# GCSE GEOGRAPHY (9-1) – NATURAL HAZARDS: TECTONIC HAZARDS. KNOWLEDGE ORGANISER

## KEY TERMS

**Hazard Risk:** The probability or chance that a natural hazard may take place.

**Natural Hazard:** A natural event (for example earthquake, volcanic eruption, tropical storm, flood) that threatens people or has the potential to cause damage, destruction and death.

**Tectonic Hazard:** A natural hazard caused by movement of tectonic plates (including volcanoes and earthquakes).

**Tectonic Plate:** A rigid segment of the Earth's crust which can 'float' across the heavier, semi-molten rock below.

**Plate Margin:** The margin or boundary between two tectonic plates.

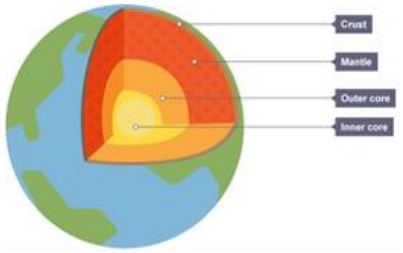
**Primary Effects:** The initial impact of a natural event on people and property, caused directly by it.

**Secondary Effects:** The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale.

**Immediate Responses:** The reaction of people as the disaster happens and in the immediate aftermath.

**Long-term Responses:** Later reactions that occur in the weeks, months and years after the event.

## STRUCTURE OF THE EARTH




**The inner core** is in the centre and is the hottest part of the Earth. It is solid..
**The outer core** is the layer surrounding the inner core. It is a liquid layer.
**The mantle** The mantle is made up of semi-molten rock called magma.
**The crust** is the outer layer of the earth. It is a thin layer between 0-60 km thick. The crust is the solid rock layer upon which we live.

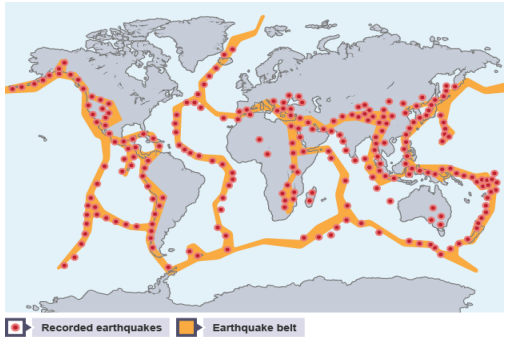
## HAZARD RISK

Natural hazards are occurring more frequently today than 100 years ago. Some regions around the world are more vulnerable to natural hazards than others.

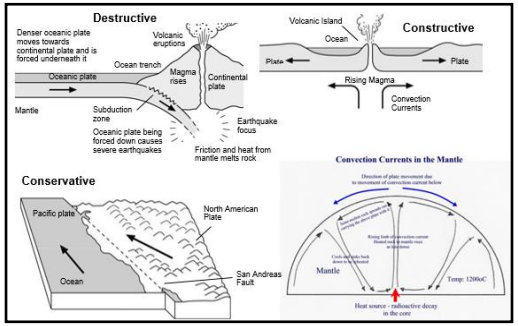
Factors which have led to this increase include urbanisation; poverty; climate change and farming.

## DISTRIBUTION OF EARTH HAZARDS

Not random - 98% at plate margins.
In many cases both occur in the same place.
Both tend to occur in narrow bands that are found in the middle of oceans e.g. Atlantic and along edges of continents e.g. West coast of South America.
Strong pattern around the edges of the Pacific Ocean (Ring of Fire).
Earthquakes occur without volcanoes through central Asia.
Volcanoes are also found in more isolated clusters e.g. Hawaiian Islands in the Pacific Ocean (Hot Spots = where the Earth's crust is thin).




