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Carbon Trading to Combat Climate Change

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Abstract*: Global climate change has negative effects, on impoverished individuals and poor countries are more severely affected than others. They are particularly at risk due to their heavy reliance on natural resources and poor ability to adapt to climatic change upshots. However, by lowering carbon emissions, carbon trading systems should enhance the environment's air quality and sustenance. The amount of greenhouse gases in the atmosphere is more dependent on human activity, making it easier to govern and control. The main organic sources of greenhouse gases are biomass decomposition, natural fires, and biological respiration. Anthropogenic greenhouse gas emissions increase the Earth's natural greenhouse effect and cause global warming by trapping outgoing infrared radiation within the atmosphere due to the formed pseudo blanket. Global warming impacts humans, plants and animals via a variety of mechanisms with varying levels of complexity, directness, and timing. The negative effects of climate change may be mitigated through adaptation, but this option must be carefully considered given that developing nations are clearly at a disadvantage in terms of technology, resources, and institutional capacity. The capacity to adapt is particularly related to socioeconomic characteristics.*

Keywords— ***Adaptation, Biomass, Capacity, Gases, Natural, Mitigation***

1. INTRODUCTION

The Intergovernmental Panel on Climate Change report (2015) showed the overwhelming evidence of climate change includes rising sea levels, disappearing glaciers, altered precipitation patterns, and a warming of the planet. The report further indicated that average temperatures will rise sharply by 0.2 degrees Celsius every ten years at the current rate of greenhouse gas emissions eventually hitting the 2 degrees Celsius threshold by 2050 Recent evidence points to even more rapid change, which will have a significant and, in some cases,(IPCC, 2018) irreversible impact on not only people but also species and eco-systems(O'neill et al., 2017; C*limate change*, 2001).

The quantity of greenhouse gases (GHG) in the atmosphere is more dependent on human activity and natural processes, making it easier to govern and control. The main natural sources GHG of are biomass decay, decomposition of food, natural fires, and organic respiration(Adger & Barnett, 2009). The burning of fossil fuels, deforestation, and cement manufacture are examples of anthropogenic sources. Since the start of the Industrial Revolution, the concentration of GHG in the atmosphere has increased since 2005, and it is still rising at a pace of 0.4% year. Although there is year-to-year variability in concentration rate, the yearly GHG concentration rate was higher during the last 10 years (1995-2005) (on average of 1.4 ppm per year) (IPCC, 2018; O'neill et al., 2017).

The primary natural resource on which the other earth's components depend on is the climate. It affects the availability of water, food, and energy. It prepares the ground for the development of habitats and has an impact on species density and distribution as well as the rate of primary productivity(Zhou, 2021). Additionally, Climate is a physical phenomenon on which weather sits. Weather comprises of rainfall, humidity, sunshine, wind, and temperature of which have an impact on the biophysical environment(Berga, 2016).

Over the recent past the changes in climate have been experienced all over the world. The most recent natural calamity to confirm the fact of climate change is the super typhoon Haiyan which severely damaged parts of the Philippines, floods in Western Germany and Malaysia in 2021. The fiercest hurricane to ever take place was in Miami, Hawaii, and Central America. Of that, buildings were destroyed, and communication and power were cut off with injuries and death to people. It, moved at the speed of 370-mile-wide and 3.5 times stronger than Hurricane Katrina. Winds gusted up to 235 mph and reached a top speed of 195 mph. The waters rose to as high as fifteen feet high throughout the nation, destroying villages on numerous islands and bringing ships ashore where houses had stood. The United Nations over the years have reported the displacements of 11.8 million people by storms and losing land as well as agricultural fields.

The study by Chavula (2021) tales, how climate change poses a severe threat to poverty reduction and destroying years of development work. Despite the fact that climate change

affects everyone, poor households and low-income countries are more severely affected. Therefore, Reddy (2011) alludes the risk due to heavy reliance on natural resources and poor ability to adapt to climatic extremes. Somewhat restoring and preserving important ecosystems can support livelihoods that rely on these ecosystems' functions and assist people in their adaptation efforts. By fostering low-carbon societies, (Chavula, 2022) poses that greenhouse gas emissions can be decreased, human health and wellbeing maybe enhanced.

