Session 2: Earthquakes

After a general introduction to natural hazards and disasters, this session moves on to look more specifically at earthquakes, with a focus on **tectonic** hazards.

The Nepal earthquake of April 2015 is used in activities to contextualize learning for students.

Some of the activities could be adapted to other natural hazards. This is a useful session for those teaching new GCSE and 'A' level specifications from September 2016, and who require a case study of an event of this kind.

Contents

Introductory activities (all ages)

1. Tectonic background
2. Earthquake introduction
3. An introduction to the role of the Red Cross in earthquake preparedness
4. A grab bag

Activities for Key Stages 3-5

KS3: Exploring the tectonic situation in Nepal
KS4: The Nepal earthquake – why did it happen where it did?
KS5: Earthquake prediction – is it possible?

Learning objectives

Young people are able to:

> Understand the physical geography behind a **specific** natural disaster. *The Nepal earthquake is the one used in exemplars but schools could select their own.*

> Appreciate that there are a range of factors influencing the impact that an earthquake has on communities.

> Begin to compare and contrast the impacts of hazards in different locations and the nature of the humanitarian response to them.

> Start to communicate those impacts in the short and long term and understand the role of the Red Cross within this.

Key questions

> Where do earthquakes happen, and why?

> What were the **causes** of the Nepal earthquake?

> How can people who live in areas prone to natural hazards prepare themselves for future events?

> Could the Nepal earthquake have been predicted?

Chitra Kumari Khatri, 75, sits on the ruins of her house in the city of Singati in Dolakha area, Nepal. The house collapsed during the earthquake in May 2015.

Introductory activities

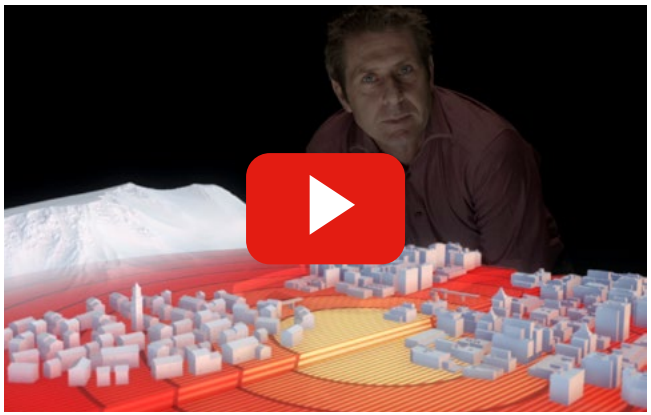
You will need:

> ***Access to YouTube to show a short NERC film and video from the British Red Cross.***

1. Tectonic background

The session starts with an exploration of the background to earthquakes.

Show a **short film** *(around 6 minutes long) made by* ***Professor Iain Stewart****, Director of the Sustainable Earth Institute at Plymouth University.*



This is a Natural Environment Research Council (NERC) film exploring the anatomy of an earthquake. It explores what happens when a seismic hazard deep beneath the Earth's surface meets a vulnerable population above.

As people around the world continue to flock towards urban centres such as Tokyo, Istanbul and San Francisco, how can they prepare for the looming threat of a direct seismic strike?

Discussion questions

> What are the reasons why the settlement shown is at risk?

> What is happening deep beneath the ground below the settlement?

> What happens when the fault line slips?

> How are the buildings on the surface affected?

> Why were different buildings affected differently?

> What factors influence the number of casualties?

> What might the short and long term impact be on people affected by the earthquake?

> How might we prepare our cities and communities against earthquakes for the future?

Discuss this comment: "Earthquakes don't kill people, buildings do…"

Suggested extension for KS5 students

Following a viewing of this video, KS5 pupils may want to investigate aspects of seismology further:

> How are the magnitudes of earthquakes measured?

> How do the different seismic waves travel through the earth?

> How are they shown on a seismometer trace?

Rescue operation at Kolache-2, following the earthquake.
Bhaktapur district, Nepal
April 2015

Photo © Sailendra Kharel/IFRC.

2. Earthquake introduction

The session starts with an exploration of the background to earthquakes.

Explain that you are going to be looking at the Nepal earthquake as a case study. Read out the text below which describes what happened when the earthquake struck.

On Saturday 25 April 2015, the streets of the Nepalese capital: Kathmandu were busy with residents and tourists meeting friends, selling their produce in the markets or preparing for lunch.

Traffic flowed along the streets into and out of the city, bustling with motorised and horse-drawn vehicles and bicycles.

In the villages further up and down the valley, farmers tended their crops, and the sun shone on stupas and temples.

A crowd of people started to climb the stairs up the famous Dharhara tower, a World Heritage site.

At 11:56 am everything changed. The earth started to shake as a magnitude 7.8 earthquake struck the Kathmandu Valley. It was the biggest earthquake in Nepal for over 80 years, since a large earthquake in 1934.

The epicentre of the quake was Barpak village, around 75 km north-west of Kathmandu in the Gorkha region.

The seismic focus lay at a depth of 10 km, close to the surface. The million-strong population of Kathmandu had their lives thrown into chaos, along with the residents of the many villages within a 100km radius of the quake.

3. An introduction to the role of the Red Cross in earthquake preparedness

The International Red Cross and Red Crescent Movement helps communities prepare for disasters all over the world.

Show students the **British Red Cross video** (6 minutes long). This was filmed in 2014 – one year before a major earthquake struck Nepal. The film shows the ways in which the Nepal Red Cross was supporting people to prepare for a major earthquake.

Encourage young people to reflect on the difference this preparedness work may have made in reducing the humanitarian impact of the 2015 earthquake.

