

Are we on the right track for climate change mitigation?

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“After some thinking, Kingfisher reckons that only by uniting the power of the entire village could they chase Snake away.”

In “The Virtue of Sacrifice”; *The Kingfisher Story Collection* (2022)

Climate change, primarily driven by human activities, is becoming one of the most urgent global challenges of our time. Despite lingering doubts about climate change in some research documents, strong consensus within the scientific community still affirms that global surface temperatures have risen in recent decades.

Over the past decade, significant efforts have been made by humans to address the climate change crisis, resulting in certain impacts in combating climate change and raising awareness about its consequences. However, the question remains: Are we heading in the right direction to effectively address this crisis, or do we need to reconsider our approach? This essay will examine some of major achievements in the fight against climate change, the increasing awareness of its impacts, the escalating severity of the climate crisis, and whether our actions are on the right track or require reevaluation.

Progress in the Fight Against Climate Change

In recent decades, humans have achieved significant progress in addressing climate change. Some notable achievements include:

Renewable Energy

The rapid development of renewable energy sources such as wind, solar, and hydropower has significantly reduced dependence on fossil fuels and led to a substantial decline in greenhouse gas emissions created by fossil fuels in the energy sector (Bogmans, 2019).

Solar and wind energy have seen rapid growth in recent years, becoming more practical and efficient. For instance, solar energy set a record by generating an additional 245 TWh in 2022, while wind energy reached a record production of 312 TWh. As a result, solar and wind energy now account for 12% of global electricity production, up from 10% in 2021. The combination of solar and wind energy surpassed nuclear energy production in 2021 and is quickly catching up with hydropower production. Currently, over 60 countries produce more than 10% of their total electricity from wind and solar energy (Wiatros-Motyka, 2023). Some countries have achieved significant milestones in renewable energy. On September 20, 2023, Australia's national electricity market set a record for renewable energy production, including solar from rooftop systems, large-scale solar power plants, and wind energy, reaching a rate of 70.6%, the highest in history (Vorrath, 2023).

Coal, a major contributor to carbon emissions, has experienced a significant decline in consumption in recent years. In 2022, coal consumption in North America and Europe decreased by 6.8% and 3.1%, respectively. This reduction is attributed to various factors, including the rapid development of renewable energy, rising coal prices, and government policies aimed at limiting coal usage (Energy Institute, 2023).

International Agreements and Emission Regulations

In 2015, nearly 200 countries joined the Paris Agreement, a global commitment to limit global warming to below 2 degrees Celsius above pre-industrial levels and strive to limit it to 1.5 degrees Celsius. This agreement has been ratified by 196 countries and is considered a significant step to drive global action on climate change. Additionally, the U.S. Environmental Protection Agency (EPA) has issued final regulations to limit and gradually reduce the production and consumption of hydrofluorocarbons (HFCs), another greenhouse gas, in the United States (EPA Press Office, 2022).

Technological Advancements

Technological advancements have significantly improved energy efficiency, transportation options, and carbon capture and storage methods, providing practical solutions to reduce emissions. Initiatives such as the Carbfix carbon mineralization project in Iceland allow CO₂ to be injected into water and then pumped into basalt rocks. The Climeworks direct air capture plant in Switzerland captures CO₂ directly from the atmosphere and sells it to companies for the production of carbonated beverages and other products (Evans, 2017).

Electrification in the transportation sector is a crucial way to reduce greenhouse gas emissions. Electric vehicles are becoming more popular and affordable, with many countries setting ambitious targets for transitioning their transportation fleets to electric power. In

2022, global electric vehicle sales increased by 108%, and electric vehicles now make up over 10% of new car sales worldwide (Nadel, 2019).

Public Awareness and Scientific Consensus

One positive development in the fight against climate change is the increasing awareness of its severe consequences. People are becoming more aware of the seriousness of the issue and are taking measures to reduce their carbon emissions. This growing awareness has led to various initiatives at the individual, community, and corporate levels to implement sustainable practices and reduce emissions. From using electric vehicles to adopting sustainable farming practices, people are recognizing climate change as a genuine and urgent threat.

According to a recent survey by the Pew Research Center, a majority of Americans believe that climate change is harming U.S. citizens, with 63% believing that the situation will worsen in their lifetime. The survey also shows that young adults aged 18 to 29, in particular, perceive the increasingly dire effects of climate change, with 78% of them believing that climate change will have a somewhat or very negative impact on U.S. citizens in their lifetime (Tyson & Kennedy, 2023).