1.1. History and Concepts of Carbon Trading

The Kyoto Protocol, which was adopted by some nations at the climate change summit in 1997 in an effort to reduce greenhouse gas emissions, gave rise to the idea of carbon trading. Maximum carbon emission levels have been allocated to the signatory nations(Scholtz & De Villiers, 2011). On the other hand, a nation that emits less than its cap can exchange "emissions" units with other nations who require them for carbon trading(Breidenich et al., 1998).

Carbon trading refers to the trading of emissions of primary greenhouse gases: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and Sulphur hexafluoride (SF6). Several emissions trading schemes (ETSs) are currently in use all over the world. Some of the programs are related to the Kyoto obligations. The Cap-and-carbon trade program has considerably advanced carbon trading in industrialized nations. The Kyoto Protocol created an international market for nations to trade with regards to GHG especially CO_2(Faure et al., 2003). Therefore, EU (European Union), US (United States), China and New Zealand all have compliance markets now, accounting for approximately 140 billion dollars in trade value and up to 5 million tonnes of emissions annually. The global market was expected to reach magnitudes of $2–3 trillion by 2020, with talk of expanding the global carbon trade and proposed markets in Australia and Japan among other nations.

Nonetheless, the international carbon markets continue to be a significant part of many nations' carbon policies, climate change policies despite concerns about a post-Kyoto international framework. Nevertheless, O'Neill & Oppenheimer (2002) reported the carbon market experiencing a significant growing. The growth has come under fire for the Kyoto Protocol's inability to achieve real emissions reductions and the EU Emissions Trading Scheme's excessive allotment of grants (EU and ETS). With the inclusion of HFC-23 projects in the Clean Development Mechanism and the nearly universal grants of permits in the EU and ETS, they have come under fire for giving financial windfalls to polluters or major GHG emitters.

1.1.1. Types of Carbon Trading

Even though, as earlier demonstrated, carbon trading is designed in such a way that the targets can typically be met without actual reductions taking place. Carbon trading is a complex system that sets itself a simple goal: to make it cheaper for businesses and governments to meet emissions reduction targets. The regulatory compliance market and the voluntary market are the two different forms of carbon markets. Companies and governments who are required by law to account for their GHG emissions use the compliance market(Bond & Erion, 2009). Mandatory national, regional, or global carbon reduction regimes govern it. The trading of carbon credits occurs voluntarily on the voluntary market. The two markets are very different in size(Breidenich et al., 1998).On the regulated market in 2008, 119 billion dollars and on the unregulated market, 704 million dollars, were traded. The EU Trading System, Clean Development Mechanism (CDM), and Joint Implementation are the three Kyoto Protocol procedures that are crucial for the regulated market (ETS). Despite not having ratified the Kyoto Protocol, some nations have additional state and regional GHG reduction plans that are legally enforceable. Only the CDM is open to developing nations.

In general, the voluntary market is more intriguing than the regulatory market for small-scale in Agriculture, Forestry and other Land-use (AFOLU) projects in developing nations. The CDM market has quite complicated project registration procedures and methodologies, and the majority of agriculture, forestry, and "Reducing Emissions from Deforestation and Degradation" (REDD) projects are excluded. However, a quick overview of the CDM is provided because there are some opportunities for smaller-scale initiatives (such as renewable energy).

The voluntary market has grown to be crucial for projects in forestry and agriculture. The private sector is the primary purchaser of voluntary carbon credits. The most typical reasons for purchasing carbon credits are corporate social responsibility (CSR) and public relations. Other factors include certification, reputation, and advantages for the environment and society. Some companies offer clients to neutralize their carbon emissions (e.g. British Airways offered carbon neutral flights and Morgan Stanley provides the equivalent amount of carbon credits). The private sector can either purchase carbon credits directly from projects, companies (e.g. Eco securities) or from carbon funds (e.g. the World Bank Bio Carbon Fund). In these markets, the backstory of the credits is extremely important. AFOLU projects are usually valued highly for their social and environmental benefits, as they deal with people's livelihoods and the protection of important ecosystems.

