

Answering Techniques

General

- For calculated data (e.g. %, diff., temp. range), quote the original data first
- Always ATQ w.r.t. question stem
- 'Evaluate', 'describe impacts (did not specify + or -)' = discuss both + and -

Section A (W&C GI)

1. Suggest hypothesis.

As ___ increases / decreases, ___ increases / decreases.

2. Suggest guiding question.

How does ___ affect ___?

3. Support / reject or validity of hypothesis.

ATQ. 2 Supporting evidence + 1 anomaly: When ___ is (much) higher / lower / highest / lowest at ___, the ___ is (much) higher / lower / highest / lowest.

4. Test hypothesis / answer guiding question / show ___ on a graph.

ATQ. x-axis (independent) = ___, y-axis* (dependent) = ___

- Trend: temp. → simple line graph, rainfall → simple bar graph
- Multiple locations / variables: temp. → comparative line graph, rainfall → comparative bar graph

*For multiple weather variables: y-axis with 1st vertical line = ___ on the right and 2nd line = on the left. Plot data accurately using different coloured lines

/ bars. Use a legend to indicate different colours for different...

- Relationship → scatter graph
Plot best-fit line. Positive gradient = positive relationship. Negative gradient = negative relationship.

5. Drawing conclusions

General relationship. Decrease / increase is less / more significant at lower / higher ___ of __, at ___% from ___ to ___. Bring in theory if applicable.

6. Ensure reliability

- One location = data does not account for changes in ___ across multiple locations → take measurements at 2 other locations such as ___ and ___.
- Once at _ a.m. / p.m. daily = data does not account for changes in ___ due to variable weather throughout the day → in the morning at _ am, afternoon at _ pm and at night at _ pm
- Different timings = data does not account for changes in ___ due to variable weather throughout the day → split into groups of 3 stationed at each location to take readings simultaneously (and obtain average readings)
- Took measurements for _ days = scope of data collection isn't large enough → extend over a longer period of time of _ days / weeks / months

Sections B & C

7. Describing relationships.

As variable X increases / decreases from ___ to ___, variable Y increases / decreases from ___ to ___. + Anomalies, if any

8. Describing trends.

Overall trend: increase / decrease / constant from ___ to ___. + Significant changes (same direction as overall trend): greatest / least increase / decrease of ___% from ___ to ___. + Anomalies (opposite direction). + Comparisons if there are more than 2 variables

9. Describe distributions/patterns.

Describe locations of low and high conc.: evi + descriptive words (e.g. highest / smallest, conc. / dispersed, inland / coastal) + specify names + compass directions + (choropleth maps) categorise into 'high', 'moderate' and 'low' + Anomalies, if any

10. Compare and contrast.

Compare = at least 1 sim. & 1 diff. Contrast = only diff.

11. 8 mark essay.

- Intro: While main factor, there are also other factors like...
- 4 body paras (2v2 on both sides)
- Balanced conclusion: short-term / long-term, DC / LDC, possible negative effects, how fast it takes for benefits to set in, cost and ease of strategy etc.

GEOGRAPHICAL INVESTIGATION



WEATHER

Stevenson Screen

A Stevenson Screen is a great place to store thermometers and other instruments as they provide cover from direct sunlight as well as adequate air circulation / ventilation!

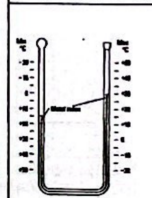
FEATURES:

- PAINTED WHITE: reflect heat from the box
- MADE OF WOOD: prevent absorption and conduction of heat
- DOWNWARD SLANTING LOUVRES: allow free air circulation and keep out rain and direct sunlight
- DOUBLE-LAYERED ROOF: create air space (air is poor conductor of heat)
- 4 LEGS 1 M HIGH: avoid the influence of warmed ground surface

SETTING:

- Open area and away from buildings and trees so as to have good air flow circulating around the box.
- Grassy area as concrete and pavement attract a lot more heat.

Max-Min Thermometer



Max temp = 25°C
Min temp = 20°C

Diurnal temp range = 25 - 20 = 5°C

Ensuring ACCURACY

- Measured using an analogue or digital thermometer.
- Maximum and minimum temperatures during the day are measured using the maximum-minimum thermometer.
- The maximum and minimum temperatures are indicated by the lower end of the metal indices in the right bulb ("maximum") and left bulb ("minimum") respectively.
- The maximum-minimum thermometer is usually housed in a Stevenson Screen where it is kept out of direct sunlight.

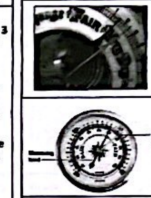
Ensuring RELIABILITY

- Shield bulb from direct sunlight with clipboard/paper/hand (the shade) as a thermometer in direct sunlight is registering the heat energy of sunlight and not the true air temperature.
- Hold the thermometer about 1.5 m above the ground to avoid picking up heat from the warmed ground.
- Hold the thermometer by its plastic edges and not by the glass bulb as our fingers can warm the bulb.
- Ensure the thermometer is vertical and our eyes at the level with the top of the liquid in the tube when taking readings to avoid parallax error.
- Take at least 3 readings at each timing and find the average.

Ensuring RELIABILITY

- Take temperature readings for at least 3 times a day and for at least 3 days as temperatures will change within each day and everyday.
- Ensure readings are taken at the same time and exact same spot for each day to ensure consistency when making comparisons with data from other sites.

Barometer



Before using the barometer, you have to align it. Check that the moveable pointer is aligned with the measuring hand to mark the CURRENT pressure.

AIR PRESSURE

- Ensure the moveable pointer is arranged over the measuring hand to get the current pressure.
- Take 3 readings at each timing and find the average.

Ensuring ACCURACY

- If the measuring hand moves to the LEFT, it means air pressure is FALLING!
- If the measuring hand moves to the RIGHT, it means air pressure is RISING!

Ensuring RELIABILITY

- You may wish to compare the air pressure measured with the local weather station.
- Take at least 3 readings each day (different timings) and over at least 3 days.

Sling Psychrometer

The wet bulb thermometer is placed with a wick in a dish.

RELATIVE HUMIDITY

- Dip the wick of the wet bulb thermometer in water.
- Swing it at a steady pace.
- Stop swinging it after 1 minute and read the temperature on the wet bulb thermometer.
- Next, swing sling psychrometer again for a minute. Then read the wet bulb temperature again.
- If the two temperatures are different, repeat steps above until the same temperature is recorded consecutively.
- Then read and record the temperature on the dry bulb thermometer.
- Calculate the difference between the wet bulb temperature and dry bulb temperature - wet bulb depression.
- Finally, determine the relative humidity using the RH conversion table.

Sling Psychrometer

The wet bulb thermometer is placed with a wick in a dish.

RELATIVE HUMIDITY

- Stand in an open, shady spot so that the radiant heat from the sun does not affect the thermometers.
- Do not hold the wet bulb wick with our fingers as the oils from our fingers may affect the evaporation of water from wick.
- Do not hold the glass bulb of both thermometers as our fingers may warm the bulbs.
- Swing the sling psychrometer far from our body and face the wind direction so that the wind can blow over the wick.
- Only take wet bulb temperature reading when consecutive readings are the same.

RH Conversion Table

Wet Bulb Temp (°C)	Wet Bulb Depression (°C)	Relative Humidity (%)
1	1	99
2	2	98
3	3	97
4	4	96
5	5	95
6	6	94
7	7	93
8	8	92
9	9	91
10	10	90
11	11	89
12	12	88
13	13	87
14	14	86
15	15	85
16	16	84
17	17	83
18	18	82
19	19	81
20	20	80
21	21	79
22	22	78
23	23	77
24	24	76
25	25	75
26	26	74
27	27	73
28	28	72
29	29	71
30	30	70

DRY BULB TEMPERATURE = 32°C
WET BULB TEMPERATURE = 28°C
WET BULB DEPRESSION = 32 - 28 = 4°C
RELATIVE HUMIDITY = 74%

Clouds

How we measure cloud amounts?

- Cloud cover is measured in oktas, or eighths of the sky.
- If you look up at the sky, and mentally divide it into 8 boxes, then imagine all the cloud you can see squashed into these boxes.
- How many boxes do the cloud fill? This is how many oktas of cloud there are.

Clouds

How we measure cloud amounts?

- The same person should be assigned to determine coverage of sky by clouds to standardise the readings at different timings and over a few days.
- Cloud cover when viewed through the oktas grid may not be accurate as it is subjective. The clouds may only cover a portion of the grid and the students will need to decide what they consider as 1 okta.
- It will be more accurate if the same person can lie down flat on the same spot and lift the grid up to count.

Wind Speed

Wind speed can be measured using a handheld anemometer.

- Hold the anemometer and stand at an open corridor high up in your school building OR
- Hold the anemometer while standing in an open area where the wind blows freely.
- When the wind blows, the cups rotate and the wind speed is read off the scale.

Wind Vane

Place the wind vane upright in an open area without trees or buildings, where the wind is blowing directly at it.

- OR
- Stand at an open area and hold it upright, slightly away from you and above your head.
- When the wind blows, the wind vane will point in the direction that it is blowing from.

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Rain Gauge

Record the time at which the rainfall events start and end.

- Pour the collected water in the rain gauge into a measuring cylinder. Read and record the water level.
- Clear and restore the rain gauge.

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Weather Tracker

Can measure the following (amongst others):

- temperature
- relative humidity
- wind speed
- air pressure
- cannot measure: precipitation / rainfall
- wind direction

Advantages of using weather tracker:

1. **READING**
2. **INSTANT** measurement
3. **EASY** to read
4. **CAN** measure several weather elements
5. **ACCURACY**
6. **PRECISE** decimal point reading (precise / exact)
7. **LESS** chance of human error
8. **CONVENIENCE**
9. **PORTABLE** / easy to carry
10. **LIGHTWEIGHT**

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Maps

Show the location of physical features and human activities found at the fieldwork site.

- We can infer how the physical features and human activities to be studied interact prior to the fieldwork investigation if we study these maps.
- Can be annotated with the locations of recorded data.
- Can also be updated with data collected during fieldwork investigation which can then be used in presentations and reports.

