FUNH5000 Assignment2

——What are the solutions to climate change?

1. Introduction

Climate change refers to long-term alterations in the Earth's climate system due to natural and human-induced factors. It is primarily characterized by rising global temperatures and increasingly frequent extreme weather events (IPCC, 2022; Coumou & Rahmstorf, 2012; Robinson, 2021). Since the Industrial Revolution, global temperatures have risen by approximately 1.1°C, with projections suggesting an additional increase of 1.5°C to 4°C by the end of this century (Hansen et al., 2017; Allen et al., 2018).

Global temperatures have led to more frequent and intense extreme weather events, including heavy rainfall, flooding, droughts, heatwaves, and hurricanes. These events have significantly impacted human societies and the environment (Swain et al., 2020). For instance, in 2023, Europe faced record-high temperatures, with Spain and Italy experiencing temperatures exceeding 45°C, leading to numerous fatalities and forest fires. In 2025, wildfires ravaged the western United States, destroying thousands of hectares of forest and forcing evacuations.

This paper explores viable solutions to address climate change. Chapter 2 briefly introduces the main causes of climate change, particularly the role of greenhouse gas emissions in global temperature rise. Chapter 3 examines various strategies for mitigating climate change, while Chapter 4 provides a conclusion and summary of the findings.

2. Main Causes of Climate Change

The primary cause of climate change is the increase in greenhouse gas concentrations, which trap heat in the Earth's atmosphere, leading to global warming.

2.1 Carbon Dioxide (CO_2) Growth Trend

Since the Industrial Revolution, CO_2 concentrations in the atmosphere have sharply increased. According to NOAA (2023), the global average CO_2 concentration reached 419.3 ppm in 2023, about 50% higher than pre-industrial levels. This rise is mainly due to human activities such as burning fossil fuels for energy production and transportation. Over the past 60 years, the annual

growth rate of CO_2 has been about 100 times faster than natural increases, underscoring the urgency of reducing carbon emissions.

2.2 Methane (CH_4) Growth Trends

Methane, a potent greenhouse gas, has also seen significant growth. Methane has 25 times the warming potential of CO_2 and is primarily emitted through agriculture, livestock farming, and fossil fuel extraction. Research by Saunois et al. (2020) shows that methane emissions have risen sharply in recent years, contributing significantly to climate change. Reducing methane emissions is crucial to mitigating climate change (Skeie et al., 2023).

3. Potential Strategies for Mitigating Climate Change

To mitigate the impacts of climate change, nations have adopted several strategies to reduce greenhouse gas emissions and adapt to the changing climate. These strategies include transitioning to renewable energy, developing carbon capture and storage (CCS) technologies, and adopting sustainable land use and agricultural practices.

3.1 Energy Transition: Reducing Reliance on Fossil Fuels

One of the most important strategies to mitigate climate change is transitioning to renewable energy sources. Energy production, particularly from fossil fuels, accounts for a large portion of global emissions. Shifting to clean and low-carbon sources such as solar, wind, and hydropower can help reduce emissions.

Significant progress has been made in renewable energy development. According to the International Renewable Energy Agency (IRENA), global renewable energy capacity reached 2,800 gigawatts in 2022, accounting for approximately 29% of total global power capacity. The rapid growth of solar and wind energy offers hope for a cleaner energy future. However, challenges remain, particularly in developing countries where high costs and limited technological capabilities hinder the transition. International cooperation and financial support are essential to overcoming these barriers.

3.2 Carbon Capture and Storage Technologies

Carbon capture and storage (CCS) involves capturing CO_2 emissions from sources like power plants and storing them underground to prevent their release into the atmosphere. CCS is crucial for industries where reducing emissions is difficult, such as steel and cement production. According to

the International Energy Agency (IEA), CCS could reduce global emissions by up to 15% by 2050.

However, CCS technology faces challenges, including high costs, technical limitations, and potential risks of leakage. Many developing countries lack the financial resources and technical expertise to implement CCS on a large scale. Therefore, it is essential to continue investing in CCS research and to provide support to help developing countries deploy this technology.

3.3 Changing Land Use and Agricultural Practices

Agriculture and land use are significant sources of greenhouse gas emissions, especially methane and nitrous oxide. Sustainable agricultural practices and land use changes can reduce emissions while enhancing carbon sequestration. For example, "carbon farming" techniques, which improve soil management and reduce chemical fertilizer use, can increase the soil's ability to store carbon.

Additionally, restoring and protecting forests can capture large amounts of CO_2 from the atmosphere. Research shows that the global agricultural system could absorb about 1 billion tonnes of CO_2 annually through sustainable practices. However, over-cultivation and overgrazing remain significant challenges. Governments and the international community must strengthen policies and promote sustainable agriculture to enhance its resilience to climate change.

3.4 Integrated Policies and Global Collaboration

Climate change is a global issue that requires collective action. International agreements such as the Paris Agreement provide frameworks for global cooperation. Under this agreement, nations have committed to limiting global temperature rise to well below 2°C, with an aspiration to limit it to 1.5°C. Achieving these targets requires effective emission reduction policies and strong international collaboration, including technology transfer and financial support for developing countries.

Global cooperation is particularly critical for developing nations, which are often more vulnerable to climate impacts. Developed countries must increase their financial and technological support to help these nations address climate change challenges.

4. Conclusion

In conclusion, climate change is an urgent global challenge that demands immediate and coordinated action. The rise in global temperatures and the increasing frequency of extreme weather

events, driven by human-induced greenhouse gas emissions, highlight the need for effective mitigation strategies. Reducing CO_2 and methane emissions through energy transitions, CCS technologies, and sustainable agricultural practices is critical to minimizing the impacts of climate change.

Moreover, global cooperation and integrated policies, such as the Paris Agreement, are essential for ensuring that climate action is coordinated worldwide. While significant progress has been made, much remains to be done. Continued investment in renewable energy, carbon capture technologies, and sustainable agriculture, along with stronger international collaboration, is essential for achieving the goal of limiting global warming to well below 2°C. Only through these efforts can we ensure a sustainable and resilient future for the planet.

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2025/4/12 10:34:44

> Reasoning
> I'm considering the user's request for solutions to climate change.
> Thinking through climate change solutions
> Concluding solutions for climate change
> Tackling climate change's multifaceted challenges
> Considering climate change solutions
> Focusing on climate change solutions
> **Pitching solutions**
> Climate change is a significant challenge, and finding effective solutions is crucial.
> Reasoned for 7 seconds

Here's an enhanced version of your paper with some improvements in clarity, structure, and style: