

Unit 2 The restless earth – earthquakes and volcanoes

About the unit

In this unit pupils learn about the patterns and processes associated with earthquakes and volcanic activity. Pupils contrast the impact of this type of activity on more and less economically developed countries (MEDCs and LEDCs).

The focus of the unit is describing patterns and processes; understanding and explaining the complexities of tectonic activity are left until year 9.

This unit is expected to take 12–20 hours.

Key aspects

Geographical enquiry and skills

Pupils will:

- ask geographical questions
- collect/record/present evidence
- appreciate values and attitudes
- communicate appropriately
- use atlases/globes/maps
- use secondary evidence
- draw maps, plans and graphs
- communicate, including using ICT

Knowledge and understanding of places

Pupils will:

- locate places and environments
- describe and explain physical and human features
- explore interdependence and global citizenship

Knowledge and understanding of patterns and processes

Explored through:

- tectonic processes
- environmental issues

Knowledge and understanding of environmental change and sustainable development

Pupils will study:

- environmental change and management

Expectations

At the end of this unit

most pupils will: describe the distribution patterns of earthquakes and volcanic activity and identify their link with the earth's 'active zones'; describe the physical and human effects of volcanic eruptions and begin to explain their different impacts in MEDCs and LEDCs; describe the reasons for the level of devastation of some earthquakes and how people try to minimise their effects; begin to explain why people choose to live in these zones; suggest suitable geographical questions and use a range of geographical skills to help them investigate earthquakes and volcanoes; use primary and secondary sources of evidence and communicate their findings using appropriate vocabulary

some pupils will not have made so much progress and will: describe and compare the location of some earthquakes and volcanic activity and recognise that they coincide with the earth's 'active zones'; describe some of the effects of volcanic eruptions and compare and offer explanations as to why their impacts in MEDCs and LEDCs may be different; understand that some earthquakes are more devastating than others and offer some reasons why people choose to live in these zones; use skills and sources of evidence to respond to a range of geographical questions about earthquakes and volcanoes, and begin to use appropriate vocabulary to communicate their findings

some pupils will have progressed further and will: describe and begin to explain the distribution patterns of earthquakes and volcanic activity and their relationship with the earth's 'active zones'; describe and begin to explain the physical and human effects of volcanic eruptions and why their impact differs in MEDCs and LEDCs; offer explanations as to why people choose to live in these zones; suggest relevant geographical questions and select and use appropriate skills and ways of presenting information; select information and sources of evidence in their investigations of earthquakes and volcanoes and present their findings both graphically and in writing

Prior learning

It is helpful if pupils have:

- used an atlas index
- carried out research using a range of sources, *eg internet, CD-ROMs, library*
- drawn plans and maps at a variety of scales
- used world maps (of different projections) and globes
- some knowledge of countries with different levels of economic development

Language for learning

Through the activities in this unit pupils will be able to understand, use and spell correctly words relating to:

- tectonic activity, *eg volcano, earthquake, vent, magma, lava, igneous, active, dormant, extinct, natural hazard, crust, friction*
- development, *eg more economically developed country, less economically developed country, cause, effect, evacuation, migration*

Speaking and listening – through the activities pupils could:

- identify the main points of a task, TV programme, etc

Reading – through the activities pupils could:

- follow the sequence of actions, processes or ideas being described

Writing – through the activities pupils could:

- introduce, develop and conclude pieces of writing appropriately
- use capital letters, full stops, exclamation and question marks correctly

Resources

Resources include:

- video of volcanic activity
- ‘Teaching geography using televisual resources’, *Geography teacher’s handbook* (Geographical Association)
- general information on the 1995 Kobe earthquake, *eg video footage, websites, CD-ROM encyclopedias*
- newspaper articles about LEDCs and MEDCs, including information on volcanic eruptions
- atlases, world outline maps (Pacific-centred if possible), world population distribution map
- sandpaper, a wooden block and an elastic band
- statistics on the 1995 Kobe earthquake and ‘The Kobe earthquake’, *Optional tests and tasks for geography* (SCAA, 1996)
- a computer paint or draw package
- a poem, *eg ‘After the earthquake’ by Angela Topping (Staffordshire Poetry Archive at www.sln.org.uk/geography/)* or text, *eg ‘Tomorrow is a great word’ by Janeen Brian (Magic Bean Junior Novel – Big Book)*
- supporting video programmes:
 - *Geographical eye over Asia, programme 5: Indonesia – Story of a volcano* (Channel 4 Education)
 - *Geographical eye – Disasters, programme 1: Earthquakes* (Channel 4 Education)
 - *Geographical eye special – Planet earth, programme 1: Tectonics* (Channel 4 Education)