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ANNOTATED PHOTOGRAPHS

Advantages:

- Convenient, as most mobile phones are now equipped with cameras.
- Photographs can capture the entire landscape as we can take a few photographs of the same area of study and merge them together.
- Photographs can record features on the fieldwork site for future reference.
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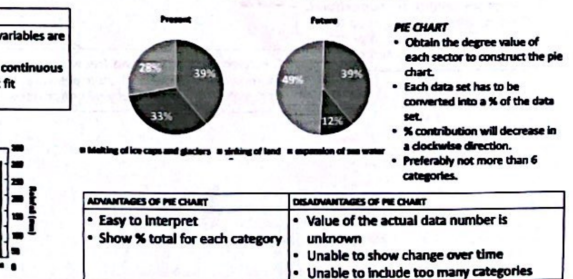
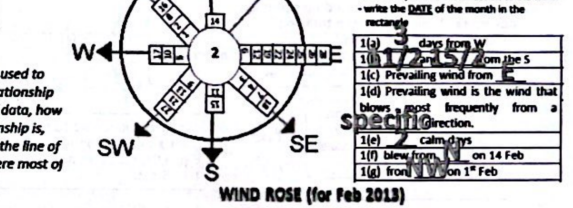
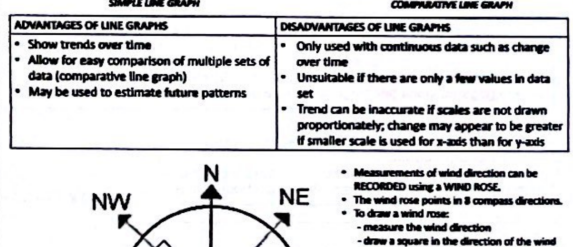
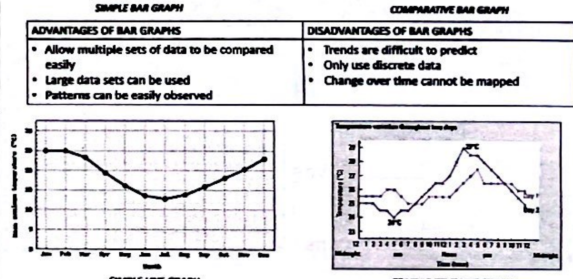
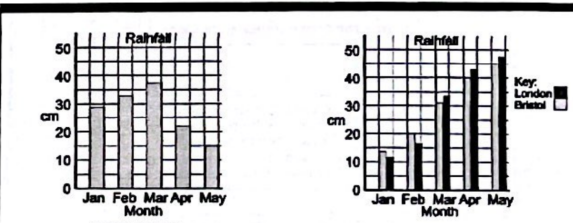
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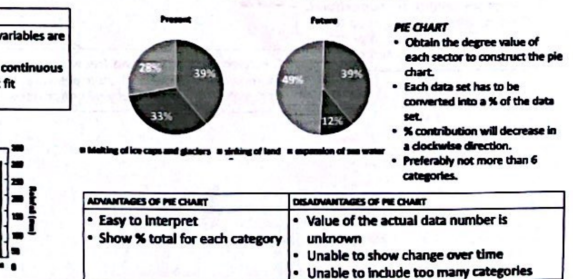
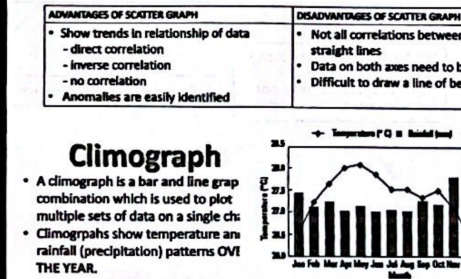
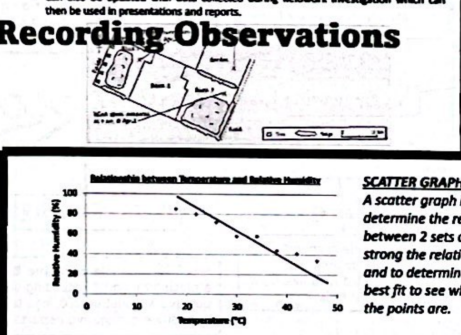
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Data Presentation



Natural Hazards

threatens human lives
damages property

caused by severe and extreme
weather and climate events

Climate Hazards

Floods
Storms

Caused by plate movements

when continental crusts and ocean floors move

CAUSES OF TECTONIC HAZARDS

Internal Structure of Earth

Lithosphere (crust and
uppermost mantle)

High temperatures and
pressure → rocks close
to melting point → easily
deformed

Asthenosphere

Crust
• Basalt and
granite rocks
• A few km to
more than
70 km thick

Denser

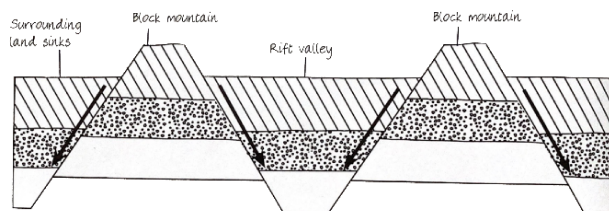
Mantle
• Mostly solid rock
that flows under high
temperature and
pressure
• 2,900 km thick
• Temperature between
800°C and 3,000°C

Less Dense

Core

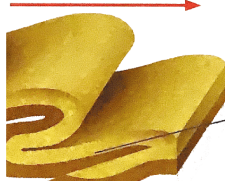
• Mostly iron and nickel
• Separated into liquid outer core and
solid inner core
• About 3,500 km thick
• Temperature between 3,000°C and
5,000°C

Total depth from crust to core: 6,378 km



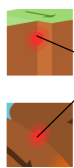
Tensional force

Increasing compressional force



Earthquakes

Subduction / transform plate boundary →
friction between moving plates → slow build-up
of stress → rocks suddenly slip many metres
when they can no longer withstand the
increasing stress → earthquakes which release
energy in the form of seismic waves along the
surface of the earth → ground vibrates violently



Upfold/
Anticline
Downfold/
Syncline

Compressional forces from converging plates creates
immense pressure which causes layers of rocks to
buckle and fold. A folded rock layer consists of the
anticline (upfold) and syncline (downfold).

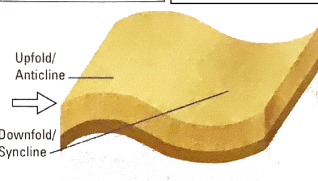
Focus: point of sudden energy release where
seismic waves radiate out
Epicentre: point on earth's surface directly above
the focus

Rift Valleys and Block Mountains

Tensional forces from diverging plates results in
parts of the crust being fractured, causing:

- A central block of land to subside, forming a **rift valley**
- The block of land with steep slopes left standing higher than the surrounding land is the **block mountain**

Fold Mountains



Compressional force

Plate Movement

Type of Crust	Location	Thickness
Oceanic Crust	Beneath deep oceans	5-8 km
Continental Crust	Beneath continental land masses Under shallow seas close to continents	35-70 km

Convectional currents: movements of heat within the mantle

1 Material in the mantle is heated by the core, causing the mantle material to expand, rise and spread out beneath the plates. This causes plates to be dragged along and move away from each other

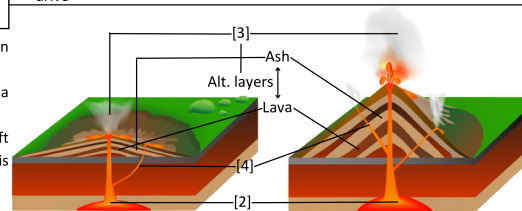
2 Hot mantle material cools slightly and sinks, pulling the plates along

The sinking mantle heats up again as it nears the core and the whole process repeats

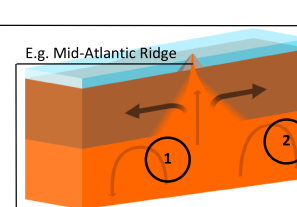
Slab-pull force: dense, sinking oceanic plate at subduction zones pulls the rest of the plate behind it

3 The subducting drives the downward-moving portion of convection currents

The mantle material which is found away from where the plate subducts drive

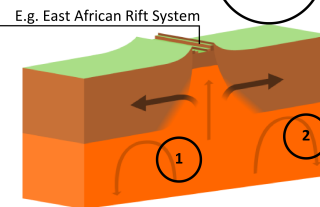


Feature	Shield Volcano E.g. Mount Washington, USA	Stratovolcano E.g. Mount Pinatubo, Philippines
Common Occurrence	Divergent plate boundaries E.g. Atlantic Ocean	Convergent plate boundaries E.g. Pacific Ring of Fire
Explosion	• Allows gases to escape more easily • Flows more easily through the vent and erupts gently	• Trap gases, building up pressure • When magma rises, trapped gas expands and causes a violent explosion
Lava	• Low-silica lava flows easily and spreads out over a large area before solidifying • Gentle sloping sides with wider base	• High-silica lava does not flow easily and solidifies near the vent • Steep sloping sides with wide base



Oceanic-Oceanic Divergence

E.g. North American Plate & Eurasian Plate



Continental-Continental Divergence

E.g. African Plate - Nubian Boundary & Somali Boundary

Fractures are formed at the plate boundary

Sea Floor Spreading

Magma rises from the mantle to form new sea floor. Lava flows out onto the sea-floor, cools and solidifies, forming a **mid-oceanic ridge**.

Undersea Volcanoes

At various points along the mid-oceanic ridge, magma builds up and solidifies to form undersea volcanoes.

Volcanic Islands

When undersea volcanoes grow above sea level, they are known as volcanic islands. E.g. The Azores in the North Atlantic Ocean

Volcanoes

[1] Magma Formation

The subducting plate melts the mantle above it, forming magma.

[2] Build-up of Magma

Magma is less dense than surrounding rocks → rises and accumulates in the magma chamber → pressure builds up

[3] Volcanic Eruption

Magma forces its way to the earth's surface through vents → pyroclasts are released → new eruption of lava covers the pyroclasts and builds up the volcano → lava builds up around the vent and solidifies to form a crater

[4] Secondary Cones

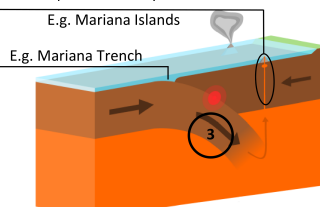
Blocked vent → forces magma out of a new, secondary route to the surface → a secondary cone is developed

[5] Caldera

Explosive eruption → blows off summit → loss of structural support → sides of the crater collapse inwards, forming a caldera

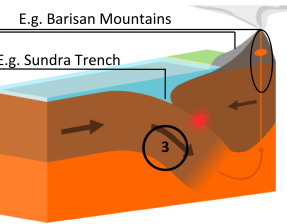
Oceanic Trench

At the point of subduction, a depression in the sea floor is created.



