 1. It lays a firm foundation of understanding to enable them to consider the challenges of climate change later through the Upper Key Stage 2 programme. Throughout the enquiry, pupils are encouraged to reflect upon how climate has such an important influence upon landscapes, plants, animals and human activity on Earth – they investigate this relationship at a number of scales. Pupils apply a wide range of geographical and computer skills throughout the enquiry to enable them to better understand the relationship between climate and living things and also to introduce them to the concept of biomes. Towards the end of the enquiry the pupils are able to develop their understanding of how climate is the main factor determining the distribution of biomes on Earth through the study of two biomes in depth.

Context

Initially pupils revisit their work on weather carried out in the school grounds and local area at Key Stage 1. Following this they are introduced to the concept of climate in the context of the United Kingdom. The focus here is on enabling pupils to see how climate varies, even across a relatively small country in terms of land area as the UK, and to understand some of the reasons for this. From the UK the pupils then begin to look at climate on a global scale and are able to apply a range of geographical skills to identifying the characteristics and distribution of different climate zones across the world. The remainder of the enquiry then focuses on enabling pupils to understand what a biome is and how the landscapes, plants and animals within the different biomes of the world are determined largely by climate. This is achieved by looking in depth at two biomes within the continent of South America – the tropical rainforest biome of the Amazon Basin and the hot desert biome of the Atacama Desert.

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.

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- Identify, locate; describe and explain how plants and animals are adapted to the climate of either the coniferous forest or savanna biome.

Key Subject Vocabulary

Weather; Climate; Temperature; Political map; Temperate; Council; Pattern; Location; North Pole; Equator; Location; Distribution; Country; Prevailing; Wind; Ocean; Climate graph; Classification; Key; Tropic of Cancer; Tropic of Capricorn; Polar; Continental; Mediterranean; Tropical; Equatorial; Drought; Annual; Winter; Summer; Mild; Season; Northern Hemisphere; Southern Hemisphere; Meteorological; Climate station; Average; Coniferous; Tropical; Rainforest; Savanna; Hot desert; Ice cap; Tundra; Mountain; Environment; Grassland; Shrubs; Trees; Animals; Herbivores; Landscape; Lichens; Moss; Deciduous; Forest; Evergreen; Predators; Humid; Oxygen; Drought; Carnivore; Biome; South America; River; Amazon Basin; Amazonia; Nile; Andes; Tributary; Source; Mouth; Humid; Convection; Condensation; Cloud; Thunderstorm; Cumulonimbus; City; Inhabited; Polar; Sahara; Adaptation.

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.

Key Question: Why are jungles so wet and deserts so dry?

Science

Living things and their habitats

Pupils should be taught to:

- Recognise that living things can be grouped in a variety of ways.
- Explore and use classification keys to help group, identify and name a variety of living things in their local and wider environment.
- Recognise that environments can change and that this can sometimes pose dangers to living things.

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; and identify a range of ways to report concerns about content and contact.

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NOTES

Ancillary Question 1: Why is climate different across the United Kingdom?

During the Key Stage 1 enquiries, pupils investigated the weather, i.e. the conditions of the atmosphere including temperature, rainfall, cloud cover, wind strength and direction at one moment in time. Ask the pupils to look out of the window and to describe the weather. Is the weather the same as it was yesterday or last week? The weather changes during a day and often from one moment to the next! Weather happens from day to day.

Climate, on the other hand, is the average pattern of the weather that a place receives over 30 years. We can't make generalisations about weather conditions from one day to the next but we can when we average out what happens over a much longer time frame. When we measure average weather conditions in a place over 30 years, we can then begin to describe its climate. In comparison to many other places in the world, the United Kingdom is a small country, in terms of land area, and generally it is never very hot and never very cold. We have what is called a *temperate* climate. However, this does not mean that the climate (average weather conditions) is the same in every place. Even in a small country the climate of one place can be very different to the climate of another.

Divide the pupils into pairs and give them the two maps in **Resource 1**. These show average January and July temperatures across the United Kingdom – they are not the same! Using a copy of the political map showing administrative areas in **Resource 2**, the pupils can now work together to interpret the maps and fill in the tables in **Resource 3**. Having completed this exercise, take some time to discuss with the pupils the *pattern* of temperatures they can see in the two maps. Why does it get colder the further north you go and why is it so much warmer in the south of the country? This is because of the location of the UK in the world – about half way between the North Pole and the Equator. The further north you travel in the UK towards the North Pole, the colder it becomes and the further south you travel towards the Equator the warmer it becomes.