1.1.2. Benefits of Carbon Trading

In the past, carbon trade programs have been quite successful in addressing environmental issues, with the trading of Sulphur dioxide permits helping to reduce acidic rain. The main draw for governments trying to reduce GHG is that carbon trading is a lot simpler to put into practice than pricey direct regulations and unpopular carbon taxes. Carbon taxation is an important tool for internalizing the costs of air pollution.

Wind energy with zero emissions generates electricity that aids in the fight against global warming and other negative environmental problems.

Due to the associated expenses, a carbon trading system ought to lower carbon emissions, enhancing environmental air quality(Hepburn, 2007). As a result, there should be less carbon dioxide released into the atmosphere, which should lessen the greenhouse effect and any resulting possible harm from climate change. The Kyoto Protocol is best seen as a relatively modest first step in limiting the heightened greenhouse effect and preventing climate change caused by humans. As a result, the targets have been incredibly modest in comparison to the 80% emission reductions from the 1990 levels that have been estimated to be required by 2050 in order to stabilize atmospheric concentrations and have a chance of preventing temperature increases by over 2°C.

2. TALES OF CARBON TRADING IN AFRICA

Africa has not reaped many gains from economic globalization, and its economy continues to be dependent on a small number of basic items, the pricing of which are set by outside forces. Africa's interests have only played a minor role in the implementation of climate policies, which demonstrates the unjust distribution of resources, access, and development(Lohmann et al., 2006). It may be argued that the implementation of carbon trading regimes has not given Africa access to money or technology. Only 2% of the projects funded by the Clean Development Mechanism (CDM), the primary carbon market established by the Kyoto Protocol, are located in the continent of Africa; and just 6% of these projects are located in sub-Saharan Africa.

Since business interests dominate the carbon market, the majority of CDM credits are given out for straightforward adjustments that reduce industrial gases other than GHG. These gases are not produced in factories that are located in Africa. Although the most popular method of generating electricity in sub-Saharan Africa is hydro power(Nath et al., 2015). Simply said, sub-Saharan African nations are not assessed to be polluting enough or consume enough to successfully compete for CDM projects.

However, the strategies supported in these discussions can make the issues related to carbon trading worse rather than better. The main recommendation is to switch from a project-based approach to one that covers entire economic sectors. This does not, however, address the fundamental issue with carbon "offsetting," namely its lack of social and environmental integrity(Bond et al., 2009). A sectoral strategy would not deal with the geographic imbalance in favor of middle-income nations. Reducing Emissions from Degradation and Deforestation is a second program that is closely related to carbon markets (REDD+).

The displacement of communities reliant on forests and the financial incentive to replace complex forest ecosystems with monoculture plantations could result from this, though. The ability to account for the "savings" in emissions from REDD is still seriously questioned. Carbon trading, according to the evidence thus far, mostly aids powerful governments and business leaders in meeting the calls for action on climate change while keeping the status quo in terms of trade and geopolitics. One of the suggested solutions to combating climate change is carbon trading. Alternative options must to be taken into consideration given the difficulties it faces.

3. CAUSES AND IMPACTS OF CLIMATE CHANGE

3.1. Causes of Climate Change

Land formation, ocean formation, volcanic eruption, altered solar activity, and altered earth orbit are all examples of natural processes that can lead to climate change. Therein, major volcanic eruptions (i.e., which can change how heat and precipitation are distributed) (which can sporadically increase the concentration of atmospheric particles, blocking out more sunlight). Nevertheless, the Earth's atmosphere has changed all that much over the past years. This has affected; people,(Bond et al., 2009) animals, and plants to survive, due to the temperature and the balance of heat-trapping as a result of greenhouse gases accumulation in the atmosphere. As of today, however, it's difficult for us to maintain the balance of GHG in the atmosphere. However, an increasing amount of greenhouse gases in the atmosphere by use of fossil fuels for energy (e.g. for homes, powering vehicles, generate electricity, and manufacturing a wide range of goods)(Toth & Hizsnyik, 2008). However, the aforementioned processes greatly contribute to the potential of the natural greenhouse gas effect that is global warming through increased amount of these gases. Over the past years the entire world has been warmer at a rate never seen in human history, (Duarte et al., 2013) all because of the human-induced and/or amplified greenhouse gases emissions. This effect is what raises environmental concerns globally.