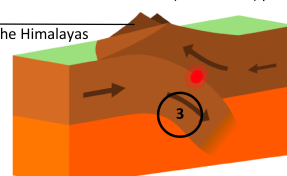
Oceanic-Oceanic Convergence

E.g. denser Pacific Plate subducts beneath Philippine Plate



Oceanic-Continental Convergence

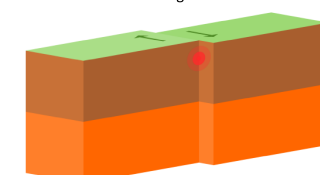
E.g. denser Australian (oceanic) plate subducts beneath Eurasian (continental) plate



Continental-Continental Convergence

E.g. Indian Plate & Eurasian Plate

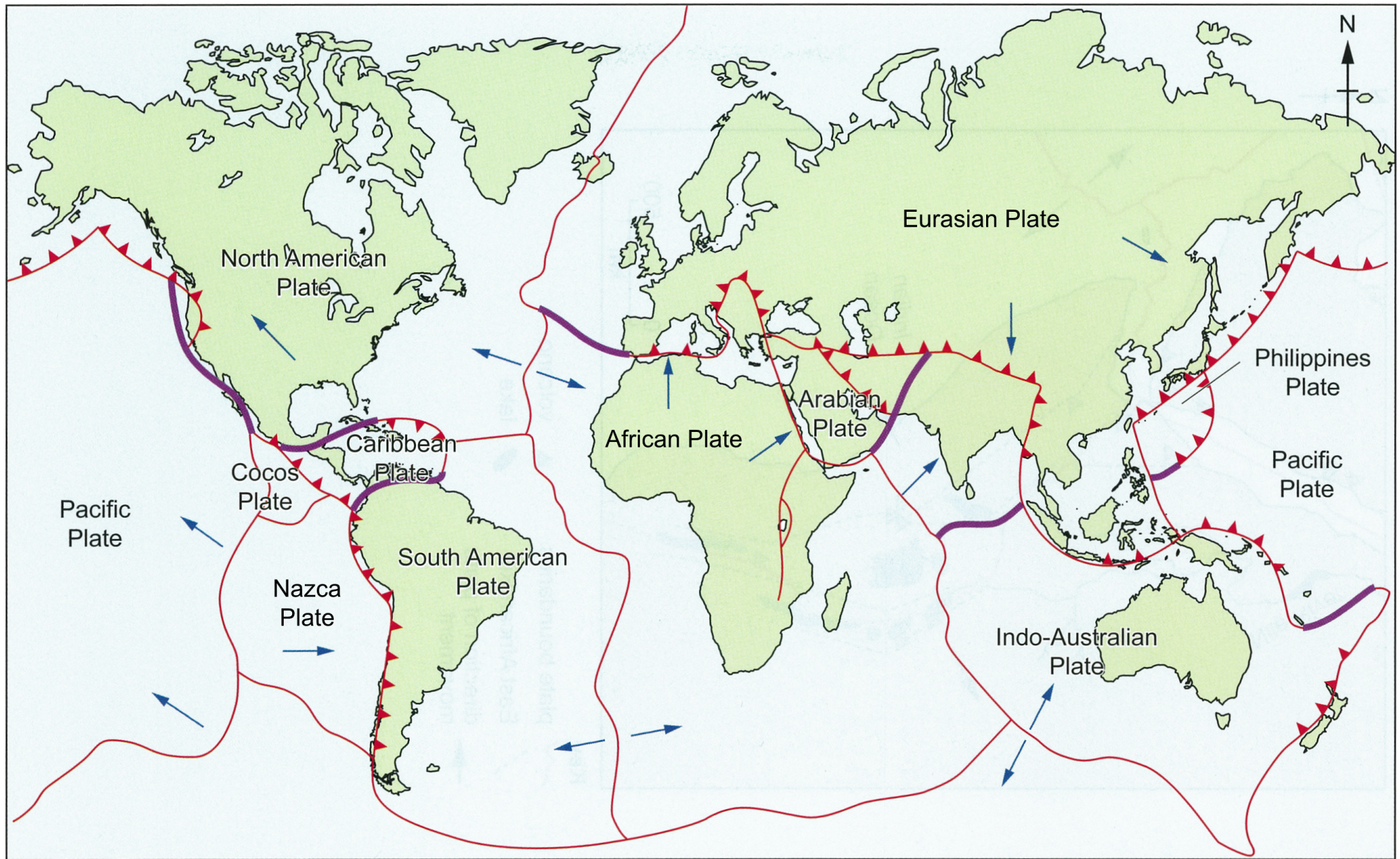
Two continental plates collide and push against one another → plates are too thick and buoyant → resist subduction → plates break and slide along fractures in the crust



Continental-Continental Transform

E.g. Eurasian Plate & Anatolian Plate
Plates slide past each other, forming transform faults

Major tectonic plates and types of plate boundaries



Key

▲▲▲ convergent boundary

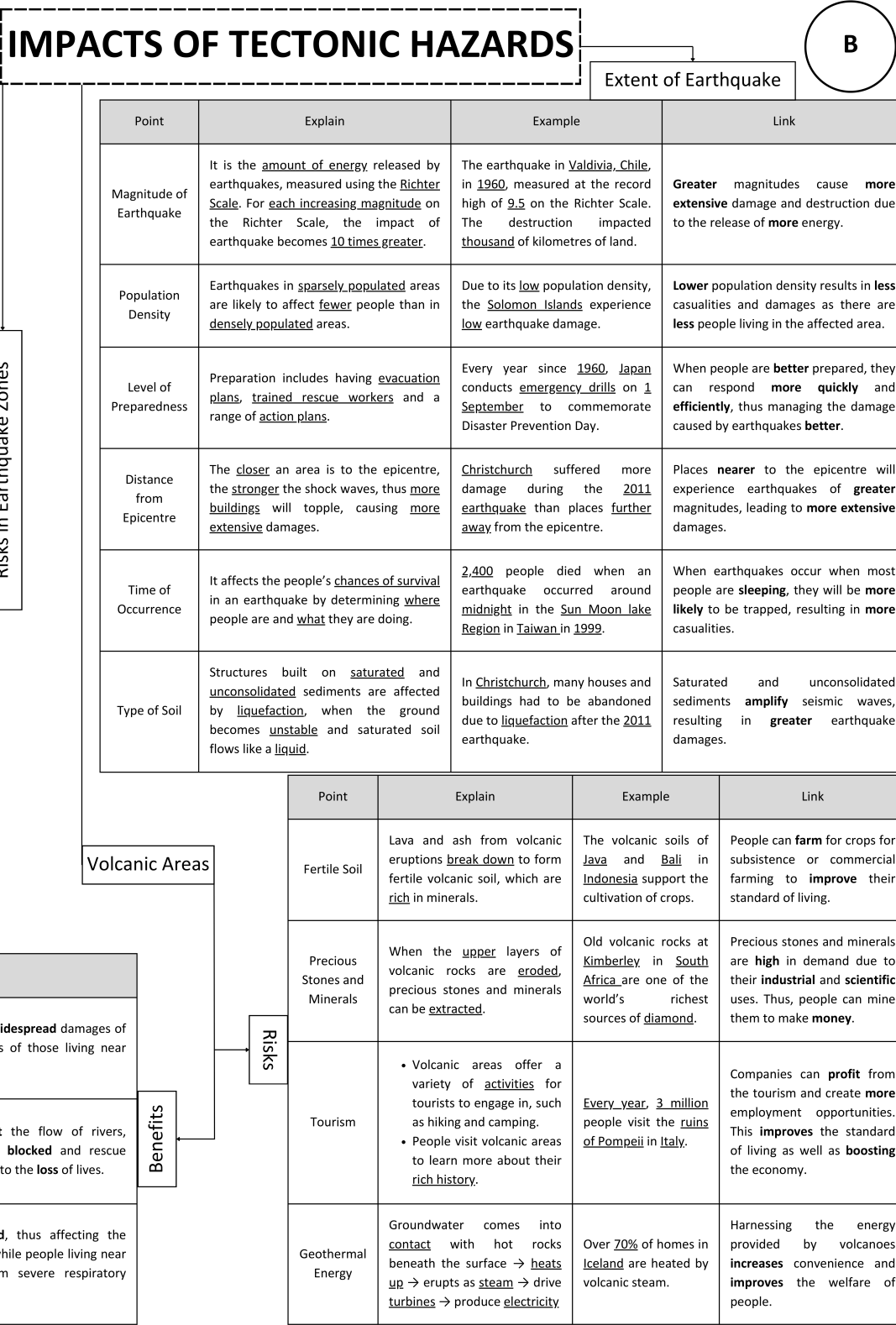
— divergent boundary

— transform boundary

→ direction of plate movement

Point	Explain	Example	Link
Tsunamis	It is an unusually large sea which may be formed due to an explosive underwater volcanic eruption .	The 2004 9.2 magnitude North Sumatra earthquake caused damages to coastal communities in 12 countries.	Tsunamis can travel long distances and cause widespread destruction at coastal areas when it sweeps inland.
	1 Seismic energy from an offshore earthquake forces out a mass of sea water		
	2 Starting height: < 1 m wave length: 100-150 km speed: 800 km/h		
	3 Shallower water → greater friction → slows the waves → increase in height		
	4 Point of impact on the coast → speed: 30-50 km/h height: 15 m		
	5 Movement of sea floor → causes a void → water rushes to fill in → water is then forced out again → tsunami		
Disruption of Service	Earthquake vibrations snap pipes and break cables , causing the outbreak of fires .	The earthquake in Kobe, Japan , in 1995 damaged pipes and transmission lines.	Over a large area, supply of electricity, gas and water are disrupted , leading to a temporary decline in many people's standard of living.
Landslides	Earthquake vibrations weaken slopes of hills and mountains, resulting in landslides. When there is heavy rainfall , the soil becomes saturated, causing the mixed soil debris to flow down the slope.	In 1970 , an earthquake off the coast of Peru destabilised the slopes of Mount Huascarán , triggering a massive landslide.	Many people will be unable to survive the disaster, thus leading to a high death toll.
Destruction of Properties and Infrastructure	Earthquakes can cause widespread destruction to many homes and cracks to form in roads and bridges.	The earthquake in Tōhoku, Japan , in 2011 , forced hundreds of thousands of people from their homes, while many roads were damaged.	There will be a severe shortage of housing while transportation is severely disrupted , leading to decreased accessibility. Large amounts of resources would have to be spent on repair works, putting a strain on the government's limited budget.
Loss of Lives	Hazards associated with living in earthquake zones can cause great destruction when an earthquake occurs, threatening the lives of those living there.	28,000 people died when the 9.0 magnitude 2011 earthquake in Tōhoku, Japan resulted in powerful tsunamis.	When people are unprepared and did not take necessary precautionary measures to minimise damage, there will be loss of lives when an earthquake occurs.

Point	Explain	Example	Link
Massive Destruction by Volcanic Materials	Volcanic materials such as lava and pyroclasts are released. - Low-silica lava moves rapidly and flows over long distances. - Volcanic bombs of heated rocks can fall in surrounding areas.	The ongoing eruption of Kilauea in Hawaii since 1983 has destroyed many homes and highways.	Volcanic materials can lead to widespread damages of property and threaten the lives of those living near volcanic areas.
Landslides and Lahars	- Due to the structural collapse of a volcanic cone, rock fragments can fall from the volcano (landslides). - Landslides can generate flows of wet volcanic debris (lahars) when pyroclasts mixes with water from melted ice or lakes.	The eruption of Mount St. Helens, USA in 1980 led to a landslide that was saturated with water, thus forming many lahars.	Landslides and lahars obstruct the flow of rivers, causing floods. Roads may be blocked and rescue efforts are hampered. This leads to the loss of lives.
Pollution	- Volcanic eruptions eject thick plumes of ash and release harmful gases such as sulfur dioxide. - The fine ash particles can be carried by wind over large distances.	The 2010 eruption of Eyjafjallajökull in Iceland resulted in a closure of air space over much of Europe as ash particles posed a serious danger to aircraft engines and structures.	Human activities are disrupted , thus affecting the economy of the affected area, while people living near volcanic areas will suffer from severe respiratory problems.



