# GCSE Geography Hostile World Revision Guide

Improve that grade!

# Hostile World

**Section A – Living with Natural Hazards**

Many people now live in hostile areas of the world. Areas close to plate boundaries and areas that suffer from tropical storms or wildfires can pose dangers for the people who live there. They have to be able to understand the causes and effects of these hazards in order to prepare for and respond to them.

Below are the key questions that the exam board set for you. It looks a lot but we have broken it down for you so that you cover everything!

1. **What are the causes and effects of earthquakes and volcanic eruptions and how do people prepare and respond to them?**
    a. Where do earthquakes and volcanoes occur?
    b. What happens at plate boundaries?
    c. What are the effects of E & V? (case study examples)
    d. Why do people live in areas where they occur?
    e. How can you reduce the effects of them? (case study examples)

2. **What are the causes and effects of tropical storms and how do people prepare and respond to them?**
    a. Where do tropical storms occur?
    b. How do they form?
    c. What are the effects of tropical storms in LEDCs and MEDCs? (case study examples)
    d. How can you reduce the effects of them? (case study examples)
    e. What will happen in the future to the number of tropical storms due to climate change?

3. **What are the causes and effects of wild fires and how do people prepare and respond to them?**
    a. Where do wildfires occur?
    b. How do they start?
    c. What are the effects of wildfires in LEDCs and MEDCs? (case study examples)
    d. How can you reduce the effects of them? (case study examples)
    e. What will happen in the future to the number of tropical storms due to climate change, El Niño/La Nina and population growth?

## What is the examiner looking for?

The examiner wants to know that you can:

| Assessment Objectives | | % Weighting |
|---|---|---|
| AO1 | Recall, select and communicate their knowledge and understanding of places, environments and concepts. | 30% |
| AO2 | Apply their knowledge and understanding in familiar and unfamiliar contexts. | 30% |
| AO3 | Select and use a variety of skills, techniques and technologies to investigate, analyse and evaluate questions and issues. | 40% |

## What types of questions will I have to answer?

To demonstrate the above you will answer a variety of questions.

These with range from defining key terms and looking at patterns e.g.

**1** (c) Weathering and erosion are important physical processes in coastal areas.

**1** (c) (i) What does weathering mean?

.....

.....

.....

.....

*(2 marks)*

to recalling your understanding of a topic;

**1** (a) (iv) Explain why the Mediterranean coastal region is called a 'multi-use' area.

Use **Figure 1** and your own knowledge.

.....

.....

and then analysing an issue in more depth;

**1 (d)** Modern industries are often found in science and research parks.

Explain why there has been a growth in the number of science and research parks in more developed countries.

You will always be given a source to use in the exam. Examples could be a photo, a map, a newspaper extract or a graph. Remember that they have spent time and money on reproducing these resources so the answer will be in the resource! Spend time looking carefully at it before attempting to answer the question.

You may also be asked to use the resource and your own knowledge to answer the question. This means that they want you to give another example as well!

**Key tips for the exam:**

Practise – answer practise exam questions and hand them to your teacher for feedback!

Read the question – what are they asking you to do?

Answer the question – this may appear obvious but don't just write about everything you know actually write about the question they are asking you

Case studies – put in examples and data to show the examiner you actually know your stuff!

## General Mark Scheme for long answers

**Level 1 : Basic**
Knowledge of basic information
Simple understanding
Little organisation; few links; little or no detail; uses a limited range of specialist terms
Reasonable accuracy in the use of spelling, punctuation and grammar
Text is legible.

**Level 2: Clear**
Knowledge of accurate information
Clear understanding
Organised answers, with some linkages, occasional detail/exemplar; uses a good range of specialist terms where appropriate
Considerable accuracy in spelling, punctuation and grammar.
Text is legible.

**Level 3: Detailed**
Knowledge of accurate information appropriately contextualised and/or at correct scale
Detailed understanding, supported by relevant evidence and exemplars
Well organised, demonstrating detailed linkages and the inter-relationships between factors.
Clear and fluent expression of ideas in a logical form; uses a wide range of specialist terms where appropriate
Accurate use of spelling, punctuation and grammar
Text is legible

A perfect answer is not usually expected, even for full marks.

## Key Terms and Ideas

You should be able to describe the distribution of earthquakes and volcanoes

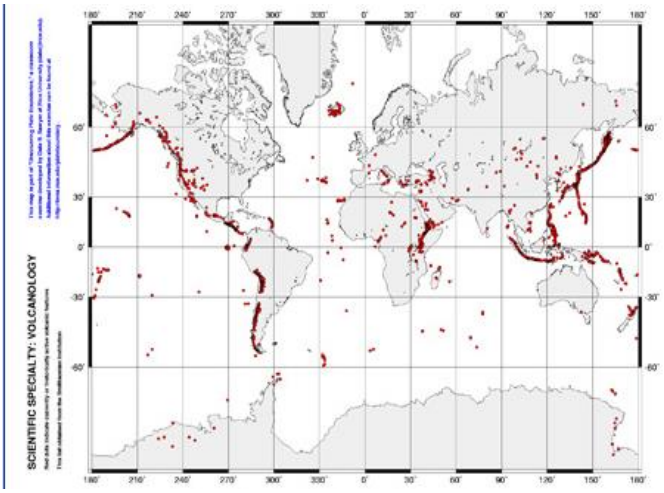



Figure 1: The distribution of volcanoes

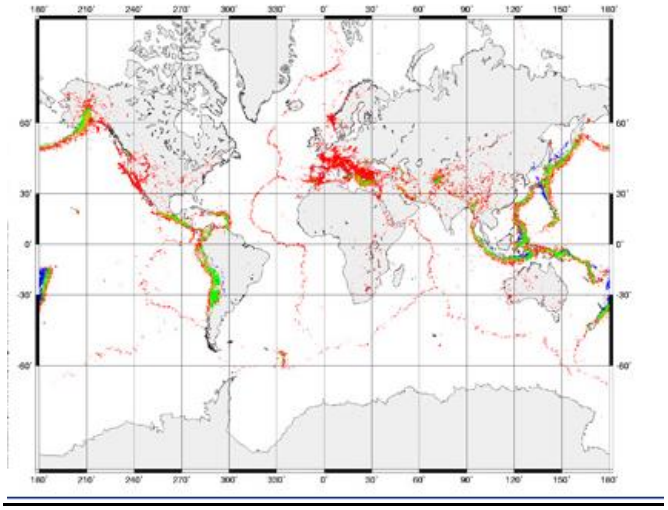


Figure 2: The distribution of Earthquakes

**How to describe patterns on maps**

**Begin with a general statement**
*e.g. 'The map shows that volcanoes and earthquakes are found...'*

Go on to give **greater detail** about **where** in the world they are and are not found. Include **place names** e.g. *countries, continents, oceans, mountain ranges*…. Mention **directions** for the patterns: *north to south… to the south west* etc.

