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Nikil S
Dept. of Physics
PSG College of Arts and Science
India

Corresponding Author
Nikil S
nikilshanmugam2@gmail.com
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Climate Change in the Recent Years – Where do We Stand?

Climate change is far reaching, fast and heightening. That is the critical finding of the most recent logical report from the Intergovernmental Panel on Climate Change. It tracks down changes in the World's environment in each area and across the entire environment framework. Many changes are remarkable in thousands, in the event that not countless years. Some, like proceeded with ocean level ascent, are irreversible over hundreds to millennia. The report focuses areas of strength to supported decreases in outflows of carbon dioxide and other ozone depleting substances to restrict climate change. Hotter temperatures likewise cause more outrageous climate, which incorporates longer and more regular dry seasons as well as additional violent storms, floods, and heavy snowfall. These climate variations present different challenges. Crop development turns out to be seriously difficult, natural surroundings for plants and creatures change, and water sources are diminished. Climate change similarly causes more perpetual and outrageous destructive occasions, for instance, typhoons, floods, cyclones, heat waves and dry season. Geoengineering innovation has been put forth these days to decrease environmental change influences however, they have legal and unexpected issues in carrying out.

INTRODUCTION

Fundamentally, climate change refers to a long-term change in temperature and weather patterns. Initially, climate change was a natural phenomenon, but over the past 200 years, thanks to the advancement of several technologies, mankind has become the only factor responsible for it. The combustion of fossil fuels like coal, gas, and oil, which results in the production of heat-trapping gases, is a major contributor to climate change. Carbon dioxide and methane are

two major greenhouse gases that contribute to climate change. Therefore, when these greenhouse gases burn, they mix together in the atmosphere and create a sort of "blanket" that envelops the earth's atmosphere, raising the temperature on the surface of the planet. The four main indicators of climate change, according to the World Meteorological Organization (Geneva, 18 May 2022 (WMO)), are greenhouse gas concentrations, sea level rise, ocean heat, and ocean acidification. People often believe that climate change means warmer temperatures, but that is not the case. Rise of temperature is just the beginning, since earth is a system, a small change in one area can cause major anomalies in other areas. There is a misconception among the general population that global warming and climate change are one and the same, but that statement is completely untrue. Global warming refers to the gradual increase in the earth's temperature, whereas climate change refers to the long-term change in weather patterns and the side effects caused by it. Some of the side effects include frequent droughts, melting glaciers and so on.

WHY IS CLIMATE CHANGE PROJECTED AS A BAD THING FOR THE PLANET AND TO THE LIFE ON EARTH?

Oceans, weather, food, and even our health may suffer as a result of climate change. Antarctica and Greenland's ice sheets are both melting. Due to the extra water that was once held in glaciers, sea levels rise, causing the oceans to overflow and inundate coastal communities. In addition to longer and more frequent droughts, warmer temperatures can lead to more intense storms, floods, and heavy snowfall. These climatic changes provide a number of challenges. Growing crops becomes more difficult, animal and plant habitats alter, and water resources are diminished. In addition to creating new agricultural problems, climate change can have a direct influence on human physical health. The global temperature has risen by 1.5° Fahrenheit during the past 100 years, and over the next 100 years, it is predicted to climb by another 0.5° to 8.6° Fahrenheit.

