Secondary 3 Physical Geography
Chapter 1: Coasts
Revision

This set of notes is supposed to act as a trigger for your thoughts during your revision. It is **NOT SUITABLE** for those who are still unfamiliar with content. Otherwise, please refer to the PowerPoint slides.

Gateway 1

- Factors affecting coastal environments
- Waves basics
- Wave refraction
- Coastal processes
- Coastal landforms

Factors affecting coastal environments

Factors: waves, tides, currents, geology (study of rocks), types of ecosystems, human activities

Waves, tides and currents

- Waves affect the rate of erosion.
- Tides affect the rate of sediment transport and the rate of erosion.
- Currents affect the distribution of sediments.

Geology (study of rocks)

- Determines the rate of erosion.
- Harder rocks (e.g. granite, basalt) will erode slower than softer rocks (e.g. limestone). Erosion weakens the rocks *(studied more under the section of solution)*.

Waves basics

Basics of waves: waves in the open ocean and waves close to the coastline, constructive and destructive waves

Waves in the open ocean and waves close to the coastline

- Waves in the open ocean have a long wavelength and low wave height.
- As waves approach the coastline, the water gets shallower and the waves start to interact with the seabed. The base of the wave eventually slows down due to friction. The wavelength of the wave decreases whereas its wave height increases. The wave crest will become steeper and it topples over, causing the wave to break on the coast.

Constructive waves and destructive waves

- Constructive waves break far from the shore with little energy. They have a stronger swash than backwash. The waves have a low gradient and constructive waves are generally seen in low energy environments. Deposition is more prominent.
- Destructive waves break far from the shore with high energy. They have a stronger backwash than wash. The waves have a steep gradient and destructive waves are generally seen in high energy environments. Erosion is more prominent.

Wave refraction[1]

- Waves change direction as they approach a coast.
- When they approach a headland, they will converge and bend towards it, resulting in greater wave energy to be concentrated, leading to more erosion.
- When they reach the adjacent bays, they will diverge, resulting in the wave energy to be spread out. Deposition occurs here.
- Over time, the coastline will straighten due to the effects of coastal erosion and deposition.

Coastal processes

Coastal processes: coastal erosion (HAAS), sediment transport

Coastal erosion (hydraulic action)

- Waves strike against a rock surface, trapping air in the rock joints, exerting pressure on the rock surface.
- The joints weaken and the rocks shatter.

Coastal erosion (abrasion)

- As waves break, sediments are hurled against the coast. The sediments knock and scrape against the coastal cliff, further weakening the surface.
- Usually, the cliff will be undercut due to the powerful effects of coastal abrasion.

Coastal erosion (attrition)

- When rock particles carried by waves rub or hit one another, they break down into smaller pieces and become smoother and rounded over time.

Coastal erosion (solution)

- Seawater reacts chemically with water-soluble minerals in rocks and dissolves them (i.e. limestone rocks are easily eroded by carbonic acid in solution).
- The rocks weaken and eventually disintegrate.

Sediment transport

- As waves approach a coast, they move up at an angle as swash. The pull of gravity and friction with the seabed drags them down perpendicularly as backwash.
- Waves generate longshore currents (parallel to the coastline) in the nearshore zone.
- Longshore drift = longshore current + beach drift.

Coastal landforms

Erosional landforms: cliff and shore/wave-cut platform, headland and bay, cave, arch and stack

Depositional landforms: beach, spit and tombolo

Cliff and shore/wave-cut platform

- Hydraulic action and abrasion may erode a crack on the rock surface. This enlarges the crack to form a notch.
- The notch may be further deepened to produce a bigger hollow space called a cave. Erosion causes the roof of the cave to collapse and form a cliff.
- Over time, an overhanging cliff will be formed. The cliff will collapse, causing the materials to be deposited at the foot of the cliff. *(Can elaborate about further erosion)*
- The cliff will retreat inland and a gently sloping platform known as a shore platform (submerged during low tides) is formed.

Headland and bay

Caution: There is a difference when a question asks to **explain how the coastline is straightened over time**[1] and **explain the formation of headlands and bays**.

- Some coastlines have alternate bands of more resistant and less resistant rocks. The less resistant rocks will be eroded quicker.
- When the less resistant rocks are eroded, bays are formed. Bays are wide indented coasts.
- The remaining more resistant rocks extend into the sea, forming headlands.

Cave, arch and stack

- Waves attack lines of weakness at the base of a headland and undercut it. The continuous action of waves forms a cave that is hollowed by wave action.
- Caves may develop on each side of the headland. Erosion joins the waves together, leaving a bridge of rock above the opening called an arch.
- The roof of the arch may collapse, forming a stack.

Spit and tombolo

- Spits are formed by longshore drift. Even if there is a sudden change in the orientation of the coast, the longshore drift will continue to transport the sediments in the original direction.
- Materials accumulate, become thicker and appear above water.
- The spit often has a curve/hook due to wave refraction.
- It grows via deposition and eventually joins a nearby island to form a tombolo.

Gateway 2

- Uses of coastal areas
- Coral reefs (distribution, environmental conditions for growth, pressures)
- Mangroves (distribution, adaptations, values, pressures)

Uses of coastal areas

Uses: fisheries and aquaculture (i.e. Ca Mau, Vietnam), housing and transportation (i.e. Kukup, Malaysia), tourism and recreation (i.e. Sentosa, Singapore)

Coral reefs

Coral reefs: distribution, environmental conditions for growth, pressures

Distribution of coral reefs

- Mostly found between the Tropic of Cancer and Tropic of Capricorn (i.e. The Great Barrier Reef, Australia)

Environmental conditions for growth

- Warm, shallow and clear tropical saline waters no deeper than 60m. This is to allow photosynthesis of coral food.
- If there is low salinity, sunlight will not penetrate through the water so the corals are unable to carry out photosynthesis, hindering their growth.

Pressures threatening coral reefs

- Fishing methods (i.e. Philippines, Indonesia)
- Recreational use of coast
- Coastal development (i.e. Singapore, Japan)
- Climate change (i.e. Micronesia, Venice)

Mangroves

Mangroves: distribution, zonations, adaptations, values, pressures

Distribution of coral reefs

- Mostly found on the coastlines of areas between the Tropic of Cancer and Tropic of Capricorn.

Coastal zonation

- Grow in saltwater and they have breathing aerial roots (e.g. Avicennia).
- Trees are subject to strong tides and sediment changes.
- Aerial roots help plants take in oxygen from the atmosphere as the muddy ground is oxygen-deficient.
- Leaves have salt glands that secrete salt. Salt is washed away by the sea during high tides.
- Fruits are buoyant so they can float on water and germinate in other areas.

Middle zonation

- Mangroves have prop/stilt roots. Sedimentation allows the plants to grow to a greater height (e.g. Rhizophora).
- Prop roots help plants anchor themselves firmly to the ground so that they are not easily swept away by waves.
- Fruits are javelin-shaped to allow the fruit to pierce into the soft mud for germination.

Inland zonation

- Least tolerant mangroves to saltwater (e.g. Bruguiera).
- Knee-like roots allow oxygen intake in waterlogged oxygen-deficient soil conditions and provide stability for the tree in the soft unstable ground.
- Roots trap soil (essential for growth) between their roots.

Values of Mangroves

- A breeding ground and habitat for marine creatures.

Pressures threatening mangroves

- Clearing of mangroves for wood and charcoal (e.g. Malaysia).
- Conversion to other land uses (e.g. Ca Mau, Vietnam).
- Rising sea level (e.g. Venice, Micronesia)

Gateway 3

- Laws and regulations
- Soft engineering measures
- Hard engineering measures

Laws and regulations

Laws and regulations: limit damaging activities, protect coastal resources, restrict development in areas prone to natural hazards

Limit damaging activities

- Damaging activities threaten to disrupt the balance of ecosystems (i.e. clearing mangroves for aquaculture farms).
- Such activities cannot be banned but they can be minimised to ensure a balance between needs, intactness of nature and economic profits.

Protect coastal resources

- Aims to prevent resources from being depleted.
- An example is limiting damage to grasses planted to stabilise dunes on Port Phillip in Melbourne, Australia to prevent sand from being blown and burying houses. Done by fencing off dunes, building access paths and building walkovers to the beach to avoid grasses being trampled on by beach-goers.
- However, this destroys the aesthetic appeal of the beach.