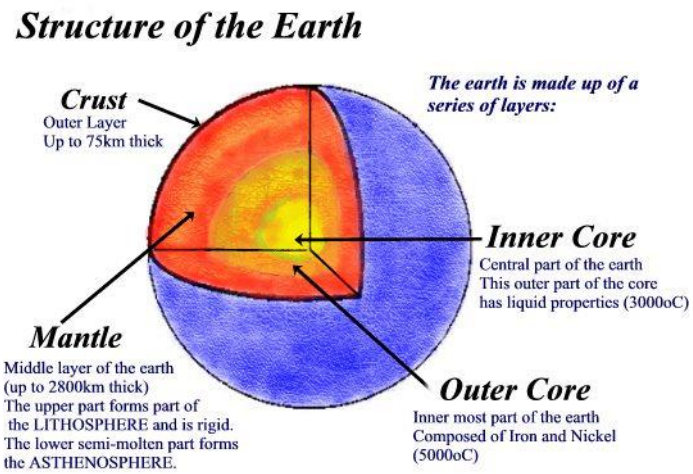
**Useful words/phrases**

narrow belts in lines | coastline | grouped together | in similar places | distributed | Pacific Ocean edge

Earthquakes and volcanoes are found in narrow belts, along plate boundaries. These are often found along the coastal areas. For example the Ring of Fire is a well know area of volcanoes and earthquakes around the pacific plate. They are found in similar places and are often grouped together. There are some odd volcanoes found in 'hotspots' in the centre of plates where the crust is weaker.

## The structure of the earth

The earth is made up of layers with different properties.



On the outside of the earth the crust is broken into different pieces. Each of these pieces is called a plate. Where the plates met is called a plate boundary. The plates can be either **continental** or **oceanic.** The plates move in different directions due to the convection currents in the mantle (where heat from the core warms the mantle – the mantle rises towards the surface where it cools down and sinks again. These currents cause the plates to move very slowly. Only a few mm per year). Plates can move towards each other, away or pass sideways.

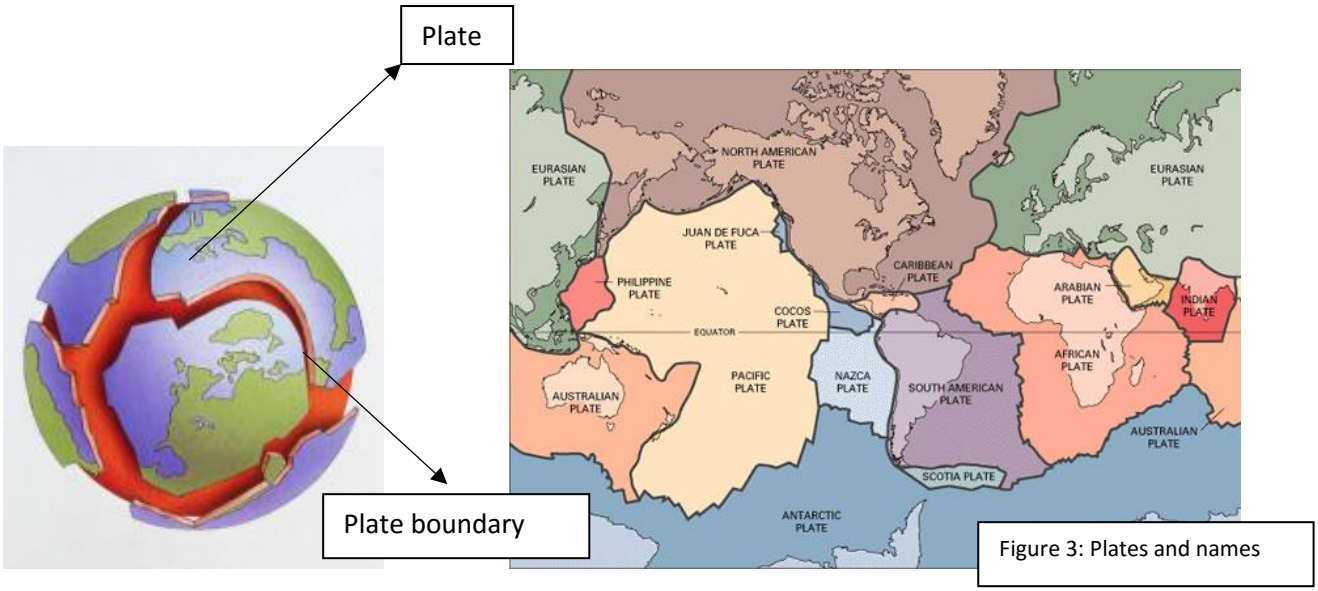
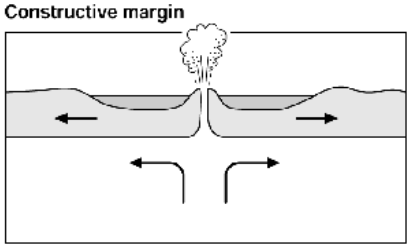
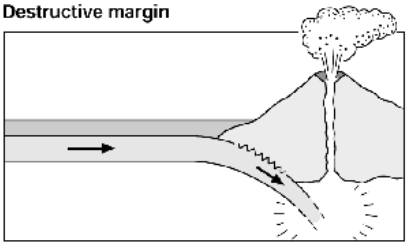