RESPONSES TO EARTHQUAKES

Preparedness Measures

Point	Explain	Example	Link	Limitations
Landuse Regulation	- Set of rules <u>restricting</u> developments in areas at risk of <u>liquefaction</u>, where the ground becomes unstable. <u>Prohibition</u> of constructing new buildings on <u>low lying</u> land which are vulnerable to tsunamis.	In <u>California, USA</u> , all new building developments are not built across areas at risk of liquefaction.	This reduces the impact and damages on these areas.	It is <u>costly</u> for the government to compensate those who have to move, and put into place effective protection measures.
Infrastructure	- Steel and reinforced concrete are able to <u>withstand</u> earthquakes better. - Damping devices act as <u>shock absorbers</u> for some of the seismic energy released during an earthquake. - Buildings with wide and heavy bases are <u>less likely</u> to collapse.	A <u>damping device</u> is installed in <u>Taipei 101</u> in <u>Taiwan</u> , which is made of steel and reinforced <u>concrete</u> , and its foundation is reinforced by heavy <u>metal bars</u> .	Constructing buildings that can withstand potential earthquakes leads to fewer lives lost and faster rescue and evacuations.	This adds to the <u>cost</u> of construction and maintenance of buildings.
Emergency Drills	People <u>practise</u> the steps to take when an earthquake occurs. This includes moving to safe locations and practising first aid.	Every year since <u>1960</u> , <u>Japan</u> conducts <u>emergency drills</u> on <u>1 September</u> to commemorate Disaster Prevention Day.	This creates awareness among the population and reduces levels of panic during an event, minimising the number of casualties.	There is <u>insufficient</u> time for evacuation as earthquakes are difficult to predict.
Earthquakes Monitoring and Warning Systems	Earthquakes can be monitored by - Studying the <u>history</u> of when and where earthquakes have occurred. - Installing earthquake <u>sensors</u> in earthquake-prone zones	Earthquake motion data is gathered from hundreds of <u>observations stations</u> installed on bridges and roads in <u>Japan</u> .	This allows the frequency and magnitude of earthquake to be predicted , thus allowing more time for evacuation.	Earthquake sensors are <u>expensive</u> to obtain, install and use.
Tsunami Monitoring and Warning Systems	Deep-ocean tsunami <u>detectors</u> monitor tsunamis by measuring and relaying temperature and pressure periodically.	A network of pressure sensors, seismographs and deep ocean tsunami detectors are located in <u>Hawaii, USA</u> .	This allows the path of tsunamis to be forecast , thus allowing more time for evacuation.	The detectors are prone to giving <u>false</u> alarms when waves are high.

Short-Term Responses

Point	Implementation	Successes	Limitations
Search and Rescue	People trapped under collapsed buildings are <u>quickly</u> located and freed.	Some <u>survivors</u> are found after being trapped for a couple of weeks without food. After the <u>2011</u> earthquake in <u>Tohoku, Japan</u> , <u>sniffer dogs</u> and <u>heat sensors</u> were deployed and successfully rescued many who were trapped.	Rescue workers only have a limited time of <u>72 hours</u> to find trapped survivors. Without food and water, trapped people are unlikely to survive after 72 hours. Rescue workers had a <u>limited</u> time of 72 hours to rapidly search through two towns after the <u>2011</u> earthquake in <u>Tohoku, Japan</u> .
Emergency, Food and Medical Supplies	The injured are <u>treated</u> and <u>clean</u> drinking water is provided to survivors to prevent dehydration and the spread of diseases.	The provision of <u>immediate</u> aid helps survivors continue with their lives. After the <u>2002</u> earthquake in <u>Afyon</u> , the <u>Turkish Red Crescent Society</u> immediately responded by delivering <u>50,000</u> blankets to the region.	Medical supplies, food and water may not be sufficient and this may cause <u>social unrest</u> . After the <u>2010</u> earthquake in <u>Haiti</u> , looting and fighting broke out as people <u>fought</u> for food and medical supplies.

Long-Term Responses

Point	Implementation	Successes	Limitations
Rebuilding of Infrastructure	Infrastructure and amenities are <u>rebuilt</u> and <u>improved</u> upon after a disaster.	Authorities often develop <u>stricter</u> building codes to ensure infrastructure is restored at a <u>higher</u> safety level than before. After the <u>1995</u> earthquake in <u>Kobe, Japan</u> spent <u>billions</u> developing technology to build more earthquake-resistant buildings.	Earthquake-resistant buildings are not necessarily protected against <u>tsunamis</u> . In the coastal areas of <u>Chile</u> , when an earthquake struck, tsunamis massively damaged many earthquake-resistant buildings.
Provision of Health Care	Loss of loved ones after earthquakes cause long-term <u>trauma</u> , which are treated with long-term <u>counselling</u> .	Problems can be identified and addressed <u>early</u> . Health workers were deployed to <u>Christchurch, New Zealand</u> , after the <u>2011</u> earthquakes when problems of depression were identified.	Improving health options, such as restoring the resilience of people after an earthquake, can be very <u>challenging</u> . Many survivors of the <u>2010</u> earthquake in <u>Haiti</u> continue to lack access to basic necessities.

KQ1: ELEMENTS OF WEATHER

Condition of the atmosphere of a specific place over a **short** period of time.

A

KQ1.1: TEMPERATURE

AFFECTED BY:	DESCRIBE	EXPLAIN
1. LATITUDE • Refers to the distance away from the equator	At equator/low latitudes, temperatures are higher. At higher latitudes, temperatures are lower.	Solar angle is HIGH → heat from the sun is concentrated on a small area. Solar angle is LOW → sun's rays strike at a lower angle and the solar energy is spread out over a wider area.
2. ALTITUDE • Refers to the height of a place in relation to the sea level.	At higher altitudes, temperatures are lower. Temperature decreases by 6.5°C with every 1000m increase in altitude.	2 reasons: 1. Distance from the surface • About half of the solar energy that reaches Earth's surface will be absorbed directly. • Next, the warm surface then re-release the heat, warming up the atmosphere nearest to the ground. • The higher the altitude, the further you are from the surface of the earth which emits heat. 2. Air is thicker closer to earth's surface • Additionally, gravity attracts more air molecules closer to earth's surface. • Hence, there are more air molecules to absorb heat re-released by earth's surface. • As a result, the higher the altitude, the lower the temperature.
3. CLOUD COVER • Refers to amount of the sky that is covered by clouds.	PRESENCE OF CLOUDS When there is more cloud cover, diurnal (daily) temperature range is smaller. ABSENCE OF CLOUDS When there is less cloud cover, diurnal (daily) temperature range is larger.	• During the day , clouds reflect a lot of the Sun's energy back into space → air near earth's surface is cooler (does not heat up as much). • During the night , clouds absorb heat radiated from earth's surface, preventing it from escaping into the space → air near earth's surface is warmer (does not cool down as much). • During the day , absence of clouds allow large amounts of sun's energy to reach the earth , heating up earth's surface. • During the night , absence of clouds allow more heat radiated from the earth's surface to escape into space. → air near earth's surface cooler.
4. DISTANCE FROM SEA	MARITIME EFFECT • Causes coastal areas to have smaller annual temperature range. • Due to this effect, coastal areas experience cooler summers and warmer winters . CONTINENTAL EFFECT • Causes inland areas to have a larger annual temperature range. • Areas further inland experience warmer summers and colder winters	During Summer: • Air over the sea is cooler than air over land because sea heats up slower . Cooler air over the sea helps lower the temperature of coastal areas. Coastal areas are cooler than areas inland. During Winter: • Air over the sea is warmer than air over the land because sea loses heat more slowly than land. Warmer air over the sea helps increase the temperature of coastal areas. Coastal areas are warmer than areas inland. During Summer: • Land heats up faster than sea. Thus, Inland areas are warmer than coastal areas as it not influenced by sea. During winter: • Land loses heat faster than sea. Thus, Inland areas are cooler than coastal areas as it is not influenced by sea.

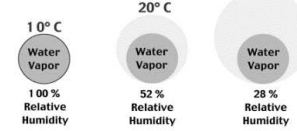
KQ1.2: RELATIVE HUMIDITY (%)

$$\frac{\text{Actual amount of water vapour in the air (g/m}^3\text{)}}{\text{Maximum amount of water vapour the air can hold (g/m}^3\text{)}} \times 100$$

at a given temperature.

Relative Humidity Decreases as temperature Increases (inverse relationship)

Example:



DESCRIBE

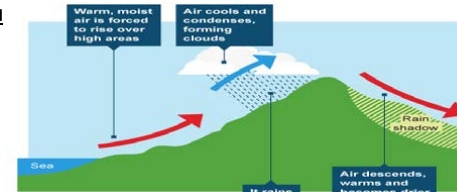
- When temperature increases from 10°C to 20°C, relative humidity decreases by 48%
- When temperature increases from 20°C to 30°C, relative humidity decreases by 22%

EXPLAIN

- This is because when temperature rises, the parcel of air **EXPANDS** and it can hold **MORE water vapour**.
- If the amount of water vapour in the air *stays the same*, RH decreases.

KQ1.3: RAINFALL

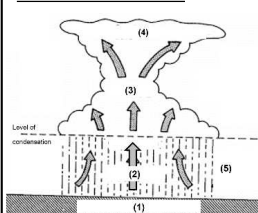
RELIEF RAIN



Condition: Warm, moist air forced over a MOUNTAIN

- Wind blows the warm, moist air up against the mountain.
- Air is forced up the **windward** side of the mountain.
- As the air cools to dew point temperature, **condensation** occurs. When the water droplets become heavy enough, they fall as relief rain.
- By the time the air moves to the **leeward** side, the air is **dry** and no rain falls.

CONVECTIONAL RAIN

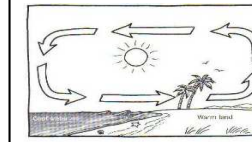


Condition: Intense heating (normally near the equator)

- Air near the surface of the ground is **heated strongly** by solar energy.
- The heated air **expands**, becomes **less dense**, and **rises**.
- As the air cools to dew point temperature, **condensation** occurs.
- As the ground gets heated continuously, **cumulonimbus clouds** are formed.
- When the water droplets become heavy enough, they fall as convectional rain.

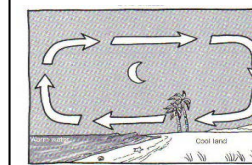
KQ1.4: PRESSURE AND WIND

SEA BREEZE

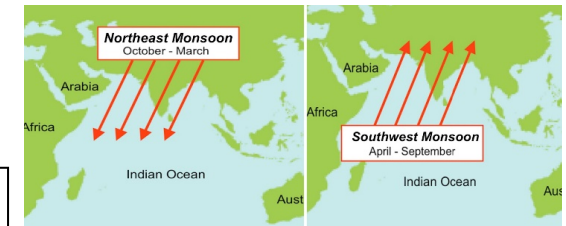


During the **DAY**, the **land heats up faster** than the sea. Warm air expands & rises, creating an area of **low** pressure over land. The reverse happens at sea.
Since air moves from high pressure to low pressure area, **sea breeze** blows **FROM sea** (high pressure) to land (low pressure).

LAND BREEZE



At **NIGHT**, **land cools down faster** than sea. Cold air sinks, creating an area of high pressure over land. The reverse happens at sea.
Since air moves from high pressure to low pressure area, **land breeze** blows **FROM land** (high pressure) to sea (low pressure).