Restrict development in areas prone to natural hazards

- Discouraging over-fishing and destructive fishing methods to protect marine ecosystems and sustain endangered species.
- Carried out at the Wakatobi National Park, Indonesia where the banning of fishing has led to the recovery of the fish population.
- Local fishermen suffered a loss of income as they have been denied their traditional fishing grounds.

Soft engineering measures

Soft engineering measures: beach nourishment, planting vegetation and stabilising sand dunes, encouraging coral reef growth

Beach nourishment

- Replenishing of large quantities of sand from another source.
- Implemented on Siloso Beach in Sentosa, creating an aesthetically appealing beach for recreational purposes.
- Changes a coast into a wide, sandy beach but an expensive strategy.

Planting vegetation

- Mangrove-planting near coasts uses human power.
- Mangroves were planted along the entire 4800km Malaysian coastline against strong waves and winds, preventing erosion.
- Prop roots trap sediments and reduce coastal erosion and mangroves form a wall of protection against natural disasters like tsunamis.
- Mangroves only grow in tropical regions, (both freshwater and saltwater). Requires calm conditions for survival (no destructive waves).

Stabilising sand dunes

- Involves the use of vegetation to bind existing sand dunes which exist along the coast.
- Marram grass is planted at Omaha Beach, New Zealand.
- Prevents coasts from being disturbed by human activities. The dunes protect the coast from erosion. Inexpensive.
- Can only be implemented on sandy beaches since coastal dunes are formed there naturally.

Encouraging coral reef growth

- Involves the cultivation of coral polyps in laboratories and subsequently transplanting them along the coast by human means.
- Coral reefs in Malaysia are protected to enhance growth to slow down oncoming waves, reducing erosion.
- Artificial reefs can act as a natural off-shore breakwater to absorb the impact of waves and protect the coast behind it. No environmental damage as it is a fully natural process.
- Cannot be implemented in all coastal regions as coral reefs only grow in warm tropical areas and specific zones where water is not so deep and reefs can still absorb sunlight.

Hard engineering measures

Hard engineering measures: seawalls, gabions, breakwaters, groynes, tetrapods

Seawalls

- Concrete structures built parallel to a coast.
- Seawalls are built around the Esplanade in Singapore to absorb wave energy and protect the coast from erosion.
- Reflect energy from the incoming waves. Costly as it requires much manpower, machinery and resources as well as expertise. May be unaffordable for LDCs.

Gabions

- Wired cages containing small rocks used to form a wall to protect the coast.
- Gabions in Norfolk, United Kingdom, weaken wave energy to reduce the rate of erosion.
- Dissipates wave energy.
- Short term strategy as wired cages corrode easily by seawater by solution. May alter the natural coastal processes of erosion and deposition. The natural environment may be disturbed as a result.

Breakwaters

- Structures composed of concrete or boulders built parallel to the coast or with one end attached to the coast.
- Break the force of oncoming waves before they reach the shore.
- Built at East Coast Park, Singapore and are used to accumulate sediments, forming beaches.
- Protects only a limited area of the coast. Areas located away from breakwaters will not receive sufficient sediments and will be eroded away over time.

Groynes

- Low walls constructed at right angles to the coast to trap beach sediments.
- Absorb energy waves and cause materials to be deposited on the side of the groyne facing the longshore drift.
- Built at East Coast Park in Singapore, slowing down beach drifting and encouraging the development of a wide beach.
- Short term strategy. Requires constant maintenance as it is continuously impacted upon the waves. Erosion and deposition may impact natural habitats.

Tetrapods

- Four-legged concrete structures stacked offshore in an interlocking position.
- Successfully implemented off the coast of Hokkaido in Japan.
- Allow water to pass around them rather than hitting against them. Has a longer life span compared to other hard engineering structures as gaps in interlocking tetrapods allow water to flow freely.
- Hazard to swimmers and surfers. Aesthetically unappealing and affect the natural beauty of coasts.

Secondary 3 Physical Geography
Chapter 2: Living with Tectonic Hazards
Revision

Gateway 1

- Internal structure of the Earth
- Tectonic plates (composition, movement)
- Divergent plate boundaries (OO, CC)
- Convergent plate boundaries (OO, CC, OC)
- Transform plate boundaries

Internal structure of the Earth

The Earth is made up of the core, mantle and crust.

Core

- Rich in iron and nickel. Divided into the outer core and the inner core.
- The outer core consists of liquid whereas the inner core is solid (pressure).
- Temperature varies between 3000°C and 5000°C.

Mantle and asthenosphere

- The mantle consists of mainly solid rock which flows under high temperature and pressure. The uppermost mantle is beneath the crust and it is dense and rigid.
- The asthenosphere lies beneath the uppermost mantle and it comprises viscous rocks.
- Temperature varies between 800°C and 3000°C.

Crust[2]

- The crust consists of solid rocks. There are two types of crust – oceanic and continental.
- The oceanic crust is found beneath the oceans whereas the continental crust is found beneath the continents.
- Oceanic crust is thinner and denser but the continental crust is thicker and less dense.

Tectonic plates

Composition of tectonic plates (a repetition of Index 2)

Movement of tectonic plates (convectional currents)

- Material in the mantle is heated by the core, causing convection currents in the molten mantle material. The mantle expands, rises and spreads out beneath the plates. Plates are dragged along as they diverge.
- The hot molten mantle cools slightly and sinks, pulling the plates along (converge). The sinking mantle material heats up again and the cycle repeats.

Movement of tectonic plates (slab-pull force)

- Occurs when a denser oceanic plate subducts a plate of lesser density and pulls the rest of the plate along.
- The subducting plate drives the downward-moving portion while mantle material away from the subduction zone drives the rising portion of the convection currents.

Divergent plate boundaries

Divergent plate boundaries consist of OO and CC.

OO divergence

- Magma rises from the mantle to fill the gap between the plates as they diverge. The new seafloor is formed when the magma cools and solidifies (sea-floor spreading).
- At the spreading zone, a mid-oceanic ridge forms (elaborate on the age of rocks).
- At various points along the ridge, magma builds up above the ocean to form volcanic islands.
- i.e. Mid-Atlantic Oceanic Ridge (Eurasian and North American Plate)

CC divergence

- The plates are stretched, forming fractures on the continental crust. Eventually, a rift valley is formed.
- i.e. East African Rift Valley (Nubian African and Somalian African Plate)

Convergent plate boundaries

Convergent plate boundaries consist of OO, CC and OC.

OO Convergence

- The denser oceanic plate will subduct beneath the less dense oceanic plate. A deep oceanic trench is formed at the subduction point. The mantle material of the subducted oceanic plate melts, forming magma.
- The magma rises through the crust, forming volcanoes. Eventually, an arc of islands is formed.
- Earthquakes may occur at the boundary between two plates due to friction between the moving rocks when a plate subducts under another.
- i.e. Mariana Oceanic Trench and Mariana Volcanic Islands (Philippine and Pacific Plate)

CC Convergence

- The crusts are compressed and folding occurs, forming a range of fold mountains.
- Either plate does not subduct as they are of similar densities.
- i.e. Himalayan Fold Mountains (Eurasian and Indian Plate)

OC Convergence

- The denser oceanic plate subducts beneath the less dense continental plate. An oceanic trench is formed at the point of subduction.
- The continental plate buckles and folds, forming fold mountains. The sinking oceanic plate causes mantle material to melt to form magma.
- The magma rises above the crust, giving rise to volcanoes and volcanic islands.
- i.e. Peru-Chile Trench and Andes Fold Mountains (oceanic Nazca and continental South American Plate)

Transform plate boundaries

Transform

- Plates slide past each other, forming a transform fault.
- Tremendous stress builds up and is released in the form of earthquakes.
- i.e. San Andreas Fault (San Andreas, California, USA)

Gateway 2

- Fold mountains
- Rift valleys and block mountains
- Volcanoes
- Earthquakes
- Risks of living in earthquake zones
- Risks and benefits of living near volcanic areas

Fold mountains

Fold mountains

- Formed along convergent plate boundaries.
- Compressional force causes the layers of rocks to buckle and fold.
- In a folded rock layer, the upfold is called the anticline and the downfold is called the syncline.
- When there is increasing compressional force on one limb of a fold, the rocks may buckle until a fracture forms. The limb may move forward to ride over the other limb.

Rift valleys and block mountains

Rift valleys

- A valley with steep sides formed along fault lines.
- When sections of the crust extend along fault lines, tensional forces can cause a central block of land to subside between a pair of parallel faults, forming a rift valley.

Block mountains

- A block of land with steep sides.
- Formed when parts of the crust extend along fault lines and rock masses surrounding a central block sink due to tensional forces.