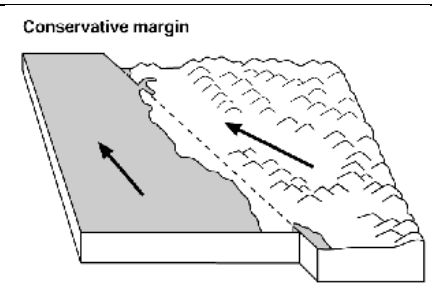
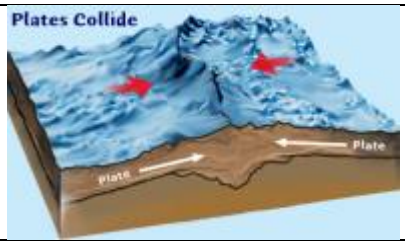

Figure 3: Plates and names

| **Oceanic Crust** | **Continental Crust** |
|---|---|
| Heavier (denser) but thinner | Is lighter but thicker |
| It can sink | It cannot sink |
| Constantly being renewed and destroyed | It is permanent as it cannot be destroyed |
| Fund under the oceans | Found under land |

## Plate boundaries

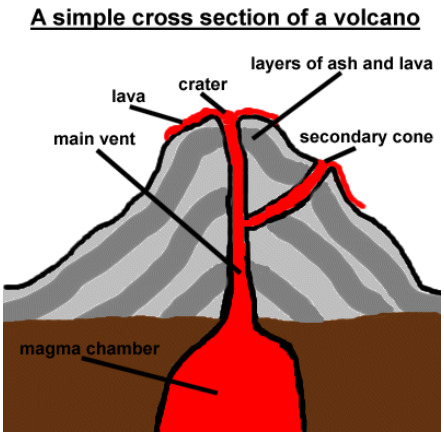
There are four plate boundaries. Learn what happens at each plate boundary and be able to describe and explain using key words and examples.

| Boundary Type | What happens | Example |
|---|---|---|
| Constructive margin  | This is where two plates move apart. As a gap appears between the plates, mantle rises to fill this gap. When mantle reaches the surface it is called lava. The lava erupts in frequent gentle eruption. New land or crust is created. Along the mid Atlantic ridge the ocean floor is spreading (growing) but 1cm per year.<br><br>Volcanoes ✓ Earthquakes ✓ | Iceland.<br>Mid Atlantic ridge |
| Destructive margin  | The oceanic crust moves towards the lighter continental. As the oceanic crust is heavier it is forced downwards (subducted) into the mantle. This is called the subduction zone. As the oceanic plate is forced downwards the pressure increases and friction builds up. The continental crust buckles and forms mountains. When there is a sudden movement or release violent earthquakes happen as shockwaves occur on the surface. Where the plate sinks a deep oceanic trench is created. The sinking plate is heated (due to friction) and turns the rock back into magma. This magma is less dense than the mantel and so rises, if this happens in the sea Island arcs are formed (volcanoes in the water). This magma then rises and is forced out as violent volcanic eruptions.<br><br>Volcanoes ✓✓ Earthquakes ✓✓ | South American Plate moving towards the Nazca Plate |

| | | |
|---|---|---|
|  | Two plates try and slide past each other. This is not a smooth process and the two plates stick or lock together creating friction, as the tension builds up the sudden release causes a severe earthquake as shockwaves occur near the surface. The crust is neither created nor destroyed.<br><br>Volcanoes ✖ Earthquakes ✓✓ | Californian Fault |
|  | Two plates of the same density (often continental) move towards each other. As neither is heavier than the other they cannot sink so are pushed together and buckles and pushed upwards to form high mountains called fold mountains. There are no volcanic eruptions but there are severe earthquakes.<br><br>Volcanoes ✖ Earthquakes ✓✓ | Himalayas |

## Volcanoes

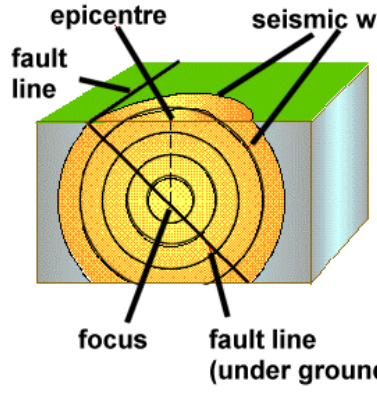
Pyroclastic flows are avalanches containing hot volcanic gases, ash and volcanic bombs. On steep volcanoes pyroclastic flows can reach speeds of over 100 miles per hour.




Lahars are volcanic mudflows created when water (from rain or melt water from glaciers) and ash mix. This deadly combination can have devastating results on the surrounding area. When lahars settle they can be metres thick and as hard as cement. Lahars can occur long after a volcanic eruption.

You should be able to define and use these words in your writing; Crater, Cone Magma, Lava, Pyroclastic Flow, Lahars, ash, gas, layers, extinct, dormant, active,

## Earthquakes




**Earthquakes**

Earthquakes occur along plate margins (where plates meet). When plates move past, towards or away from each other the movement is not smooth. Friction causes the plates to get stuck. This causes pressure to build up. Earthquakes occur when this build up of pressure is released. The point where the earthquake starts is called the focus. Energy waves race rapidly from this point.The point at ground level, directly above the focus, is called the epicentre.

## Why do people live in areas where volcanoes and earthquakes occur?

Benefits of living near volcanoes:

- Geothermal energy (Iceland)
- Tourism – provides jobs for people, people can work on the mountain e.g. forming souvenirs out of lava e.g. Mount Etna

- Fertile soils around the volcano after the lava has weathered
- The volcano has not erupted in  along long time so people do not perceive it to be a danger
- Some people cannot afford to move away
- Precious stones are formed and can be mined as can pumice stones, and materials for building and minerals such as ore.