Not only is the pattern of average temperatures across the UK different from one location to another, so also is the distribution (how something is spread out over an area) of rainfall during an average year. Again, this may be very surprising for such a small country. Give out copies of the average annual rainfall map in **Resource 4**. What is the difference between the highest annual average rainfall received in one place and the lowest annual average rainfall? Whereabouts are these two places located? The wettest is in the west and the driest is in the east of the country. Whereabouts in the UK is the place with the highest temperature ever recorded, compared with the two places that have recorded the lowest temperatures?

We have seen that average temperatures decrease from south to north (or increase from north to south) in the UK, so what about the pattern of rainfall? It is much heavier in the west and north and decreases the further east you travel. What clues are there on the map to help us explain why this is so? What do the arrows indicate? The prevailing (direction from which they most often blow) winds that travel across the UK come in a southwesterly direction in both winter and summer. Look at the map in **Resource 5**. Before reaching the UK over what do these winds blow? The Atlantic Ocean. As they blow for thousands of kilometres over the Atlantic Ocean, the prevailing winds absorb a lot of moisture which then falls as rain when they reach the UK – most falls on the land they meet first (the west) and consequently less rain falls to the east.

Before moving on, support the pupils to locate the position of their home settlement as accurately as possible on the rainfall distribution map in **Resource 4**. What is the average annual rainfall of where they live? How does it compare with the rest of the UK? Is it wetter or drier than most? Similarly, what about January and July temperatures, as shown on the maps in **Resource 1**, compared with the rest of the country?

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Ancillary Question 2: What are the world's climates?

Give out copies of the map and key in **Resource 6**. Explain that the Earth is divided up into different climates according to patterns of temperature and rainfall that places experience. Allow time for the pupils just to explore the map and in particular, to understand the different classifications of climate shown in the key. What kind of climate does the United Kingdom have according to the key?

Using both of the maps in **Resources 6** and **7**, the pupils can now complete the table in **Resource 8** to identify the kind of climate they would mostly find in a number of countries around the world. For a number of the larger countries in the table they will have to list more than one category of climate.

Using the map in **Resource 9** together with the map in **Resource 7** the pupils can familiarise themselves with how rainfall varies throughout the world by filling in the correct answers to the questions on a copy of **Resource 10**. Ask the pupils what they notice about the location of the wettest places on Earth in relation to the Equator and the Tropics of Capricorn and Cancer? The wettest places on Earth are all found around the Equator and between the Equator and the Tropics of Capricorn and Cancer. How does this compare with the pattern of the very driest areas on Earth? Which continent is the only one without a very dry area? The distribution of very dry areas on Earth is much more evenly spread than the location of the wettest areas – there are very dry areas in every continent except Europe.

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Ancillary Question 3: How do climate graphs help geographers compare the climate of one place with another?

Explain to the pupils that geographers draw a special graph, such as those in **Resource 11**, called a climate graph. Climate graphs allow us to see very quickly and easily the pattern of average temperature each month (shown by a continuous red line) and average monthly rainfall (shown by blue bars). Temperature is read from the left-hand vertical axis and rainfall on the right-hand vertical axis. They are a quick and easy way of summing up the climate of a place at a glance.

Resource 11 shows the climate graphs of nine places in the world that, as yet, remain anonymous. Each place is a good example of a type of climate.

Firstly the pupils need to match the climate descriptions in the table in **Resource 12** with what they work out to be the correct climate graph 1–9. Climate graph 5 might present a challenge and appear not to fit any of the descriptions. Tell the pupils that this place is, in fact, in the Southern Hemisphere so reverse the seasons, i.e. June and July will be the middle of winter and December and January in the middle of summer. This may help.

The correct order of the climate graphs is shown in **Resource 13**. Discuss with the pupils which graphs they found to be the easiest to match and which were the most challenging. Now that the pupils have correctly matched the answers 1–9, the next challenge is to see whether they can match the climate graphs 1–9 to the nine climate stations around the world shown on the map in **Resource 6**. The answers are also in **Resource 13**.