Future learning

This unit ensures that pupils are introduced to physical geography early in year 7. It is followed by subsequent studies in year 8 in unit 7 ‘Rivers – a fieldwork approach’, unit 8 ‘Coastal environments’ and unit 13 ‘Limestone landscapes of England’, where more detailed work on processes occurs. While there is some overlap with unit 21 ‘Virtual volcanoes and internet earthquakes’, the pitch of this later unit is more appropriate for pupils’ cognitive development and their ability to understand more complex information. Other aspects of this unit lead on to more work on population distribution in unit 3 ‘People everywhere’ and unit 16 ‘What is development?’. Opportunities for pupils to practise and consolidate their literacy skills are identified in most other units which follow.

Links

The activities in this unit link with:

- other geography units – unit 3 ‘People everywhere’, unit 7 ‘Rivers – a fieldwork approach’, unit 8 ‘Coastal environments’, unit 13 ‘Limestone landscapes of England’, unit 16 ‘What is development?’
- mathematics – handling data and representation
- ICT – using internet news sites
- key skills – working with others, improving own learning and performance
- citizenship – global community
- science scheme of work – unit 8H ‘The rock cycle’

What do we already know about earthquakes and volcanoes?

- to classify using criteria
- to share what they know about earthquakes and volcanoes
- Ask pupils to brainstorm a response to the enquiry question. Classify pupil responses by grouping/linking, *eg volcanic eruption or earthquake, cause/effect, named case study*. Ask pupils what criteria they used for classification.
- classify and link information
- display existing knowledge about earthquakes and volcanoes

Where do earthquakes and volcanoes occur?

- to use an atlas
- to research locations of earthquakes and volcanoes using the internet and CD-ROMs
- to map the distribution of tectonic activity
- introduce, develop and conclude pieces of writing appropriately
- Ask the pupils to research earthquake and volcano locations using the internet (provide appropriate websites on screen) and/or CD-ROMs. Plot the locations on a world outline map using an atlas – consider how to distinguish between earthquakes and volcanoes in the key. Ask them to add to the map the numbers of lives lost.
- Discuss the meaning of the word 'describe' with the class, then create a vocabulary bank describing the patterns shown on the map. Ask pupils to use the word bank to write a description of the world distribution of earthquakes and volcanoes. Lower-attaining pupils may benefit from the support of a report writing frame. Using pupils' written outcomes, consider the characteristics of 'good' geographical description.
- Carry out a 'maps from memory' activity. Show a map of the distribution of the world's major plates – named. Provide pupils with world outline maps and ask them to work in groups to 'build up' a map showing the distribution of the 'active zones' and named tectonic plates.
- Discuss with the pupils the pattern of earthquakes and volcanoes and whether there are relationships with the world map showing the 'active zones'. *What does this suggest?*
- plot accurately, using a key, and describe the locations of earthquake and volcanic activity
- identify the components and characteristics of good 'description'
- identify and describe global patterns using appropriate vocabulary, and identify links between earthquakes, volcanoes and 'active zones'
- write a well-structured geographical description using specialist vocabulary appropriately
- By working in pairs pupils can be encouraged to discuss and evaluate both their geographical understanding and their literacy skills.
- Pupils may need reminding how to research and read effectively on screen.
- Number of lives lost may be printed in figures or drawn as graphs. If the latter, there is an opportunity for links to be made with mathematics (data handling and representation).
- The characteristics of a 'good' description may be listed in pupils' exercise books or glossaries for future reference.

What are volcanoes?

- to use appropriate graphical techniques
- to identify the characteristics of volcanoes and volcanic activity
- Arrange for pupils to watch video footage of volcanoes and volcanic activity. Ask them to create 'wordscapes' from selected 'stills' using nouns and adjectives (the pause button allows wordscapes to be constructed on a sketched outline from a television 'still'). Discuss the geographical vocabulary used and identify key words for pupils to define and learn.
- define and spell 'key' vocabulary correctly to identify the characteristics of volcanoes
- Science: links with work on the formation of igneous rocks.
- Display key words in the classroom for the duration of the unit – add to them as appropriate. Pupils may add them routinely to glossaries.

