# Global Hazards

# Introduction

## Overview

Delivery guides are designed to represent a body of knowledge about teaching a particular topic and contain:

* Curriculum Content: A clear outline of the content covered by the delivery guide;
* Thinking Conceptually: Expert guidance on the key concepts involved, common difficulties students may have, approaches to teaching that can help students understand these concepts and how this topic links conceptually to other areas of the subject;
* Thinking Contextually: A range of suggested teaching activities using a variety of themes so that different activities can be selected which best suit particular classes, learning styles or teaching approaches.

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# Curriculum Content

## Overview

| 1.1. How can weather be hazardous? | | Scale |
| --- | --- | --- |
| a. Why do we have weather extremes? | * Outline of the global circulation system including the effects of high and low pressure belts in creating climatic zones | G, R |
| * How the global circulation of the atmosphere causes extremes in weather conditions in different parts of the world. * The extremes in weather conditions associated with wind, temperature and precipitation in contrasting countries | G, R |
| * The distribution and frequency of tropical storms and drought, and whether these have changed over time. * Outline the causes of the extreme weather conditions associated with tropical storms. * Outline the causes of the extreme weather conditions of El Niño/La Niña leading to drought. | G, R |
| b. When does extreme weather become a hazard? | * **Case studies** of **two** contrasting natural weather hazard events arising from extreme weather conditions. The case studies must include a natural weather hazard from each bullet point below: * flash flooding or tropical storms * heat wave or drought.   There must be **one** UK based and **one** non-UK based natural weather hazard event.   * For each chosen hazard event, study the place specific causes (including the extreme weather conditions which led to the event), consequences of and responses to the hazard. | N, R, L, F |
| **1.2. How do plate tectonics shape our world?** | | |
| a. What processes occur at plate boundaries? | * The structure of the Earth and how it is linked to the processes of plate tectonics including convection currents. | G |
| * The processes that take place at constructive, destructive, conservative and collision plate boundaries as well as hotspots. |  |
| * How the movement of tectonic plates causes earthquakes, including shallow and deep focus, and volcanoes, including shield and composite. |  |
| b. How can tectonic movement be hazardous? | * A case study of a tectonic event that has been hazardous for people, including specific causes, consequences of and responses to the event. | N, R, L |
| c. How does technology have the potential to save lives in hazard zones? | * How technological developments can have a positive impact on mitigation (such as building design, prediction, early warning systems) in areas prone to a tectonic hazard of your choice. | R, L |

# Thinking Conceptually

## Overview

### General approaches

The study of global hazards lends itself to thinking about causes, effects and responses, at different scales (local to global), and in different contexts (how developed the area is, and social, economic and environmental factors). This encourages students to use geographical knowledge and understanding to explain why hazards occur, how they impact the lives of people and reactions to hazard events in different places.

 The case studies can be learnt through enquiry-based study (\*Roberts, 2013) where students are encouraged to ask their own questions about an event (creating a need to know), using data such as photographs and statistics, making sense of the data through different methods of analysis and reflecting on what they have learnt e.g. by making judgements about how sustainable responses to hazards are.

\*Roberts, M. (2013) *Geography through Enquiry: Approaches to teaching and learning in the secondary school*. Geographical Association: Sheffield

### Common misconceptions or difficulties students may have

There are some basic concepts that students need to know before they can understand weather and climate patterns and plate tectonics e.g. low pressure derives from rising air, that the Earth’s land does not grow simply because new crust is created and what causes extreme weather events.

Students should also be made aware that global hazards (climatic and tectonic) are complex and unique – each event is different and will subsequently present a range of challenges for human populations. For example, a magnitude 7 earthquake in one place will have very different effects to a magnitude 7 in another place. Students therefore need to understand that there are multiple influences which impact just how hazardous weather and tectonic events can be.

### Conceptual links to other areas of the specification – useful ways to approach this topic to set students up for topics later in the course

This topic presents opportunities to link with students’ learning about development – persistent hazards can impact the development level of a country, and the level of development can hinder or help recovery and coping strategies. Students can also make links with their learning about sustainability (e.g. how sustainable are earthquake responses?), changing climates (is this responsible for more floods / droughts in certain areas?) and distinctive landscapes (how do tectonic forces shape the landscape?).

# Thinking Contextually

## Overview

### Approaches to teaching the content

There are many geographical contexts that could be used to frame student learning about global hazards. For example, understanding the distinction, and relationship, between physical and human factors is necessary in identifying and categorising the causes of flooding. Appreciation of global, national and local is useful as hazards pose challenges at all scales; a volcanic eruption in one country can ground flights in another. Being able to distinguish between the social, economic and environmental is key to understanding the causes, consequences of and responses to hazards; drought in the Horn of Africa causes death, loss of income and soil erosion.