## PLATE MARGINS



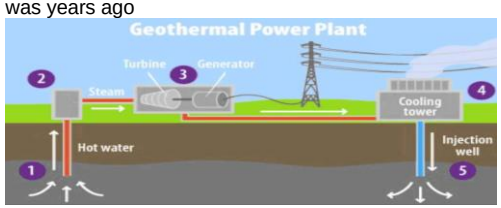

**Volcanoes occur at destructive and constructive plate margins.**

**Earthquakes occur at all plate margins.**

Earthquakes:
When two plates are sliding past each other, parts get locked like teeth. Enormous tension builds up. Suddenly, rock gives way. Tension is released and waves of energy called seismic waves travel in all directions. The focus of the earthquake is the point where the rock gives way. The epicentre is directly above it on the Earth's surface.

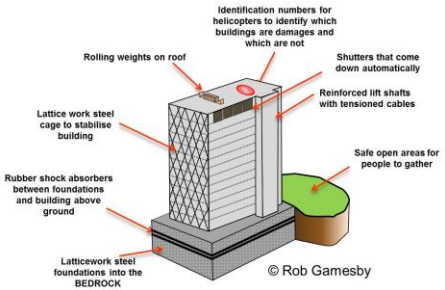
## LIVING WITH TECTONIC HAZARDS

**Geothermal energy** – in volcanically active areas, this is a major source of electrical power and hot water
**Tourism** - volcanic landscapes can have beautiful scenery; hot springs; mud baths
**Mining** - many building materials and industrial chemicals come from volcanoes; volcanic areas also have rich mineral deposits e.g. diamonds, gold and copper
**Farming** – the soil around volcanoes is fertile because it's full of minerals from volcanic ash and lava; this makes it ideal for growing crops
**Family, friends and feelings** – people living in hazardous areas don't want to leave as they want to stay with their friends and family; they can't afford to move; they don't think there is a risk as the last hazard was years ago




## REDUCING RISK FROM HAZARDS

**Monitoring** – recording physical changes to help forecast when and where a hazard might strike e.g. tilt meters to measure changes in shape of ground,
**Prediction** - attempts to forecast an event (when and where) based on current knowledge
**Protection** - actions taken before a hazard strikes to reduce its impact e.g. educating people, constructing earthquake-proof buildings etc.
**Planning** - actions taken to enable communities to respond to, and recover from, natural disasters e.g. emergency evacuation plans, warning systems etc.




## CASE STUDY: Chile – HIC – 2010

**Location**: Western part of South America
**Date**: 27th February 2010
**Magnitude**: 8.8 on the Richter scale

**Cause**: Nazca plate has **subducted** beneath the South American plate. This is a **destructive** plate boundary.

**Primary Effects**: 500 people killed, 12,000 people injured and 800,000 people affected. US$30 Billion in damage. Santiago airport badly damaged.

**Secondary Effects**: 1500km of road cut off by landslides. Coastal towns devastated by tsunamis. Fire at the chemical plant in Santiago.

**Immediate Responses**: Swift and effective response by emergency services. Key roads repaired within 24hours. Most power and water restored within 10 days. $60 million national appeal built 30,000 emergency wooden shelters.

**Long Term Responses**: Strong economy reduced need for foreign aid. Government reconstruction plan to help 200,000 households. Full recovery within four years likely.

## CASE STUDY: Nepal – LIC - 2015

**Location**: Between China and India in Asia
**Date**: 25th April 2015
**Magnitude:** 7.9 on the Richter scale

**Cause**: Indo-Australian plate has **collided** with the Eurasian plate. This is a **destructive** plate boundary.

**Primary Effects**: 9000 people died, 20,000 people injured, 8,000,000 affected. Widespread destruction of buildings and infrastructure. US$5 billion of damage.

**Secondary Effects**: Communities were cut off by landslides. Avalanche on Everest killed 19 people. Avalanche caused flooding in Kathmandu, city evacuated.

**Immediate Responses**: Search and rescue teams, water and medical support arrived from UK, India and China. 500,000 tents provided shelter for homeless. 300,000 people migrated from Kathmandu to seek support and shelter with family and friends.

**Long Term Responses**: Over 7000 schools to be build or repaired. Stricter building codes on buildings being enforced. In June 2015, an international conference was help to discuss reconstruction and seek support from other countries.

