

The Challenge of Natural Hazards



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Natural hazards are extreme natural events that can cause loss of life, extreme damage to property, and disrupt human activities.

Natural hazards can be placed into two categories:

- **Tectonic hazards** occur when the Earth's crust moves e.g. earthquakes
- **Weather hazards** occur when a region has certain weather conditions e.g. hurricanes

People living in poverty are more vulnerable to the effects of natural hazards for many reasons. They're often forced to live in makeshift homes, on land prone to flooding, storms and landslides. Making a living is hard - few have home or business insurances, or savings to fall back on in an emergency. And when a disaster strikes, poor diet and being far removed from the nearest healthcare facilities means that diseases spread rapidly.

In the countries where UWS works, natural hazards are a constant challenge. Nepal is affected tremendously by earthquakes, none less so than the 2015 earthquake which was the worst earthquake to have struck Nepal since 1934. Additionally, Myanmar is set to become one of the five countries in the world most negatively impacted by climate change. Droughts, floods and tropical storms are becoming increasingly frequent, while the growing seasons for crops are more and more unpredictable. The people who have contributed least to the climate emergency are suffering most.

How to use the learning pack

These activity ideas and resources are designed to support learners aged 11-16 to learn and think about the challenges faced by those affected by natural hazards.

The case studies provided can also support GCSE Geography learners to fulfill compulsory elements of the specification.

In this pack learners will:

- Consider **factors that influence the impact** of natural hazards.
- Understand how seismic design and education can **reduce earthquake risks**.
- Use **real-life stories** to learn how communities in Nepal and Myanmar are affected by natural hazards.
- **Play a vulnerability game** to understand that climate change disproportionately impacts different people and communities.

Tectonic Hazards:

Earthquakes in Nepal

On April 25, 2015, at 11:56 AM local time, a **7.8 magnitude earthquake** struck **82 km northwest of Kathmandu**, Nepal's capital. This was followed by **480 aftershocks**, the largest being a **7.3 magnitude quake on May 12**. Thousands of lives were lost, and infrastructure, including over **32,000 classrooms**, was severely damaged. With the epicenter near **Sankhuwasabha**, a region where UWS operates, UWS's support became crucial.

2015 Earthquake Fact File

Nepal is situated along the Main Himalayan Thrust (MHT) arc, where the Indian plate underthrusts the Eurasian plate towards the north-northeast at a rate of 45 mm/year. This is a **destructive plate boundary**. The boundary region between these two plates has a history of large and great earthquakes, making it one of the most seismically hazardous regions in the world.

Economic Impacts	Social Impacts	Environmental Impacts
<ul style="list-style-type: none">• 500,000 buildings collapsed• 32,145 classrooms destroyed• 446 public health facilities fully damaged (and additional 765 partially damaged)• 14 HEP stations were damaged, causing 25% loss of electricity capacity• Damage and loss of over \$7billion and needs of \$6.9billion, over half of Nepal's US\$20billion GDP (GFDRR, 2017)	<ul style="list-style-type: none">• 8790 deaths• 55% of the dead were woman• 22,300 injuries• 2.8 million displaced• 1.4 million in need of food and assistance	<ul style="list-style-type: none">• ~3600 landslides and avalanches• Avalanche on the south slopes of Mt Everest• Langtang region (in central Nepal) devastated by a 2-3km wide avalanche (killed 300 people)• 1000s people evacuated due to the threat of flash flooding.• Landslide debris created a dam on the Kali Gandaki river.• All homes 1km upstream were flooded.

What factors affect the impact of an earthquake? How can vulnerability to this hazard be reduced?

Why might an earthquake do more damage at 8am or lunchtime, than at 11pm?

Why do people continue to live in areas at risk of tectonic hazard?