As a final activity in this enquiry the pupils can go online at www.metoffice.gov.uk/public/weather/climate/ and download the average monthly temperature and rainfall figures from the Meteorological Office climate station closest to their school or where they live. Click on the appropriate red dot, then click on 'Averages table' along the top tool bar and the data will be presented. The Met Office temperature data for each month shows both a maximum and minimum temperature. Pupils should calculate an average to arrive at one temperature figure. Using the data the pupils can now draw a climate graph on a copy of the template in **Resource 14**. When complete, take time to display and discuss. Of the nine climate graphs they have studied previously, which one is their graph most similar to and which is it most different from? The closest comparison should be with Paris (climate graph 4) because Paris, like all of the United Kingdom, is in the temperate climate zone – generally mild and wet all year.

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Ancillary Question 4: How does the climate affect the plants and animals living in a place?

In **Resource 15** there are photographs of eight different places around the world. Divide the pupils into pairs and ask them to look carefully at each environment. For each location the pupils need to be encouraged and supported to answer two questions: *What is the climate of this place like?* Think particularly about temperature and rainfall; and also: *What kind of plants and animals are likely to live here?*

Then see if the pupils can match the photographs 1–8 with the descriptions of climate and plants and animals in the table in **Resource 16**. The answers are in **Resource 17**.

Now the pupils can look at the eight animals in **Resource 18** and the eight plants in **Resource 19** and complete the same kind of exercise, by matching the animals and plants to the most appropriate descriptions of climates from around the world. The answers are in **Resource 17**.

Finally in this enquiry, distribute copies of the world map of biomes in **Resource 20**. Explain that, during this enquiry, the pupils have been investigating the different types of plants and animals that are found in places with different climates around the world. Such large communities of plants and animals covering distinct areas of the world are called *biomes* and the many different types are shown on the map. We can't look in detail at all of the biomes so let's get to know two in more detail – hot deserts and tropical forest biomes. We can find both in the continent of South America.

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Ancillary Question 5: Why is the jungle of the Amazon Rainforest so wet and humid?

Encourage the pupils to look carefully at the continent of South America on the map of biomes in **Resource 20**. The tropical forest biome is shaded dark green. What do the pupils notice about the area of the tropical forest biome in South America compared with all of the others? What can be found in the middle of the biome? A network of rivers. Which river in particular?

Let's look at more detailed maps in **Resource 21** and **Resource 22**. The River Amazon is the world's greatest river in terms of the volume of water it carries and it is only a few kilometres shorter than the River Nile (the longest river in the world). At any second of the day or night one-fifth of all the river water in the world will be found in the River Amazon and its tributaries (smaller rivers that flow into and join a larger river). Where does the River Amazon have its source (where it begins)? It is high up in the Andes Mountains in Peru. A wide variety of films that can be shown to introduce the Amazon and the wonder and diversity of the ecosystem of the tropical rainforest of the Amazon Basin can be sourced at

www.bbc.co.uk/nature/habitats/tropical_and_subtropical_moist_broadleaf_forests#intro and also at www.youtube.com/watch?v=YUuA-C_I3DE

Resource 23 includes the climate data for the city of Manaus, located in the middle of the Amazon Basin in Brazil. The pupils can use this data to draw their own climate graph using the template in **Resource 14**. How much rain falls in Manaus every year? Compare this with the average of 700 mm for Birmingham – most British people think it rains a lot in the United Kingdom! It rains almost every day of the year in Manaus and this, combined with the hot temperature, makes the weather conditions very humid – perfect conditions for a jungle to grow.

But why does it rain every day? Divide the pupils into pairs and give them a copy of the diagram in **Resource 24**. Explain that this diagram explains why it rains every day in the tropical rainforest of the Amazon Basin. What do they think might go in each of the five boxes to describe what is going on here? Allow time for the pupils to speculate and reason. Then take feedback and discuss the thoughts of the whole group.

Finally give the pupils the jumbled list of statements in **Resource 25** to read through. Can they now reorder them and write them in the correct boxes on the diagram in **Resource 24**?

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Ancillary Question 6: Why is Arica the driest inhabited place on Earth?

Without any other introduction or explanation project the two images in **Resource 26**. Explain to the pupils that this is a very special place. It holds an important record. It is number one in the world for something – can they work out what it might be from the images? What kind of place is this? Where might it be? Any there any clues as to the surrounding natural environment or weather and climate? Is there any evidence of what people do here?