Furthermore, a survey of 88,125 climate-related research papers found that over 99.9% of scientifically evaluated articles agree that climate change is primarily caused by human activities (Lynas et al., 2021).

The Development of Carbon Markets

The carbon market is a crucial mechanism in the fight against climate change, helping assess the value of carbon emissions and encouraging businesses and organizations to take actions to improve their emission reductions. The carbon market has undergone significant growth in recent decades and is now active in more than 60 countries and regions worldwide (Gaspar & Parry, 2021). This marks a significant step in building a global system to address climate change and incentivize participants to implement measures to mitigate carbon emissions. The carbon market plays a crucial role in shaping the behavior of businesses and encouraging them to engage in efforts to reduce harmful emissions to the environment.

Inadequate outcomes despite exerted efforts

Despite the progress made and the heightened awareness of climate change, its severity continues to escalate.

Recent data has recorded continuously rising global temperatures, resulting in more frequent and severe heatwaves, droughts, and wildfires (Rodell & Li, 2023). US National Centers for Environmental Prediction data shows that the average global temperature reached 17.23°C, the highest ever recorded, on July 6, 2023 (Ogasa, 2023). Increasing sea temperatures have also led to the death of numerous marine species, severely impacting

ecosystems. Mass mortality events have been witnessed around the globe recently, such as the breeding failure of around 7,000 emperor penguins in Antarctica (Fretwell et al., 2023), the widespread bleaching among Caribbean coral reefs (Chow, 2023), the unusual die-off of 700 gray whales in the West Bank (Baumhardt, 2023), the die-off of more than a hundred of dolphins in the Brazilian Amazon rainforest (The Associated Press, 2023), etc.

The melting of polar ice caps and glaciers is occurring at an alarming rate, contributing to rising sea levels and coastal erosion (Purich & Doddridge, 2023). The most recent data presented by the National Snow and Ice Data Center (NSIDC) indicates that the September 2023 extent of Antarctic sea ice has reached its lowest recorded level in history (Biino, 2023). Oceans are also becoming increasingly acidic, posing a threat to marine ecosystems and organisms, especially those that use CaCO₃ to produce shells, tests, and skeletons (Findlay & Turley, 2021).

Perhaps, the most concerning aspect of the climate crisis is the continued increase in greenhouse gas emissions. Despite efforts to reduce emissions, they not only persist but also increase. The COVID-19 pandemic provided a brief "pause" for humans to reflect on their impact on the climate. However, immediately after the pandemic, greenhouse gas emissions rapidly rebounded. According to the International Energy Agency (IEA), CO₂ emissions are set to reach a record high in 2023, with no clear peak in sight (Frangoul, 2023).

To prevent climate change, the European Union (EU) has pledged to reduce greenhouse gas emissions by at least 55% below 1990 levels by 2030. However, over the past three decades, the EU has only reduced emissions by about 32%, leaving a significant gap to be closed in the next seven years. New estimates from the European Environment Agency project that current policies will only achieve a 43% reduction in emissions by 2030 compared to 1990 levels. This figure rises to 48% when including planned but unimplemented policies. However, it still falls short of the initial target (European Environment Agency, 2023).

Have we done the right things?

Even if humanity were to achieve immediate net-zero emissions, climate change would not stop immediately. The climate system has its inertia, meaning that past emissions will continue to influence the climate for many decades, even centuries (Earth Observatory, 2007). This indicates that we cannot expect our efforts to immediately halt the manifestations of climate change. However, we still hope to see strong measures that can mitigate the severity or at least slow the increasing emissions caused by humans.

In reality, the results have not yet reflected the expectations, leaving the question of whether humans are doing the right thing in the fight against climate change unanswered. Despite significant achievements and increased awareness, the rate of climate change continues to accelerate, and the persistence of greenhouse gas emissions remains a cause for concern. Clearly, more endeavors need to be done, and the urgency of the situation requires us to

reassess our approaches and priorities, particularly in terms of changing fundamental human behaviors (Joy & Barnard, 2023). An eco-surplus culture needs to be rapidly built in society, especially the business sectors, to shift the priorities in consumption and production behaviors (Nguyen & Jones, 2022; Vuong, 2021). Additionally, an eco-surplus culture will be foundational for groundbreaking environmental initiatives and climate change reduction innovations (Vuong, 2023).

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