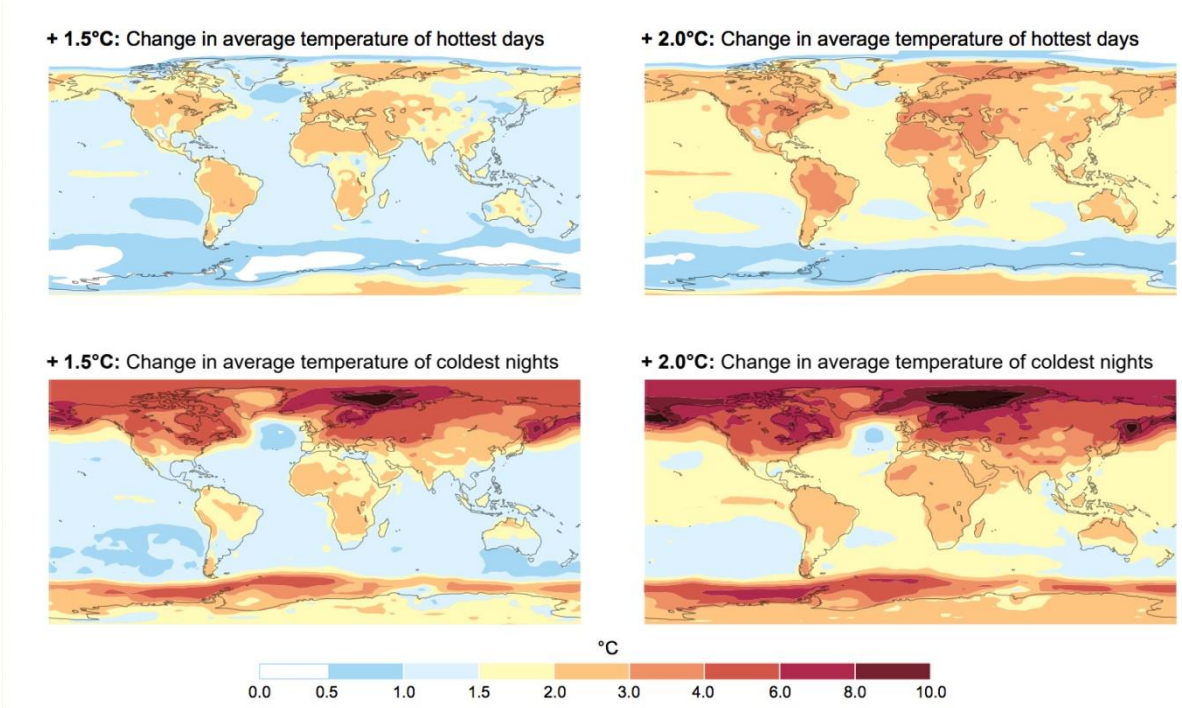

Figure. 1 The average temperature of the year's hottest day and coldest night

Source: IPCC, 2018

The average temperature (Figure 1) of the year's hottest day (top) and coldest night (bottom) are projected changes with 1.5 degrees Celsius and 2 degrees Celsius of global warming, respectively, compared to pre-industrial levels.

For their survival, animals and flora are making an effort to adapt to these conditions. If even one of these animal groups becomes extinct, it might have a cascade effect on the food chain since there would be no live plants or animals, which would mean there would be no living humans. Ocean acidification, which results in the corrosive levels in the seas from the carbon dioxide interacting with the salt water, is caused by rising temperatures making the world's oceans hotter. Ocean acidification harms animal life and is to blame for the Great Barrier Reef's demise. This is a problem since almost 1 billion people rely on sea life as their primary source of protein. Around 65% of the polar ice covers have disintegrated since 1979 as a result of the polar ice covers weakening due to warmer oceans. Every year, the globe loses almost 400 billion tonnes of ice—enough to fill 64 cubic miles and measure 4 miles on each side—which melts and replenishes the ocean. When the oceans are overloaded with water, like in Louisiana, the coastlines are unable to contain it, and beach front neighbourhoods are swamped and destroyed. Additionally, climate change increases the frequency and severity of catastrophic occurrences including tropical storms, floods, tornadoes, heat waves, and drought.

IS IT POSSIBLE TO REVERSE IT?

Although global warming cannot be stopped immediately, it can be reduced by reducing human emissions of heat-trapping gases and soot (also known as "black carbon"). Even if all human emissions of heat-trapping gases stopped immediately, Earth's temperature would continue to rise for a few decades because ocean currents would bring additional heat stored in the deep ocean up to the surface (Figure.2).