In session 3 we will hear from a Red Cross volunteer who responded to the earthquake and learn more about the difference this work made.

Ask young people to discuss the preparations they might make if they lived in a disaster prone area. Ask them to make a plan of what they would need to do to protect themselves and their community.

4. A grab bag

Before starting the main activity, ask students to imagine that they are going to be visiting an area that is at risk of earthquakes.

For people living in, and visiting, earthquake prone countries it's a good idea to have an emergency bag that you can grab and take with you in the event of an earthquake.

Ask students: What would you pack in your grab bag if you lived in an earthquake-prone area?

Why not draw this bag, and add in some of the most important equipment that would be of use to you?

You could also pack a bag containing some of the items that you think might be useful and bring it in to school to show students.

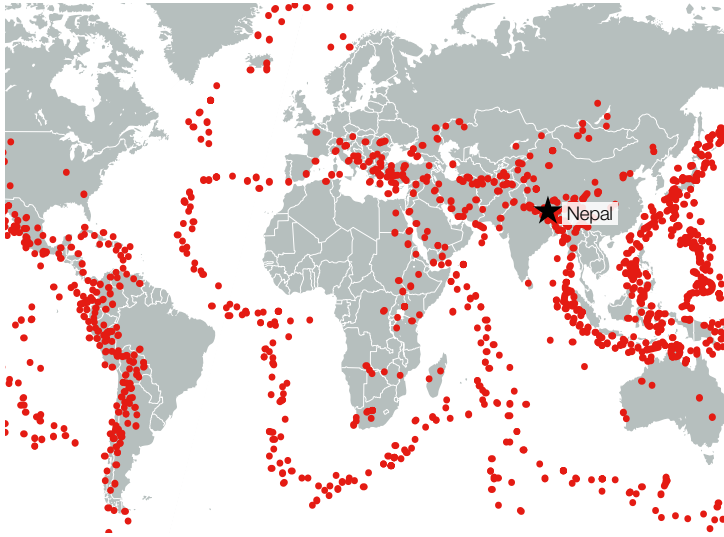
A member of the Village Disaster Protection Unit announces evacuation warnings during a simulation. Khammouane Province, Laos 2015

Photo © Bart Verweij/IFRC.

Activities for key stages 3-5

Students should now be asked to complete an age-appropriate activity from the following list.

NB: Elements of younger (or older) age group activities may still be used with particular age groups. Don't feel confined to the age bracket. You are welcome to adopt or adapt these ideas.



KS3: Exploring the tectonic situation in Nepal

In this activity: students will identify the earth's tectonic plates and discuss the reasons for earthquakes. They will also identify the impacts of the movement that occurs when an earthquake happens.

You will need:

> Nepal population with shake intensity map (PDF)
> Traffic camera questions sheet (PDF)
> Modified Mercalli Scale intensity sheet (PDF)

Introduce the context of this activity: investigating the reason for earthquakes in certain parts of the world.

Explain that what causes earthquakes has been known for some time, and we will explore it in this activity.

1. Background

Read the following statement to the class.
Every day, there are thousands of earthquakes that happen somewhere in the world, about fifty of which are significant enough to be noted by the National Earthquake Information Centre (NEIC) of the **United States Geological Survey (USGS) - http://earthquake.usgs.gov/**

The earth's crust is split into large pieces called plates, some of which are thousands of kilometres across.

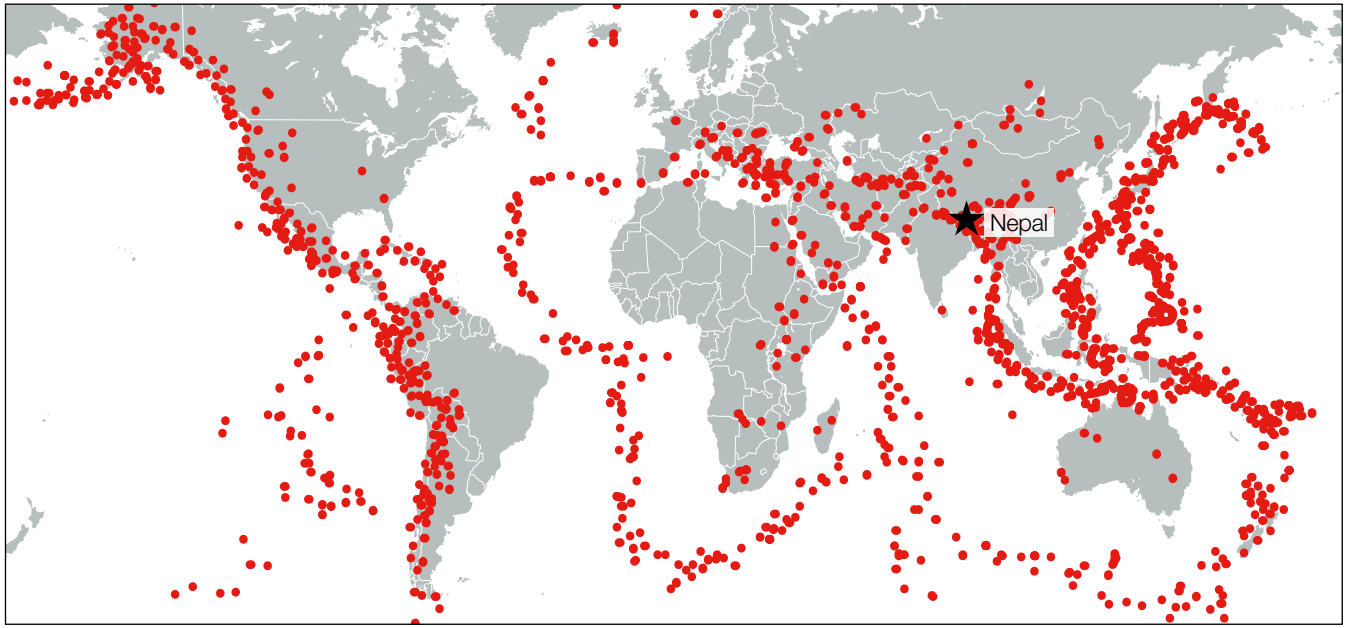
Some plates are mostly **continental**, and others are more **oceanic**. The boundaries between the plates are where the activity mostly happens.