Why people live in places that have earthquakes:

- Maybe a country that is 'prepared' for earthquakes e.g. Japan, California
- They don't occur that frequently so it is worth the risk




## What are the effects of volcanoes and earthquakes?

**Primary Effects:** caused directly by the event itself e.g. buildings destroyed by fires in a volcanic eruption or buildings collapse in an earthquake.

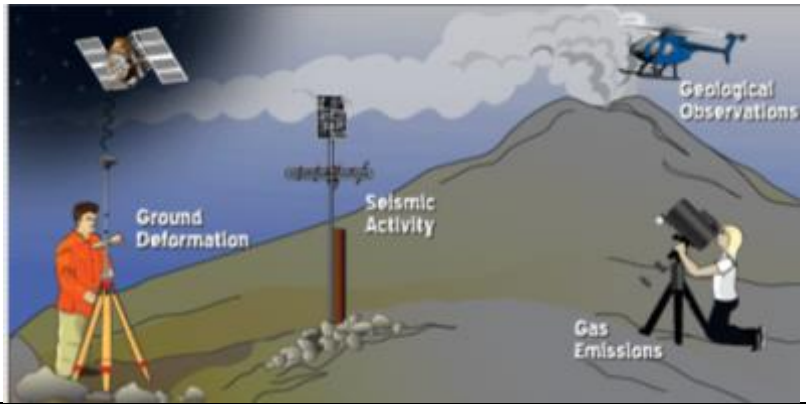
**Secondary Effects:** those result from the primary effects for example homelessness.

Effects will differ depending on the strength, duration and magnitude of the event and how much warning people received.

For each of the case studies you should classify the effects into Primary and secondary.

| | |
|---|---|
| Location and Name | Soufriere Hills Volcano Montserrat |
| Details | 25th June 1997 |
| Primary and Secondary Effects | **Primary Effects:** 2/3rds of Montserrat covered in ash, 50% of the population were evacuated to the north of the Island to live in makeshift shelters, 23 people died, the capital Plymouth was in the south and so was abandoned, valleys were blocked with ash and so there was flooding, the airport and port were closes, farmland destroyed, forest fires, many schools and hospitals destroyed.<br><br>**Secondary Effects:** Most of the southern area destroyed and so remaining inhabitant have to live in the harsher north area, transport remains a problem, tourist industry suffering, over half the population left the island and have not returned. |
| | The volcano had been rumbling for a long time – the eruption became on the 18th July 1995 ... and erupted violently on the 25th June 1997 killing 19 people and destroying many villages. Because the eruption had been occurring for a long time, planners had drawn up exclusion zones – they had divided the island into safe, and unsafe areas. People were warned not to go into the exclusion zone. Sirens were set up to warn people if the volcano was to erupt. When it did 5 million cubic meters of lava and pyroclastic flow spilled down the volcano. Villages were destroyed and land previously used for farming was covered in rock and ash deposits. Some of the volcanic booms (rocks) deposited in Bethel were up to 5 metres in size. This caused widespread destruction. Some houses were totally destroyed (100-150), others were buried or burned down by the intense heat. The eruption of the volcano should not have had a major impact on the people of Montserrat as the areas affected were in the Exclusion Zones. On 25 June 1997 some authorised people were in the Exclusion Zone to carry out essential tasks and monitor the volcanic activity. When an eruption looked likely all these people were able to evacuate safely by responding to the emergency sirens. Some unauthorised people were also in the Exclusion Zone, they were mainly people farming their fields. The port and airport were destroyed. The capital Plymouth was in the exclusion zone and was abandoned. The Montserrat |

| | |
|---|---|
| | Volcano Observatory (MVO) play a key role monitoring the development of the Soufrière Hills Volcano. Despite sophisticated monitoring equipment it still remains very difficult to pinpoint exactly when an eruption will happen. |


| | |
|---|---|
| Location and Name | Haiti Earthquake |
| Details | 12th January 2010 magnitude 7 earthquake at 16.53 local time. |
| Primary and Secondary Effects | Haiti is situated to the north of the Caribbean Plate, on conservative plate boundary with the North American Plate. The North American plate is moving west. This movement is not smooth and there is friction between the North American Plate and the Caribbean Plate. Pressure builds between the two plates until it is released as an earthquake. The epicentre of the earthquake was 16km south west of Port-Au-Prince. The earthquake was caused by a slip along an existing fault in this area (Enriquillo-Plaintain Garden fault).<br><br>As of Feb. 12, an estimated three million people were affected by the quake; the Haitian Government reports that between 217,000 and 230,000 people had been identified as dead, an estimated 300,000 injured, and an estimated 1,000,000 homeless. The death toll is expected to rise. They also estimated that 250,000 residences and 30,000 commercial buildings had collapsed or were severely damaged.<br><br>So, why did so many people die in the Haiti earthquake? There are a number of reasons for this:<br><br>1. The earthquake occurred at shallow depth - this means that the seismic waves have to travel a smaller distance through the earth to reach the surface so maintain more of their energy.<br>2. The earthquake struck in the most densely populated area of the country.<br>3. Haiti is the poorest country in the Western Hemisphere<br>4. The buildings in Port-Au-Prince and other areas of Haiti were in very poor condition in general and were not designed or constructed to be earthquake resistant.<br>5. 3 Million people live in Port au Prince with the majority living in slum conditions after rapid urbanisation.<br>6. Haiti only has one airport with one runway. The control tower was badly damaged in the earthquake. The port is also unusable due to damage.<br>7. Initially, aid had been piling up at the airport due to a lack of trucks and people to distribute it. Water and food have taken days to arrive and there is not enough to go around.<br>8. Rescue teams from around the world took up to 48 hours to arrive in Haiti due to the problems at the airport. Local people have had to use their bare hands to try and dig people out of the rubble.<br>9. There has been a severe shortage of doctors and many people have died of injuries such as broken limbs<br>10. Cholera and has ravaged the community and over a year on people are still living in makeshift camps. |

| | |
|---|---|
| Location and Name | Mount Pinatubo, Philippines |
| Details | 9th June 1991, Philippines lies on a destructive plate boundary, last erupted 1380. |
| Effects | There were several advance warnings of the eruptions. 7 June the USA evacuated all 15,000 people from the nearby airbase. The volcanoes started erupting on the 9th June and the biggest eruption occurred on the 12th |