## 1. What is the global circulation system?

To help students understand why we have weather extremes globally students will need to explore the global circulation system, which can be a tricky topic for many students to grasp.

As a starting point get students to study the global circulation diagram to try and establish what the diagram shows. In pairs students will then need to verbalise in 30 seconds what they think the diagram shows to each other.

In differentiated groups of three, students become an expert on one of the three cells (Hadley, Ferrel and Polar). Each student will need to read the information for their cell (see Resource link) and become an expert to help explain their cell to the other members of their group.

As an extension, students can investigate how the global circulation system impacts the UK’s weather using the top 2 paragraphs under the heading “Global circulation and the UK weather” by answering the following two questions:

* Which cells influence the UK’s weather?
* What is the impact on the UK’s weather and why?

### Resources

[Global circulation patterns](https://www.metoffice.gov.uk/weather/learn-about/weather/atmosphere/global-circulation-patterns)

## 2. What are the extremes in weather conditions?

Students need to know about extremes in weather conditions in contrasting countries. In this activity, they should use the climate data provided (Learner Resource 1) to draw two climate graphs, one for Phoenix, Arizona (USA), a hot arid desert environment, and one for Kathmandu (Nepal), a wet subtropical region.

Drawing the climate graphs should allow students to see very quickly the stark differences between these two climates. See Learner Resource 1. They should then describe and compare the climate of the two places, using the guidance provided.

An extension task would be to explain why those places have the climate they do, as detailed on Learner Resource 1.

### Resources

Learner Resource 1 (Available on Teach Cambridge)

## 3. What is the distribution and frequency of hurricanes?

It is important that students have an awareness of the distribution and frequency of climatic hazards, including hurricanes. Standalone case studies of hurricanes are often only the most deadly or most economically damaging and do not give students any sense of how frequently some parts of the world are affected by such a climatic hazard. This activity combines locational learning with looking at geographical spatial patterns and the consequences that hurricanes have on people and places.

Students are presented with a range of data for ten hurricanes that occurred between 2004 and 2008 in the USA (Learner Resource 2). They should use this data to annotate their map (also Learner Resource 2); choosing to categorise it how they wish (you could suggest symbols for the category of hurricane and numbers of varying colours for human and economic cost).

As an extension to this they could do the exam-style question (on Learner Resource 2) to give them some idea of how this type of data could be used to assess their description skills.

### Resources

Learner Resource 2 (Available on Teach Cambridge)

## 4. What are the consequences of drought?

Students need to know the consequences of drought and the video clip will help them to see how drought effects people and landscapes. This activity could be used when starting to discuss the effects of drought, to see what they already know and understand, and perhaps again at the end, to see how student answers have developed.

In this activity they should watch the video clip, but with no sound. On the first play, they should just watch. On the second play, they should write down words and phrases that come to mind as they watch. Then, they should write a suitable commentary for the video clip. The video could be played again with the actual commentary playing, so that students can note any key terms or create a table with causes (human and physical) and effects of drought.

### Resources

[Droughts video](https://education.nationalgeographic.org/resource/droughts)

## 5. What is life like in The Sahel (Niger)

A way to get students thinking about the personal impacts that extreme weather can have is to position them in that context; making them imagine that the weather is their everyday reality and that they have to adapt to it.

Students should watch the video clip and study the climate data for Agadez, Niger. In pairs they should imagine that they are one of the following groups of people; farmer, local resident/villager, World Food Programme (WFP) consultant. They should each write a letter to the other describing what it is like to live/be in that place (see the bullet points below). The focus should be on the day-to-day and how they adapt to the weather conditions as well as description of any climatic hazards they face, the impacts on local people and the environment.

* What the weather is like on that day? (a day in April)
* What you have done that day?
* What it is like where you live?
* What climatic hazards do you and the community face?

As an extension task students can read the Guardian article students should then answer the following questions.

* What are the contrasting climate challenges that Niger faced in 2011 and 2012? Why has the increased rainfall not solved the crisis in The Sahel?
* What are the responses in the long term to drought in The Sahel?

### Resources

[Sahel drought video](https://www.youtube.com/watch?v=92bUMNz-mJE)

[Climate Agadez, Niger](https://www.worlddata.info/africa/niger/climate-agadez.php)

[The Guardian article](http://www.theguardian.com/global-development/poverty-matters/2012/sep/28/sahel-chronic-hunger-crisis-solutions)

## 6. How do plate tectonics shape our world?

This activity helps students to understand the different types of plate boundary that occur around the world. Whilst students do not need to be able to label and name every plate, it is useful for them to visualise the global pattern of tectonic plates and understand the way they are moving in relation to one another. This will help them to understand tectonic hazards they study later.

