

Rocks and Plate Tectonics

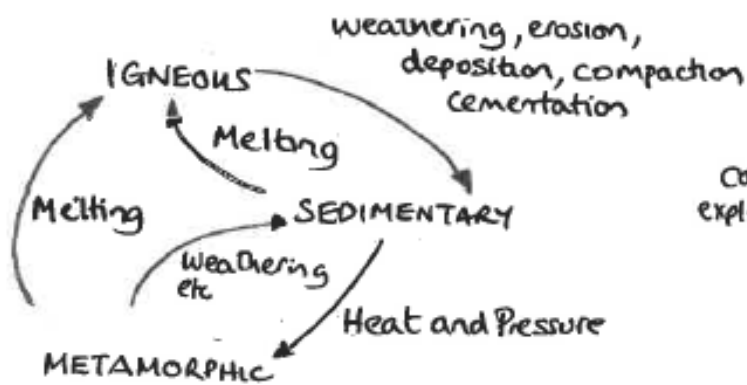
Students must be able to:

- Name and describe the characteristics of the three main rock groups.
- Appreciate the scale of geological time in relation to major changes in life on Earth.
- Name and locate the main structural features of the planet from core to crust.
- Know the broad sequence of occurrences and features at different plate boundaries.
- Label a diagram to show the structure of a volcano and describe volcanic hazards.
- Describe the causes and effects of earthquakes, including tsunamis.

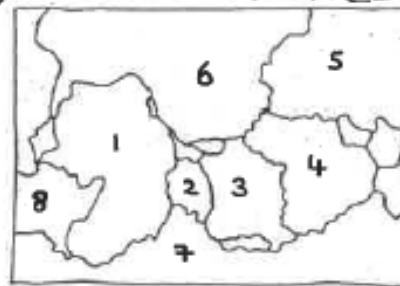
Key Knowledge:

1. **The Earth is around 4.6 billion years old. We as humans are insignificant on the geological timescale. Geological time is divided into Eras and Periods based on events in world history including changes in climate, sea level and geology.**
2. There are four main layers that are found within the Earth: crust, mantle, outer and inner cores. Each layer has different characteristics and properties. This is still supported by numerous pieces of evidence but as yet we can't prove it.
3. **The three main rock types: igneous, sedimentary and metamorphic are all connected together by the rock cycle. These rocks are constantly changing across geological time due to a number of geomorphological processes.**
4. The Earth's crust is divided into large chunks or sections called plates. These plates are moving slowly and being pulled around by convection currents (heat from inside the Earth's structure.) This internal heat and movement drives volcanoes and earthquakes at the edges of these plates.
5. **There are four main types of plate boundary: destructive, constructive, collision and conservative. They all involve different plate movements which determine if the boundary experiences earthquakes, has volcanoes or builds mountains.**
6. Earthquakes are a sudden movement in the earth's crust. They occur as pressure is released as seismic waves within the earth's crust. Their severity and impact can vary depending on a number of physical and human elements.
7. **Earthquakes in LIDCs can have disproportionately devastating effects. Nepal is one of the poorest countries in Asia, in 2015 it experienced a major 7.8 earthquake which killed over 9000 people and had serious long term impacts.**
8. The three Ps of surviving natural hazards are Predict, Prepare and Protect. The location of an event determines how people deal with hazards. There are several ways in which people reduce the impacts of an earthquake, including good emergency planning and earthquake-proof building design.
9. **Tsunamis are a significant secondary effect of earthquakes. In 2011 the Tohoku tsunami was triggered by a massive 9 on the Richter scale which caused significant damage to Japan. The earthquake and tsunami was the most costly tectonic event in the history of the Earth.**
10. There are different types of volcano, including shield and composite. The type of volcano depends on the location (plate boundary) and type of volcanic material within the volcano.
11. **Gunung Merapi (Fire Mountain) is a composite volcano on the Indonesian Island of Java. It has erupted 68 times since 1548.**
12. Volcanoes and earthquakes are natural hazards. Over 500 million people live in direct risk of volcanic eruptions. There are some positive opportunities provided by some environments but 'inertia' and a belief 'that it could never happen to them' could also be major factors.

