

What is global warming and what are the dangers associated with it?

Global warming: the two words dreaded by Geographers. Yet what's so bad about it? For millennia there have been fluctuations in the Earth's temperature; indeed global warming and cooling are common events when looking at the timescale of the Earth. Global warming is becoming a much more pressing problem as we are seeing more and more extreme natural disasters. This increase in natural disasters can be seen to have been potentially caused by the warming of the Earth. Panels all over the world including the Intergovernmental Panel on Climate Change (IPCC) repeatedly meet to discuss possible solutions. This really is a global problem as it is seen to affect all regions around the globe.

The greenhouse effect was discovered in 1827^[1] and it is the system responsible for keeping the Earth warm.

Yet what actually is the greenhouse effect?

The greenhouse effect can be defined as being the blanketing effect of greenhouse gases, such as carbon dioxide, carbon monoxide and sulphates, in the atmosphere^[3]. This leads to the Earth being warmer than it would otherwise be, and, leads to a temperature increase of about 33 degrees centigrade^[2]. As the sun's rays pass through the atmosphere: some radiation is absorbed by plants and the soils, some is reflected back out into space and some is trapped by the atmosphere^[2]. Plants and soils emit thermal radiation, which along with the radiation trapped in the atmosphere, leads to the warming of the planet which is blanketed by the atmosphere.

Furthermore the greenhouse effect can be seen to work through convection. Convection is defined as the 'heat transfer in a gas or liquid by the circulation of currents from one region to another'^[15]. It is present in the atmosphere on a large scale. In the troposphere (the lowest three quarters of the atmosphere), convection is the dominant process for transferring heat^[1]. Convective equilibrium is formed as a result of this constant warming and cooling of the air in the atmosphere^[1].

Thus it is evident that both the radiation and convection of thermal energy play an important role in keeping the Earth warm. The greenhouse effect enables the Earth to sustain life.

However the greenhouse effect can be increased due to human activities and this in turn leads to the Enhanced Greenhouse Effect. It means that more energy is being absorbed by the earth than emitted and thus leads to global warming when it happens on a large scale as we can see happening at the moment^[1]. In pre-industrial times the amount of carbon dioxide in the atmosphere averaged 280ppm (parts per million) and has risen to 392ppm in 2013 (with a daily average at Mauna Loa recording 400ppm as of May 2013)^[17]. The increase in carbon dioxide is reducing the thermal radiation released into space, resulting in higher temperature levels. This drastic increase will clearly have a huge, and possibly, dangerous effect on the planet. It is clear that the enhanced greenhouse effect is potentially having a negative impact on ecosystems around the world, and humans being just a small part of ecosystems will inevitably feel the impacts too.

Oceans can also be seen to have a huge impact on climate change as they are both huge heat and carbon sinks^[18]. Indeed they currently absorb around 90% of the excess heat energy that is caused by the enhanced greenhouse effect^[19]. Ocean currents can be seen to warm coastal areas as they act as

insulators and so as the sea temperatures rise they will cause coastal areas to heat up. Furthermore it is evident that as sea temperatures rise the oceans will become less able to absorb carbon dioxide.

The Enhanced Greenhouse Effect is changing the world, that much is clear, and it is important to look carefully at any dangers that this phenomenon might bring. There are numerous negative effects of global warming. For the purpose of this essay I will be looking at two; the increase in natural disasters and the increase in spread of disease. This is a far from comprehensive list; however, they are important factors nevertheless.

There are important factors which alter the rate of global warming, yet there is a lot of uncertainty surrounding this. The IPCC states that there are many uncertainties 'particularly with regard to the timing, magnitude and regional patterns of climate change'^[1]. This makes it difficult for us to predict the future dangers of global warming and for us to predict when different warming related events will occur.

Natural disasters

The occurrence of natural disasters such as avalanches, mudflows and droughts seem to have increased substantially in recent years^[16]. Global warming is causing ice caps and glaciers to melt; the melting snow then becomes unstable which causes avalanches. Due to the increased instability of the snow, thanks to global warming, the risk of avalanches is increased. The melting ice brings additional water runoff to mountainous areas increasing the risk of mudslides and flooding.

Global warming is affecting airflow patterns with a resulting change in rainfall distribution which is exacerbated by the El Niño effect. (The El Niño effect is 'a temporary change in the climate of the Pacific ocean' whereby the temperature of the ocean increases slightly. It causes wet weather in the US and droughts in Indonesia and Australia¹⁴) In addition the process of evapotranspiration has increased due to global warming with the result that significantly more moisture can be held in the atmosphere. It is predicted that there will be an increase in droughts with water sources being reduced by up to 30%. Furthermore the changing airflow due to warming will lead to more rain in the northern hemisphere meaning that flooding is predicted to increase.