- Between **Oct and February**, the **Southern Hemisphere** experiences **summer**. The air over Australia heats up, expands and rises, forming a region of **LOW** pressure over **Australia**.
- At the same time, the **Northern Hemisphere** experiences **winter**. Cold air sinks, creating an area of **HIGH** pressure over Central Asia and India.
- Due to the difference in pressure, **air moves from the Indian and Central Asia to Australia**.
- As the winds cross the Equator, the **Coriolis effect** deflects the winds and they head for **Australia**.
- The **monsoon winds pick up moisture** as it travels over Indian Ocean, bringing **heavy rain to Australia**.

- Between **June and Sept**, the **Northern Hemisphere** experiences **summer**. The air heats up, expands and rises, forming an area of **LOW** pressure over **Central Asia/India**.
- At the same time, the **Southern Hemisphere** experiences **winter**. Cold air sinks, creating an area of **HIGH** pressure over **Australia**.
- Due to the difference in pressure, **air moves from Australia to India and Central Asia**.
- As the winds cross the Equator, the **Coriolis effect** deflects the winds and they head for **Central Asia**.
- The **monsoon winds pick up moisture** as it travels over Indian Ocean, bringing **heavy rain to India**.

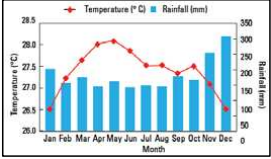
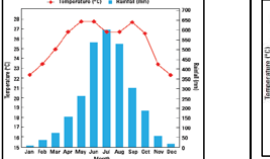
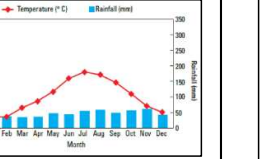
KQ2: CLIMATE

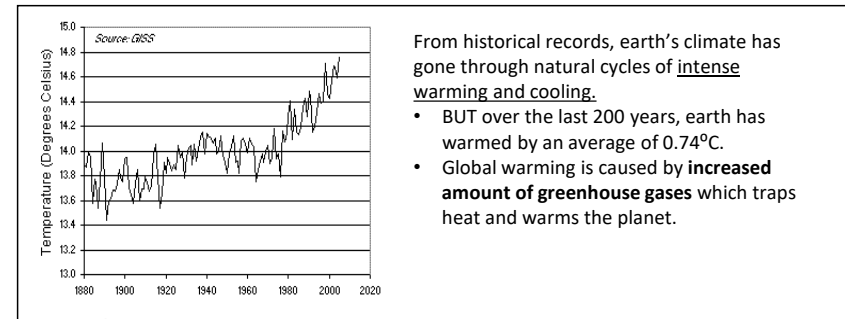
Average condition of the atmosphere of a specific place over a long period of time, usually over 30 years.

KQ1.5: TYPES OF CLIMATE

CLIMATE CHANGE

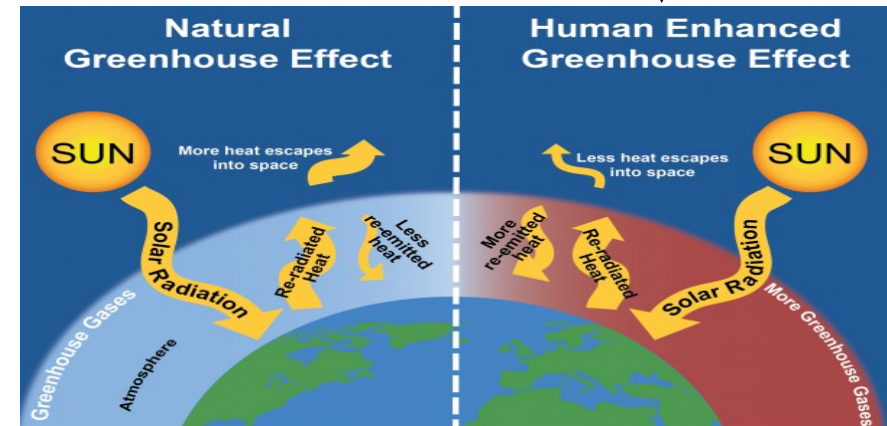
Variation in the global climate in the long term.

		EQUATORIAL	MONSOON	COOL-TEMPERATE
CLIMOGRAPH				
LOCATION		Between 10° north and south of the Equator. (eg. Johor, Malaysia)	Between 5° and 25° north and south of the Equator. (eg. Chittagong, Bangladesh)	Between 45° and 60° north and south of the Equator. (eg. London, England)
TEMPERATURE	DESCRIBE (read the values from the graph)	- High <u>mean annual temperature</u> of about 27°C. - Small <u>annual temperature range</u> of 2°C to 3°C.	- High <u>mean annual temperature</u> but still lower than equatorial climate. - Small to moderate <u>annual temperature range</u> of about 6°C	- Low <u>mean annual temperature</u> of 10°C. - Large <u>annual temperature range</u> of 25°C.
	EXPLAIN	At <u>low latitudes</u> , <u>solar angle is high</u> → Sun's rays are more <u>concentrated</u> on a small area.	At <u>high latitudes</u> , <u>solar angle is low</u> → Sun's rays are more <u>concentrated</u> on a small area.	Experiences <u>four seasons</u> due to the <u>tilt</u> of the earth and its revolution around the sun. Eg: During <u>winter</u> , these places have <u>shorter days</u> and receive <u>less energy from the sun</u> .
RAINFALL	DESCRIBE	- High <u>total annual rainfall</u> of more than 2000 millimetres. <u>Evenly distributed</u> rainfall all year round.	- High <u>total annual rainfall</u> of 2000mm. - Experiences <u>distinct wet & dry season</u>.	- Low <u>total annual rainfall</u> of 600 mm <u>Evenly distributed</u> rainfall all year round
	EXPLAIN	Due to <u>high temperatures</u> throughout the year, <u>water evaporates quickly</u> into the air to <u>form cumulonimbus clouds</u> . <u>Convectional rain</u> often occurs in these places.	Rainfall affected by <u>monsoon winds</u> . In such places, there is <u>concentrated rainfall</u> in the <u>summer</u> , and <u>dry season</u> is experienced <u>during winter</u> .	Generally due to <u>low temperatures</u> , <u>water evaporates slowly</u> into the air to <u>form clouds</u> , resulting in <u>lower rainfall</u> .



GLOBAL WARMING

Increase in global temperatures over a long period of time.



GREENHOUSE EFFECT

It is a **NATURAL** process where greenhouse gases trap heat in the atmosphere to keep the atmosphere warm to sustain life on earth.

- Incoming solar energy from the sun passes through the atmosphere.
- Most of it is absorbed by the earth's surface which then heats up.
- The warmed surface of the earth then re-release the energy to the atmosphere.
- Greenhouse gases (i.e CO₂, methane) **absorb the re-released energy**, warming up the atmosphere.

ENHANCED GREENHOUSE EFFECT

It is the increase in the concentration of greenhouse gases in the atmosphere due to **HUMAN** activities, which traps more heat, leading to a rise in global temperatures.

KQ2.1: CAUSES OF CLIMATE CHANGE

C

NATURAL CAUSES

POINT	EXPLAIN	EXAMPLE	LINK
Volcanic Eruption	When a volcano erupts, large volumes of <u>sulfur dioxide</u> are released into the atmosphere. - Sulfur dioxide <u>reacts with water to form sulphur-based particles</u> in the atmosphere. Together with dust and ash, these particles <u>reflect solar energy back into space</u>. - This results in <u>global dimming</u>, which will temporarily <u>cool the earth</u> for months or years.	In 1991 , <u>Mount Pinatubo</u> released huge amount of ash that circulated the earth. This causes the <u>temperature to fall</u> in the Northern Hemisphere <u>by 0.6°C</u> .	Therefore, an increase in sulphur dioxide levels in the atmosphere, will result in global dimming. This will lead to the global cooling of some parts of the earth.
Variation in solar output (sunspots)	Sun gives out different amount of solar radiation due to changes in its magnetic field. - An <u>increase in magnetic activity</u> results in an <u>increase in sunspots</u>. <u>Areas surrounding the sunspots give out more energy</u> to make up for the cooler sunspot areas. - This will result in an <u>increase in solar radiation</u>.	The average sunspot cycle lasts for 11 years. In 2000 , the <u>peak in the number of sunspots</u> coincide with <u>high solar activity</u> . <u>Global temperatures increased</u> during this period.	Thus, an increase in number of sunspots will result in an increase in solar radiation, increasing the global temperatures.

HUMAN/ANTHROPOGENIC CAUSES

POINT	EXPLAIN	EXAMPLE	LINK
Deforestation - loss of forests due to the removal of trees in forested areas.	Trees are felled to make products or to clear areas for other uses. With deforestation, fewer trees absorb carbon dioxide, leading to an increase in carbon dioxide levels in the atmosphere. Also, the carbon that were stored in trees were also released, adding on to more carbon dioxide.	The greatest overall loss of forests occur in <u>Amazon Rainforest</u> . This is to make space for development for agricultural and commercial activities.	An increase in deforestation will lead to an increase in carbon dioxide levels in the atmosphere, leading to enhanced greenhouse effect → global warming.
Changing land use – Agriculture - practice of cultivating land, producing crops (vegetables) and raising livestock (farmed animals).	Land is <u>converted to urban areas</u> for agriculture. Tractors use <u>fossil fuels</u> which release carbon dioxide. <u>Cattle farming releases millions of tonnes of methane</u> gas every year as a waste gas. <u>Use of inorganic fertilisers increases amount of nitrous oxide in the soil</u>. Nitrous oxide is released when soil is ploughed. Organic materials such as dead leaves releases <u>methane during decomposition</u>.	In <u>Argentina</u> , methane from cows contribute more than <u>30% of the country's total greenhouse emissions</u> .	This results in an increase in greenhouse gases level in the atmosphere. This will thus lead to enhanced greenhouse effect.

POINT	EXPLAIN	EXAMPLE	LINK
Changing land use – Industries - production of goods and services within a country.	One form of industry is manufacturing. As population increases, manufacturing also increases. Increase demand for energy to manufacture goods also result in an increase in burning of fossil fuels. This releases even more carbon dioxide.	<u>China and India</u> have contributed to global greenhouse gas emission significantly as both of them have enjoyed <u>rapid industrialisation in recent years</u> .	This results in an increase in greenhouse gases level in the atmosphere. This will thus lead to enhanced greenhouse effect.
Changing land use – Urbanisation -increase number of people live in urban areas such as cities and towns.	With more people living in urban areas (cities), <u>more energy is required to meet the demand for various activities</u> such as heating, cooking and for transportation. This will lead to an increase in the burning of fossil fuels to meet the increasing demand for energy.	Household activities - energy is needed for heating, cooking, lighting and cooling. Transportation - energy is needed for large number of cars, buses and other forms of transportation.	The burning of fossil fuels will release large amounts of greenhouse gases in the atmosphere. This will thus lead to enhanced greenhouse effect.

HUMAN causes contribute more to the global warming/climate change than natural causes!