What does that mean? Altering the levels of greenhouse gases such as carbon dioxide, methane, water vapor, nitrous oxide, halocarbons(i.e. a group of gases containing fluorine, chlorine and bromine) and sulfur dioxide influence climate change(Murray & Ebi, 2012). As these gases build up in the atmosphere, concentrations rise over time. The use of fossil fuels for transportation, building, heating and cooling, and the production of cement and other products has led to an increase in carbon dioxide.

As a result of deforestation, fewer plants are able to absorb CO_2. Methane levels have increased as a result of human activities related to agriculture, the distribution of natural gas, and landfills. Carbon dioxide levels are also emitted by natural processes like the decomposition of plant matter(Smith et al., 2009). Thereby,, releasing methane from organic processes that take place, for instance, in wetlands(Zimmerman & Faris, 2011; Zhou, 2021). Human activities like the usage of

fertilizers and the combustion of fossil fuels also release nitrous oxide.

Human activities have increased ozone through the release of gases including carbon monoxide, hydrocarbons, and nitrogen oxide, which chemically react to form ozone. Ozone is a greenhouse gas that is continuously produced and destroyed in the atmosphere through chemical reactions in the troposphere. As previously established, halocarbons emitted by human activities cause the ozone layer depletion.

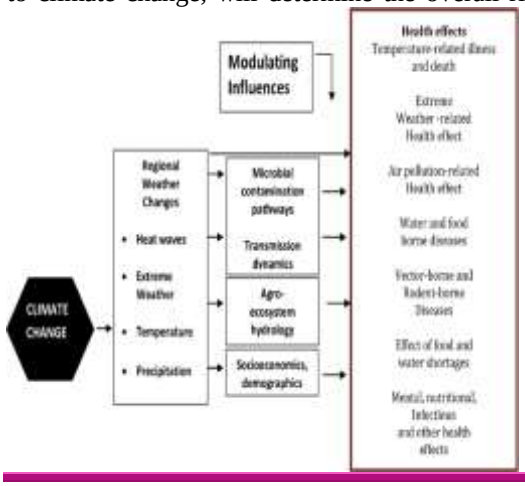
Water vapor is the most prevalent and significant greenhouse gas in the atmosphere. However, the amount of atmospheric water vapor is mostly unaffected by human activity(Adger & Barnett, 2009). Water vapor contributes to increased temperatures that affects human, plants and animals(Yohe, 2010; Germany et al., n.d.). For instance, more water vapor is present in the atmosphere, the warmer the environment. Basically, CH_4 undergoes chemical oxidation in the stratosphere, creating a little amount of water vapor, human activities somewhat contributes to the amount of water vapor in the atmosphere indirectly through CH_4 emissions(Marbaix et al., 2020).

3.2. Impacts of Climate Change

Economic Impacts

The effects of climate change on the economy and on living things is profound (IPCC, 2018). The ecology and biological diversity of a place can be significantly impacted by even a minor increase in mean annual temperature, wind and humidity. Human health and the stability of ecosystems and biodiversity are essential. These are affected by drought, floods, and other climate change effects which have a significant economic impact. According to some experts, these impacts will eventually account for 5% to 20% of worldwide income(Nyong et al., 2007a). The costs of the effects of climate change have not yet been accurately estimated by the IPCC.

An in-depth examination of industries including agriculture, fisheries, and industry, all of which are vulnerable to climate change, will determine the overall risk exposure.



The economies of developing countries frequently depend heavily on agricultural commodities and natural resources plucked from the ecosystems, (Brechin, 2003). More recent studies on these impacts have given particular attention to the economic impacts of climate change on the following: cash crops (e.g. coffee, tea, and cotton), livestock, wildlife, and tourism, and horticultural crops.