| | |
|---|---|
| | June when an explosion sent a cloud of gas and steam 30km into the sky. As the ash fell it turned day into night and 50cm of ash fell on nearby farm land destroying all crops. Planting was still impossible the following year. Some ash even reached Australia. The eruptions lasted several days and there were earthquakes. This was the monsoon season so the torrential rain turned the ash into mudflows. The weight of the ash caused buildings to collapse including 200,000 houses, schools and the local hospital. Power supplies were cut off for weeks and there was no clean drinking water. Bridges were blocked. 1 million farm animals died. Hundreds of farmers were forced to migrate to the cities to seek shelter and work. Huge refugee camps were set up but diseases like malaria and diarrhea spread quickly. The ash in the sky went so high it travelled around the world in a few days and blocked out some of the sun's rays reducing the earth's temperature. 6 people died as a direct result of the eruption, 1100 after. |

| | |
|---|---|
| Location and Name | Kobe , Japan |
| Details | At 05.46 on 17th January 1995 an earthquake measuring 7.2 on the Richter scale struck the heavily populated city of Kobe, Japan. |
| Primary and Secondary Effects | The earthquake occurred along the destructive plate boundary where the Pacific and the Philippine Plate (oceanic) meet the Eurasian (continental) plate.<br>Many freeways and buildings were destroyed, despite the strict building regulations, and 5000 were killed. Fires spread as a result of broken gas mains. 250,000 people were left homeless |

## How can we prepare for and reduce the damage caused by earthquakes and volcanoes

If people can plan and prepare they can reduce the risks.

**Key Terms**

**Retrofitting**: the addition of new technology to older buildings
**Appropriate technology**: technology designed with the consideration o the community it is intended for so that they can understand it, fix it and maintain it.
**Epicentre**: the point on the earth's surface directly above the focus of an earthquake
**Building Code**: regulations which state how a building should be constructed in order for it to be safe.

Remember that the preparedness will depend on how developed the country is. LEDCs will be less likely to be able to plan and prepare. This means that there is often a higher death toll associate with E&V.

| Earthquakes | Volcanoes |
|---|---|
| • Older buildings can be retrofitted to strengthen them to reduce the effects of shaking<br>• Computer controlled weights can be fitted in the roof to counter balance the shockwaves<br>• Cross bracing to add strength to prevent twisting<br>• Automatic window shutters to prevent the glass from shattering<br>• Foundations of the building set deep into the ground<br>• Automatic gas and electricity shut off to prevent fires. Sprinkler systems included.<br>• Rubber shock absorbers in the foundations to absorb the energy of the shock waves.<br>• In LEDCs bamboo houses are built because they are very strong yet bends easily so does not collapse as easily. Bamboo grows quickly. In Costa Rica in Jan 2009 the Bamboo houses in the epicentre of the earthquake survived without damage.<br>• In LEDCs hollow bricks can be used which cause less damage if they fall.<br>• **Earthquake preparedness** – making people aware through education and advertising campaigns what actions to take before, during and after an earthquake.<br>• In **Japan** September 1st is 'Disaster day@ where all people including emergency crews practise. | • Monitor volcanic activity through satellites and seismographs and measuring volcanic gases<br>• Using tilt meters to measure the changing shape of the volcano will allow people to tell if it is going to erupt soon.<br>• Restrict certain areas around the volcano e.g. Soufriere Hills Volcano in Montserrat 1995.<br>• Evacuate the area (e.g. Indonesia May 2006 Mount Merapi threatened to erupt, the elderly, women and children were the first to be evacuated, then two weeks later the warning horns were sounded and army trucks ensured that everyone else left. 17,000 people were evacuated.<br>• Build earth and rock walls to divert lava away from villages and towns e.g. Mount Etna<br>• Use planes and helicopters to drop water onto the lava to cool it down and divert the lava e.g. Iceland – Surtsey 1983.<br>• In areas where volcanoes emit large quantities of ash build houses so that the roofs are sloped and built of smooth materials so that the ash can fall off.<br>• Plastic coverings on roofs can stop erosion of material.<br>• Filter systems are installed in buildings to stop the ash getting into computers and electrical equipment.<br>• Encourage residents to keep an emergency kit to hand |

| | |
|---|---|
| • Using maps showing where earthquake shaking is likely to happen can help with knowing what to do.<br>• Computer generated models can show what might happen and people can plan accordingly.<br>• Ensure that houses are built according to building codes e.g. houses in high risk areas must have earthquake proofing.<br>• | including things like a torch, water, breathing mask, radio.<br>• Develop volcanic hazard maps (like we did for Montserrat) to predict where the danger will be and display them in public buildings and plan accordingly. |

## Why are there different effects between LEDC and MEDCs?

**Earthquakes**

**MEDC and LEDCs;** Earthquakes tend to have a greater impact in Less Economically Developed Countries (LEDCs) than More Economically Developed Countries (MEDCs). Buildings in More Economically Developed Countries (MEDCs) are more likely to withstand an earthquake, because they may be designed to withstand tremors. They may have seismic isolators (e.g. Japan) or deep foundations (e.g. USA). In 1995 an earthquake measuring 7.2 on the Richter scale hit the Japanese city of Kobe. Only 5000 people were killed. However, in LEDCs the buildings are often of poor design because of cost. This is one reason why earthquake damage in LEDCs is usually greater. For example in 1999 an earthquake measuring between 6.8-7.0 on the Richter Scale killed 17 000 people in Turkey. MEDCs are more likely to have response plans available. In Japan school students practice an earthquake drill on the 1st September every year. Emergency services are well trained in responding to a tectonic hazard. In contrast LEDCs tend to lack disaster response plans. LEDCs often have to rely on aid from MEDCs to assist in responding to earthquakes. Aid can come in many forms e.g. medical facilities, tents, rescue teams etc. Aid can take anywhere up to 3 days to arrive. This reduces the chance of survival for many people injured or trapped beneath buildings.