| Key term | Definition |
|------------------------------------|---|
| Igneous: | a rock formed through the cooling of magma or lava. The slower the cooling, the larger the rock crystals and the harder the rock, although all igneous rocks are very hard. |
| Sedimentary | any rock formed from sediments under pressure from other overlying sediments |
| Metamorphic | rocks created by the chemical alteration of existing rocks under the influence of temperature, pressure, or both. |
| Crust | solid, outer layer of the earth, between 5 and 125km thick. It is either continental or oceanic and is divided into large segments called plates. |
| Mantle | the layer of the earth between the crust and the core. It extends to a depth of 2900km and is mostly made of silicates, iron and magnesium. |
| Core | central interior of the earth. Thought to be an inner core, mostly solid under extreme temperature and pressure, and an outer core, mostly liquid, both composed of iron and nickel. |
| Tectonic plate | large section of the Earth's crust. |
| Plate Tectonics | the theory concerning the structure of the earth and the processes occurring which explain the configuration of the continents and the location of earthquakes and volcanic activity. |
| Destructive plate boundary | a plate boundary where the plates move towards each other and where one is subducted beneath the other and so is destroyed as it returns to the <u>mantle</u> . |
| Constructive plate boundary | a plate boundary where the relative movement of the crustal plates is apart from each other allowing magma to rise from the mantle and solidify to construct new crust. |
| Conservative plate boundary | where the two crustal plates try to move past one another. |
| Collision plate boundary | where two continental plates move towards each other. |
| Epicentre | point on the surface directly above the focus of an earthquake. |
| Focus | the actual point within the crust where the energy was released. |
| Seismic waves | waves of energy released by an earthquake. |
| Seismometer | an instrument used to detect and record seismic waves. |
| Richter Scale | measures the energy released during an earthquake. Runs from 1 to 10 on a logarithmic scale i.e. each level increase is 10x stronger |
| Tsunami | a large wave(s), caused when an earthquake displaces the water above. |



3) TECTONIC PLATES



1. PACIFIC PLATE
2. NAZCA PLATE
3. SOUTH AMERICAN PLATE
4. AFRICAN PLATE
5. EURASIAN PLATE
6. NORTH AMERICAN PLATE
7. ANTARCTIC PLATE
8. INDO-AUSTRALIAN PLATE