The plates are slowly moving (usually this is described as the same rate that your fingernails grow – so quite slow) and the tension and pressure this creates builds up beneath the ground until it gives way, rock fractures and shock waves are released.

Depending on the area of rock that breaks apart, and the depth at which this happens, the shock waves result in more movements, whether vertical or side-to-side or both. The shock waves are sent out from **the focus** or hypocentre. The point on the surface immediately above the focus is called the **epicentre**.

The energy in these shock waves cause the ground to move in particular ways, and start to impact people and property on the surface. The nature of geology and surface materials can influence how severely the waves are felt.

If we were to plot earthquake locations over a reasonable period of time (perhaps a few weeks), we would see a good match between the lines along the boundaries between plates and where earthquakes happen.



Photos on page 48, top to bottom © Gianluca Fortunato/Italian Red Cross, © Emil Helotie/IFRC,© Japanese Red Cross, © Emil Helotie/IFRC.

2. Where do earthquakes occur?

Ask students to write a short description of where earthquakes occur and add an explanation of why there are found there.

Students could also be asked to mark recent earthquakes on a paper copy of a world map which has the tectonic plates marked on it.

Different groups could be asked to share information about one particular tectonic plate, and discuss which countries have been most affected by movement of that plate.

3. Mapping activity

If you have Google Earth installed on your computer, you can use the USGS's Google Earth files to visualise recent earthquakes to see how they fit into this pattern.

Click this link to go to the page, where you can download an Automatic Feed file, and then open it in Google Earth. **http://earthquake.usgs.gov/earthquakes/feed/v1.0/kml.php**

Of course, there is rarely just one earthquake in isolation. Small quakes will often occur either side of the main earthquake, and this is what happened with the Nepal earthquake.

There are similar impacts with other hazards: the main event is often not the only event that affects people.

You may want to share copies of the **Nepal population with shake intensity map (PDF)**, *which shows the affected population within earthquake intensity contours. We will look at this in more detail in session 3.*

4. Traffic camera

Show students a **short video** which was captured by a traffic camera, which was filming a street in Kathmandu when the 2015 earthquake happened.

Ask students to note down the hazards that they see as they watch the video. Pause after each minute of the video and discuss what you've seen and suggested as hazards.

Students can enter the impacts that they have noted on the **Traffic camera question sheet (PDF)**

Students may also be issued with a copy of the **Modified Mercalli scale intensity sheet (PDF)** *to help them identify / estimate the level of shaking at this location.*

Once students have filled out the worksheets, they can discuss:

> What were the main hazards they noted?

> How might the people shown in the video have felt?

> What might have been going through their minds as the ground started moving?

> What do people do to make themselves more safe?

5. Extension: compare and contrast

Earthquakes are not all the same, and even two earthquakes of a similar size can have very different effects.

The Red Cross was active following earthquakes in Haiti in 2010 and Nepal in 2015.

What do young people know about these two earthquakes?

Encourage them to investigate more about the two events including how different the impacts were and some of the reasons for these differences.

Two visual resources about the Red Cross response to the earthquakes in Haiti and Nepal may help students with their research:

> Haiti – the big picture

> Nepal storify

Haiti and Nepal

> Discuss the events, what happened, what was the scale, where were they?

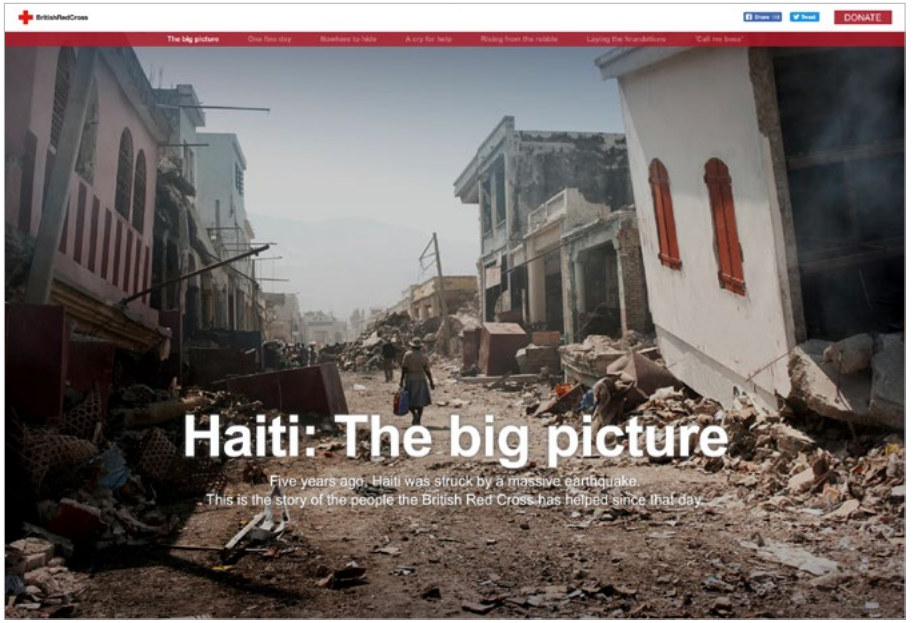
> What was similar or different about the two events?