Importantly, seismologists know of massive, accumulated strain in the fault zone. It is estimated that the 2015 earthquake released only **4-5% of stored energy**, meaning that energy still remains within the fault zone. **Another major earthquake or a series of earthquakes, greater than magnitude 8.0 is predicted.** This places even greater importance on **building back better...**

Build Back Better - UWS Nepal Schools

Moving forward from the 2015 event, it is vital to heighten resilience to the earthquake hazard in this region.

Specifically, there is the need for the strengthening of existing, and new, priority structures and lifeline structures such as hospitals and schools, which can provide temporary shelter in an earthquake event. Heightening community preparedness to an earthquake event and its associated secondary hazards, such as flooding and landslides, is also critical to minimise fatalities in future events.

Earthquakes don't kill people... but buildings do!

In Nepal, UWS schools are constructed using locally-sourced concrete and iron and contain a clean water well, handwashing facilities and latrines, and a teachers house.



Children lining up in front of a UWS School in Sankhuwasabha, Nepal

UWS schools encompass seismic design, in line with Nepal's National Building Code

UWS Nepal school buildings consist of reinforced concrete (RC) frames and bricked walls. Reinforcing concrete with steel rods strengthens the building, as well as making it slightly flexible and able to sway during earth movements. The classrooms are placed linearly, and the U-layout is adopted whenever possible. UWS Nepal's design ensures an earthquake resistant permanent structure. It also includes enough openings to allow for proper ventilation and well-lit classrooms. The roofs are made from corrugated iron, designed to withstand heavy monsoon rains. Since landslides are a common occurrence in some communities, caused by either heavy rain or earthquakes, UWS has also built land protection structures like retaining and gabion walls in some schools to minimize the risk of landslide.



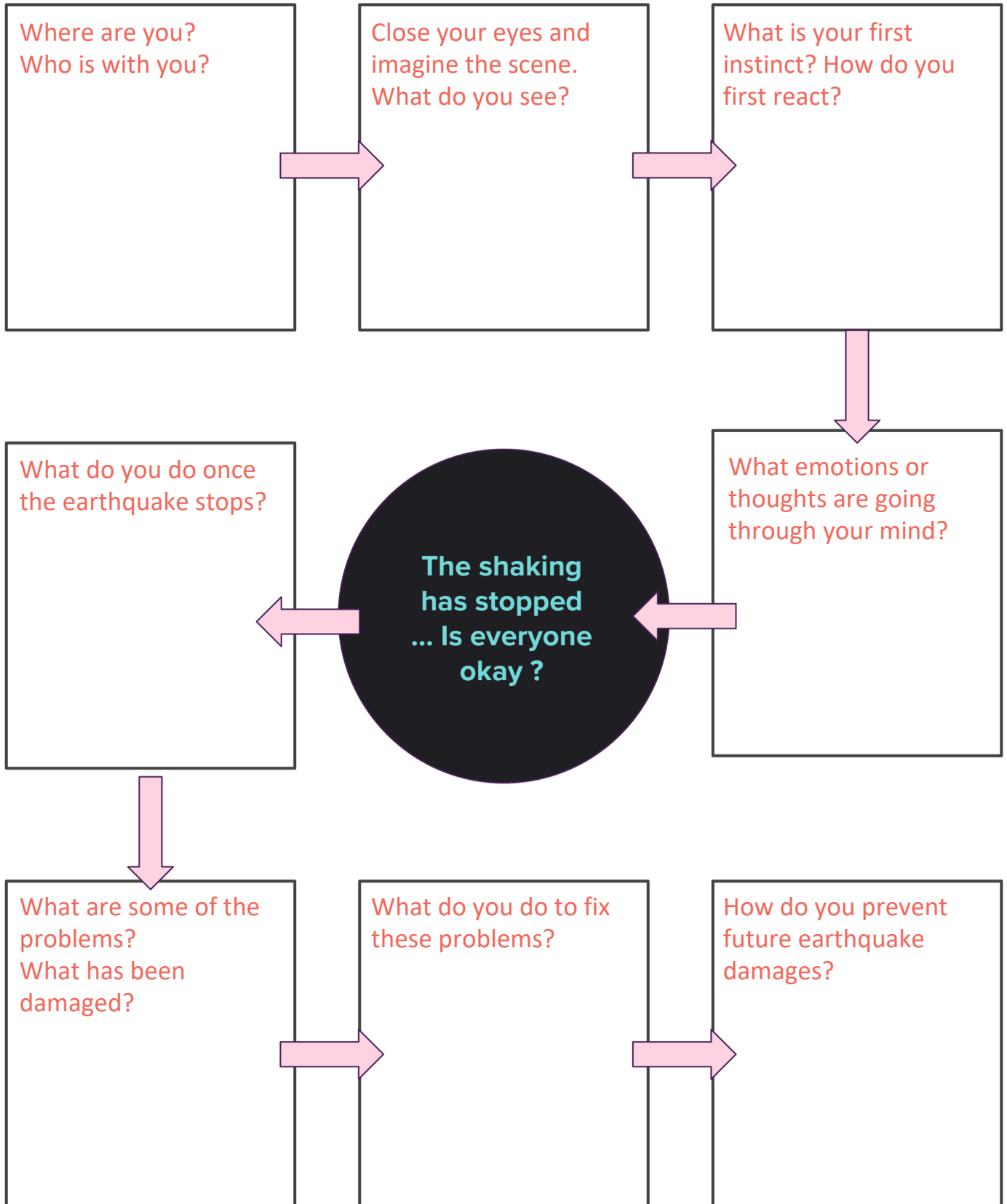
Duck...Cover...Hold!