Thus this shows us how natural disasters have been predicted to increase due to global warming. This will have a negative effect, particularly on Less Economically Developed Countries where they have a smaller capacity to cope.

Spread of disease

Climate Matters states that 'Climate change might increase the likelihood of disease epidemics'^[9], and this would clearly have a drastic effect on animal and plant populations. Some examples include:

- Arctic parasites which are growing at an increased rate due to the rise in temperature, which makes the Arctic environment friendlier to them. They will threaten plant populations in the Arctic which is disrupting the fragile Arctic ecosystem.
- Coral reefs in the Caribbean are deteriorating as bacteria and fungus growing on the reefs is spreading at an increasing rate. Coral reefs take in 1/3 of the planet's CO₂, and, with the growing destruction of coral reefs this means that more CO₂ is being released into the

atmosphere rather than being trapped in this carbon sink which will in turn lead to the further increase of global warming.

- Furthermore there is an increasing danger of disease to Harlequin frogs as the warmer temperatures encourage the growth of the disease chytridiomycosis which endangers them and it can be seen to be a particular threat to them.

These portray only a few examples of the direct effect of global warming on the spread of disease. Indeed examples like these are predicted to increase given the current trend of warming.

This trend is also affecting people and poses a threat to human health. There is evidence that the incidence of malaria and dengue fever is increasing due to global warming ^[10].

As the atmosphere warms up, there will be an increase of humidity in certain areas. Thus there will be a greater area for mosquitos to breed as they are reliant on the heat and moisture to survive. Malarial regions have temperatures in the range of 15 °C to 32 °C with 50% to 60% humidity ^[1]. This means that malaria, which is a tropical disease, could potentially spread to the mid-latitudes as a direct consequence of global warming ^[1].

Dengue fever is also dependant on warmth and humidity and so too will increase due to global warming. Dengue fever is considered to be the most serious viral infection transmitted in people by insects; both in terms of the number of infected people and the number of deaths ^[12]. Furthermore researchers have examined three different climate models and they all show that the potential of a dengue fever epidemic increases rapidly with even a small temperature rise ^[12].

The increase of areas susceptible to these diseases will put people at a particular risk as they will lack any natural immunity to the diseases and so the diseases are likely to become even more fatal than they are at the moment.

Conclusion

These are only a few examples of how global warming will adversely affect human life. It contributes to an increase in natural disasters and the spread of disease in addition to other dangers like rising sea levels. People have a low tolerance to temperature changes and are vulnerable to environmental changes which are both products of global warming. The dangers outweigh any positive aspects such as longer growing seasons. Overall global warming costs us billions of US dollars and already contributes to more than 150 000 deaths per year ^[13].

But at the same time people are slow to react and only want to take action when it is certain that global warming is an issue. When looking at global warming it is we can see that there is a lot of scientific uncertainty surrounding this topic, however it is clear that we cannot use this as an excuse to sit back and do nothing. Some things however are certain: if the carbon dioxide concentration in the atmosphere doubles and nothing else changes save for the atmospheric temperatures we are looking at a temperature rise of about 1.2 °C^[1]. This figure is widely accepted. Yet there is still huge uncertainty as global models are complicated by feedbacks and regional variations. Although we can look at these complications through climate models, it is clear that there are still inadequacies in the models and so this limits the results. This makes it hard for us to know exactly what will happen because of climate change and so it is hard to know what needs to be done or how dire the situation is in fact. It is clear however that the rate of climate change will be massive; possibly greater than

the Earth has seen for millennia^[1]. This uncertainty is widely used as an excuse to continue spewing huge quantities of greenhouse gasses into the atmosphere, yet the repercussions will have to be faced at some point and the uncertainty has to stop being used as an excuse. It is better to face it now than before it's too late.

The dangers I have highlighted make it evident that mitigation has to take place to try and to stop the growing problem of global warming. Some scientists believe that it is not possible to reverse global warming^[1]. And thus for humans to survive this action and adaptations need to take place. The world has survived for billions of years; people for only a few hundred thousand. Climate change is a global problem and all countries must cooperate in order for any mitigation strategies to work. It will need worldwide consensus and cooperation on a scale never seen before. Perhaps this is the real task facing the United Nations.

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