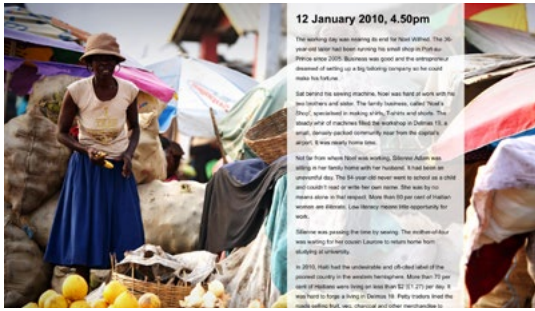
> Discuss the impact on people, how were individuals and communities affected in each case?

> What were some of the short and longer term impacts?

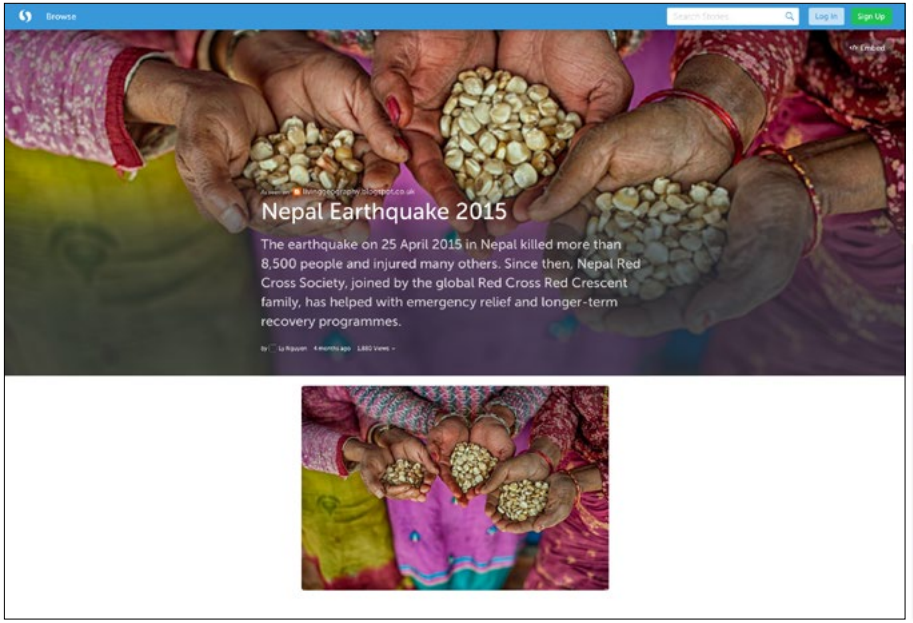
> What support did the Red Cross give in each case? What was their role?

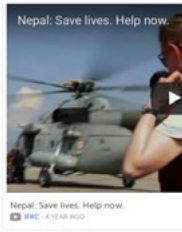
Students could create two mind maps or tables to compare and contrast the two events.





Haiti – the big picture





Nepal storify

KS4: The Nepal earthquake – why did it happen where it did?

In this activity: students will investigate the causes of the Nepal earthquake and start to explore the humanitarian response to the disaster.

You will need:

> Nepal factsheet (PDF)
> Nepal earthquake factsheet (PDF)
> Explaining the earthquake answer sheet (PDF)
> 'What's in a name' worksheet (PDF)

Hand out copies of the factsheets that have been produced for the resource: Nepal factsheet (PDF) *and* Nepal earthquake factsheet (PDF).

1. One week in: the Nepal earthquake video

A week on from the earthquake, **Professor Iain Stewart**, Director of the Sustainable Earth Institute at Plymouth University, produced a short video exploring what was known about the earthquake at that stage, and the unfolding impact it was having in Nepal.

Professor Stewart is well known from a number of BBC series on the "power of the planet", and the forces that shape it. He works in the area of communicating geosciences, and has a good understanding of the interaction between natural disasters and people.

NB: the video is 17 minutes in full but just showing the first five minutes will help develop young people's understanding around the Nepal earthquake.

It may be possible to show the video to the whole class, but it would be preferable to have a computer room, or tablets with headphones so that students could look through this at their own pace.

Encourage students to pause as required and replay certain sections – the whole video lasts for 17'36" so requires some concentration.

After watching the video, students should be able to explain why Nepal is prone to earthquakes, and the names of the particular plates involved.

Encourage them to complete print copies of the Explaining the earthquake answer sheet (PDF) *to record their responses to the video.*

Key question

What was it about the location and intensity of the Nepal earthquake that meant the humanitarian impact, in terms of people killed, injured and displaced from their homes, was so significant?

It may also be possible to set this as a homework task, and students could come back and discuss what they have found in the following lesson.

2 . The Red Cross' global response to the Nepal earthquakes

Show students the Nepal earthquake appeal: The Red Cross' global response video.

This video draws attention to the severity of the situation in Nepal after a secondary 7.3 magnitude earthquake hit just weeks after a 7.8 magnitude earthquake.

Regions already struggling to cope with the initial impact were hit hard by the second quake. It shows how the power of the International Red Cross and Red Crescent Movement was mobilised to support the Nepal Red Cross with provision of emergency medical assistance, first aid, shelter, clean water and search and rescue operations.

Discussion questions

> What were the impacts of the earthquakes on survivors and how did the Red Cross act to get help to those who most needed it?

> When was the Nepal Red Cross able to start helping people after the disaster?

> What images and phrases stand out in the video and show the humanitarian impact of this natural disaster?

Supporting resources:

*A **Pinterest** board of relevant images has been provided for your assistance with this activity (and others) and can be viewed following this link:* **https://uk.pinterest.com/geoblogs/natural-disasters-earthquakes/**

Teachers may find it helpful to make some of these available for students to refer to.

> Article by Andrew Revkin referred to in the article: **http://dotearth.blogs.nytimes.com/2015/04/29/dire-prospects-seen-when-the-full-nepal-earthquake-death-toll-is-tallied/?_r=1**

> Earthquakes without Frontiers organisation: **http://ewf.nerc.ac.uk/**

> David Petley's Landslide blog: **http://blogs.agu.org/landslideblog/** (particularly helpful for KS5 students)

> Short 16" animation showing the creation of the Himalayas: **http://www.tectonics.caltech.edu/outreach/animations/himalayas_small.html**

> Detailed information on the earthquake: **https://www.youtube.com/watch?v=jfwhatz12Uk**

You may also note that there are lots of acronyms in this resource. These relate to organisations involved in supporting people after hazard events.

If students are finding that there are too many of these to remember, you could hand them a copy of the **'What's in a name' sheet (PDF)** *to keep track of them.*

Nepalese Red Cross Voluntaries help unload a shipment of canned food.
Kathmandu, Nepal
May 2015

Photo © Palani Mohan/IFRC.

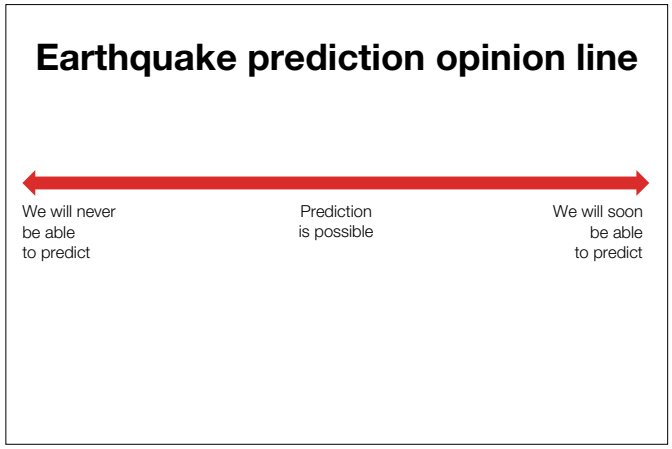
KS5: Earthquake prediction – is it possible?

In this activity: students will consider the possibility of earthquake prediction in the future. They will also discuss the advice given to people living in earthquake prone areas and whether this could be improved.

KS5 students could start their activity by watching the **video** used in the KS4 resource.

You will need:

> Earthquake prediction opinion line (PPT)



1. Earthquake prediction opinion line

"There is as yet no reliable way of predicting in the short term (days to weeks or months) when an earthquake of a given size will occur in a specific location"
European Geosciences Union

Every day, we can access several **weather forecasts** from various agencies, including the Met Office. Computer models predict what the weather is likely to do for the next few hours, based on wind directions, temperature readings and satellite pictures. The atmosphere is very complex, but the forecasts are reasonably accurate. Unfortunately, predicting earthquakes is not as easy. It is the ultimate goal of seismologists, as it could result in the saving of many thousands of lives, and would also ensure that humanitarian agencies could prepare and target their response more effectively.

Ask students to add their opinions onto the Earthquake prediction opinion line (PPT)

Where would they place themselves with regards to the statements?

Discuss the factors which influence their decision.

2. Flipboard magazine

Students should be given access to a tablet or computer which has access to the Flipboard app or website. **Flipboard** allows students to collect materials from a range of websites and insert it into a 'magazine' which can be flipped through and read on the screen.

Students will need to login to an account, which could be provided for them in advance.

Question: What would be your advice for those living in an earthquake prone area?

Task: Produce a Flipboard magazine of relevant articles to refer to for those living in earthquake prone areas. The magazine should include details on the steps that can be taken to prepare for an earthquake. It should include advice from humanitarian organisations, who are involved in this mitigation activity.

Students may also choose to include information about early warning signs and precursors in their magazine.

Supporting information: There are some signs which people may notice just before an earthquake, but these may offer at best a few seconds warning. Volcanoes are more helpful in providing signs that an eruption is imminent, and many volcanoes have an array of sensors installed on them for this purpose.

There have also been many reports of unusual behaviour by animals and birds in advance of earthquakes. These warnings are called **precursors**.

Some suggested indications that an earthquake might be imminent include:

> **Foreshocks:** Earthquakes don't usually act alone. They work in clusters as the rock below the ground starts to give way under the strain of pressures built up by plate movement. The main shock is the largest tremor, but it may be accompanied by dozens of a similar size, and these may carry on as aftershocks. Until the sequence is over, there is no way to tell which quake is the big one. If you are shaken by a small quake, should you assume a bigger one is on its way?

> **Radon gas emissions:** this has been noted by some scientists, but is not always connected with tremors.

> **Changes in levels of groundwater:** pressures placed on rocks may affect the flow of phreatic water (water stored in the saturated area below the water table).

> **Animal behaviour:** there have been lots of reports, going back centuries of animals leaving an area, but this could be anecdotal, and wouldn't be enough to base a prediction on.

Considerations

A major issue with prediction is that of public confidence in the warnings.

Evacuating an area would be a massive upheaval, possibly result in other deaths in the process, and may leave areas open to looting and criminal activity.