In earthquake-prone countries, hospitals, emergency services and schools practise for an earthquake. They have drills so that people know what to do in the event of an earthquake. This helps to reduce the human impact.

Design an Earthquake Resistant Village:

Learners will consider ways to protect against earthquakes in low-income countries, through annotating their buildings and explaining its design features. Learners will need to carry out research into exactly what sort of features the different types of buildings in the village will need - don't forget about the secondary hazards as well as the primary event. Learners should design earthquake education posters for the village school detailing how UWS students should respond during an earthquake.

It's An Earthquake....



Adapted from Southern California Earthquake Center (ND) ShakeOut Curriculum.

Natural Hazard Stories:

Learners will use case studies to investigate how communities in Nepal are being affected by earthquakes. Using the prompts above, Learners could create a short story, newspaper article, diary entry, cartoon strip or poem to describe the feelings and opinions of a person affected by natural hazards. Learners could make a display board of their creative writing and/or give an assembly to share their work.

Weather Hazards:

Tropical Storms in Myanmar

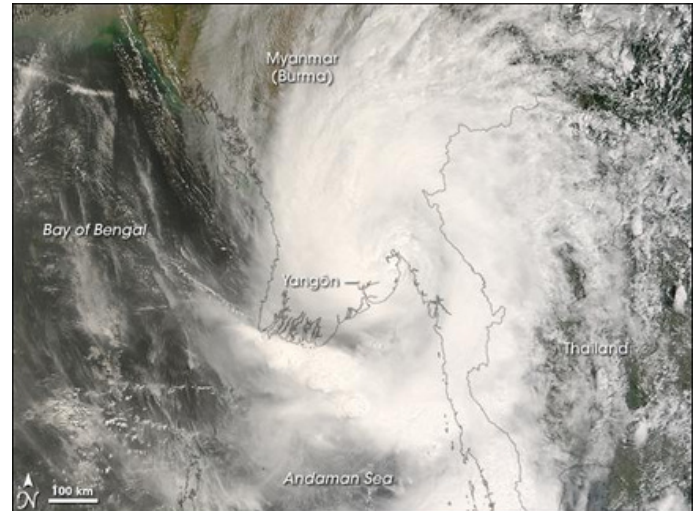
The strongest tropical storms are called hurricanes, typhoons or tropical cyclones. These different names all mean the same thing but are used in different parts of the world.