Next show them the map in **Resource 27**. The photographs in **Resource 26** are of the city of Arica in the country of Chile – can the pupils locate it? At this point, cross-reference with the political map of South America in **Resource 21**. Referring back to the map of world biomes in **Resource 20**, ask the pupils in which biome the city of Arica can be found? It is hot desert – is this a clue to why Arica is so famous? It is the driest inhabited place on Earth with only an average of 0.76 mm of rainfall each year! This is because it is surrounded by the Atacama Desert, which is the driest non-polar desert in the world (central Antarctica at the South Pole is drier). Some places in the Atacama Desert haven't had any rainfall for 500 years – see the location of Arica on the *Google Earth* image in **Resource 28**.

Now encourage the pupils to look carefully at the images of the Atacama Desert in **Resource 29**. The Atacama Desert is very long and narrow – 1000 km from north to south and only 150 km at its widest point (west to east). What is the landscape of the desert like? Do they find anything surprising about the landscape? Some pupils might well find the lack of sand and sand dunes that characterise the Sahara Desert (the largest hot desert) a surprise. The Atacama is a rocky or stony desert – the white colour that appears in some of the photographs is, in fact, salt deposits.

So why is the Atacama Desert so dry? Give each pupil a copy of the diagram in **Resource 30**. When finished this will enable them to understand why it hardly ever rains in the city of Arica or across the Atacama Desert as a whole. What do they think the empty four boxes should say? Encourage and support plenty of speculation and reasoning here.

As a summative piece the pupils can add the following five pieces of information to the correct boxes:

- *Moist air flows in from the southeast across the Pacific Ocean towards Arica.*
- *Immediately the moist air is forced to rise into the atmosphere as it meets the Andes Mountains.*
- *As the air rises it condenses to form water vapour in huge clouds above the mountains.*
- *All the rain falls on the eastern side of the Andes Mountains.*
- *The city of Arica and the Atacama Desert remain the driest places on Earth.*

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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	Observe, describe and explain in basic terms the pattern of climate in the United Kingdom	Oral Annotated maps Completed table of data
2	Identify, describe and begin to offer reasons for the distribution of different types of climate around the world	Oral Map interpretation Completed tables of data
3	Compare and contrast the temperature and rainfall data in different climate graphs to reach conclusions about the climate in different locations in the world	Comparison tables Oral Short explanatory piece of writing
3	Construct a climate graph from temperature and rainfall data for their home location and compare and contrast this with climate graphs of other locations to reach conclusions and make judgements	Climate graph Oral Short PowerPoint
4	Understand how climate affects both the landscape of different biomes and the plants and animals that can live there	Matching of landscapes, plants and animals to different biomes Oral explanation
5	Observe, describe and explain why areas of tropical rainforest such as the Amazon Basin have so much convectional rainfall;	Completed convectional rainfall flow diagram
6	Describe the natural environment of the Atacama Desert and explain why the city of Arica is the driest inhabited place in the world	Photograph and Google Earth interpretation Completed flow diagram
Homework	Identify, locate, describe and explain how plants and animals are adapted to the climate of either the coniferous forest or savanna biome	Report

Homework possibilities

To run in conjunction with Ancillary Questions 3–6 the pupils could be challenged to write a geographical report about another biome such as coniferous forest or savanna. The focus could be on extending their understanding of the concept of adaptation by being required to describe and explain how plants and animals are adapted to the climate of the biome. A possible structure could be: *Location (with map); Images to illustrate the characteristics of the environment; Climate; Common animals and plants; Examples of adaptation.*

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Further reading



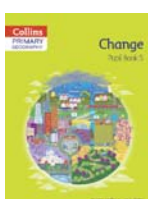



Collins *Big Cat* has books for every child in the classroom with a wide variety of genres, top authors, relevant topics and a range of engaging formats and illustrative styles. Listed below is a selection of from the Big Cat list to support the enquiry topics in Connected Geography for KS1. Find out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

ISBN: 978-0-00-812781-7	<i>The Four-Desert Challenge</i>	Rob Alcraft	
ISBN: 978-0-00-812777-0	<i>Spotlight on Brazil</i>	Charlotte Coleman-Smith	

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ISBN: 978-0-00-756369-2	<i>Primary Geography Interactive resources 3-6</i>		