# GCSE GEOGRAPHY– NATURAL HAZARDS: WEATHER HAZARDS - KNOWLEDGE ORGANISER

## KEY TERMS

**Global atmospheric circulation:** the worldwide system of winds.

**Jet streams:** fast flow currents of air that circles the planet at a height of 10 km.

**Convection cell:** differences in air temperature lead to the formation of high and low pressure.

**Tropical Storm:** A storm that has a low pressure center, spiral rain bands and strong winds (known to as several names as below).

**Cyclones:** Indian and South Pacific oceans.

**Hurricanes:** Atlantic and the Eastern Pacific oceans.

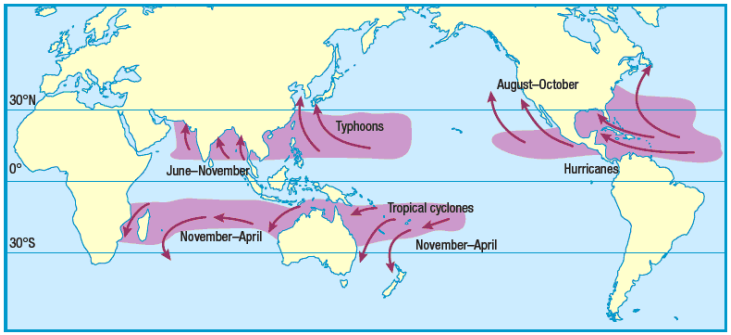
**Typhoons:** West of the North Pacific ocean.

**Coriolis Effect:** the deflection or bending of the wind, due to the rotational spin of the earth.

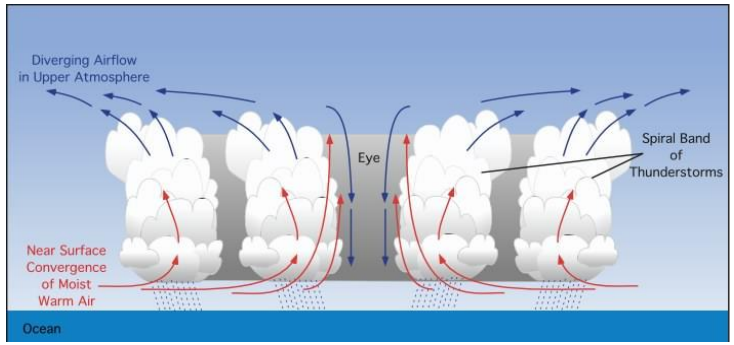
**Saffir Simpson Scale:** A series of measurements showing how intense a storm is, runs from 1 to 5 with 5 being the strongest.

## DISTRUBUTION OF TROPICAL STORMS

Tropical storms occur in the tropics south of the Tropic of Cancer and north of the Tropic of Capricorn. The temperatures here are higher than the poles and it must be above 27 degrees Celsius and at a depth of 60 to 70 meters. The warmest seasons are between summer and Autumn when the water is warmest. Tropical storms do not develop along the equator as the Coriolis force is not strong enough to cause a storm to spin.




## STRUCTURE OF TROPICAL STORMS




## CAUSES OF A TROPICAL STORM

1. Air is heated above the surface of warm tropical oceans. The warm air rises rapidly under low-pressure conditions.
2. The rising air draws up more air and large volumes of moisture from the oceans causing strong winds.
3. The Coriolis Effect causes the air to spin upwards around a calm central eye of the storm.
4. As the air rises it cools and condenses to form large clouds which generate rainfall.
5. Cold air sinks in the eye resulting in no cloud and calm and dry conditions.
6. The tropical storm travels in the direction of the prevailing wind.
7. When it meets land it is no longer fuelled by moisture so it loses power.

## UK WEATHER EXTREMES

Storm Events (west coast of UK) heavy rain

Flooding (heavy rainfall is the usual cause)

Drought events (deaths, lack of water) (2003)

Cold weather extremes (2010-2011).