- Volcanic eruptions only have **short-term** effects on the earth's climate. This is because the temporary global cooling effect will stop **once the volcanic dust and ash settle**. Two years after the Mount Pinatubo eruption, the global climate returned to its original state.
- Furthermore, despite the large volumes of carbon dioxide released by the volcanoes, **human activities since the mid-1980s have resulted in more than 100 times the amount of carbon dioxide emitted by volcanoes**.
- Thus, based on the **timeframe** and **scale** of greenhouse gases released, **HUMANS** have contributed much more to global warming than natural causes.

KQ2.2: IMPACTS OF CLIMATE CHANGE

managed by

KQ2.3: RESPONSES TO CLIMATE CHANGE

POINT	EXPLAIN	EXAMPLE	LINK
SEA LEVEL RISE ☹️	Higher temperatures can cause <u>ice caps to melt</u> and the <u>water in seas to expand</u> . Both events can <u>lead to the rise in sea level</u> . Rising sea level <u>threaten low-lying areas</u> and islands. <u>Two-thirds of the world's largest cities</u> located in coastal areas are also <u>at risk</u> due to rising sea levels.	It is estimated that the <u>Maldives</u> will lose 80% of its land when the sea level rises by <u>half a metre</u> .	Sea level rise may result in loss of properties and many other negative impacts.
FREQUENT EXTREME WEATHER EVENTS ☹️	Higher temperatures have resulted in <u>faster rates of evaporation</u> in a warmer atmosphere. This can create more extreme weather events such as <u>hurricanes</u> . Hurricanes create <u>storm surge</u> , which can lead to <u>coastal floods</u> . Properties are destroyed and people are unable to attend work.	Hurricanes in <u>USA</u> are expected to be 40% more frequent with global warming.	An extreme weather event results in significant economic losses and the loss of lives .
SPREAD OF INFECTIOUS INSECT-BORNE DISEASES ☹️	Climate change has resulted in increased temperatures and rainfall in various parts of the world. These favourable conditions encourage insects such as <u>mosquitoes to breed</u> , resulting in the spread of malaria and dengue fever . Malaria can cause high fever, chills and flu-like symptoms. Dengue fever can cause fever, headaches and severe bleeding.	Distribution of these diseases is also changing . In 2004, <u>dengue fever</u> was reported in the <u>cool climate areas of Nepal and Bhutan</u> .	Spread of such diseases may result to death , if not treated properly.
Lengthening the growing season in certain regions 😊	Higher temperatures may result in <u>longer growing seasons</u> in some regions. • Growing season refers to the <u>period during which crops can be grown</u> .	(+) An increase in the types of crops that can be grown in the United Kingdom . New crops such as blackberries and maize can be cultivated. (-) In Yunnan province, China , the production of fruits such as apples and cherries, and nuts such as almonds and walnuts is reduced as these fruits and nuts require cool weather conditions	Lengthening of the growing season may result in an increase in some crops, resulting in more food production for consumption.

POINT	EXPLAIN	SUCCESSSES	LIMITATIONS
INTERNATIONAL KYOTO PROTOCOL	An international agreement across countries to <u>reduce the level of greenhouse gases</u> in the atmosphere to <u>tackle global warming</u> . • <u>37 developed countries</u> have to reduce their GHG level as they have largely contributed to the rise of greenhouse gases <u>due to their industrial activities</u> in the past. • These countries are expected to reduce their greenhouse emissions by <u>at least 5% below their 1990 levels</u> between 2008 and 2012. • Developed countries are also to <u>provide funds to the less developed countries</u> to help them reduce greenhouse gas emissions.	Encouraged the world to come together for the first time to take action on climate change on a global scale . Countries such as Finland, Greece and Ireland have met or even exceeded their targets.	Effort depends on a country's willingness to commit to reducing their emissions. The total amount of emissions contributed by China, USA and India combined is 50% of the world's total emissions, enough to erase all the reductions in emissions made by other countries under the Kyoto Protocol.
NATIONAL SINGAPORE GREEN PLAN 2012	• Launched by Ministry of Environment in 2002 • Aims to <u>generate 60% of Singapore's energy needs using natural gas by 2012</u> • <u>Cleaner form of energy</u> than coal as it does not produce smoke	In 2010, about <u>79%</u> of Singapore's electricity generated from <u>natural gas</u> Exceeded the ministry's target	Natural gas <u>requires complex treatment</u> plants to process and pipelines to transport <u>High maintenance cost</u>
NATIONAL GREEN MARK SCHEME	• Launched by Building Construction Authority (BCA) • Allows <u>buildings to be evaluated and certified</u> according to <u>energy-efficiency</u> and <u>environmental friendliness</u> • E.g. Buildings that run partly on <u>solar energy</u>	E.g. Oasia Hotel, <u>National Library Building</u> have <u>energy savings of 15% to 35%</u> By 2030, 80% of the buildings in Singapore will be Green Mark-certified, compared to 20% in 2013. Cuts down GHG emissions by reducing use of fossil fuels	Singapore companies tend to be <u>conservative about new ideas</u> <u>Cost more to build as 'green' materials like bamboo or recycled metal are more expensive</u>
NATIONAL PLANT-A-TREE PROGRAMME	• Started by the Garden City fund and Singapore Environment Council to <u>maintain Singapore's status as a Garden City</u> • <u>Residents donate money</u> to buy a tree or <u>take part in tree planting events</u>	Contributed to about <u>60,000 trees planted yearly</u> throughout Singapore by NParks Trees are the green lungs of the environment = <u>remove CO2 from the atmosphere</u>	Trees take <u>many years to mature</u> , it takes time to be effective E.g. Even fast-growing trees like angsanas, raintrees planted by NParks <u>took 25 years to reach full height</u>

GLOBAL TOURISM

Who are the tourists?

A tourist is a person who

- travels and stays in places outside their usual environment for more than 24 hours but
- not more than one consecutive year for leisure, business and other purposes.

TYPES OF TOURISM

TYPES		DESCRIPTION	EXAMPLES
Places of scenic beauty		Natural environment with unique scenic features which attract tourists. • Honeypot tourism – tourism that attracts large numbers of people due to a site's scenic beauty. - Tend to be overcrowded. - wide range of facilities available	Victoria Falls in Africa - Attracts an average 300,000 visitors a year.
Places with good facilities	Meetings, Incentives, Conventions and Events (MICE)	• Brings in large groups of people for certain activities, mainly to attract business travellers. • Have venues to hold large-scale events with good supporting infrastructure and services such as international airport.	Singapore is the leading convention city in Asia Pacific. - Attracted 3.2 million business travellers in 2012.
	Medical Facilities	People travelling to a place to undergo medical procedures that would enhance or restore health. • Reasons to travel include: ✓ To <u>avoid waiting periods</u> in their own countries ✓ To <u>avoid paying high medical costs</u> in their own countries ✓ To <u>seek better quality medical procedures</u>	South Korea is famous for its plastic surgery.
	Theme Parks	Places with amusement park settings or attractions that have a central subject or theme. • Often <u>set up by large-scale enterprise</u> that is part of an international chain. • <u>Facilities</u> in theme parks <u>cater to tourists of different age groups</u>.	Disneyland theme parks in USA, China and Japan.
Places with rich culture	Heritage	Places that allow tourist to <u>experience the culture</u> and to <u>better understand their history</u> . • Learn and appreciate a country's identity, culture and history from heritage sites and activities.	The Great Wall in China
	Film-induced	Locations which are <u>featured in films</u> . • Find out how these locations inspired part of the film.	'The Lord of the Rings' influenced people to visit New Zealand.
	Pilgrimage	People travelling to <u>take part in a religious activity</u> . • Places usually attract many tourists during major religious holidays.	Mecca in Saudi Arabia for Islam.
Places of conflict	Dark Tourism	Places associated with <u>death and tragedy</u> . • Visitors are usually survivors or friends of those affected. Others may be interested to understand an event better.	The Chu Chi Tunnels in Vietnam

ROLES IN PROMOTING TOURISM

POINT (ROLES)	ELABORATE	EXAMPLE	LIMITATIONS	LINK
GOVERNMENT	• <u>Implement policies and regulations</u> by <u>extending tourists' length of stay</u>. • <u>Set up agencies</u> to develop strategies to promote tourism. • <u>Approve building</u> of tourist facilities and infrastructure and directly involved in the planning, funding and building of them. • <u>Ensure safety and security</u> of popular tourist destination.	<u>Singapore Tourism Board (STB)</u> is a government agency which aims to make Singapore a leading tourist destination. - <u>Facilitate investment</u> of tourism-related businesses - <u>Promote development</u> of new <u>attractions</u> (eg River Safari)	- <u>LDCs may not have the funds/ resources</u> to build attractions/ preserve the heritage sites - Some countries may have <u>limited land space</u> to invest in tourism industry	Government is able to promote tourism by implementing policies to attract more tourists into their country.
MEDIA	Media are channels which <u>news and information are communicated to the public</u> (eg. TV and internet) • <u>Positive reports</u> – such as friendly locals and interesting culture, can encourage people to visit. • <u>Negative reports</u> – such as pollution, can discourage people from visiting. • Media can motivate people to go to places that was <u>previously not considered</u>. • <u>Travel writers offer opinions</u> and reviews and often <u>evaluate destinations</u> for their readers.	The website ' <u>Travel Online</u> ' encourages readers to visit <u>Fiji Island</u> due to its scenic beauty.	- Reviews <u>may be biased or opinionated</u> thus may not reflect the true representation of the country	Media is able to promote tourism by influencing the decisions of travellers through the reviews that are easily accessible.
INTERNATIONAL ORGANISATION	<u>Group of different countries</u> that work together for a <u>common goal</u> . • <u>Help produce guidelines</u> that meet the needs of <u>economic development</u> and <u>environmental sustainability</u> caused by tourism. • Their positive and negative reports can influence tourists' decisions.	Organisation for Economic Co-operation and Development (OECD) Tourism Committee: • <u>Identifies key challenges</u> related to <u>employment</u> and <u>local development</u> that would affect tourism. • <u>Produces guidelines</u> on measuring <u>social and economic impacts</u> of tourism. • Promotes tourism as a <u>tool for national growth and job opportunities</u>.	- <u>LDCs may not have the resources</u> to implement the guidelines that suggested by the International Organisations - These guidelines are <u>not legally binding</u> thus may limit its effectiveness overall (especially sustainable tourism.)	International organisations are able to promote tourism by influencing tourists' decisions through their positive reports.

GLOBAL TOURISM

EVOLUTION OF
TOURISM

from

Mass Tourism – involves large numbers of tourists visiting a particular place together.
Eg. Package Holiday

to

Niche Tourism– Special Interest tourism based on a particular area or activity.