Volcanoes

Volcanoes: process of a volcanic eruption, shield volcanoes and stratovolcanoes

Process of a volcanic eruption

- Formed by vulcanicity.
- Magma seeps into the magma chamber, building up pressure in it.
- When the pressure in the chamber reaches its threshold, magma moves via vents to the Earth's surface. Volcanic materials are ejected during this process.
- Much lava solidifies near the vent to form a crater. Subsequent new layers of lava and volcanic materials build up the volcano.

Shield volcanoes

- Have gentle sloping sides and a broad summit.
- Due to the ejection of low-silica lava. As low-silica lava is less viscous, it flows easily, spreads over a large area before solidifying.
- The lava does not trap much gas so eruptions are not explosive.
- Common along divergent plate boundaries where magma can rise directly above the mantle.

Stratovolcanoes

- Develop from successive eruptions of lava and pyroclasts. Pyroclasts are ash and rock fragments that are ejected during a volcanic eruption.
- After an eruption of pyroclasts, the subsequent eruption ejects lava which covers them and prevents them from being eroded.
- Forms a high volcano with a concave shape. It is steeper at the top and gentler at the base.
- Secondary cones may develop as magma from the vents seeps into the sides of the cone and erupts.
- Pyroclastic flow and lahars may result from volcanic eruptions. Lahars are formed when pyroclasts mix with water from melted ice or lakes and they are fast-flowing mudflows.

<u>Earthquakes</u>

Basics of earthquakes

- A vibration in the Earth's crust caused by the sudden release of stored energy in the rocks found along the fault lines. Occurs when there is movement along plate boundaries.
- The plate movements lead to the build-up of stress on the rocks on either side of the fault. When it reaches their threshold, the rocks slip, causing an earthquake.
- Energy is released via seismic waves. These waves radiate out from the focus. The point on the Earth's surface directly above the focus is known as the epicentre.

Extent of earthquakes

Influenced by population density, time of occurrence, level of preparedness, distance from the epicenter and type of soil.

Risks of living in earthquake zones

Risks: tsunamis, disruption of services, landslides, destruction of properties, destruction of infrastructure, loss of lives

Tsunamis

- The subduction of the denser oceanic plate causes the built-up of much pressure.
- As the threshold is reached, the oceanic plate snaps back to its original position, causing much energy to be released in the form of seismic waves.
- This causes an offshore earthquake (displaces a huge mass of seawater). The wave created has a large wavelength but a low height.
- On reaching shallower water, friction with the seabed slows down the waves and forces them to increase in height, resulting in a tsunami that breaks violently at the coast.

Disruption of services

- Can potentially affect a large area (i.e. electricity, gas, water etc.)
- The earthquake in Kobe in 2004 damaged pipes and transmission lines, disrupting supplies to about 80% of Kobe's residents.

Landslides

- The shaking of the ground during earthquakes can weaken the slopes of hills and mountains, leading to landslides.
- Mudflows may occur when there is heavy rainfall, saturating the soil, causing the mixed soil debris to flow down the slope.
- Often experienced in Indonesia and the Philippines (tropical areas).

Destruction of properties and infrastructure

- People may be without homes after the disaster and reside at temporary shelters while their homes are being rebuilt.
- Earthquakes may cause cracks to form in infrastructure. Transportation can be disrupted.
- After the earthquake in Kobe in 1995, many places in the city became inaccessible or difficult to reach.

Loss of lives

- Threaten the lives of those living in earthquake zones.
- Important for people living in earthquake zones to be prepared and take necessary precautionary measures to minimise the damage.

Risks of living near volcanic areas

Risks: massive destruction by volcanic areas, pollution

Massive destruction by volcanic areas

- Volcanic materials can lead to widespread damage to property.
- Landslides can obstruct the flow of rivers which block roads and bury villages and farmlands.
- Ongoing eruption of Kilauea, Hawaii since 1983 has destroyed many homes and highways.

Pollution

- Ash particles may block sunlight, suffocate crops, and cause severe respiratory problems.
- Volcanic eruptions can also release gases which may be harmful to people.
- The eruption of Eyjafjallajökull in Iceland in 2010 produced extensive volcanic ash clouds containing tiny particles of abrasive glass, sand and rock, posing a danger to aircraft engines and structures.

Benefits of living near volcanic areas

Benefits: fertile soil, precious stones and minerals, tourism, source of geothermal energy

Fertile soil

- Lava and ash from volcanic eruptions break down, forming fertile volcanic soils. They are favourable to agriculture.
- The volcanic soils of Java and Bali support the cultivation of crops, supporting a large rural population over many decades.

Precious stones and minerals

- These resources (e.g. diamond) can only be from a volcanic area after millions of years
- The old volcanic rocks at Kimberley, South Africa are one of the world's richest sources of diamond.

Tourism

- Purposes to hike and camp or to enjoy the scenery. Volcanic areas are rich in history.
- Pompeii, Italy was buried by ash layers from the nearby Mount Vesuvius in 79 CE. The unearthed archaeological site has revealed buildings left intact.

Source of geothermal energy

- Derived from the heat in the Earth's crust. When groundwater comes into contact with hot rocks beneath the surface, it heats up and erupts as hot water or steam which can be harnessed to produce electricity.
- Most of Iceland's electricity is generated from geothermal power due to a large number of volcanoes in the country. 70% of homes in Iceland are heated by volcanic steam.

Gateway 3

- Preparedness measures
- Short-term responses
- Long-term responses

Preparedness measures

Preparedness measures: land use regulation, developing infrastructure, emergency drills, earthquake and tsunami monitoring and warning systems

Land use regulation

- A set of rules implemented to restrict developments in certain areas.
- In California, USA, all new building developments are not built across fault lines or areas at risk of liquefaction.
- This would reduce casualties and economic damages.
- A costly measure as the government acquires unsafe land. Existing owners might also be reluctant to give up land.

Developing infrastructure

- Effective building design can reduce the collapse of buildings and minimise the damage caused by an earthquake.
- Can build shake-resistant roads, bridges and dams on the ground.
- Homes, office buildings and factories can be fitted with trip switches, preventing fires from breaking out.
- Taipei 101 is made of steel and reinforced concrete which is able to withstand earthquakes better than brittle materials. Presence of a damping device, acting as counterweights. This prevents the building from swaying too much and collapsing.
- Fewer lives are lost. Faster rescue and evacuations and less money spent on recovery for the affected areas.
- Expensive measure and it is not cost-effective to retrofit existing buildings.

Conducting emergency drills

- People practice the steps to take when an earthquake occurs.
- Every year since 1960, Japan conducts emergency drills on September 1st to commemorate Disaster Prevention Day. People all over Japan are involved where a simulation of an earthquake of high magnitude is carried out.
- This would prevent widespread panic and hysteria in the event of an earthquake and the public would know how to act appropriately.
- It is based on the magnitude of past earthquakes so the emergency scenario might not be realistic. May turn out unprecedented.

Earthquake monitoring and warning systems

- Seismic risk maps show the likelihood of locations at risk from earth movements or liquefaction are produced from such studies. Earthquake sensors in earthquake-prone zones help monitor the frequency of vibrations and detect possible developments of an earthquake.
- Technology can be used to predict the occurrences of earthquakes.
- The warnings provided may not provide sufficient time for an evacuation. Noise, lightning or device failure may interfere with the seismograph and result in false warnings being given. It is difficult to give accurate warnings when multiple earthquakes occur close to each other.

Tsunami monitoring and warning systems

- Purpose to warn people about the occurrence of a tsunami.
- Technology can be used to measure movements on the Earth's surface and predict the occurrences of tsunamis.
- When the warning system for impending 2011 Tohoku earthquake alerted millions of people a minute before it struck, procedures of earthquake drills were followed and speedy evacuation helped save some lives.
- Tsunami detectors are prone to giving false alarms when waves are high. There is little time to evacuate once an approaching tsunami is detected.

Short-term responses

Short-term responses: search and rescue, emergency, food and medical supplies

Search and rescue

- People trapped under collapsed buildings are quickly located and freed.
- After the 2011 Tohoku Earthquake, sniffer dogs and heat sensors were deployed and successfully rescued many who were trapped.
- Some survivors are found after being trapped for a couple of weeks without food.
- Rescue workers only have 72 hours to find trapped survivors. Without food and water, trapped victims are unlikely to survive after 3 days.