4) PLATE BOUNDARIES

i) **DESTRUCTIVE MARGIN** eg South American and Nazca Plate



ii) **CONSTRUCTIVE MARGIN** eg Mid-Atlantic Ridge



iii) **CONSERVATIVE MARGIN** eg San Andreas Fault

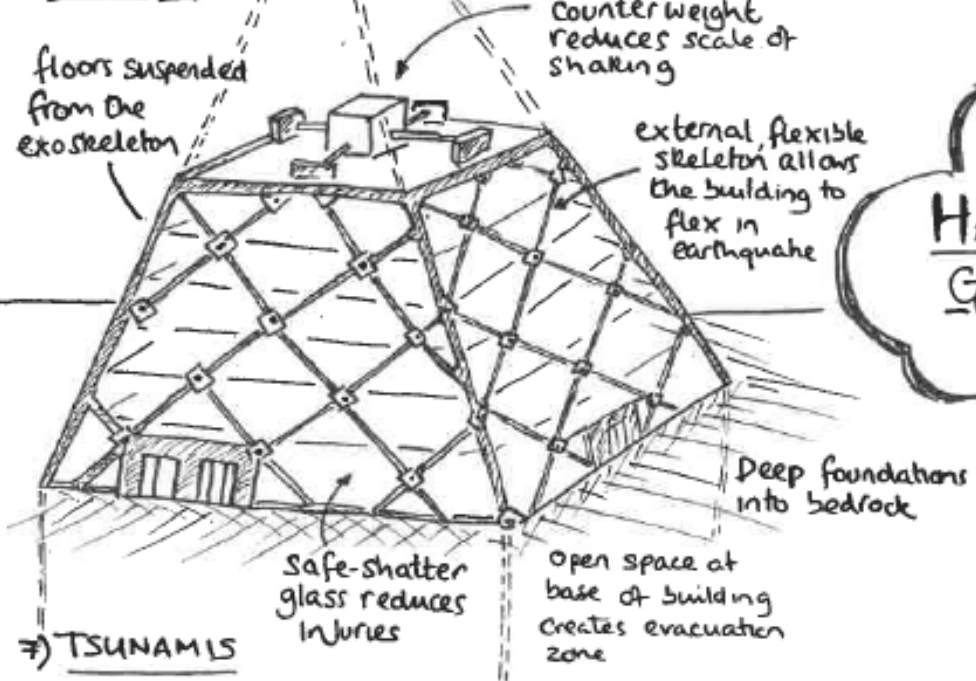


iv) **COLLISION MARGIN** eg Himalayas Eurasian and Indo-Pacific

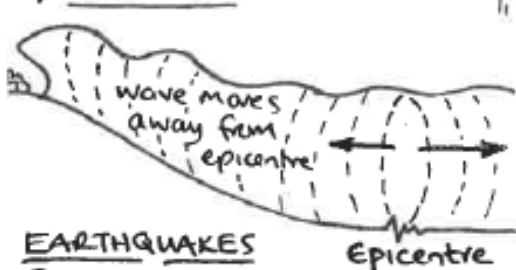


YEAR 9 HAZARDOUS EARTH
Geology and Plate Tectonics

8) EARTHQUAKE PROOFING



7) TSUNAMIS



EARTHQUAKES

PRIMARY EFFECTS

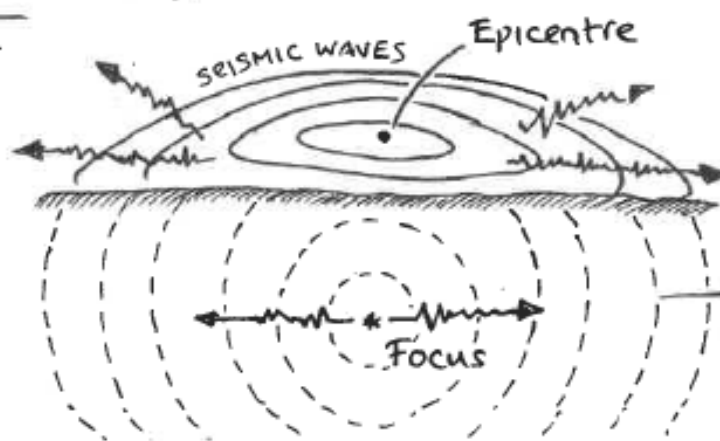
- Shaking
- Buildings collapse
- Burst water and gas pipes
- Destroyed infrastructure

Secondary Effects

- Tsunamis
- Fires
- Disease from broken sewers
- Loss of jobs/industry

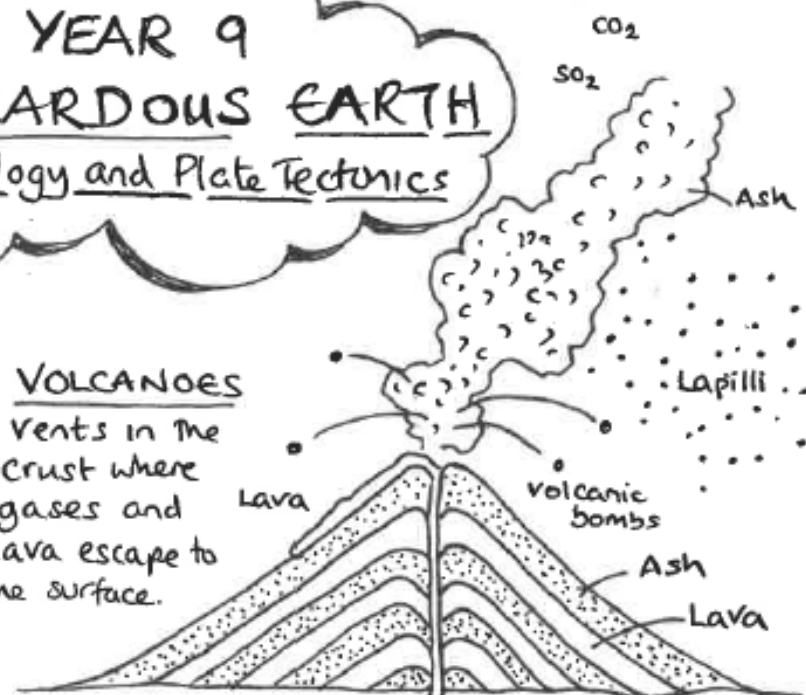
6) EARTHQUAKES

A sudden movement in the earth's crust.



5) VOLCANOES

Vents in the crust where gases and lava escape to the surface.



○ Violent eruptions

A composite volcano

eg. Gunung Merapi

layers of lava

A shield volcano

○ Gentle eruptions

eg. Mauna Loa

SUMMARY

| | Volcanoes | Earthquakes | Crust types |
|--------------|-----------|-------------|-------------|
| DESTRUCTIVE | ✓ | ✓ | O + O or C |
| CONSTRUCTIVE | ✓ | ✓ | O + O |
| COLLISION | x | ✓ | C + C |
| CONSERVATIVE | x | ✓ | CoO + CoO |

Crust types
C = Continental
O = Oceanic

Coast and Coral Reefs

Students must be able to:

