

# The implications of the enhanced greenhouse effect environmental sciences essay



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1. 0 Introduction The greenhouse effect (GHE) is the term used to describe the barrier against loss of heat from the sun, in order to warm the earth. Without this process the Earth's temperature would be approximately  $-19^{\circ}\text{C}$ , which would make the Earth almost inhabitable (Smithson et al, 2008). This report will focus on the enhanced greenhouse effect, and four of the key implications it will have on future weather and climate patterns for the Earth.

2. 0 The Greenhouse effect Goudie (2006) states that the GHE works because of the presence of greenhouse gases (GHG) such as, carbon dioxide, water vapour, methane and nitrous oxide, in the atmosphere which absorb infrared radiation. The ultraviolet radiation and light from the sun penetrates the Earth's atmosphere, warming the earth's surface. This energy is re-radiated back into the atmosphere as infrared radiation, which is absorbed by the trace gases in the atmosphere, causing the average temperature of the Earth's surface and atmosphere to remain stable for life to exist. Even though the effect regulates Earth's temperature in order for human and other life to exist, humans can have an adverse affect on the natural process. This is done by increasing the amounts of trace gases that appear in the atmosphere and therefore enhancing the process, causing more radiation to be absorbed, making the Earth increasingly warmer (Hansen et al, 1981).

2. 1 The enhanced Greenhouse effect An increase in technological advances and human activity since the industrial revolution in the 1760s, has offered a significant advancement in benefits and convenience to humankind. However, this increase in activity has led to an additional release of the atmospheric concentrations of several of the greenhouse gases. This leads to more stresses to natural processes, leading to more heat being retained and therefore an overall warming of the Earth's temperature

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(Watson et al, 1990). CO<sub>2</sub> levels before human industrialisation are thought to be around 260-270ppm (Wigley, 1983), however today's values are thought to be in the region of 397ppm (NOAA, 2013), which suggests that anthropogenic activities have significant impacts on the amount of CO<sub>2</sub> in the atmosphere. The most significant CO<sub>2</sub> contributors from anthropogenic actions include the burning of fossil fuels such as, oil, coal and gas. In addition, deforestation is also a major contributor to CO<sub>2</sub> release in the atmosphere. The increase in other trace gases in the atmosphere such as methane, which is increased mainly by agricultural advancements, and chlorofluorocarbons (CFCs), that are mainly released as a result of refrigerants, foam makers and aerosols, all have severe implications on natural earth and human processes.

### 3. 0 Implications: Sea Level rise

Sea level rise is the most talked about implication of the EGHE. Peltier (1989) states that the cause of rising sea level is the increase of the mass of water in the oceans, due to the melting ice sheets and glaciers caused by a warmer climate. A prediction in global sea level rise is a main topic area in the literature. An increase in the temperature due to an increase in greenhouse gases was found by Bryan (1995), who predicts that a 1% increase in CO<sub>2</sub> in the atmosphere per year could cause an average of  $15 \pm 5$  cm rise in sea level. Church et al (1991) also suggests that an increase in average global temperatures of 3°C by 2050, could cause sea level rise by thermal expansion of 0. 2 to 0. 3m. An increase in sea level could have devastating impacts on low lying countries around the globe. Results from some studies, suggest that if there is no adaptive response to a change in the level of the oceans, then significant adverse impacts would be seen. Nicholas et al (1999) suggests that low lying and densely populated areas are most at risk

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from an increase in sea level. They state that 22% of the world's coastal wetlands could be lost by 2080 with countries such as Africa, South and South-east Asia and Southern Mediterranean experiencing vulnerability to coastal flooding. However, the Caribbean, Indian and Pacific Ocean islands are thought to experience the largest increased risk in flooding. 3. 1

Implications: Seasonal Precipitation and temperature changes Changes to climate patterns and trends, in particular those in seasonal cycles, are also considered to be an implication of the enhanced greenhouse effect. Thomson (1995) argues that the seasonal temperature cycle is being altered by the enhanced greenhouse effect. He showed a correlation between a shift in 20th century temperature cycles and the concentrations of CO<sub>2</sub> in the atmosphere, which he argues, is a direct result of anthropogenic influences. An increase in CO<sub>2</sub> emissions is the main greenhouse gas that is thought to change climate change and seasonal changes in temperature and precipitation. This is supported by Hennessy et al (1997) who suggests that a doubling of CO<sub>2</sub> in the atmosphere could increase the global average precipitation amount by 10%. 3. 2 Implications: Extreme weather events In addition to the obvious climatic changes, it is also suggested that a change and increase in natural disasters could be seen by the enhancement of the greenhouse effect. For example, Whetton et al (1993) ran several General Circulation Models (GCMs) and found that if CO<sub>2</sub> in the atmosphere doubled than a severe increase in the frequency of high-rainfall events would be seen across most of Australia. This gives the further implication that the frequency of a flood event would also increase. They also found, that by running several GCMs, the sensitivity of soil water regime is influenced by the changes in rainfall and temperature. With warmer temperatures, an increase

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in evaporation would occur which would lead to a significant drought in the South of Australia. As well as the primary event itself causing ecological effects, the secondary, economical, environmental and social, impacts need to be considered. Lynch (1987) reported that a flood affecting Sydney in 1986 caused damage of over A\$100 million and killed six people, with an increase in the amount and intensity of such events are likely to cause catastrophic damages to crops, communities and the physical environment. GCMs play an important role in trying to predict the implications of the EGHE. By using CO<sub>2</sub> as a control and increasing it by twice its current limit, Lambert (1994) found that the frequency of intense winter cyclones will increase however, the overall number of cyclones will decrease. Webster et al (2005) examined the number and intensity of tropical cyclone over the past 35 years where there was increasing sea surface temperature. They found that there was a large increase in the number of category 4 and 5 hurricanes. They also suggest that whilst the number of intense cyclones has increased the number of cyclones and cyclone days have decreased.

### 3.3 Implications: Human health and conflict

The IPCC (2007) report claims that climate change, will have an impact on human diseases and allergies. Patz et al (2005) suggests that climate fluctuations have direct links to many prevalent human diseases. For example, heat waves increase the chances of cardiovascular mortality and respiratory illnesses, crop failures due to changes in regional climates could cause malnutrition and the transmissions of infectious diseases could also be altered. Khasnis (2005) also found a direct link between global warming and the serious implications for all aspects of human life. The shift in transmissions could result from increased migration, portable water sources, and a reduction to host resistance to

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infections, can cause crop failures and famine. Not only does climate change have direct implications on human health, Beggs (2000) suggests that medication-related health implications may also exist. It is suggested that a deterioration of storage conditions from increased heat stress could cause medication-induced heat intolerance. In addition, climate change may also have implications on security, peace and conflicts. Salehyan (2008) suggests that mass migration and armed conflict around the world would be increased as resource competition exacerbates from a change in climate. Water resources could be the major impicator for global conflict.

#### 4. 0 Conclusion

In conclusion, the enhanced greenhouse effect causes natural earth and climatic processes to develop into what, could potentially be, a catastrophic and dangerous earth to live. The melting of the ice caps due to warmer air and water temperatures will increase the water mass in the oceans. This in turn will have an effect on the low lying countries and islands around the globe. The increased frequency and intensity of local and global weather events could also cause many problems for differing places around the world, however, it has been suggested that the number of events may not increase but the number of intense events may increase. Humans are the thought to be the ones that are enhancing the greenhouse effect with the pumping of extra greenhouse gases into the atmosphere, but they are also the ones which many might argue, are being affected the most. An increase in risk to human health due to extremities in adverse weather patterns and war and conflict may increase over a lack of depleting resources.

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