Emergency, food and medical supplies

- The injured are treated and clean drinking water is provided to survivors to prevent dehydration and the spread of diseases.
- After the 2002 Afyon Earthquake, the Turkish Red Crescent Society immediately responded by delivering tents, blankets and heaters to the region.
- The provision of immediate aid helps survivors continue with their lives.
- Medical supplies, food and water may be insufficient which, leading to social unrest.

Long-term responses

Long-term responses: rebuilding of infrastructure, provision of healthcare

Rebuilding of infrastructure

- Infrastructure and amenities are rebuilt and improved upon after a disaster.
- After the 1995 Kobe Earthquake, the Japanese government spent billions of dollars developing technology to build more earthquake-resistant buildings.
- Authorities develop stricter building codes to ensure infrastructure is restored at a higher safety level than before.
- Reinforced buildings which are built to protect against earthquakes are not necessarily protected against tsunamis.

Provision of healthcare

- Health options are provided. The loss of loved ones, homes or jobs causes long-lasting trauma.
- A year after the 2011 Christchurch Earthquake, anxiety and depression were identified amongst all age groups. More health workers were deployed in the area.
- Problems can be identified or addressed early.
- Improving health options (e.g. restoring the resilience of people) can be very challenging.

Secondary 3 Physical Geography
Chapter 3: Weather and Climate
Revision

Gateway 1

- Temperature (latitude, altitude, distance from the sea, cloud cover)
- Relative humidity
- Clouds
- Rainfall (convectional and relief/orographic rain)
- Air pressure and wind systems (sea and land breezes, monsoon winds)
- Climatic types (equatorial, monsoon, cool temperate)

Temperature

Factors influencing the temperature of locations: latitude, altitude, distance from the sea, cloud cover

Latitude

- Temperatures at lower latitudes are higher than at higher latitudes because the Sun's rays strike at a higher angle of incidence. ***Talk about concentration of solar energy.***
- Affects the mean annual temperature.
- i.e. Compare the latitudes of Singapore and London.

Altitude

- Temperature generally decreases by 13°C with every 2km increase in altitude.
- The Earth's surface is warmed up by the incoming shortwave radiation. At lower altitude, there are more atmospheric gases to trap the heat emitted from the warm ground.
- Greenhouse gases absorb the outgoing longwave radiation, warming the atmosphere. Air that is further from the Earth's surface absorbs less heat from the longwave radiation as air is less dense at higher altitudes.
- Compare the altitudes of Singapore and Cameron Highlands.
- Affects the mean annual temperature.

Distance from the sea

- Areas further from the sea experience a hot summer and cold winter (continental effect).
- Areas nearer to the sea experience a warm summer and mild winter (maritime effect).
- Affects the annual temperature range.

Cloud cover

- Compare to the presence of clouds during the day and at night, incoming shortwave radiation absorbed and longwave radiation emitted.
- Affects diurnal temperature range.
- Compare Singapore and the Sahara Desert.

Relative humidity

Relative humidity

- Ratio of the actual amount of water vapour to the max. amount of water vapour air can hold.
- Measured using a sling psychrometer.
- Inversely related to temperature. ***Spreading out of air molecules.***
- Tropical areas experience higher rainfall than temperate areas.
- When the R.H. = 100% (dew point temp.), saturation occurs. Condensation takes place.

Clouds

Clouds

- Condensation occurs at dew point temperature.

Rainfall

Types of rainfall: convectional and relief/orographic

Convectional rain

- Incoming shortwave solar radiation from the Sun reaches the Earth.
- Surrounding air is heated up. The warm air expands and rises.
- As the air rises, it cools. It reaches dew point temperature and condensation occurs.
- Cumulonimbus clouds are formed.
- Water droplets fall back to the Earth's surface as convectional rain (common in the tropics).

Relief/orographic rain

- The warm, moist air from the sea comes into contact with the windward side and it rises.
- Air cools as it rises. Reaches dew point temperature and condensation occurs. Forms clouds.
- Falls back to the Earth's surface as relief rain.
- No rain falls on the leeward slope as the air is too dry.

Air pressure and wind systems

Air pressure, land and sea breezes, monsoon winds

Air pressure

- Inverse relationship with height.
- Air is less dense at higher altitudes (less force).

Land and sea breezes

- Remember DBS and NLB.
- Sea breeze during the day, land breeze at night.

SW Monsoon

- Remember SW69.
- The air over Central Asia heats up, expands and rises (low pressure).
- The low temperature in the southern hemisphere causes the air to be cold and dense (high pressure).
- Air from Australia moves to the Indian subcontinent and Central Asia as the SE monsoon winds. Winds deflect to the right (Coriolis).
- Become SW monsoon winds and head for Central Asia.
- Travels over the Indian Ocean and brings rain to the Indian subcontinent.

NE Monsoon

- Remember NE1002.
- The air over Australia heats up, expands and rises (low pressure).
- The northern hemisphere is experiencing winter. The low temperature causes the air to be cold and dense (high pressure).
- Air moves to Australia as the NE monsoon winds.
- As the winds cross the Equator, the Coriolis effect deflects the winds to the left. Become NW monsoon winds and warm up as they head for Australia.
- Travels over the Indian Ocean, bringing rain to Australia.

Climatic types

Climatic types: equatorial, monsoon, cool temperate

Equatorial climate

- High temperatures. ***Why?*** A high mean annual temperature and a small annual temperature range. These areas receive long hours of sunlight.
- High R.H. due to rapid evaporation rates caused by high temperatures. Convectional rain is common and usually falls in the late afternoon. High annual rainfall, no distinct dry season.

Monsoon climate

- High mean annual temperatures but lower than that of equatorial climatic regions.
- Generally a high mean annual temperature and a small annual temperature range.
- High annual rainfall. These areas have distinct wet and dry seasons due to monsoon winds.

Cool temperate climate

- Experiences the four distinct seasons due to the tilt of the Earth and its revolution around the Sun. Large annual temperature range. Mild and short winters as these areas receive less energy from the Sun. Summers are cool and warm and receive more solar energy. ***Why?***
- Low annual rainfall. Rain falls throughout the year with no distinct wet or dry seasons.

Gateway 2

- Natural causes of climate change
- Greenhouse effect and enhanced greenhouse effect
- Anthropogenic causes of climate change
- Impacts of climate change
- Responses to climate change

Natural causes of climate change

Natural causes: volcanic eruptions, variations in solar output

Volcanic eruptions

- Large volumes of carbon dioxide, sulfur dioxide, water vapour, dust and ash are released when a volcano erupts.
- Sulfur dioxide reacts with water to form sulfur-based particles. ***Relate to Chemistry.***
- These particles reflect solar energy back into space, resulting in a cooling influence on global temperature.
- Eruption of Mount Pinatubo in 1991.

Variations in solar output

- Sunspots are dark spots on the Sun's surface that indicate cooler regions. The number of sunspots rises and falls due to changes in the Sun's magnetic field.
- To compensate for the cool sunspots, the Sun radiates more solar energy.
- Number of sunspots is directly proportional to the global temperature.

Greenhouse effect and enhanced greenhouse effect

Greenhouse effect

- The incoming shortwave radiation from the Sun passes through the greenhouse gases found in the atmosphere.
- Some shortwave radiation is reflected by the Earth and the atmosphere. Most shortwave radiation is absorbed by the Earth's surface.
- The Earth emits longwave radiation to the atmosphere. Greenhouse gases absorb longwave radiation, warming the atmosphere.

Enhanced greenhouse effect

- Refers to an increase in the concentration of greenhouse gases in the atmosphere.

Anthropogenic causes of climate change

Anthropogenic factors: deforestation and carbon oxidation, agriculture, industrialisation, urbanisation

Deforestation and carbon dioxide

- Fewer trees for photosynthesis so more carbon dioxide traps heat.
- Deforestation exposes the soil to sunlight and increases the soil temperature, leading to a faster rate of carbon oxidation (carbon from dead matter + oxygen from the atmosphere) that contributes to more carbon dioxide in the atmosphere.
- The Amazon rainforest has the highest rate of deforestation due to the need for development activities.

Agriculture

- Decomposition of dead leaves and animals releases more methane. Cattle release methane.
- Using ammonium nitrate to improve crop yields increases nitrous oxide.
- Cows in Argentina account for 30% of the country's greenhouse gas emissions.

Industrialisation

- To produce goods and services for the people. More fossil fuels are burnt, more carbon dioxide is produced.
- China and India are contributing a lot to global carbon dioxide emissions due to their high level of industrial processes.