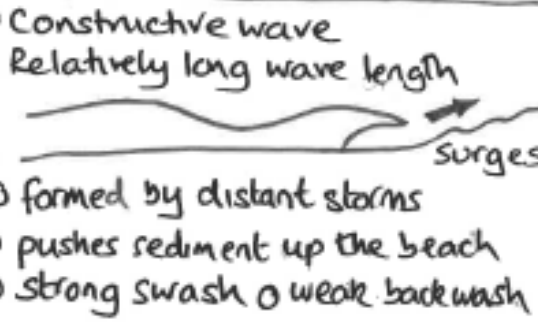
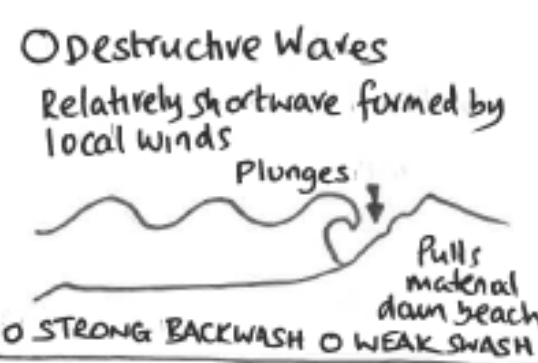
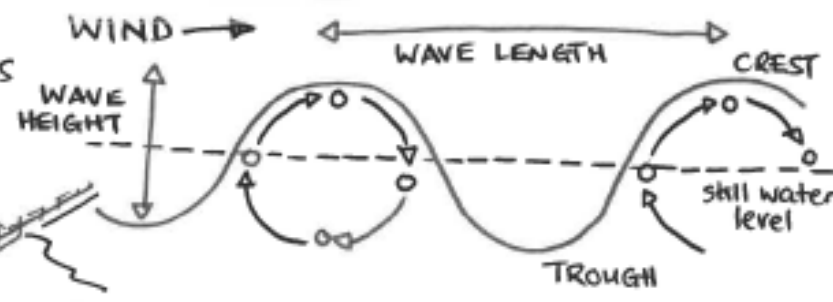
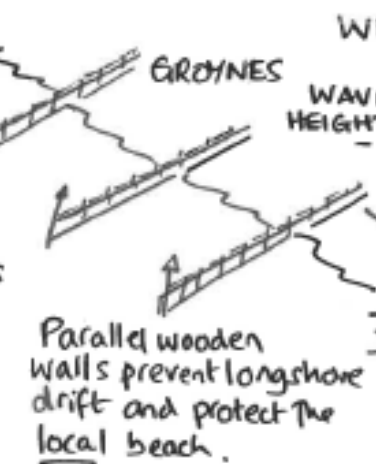
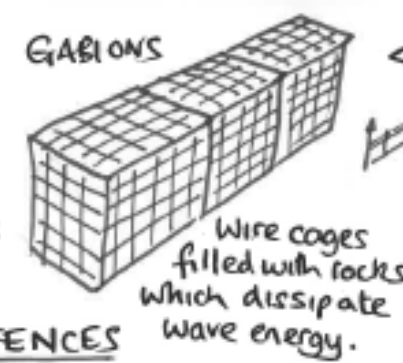
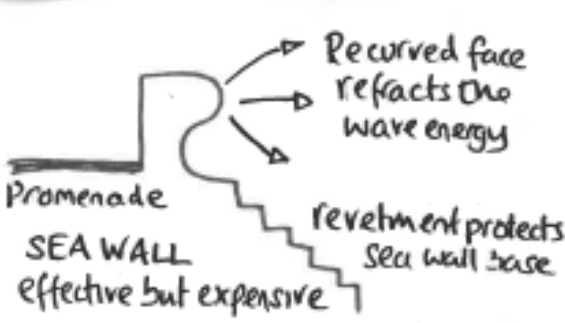
- Explain the importance of our oceans to our planet and its people.
- The location and reasons for the locations of coral reefs, including conditions for healthy coral growth.
- The ecological importance of coral reefs for biodiversity and its importance to humans.
- The recognition of different types of coral reefs and reasons for their evolution.
- Evaluate current threats to the coral ecosystem and link to their specific location.
- Give examples of management of coral reefs and consider the contributions individuals can make to the future of coral reefs.

Key Knowledge:

- Waves and tides create constant movement on the surface of the world's seas and oceans and along their coastlines. They derive their energy from the wind and the moon.**
- Waves convert the energy of the wind into the circular motion of water. This energy travels through the surface of the sea and can **erode** the coastline. Waves carry sediment to be deposited elsewhere.
- Geology can have a major influence on rates of erosion and therefore the landforms they create. Resistant rocks may form headlands while less resistant rocks may erode into bays.**
- Waves refract (bend) around headlands to concentrate their erosive power at the headland creating dramatic coastal scenery including caves, arches, and stacks. Wave energy is spread out in bays where material is deposited to form beaches.
- All the material eroded from the coastline must be transported elsewhere and ultimately deposited. Beaches are made up of eroded material. Longshore drift transports sediment along a coast in a zig-zag motion. Spits form where there are large amounts of sediment carried by longshore drift to a break in the direction of the coastline.**
- Nearly three quarters of the Earth's surface is covered by ocean which makes the Earth appear blue from space. The five oceans give us food, create our weather patterns, moderate our climate and act as a global carbon sink.
- Most of the islands found in tropical seas have an intimate relationship with coral – a tiny colonial animal, related to jellyfish, which has a hard calcium carbonate shell.**
- Many of the tropical islands of the South Pacific, along with the Caribbean and Indian Ocean began life as volcanoes but have been transformed by plate movement and the growth of coral reefs. Some are still active volcanoes (Montserrat) while other have become coral atolls (Tuvalu).
- There are many threats to the health of the ecosystems of the South Pacific, as well as to human populations. Most are caused by the unsustainable use of natural resources such as over-fishing and climate change linked to the burning of fossil fuels.**
- As many of the problems facing tropical seas are anthropogenic (man-made), so the solutions to these issues can also be found in the people of the world working to saving our natural environments. These solutions include designating marine reserves, controls on fishing and reducing pollution.