Learning objectives

Pupils should learn:

Possible teaching activities**Learning outcomes**

Pupils:

Points to note

What happens when a volcano erupts? Do volcanic eruptions have the same impact in different places?

- to use secondary sources of evidence including ICT
 - to construct a storyboard
 - to identify similarities and differences
 - to communicate accurately in ways appropriate to task and audience
 - to follow the sequence of actions, processes or ideas being described
 - to consider how environments in 'active zones' might be managed (higher-attaining pupils)
- Divide the class in two. Ask one half to carry out an investigation into a volcanic eruption in an LEDC, and the other half an investigation into a volcanic eruption in an MEDC, *eg MEDC includes Mt Etna or Mt St Helens and LEDC includes Mt Pinatubo or Nevada del Ruiz*. Ask them to produce a brochure to inform visitors to the volcanic region about the latest eruption. The brochure should include various features, *eg a map showing the location of the volcano within the country, an annotated map of the region locating features of the eruption, a 'storyboard' to show the sequence of events including physical and human causes and effects, eg amount of warning, evacuation of people, loss of possessions*. To help them with the construction of the 'storyboard', suggest they create a vocabulary bank and include specific facts, figures and place names. Lower-attaining pupils may need more support, *eg a planning framework with boxes indicating the components of the storyboard into which they draft their information – one box should contain key vocabulary*.
 - Ask pupils to refer back to the first map they drew which shows the number of lives lost. Ask them what they notice – whether there is a link between the number of deaths and the state of development and to suggest why.
 - Discuss with the class the causes and effects of eruptions in LEDCs and MEDCs and use their responses to build up a diagram of the similarities and differences on the board. Ask them to describe and explain the differences identified.
 - Ask higher-attaining pupils how the area they studied might plan for future eruptions.
- read information texts with understanding
 - describe the physical and human effects of volcanic eruptions
 - describe and explain differences experienced by LEDCs and MEDCs when eruptions occur
 - produce a brochure which presents information clearly in a variety of ways, with accurately written text that is appropriate for display
 - identify ways of managing environments in 'active zones' (higher-attaining pupils)
- ICT: this activity provides pupils with the opportunity to use ICT to investigate topical information such as online newspapers and news sites on the internet. Teachers could provide web addresses with supporting information electronically, to speed pupils' access.
 - Language for learning: this activity provides opportunities for more extended reading, requiring pupils to follow the sequence of actions, processes or ideas being described. To encourage pupils to read with understanding ask them to make notes of main points, under headings, for use later when writing their brochure.
 - Language for learning: the brochure task provides an opportunity to emphasise accuracy in the use of capital letters and end-of-sentence punctuation.

Learning objectives

Pupils should learn:

Possible teaching activities**Learning outcomes**

Pupils:

Points to note**What happens in an earthquake?**

- to observe and select appropriate vocabulary
- Demonstrate earthquake activity using two sheets of rough sandpaper, a wooden block and an elastic band. Cover the block with one piece of sandpaper, attach the elastic band to one end and place the block on the second piece of sandpaper. Pull the elastic band and observe what happens as the tension increases. Ask pupils to choose appropriate words to describe what happens. Discuss with them the adjectives which might describe the sensation of experiencing an actual earthquake.
- describe what happens when plates in the 'active zones' move and what it might feel like to be there

How can language be used to evoke emotion?

- to use poetry/text to explore how victims of earthquakes might feel
- Read a poem, eg *'After the Earthquake'* by Angela Topping, or text, eg *'Tomorrow is a great word'* by Janeen Brian (see Resources section).
- Ask pupils to reflect in silence on the impact of the earthquake on its victims. *How would they feel?* Ask them to use coloured markers to identify, on an extract of the text, words and phrases which involve feelings and then to add notes to show how the effect was achieved.
- identify how text may convey feelings
- Pupils could reflect on the impact of an earthquake on people, contributing to pupils' spiritual development.
- Language for learning: pupils could use highlighting and note making as appropriate on different texts.
- English: use of poems/stories links with work in English.

What happened in the 1995 Kobe earthquake in Japan?