## CLIMATE CHANGE AND TROPICAL STORMS

- As the temperatures increase sea level will rise due to thermal expansion. Storm surges are expected to get higher.
- A warmer atmosphere will mean the air can hold more moisture and heavier rainfall is expected.
- *Predicting storm changes is unreliable*

**Intensity:** Warmer oceans equals more intense storms. Every 1 degree Celsius of warming will increase wind speed by 5%.

**Frequency:** Amount will stay the same or decrease but there will be more severe storms (categories 4 and 5).

**Distribution**: The areas are not likely to change.

## NAMED EXAMPLE: Typhoon Haiyan

Event: Typhoon Haiyan 2013, Philippines.

**Primary Effects:** 6300 killed and over 600,000 people had to leave their homes.

40,000 homes were destroyed

90% of Tacloban city was destroyed.

**Secondary Effects**: 6 million jobs were lost due to fishing boats being destroyed and fields becoming infertile. Shortages of food, water, power and shelter lead to diseases spreading. Looting and violence in Tacloban.

| Immediate Response | Long Term Response |
|---|---|
| Rapid overseas aid from NGOs arrived in the Philippines.<br>US helicopters assisted search and rescue.<br>Over 1,200 evacuation centers were set up. | UN and international financial aid, supplies and medical support.<br>Rebuilding of infrastructure such as roads and the airport.<br>Homes were rebuilt<br>More cyclone shelters were rebuilt. |

## PREPERATION TO REDUCE EFFECTS

**Monitoring**: allows predictions which save lives. Satellites: classic cloud pattern which satellites monitor. Monitors clouds every 3 hours. Aircraft: special planes fly through to gather data to help develop further understanding.

**Prediction:** monitored weather data fed into computers. Super computers can now give up to 5 days advance warning.

**Protection:** buildings have area of weakness which can be reinforced to reduce damage.

Hurricane straps between walls and roofs should be installed, emergency generator, reinforce garage doors and remove trees near buildings.

**Planning:** American National Hurricane preparedness week, supply kits, fuel in vehicles, planning with family what to do.

## UK EXTREME WEATHER EXAMPLE

**Event:** Flooding of the Calder Valley. Towns affected were Todmorden, Hebden Bridge, Mytholmroyd, Sowerby Bridge and Elland.

**Causes**: Two months' worth of rain fell overnight on Christmas Day 2015. Calderdale's ground was saturated by one of the wettest Novembers and Decembers in history.

**Social Impacts**: Over 2500 homes were destroyed, schools were shut and also roads were blocked which meant emergency services couldn't reach

**Economic Impacts:** 4000 businesses were closed or damaged in the flood. The railway lines were blocked between Todmorden and Hebden Bridge.

**Environmental Impacts:** Sewage and chemicals spilled into the rivers and onto the land, which required cleaning up.

**Responses:** £55 million flood defense scheme was created in the Calder Valley.

£9 million was spent on repairing existing on flood defenses.

Flood sirens were installed throughout the Calder Valley.

# GCSE GEOGRAPHY – COASTAL LANDSCAPES – KNOWLEDGE ORGANISER

## KEY TERMS

**Landscape:** area of land classified as being visually distinct

**Waves:** ripples in the sea caused by wind

**Cliff:** steep high rock face formed by weathering and erosion

**Beach:** zone of deposited material

**Transportation:** movement of material

**Mass Movement:** downhill movement of material

**Deposition:** Occurs when material being transported by the sea is dropped due to the sea losing energy.

## UK Landscapes / Waves

What causes waves:

- Speed of the wind, how long the wind has being blowing for, the fetch (the distance the wind has being blowing for)

Constructive

- Bays / build up beaches / summer
- Strong swash / weak backwash

Destructive

- Exposed areas / destroys beaches / winter
- Weak swash / strong backwash

Long Shore Drift

- Transportation of material due to prevailing wind
- See diagram on the back.