| Key term | Definition |
|--------------------|---|
| Erosion | The wearing away of the land by movement. |
| Hydraulic Action | erosion through the breakdown of rock through the sheer impact force of waves. |
| Abrasion | erosion through the scraping away of rocks as material carried by the waves crash in to the land. |
| Attrition | erosion as sediments collide and become smaller and more rounded. |
| Solution | erosion as material is dissolved by the water at the coastline |
| Destructive waves | a steep, short wave-length and high frequency wave which causes a net loss of material from the beach as the backwash is stronger than the swash |
| Constructive waves | a relatively low-height, long-length, low-frequency wave where the net movement of material is up the beach because the swash is stronger than the backwash |
| Fetch | the distance wind has travelled over open water to create waves. |
| Longshore Drift | the movement of sediment along a coast. The swash is often at an angle to the coastline, while the backwash brings material down at 90° to the beach slope. Sediment is thus moved in a zig zag motion along the beach. |
| Swash | the movement of water up a beach with the breaking of a wave. |
| Backwash | the movement of water down a beach to the sea after having run up the beach in the swash. |
| Hard engineering | solutions to problems of resource management involving building of structures e.g. sea walls. |
| Soft engineering | solutions to problems of resource management involving working with nature. |
| Coral | tiny animal (polyp) which lives in large colonies in warm, shallow, clear and pollution-free salt water. |
| Coral Reef | offshore accumulation of dead coral, usually with live coral growing on top |
| Polyps | tiny, soft-bodied organisms related to sea anemones and jellyfish. At their base is a hard, protective limestone skeleton, which forms the reef. |
| Zooxanthellae | algae that are able to live in symbiosis with marine invertebrates such as corals, jellyfish, and sea anemones. |
| Fringing Reef | growing along the coastline around islands and continents, fringing reefs are the most common type of reef. |
| Barrier reefs | reef running parallel the coastline but are separated by deep, wide lagoon |
| Atoll | rings of coral that surround protected lagoons |
| Biodiversity | the variety of plant and animal life in a particular habitat, a high level of which is usually considered to be important and desirable. |
| Sustainability | meeting today's needs in such a way as to protect the environment and resources for the future. |

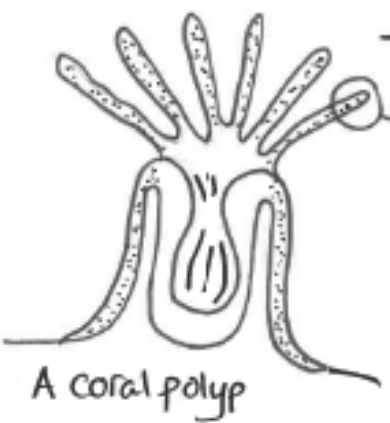
YR 9 COASTS AND CORAL



Features of a sea wave

WAVES

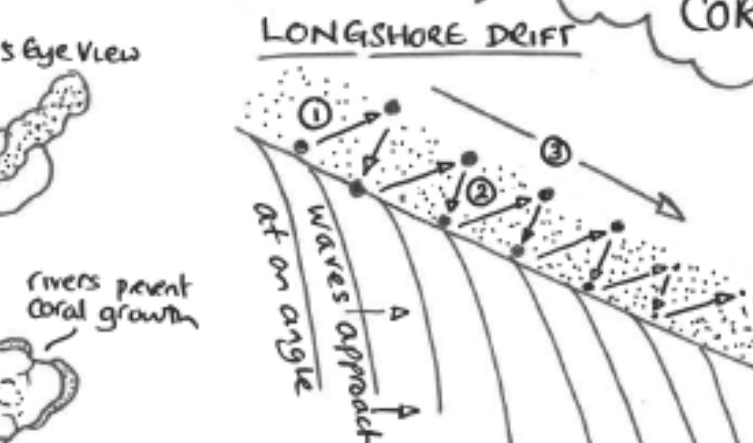
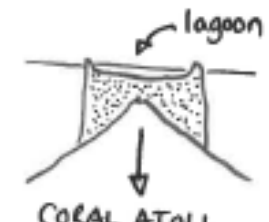
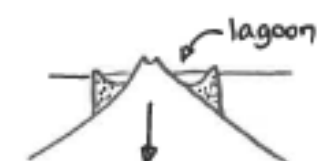
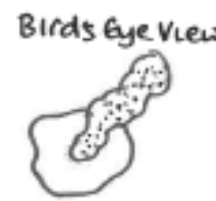
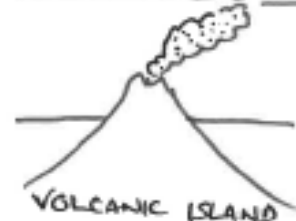
Created from the friction between wind and the surface of the sea
○ Fetch - the distance and direction a wind can blow over the sea to create waves.