Urbanisation

- More people living in urban areas so more fossil fuels are burnt. ***Purpose?*** This produces carbon dioxide.
- The world's fastest urbanisation is in India. ***Relate to industrialisation.***

Impacts of climate change

Impacts: sea level rise (+), extreme weather events (-), infectious insect-borne diseases (-), lengthened growing season (+/-)

Rise in sea level

- Melting of glaciers. Higher temperatures in the atmosphere causes water to expand and rise.
- Low-lying areas will be flooded. Some animal species may face extinction.
- Case study of Venice.

Frequent extreme weather events

- Effects of floods, droughts, heat waves and tropical cyclones.
- 2003 heat wave in Europe killed 70,000 people.

Spread of infectious insect-borne diseases

- Higher temperature and heavy rainfall result in more insects to thrive. May lead to the spread of infectious insect-borne diseases.
- Europe used to have moderate temperatures but is now facing the problem of mosquitoes growing in large numbers. ***Effect?***

Lengthened growing season

- Higher temperature may lead to longer growing seasons in some regions.
- Maize and blackberries can now be cultivated in the United Kingdom.
- Production of crops can be reduced in some countries as some crops require cool weather conditions.
- Apples have seen a decrease in production in China.

Responses to climate change

International responses: Kyoto Protocol

National responses: Singapore Green Plan/reducing fossil fuel usage, Green Mark Scheme/building energy-efficient buildings, Plant-A-Tree/reforestation

Kyoto Protocol

- Drawn up in 1997 and came into force in 2005. Purpose to reduce greenhouse gases in the atmosphere.
- Finland and Greece were successful in reducing their combined greenhouse gas emissions.
- Denmark, Austria and Spain were unable to achieve their targets. Countries that did not sign the Kyoto Protocol (e.g. China) continued to contribute high emissions of greenhouse gases.

Singapore Green Plan

- Switching to cleaner sources instead of burning fossil fuels.
- The Singapore Green Plan aims to generate 60% of Singapore's energy by using natural gas, a cleaner form of energy.
- Infrastructure to process and transport cleaner forms of energy is expensive.

Green Mark Scheme

- Constructing more energy-efficient buildings. Using solar energy to power up buildings is successful in reducing the use of fossil fuels to generate electricity.
- The Green Mark Scheme evaluates and certifies buildings which are considered 'green' and many buildings like the NLB have reported a 15% to 35% energy saving.
- Green buildings may cost more to build and developers who only look for immediate profits will not consider constructing such buildings.

Plant-A-Tree

- Planting trees and plants in tree-planting events that take place monthly throughout Singapore.
- Trees are the green lungs of the environment.
- The Plant-A-Tree Programme has contributed to an estimated 60,000 trees yearly throughout Singapore by the National Parks Board.
- Trees take many years to mature so the positive effects of tree planting will take time to materialise.

Gateway 3

- Basics of tropical cyclones (characteristics, distribution)
- Hazards posed by tropical cyclones
- Impacts of tropical cyclones
- Responses to tropical cyclones

Basics of tropical cyclones

Characteristics of tropical cyclones

- Strong winds due to strong pressure gradient. Huge pressure difference creates strong winds.
- Middle of the cyclone has an eye, an area of low pressure. Characterised by calm conditions and the absence of clouds.
- Warm moist air from the ocean rises, forming an area of low pressure. Condensation occurs and releases latent heat.
- Dense cumulonimbus clouds which produce torrential rain are formed.
- The cyclone fades away when it reaches land. ***Why?***

Distribution of tropical cyclones

- A latitude of 8° to 15° north and south of the equator.
- Conditions required are a high ocean surface temperatures of above 26.5°C and the Coriolis Effect. ***Why is the Coriolis Effect important?***

Hazards posed by tropical cyclones

Hazards are storm surges, strong winds and torrential rainfall.

Impacts of tropical cyclones

Physical: damage to houses and infrastructure
Economic: cost of repairs due to damaged properties, loss of income due to damaged crops, food shortage
Social: disruption to water and sanitation facilities, spread of insect-borne diseases, homelessness

Responses to tropical cyclones

Emergency action

Mitigation measures: prediction and warning, land use control, reducing vulnerability of infrastructure

Emergency action

- Taking prompt action to respond to situations that put residents at risk to minimise injuries and deaths.
- Cyclone-resistant raised concrete shelters built in high-risk areas of Bangladesh have acted as shields.
- The number of casualties can be greatly reduced.
- Cyclone shelters are very expensive to build and require regular maintenance.

Prediction and warning

- Involves predicting the arrival of cyclones. ***Technological stuff.***
- Meteorologists who studied records of the 2005 Hurricane Katrina gave warnings to residents to evacuate regarding the 2008 Hurricane Ike.
- Makes it possible to predict when a violent cyclone could occur. ***How?***
- The severity and time of occurrence of future cyclones cannot be accurately predicted.

Land use control (coastal)

- Regulates the use of land by placing restrictions on how the land can be used.
- Practised at the coastal parts of Taiwan and Japan.
- Minimising development in high-risk areas limits exposure to hazards.
- Only successful if authorities exert strict enforcement. Needs time and manpower.

Land use control (floodplain)

- Drawing up a master plan to protect critical assets from flooding.
- Farmers' crops suffered less damage during wet monsoon seasons and income generation has boosted.
- Resulted in conflicting demands for water use.

Reducing vulnerability of infrastructure

- Reinforced structures include water and wind-resistant buildings and protective barriers.
- Houses in Florida, USA, have wind and water-resistant buildings. They suffered little damage from Hurricane Wilma in 2005.
- Regular inspection and expensive maintenance are needed.

Secondary 4 Human Geography
Chapter 1: Tourism
Revision

Gateway 1

- Types of tourist destinations
- Roles of different stakeholders in promoting tourism

Types of tourist destinations

Places of scenic beauty

- Attract tourists with their awe-inspiring sceneries (honeypot tourism).
- i.e. The Grand Canyon, USA and Ha Long Bay, Vietnam.

Places with good facilities: MICE facilities, medical facilities, theme parks

MICE facilities

- MICE (meetings, incentives, conventions and exhibitions) refers to travelling for business.
- Tourists can stop by international air routes.
- Infrastructure (e.g. convention halls) cater to the needs of tourists. (i.e. Marina Bay Sands and Suntec City)

Medical facilities

- Travelling for medical care. Services provided in the destination are much better than those in the tourists' home country.
- i.e. tourists travelling to South Korea for plastic surgery or Singapore for its reputable healthcare services.

Theme parks

- Have a central theme with fun-filled activities. i.e. LEGOLAND Malaysia, Nusajaya.

Places with rich culture: heritage tourism, film-induced tourism, pilgrimage tourism

Heritage tourism

- Tourists experience the distinctive culture of the location. Structures include museums and national monuments.
- i.e. The Forbidden City, Beijing and The Tower of London, United Kingdom.

Film-induced tourism

- Viewers can satisfy their curiosity and pique their interests.
- i.e. visiting the slums in Mumbai which were used to shoot Slumdog Millionaire.

Pilgrimage tourism

- Travelling to religiously sacred or holy places in pursuit of spiritual or mental happiness.
- i.e. Muslims visiting The Kaaba, Saudi Arabia and Christians visiting Jerusalem.

Places of conflict

- Areas of war, tragedy etc. Able to participate in dark tourism (associated with tragedy).
- i.e. Auschwitz Concentration Camp, Poland.

Roles of different stakeholders in promoting tourism

Government

- Has the authority to grant visitors' visas and dictate duration of stay.
- Responsibility to plan, fund and build tourism-related infrastructure.
- At Mandai Zoo, the River Safari is in addition to the Night Safari to cater to the diverse likes of tourists. Gives tourists more choices and sustain repeated visits.

Media

- Able to disseminate information to the public.
- Positive and negative reports can influence visitors' perception of the destination.
- Examples include Drew Binsky and Nas Daily.

International Organisations

- Work together for a common purpose.
- Reports produced can encourage or discourage tourists from visiting a place.
- An example is the World Health Organisation (WHO) which gives health advisories. ***How will it influence tourism?***

Gateway 2

- Reasons for influences in tourism trends
- Reasons for fluctuations in tourism trends

Reasons for influences in tourism trends

Developments in technology: better and affordable transport, ease of access to information

Better and affordable transport

- Improved in terms of safety, efficiency, seating capacity and no. of air routes.
- A commercial flight from Singapore to London now takes 14 hours. ***Compare it to the past (e.g. stopovers at major cities)***

Ease of access to information

- Online booking and research enable travellers to purchase their tickets without going to travel agencies. Travellers have better information access at their destination. ***Explain.***
- Airport surveillance and electronic checks make tourists feel a safer about travelling.

Demand factors: disposable income, leisure time, changing lifestyle

Disposable income

- Refers to the remaining income after taxes have been deducted.
- People nowadays have a higher disposable income. ***WHY?***
- Can afford to travel more frequently and to more expensive destinations.

Leisure time

- More leisure time allows people to travel more.
- The French and Australians have 20 or more days of annual leave.

Changing lifestyle

- People are now extravagant and are more willing to spend on holidays to enjoy.
- Health-conscious ones opt for wellness holidays and visit spa resorts in Bali.

Destination factors: attractions, investment in infrastructure and services, access to information

Attractions

- Entice tourists.
- Natural attractions (e.g. Niagara Falls) and man-made ones (e.g. Burj Al Arab).

Investment in infrastructure and services

- Transportation and accommodation.
- Destinations with more infrastructure and services are likely to attract tourists.
- i.e. a dense transport network in Singapore and the expansion of Changi Airport's terminals.

Access to information

- Ease of obtaining travel-related information.
- Street signs in Chinatown are written in both English and Chinese. ***So what?***
- Gives tourists a sense of security and assurance that help is available.

Reasons for fluctuations in tourism trends

Disasters

- Cause damage to properties and injure or take away lives. Deter tourists from visiting affected destinations.
- After the 2011 Tohoku Earthquake and tsunami, many foreign tourists avoided trips to disaster-hit areas. Concerns about radioactive contamination and the start of another earthquake.

Recessions

- Economic slowdowns.
- Result in unemployment and lower incomes. Less disposable income for holidays.
- The 2007-2008 Global Financial Crisis caused many banks to declare bankrupt due to massive debts.

Political situations

- Poses threats to tourists. Dangers caused by armed conflicts.
- The 2011 Libyan Civil War involving armed conflict caused the number of tourists visiting Libya and its neighbouring countries to experience a decline in tourists.

Diseases

- Tourists fear getting infected by infectious diseases.
- Diseases may extend beyond their geographical boundaries (e.g. MERS and SARS).
- The 2003 SARS outbreak in Singapore caused visitor arrivals to decline greatly.

Gateway 3

- Impacts of tourism
- Roles of different stakeholders in protecting tourist areas

Impacts of tourism

Economic impacts: employment opportunities (+), growth in income (+), development in infrastructure and facilities (+), seasonal unemployment (-), underuse of facilities at certain times of the year (-), shortage of services (-)

Employment opportunities

- Able to work at hotels, souvenir shops etc.
- Hone a skill in the tourism sector.
- Vast amount of employment opportunities created when the IRs at Sentosa were opened.

Growth in income

- Tourism is an important source of revenue.
- The annual F1 race in Singapore generated much revenue from international tourists.

Development in infrastructure and facilities

- Construction of transport, electricity and telecommunication networks and modern sewage systems.
- Expansion of the Beijing underground rail systems construction of the Beijing National Stadium to cater to the 2008 Olympic Games.

Seasonal unemployment

- Industry fluctuates between peak (workers' shortage) and off-peak seasons (unemployment).
- Ski resorts in the Alps have peak seasons during winter where tourists go skiing. ***How will it lead to seasonal unemployment?***

Underuse of facilities at certain times of the year

- May be underused or abandoned after events due to high maintenance costs. ***WHY?***
- The Chinese government spent huge amounts of money to renovate the venues used for the 2008 Beijing Olympics.

Shortage of services

- Tourist infrastructure requires land, water and electricity. ***What will happen to non-tourist areas?***
- Kathmandu faces a worsening water crisis due to drought caused by tourists competing its use.

Socio-cultural impacts: preservation of local customs and heritage (+), dilution of local customs and heritage (-), increased crime (-)

Preservation of local customs and heritage

- Ethnic districts of Chinatown and Little India have their façade unchanged, allowing visitors to have a greater appreciation of Singapore's heritage.

Dilution of local customs and heritage

- Tourism activities may predominate, causing cultural dilution.
- i.e. the Kayan Lahwi women in Thailand. Tourists aggressively take pictures of them without permission and treat them like exhibits which they paid for.

Increased crime

- Affects tourists and locals.
- i.e. pickpocket cases are common in France.

Environmental impacts: conservation of natural environment (+), vandalism (-), littering and pollution (-), destruction of habitat (-), increased carbon footprint (-)

Conservation of natural environment

- Prevents environmental degradation and sustain tourist numbers.
- The government conserved the wetlands of Sungei Buloh in Singapore to provide a habitat for migratory birds. Tourists can enjoy bird watching there.

Vandalism

- Tourists vandalise out of fun or boredom.
- Cases of graffiti at the Great Wall of China in Beijing.

Roles of different stakeholders in protecting tourist areas

Local communities

- Promote community-based tourism. Offer accommodation and providing transport.
- In the Candirejo Village, Indonesia, villagers offer community-based tourism whereby tourists are guided on the local horse-drawn transport and witness village life and savour local food.
- However, many have failed as most locals are inexperienced in running such enterprises.

Visitors

- Responsible in respecting the culture of the locals and environment.
- In Malaysia, as a sign of respect, visitors have to remove their shoes and must be properly attired before they enter mosques.
- In some tourist areas, due to tourist influx, locals deliberately tend to the visitors' demands. Results in culture dilution.

Planning authorities

- Help in managing and maintaining the tourist infrastructure to manage the negative impacts of tourism.
- In Singapore, the STB conserved the façade of ethnic districts to allow tourists to have a greater appreciation for Singapore' culture and heritage.
- Tourists may fail to follow the guidelines as they feel that the use of scarce resources is justifiable with payment. They may feel self-important and show little respect, creating disharmony between locals and tourists.

Tour operators

- Show concern for the protection and conservation of the environment.
- In Phuket, the Phuket Alternative Tours (PAT) limits sea canoeing numbers to 64 daily due to the carrying capacity of the ecologically sensitive region.
- Tour operators might be driven by profits. Fail to conduct tourist activities following ecotourism guidelines.

Non-governmental organisations (NGOs)

- Act as communication channels for local communities and tour operators. Give monetary and manpower support via marketing campaigns.
- In India, the Wildlife Protection Society, an NGO, warned against the hunting of the endangered Bengal Tigers. Its population has declined greatly as compared to a century ago.
- NGOs have limited political power. Need enforcement by the government to implement laws and policies.

Secondary 4 Human Geography
Chapter 2: Food Resources
Revision

Gateway 1

- Variation in food consumption patterns between DCs and LDCs
- Impact of inadequate food consumption on individuals and countries
- Impact of excess food consumption on individuals and countries

Variation in food consumption patterns between DCs and LDCs

Economic factors: disposable income, prices of food

Disposable Income

- Refers to the amount of income an individual has left after taxes have been deducted.
- Determines how much money people have to buy food.
- Rising in both DCs and LDCs.

Prices of food

- People in LDCs are more affected by food prices than those in DCs. ***WHY?***
- A sharp increase in prices could lead to large changes in consumption patterns of people in LDCs. ***WHY?***

Socio-cultural factors: religious beliefs, food preferences, migration, population growth

Religious beliefs

- Different faiths influence people's food choices and preparation.

Food preferences

- Fast foods popularised because of their convenience and affordability.
- Many people have chosen to eat organic products due to the perceived health benefits it brings. ***WHY?***

Migration

- Globalisation led to cuisines to extend their geographical boundaries.
- Examples include Japanese sushi and Korean kimchi.

Population growth

- One of the key drivers in increasing demand for food worldwide.

Political factors: stability of food supply, food safety

Stability of food supply

- Greater food consumption in DCs as many people in Sub-Saharan African countries have insufficient food to eat.
- Stability affected by civil wars (e.g. Arab Spring 2011) and natural disasters (e.g. 2010 Haiti Earthquake).

Food safety

- The government is responsible for ensuring that food products are safe, properly labelled and packaged for consumption.
- The tsunami triggered by the 2011 Tohoku Earthquake in Japan led to a destruction of nuclear plants in Fukushima. Radiation emitted from the plants contaminated Japan's farmlands and water bodies. Singapore temporarily restricted Japanese food imports to ensure safety of consumers.

<u>Impact of inadequate food consumption on individuals and countries</u>

Health impacts: malnutrition, starvation

Malnutrition

- Caused by imbalanced consumption of nutrients.
- Hinders healthy tissue growth and proper function of organs.

Starvation

- Body becomes skeletally thin and organs become permanently damaged.
- Much more common in LDCs. ***WHY?***

Economic impacts: lower productivity, diversion of financial resources to healthcare, long-term debt due to food and financial aid

Lower productivity

- Sickly people are usually not mentally alerted and unmotivated to perform tasks.
- Individuals have lower incomes and nations have lower revenues.

Diversion of financial resources to healthcare

- More people fall sick, the demand for healthcare increases.
- Increases the overall cost of providing healthcare.

Long-term debt due to food and financial aid

- Help people and countries cope with insufficient supply of food.

Political impact: social unrest

- Hungry people are often angry. They spark social unrest against the authorities due to their unhappiness in the prices of food.
- Violent riots erupted in Mozambique in 2010 when wheat prices increased due to shortage caused by the drought in Russia, its wheat supplier.

Social impact: scavenging

- People might scavenge in rubbish dumps or landfills to look for food.
- However, the food there is contaminated with bacteria.

Impact of excess food consumption on individuals and countries

Health impact: obesity

- Excessive consumption of food results in obesity.
- Obesity increases vulnerability to illnesses such as coronary heart disease.
- More common in DCs than in LDCs. ***WHY?***

Economic impacts: lower productivity, diversion of financial resources to healthcare

Lower productivity

- People are generally slow and not mentally alert.

Diversion of financial resources to healthcare

- Government increases public health expenditure.
- Individuals have a lesser disposable income due to higher medical bills.

Social impacts: food wastage, dieting

Food wastage

- DCs have abundant and a wide variety of food.
- However, people are picky and spoilt for choice.

Dieting

- People become increasingly aware of the health benefits of maintaining the right mass.

Gateway 2

- Factors affecting intensity of food production
- Effects of continuing intensification of food production
- Reasons for food shortage

Factors affecting intensity of food production

Physical factors: climate, soils and drainage, relief

Climate

- Determines the types of crops that can be grown and the productivity of the land.
- Places with regular rainfall are favourable for higher food production.

Soils and drainage

- Influence the types of crops grown and productivity.

Relief

- Temperature decreases with increasing altitude. Some crops grow well in cooler areas.
- In Cameron Highlands, Malaysia, strawberries can be cultivated as the region is located at a high altitude.

Economic factors: purpose of farming, demand and capital, agribusiness

Purpose of farming

- Subsistence farming is practised to ensure long-term food security. Widely practised in Sub-Saharan Africa. Involves simple farming tools. Low crop yield.
- Commercial farming is practised for the purpose of selling crops to earn profits. Generally receives high cash returns. Widely practised in areas like North America and Europe. Involves machinery (e.g. harvesters). Crop yield is high.

Demand and capital

- High demand causes food shortage which in turn causes price to increase, encouraging farmers to increase output to meet demand (relate to demand and supply) and earn more money from the high prices.

Agribusiness

- Corporations tend to increase intensity of food production and supply to supply food worldwide.

Political factors: government policy, ASEAN

Government policy

- The government may introduce tax incentives for farmers to acquire capital or invest in training facilities and research centres for farmers to help farms gain more productivity.
- The Punjab Agriculture Department educated farmers on the best seed variety and modern irrigation methods to ensure greater agricultural productivity.

- The government can stockpile food to ensure a stable food supply for the population in times of emergency.
- Import food products to lower the cost of food production.

ASEAN

- The leaders of the 10 ASEAN countries, together with China, Japan and South Korea signed the ASEAN Plus Three Emergency Rice Reserve (APTERR) to ensure availability and accessibility of rice during a regional food emergency.

Technological factor: Green Revolution

- High-yielding varieties are developed by cross-breeding a range of existing cereals. They have valuable traits like a shorter growth duration. 'Wonder Rice' has a much shorter growing season as compared to the non-HYVs.
- Chemical fertilisers can be used based on the type of crop and land. Toxic pesticides are used destroy pest-eating crops.
- Irrigation is an artificial method of supplying water to the land (e.g. sprinklers and pumps). ***How will it benefit monsoon regions?***
- Machinery and combined harvesters improve efficiency in the agricultural field by expediting the farming and harvesting processes.

<u>Effects of continuing intensification of food production</u>

Effect of irrigation on water and soil quality: waterlogging and salinisation

- Waterlogging occurs when excess water seeps into the soil, causing the soil to be oversaturated. ***What happens to the crops?***
- Salinisation occurs when water added to the soil during irrigation evaporates directly from the moist soil. As such, salt is left behind. ***What happens to the crops?***
- The Murray-Darling Basin in Australia is characterised by excess irrigation and high evaporation rates. The soil might be too hard and plant growth is limited.

Effect of chemicals on water and soil quality: eutrophication

- The overuse of fertilisers and pesticides causes chemicals to become concentrated in the soil. They may seep into groundwater or washed into water bodies.
- Eutrophication occurs when these chemicals reach the water bodies. This increases algae growth. ***What happens to the crops?***

Reasons for food shortage

Physical reasons: climate change, extreme weather events, pests

Climate change

- Temperature may increase and lengthen the growing season in some areas. This caused production to increase in some areas (e.g. China and France).
- Climate change may cause some areas to be unsuitable for farming, causing production to drop (e.g. Vietnam and India).

Extreme weather events

- Extreme weather occurrences might cause crop damage and damage to infrastructure. Economically-damaging to LDCs. ***WHY?***
- Tropical Cyclone Yasi wiped out a large portion of crops, especially bananas. Australia experienced a food shortage.

Pests

- Pests destroy food quickly.
- Occurred in Liberian farms in 2009 where many caterpillars devoured crops. Liberia plunged into a food crisis.

Economic reasons: rising demand from emerging economies, soaring cost of fertilisers and transport, conversion of farmland to industrial crop production

Rising demand from emerging economies

- Rising affluence in BRICS has brought about a rising demand for food products especially by the rapidly growing urban middle class.
- This leads to food shortage in the LDCs.

Soaring cost of fertilisers and transport

- There is a positive correlation between rising cost of transport and fertilisers and food shortage.
- In 2011, increase in global crude oil prices causes Kazakhstan to increase the price of wheat to its neighbouring country, Tajikistan.

Conversion of farmland to industrial crop production

- Biofuel crops are more financially-rewarding. Conversion of farmland to industrial crop production has caused food shortage as farmers are enticed to such profits.
- In the United States, 25% of food crops grown are meant for vehicles to consume instead of food for people.

Political reasons: civil strife, poor governance

Civil strife

- Funds will be channelled to buying weaponry and not for farming needs.
- Farmers may abandon crops and leave the unsafe countries. The lack of food may start another cycle of civil strife and cause a vicious cycle.

Poor governance

- Corruption and embezzlement of public funds for personal gain.
- In Bangladesh, the poor were unable to receive government food subsidy due to corruption.

Social reasons: lack of accessibility, inadequate logistics of food distribution and storage, rapid population growth

Lack of accessibility

- Better transport network in DCs leads to easier food transportation.
- There is greater accessibility when there are more food outlets.
- Many LDCs lack enough roads that facilitate access to food.

Inadequate logistics of food distribution and storage

- May be hindered by natural disasters.
- Shortage of storage facilities in accessing remote areas worsen food shortages.

Rapid population growth

- Food supply unable to meet the demand.
- Prevalent in Sub-Saharan Africa, increasing the risk of food shortage.

Gateway 3

- Strategies to address food shortage

Technological strategies: storage, farming technology, biotechnology

Storage

- Using refrigerated warehouse storage or delivery trucks to keep food fresh for a longer time.
- Crops can be distributed to places further away from its area of production. Larger variety of food being made available and accessible.
- Silos are built in Timor-Leste and this helped reduce the loss of crops to pests.
- Expensive strategy. Farmers in LDCs might be unable to afford silos.

Farming technology

- As part of the Green Revolution, improved farming technology has increased crop yield for farmers.
- Farmers are able to farm more efficiently, reducing their dependence on labour.
- Using computers in Singapore's high-tech farms has led to fewer workers required on the farms.
- If improperly managed, it would lead to environmental problems (e.g. waterlogging).

Biotechnology

- GM food refers to food derived from crops that have had their genetic make-up modified.
- GM crops have a higher yield than non-GM crops. This helps farmers to earn a higher income and countries to be more self-sufficient in food production.
- GM tomatoes were commercially grown and popular in the late 1990s in the USA due to their firmness for a longer period.
- For many small farmers in LDCs, seeds to grow GM crops are unaffordable.