## Physical Processes

**Weathering**

- Chemical: chemical reaction with rocks
- Mechanical: freeze-thaw

**Transportation**:

- Solution: particles dissolved in water
- Suspension: particles carried in water
- Saltation: particles hop along
- Traction: large boulders roll along

**Mass Movement**

- Sliding: material on mass moves downslope
- Slumping: material moves in a straight path
- Rock fall: rocks fall off

**Erosion**

- Hydraulic Action: sheer force of the water
- Attrition: rocks collide with rocks / sea bed
- Abrasion: rocks rub against sea bed
- Solution: rocks dissolve in water

## Coastal Realignment

Managed retreat is when a decision is made to no longer, 'hold the line' and allow the coast to flood / erode land. Case study: Medmerry, West Sussex.

**Benefits**

Social: reduces pressure on other areas along the coastline.

Economic: it is cheaper in the long term.

Environmental: designed to conserve or enhance the natural environment.

**Costs**

Social: relocation of people to other areas and communities split up

Economic: short term costs are high due to compensation pay outs

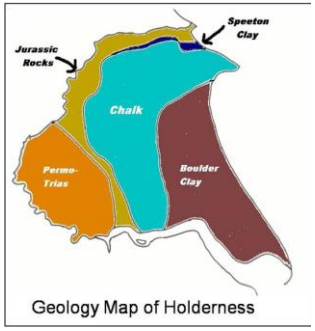
Environmental: large areas of agricultural land is lost

## Rock Structure – Holderness Coast

- Soft rock is easily eroded (boulder clay) compared to harder rock (chalk)
- Discordant coastline (boulder clay in the south and chalk in the north)

Landforms on the Holderness Coast

- Flamborough Head: crack, cave, arch, stack, stump / wave cut platform / headland and bays / rock falls
- Skipsea: slumping / sliding cliffs / beach
- Spurn Point: spit



Geology Map of Holderness

## Features of Erosion

Headland and Bays (see diagram)

- Flamborough Head / Bay
- Headland is a cliff that juts out into the sea (hard rock) and a bay is formed due to soft rock being eroded quickly.

Wave Cut Platforms (see diagram)

- Flamborough, Holderness Coast
- Caused by high and low changes
- Cliff retreat overtime

Caves, arches and stacks (see diagram)

- Flamborough Head, Holderness Coast
- Headland formed
- Crack eroded through HA and attrition
- HA and attrition forms a cave
- Cave eroded on both sides forming an arch
- Weathering causes arch to weaken and collapse
- Stack is left and is eroded down to become a stump due to HA, attrition and solution

## Features Deposition

Beaches

- Low energy constructive waves occur
- Material is deposited and built up over time as it is carried up the beach and weak backwash means material cannot be transported away

Sand Dunes Requirements for Formation

- A large flat beach
- Large supply of sand
- Large tidal range to allow the sand to dry
- On shore wind to move material to the back of the beach
- An obstacle such as driftwood for the dune to form against

Spits and Bars (see diagram)

- Spit forms due to long-shore drift and deposition and is only connected to land on one side
- Bar forms due to long-shore drift and deposition and is connected to land on both sides

## Coastal Management (Hard / Soft)

**(HE) Sea Walls**:– (+) sense of security, last for many years (-) £5,000 a metre, ugly to look at

**(HE) Groynes**:– (+) act as windbreaks, stops long-shore drift, £5,000 per groyne (-) restrict sediment supply down the coast and can increase erosion rates

**(HE) Gabions**:– (+) £110 a metre, last 20 to 25 years (-) dangerous when damaged, damages sea birds feet

**(HE) Rock Armor**:– (+) £1,000 a metre, quick and easy to complete (-) makes access to the beach difficult, rocks imported and inflates the costs.

**(SE) Beach nourishment**:– (+) wider beach means more room for users protects coastal properties, (-) costs £300,000 to hire a dredger, needs to be repeated

**(SE) Beach profiling**:– (+) protects a large area of land (-) bulldozers restrict access to the beach, £200,000 a year

**(SE) Sand Dune Regeneration**:– (+) sand dunes protect land, small planting projects use volunteer labour (-) has to be checked using twice a year, sand dunes change naturally

# GCSE GEOGRAPHY– COASTAL LANDSCAPES – KNOWLEDGE ORGANISER