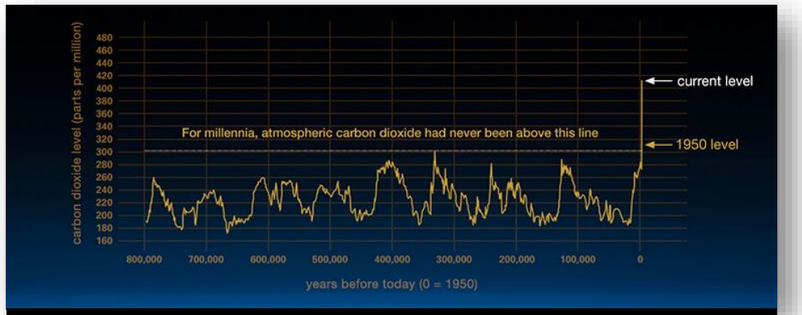
A-Level Geography Resource Package

[Physical >> Water & Carbon Cycles >> 3.1.1.4 Water, Carbon & Life On Earth]

This is a very important document – so ensure you learn the positives & negatives as best as possible, such that in a 20-mark question you could input them with named examples within your answer!

Reducing The Impact Of Climate Change



Information Box & Graphs provided by NASA @climate.nasa.gov

Information Box:

"Ancient air bubbles trapped in ice enable us to step back in time and see what Earth's atmosphere, and climate, were like in the distant past. They tell us that levels of carbon dioxide (CO2) in the atmosphere are higher than they have been at any time in the past 400,000 years. During ice ages, CO2 levels were around 200 parts per million (ppm), and during the warmer interglacial periods, they hovered around 280 ppm (see fluctuations in the graph). In 2013, CO2 levels surpassed 400 ppm for the first time in recorded history. Today, we stand on the threshold of a new geologic era, which some term the "Anthropocene", one where the climate is quite different to the one our ancestors knew. If fossil-fuel burning continues at a business-as-usual rate, such that humanity exhausts the reserves over the next few centuries, CO2 will continue to rise to levels of order of 1500 ppm. This graph not only conveys the scientific measurements, but it also underscores the fact that humans have a great capacity to change the climate and planet."

Initiative:	Exemplar Information:	Scheme Benefits:	Scheme Drawbacks:
Natural Carbon Sequestration "A natural or artificial process by which carbon dioxide is removed from the atmosphere and held in solid or liquid form." 'Carbon Farming & Afforestation'	https://www.carbonbrief.org/mapped-where-afforestation-is-taking-place-around-the-world ^ Global Planted Forest since 1990. China has planted over 78 million hectares, the US 26 million hectares, Brazil 7 million hectares (however nowhere near amount simultaneously deforested.)	• Afforestation is an easily implementable and cost-effective solution in reducing CO2 emissions over longer term acting as a carbon sink, whilst the use of carbon farming increases plant growth due to higher levels of Carbon held within soil.	• Tree growth can take quite a long time and must be conducted on a huge scale to be considered a truly viable alternative. • Often deforested land has loose soil and depleted nutrients, thus not so initially good for vegetation.
Artificial Carbon Sequestration 'Carbon Capture & Storage Technologies' [CCST]	Century Plant (Texas, USA) Occidental Petroleum operates a hydrocarbon processing plant and related pipeline infrastructure - with a total CO2 capture capacity of 8.4 Mt/annum, the Century plant is the world's largest artificial CCST example.	• CCST can reduce up to 90% of emissions from conventional Hydrocarbon-Fired Power Stations. This is then pumped into the ground or deep ocean where it forms a part of the slow carbon cycle, thus less impacting atmospheric climate change.	• Currently limited to wealthy, HICs which are not really the largest emitters in the first place. This is because they are expensive and not really a priority for many nations within their energy mix.
Alternative Energy Production 'Renewable Technologies' *E.G. HEP [Hydroelectric Power], PV [Solar Power], Tidal, On/Offshore Wind, Geothermal, Biomass etc…*	Iceland Generates the entirety of its required energy from renewable sources - Hydroelectric (73%) and Geothermal (27%) - totaling 18,000 GWh. This is a model for many other nations, although some others are catching up, especially in Scandinavia and Western Europe.	• Improving technology has made them far easier to implement for a lower cost with many different options working in different nations. • Directly Carbon-Neutral implementation method which is a legitimate alternative to Hydrocarbon Fuel Extraction & Burning.	• Mostly still somewhat dependent on external factors and are smaller scale options. • To fit within the energy mix and meet all needs, a large variety of technologies need to be working in tandem.
Combined Heat & Power [CHP] The use of power stations which convert excess thermal energy and carbon into useful heating for industry and residential purposes.	Metz, France 45MW boiler uses food waste which is converted into heat and electricity. This is enough energy for 30,000 homes and similar initiatives are now being replicated across France.	• Highly effective method of reducing necessary energy consumption (& INDIRECTLY) carbon emissions. This can result in 20% reduction in CO2. The schemes also have 80% efficiency levels, far greater than comparable conventional power generation.	• Expensive & currently still small-scale initiatives are being trialed. Relatively new technology has prohibited widespread adoption.
International Agreements	Paris 2015 Climate Accord Signatories from 195 nations across the world, pledging to keep global temperature increases "well below 2℃, with further measure to try to maintain 1.5℃. Notably the USA pulled out under President Donald Trump because he considered it "bad for the economy."	• These can help encourage the nations of the world to show cooperation, overseen by Intergovernmental Organizations such as the UN and pledge to reduce emissions. The most directly widespread, largest scale	• As per exemplar information, countries can choose to pull out or not join, often these are only 'targets' meaning that some nations may not necessarily stick to them. Others have a habit for falsifying statistics, so this may need to be overseen.
'Local' Case Study Schemes	*Amazon Rainforest Schemes Geography Resource Package*:https://583daeb7-8767-411c-9387-a7803a5f9622.filesusr.com/ugd/927b29_af627e2eb3954f3598bb1c0d2380bed1.pdf	• Often, they make really tangible benefits on a local scale, and can be tailored to also benefit the community, provide jobs, education etc… • Often NGOs and charities also are supportive.	• 'Local' hence unless enacted by many parties at the same time unlikely to have a direct effect on global scale carbon emissions & hence climate change.