Geography — Climate

*All notes are either from online/school notes.

Greenhouse effect:

1. Shortwave radiation from the sun travels towards the Earth.
2. Most shortwave radiation is absorbed by the Earth's surface.
3. Some shortwave radiation is absorbed and reflected by clouds.
4. Longwave radiation from the Earth escapes towards space.
5. Some longwave radiation is absorbed by greenhouse gases and re-emitted in the atmosphere, keeping the Earth warm.

- Greenhouse gases:
- Methane
- Carbon dioxide **[1]
- Water vapour

Differences/similarities between greenhouse gases and enhanced greenhouse gases:

Similarity/Differences	Greenhouse effect	Enhanced Greenhouse Effect
Type of causes	Natural	Manmade/Anthropogenic
Amount of shortwave radiation absorbed by the Earth, which warms the Earth's surface.	Similar	Similar
Some shortwave radiation is also absorbed and reflected by clouds in the atmosphere.	Similar	Similar
Amount of Greenhouse Gases in the atmosphere	Less	More

[1] From the burning (combustion) of fossil fuels.

Amount of longwave radiation is absorbed by Greenhouse Gases in the atmosphere as the longwave radiation escapes towards space.	Less	More
Amount of longwave radiation re-emitted back down to Earth's surface, keeping the Earth warm.	Less	More
Effect on Earth's temperature.	Warm temperature to sustain life on Earth.	Global warming, which threatens the Earth's ecosystem and people's way of life.

Anthropogenic causes[2]:

Anthropogenic cause 1	Anthropogenic cause 2	Anthropogenic cause 3
Agricultural	Industries	Urbanisation

Changing land use involves a change from one land category to another.

When land is cleared through large scale of deforestation, it also increases carbon emission because:

- The clearing of trees reduces the number of trees that absorb carbon dioxide through photosynthesis.
- During photosynthesis, trees store carbon, when these trees are cut down or burned, the stored carbon is then released back.
- Clearing of trees exposes the soil beneath to sunlight. This increases the soil temperature and rate of carbon oxidation[3].

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[2] Environmental change caused or influenced by people, either directly or indirectly.
[3] Process in which carbon (in soil) reacts with oxygen to produce carbon dioxide.

Natural + Human system:

Natural system: refers to all physical, chemical & biological materials and interactions on Earth, independent of any human involvement.

Human system: refers to all human activities & social interactions on Earth.
- The idea of 'systems' implies that each part of the process is interconnected.
- Human system can have direct/indirect impact.

^ Higher atmospheric pressure leads to higher ocean surface temperature.
- Many of the excess heat trapped by greenhouse gases have been absorbed by the oceans.
- Leads to higher ocean temperature.

^ Higher ocean temperature leads to the slowing down of global ocean circulation.
- Large scale movement of water around the oceans in the world global ocean circulation. This includes both:
- Warm surface flow & cool subsurface flow

^ Process of ocean circulation:
- Warm surface water moves from the equator to the poles due to winds.
- Water then cools, becomes denser and sinks.
- Cold water then spreads along the bottom of the ocean, forming cool subsurface flows.
- Eventually, cool water rises back towards the surface of the ocean.

^ Disruption to the process caused by climate change:
- Due to rising atmospheric temperatures, water gains heat, become less dense. (Refer to day/night wind for more info)
- Sinking of the water at the poles is reduced, which slows down flow of water.

Changes in precipitation on land

Droughts	Excessive rainfall
- Warmer atmospheric temperatures —> Reduces	- Warmer air —> Increased water vapour in the

surface water —> Dries out and vegetation + reduces occurrence of rain. - Areas with dry climates get even drier. —> resulting in droughts. - Subtropics: Regions between 23.5° and 35° North & South of the equator. - Mid-latitudes: Regions between 30° to 60° **North & South of the equator.**	atmosphere (especially so in places. With surface water —e.g.