Any 'false alarm' is likely to mean that future warnings go unheeded: the very ones that may be the most dangerous events.

This was not helped by a famous case involved an earthquake in Italy, where scientists had failed to predict an earthquake in 2009, and were initially convicted of manslaughter. They had been accused of providing "approximate, generic and ineffective" advice about whether small tremors in the area in the weeks prior to the 6.3-magnitude quake should have alerted them to the probability of a major seismic event. However, as we have explored, the connections are not definite, and the scientists were eventually acquitted.

3. Risk mapping and earthquake prediction

One strategy to reduce the impact of earthquakes is to carefully map the route of faults and ensure that buildings are not placed directly on them.

These earthquake risk maps are an important part of current thinking about earthquake preparation.

Ask young people to research:

> Were risk maps prepared for Nepal?

> Are they being prepared for vulnerable cities in places like Japan and the USA?

> How would these risk maps be helpful to aid agencies both before and after a hazard event? Ask students to consider how they would influence the position of storage depots, schools and medical facilities for example.

4. Conclusion

To conclude, ask students: How might more precise prediction of earthquakes change the nature of the work of humanitarian organisations like the Red Cross?

Encourage them to consider the impact better prediction might have on disaster preparedness, response and recovery activities. Prompt them to also think about the potential impact reduction in terms of the numbers of people affected and the ways in which they might be affected.

A Philippine National Red Cross volunteer with a hazard map in a village near the town of Roxas. Hazard mapping, using everything from the latest global positioning system technology to lengths of string, is a key part of disaster risk reduction in the Philippines. Palawan island, Philippines

Final written task

Research and write an answer to one of the following 'A' level style questions:

Assess the reasons why earthquakes are so difficult to predict, and discuss how more accurate predictions might reduce the impact of such events? (15 marks)

"If we could predict earthquakes with any certainty, they would stop being a hazard". Discuss this statement, with reference to current hazard management methods. (15 marks)

Students should make sure that they include material from this British Red Cross resource: **http://www.redcross.org.uk/What-we-do/Preparing-for-disasters**

They should also refer to earthquake risk mapping, and the work of mapping agencies.

5. Extension activities

One additional extension activity would be for teachers or older students to create an account for **Pinterest** and start to curate their own collection of images during the completion of the activities in this resource.

Once students have completed all the activities in this session ask them to review the position of their opinions on the **Earthquake prediction opinion line (PPT)**. Has their position changed as a result of what they have learned?

This village near the mountainous epicentre of the Nepal earthquakes was almost completely destroyed. Of the 200 houses, hardly any walls were left standing.
Sathi Ghar, Kavre province, Nepal
April 2015

Supporting resources for Session 2

Nepal Red Cross Society

International Federation of Red Cross and Red Crescent Societies

Nepal population density with shake contours (intensity) for 7.8M earthquake

Population within each intensity zone

4	2,177,458	6.5	1,275,719
4.5	2,701,526	7	1,075,368
5	4,163,767	7.5	575,729
5.5	6,170,681	8	522,785
6	1,368,021	8.5	513,545

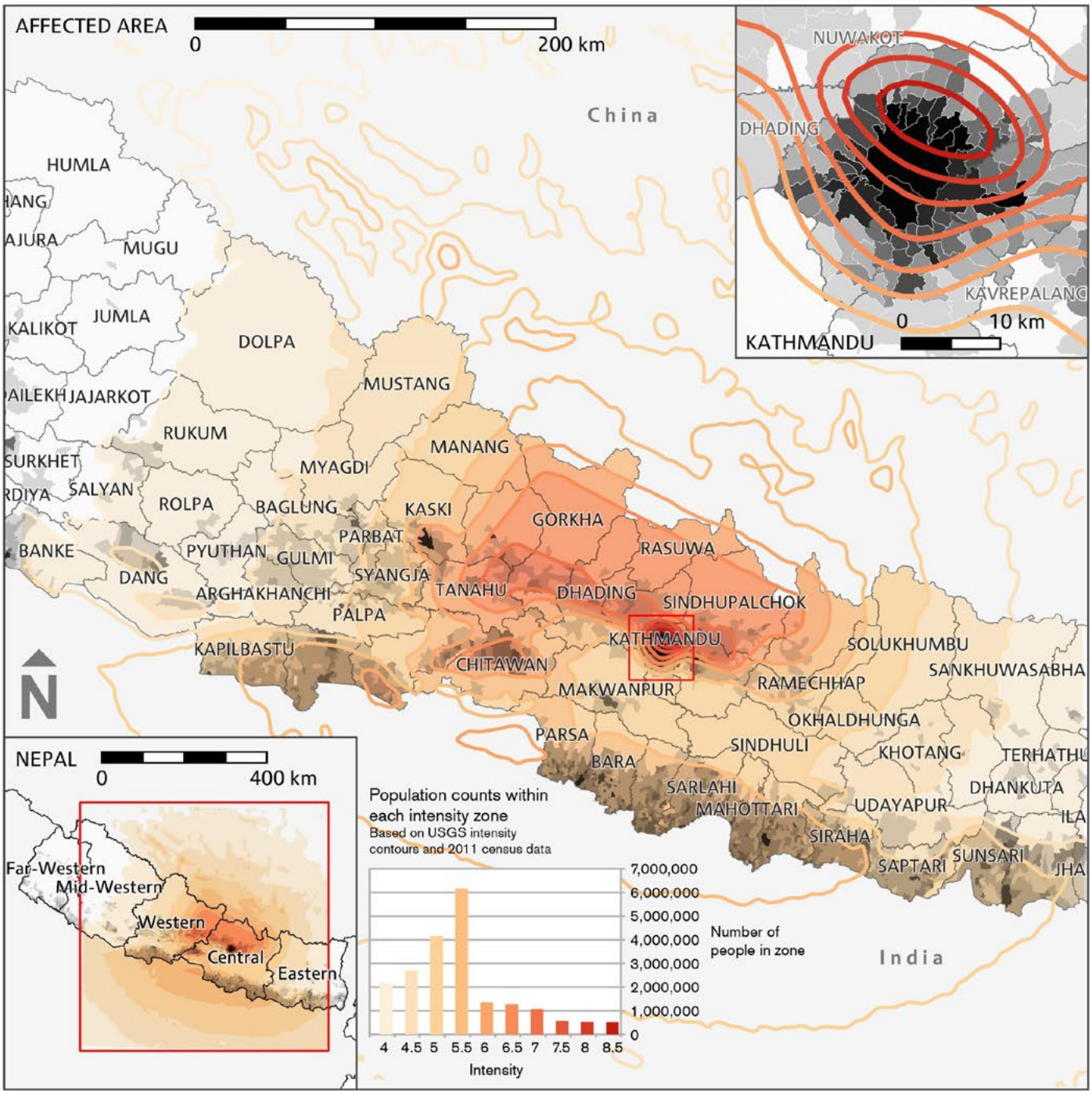
Population density (people per km²)