- Hurricane (Americas)
- Typhoon (Western Pacific)
- Cyclone (Indian Ocean)

A hurricane is an intense tropical weather system with a well defined circulation and maximum sustained winds of 119km/hour or higher.

Cyclone Nargis (2008)

As a country prone to heavy rainfall, floods occur regularly in Myanmar during the mid-monsoon period (June to August) in areas crossed by rivers or large streams. The country is also prone to cyclones, such as Cyclone Nargis in 2008. Cyclone Nargis made landfall in Myanmar on 2nd May 2008. The area hit was the low-lying Ayeyarwady delta region to the south of the country. With strong winds of up to 210km/hour and a 4 metre high storm surge, Nargis was classified as a **Category 4 cyclone** on the Saffir-Simpson scale. Cyclone Nargis was one of the deadliest cyclones to hit Asia in recent history and the worst natural disaster in the history of Myanmar.



This satellite view of the storm was acquired by the Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite.

Economic Impacts	Social Impacts	Environmental Impacts
<ul style="list-style-type: none"> • Many fishing vessels were sunk and fishing infrastructure was damaged. • A high proportion of people are dependent on fisheries activities for income and food security. • 1.75 million hectares of rice producing land was inundated with salt water. This represented 30% of total wet season rice area in the country. 	<ul style="list-style-type: none"> • Estimated 140,000 people died, many children were left orphaned • Diseases spread with many subsistence and income survivors dying from disease • 800,000 displaced from their homes. • 2.4 million people were in need of emergency food, housing and other forms of critical assistance 	<ul style="list-style-type: none"> • 41,514 acres of natural mangrove forest was affected. Mangroves are an important source of for local communities. <div data-bbox="1066 1711 1517 1924" style="background-color: #e67e22; color: white; padding: 10px; margin-top: 10px;"> <p>How does the destruction of mangroves also make the population more vulnerable to future storms?</p> </div>

Discussion: There's no such thing as a natural disaster? Learners first read [Neil Smith's \(2006\) article reflecting on Hurricane Katrina](#). Learners then conduct their own research in to preparedness to cyclones in Myanmar, and the short and long term response to Cyclone Nargis, before discussing with the class.

Climate Change in Myanmar

Evidence has shown that Earth's temperature is rising due to an increase in greenhouse gases. This has created, and will continue to create, a number of negative effects

“Myanmar is set to become one of the five countries in the world most negatively impacted by climate change.

By the mid-2000s, the monsoons, whose regularity set the seasons and are critical for farming, were becoming unpredictable. Tens if not hundreds of thousands of people from the arid middle of the country, where a few monsoon storms at the right time each year are essential for a good crop, were already leaving because of repeated drought, in search of jobs in the cities or in Thailand. In 2015, extreme rain and the long-term effects of deforestation combined to produce epic floods... Other extreme climate events, like Cyclone Nargis, will without question become more common... And if current predictions are even close to accurate, rising sea levels will submerge most of the coastline, including parts of Rangoon, within a generation”.

(Thant Myint-U, 2019:203)



Village in Eastern Shan, Myanmar

However. even within Myanmar, climate change doesn't affect everyone equally...

Climate Change Vulnerability Game

Game adapted from Oxfam GB (ND) *Stories of Climate Change*.

Aim: To understand that not everyone is affected by climate change in the same way, and that it is often the poorest communities who are most negatively impacted by the climate crisis, despite contributing the least to it.

Explain that learners are going to play a game to explore what factors make some people more vulnerable than others. Discuss with learners what being vulnerable means: Vulnerability is a measure of the extent to which a community, structure, service or geographical area is likely to be damaged or disrupted, on account of its nature or location, by the impact of a particular disaster hazard (OECD, 1997)

Organise learners into pairs or groups of three and ask them to line up at one end of the room in their groups. Give each pair or group one of the climate change vulnerability game - role cards.

Explain that the role cards represent fictional people living in Myanmar. Ask learners to spend a few minutes imagining the daily life of the person whose role they are playing.