Use Learner Resource 3. A large copy of the world tectonic map (Map 2) should be displayed outside the classroom, or on a board facing away from the rest of the class. Students should work in groups of 3/4 and take it in turns to come and look at Map 2 for 30 seconds, trying to memorise as much as possible. They should go back to their group and recall what they saw. On a copy of the blank plate map (Map 1), the group should record everything they can remember. The student who has just been observing Map 2 is not allowed to write, they must just point and describe. There should be a fixed number of ‘views’ as decided by the teacher.

When the activity is complete, students could be encouraged to complete the questions in Learner Resource 3, where they identify constructive, destructive and conservative boundaries from their maps. At this point, Map 2 could be displayed to the whole class.

### Resources

Learner Resource 3 (Available on Teach Cambridge)

## 7. What happens where tectonic plates meet?

Students need to be able to differentiate between the different types of plate boundary, the processes that occur there and the hazards that they present. They are often given the opportunity to draw an annotated diagram in exams to demonstrate their understanding and so this activity combines the diagrams of each plate boundary with differentiated activities using key terminology.

At the most basic level students should name each type of plate boundary and use the blue words and phrases to label the diagram. Use Learner Resource 3 (a-c). and the 'Plate tectonics' link to show higher level skill students should add more detail using the green hexagons as labels and annotations. As a challenge exercise students could use the words and phrases to form the basis of a paragraph that explains what is happening at each plate boundary. They can arrange the hexagons in a logical order and fill in the gaps with connecting words and phrases.

Hexagons have been chosen for this activity because for the extension activity, they effectively tessellate and give students the opportunity to make links between the different words and phrases. There is no right way to do this and students should be encouraged to make less obvious connections if possible.

### Resources

Learner Resource 3a (Available on Teach Cambridge)

Learner Resource 3b (Available on Teach Cambridge)

Learner Resource 3c (Available on Teach Cambridge)

[Plate tectonics](http://www.discoveringgalapagos.org.uk/discover/geographical-processes/location-formation/plate-tectonics/)

## 8. How can tectonic movement be hazardous?

Students need to know causes, consequences of, and responses to a tectonic event, with as much place specific detail as possible. This activity can be used as an introduction to the case study of a tectonic event in a less developed country.

Use Learner Resource 4 (the image can be changed to suit the case study you wish to teach). The aim of this activity is to “hook” the students’ interest for a very up-to-date and relevant case study. Coming up with their own questions about an image should get students thinking about what they need to know for a good quality case study (a test of their knowledge and exam technique in itself). Some guidance may be given to encourage questions such as “what were the causes”, “why did this happen” or “how did people respond?”.

### Resources

Learner Resource 4 (Available on Teach Cambridge)

## 9. What were the responses to the Nepal earthquake?

It is important that students understand the responses to natural disasters on an international scale. This activity focuses on the UK’s immediate response to the Nepal earthquake (see Learner Resource 5 - part a) and how it tried to tackle social, economic and environmental issues.

The aim of this is to get students thinking about how the UK gives aid and assistance to countries that experience natural disasters, particularly in less developed places. Students should also be able to assess how sustainable the responses were; thinking about long-term impacts and whether or not the future generations in Nepal will feel the benefits of international intervention. The purpose of the task (see Learner Resource 5 - part b) is to help students categorise the responses and to get them thinking about sustainability as a social, economic and environmental concept. A Venn diagram might be appropriate here.

The extension activity can be used to challenge students who work at a faster pace or as a consolidation activity for the whole class.

### Resources

Learner Resource 5 (Available on Teach Cambridge)

## 10. What factors can affect the earthquake hazard?

This activity would be good following the study of earthquakes and a case study. Students need to be aware that not all earthquakes of the same magnitude have the same effects. Location is a key factor, as is technology, which has the potential to save lives in earthquake zones.

In this activity, adapted from *More Thinking Through Geography*\*, students consider what factors affect the hazard posed by earthquakes, and how they are linked. They are given a set of cards, which include factors such as ‘building design’ and ‘distance from epicentre’. Once they have explained how each factor affects how hazardous an earthquake might be, they can create a concept map. They should work in pairs through all of the activities in Learner Resource 6.

There is opportunity for students to make connections between the factors e.g. how the magnitude and distance from epicenter impacts how effective the building design and construction is.

\*Nichols, A. (ed.) (2001) *More Thinking Through Geography*. Cambridge: Chris Kington.

### Resources

Learner Resource 6 (Available on Teach Cambridge)

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