0 - 213	1,267 - 2,057
213 - 475	2,057 - 3,504
475 - 819	3,504 - 7,473
819 - 1,267	7,473 - 23,053

Data from WFP, USGS, GADM
27 April 2015

Produced by SIMS supported by the American Red Cross and the British Red Cross

The maps used do not imply the expression of any opinion on the part of the International Federation of Red Cross and Red Crescent Societies or National Societies concerning the legal status of a territory or of its authorities.



< Back to activity

Traffic camera questions sheet

Watch the traffic camera video, and answer the questions below:

Timing	Hazards	How do people act/react to the hazards?
0.00 -1’00”	The traffic is quite busy.	Most people seem to be driving appropriately.
1’00”-2’00”		
2’00”- 3’00”		
3’00”- 4’00”		

Use the ***Modified Mercalli Intensity sheet*** to estimate the level of shaking that you can see during the video.

< Back to activity

Modified Mercalli Scale Intensity

After Wood and Neumann

Level	Degree of shaking	Description / exemplification
I	Not felt - instrumental	Only felt by a very few people under very favourable conditions.
II	Weak	Only felt by a few people, perhaps on the upper flood of buildings, and if sat down or in bed.
III		Starts to be felt noticeably indoors, especially on upper floors, but may not be recognised as an earthquake. Cars may rock slightly. Feels like a passing truck vibrating the windows etc.
IV	Light	Felt indoors by many, and outdoors by a few people. May awaken some if sleeping. Dishes and doors shaken. Sensation of vehicles striking building. Parked cars rock more obviously.
V	Moderate	Felt by nearly everyone, and most awakened if at night. Loose objects will fall to the floor, and windows may break. Unstable objects will fall or overturn.
VI	Strong	Felt by all and starts to create fear or panic. Heavy furniture moved from its position, and plaster may fall. Some slight damage to buildings.
VII	Very strong	Damage will vary depending on the quality of construction of buildings. Considerable damage in poorly built structures, with some minor collapses.
VIII	Severe	Damage slight in well built buildings, but partial or full collapse of those built less well. Partial collapse of substantial buildings. Chimneys fall and columns and monuments damaged. Walls collapse and heavy furniture thrown around the room.
IX	Violent	Considerable damage, even in well built structures. Frame structures will be thrown out of shape. Buildings may be shifted off foundations. Major collapses, blocking infrastructure.
X	Extreme	Most masonry and wood frame buildings destroyed, along with their foundations. Train tracks bent.
XI		Few structures remain standing. Bridges destroyed and fissures open up in the ground, which means underground pipelines are fractured. Slumps and land slips on slopes. Train tracks bent considerably.
XII		Damage is total and few buildings remain standing. Ground moves in waves, which are visible on the surface. Lines of sight distorted, and objects such as vehicles may be thrown up into the air.

< Back to activity

Nepal factsheet

Name: Federal Democratic Republic of Nepal

Population: 31.3 million (estimate 2015)

Birth rate: 20.64/1000

Death Rate: 6.56/1000

Area: 147 000 square kilometres

Bordering: China and India

Landlocked

Major cities: Kathmandu (capital, with a population of around 1.2 million)

Geography: Mountainous, with a mean elevation of 2565m, and with its highest point taking in Mount Everest at 8850m. Contains 8 of the world's 10 highest peaks.

Time difference: 5 hours and 45 minutes ahead of GMT

Economy: Amongst the poorest and least developed countries in the world, with about a quarter of its population living below the poverty line.

Climate: Variable, with cool summers and severe winters in the north, which changes to warmer summers and milder winters further south. Variable with altitude.

Natural resources: Water, timber, hydro-electric power, tourism due to scenic beauty, a few deposits of minerals.

Main land uses: agriculture (29%) and forest (25%).