Eg. *Ecotourism* – responsible travel to natural areas that conserves the environment and improves the well-being of local people.
- Help travellers better appreciate natural beauty and biodiversity
- Provide funds for conservation, directly benefit local communities
EG: Waitomo Caves in New Zealand, managed by government and locals to ensure minimal human impact on its environment.
- Control number of tourists entering the caves
- Locals receive a portion of entrance fees and employed as cave staff

REASONS FOR GROWTH OF GLOBAL TOURISM

	POINT	ELABORATE	EXAMPLE	LINK
DEVELOPMENT IN TECHNOLOGY	Better and Affordable Transport	<u>Development in technology</u> help improve safety, shortening travelling time and lower travelling costs, so travelling becomes affordable for the average person. - Today, commercial airlines can fly longer distances and at faster speeds around 900 km/h. - Airlines can fly non-stop to some destinations and this reduces travelling time.	Now, flying from Singapore to London takes 14 hours. In the 1950s, it took 2 to 4 days to do so.	More people are inclined to travel as it is cheaper and more convenient, resulting in the growth of global tourism.
	Ease of access to information	<u>Increasing numbers of budget airlines.</u> - Offer lower fares due to smaller and more fuel-efficient aircraft and selling tickets online directly without going through travel agents. - Help growth of international travellers as it allow people to: 1) Travel internationally more frequently 2) Spend holidays farther away from home 3) Travel to places not covered by commercial airlines	In Singapore, budget airline include Jetstar and Scoot. They fly to certain destinations exclusively such as Bhutan and Northern Thailand.	
DEMAND FACTORS	Higher Disposable income	Disposable income – amount of income left to a person to spend after paying taxes. - Rapid economic growth has resulted in the disposable income to increase globally.	In recent years, China and India have been experiencing rapid economic growth. - In 2016, Chinese tourists spent \$261 billion overseas, up from around \$10 billion in the year 2000.	With higher disposable income, this enables people to spend more on goods and services such as travelling. Thus, resulting in the growth of global tourism.
	Increase in leisure time	Leisure time – part of a day, week or year when people have no work commitment. - People with better income are more inclined to travel because their leisure time is in the form of paid leave. - Since the 1950s, people in many DCs and LDCs enjoy shorter working weeks, more public holidays and more paid annual leave.	In Australia, people can exchange their paid overtime for leave. This allows people to enjoy longer weekend breaks and may likely make travel plans.	Thus, with more leisure time, it allows people to enjoy longer breaks and thus may want to make use of the break to travel, resulting in the growth of global tourism.
	Changing lifestyle	Changing lifestyle – change in the way people live throughout their lifetime and from generation to generation. - Rapid economic growth leads to faster pace of life, resulting in people working longer hours than before. Thus, people are more inclined to travel as a way to relax and take a break. - With better medical technology and knowledge, people are health-conscious and lead a healthier lifestyle. These people live longer and remain physically fit to travel frequently even in their own age.	In Australia, a group of retirees known as the grey nomads spend most of their time travelling in mobile homes or vehicles to explore different parts of the country.	Thus, many healthy retirees consider travelling as a way to continue living their lives productively, increasing the growth of global tourism.
DESTINATION FACTORS	Attractions	Attractions – features that can be natural or man-made that make a place interesting or enjoyable. - Governments and businesses invest more in new places of attractions with unique features to attract more tourists so that these sites can continue to generate lucrative tourist revenue.	In 2011, Dubai City in the United Arab Emirates (UAE) attracts about 9 million travellers. - People are attracted to well-known developments such as Palm Islands, the world's largest artificial islands for high-end residential, leisure and entertainment facilities.	With more and better attractions, people will be attracted to such places and may decide to visit these place, resulting in the growth of tourism.
	Investment in infrastructure and services	- Airport expansion and development is an important transport infrastructure to meet the demand for increasing tourist arrivals by air in a country. - Many countries offer tertiary and diploma courses on tourism so that people working in the tourism industry can have formal training to provide better services (eg. Food outlets, telecommunication links) to tourists.	- Singapore's Changi Airport have undergone extensive expansion to cater to the growing number of international tourists. - Most hotels in the world provide free Wi-Fi so that tourists can share their experiences to different parts of the world.	With better infrastructure and services, tourists may feel more comfortable and convenient staying at the tourist destination, leading to the growth of tourism.
	Access to information	- Tourists are likely to visit a place when they can obtain travel-related information easily both outside and within a destination. - Information can be displayed in English to meet the needs of most international tourists. Signs can be displayed in different languages to provide security and comfort to visitors.	In Phuket, Thailand, signs are displayed in the local and English languages to meet the needs of the locals and international tourists.	Thus, more people will feel more confident and safer travelling as information can be obtained easily, resulting in the growth of tourism.

GLOBAL TOURISM

REASONS FOR FLUCTUATIONS IN TOURISM

POINT	ELABORATE	EXAMPLE	LINK
Disasters	Disasters – events that cause great damage to properties, injuries and loss of lives. - Disrupt essential tourist infrastructure, tourists feel uncomfortable visiting these places. - May affect tourism industry of other countries as there will be less tourists from the affected country visiting them.	In 2011, Japan experience earthquake and tsunami. - Experience 28% drop in tourist arrivals. - Tourism industry in South Korea also affected as number of Japanese visiting South Korea decreases.	Thus, disasters <u>discourage tourists</u> from visiting a place as they <u>fear for their own safety</u> .
Recession	Recession – period of <u>slowdown in economic activities</u> . • Regional recession – affect only a group of countries (eg. 2010 European Debt Crisis) • Global recession – affect many countries worldwide (eg. 2007 Global Financial Crisis) Many people <u>lose their jobs or income</u> → <u>less disposable income to spend on travelling</u> → <u>decrease in international tourists arrivals</u> People are <u>more likely to travel within their own country</u> as it is <u>nearer and cheaper</u> → <u>Help economy</u> of the tourists' own country.	Due to the Global Financial crisis, the number of international visitors in France has dropped by nearly one-third in summer.	Thus, recessions have led to a decrease in disposable income, allowing people to travel less or opt for cheaper travel options. This results in an increase in domestic travel but a decrease in international travel.
Unfavourable political situations	Political conflict poses dangers to both tourists and locals as it can destroy infrastructure and disrupt services. - As a result, tourists may have to postpone or cancel their travel plans. Government may issue travel advisories to discourage people from travelling.	In 2011, governments banned their citizens from visiting Libya due to a civil war in the country. - Commercial airlines reduced or cancelled their flights to the country and resulted in no tourist arrivals by air.	Thus, unfavourable tourist situations can discourage tourists from visiting a destination because they <u>fear for their own safety</u> .
Outbreak of diseases	When a place suffers an outbreak of disease, it will <u>suffer a huge drop in tourist arrivals</u> as they <u>do not want to get infected</u> with the contagious disease. Many <u>large scale MICE activities</u> may need to be <u>cancelled or postponed</u> , resulting in a drop in tourist arrivals.	In 2003, a SARS outbreak killed 775 people and infected more than 8000 people. - Singapore and Hong Kong suffered a huge decline in tourist arrivals in that year.	Thus, outbreak of diseases can lead to a decrease in tourism as people are <u>afraid to get infected</u> .

IMPACTS OF TOURISM

POSITIVE IMPACTS

	POINT	ELABORATE	EXAMPLE	LINK
ECONOMIC	INCREASE IN EMPLOYMENT OPPORTUNITIES	- Growth in tourism industry <u>creates many direct job opportunities</u> such as tour operators and souvenir shops to <u>meet the needs of the tourists</u> . - Can also <u>provide indirect job opportunities</u> such as taxi drivers and restaurant owners.	In <u>2011</u> , the tourism industry provided job opportunities for more than <u>235 million people worldwide</u> , about 6 to 8% of all jobs in the world.	Thus, an increase in job opportunities <u>provides better livelihood</u> for the locals as they are able to <u>support their families better</u> .
	GROWTH IN INCOME	- Growth in tourism → <u>more income</u> for people - Generates <u>more revenue</u> for countries from tourism receipts. ➢ Tourism receipts – <u>money received</u> from <u>tourist spending</u> .	In Philippines, <u>fishermen hired by local tour companies to take tourists to look for dolphins</u> in their boats. - <u>Earn additional income</u> besides from their fishing activities. - Tour companies and fishermen will <u>pay more taxes</u> when their <u>income increases</u> due to <u>high demand for their services</u> . → <u>increase in revenue</u> for country.	Thus, growth in tourism leads to growth in income which can <u>help locals to improve their standard of living</u> .
	DEVELOPMENT IN INFRASTRUCTURE & FACILITIES	Infrastructure and facilities such as airports, roads and hotels are developed to <u>allow a country to operate tourism on a large scale</u> . - <u>Good transport network</u> → allow tourists to <u>visit tourist destinations easily & increases accessibility</u> of locals to other places. - <u>Sports venues</u> built for key sporting events and allow locals to <u>enjoy a better sporting infrastructure</u> after the event. - Developing infrastructure → <u>provide job opportunities</u> for locals as they are hired to build them. - <u>Local businesses benefit</u> as they can supply local materials to build infrastructure.	In <u>2008</u> , <u>underground rail systems</u> were <u>expanded</u> to move <u>large numbers of visitors</u> during the <u>Summer Olympic Games in Beijing, China</u> . - <u>Continue to serve</u> local populations and tourists <u>after the Games</u> .	Thus, development in infrastructure and facilities allow locals to benefit from it after big events and thus, improve on their standard of living as they can get to places <u>more efficiently</u> .
SOCIO – CULTURAL	PRESERVATION OF CULTURE AND LOCAL CUSTOMS	Used to <u>promote heritage tourism</u> and <u>help preserve the heritage and customs</u> in the sites. - Help locals <u>learn more about the history</u> and <u>foster stronger sense of belonging</u> in the community. - <u>Revenue collected from tourist spending</u> helps to <u>fund preservation and restoration of cultural sites</u> .	<u>Entry fees to Great Pyramids of Giza</u> in Egypt is <u>used directly to fund conservation efforts</u> .	Thus, the preservation of local culture and local customs <u>provides a sense of identity and continuity</u> in a fast changing world for <u>future generations</u> .
ENVIRON- MENTAL	CONSERVATION OF NATURAL ENVIRONMENT	<u>Revenue generated from tourist activities</u> such as <u>entry fees</u> to national parks can <u>fund various projects on the conservation</u> of natural environments.	In <u>Sabah, Malaysia</u> , the <u>visitor entry fee</u> to the <u>Orang-utan Rehabilitation Centre</u> is used to <u>pay staff who help injured or orphaned orang-utans</u> .	Conservation of natural environment is important as it is a <u>large habitat for flora and fauna</u> .