Read out the list of vulnerability statements below and ask those learners whose character can agree with the statement to take a step forward (give them time in their groups to first discuss the statement and decide if they would agree with it). Encourage those groups who are unsure how to answer to ask you and/or others for advice. Eventually the learners will be spaced out across the room according to how many steps they have taken forward.

Vulnerability statements

1. You receive or received a primary school education.
2. You receive or received a secondary school education.
3. You can afford to meet your basic needs.
4. You are never short of food.
5. You do not rely on good local weather for growing crops to make a living or to have food to eat.
6. You can afford to see a doctor and buy medicine when you have health problems.
7. You have the power to influence people in your community.
8. If there is an emergency, the emergency services will come and help you and your community.
9. You have people who care about you and protect you.
10. You have money saved for difficult times.
11. You can afford a place to live.
12. You live in a sturdy house safe from bad weather.
13. If you have a place to live, it is insured.
14. You have good enough reading and writing skills to get a job that provides a regular salary.
15. If you lose your way of making an income, you can probably find another.

Once you have read out all the statements, ask learners to stay where they are and introduce their character to the other groups. Encourage learners to give reasons for their decisions about how many steps they took. Ask learners if they think that each character is correctly placed in relation to others, for example: Do you think the married man should be further forward than the 12-year-old girl? Encourage discussions where there is disagreement.

Ask learners to identify what factors make some people more vulnerable than others. How vulnerable do they think their character would be to the effects of climate change? Share the following facts to help learners identify ways in which their character might be affected.

- Climate change is causing unpredictable rainfall which affects crops, food production and water sources.
- Climate change is linked to an increased likelihood of extreme weather events. Extreme weather events such as Cyclone Nargis, damage houses, crops and roads.

Ask learners to organise themselves across the room according to how vulnerable they think their character would be to the effects of climate change (one side of the room - high vulnerability, other side of the room – low vulnerability).

Then ask learners to organise themselves across the room according to what they think the size of their character's carbon footprint would be (one side of the room – small carbon footprint, other side of the room – large carbon footprint). **Explain that climate change affects everyone, but that it is the people who contribute the least to climate change who suffer the most.**

Discussion: Why is climate change considered an environmental justice question?

Environmental Justice incorporates the fair treatment and meaningful involvement of all people regardless of race, colour, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies (Environmental Protection Agency, ND). Some also consider future generations (Stephens et al., 2001).

Learners will consider the statement that is it the people who contribute the least to climate change who suffer the most in relation to what they have learnt in this learning pack and in relation to their own carbon footprints. These can be calculated at: <https://footprint.wwf.org/#/>

In Myanmar the average person annually emits 0.44 tonnes of CO - how do your learners compare?

Climate Change Vulnerability Game: Role Cards

Name: Khin Win

Age: 12

You are a 12 year old girl from a farmer's family. The nearest school is a three hour walk away, so you have never been to school. During the day you help your mother collect water and wood. The walk to collect these is become longer every month.

Name: Nilar Tun

Age: 23

You are a female subsistence farmer growing rice. You only grow enough food for you and your family to eat.

Name: Myint Thein

Age: 42

You are a married man with four children running a supermarket in the small town of Hpa-An. You have a good income.

Name: Kyaw Than

Age: 16

You are a teenage son of the CEO of a large manufacturing company. You go to a private school and are currently applying to go to university.

Name: Thet Wai

Ages: 48

You are a local government officer living in Naypyidaw, the capital of Myanmar. You have influence and can afford everything you need.

Name: Aung Zuy

Age: 10

You are a 10 year old boy living in a rural farming village. Before UWS built a school in your village 2 years ago, you didn't go to school. Now you can read and write. You love mathematics and playing football. When you grow up you want to be a doctor.

Name: Maung Maung Aye

Age: 32

You are a farmer whose crops have failed for two years in a row. You are worried for your family's future.

Name: San Lwin

Age: 38

You are the manager of a teak plantation. You make a lot of money from the teak and have influential connections.