

**To what extent is human activity more responsible for increasing atmospheric carbon than natural drivers of change? [20 marks]**

It is undeniable that human activity is far more responsible for increasing atmospheric carbon than natural factors at present. Human civilisation has only existed in its current form for around 20,000 years, and levels have reached 409ppm, which is 100 above the previous highest concentration of around 300ppm over 300,000 years ago. However, it is important to acknowledge that historically, natural drivers of change were far more influential, particularly regarding the Milankovitch cycles.

Firstly, one reason that human activity is far more responsible than natural factors in increasing atmospheric carbon is through the combustion of fossil fuels. The Intergovernmental Panel on Climate Change (IPCC) estimates that around 90% of anthropogenic carbon is a result of fossil fuel combustion, of which 50% is absorbed into the atmosphere. It is only a matter of considering the air quality in developing nations, such as China and India, where the detrimental impacts of fossil fuel combustion are most prevalent. Air quality in these nations is among the worst in the world, with the World Health Organisation stating that 8 out of the 10 most polluted cities by particulate matter concentration are in India. These impacts are also long term, potentially permanent, and affect global air quality. As many developing nations rely heavily on industrialisation to provide jobs to communities, human activity will remain the most responsible reason for increasing atmospheric carbon for the foreseeable future.

Another reason that human activity is more responsible for increasing atmospheric carbon than natural factors is through changing land-use. Land-use is responsible for 10% of carbon release. As a higher proportion of the world is urbanising, plants and green spaces are continuing to make way for urban areas. This has short term impacts, particularly regarding the store of carbon in the biosphere, and long-term impacts, whereby the removal of carbon from the atmosphere by photosynthesis is significantly reduced. Deforestation also contributes to changing land use, with around 13 million hectares of trees cut down each year, and this accounts for 20% of annual CO<sub>2</sub> emissions globally. Deforestation has the capability of causing permanent, irreparable damage to the global carbon cycle, whereby carbon is not requested from the atmosphere at



sufficient rates, and so this proves that human activity is far more responsible for increasing atmospheric carbon than natural factors currently.

However, it is also true that natural drivers have changed have huge influence over increasing atmospheric carbon. One reason for this is the Milankovitch cycle. Eccentricity is the idea that earth's orbit oscillates from circular to elliptical, which affects the concentration of atmospheric carbon. When the earth is further from the sun during elliptical orbit (glacial periods), temperatures are lower as there is less insolation. These lower temperatures denature decomposers, reducing the level of respiration, and frozen soil prevents CO<sub>2</sub> transfer. However, during circular orbit (inter-glacial periods), permafrost melts, which releases huge quantities of methane. This enhances the greenhouse effect, which results in a positive feedback loop when the greenhouse effect causes more permafrost to melt. Thus, Milankovitch cycling is a natural driver of changing atmospheric carbon concentration and will continue to. However, Climate Central have said that despite the natural occurrence of Milankovitch cycling, Co<sub>2</sub> levels today are still higher than previous fluctuations, meaning that there are other human factors that are influencing the level of atmospheric carbon. Therefore, whilst natural factors like the Milankovitch cycle may have some impact on increasing atmospheric carbon, human activity is more likely responsible for higher levels of change than natural drivers.

To conclude, human activity has far more responsibility in increasing atmospheric carbon than natural drivers of change. Post-industrial carbon concentration has increased by 25% as fossil fuels are burned and land use change is constantly. These activities can have permanent and irreparable repercussions on global carbon concentration in the atmosphere, which makes them undeniably responsible for these changes.