Hazards: severe thunderstorms, flooding, landslides, drought, monsoon rains, earthquakes

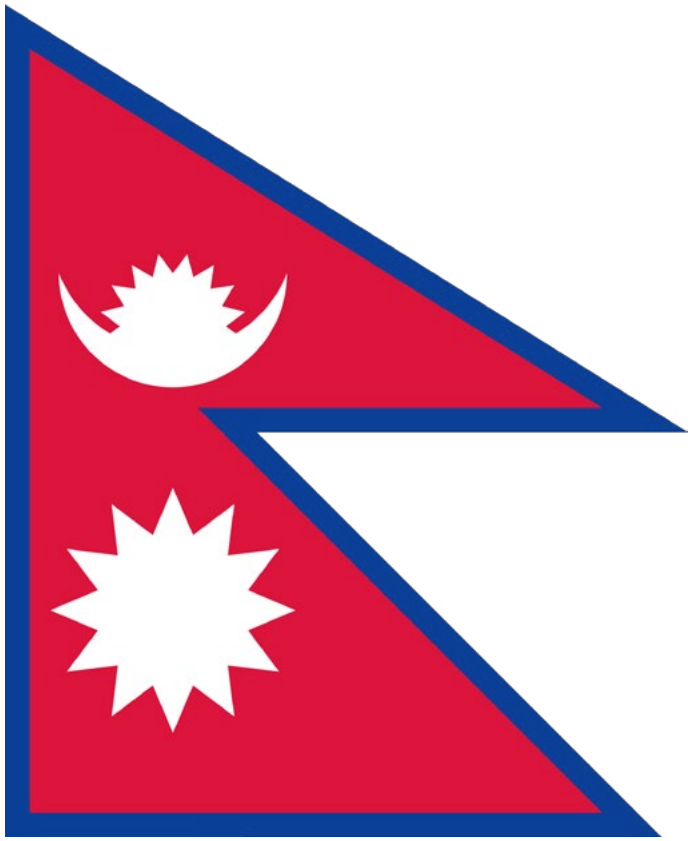
Majority religion: Hindu (81%), Buddhist (9%)

Internet users: around 12% of the population

Source: CIA World Factbook, Collins Longman World Atlas

< Back to Session 1 activity < Back to Session 2 activity


Nepal
Kathmandu



Nepal earthquake factsheet

Date: 25th April 2015

Time: 11.56am local time

Magnitude: 7.8

Location

> The earthquake occurred in the **Gorkha** district of **Nepal** near the village of Barpak, which was destroyed by the earthquake as it was the closest settlement to the epicentre.

> Lat: 28.147N 85.708E

> The ground moved by up to 3m in the area close to the epicentre.

> There were over 100 aftershocks with a magnitude greater than 4

> A second earthquake with 7.3 magnitude struck on 12 May 2015, just two weeks after the initial quake.

People affected

> 8,856 people killed.

> 22,309 people injured.

> 5.6 million people affected.

Damage to buildings and infrastructure

> Famous buildings and temples destroyed, including buildings in Durbar Square such as the Dharhara tower: a World Heritage site.

> Over 600 000 homes destroyed and over 285,000 damaged.

> Over 30,000 classrooms destroyed or damaged.

> Many health care facilities outside major cities were unable to operate.

> Extensive damage to infrastructure including transport, energy and utilities.

> A major avalanche triggered on Mount Everest, which hit the base camp.

Response

> The Nepal Red Cross responded immediately to disaster taking part in search and rescue and first aid activities as well as distributing temporary shelter and essential items to people who had been displaced from their homes.

> Emergency appeal launched immediately and had an immediate international response with many countries offering some sort of support or aid.

Economic cost

> Estimated to be around $7 billion, and rebuilding could cost a similar amount.

< Back to activity

Explaining the Nepal earthquake – answer sheet

A week on from the earthquake, Professor Iain Stewart, Director of the Sustainable Earth Institute at Plymouth University, produced a video exploring what was known about the earthquake at that stage, and the unfolding impact it was having in Nepal. Professor Stewart is well known from a number of BBC series on the power of the planet, and the forces that shape it. He works in the area of communicating geosciences, and has a good understanding of the interaction between natural disasters and people.

Watch the video here: **https://www.youtube.com/watch?v=rfJ7WEmUX1s**

Pause and replay certain sections as required – the whole video lasts for around 17 minutes.

1. Why does Nepal experience earthquakes?
Describe, and then start to explain the tectonic situation in the region

2. Draw a diagram here to represent the tectonic situation
(you may need to do a little more research on this area) – make it as complex as you can

3. Why are earthquakes strong in this part of the world?

4. What are the recent earthquakes in the region?
Use the *USGS Earthquake Finder* to explore this: http://earthquake.usgs.gov/

Date	Strength	Notes

5. How did the Kathmandu area move as a result of the earthquake, and what was the result of this movement?

6. Which areas suffered the most casualties as a result of the earthquake – explain the reasons for these casualties?

7. What were the implications of the fact that visiting tourists were caught up in the earthquake?

8. Why are early casualty forecasts usually much smaller than the later figures?

9. Why was the shaking not the strongest at the epicentre of the earthquake?

10. How did the construction of the buildings in places like Kathmandu affect the casualty rates? What work is done by humanitarian agencies to promote appropriate preparations by residents of vulnerable places?

11. What is Professor Iain Stewart able to interpret from the video footage and images that he looks at?

What additional sources could Professor Stewart have referred to?

How could humanitarian agencies such as the British Red Cross use the analysis in this resource to assist their work?

What extra question would you like to ask Professor Stewart if you had the chance?

< Back to activity

What's in a name?

There are lots of acronyms that students may encounter during this unit of work. You may want them to note them down as they come across them, and provide an explanation of what they mean.

Acronym	Meaning – and further information

< Back to activity

Earthquake prediction opinion line

We will never be able to predict

Prediction is possible

We will soon be able to predict

Download full PPT here

< Back to activity