- to use secondary sources of evidence, including moving images
- to use an atlas and maps at various scales
- to use appropriate graphical techniques
- Arrange for the class to watch video footage (with commentary) of the 1995 Kobe earthquake. Ask them to make notes of important points of information. Then ask pupils to produce a series of maps for BBC2's *Newsnight* on the day of the earthquake, showing the location of Japan, Kobe and the area affected.
- Organise pupils to carry out Task 1: 'The Kobe earthquake' from *Optional tests and tasks for geography* (SCAA, 1996) in groups of three or four.
- Ask each group to write and present a script for a five-minute report for *Newsnight* entitled 'Why did so many die in the Kobe earthquake?'. This is to be broadcast one month after the event. The maps produced for the original programme should be annotated with updated and additional information not available at the time of the earthquake. Eye-catching graphics showing relevant statistics should illustrate the report.
- describe the nature and effects of the Kobe earthquake and explain why it was so devastating
- describe how the Japanese people responded to the disaster and the plans to improve responses next time
- ICT: this activity provides pupils with the opportunity to use a painting and drawing package.
- Language for learning: watching the video provides an opportunity for pupils to listen with sustained attention and show understanding of what is heard, by identifying the main points in the commentary.
- Key skills: links with working with others, where pupils work on a one-to-one or group basis and plan with others what needs to be done; confirm their understanding of the objectives, their responsibilities and working arrangements; and carry out tasks and review progress.

Learning objectives

Pupils should learn:

Possible teaching activities**Learning outcomes**

Pupils:

Points to note**How can people try to minimise the effects of earthquakes?**

- to ask geographical questions
- to investigate and use secondary sources of evidence
- to use an atlas to locate places
- to classify using criteria
- Ask pupils to research one 'case study' about how people have attempted to reduce the effects of earthquakes, *eg earthquake 'drill' in Japan*. Ask them to present their information using a location map, writing and annotated diagrams.
- Help pupils to plot the case study locations on a world map on a display board. Discuss with the pupils questions like *Can the 'strategies' be classified and, if so, how? Are the case studies from more or less developed countries ... and why? Ask pupils to generate their own enquiry questions for discussion, eg Is the information needed to answer these questions available? What further research is needed? How might this be carried out?*

- describe a range of strategies used in different parts of the world to minimise the impact of earthquakes

- Key skills: links with improving own learning and performance, where pupils use the plan–do–review cycle, confirm their understanding of targets and how these will be met, follow plans using support, and review achievements and progress.

Why do people choose to live in active zones?

- to use an atlas to locate information about population and active zones
- to classify using criteria
- to work collaboratively
- to appreciate how people's values and attitudes affect issues
- Provide pupils with a large world map showing population distribution (with a key) and a world map showing active zones. Ask them to label the map, *eg 'very dense population in an active zone', 'fairly dense population in an active zone'*. Ask them to stick these on appropriate locations on the world population map.
- Provide a further set of labels giving 'positive' and 'negative' factors for living in specific locations, *eg 'Ash and lava from earlier eruptions of Mount Pinatubo had provided a deep and fertile soil, ideal for rice growing'; 'In 1985 Nevado del Ruiz in Colombia erupted. This caused the ice and snow on the volcano to melt and created a mudflow that hit the town of Armero, killing 21,000 of the 22,000 inhabitants'*. Ask pupils to use an atlas to stick these labels in the correct locations on the world map. Ask them to colour the 'positive factors' in one colour and the 'negative factors' in another colour. Encourage discussion if statements are ambiguous.
- Ask pupils to use this information to consider their own and others' values and attitudes about living in active zones.

- identify and compare global distribution patterns of population and active zones
- identify factors influencing people's decisions about where to live
- clarify and develop their own values and attitudes about issues

- Red and green should not be used because of colour blindness.

What is the role of aid agencies in LEDCs?

- to carry out geographical enquiry using ICT
- Discuss with pupils the role of aid agencies when disaster strikes. Ask them to investigate the role played by such agencies in a recent earthquake disaster, *eg Colombia, January 1999*. Widen this to include the part played by MEDCs in such work, using a teacher-prepared internet enquiry, *eg Which aid agencies provided support for the emergency? What types of aid were provided? How successful was the work of the aid agencies and why? How do different organisations raise funds*. These websites may be useful:
 - www.oneworld.org/
 - www.oxfam.org.uk/
 - www.christian-aid.org.uk/
 - www.dfid.gov.uk/
 - www.ifrc.org/news

- identify how people's lives and environment in one place are affected by actions in another
- describe what aid agencies do in response to earthquake disasters in different parts of the world
- explain how places are interdependent in the global community (global citizenship)

- Extension: higher-attaining pupils may be encouraged to identify their own questions and lines of enquiry.
- Citizenship: this activity provides pupils with the opportunity to reflect on the world as a global community and the political, economic, environmental and social implications of this.