**Rural and Urban areas;** Population density also affects the impact of an earthquake. Earthquakes can be a devastating phenomenon when they hit densely populated areas. Their effect can be greatly reduced in more sparsely populated areas.

**Distance from the epicentre;** The closer the epicentre the stronger the earthquake. Therefore earthquakes that have epicentres close to major urban areas tend to cause more problems than those that occur some distance from urban areas.

**Emergency response;** Lack of emergency services and poor communication links in Less Economically Developed Countries mean that people are not rescued as quickly, or cared for as well, as they would be in a More Economically Developed Country.

**Time of day;** Night time earthquakes can make it more difficult to rescue people immediately after an earthquake. However, there are few people on the street, in public buildings and at work.

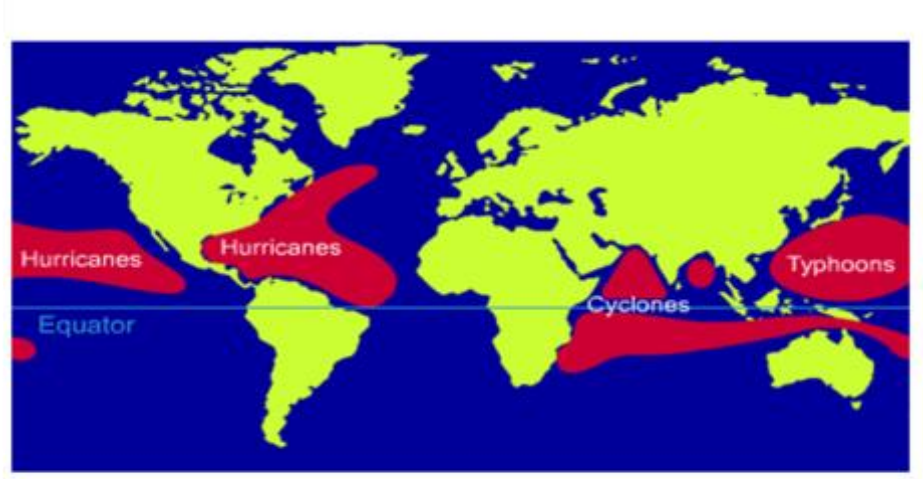
**Time of Year;** Earthquakes can result in higher fatalities if they occur in times of cold weather.

**Surface type;** The type of soil or rock that an area is built on affects the impact of the earthquake. Soils that contain a large amount of water can turn to liquid causing the buildings to sink. This is called liquefaction.

(source: http://www.geography.learnontheinternet.co.uk/topics/volcanoes.html)

## Where do tropical storms occur?

Tropical storms occur in areas where the sea surface temperatures are over 27°C. Most form between 10° and 30° north and south of the equator. They are large areas of low pressure or extreme depressions with high wind speed and lots of rain.




Tropical storms occur all over the world but have different names in different places.

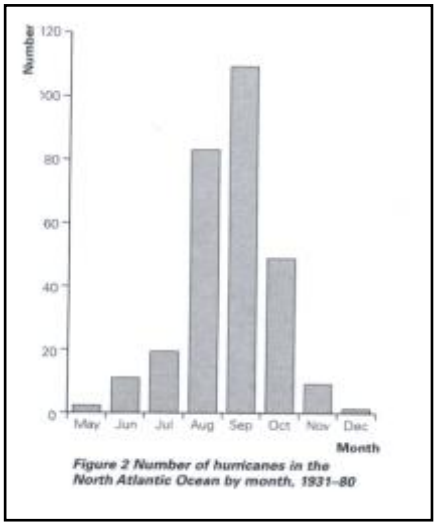


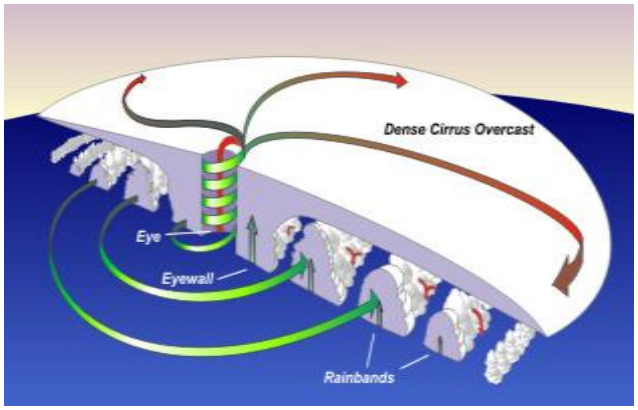

*Figure 2 Number of hurricanes in the North Atlantic Ocean by month, 1931–80*

You should be able to describe in detail where and when hurricanes occur and give reasons why if asked.

## How do tropical storms form?

Tropical storms form where there is warm seas and warm moist air. You should be able to describe in detail how a hurricane forms in stages.

1. Several small thunder storms drift over warm seas
2. The warm air from the sea surface and the thunderstorms combine and the warm air starts to rise more quickly
3. Due to the earth's rotation the rising warm air and thunder storms start to move in a spiral. As the water rises it cools and condenses into clouds (this process releases latent heat and produced even more energy)
4. The air starts to rise faster and cooler air is sucked downwards from the atmosphere to replace the warm air that is quickly rising. The wind speeds get faster.
5. The tropical storm moves over the ocean picking up more warm moist air getting bigger and bigger. The eye of the storm is where the colder air is sucked down and it is calm and there is no wind or rain there.
6. When the Hurricane reaches land it loses its source of energy and begins to weaken and disperses.




Tropical storms travel (track) westwards.