NEGATIVE IMPACTS OF TOURISM

	POINT	ELABORATE	EXAMPLE	LINK
ECONOMIC	Seasonal Unemployment	Certain tourist activities are <u>affected by climatic conditions</u> . - Workers who are hired during <u>peak periods</u> of tourist arrivals may have to find other employment during periods of low tourist arrivals. - Economy of country affected → workers <u>experience a decrease in income</u> during period of unemployment.	In <u>Japan</u> , many people are <u>hired by mountain ski resort</u> operators during <u>winter</u> as they are needed to help tourists in various winter sports such as skiing.	Thus, seasonal unemployment for the workers results in <u>lower disposable income</u> .
	Underuse of facilities	Facilities built for certain events may <u>become underused</u> when the event is over. <u>Maintenance costs</u> of these facilities will be high → <u>less funds generated</u> from tourist revenue.	After the <u>2008 Summer Olympic Games in Beijing</u> , some facilities have deteriorated. Others, such as the Beijing <u>Aquatics Centre</u>, need to be <u>renovated to generate profits again</u>.	Underuse of facilities may eventually lead to these <u>facilities become neglected</u> .
	Shortage of services	Some tourist infrastructure requires the <u>use of large amount of water, land and power</u> . → results in shortage of services such as water and electricity supplies in non-tourist places.	In Bali, large amounts of <u>water are needed to fill swimming pools</u> in hotels to meet the needs of tourists. → <u>reduces drinking water</u> for nearby <u>residents</u> . → Locals suffer shortage of water as they cannot afford to pay as much as the tourist.	Thus, shortage of services may result in <u>lower standard of living for the locals</u> .
SOCIO – CULTURAL	Dilution of culture and local customs	<u>Older buildings</u> are converted to attract more international tourists and the areas will <u>focus on commercial activities</u> . → drive locals out of the area → lose its identity, culture and values. <u>Cultural festivals & rituals may be modified</u> to suit the needs of tourists. Dancers deliberately pose for tourists.	In Thailand, tourists pay an expensive entry fee to visit the village of the Kaya Lahwi. Some expect the women in the village to take photographs with them to justify their costly payment of the entry fee.	Thus, the culture and local customs <u>become commercialised and lose their authenticity & significance</u> .
	Increased in crime	Tourists carry <u>valuable items</u> → target for crimes nearby popular tourist areas. → <u>increases crime rates</u> . <u>Easy target for scamming or cheating</u> in 'tourist traps' where tourists pay greatly inflated prices for items.	In 2010, <u>Japanese tourists</u> in London got scammed by a woman dressed as police officers. They <u>took their credit cards and withdrew money from the ATM</u> .	Thus, an increased in crime rate will result in a <u>less safer environment</u> for the tourists.

	POINT	ELABORATE	EXAMPLE	LINK
ENVIRONMENTAL	Increased congestion	Popular tourist area <u>attracts large number of tourists</u> , leading to <u>overcrowding</u> . - Attract many tourist-related businesses - Give rise to high vehicular and pedestrian traffic.	In <u>Rome, Italy</u> , <u>narrow streets are filled with tourists</u> frequently.	Increased congestion makes it <u>more difficult for locals to conduct</u> their daily business.
	Vandalism	Refers to crime of <u>deliberately damaging property belonging to other people</u> . Irresponsible tourists may <u>vandalise historical sites</u> when they visit.	In <u>China</u> , many thousands of stones and bricks of the <u>Great Wall of China</u> are <u>covered with graffiti</u> .	Vandalism may <u>destroy artefacts in the long-run</u> .
	Pollution & Littering	Tourists <u>tend to leave behind their waste at tourist areas</u> . When authorities fail to manage the waste left behind by tourists, it can lead to a degradation of the areas.	Many islands in the <u>Caribbean</u> cannot cope with <u>the many waste</u> from cruise ships due to limited land area. → <u>dispose waste directly into the sea</u>	Pollution and littering may <u>destroy the environment</u> in the long-run.
	Destruction of habitat	High tourist arrivals → careless tourists many <u>trample on plants and remove items</u> from environment. Excessive noise can disturb and frighten animals.	High volume of tourists at the <u>Red Sea Coast in Egypt</u> causes <u>damage</u> to the <u>habitats of coral reefs and fishes</u> .	Destruction of habitat will result in the <u>extinction of rare flora and fauna</u> in the future.
	Increased carbon footprint	Refers to <u>amount of greenhouse gas emissions that would produced by activities</u> that involve the use of fossil fuels. Many tourist-related activities depend on the burning of fossil fuels to power them. (eg. Aeroplanes & electricity.)	The carbon footprint of a passenger who flies from <u>Singapore to Kuala Lumpur, Malaysia</u> on an economy flight is <u>30 kg of carbon dioxide</u> .	Increased carbon footprint <u>contributes to global warming</u> , resulting in <u>climate change</u> .

TENSIONS IN MANAGING IMPACTS OF TOURISM (OPTIONAL)

Between tourists and locals	<u>BALI, INDONESIA</u> - Tourist sites often <u>congested</u> due to <u>bus-loads of foreign tourists</u>. → <u>Difficult for locals</u> to conduct their daily business. - Large number of hotels and facilities <u>deprive some locals of their water supply</u>. → <u>Tourism industry consumes 65%</u> of the water supply, resulting in water shortages in poorer areas. → <u>Locals cannot afford</u> to be connected to the city's tap water supply. - Locals expect tourists to <u>respect local customs and values</u>, which tourists sometimes <u>fail to do so</u>. → Many locals <u>object to public display of affection</u>, which some tourist may perceive as all right to do in public.
Between tourists and environment	<u>MACHU PICCHU, PERU</u> - The '<u>Inca Trail</u>', which is populated with <u>rare plants and wildlife</u>, is slowly being <u>eroded by more than 75,000 tourists</u> that hike on it each year. Some <u>hikers leave behind rubbish along the trail</u>. - Tourists may prefer to reach the site <u>using helicopters</u> for convenience. → In 2010, authorities banned helicopters from the site for <u>fear that its noise disturbs</u> the animals and plant species. - The <u>sheer weight and combined footsteps</u> of tourists visiting the place every year <u>slowly damage the land and artefacts</u> on the site.

SUSTAINABLE TOURISM

Form of tourism that allows tourist activities to continue without causing damage to the environment or without leaving negative impacts on the surrounding society and culture.

- **Conservation** of fragile environments
- Promote **sustainable tourism** through laws and regulation and support from local population

RESPONSIBILITY OF

Roles	Elaborate	Example	Strengths	Limitations
Local Communities	Benefit economically through <u>community-based tourism</u> . - It may be <u>done in partnership with a government or non-governmental organisation (NGOs)</u>. - The locals play a key role because they <u>understand the local environment</u>, so they can help to <u>design tourist activities</u> that <u>address the needs of both tourists and the environment</u>.	In <u>Central Java, Indonesia</u> , the locals from the Candirejo Village <u>set up a cooperative to manage and implement tourism-related programmes with support from the government</u> . These programmes included developing <u>homestay accommodations</u> and <u>organising local transport</u> . The <u>average income of a village</u> also <u>increased by 12.5%</u> from 2001 to 2003.	- Locals are <u>involved in decision-making</u> about tourism management strategies. <u>Increase in tourism-related employment and business</u> for locals. Locals get employed as guides, waiters and drivers.	- Some local communities <u>may face funding problems</u> when setting up businesses. - The local community <u>may not have enough skilled labour</u> such as managers that can successfully help manage impact of tourism. - May <u>need to seek help of NGOs</u> to provide skilled labour or training.
Visitors	Visitors have a <u>responsibility to respect</u> both the <u>environment</u> and the <u>locals</u> . - When visitors are <u>aware of their responsibility</u>, they are <u>less likely to cause any damage</u> to the environment and <u>also respect the local culture and customs</u>. - In this way, they can <u>enjoy their activities</u> and also <u>meet the needs</u> of the environment and the local people.	The <u>Tourism Sustainability Group</u> encouraged responsible tourists to <u>choose tourist destinations</u> which <u>emphasize conservation efforts</u> . Responsible tourists can <u>help reduce their carbon footprints</u> but also <u>feel more rewarding</u> with the fact that they have helped in conserving the environment.	- Visitor spending can <u>provide funds</u> to help <u>conserve environments</u>, <u>preserve culture</u> or maintain a tourist attraction. Tourist spending can <u>include entrance fees</u> or purchase of souvenirs. <u>Provide locals with income from employment and businesses</u>. Visitors usually require hotel workers and tour guides which are employment positions the locals can fill. - Visitors can <u>raise awareness to conserve</u> and <u>preserve attractions</u> after they realise the value of conserving and preserving the destination.	- Visitors may exhibit behaviours that can <u>damage a tourist attraction</u>. For eg. Vandalism and littering. <u>Dilute local culture and customs</u>. Large number of tourists can cause a place to lose its identity. Eg. Dancers deliberately pose for tourists to take photographs. As a result, visitors may complain that a place or performance may not feel authentic.
Tour Operators	Tour operators may <u>belong to associations</u> that <u>promote the efforts in conserving and protecting tourist sites</u> . This is because tourists are <u>less likely to visit tourist sites with damaged landscapes and deteriorating environments</u> .	In Phuket, tour operators set up <u>Phuket Alternative Tours (PAT)</u> to ensure that their <u>members operate under the guidelines of the Environment and Culture code of Practice</u> . Some guidelines include: - Conducting sustainable tourism activities - Helping to enhance the natural environment - Making visitors aware of the important value of conserving the environment.	Tour guides can offer <u>feedback to tour operators</u> about the social and environmental conditions of a tourist attraction. These <u>feedbacks are often used by planning authorities</u> to plan tourism management strategies. Tour operators can <u>regulate tourist behaviour</u> by <u>preventing tourists from littering</u> and damaging tourist sites.	The <u>need to generate profits</u> can sometimes bring tour operators into conflict with other stakeholders. It may override concerns to preserve the environment when addressing these concerns would reduce profits.
Planning authorities	Planning authorities are generally local government agencies who are <u>responsible for implementing various tourism policies</u> in the country. - They are in the <u>position to enforce certain rules, regulations, values and principles to achieve sustainable tourism</u> such as <u>restricting the number of visitors</u> that a tourist site can cope. - They can also <u>discuss and consult with the tour operators and local communities</u> to <u>design effective tourism management strategies</u> that can <u>address the needs</u> of tourists, the environment and the local people.	The <u>Singapore Tourism Board (STB)</u> puts in effort to attract large numbers of tourist arrivals and implementing measures to conserve national heritage. It has <u>launched various programmes to conserve and enhance the ethnic districts</u> of Singapore such as Chinatown and Little India.	- Often successfully <u>develop and maintain infrastructure and attractions</u> that help manage impacts of tourism. - Also <u>draft laws and policies</u> that help improve the quality of a tourist site. For eg. Craft laws that limit number of visitors or impose entrance fees to a tourist site. - Can <u>cooperate more easily with other government agencies</u> to manage impact of tourism.	<u>Difficult to plan for unforeseen factors</u> such as extreme weather or natural disasters. <u>Other stakeholders may oppose the management strategies</u> of planning authorities. For eg. Management strategies may affect local's livelihood or change their way of life.
Non-governmental organisations (NGOs)	NGOs are non-profit organisations <u>operating independently of governments</u> which are concerned about the impacts of tourism. NGOs may <u>help to design guidelines</u> or <u>advise the planning of authorities</u> in every country to reduce the negative impacts of tourism on the environment.	The <u>International Ecotourism Society (TIES)</u> has been <u>active in providing training and technical assistance</u> to tackle issues related to tourism and environment. It helps <u>develop guidelines and publish research papers</u> concerning the impacts of tourism on the environment.	- NGOs can <u>facilitate communication between various stakeholders</u>. They help to encourage other stakeholders to actively participate in managing the negative impacts. <u>NGOs support tourism management efforts of other stakeholders</u> in the form of <u>additional manpower, expertise or marketing campaigns</u>.	NGOs often <u>rely on donations</u>, and may be <u>hampered by lack of financial resources</u>.