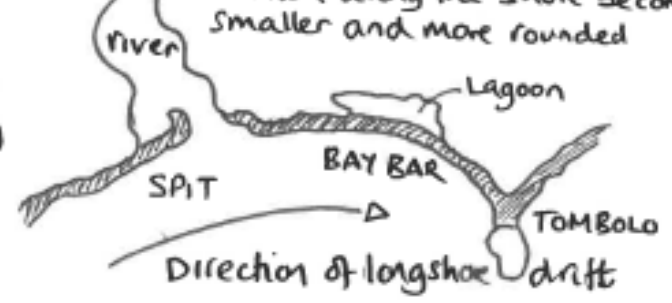
Zooxanthellae algae. This gives coral its colours
Stinging cells

CORAL
Simple creatures related to jellyfish. A coral polyp lives in a colony called a coral head. Many heads form a coral reef.

CORAL ISLAND FORMATION

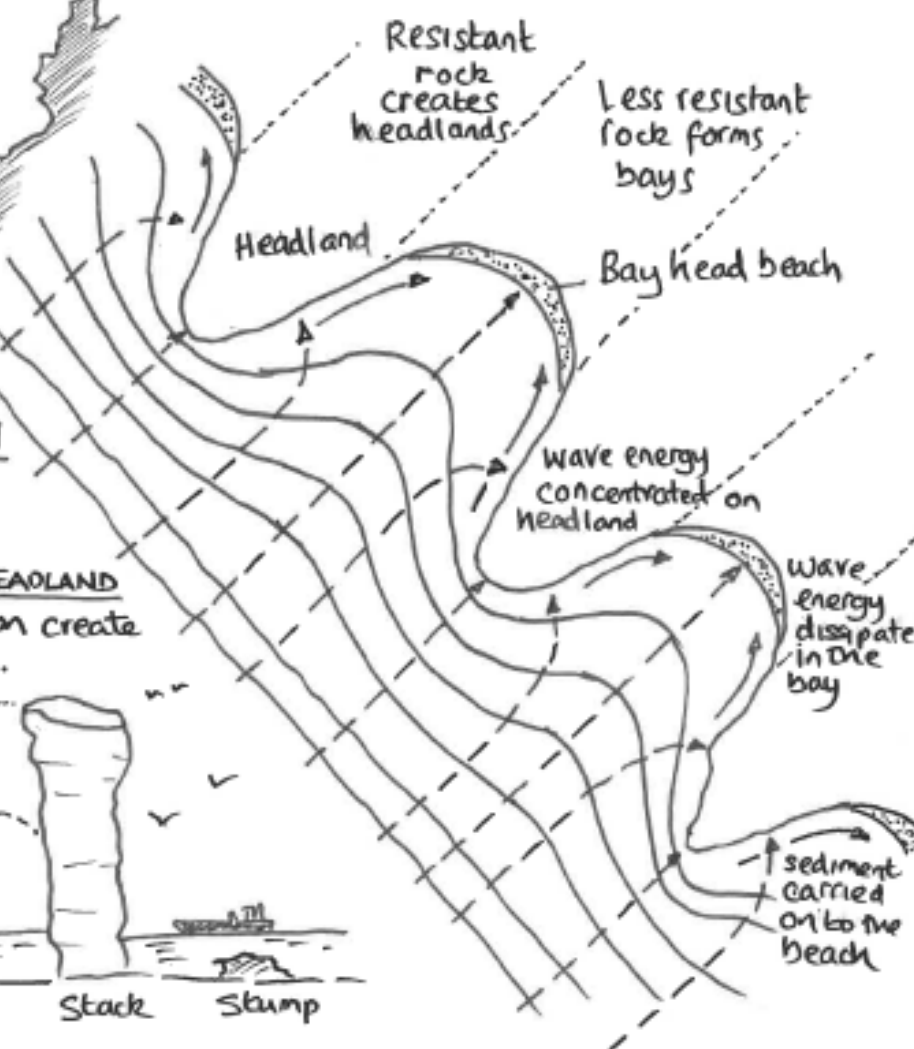
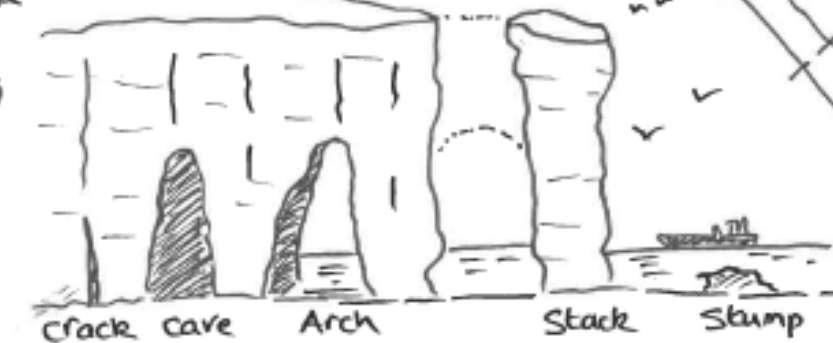