## What are the effects of tropical storms?

They are measured using the Saffir-Simpson scale.

| Saffir-Simpson Hurricane Scale | | | |
|---|---|---|---|
| *Category* | *Winds (MPH)* | *Damage* | *Storm Surge* |
| 1 | 74 - 95 | **Minimal**: Damage to unanchored mobile homes, vegetation & signs. Coastal road flooding. Some shallow flooding of susceptible homes. | 4 - 5 feet |
| 2 | 96 - 110 | **Moderate**: Significant damage to mobile homes & trees. Significant flooding of roads near the coast & bay. | 6 - 8 feet |
| 3 | 111 - 130 | **Extensive**: Structural damage to small buildings. Large trees down. Mobile homes largely destroyed. Widespread flooding near the coast & bay. | 9 - 12 feet |
| 4 | 131 - 155 | **Extreme**: Most trees blown down. Structural damage to many buildings. Roof failure on small structures. Flooding extends far inland. Major damage to structures near shore. | 13 - 18 feet |
| 5 | More than 155 | **Catastrophic**: All trees blown down. Some complete building failures. Widespread roof failures. Flood damage to lower floors less than 15 feet above sea level. | Greater than 18 feet |

The effects of tropical storms will vary according to the development of the country, the size and strength of the hurricane and the path that the hurricane follows. One of the big issues is the storm surge that often accompanies a hurricane where the sea level rises due to the strong winds and low pressure causes the coastal area to flood.

Some general effects are:

**Physical and environmental:** structural damage to buildings, roads and other infrastructure, vehicles and property damaged, sensitive environments destroyed, loss of animal habitats (often due to flooding in the storm surge), sea fish killed due to silting, fishing boats damaged.

**Social**: People suffer trauma and stress, water-borne diseases as sewage leaks out, communities destroyed and people displaced, food and water shortages, job losses, civil unrest and looting

**Economic:** costs of repair and insurance claims, loss of income and as businesses close, crops destroyed and exports lost.

| | |
|---|---|
| Location and Name | Hurricane Katrina, New Orleans USA |
| Details | Hit New Orleans at 10am 29th August |
| Primary and Secondary Effects | After crossing southern Florida - where it left some 100,000 homes without power - it strengthened further before veering inland towards Louisiana, eventually making landfall at Grand Isle, approximately 90km south of New Orleans, at 10am local time on 29 August. At this point, Katrina's sustained wind speed was approximately 200 km/h. The storm passed directly through New Orleans, destroying many lighter buildings and causing extensive damage to others. Hurricane force winds were recorded along a 200km stretch of coastline, with scenes of similar destruction and flooding in Louisiana, Mississippi and Alabama. Storm surges from the sea caused flooding several kilometres inland in some places. Thousands of people were made homeless in New Orleans. Some 80% of the city was flooded and there was widespread looting. A complete evacuation of the city has was ordered but this took several weeks to complete as roads and bridges were destroyed.<br><br>**Initially it was hoped that New Orleans had weathered the worst of Katrina, but within hours of the storm passing, it emerged that several key levees had been breached, causing floodwater to pour into the low-lying city.** By 31 August, an estimated 80% of New Orleans was underwater. The situation quickly deteriorated as it became apparent that thousands of people had been unable to evacuate or chosen to stay put. Many took refuge in the city's Superdome, but without sanitation or proper supplies, conditions inside the crowded, overheated stadium became increasingly unbearable. Law and order across the city broke down, with reports of widespread looting and violence. On 2 September a series of huge blasts, apparently at a chemical plant near the French Quarter, rocked the city. Large fires also broke out in several other districts. |

| | |
|---|---|
| Location and Name | Hurricane Hanna, Haiti 3rd September 2008 |
| Details | Haiti had had 2 hurricanes in August already (Fay and Gustav). Hurricane Hanna was unexpected. It was not expected to strike Haiti so no warnings had been given. |
| Primary and Secondary Effects | 550 people did as they were not able to be evacuated. The city of Gonaives was badly damaged with 1 million people made homeless as the tin roofs were destroyed. Much of the area was low lying and so flooded up to 3m deep and crops were destroyed. Thousands of people were left stranded on their rooftops. Some bridges and roads were washed away so help was unable to get to the people/ Mudslides buried villages in other parts of Haiti. 98% of the forests in Haiti had already been removed so there was little natural defence against the rain and mudslides were created. People lost their farmland and houses and had no income. The UN had to supervise food distribution because of rioting. Three days later a category |


Unexpected loop of hurricane path

| | |
|---|---|
| Location and Name | Cyclone Nargis, Burma/Myanmar |
| Details | May 2 2008 |
| Primary and Secondary Effects | The worst natural disaster to occur in Myanmar, 140,000 died, hundreds of towns and villages destroyed.<br>Over $10 billion dollars of damage caused. |
| | |

## How can we reduce the damage caused by tropical storms?

To reduce the damage from tropical storms people are advised to:

Forecast → Prepare → Act

| Preparation and response |
|---|
| • Track and monitor tropical storms using satellite and weather monitoring equipment.<br>• Plot the predicted path and issue warnings to those areas<br>• Update forecasts on the radio, internet and TV<br>• Education programmes to raise awareness on how to prepare and respond to tropical storms<br>• Put together an emergency kit<br>• Make a family disaster plan arranging where to meet if there is a hurricane<br>• Protect homes from strong winds and flying debris by boarding up windows, nailing down tiles.<br>• In MEDCs people can afford to build stronger houses with water resistant windows and wind proof tiles<br>• Build levees to hold back a storm surge<br>• Develop houses where the ground floor is designed to “wash out” in a storm surge and leave the house intact<br>• NGOs educated women in LEDCs on what to wear in case they have to swim in a cyclone (in Bangladesh) |

- Building community cyclone shelter
- Build homes on stilts
- Train and organise villagers in the event of an evacuation
- Make evacuation signs
- Hurricane preparedness week this year is May 22nd to may 28th – lots of activities to help families to prepare and educate them.

