

**Y10 Geography Knowledge Map. (Unit 1: Living with the physical environment. Section A: The challenge of natural hazards. Part 3 of 3: Climate Change)**

**Climate Change Effects**

1. Many of the world's glaciers and ice caps are melting. Some may disappear completely by 2035.
2. **Arctic** sea ice is 65% smaller since 1975 . Lowest extent recorded in 2014. This affects wildlife like polar bears, however this can provide shipping opportunities to use the **Northwest passage**.
3. Low-lying **Pacific Islands (Tuvalu / Maldives)** are under threat from sea level rise. IPCC average global sea level has risen between 10-20cm in the past 100 years. Rises due to melt water AND when water is warmed it expands (thermal expansion).
4. Sea levels may rise by 1m by 2100 flooding agricultural land in **Bangladesh, Vietnam, India** and **China**.
5. Bird migration is changing – bird nesting in mid 1990s discovered 65 species nested an average of 9 days earlier than in the 1970s.

**What is Climate Change**

1. Climate change has nothing to do with the ozone layer!
2. Greenhouse gases allow solar radiation into our atmosphere, but don't let it pass back out.
3. Greenhouse gases are a good thing. Without them, the Earth would be a ball of ice.
4. The problem is that there are now too many greenhouse gases, meaning that not enough radiation is getting out, and therefore the Earth's temperature is getting warmer.

**Global warming and the greenhouse effect**

**Adaptation - To change the way you do things to try to cope with a problem.**  
**Mitigation = To reduce the causes of a problem**

ADAPTATION	MITIGATION
Put in sea defences to reduce the impact of rising sea levels and coastal erosion.	Using renewable energy sources (i.e. hydro-electricity, nuclear power, solar, wind and tides.)
Have better ways to collect water when it comes.	Plant trees to take in more carbon dioxide from the atmosphere, process of photosynthesis. They also release moisture into the atmosphere. This has a cooling effect by producing more cloud, reducing incoming solar radiation.
Change farming so that you grow crops that cope better in a warmer climate. Introduce drought-resistant strains of crops, new irrigation systems and educating farmers in water harvesting techniques.	Recycle more so that less new things need to be made, meaning factories used less. Reduce pollution by cycling / walking instead of driving. Carbon capture and storage uses technology to capture CO <sub>2</sub> produced from the use of fossil fuels in electricity generation. It is possible to capture 90% of CO <sub>2</sub> that would otherwise enter the atmosphere.
	International agreements: the governments of countries making agreements with each other about releasing less carbon.

**Natural Causes of Climate Change:**  
 Scientists believe that these cycles affect the timings and seasons of the Earth's climate. In particular, the 100,000-year eccentricity cycle coincides closely with the alternating cold (glacial) and warm (inter-glacial) periods in the Quaternary period.

**Eccentricity** - This describes the path of the Earth as it orbits the Sun. The Earth's orbit is not fixed – it changes from being almost circular to being mildly elliptical. A complete cycle – from circular to elliptical and back to circular again - occurs about every 100,000 years.

**Precession** - This describes a natural 'wobble' rather like a spinning top. A complete wobble cycle takes about 26,000 years. The Earth's wobble accounts for certain regions of the world – such as northern Norway – experiencing very long days and very long nights at certain times of the year.

**Axial Tilt** - This Earth spins on its axis, causing night and day. The Earth's axis is currently tilted at an angle of 23.5 degrees. However, over a period of about 41,000 years, the tilt of the Earth's axis moves back and forth between two extremes – 21.5 degrees and 24.5 degrees.

**Sunspots** - A sunspot is a dark patch that appears from time to time on the surface of the sun. When sunspot activity is at a maximum, the sun gives off more heat. Large explosions occur on the surface of the sun resulting in solar flares. When sunspot activity is at a minimum, the solar output is reduced. This can lead to lower temperatures on Earth.

**Volcanic Activity:** Violent volcanic eruptions blast huge quantities of ash, gases and liquids into the atmosphere.

1. Volcanic ash can block out the Sun, reducing temperatures on the Earth. This tends to be a short-term impact.
2. The fine droplets that result from the conversion of sulphur dioxide to sulphuric acid act like tiny mirrors reflecting radiation from the sun. This can last a lot longer and can affect the climate for many years.

**Human Causes of Climate Change**  
**Greenhouse Effect**  
 Like a greenhouse, the atmosphere allows most of the heat from the sun (short-wave radiation) to pass straight through it to warm up the Earth's surface. However, when the Earth gives off heat in the form of long-wave radiation, some gasses are able to absorb it. Keeping the Earth warm. Without this 'blanketing' effect it would be far too cold for life to exist on Earth.

By the end of the century average global temperatures could rise by 1.8C-4C. This could lead to a rise in sea level of 28-43cm.

**Greenhouse gases**  
 CO<sub>2</sub> – accounts for an estimated 60% of the enhanced greenhouse effect. Global concentration of carbon dioxide has increased by 30% since 1850.

Nitrous oxides – very small concentrations in the atmosphere are up to 300 times more effective in capturing heat than carbon dioxide.

Methane – very effective in absorbing heat. Accounts for 20% of the enhanced greenhouse effect

- Burning fossil fuels
- Car exhaust
- Deforestation
- Agricultural fertilisers
- Power stations producing electricity
- Sewage treatment
- Burning biomass for energy
- Farm livestock