Agricultural strategies: multiple cropping and crop rotation, water and soil conservation, leasing farmland to other countries

Multiple cropping and crop rotation

- Multiple cropping is growing two or more crops in the same piece of land, resulting in annual multiple harvests.
- Leguminous crops enrich the soil for adjacent non-leguminous crops. Less crop damage because different crops are vulnerable to different pests.
- Evident in Garhwal, Himalayas where the risk of crop damage by pests is reduced.
- Requires chemical fertilisers which can be expensive.
- Crop rotation refers to growing crops one after another on the same plot of land with the crops moved around in sequence to maximise the use of soil nutrients.
- In Nigeria, leguminous soya bean is grown first and after harvest, maize is cultivated to make use of the nitrogen-enriched soil.

Water and soil conservation

- No-till farming maintains the quality of the soil through the decomposition of dead plant materials that returns soil nutrients.
- No-till wheat farming is practised in Kazakhstan. It leaves the stubble of the previous year's crop standing in the fields to trap snow. When the weather warms, it melts and seeps into the soil, making it fertile.
- Residue left on the soil hinders soil warming and drying, making planting more difficult and germination conditions less ideal.

Leasing farmland to other countries

- Land may be leased out to countries with limited land for food production. This may generate income for farmers and increase food production.
- Cambodia leases land for Kuwait for rice production, increasing food production and generating income for farmers.
- Most funds generated are channelled to combat starvation instead of improving the skills of farmers.

Social strategies: support local farmers, population control

Support local farmers

- Locals can purchase locally-produced food to support farmers.
- In Sub-Saharan Africa, agriculture is their economic backbone. It is essential for poverty reduction and food security.
- However, some people have a preference for better quality imported food.

Population control

- To reduce global population, the government can educate the public on importance of family planning.
- China's 'One Child Policy' has drastically cut down population growth.
- Population control in Sub-Saharan Africa is hindered by traditional beliefs in having large families.

Political and economic strategies: agricultural policies (national), food programmes (international)

Agricultural policies (national)

- Refer to laws pertaining to domestic agriculture.
- Singapore has been practising high-tech farming since the 1970s. Involves agrotechnology parks that contain high-tech farms. Equipped with the necessary infrastructure that modern farms require (e.g. computers).
- Local farms produce a significant percentage of food products consumed in Singapore. Singapore can reduce its reliance on food imports.
- Costly to set up high-tech farms. Small industry as there is a shortage of trained workers for high-tech farming.

Food programmes (international)

- Food programmes are designed to address specific food shortage issues.
- The School Meals Programme initiated byWFP in 2011 was targeted at 300,000 Cambodian primary school children where they were given nutritious breakfasts. The malnutrition rate reduced and children's health improved significantly.
- However, the coverage of such programmes is uneven across countries.

Secondary 4 Human Geography
Chapter 3: Health and Diseases
Revision

In my opinion, I feel that **Gateway 1** is mostly general knowledge.

Gateway 2

- Factors contributing to the spread of malaria
- Impacts of malaria
- Factors contributing to the spread of HIV/AIDS
- Impacts of HIV/AIDS

Factors contributing to the spread of malaria

Social factor: lack of proper sanitation

Lack of proper sanitation

- What is improper sanitation (provide scenarios)
- This will lead to puddles of breeding grounds for mosquitoes to breed

Economic factor: limited provision and access to healthcare

Limited provision and access to healthcare

- Road/transport inaccessibility ***(How will this make people feel?)***
- Little spending on healthcare
- More healthy Anopheles mosquitoes will get infected

Environmental factors: overcrowded living conditions, poor drainage and stagnant water, effect of climate

Overcrowded living conditions

- Ventilation, people clustering in limited space

Poor drainage and stagnant water

- Stagnant water indicates breeding grounds

Effect of climate

- Higher temperature → shorter life cycle
- Precipitation → pools of water, meaning breeding grounds for mosquitoes
- Higher relative humidity → longer lifespan
- Mention how monsoon contributes to the spread of malaria

Impacts of malaria

Social impacts: death rate, infant mortality rate

Economic impacts: burden of malaria on households, cost of healthcare, loss of productivity

Factors contributing to the spread of HIV/AIDS

Social factors: social stigma, education, lifestyle choices, lapses in medical practices

Social stigma

- Other people's strong disapproval of those infected with HIV/AIDS living in the same society
- Those infected become ostracised, discriminated etc.

Education

- Lack of education makes people unaware
- Better education → safe behaviours

Lifestyle choices

- Some people choose not to practise safe sex (list scenarios)

Lapses in medical practices

- When strict blood transfusion and blood screening procedures are not enforced
- Carelessness and negligence

Economic factors: vice trade, mobility

Vice trade

- Illegal activities (e.g. drug trafficking, prostitution)
- Make quick money, recursive, no choice
- E.g. rural China

Mobility

- Tourism
- Men who work as miners, they may encounter prostitutes when driving etc.

Impacts of HIV/AIDS

Social factors: life expectancy and IMR, orphan crisis

Orphan crisis

- Children's parents die from AIDS, become orphans
- Have little care, little access to basic necessities and are often malnourished
- Emotional trauma, ostracised

Economic impacts: cost of healthcare, loss of productvity

Gateway 3

- Challenges (malaria)
- Challenges (HIV/AIDS)
- Roles of different stakeholders in managing the spread of infectious diseases

Challenges (malaria)

SE challenges: limitations of healthcare, population movement

Limitations of healthcare

- Increasing resistance of malaria parasites to anti-malarial drugs
- E.g. Thai-Cambodian border (mefloquine)

Population movement

- Globalisation (air and train travel is prevalent)
- Leads to resurgence of the disease

Environmental challenges: climate change, monsoons

Climate change

- Temperature and precipitation
- Related to monsoons

Challenges (HIV/AIDS)

SE challenges: difficulties in HIV detection, lifestyle choices, social stigma, high cost of ART, population movement

Difficulties in HIV detection

- Only way to detect HIV/AIDS is via testing. Expensive.
- Some symptoms may develop after 10-20 years.
- Symptoms may include flu. However, these may be dismissed as common illnesses.

Lifestyle choices

- Stubbornly practise unsafe sex (list scenarios)
- E.g. practising polygamy in Kenya

Social stigma

- Discrimination and ostracisation
- Challenge is to getting support and understanding from the society to drop the social stigma and accept them.

Population movement

- Due to work such as mining activities.
- People cross over borders
- Engage in commercial sex activities
- E.g. Kinshasa Highway linking Uganda and Kenya

Roles

Individuals

Communities

- Their implementation and deployment of trained health workers may make patients be more receptive to medical treatment.
- CLTS in Sierra Leone. Purpose is to increase sustainable sanitation worldwide. The community often organises itself to go from house to house, digging toilets for each household that needs assistance.
- Effective as it has helped 754 communities improve their sanitation. ***So?***
- However, CLTS works best in rural areas where the population density is low. Urban areas lack the space for toilets.

Government: precautionary (H1N1, thermal fogging) and mitigation (Do the Mozzie Wipeout)

Thermal fogging (precautionary)

- The distribution of insecticides by using fog produced by heat.
- Effective as it helps to get rid of mosquitoes, giving promising results in disease control.
- However, thermal fogging is expensive and it can cause high levels of chemical wastage.

Do the Mozzie Wipeout (mitigation)

- Launched by NEA in 2013

- Aims are to prevent dengue outbreak and raise awareness of the need for prevention measures.
- Effective as the dengue outbreak in 2013 did not reach epidemic level although the number of neighbourhood dengue clusters increased and there were only 7 deaths.
- However, proper planning is required and sufficient personnel must deployed for inspection. Cooperation with citizens.

IO

Getting to Zero

- The Joint United Nations Programme on HIV/AIDS (UNAIDS) leads the world in achieving universal access to HIV/AIDS treatment.
- Allows for comprehensive action to tackle AIDS.
- Effective as UNAIDS' gave the Government of Kenya a whopping sum of US$483 million, thereby giving the Kenyans money to tackle AIDS. (*basically providing financial support)*
- However, HIV-related abuses of human rights continue to remain widespread, obstructing effective HIV responses.

NGO

Measles and Rubella Initiative

- M&RI is a global partnership and it ensures that no child dies from measles or is born with congenital rubella syndrome.
- Provide vaccination through routine immunisation and campaigns. Monitor the diseases and evaluate results to ensure progress.
- Effective as it has helped to raise measles vaccination coverage globally and reduced measles deaths greatly.
- However, many LDCs have limited funds to combat measles.