## What will happen in the future to the number and distribution of tropical storms?

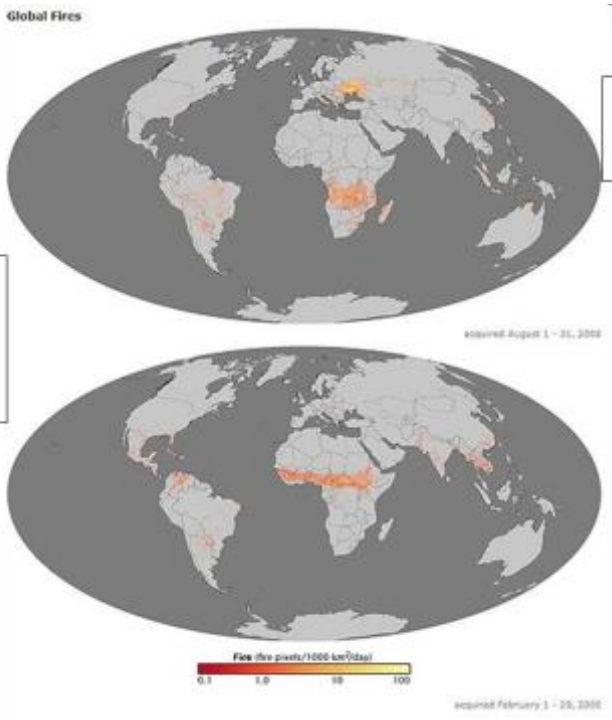
Due to climate change and increasing sea surface temperatures it is likely that there could be an increase in the numbers and strength of Hurricanes as there is more warm sea and longer periods over which they can form.

BUT opinions are divided.

| Yes more Tropical Storms | No there will be no difference |
|---|---|
| • The number of tropical storms has double over the past 100 years and they are becoming more destructive<br>• Data shows that since 1995 that Hurricanes have become more intensive and more frequent<br>• Due to global warming the sea surface temperatures have already risen by 0.5°C – what will happen in the future?<br>• The length of storms has increased by 60% in the past 25 years<br>• More tropical storms reaching category 4 and 5 than ever before.<br>• In the USA 6 out of the 10 most expensive storms have been in the past 20 years.<br>• El Nino/La Nina is affected by climate change and will in turn continue to affect the numbers of Hurricanes | • We have only had the technology to accurately measure hurricanes since the late 1960s so we cannot tell for sure what it was like before then.<br>• There is a natural cycles of variations in the Atlantic ocean and we could just be going through the peak of one of these<br>• El Nino – a warming of the ocean sea surface temperatures will increase the numbers of Hurricanes<br>• Possibility that the number of tropical storms will decline in the future as we enter a low period of activity<br>• Hurricane activity maybe increasing on one sea but declining in another |

## Where do wildfires occur?

A wild fire is an unplanned, unwanted wild land fire, including unauthorised human-caused fires.




Which continents do they occur in?

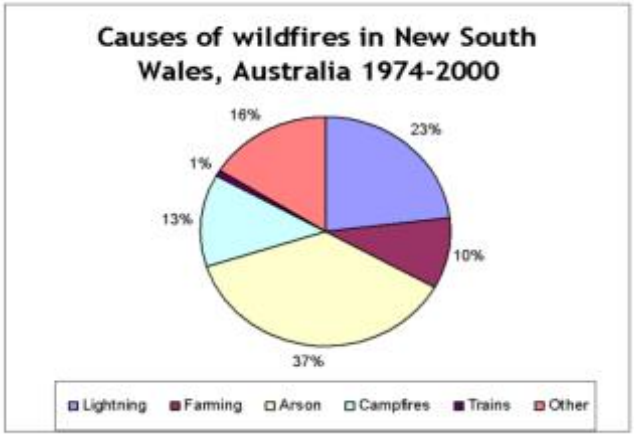
Is the pattern the same throughout the year?

Wildfires occur in every continent except Antarctica. They are common in areas the experience prolonged hot spells with drought or infrequent rain. There needs to be enough vegetation to sustain the wildfire.

## What are the causes of wildfires?

Wildfires can be classified as a “semi quasi hazard” this means that they are natural hazards but they can also be caused by humans (earthquakes, volcanoes and tropical storms can not). Dry weather and strong winds can make the wildfire spread quickly. The height of the land also affects the speed at which the wildfire travels – a fire will travel much faster uphill than down.

| Natural Causes of Wildfires | Human induced causes of Wildfires |
|---|---|
| • Lightening – biggest cause of many smaller wildfires<br>• Spontaneous heating – were a material e.g. dried leaves is heated by the sun to a point where it spontaneously bursts into flames<br>• Volcanic eruptions can cause wildfires<br>• Extreme drought and hot conditions | • Accidents – children playing with matches, campfires not put out properly<br>• Broken bottles can act as a magnifying glass and set fire to leaves<br>• Slash and burn farming method can get out of control<br>• Arson – a major cause of the Australian 2009 wildfires<br>• Train wheels or machinery emitting sparks |




## What are the effects of wildfires?

| | |
|---|---|
| Location and Name | Greece, August 2007 |
| Details | |
| Primary and Secondary Effects | |
| | |

| | |
|---|---|
| Location and Name | Victoria, Australia |
| Details | |
| Primary and Secondary Effects | |
| | |

| | |
|---|---|
| Location and Name | California, |
| Details | |
| Primary and Secondary Effects | |
| | |

## How can we reduce the damage and prepare for wildfires?


**Preventing and preparing;**

1. Education plays an important role as many fires are started by arson or accident. Smokey the bear is a huge campaign in the USA and Canada that is used in schools to educate children about the causes and how to prevent wildfires. Leaflets for adults about campfire and farming safety are also produced.
2. Fire Proofing homes and businesses is important. By removing debris from around houses and cutting back trees and grass to remove the fuel source can reduce the risk of houses burning. The Google HQ in California has 'employed' goats to eat the long grass around the building to reduce the risk of wildfires
3. GIS (geographical information Systems) can be used to map the risks of wildfires and are used in planning and preparing by governments and emergency crews.

**Responding to wildfires**

1. In accessible areas fire engines spray the fires with water and foam. Aeroplanes and helicopters drop water on inaccessible areas. Areas ahead of the wildfire are also sprayed in an attempt to dampen the vegetation so it won't burn as easily.
2. Fire lines are dug (or fire breaks) which are area where the vegetation is removed or trenches dug to try and stop the fire from spreading.
3. A backfire is where the area ahead of the fire is burnt s=to remove the fuel but this can create another fire that can get out of control too!
4. Evacuation areas set up.


What will happen in the future?