- ① material carried up the beach at the angle of swash.
- ② sediment rolls down the beach in the backwash at 90° to the slope
- ③ sediment moves in a zig-zag motion along the shore becoming smaller and more rounded



WAVE REFRACTION

FEATURES OF A ROCKY HEADLAND
Erosion and wave refraction create caves, arches and stacks.



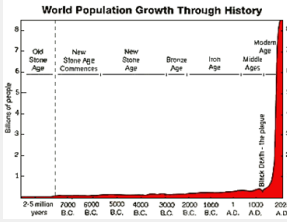
Population

Students must be able to:

- ❑ Identify causes for the changes in birth and death rates over time. This includes being able to describe and explain the changes as countries develop through the 5 stages of the Demographic Transition Model.
- ❑ To recognise how a population is structured and how it may change over time or by location.
- ❑ To be able to recognise and explain the different issues associated with a youthful and ageing population.
- ❑ Recognise the strengths and weaknesses of a number of different population policies e.g. the Chinese One Child Policy.
- ❑ Recognise factors that influence the different types of migration including “Lees” model of migration

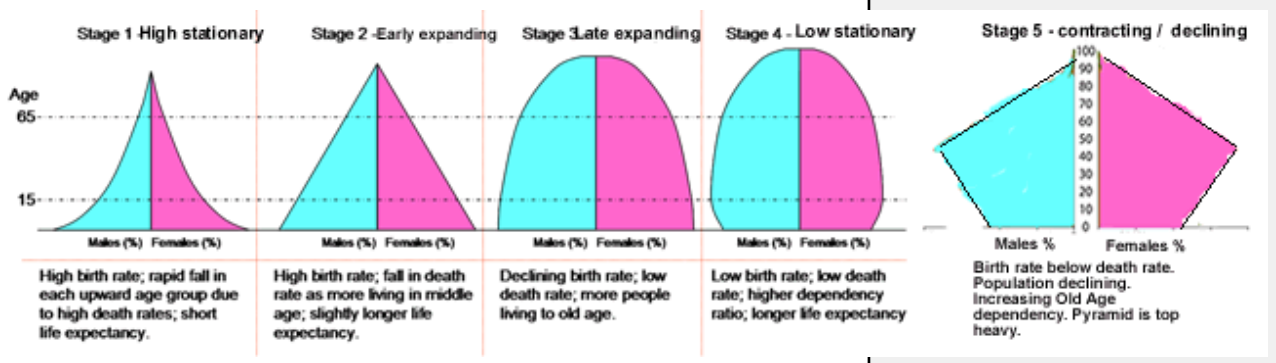
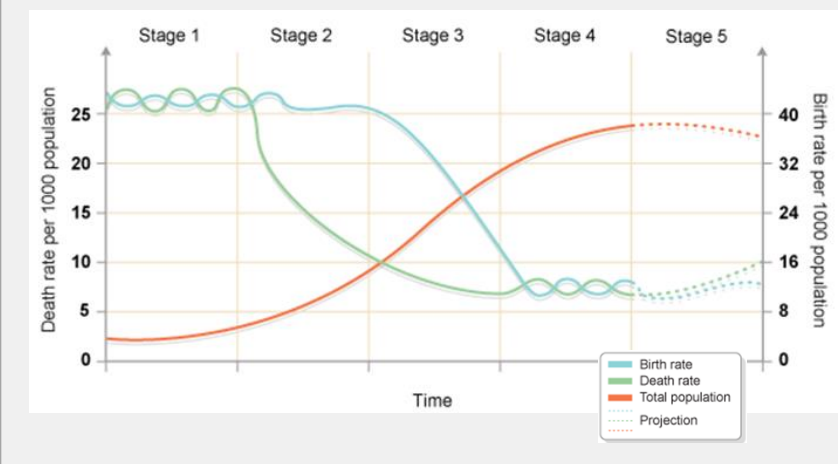
| Key term | Definition |
|------------------------------|---|
| Birth rate | Number of births per thousand people per year. |
| Death rate | Number of deaths per thousand people per year. |
| Demographic Transition Model | A theory of population change over time. Seeks to explain population increases and decreases through variations in the <u>birth rate</u> and <u>death rate</u> . |
| Migration | The movement of people either within a country or between countries, lasting longer than one year. Generally classified by motivating reason: forced e.g. poverty, war, famine. voluntary e.g. looking for better work, education. |
| Infant mortality | The number of deaths of infants below one year of age as a proportion of every thousand live births in that population in that year. |
| Population Structure | The ratio of age groups, by sex, within a population. |
| Push-Pull Model | Push / Pull Factors. Push Factors: induce people to move out of their current location. Ex: poverty, political instability, religious intolerance. Pull Factors: induce people to move to new location. Ex. Democratic gov., thriving economies, job opportunities. Simple Migration Model. |
| Lees Model | a model that accounts for push/pull factors, intervening obstacles, in order to project migratory patterns. |
| Youthful Population | The high birth rate in LICs results in a high proportion of the population under 15. This youthful population gives a country specific problems. The problems include: Young children need health care - for example, immunisations. |
| Ageing Population | This involves an increase in the median age of the population, an increasing proportion of people living to old age (and in many cases extreme old age above 85 years), increasing life expectancies and decreasing numbers of children as a proportion of the population |
| Population policy | Government interventions to try and control high population growth, stimulate low population growth or control the distribution of people within a country. |