Once this excess heat has been sent into space, the Earth's temperature will return to normal. Experts predict that the extra warming brought on by this "hidden" heat won't likely exceed 0.9° Fahrenheit (0.5° Celsius). Without further human involvement, natural processes would begin to steadily remove more carbon dioxide from the atmosphere, which would cause global temperatures to gradually decrease. It's true that without considerable action in the next two decades, it's doubtful that we'll be able to keep global warming this century under 2.7° Fahrenheit (1.5° Celsius) compared to pre-industrial temperatures, which scientists believe has a reduced likelihood of having severe negative impacts. Since the more we cross that line, the more important and wide-ranging the effects will be, it is never "too late" to take action. Alternative strategies to slow or stop global warming have been proposed. These strategies are collectively referred to as "climate engineering" or "geoengineering." One geoengineering strategy to cool the Earth's surface involves injecting reflective particles into the upper atmosphere to scatter and reflect sunlight back to space. Adding iron to the oceans to promote large phytoplankton blooms, which would absorb carbon dioxide from the atmosphere via photosynthesis, is one of the other suggestions. Many climate scientists are opposed to utilizing geoengineering until we have a much better understanding of its possible negative effects, even if these approaches may be beneficial in principle. Additionally, there are unresolved ethical and legal issues related to geoengineering.

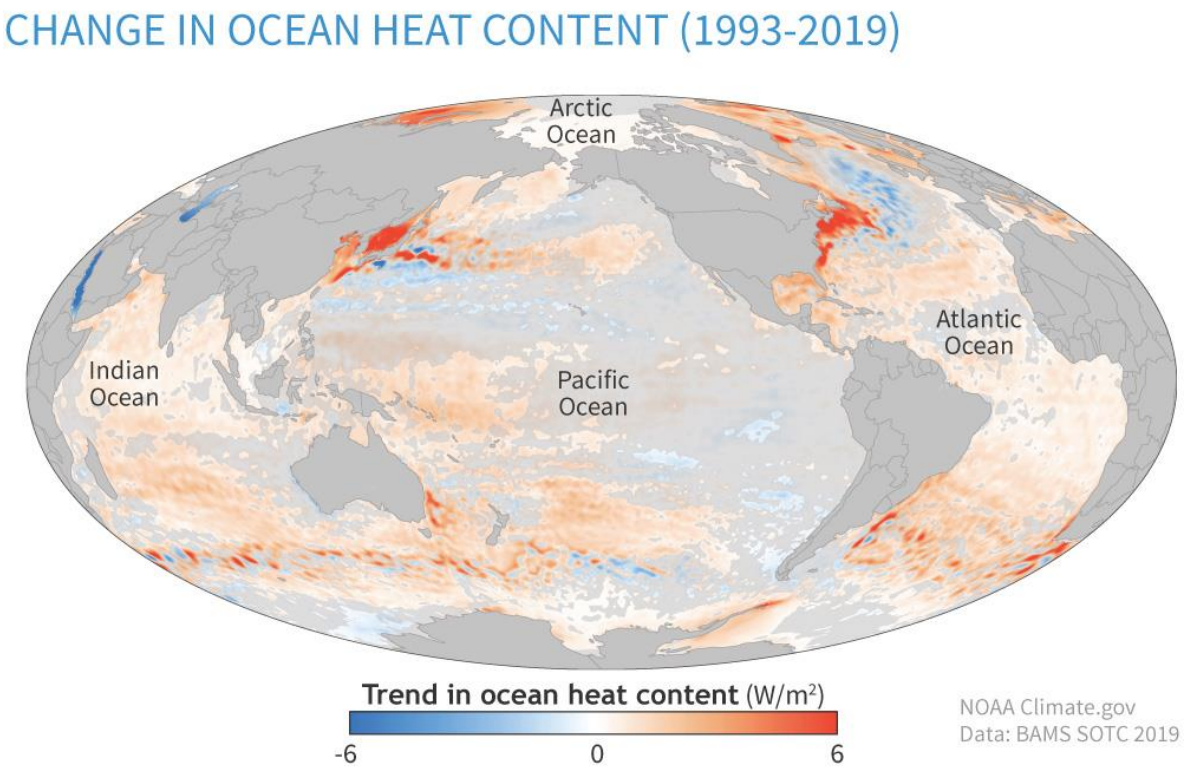

Figure 2. World map, locations of ocean change in heat content

Source: NOAA Climate.gov,2020

This map (Figure 2) shows the locations where the ocean's upper 700 metres (2,300 feet) have been storing or losing heat between 1993 and 2019. The majority of ocean basins are seeing heat gain (orange), with certain parts suffering heat loss, even if the global average trend is positive.

WHAT ACTIONS DO WE TAKE IN 2022 TO REDUCE CLIMATE CHANGE?

The Earth absorbs more sunlight due to the greenhouse effect, which warms the globe. Several strategies to cool the Earth by lowering the quantity of sunlight that initially reaches the planet have been put forth to combat this. Solar geoengineering is the aggregate term for these light-reflecting techniques. To deflect sunlight away, one technique is to squirt small particles into the sky known as sulphate aerosols. Sulfate aerosols are naturally released by volcanoes and desert dust. They are also produced from the burning of fossil fuels, and part of the heat caused by greenhouse gases is actually mitigated by them. However, when released at ground level during the combustion of fossil fuels, they result in dangerously high levels of air pollution. Scientists are experimenting with dispersing sulphate aerosols into the stratosphere using aeroplanes or hot air balloons because they may effectively increase sunlight reflectance but are too high to produce serious air pollution levels.

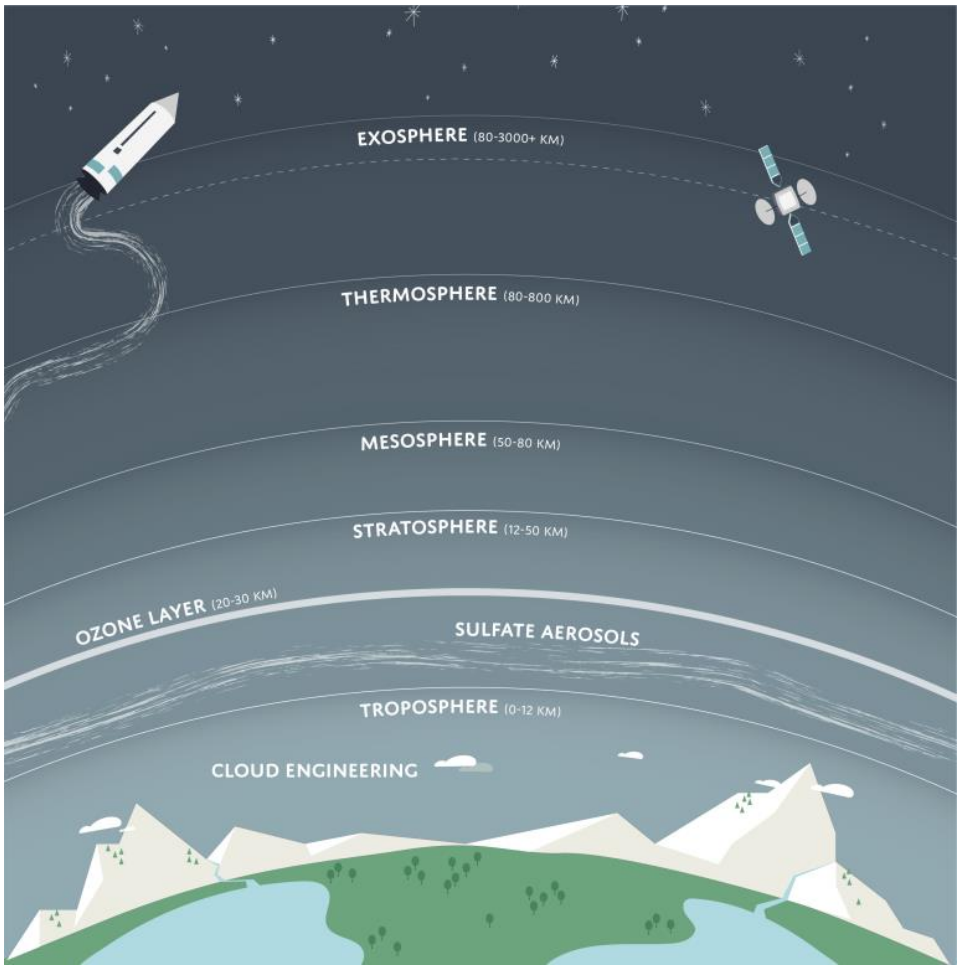

Figure 3. Five different levels in the Earth's atmosphere.