| Exponential Population Growth | |
|--|--|
| Population is increasing extremely fast Population size is determined by birth rate and death rate Birth rate = number of babies born per 1000 Death rate = number of deaths per 1000 | |



| Impacts of Rapid Population Growth | |
|------------------------------------|---|
| Social | <ul style="list-style-type: none"> Services can't cope Children have to work Not enough houses leads to shanty towns Food shortages |
| Economic | <ul style="list-style-type: none"> Not enough jobs so increased unemployment Increased poverty |
| Political | <ul style="list-style-type: none"> Government focuses on policies for the younger population Population policies to bring population under control |

The Demographic Transition Model



POPULATION CHANGE KNOWLEDGE ORGANISER

| Birth Control Policy | A case study of China |
|--|--|
| What was the Policy and why was it needed? | <ul style="list-style-type: none"> 1.3 billion in China Population resource imbalance 1979 introduced the one child policy. Strong encouragement to have one child by benefits such as better housing, longer maternity leave and free education |
| Changes to the policy | <ul style="list-style-type: none"> Young couples who are both only children can have two children. As people become wealthier, some choose to have more children and pay the fines. Couples don't need to obtain permission to have their first child. In 2014 it was relaxed to allow 2 children |
| Consequences | <ul style="list-style-type: none"> Women have been able to concentrate on having a career With boys being favoured more than girls China has a serious gender imbalance. There are now 60 million more young men than young women. There are over 15million orphans in China, mainly girls, abandoned as a result of the One Child Policy and Chinese society's economic and social preference for boys. Missionary run orphanages are usually very good but in state run ones the girls are often neglected and badly treated. 400 million births have been prevented |

| Non Birth Control Policy | Case Study : Kerela, Southern India |
|---|---|
| How has population growth been managed? | <p>Key focus has been on social changes</p> <ul style="list-style-type: none"> improving education standards and treating girls as equal with boys providing adult literacy classes in towns and villages educating people to understand the benefits of smaller families reducing infant mortality so people no longer need to have so many children improving child health through vaccination programmes providing free contraception and advice encouraging a higher age of marriage allowing maternity leave for the first two babies only providing extra retirement benefits for those with smaller families following a land reform programme |

| Ageing population | UK case study |
|-------------------|--|
| Impacts | <ul style="list-style-type: none"> People living longer. Over 16% of the UK's population over 65 years Need more money to pay for the ageing population More older people living in poverty Economy grows more slowly Health service is under pressure People work as unpaid carers |
| Strategies | <ul style="list-style-type: none"> Raise the retirement age so people will pay tax and fewer claiming a pension Encourage immigration of young people to the UK – 80% immigrants from EU under 34 years old Encourage women to have children with working family tax credits Encourage people to take out private pensions |

| Migration | Case Study : Polish to the UK |
|--------------------------|--|
| Key definition | <ul style="list-style-type: none"> Immigration : people moving into an area (known as immigrants) Emigration : people leaving an area (known as emigrants) International migration : people moving from one country to another |
| Push factors from Poland | <ul style="list-style-type: none"> High unemployment – 19% Low average wage – it is 1/3 of the EU average wage Housing shortages – just over 300 houses for every 1000 people |
| Pull factors to the UK | <ul style="list-style-type: none"> The EU allowed unlimited migrations in 2004 when Poland joined the EU More work and higher wages in the UK – high demand for tradespeople Good exchange rate – pound worth a lot compared to the Polish currency |
| Impacts in Poland | <ul style="list-style-type: none"> Poland's population fell as did the birth rate (young people had migrated) Shortage of workers in Poland Polish economy boosted by money sent home by emigrants (Euros 3 billion a year) |
| Impacts in the UK | <ul style="list-style-type: none"> UK population increased slightly Boosted UK economy as more paying taxes New shops selling Polish products open up Attendance at Catholic churches increased Racial tensions in some areas |