Source: sitn.hms.harvard.edu, 2022

There are five different levels in the Earth's atmosphere (Figure 3). Weather occurs in the troposphere, which is the layer that is closest to the Earth's surface. The troposphere contains clouds; therefore cloud engineering also takes place there. The stratosphere, the next layer, is where commercial aircraft travel and where the ozone layer is located. To prevent contaminating the air we breathe in the troposphere, light-reflecting sulphate aerosols can be sprayed into the stratosphere.

Given that it is expected to cost around $2.5 billion yearly, this method's main advantages are rapidity, reversibility, and relative cost-effectiveness. Because they are already in the atmosphere, sulphate aerosols are also the subjects of much research. It is possible that sulphate aerosols might trigger ozone-depleting processes, enabling more UV rays to reach the Earth. The stratosphere is covered in a layer of ozone, a gas that filters the most dangerous forms of ultraviolet radiation from the sun. Brightening the clouds over the seas is another way to cool the atmosphere. Generally speaking, lighter items reflect light whereas darker objects absorb it. In order to prevent light from being absorbed by the dark waters below, brighter clouds over oceans would force the clouds to reflect more light away. The number of water droplets in a cloud determines its brightness (smaller droplets have more surface area, so they scatter more light and appear brighter). Small seawater aerosols might be sprayed over the oceans to brighten clouds by causing water droplets to develop around

them. The droplets that adhere to smaller aerosols are also smaller. The amount of water that clouds can store, and how long they last, might both be impacted by adjusting the droplet size. Cloud brightening has a larger chance of changing weather patterns than blasting sulphate aerosols far into the stratosphere because clouds originate in the lowest layer of the atmosphere, known as the troposphere. Building the machinery required to take in saltwater, transform it into small droplets, and spray them into the air costs more money up front for cloud brightening. The devices would probably be transported by boats to various maritime locations, but they must be able to endure rough seas and extreme weather. In addition to continuing maintenance expenditures, the cost of constructing a sufficiently large fleet of these boats is projected to be between $3 and $5 billion. The main area of uncertainty surrounding solar geoengineering is how quickly changing sunlight would impact climate beyond temperature. Climate models can be used to study this, but real-world testing is challenging. There is also worry that the reduction in sunshine may slow down plant development, raising atmospheric CO2 levels and lowering food production. Additionally, the main cause of climate change is not addressed by these techniques.

Conducting field studies to correctly estimate possible effects and creating international agreements to deploy and monitor geoengineering technology safely are the two main geoengineering difficulties. Depending on cost, local conditions, and the climate's reaction, a variety of approaches might be utilized if geoengineering were to be implemented. Different approaches could have local or global implications; thus, the international community has to come to an agreement on regulatory rules. Since the United Nations should be advised and given guidelines for how to prioritise geoengineering techniques, several scientists have proposed for the establishment of regulatory organisations. Geoengineering could be able to slow down climate change in a more controlled way, giving us more time to create a more sustainable civilization.

CONCLUSION

There are a number of scientific methods available that are designed to reduce the impact of climate change on our planet, but majority of those technologies are expensive and are not feasible on a larger scale. Though some methods can be used on a larger scale, they are very expensive at present. Scientists around the world are still working on a feasible and economical solution to tackle climate change, so as the citizens of the world we should also try to help to save planet earth for our future generations. Various studies have proven that as the population increases the effects of climate change would become worse. It is always better to start with the small things, though one individual cannot control the entire climate change scenario but he/she can be a part of a much bigger solution to this issue. For instance, we can start by reducing our dependence on the fossil fuels which would in turn reduce the greenhouse emissions. We should try to shift towards the renewable resources such as solar, wind and so on for our energy requirements. This would help us in the long run by saving our planet Earth from the adverse effects of climate change.

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