Regarding fisheries, it is important to note that 200 million people depend on them for a living. Additionally, while fishing operations often account for a minor portion of national economies, there are some developing nations, such as the Republic of Somalia, Peru and Chile that are more reliant on fisheries. Any consideration of the economic effects of climate change must include an examination of the availability of water resources as a vital component. Understanding the effects on rain-fed agriculture as well as the industrialization and urbanization processes is important. Since water is essential to many industrial operations (such as food processing, heavy industries, and cooling), industrialization processes may be slowed down(Brechin, 2003).

There are two effects on the developing world. First off, less funding in the form of aid and subsidies for economic development will go to poor nations as wealthy countries' internal finances become more stressed. Second, the governments of these countries will be compelled to divert funds away from beneficial and growth-promoting initiatives in order to offset the costs of extreme weather (Biesbroek et al., 2010) . Such repercussions will harm the chances for near-term growth(Demski et al., 2017). Additionally, it's possible that underdeveloped nations will be less able to reconstruct. Natural catastrophe recovery will take longer than it does now, and if it takes longer than the frequency of such calamities, many emerging economies may never fully recover.

Health Impacts

Human health would be impacted by global climate change through paths that varied in complexity, size, directness, and timeliness. Similar to how effects vary globally, local population vulnerability and environmental and topographic factors have a role(Stehr & von Storch, 2005). There would be both favourable and adverse effects (although expert scientific reviews anticipate predominantly negative). This comes as no surprise given that climatic changes would affect or disrupt a wide range of ecological and physical processes that are essential to the planet's ability to maintain life.

Changes in exposure to weather extremes (heat waves, winter, cold), a rise in other extreme weather occurrences (floods, cyclones, storm-surges, droughts), (Demski et al., 2017)and an increase in the production of some air pollutants and aeroallergens are among the effects on health that are more immediately felt (through spores and molds). Increases in summer mortality brought on by the increasing frequency of heatwaves may be offset by decreases in winter mortality brought on by milder winters(Nyong et al., 2007b). The positive benefit may outweigh the negative in nations like the

United Kingdom that experience significant levels of excess winter mortality.

Figure 1. Path way and categories of health impact of climate change; adopted from Pat et al., (2000)

4. CLIMATE CHANGE MANAGEMENT OPTIONS

Adaptation

The IPCC (2018) defined climate change vulnerability as the capacity of systems to adapt to changing climatic circumstances. As well as their sensitivity to the effects of climate change. Although adaptation has the potential to lessen the negative effects of climate change, it is especially related to socioeconomic factors(Nath et al., 2015). The livelihood of adaptation needs to be carefully examined given that developing countries have a pronounced institutional, financial, and technological disadvantage(Adger & Barnett, 2009). Adaptation strategies for agricultural output could involve alterations to crop varieties, change in cropping seasons, irrigation, fertilizer use, and infrastructure.

Integrated water resource management strategies can be used in the water resources sector, and enhancing public health infrastructure is another key adaptation strategy being proposed in response to the anticipated rise in health issues mentioned above(Koch, 2014; Nzilu, 2015).

Previous studies have pointed out that, the nation's declining relative position in the global agricultural sector is due to climate change. The solutions to the aforementioned could be sustainable agriculture that includes agroforestry (Joyce et al., 2013), conservation agriculture, organic farming, agroecology to mention a few. Adaption measures are the best course of action in the case of agriculture(Joyce et al., 2013). The changes in agricultural yields are anticipated to have the greatest impact on smallholder farmers in particular, who lack resources for intensive agricultural practices. It is also important to recognize that no single adaptation strategy can be encouraged, given the uniqueness of each country's situation(Egger, 2008).

Mitigation

The term "mitigation" refers to actions taken to lessen or stop the emission of greenhouse gases(Stehr & von Storch, 2005; IPCC, 2018). Utilizing new technology and renewable energy sources, tree planting, upgrading ageing equipment to be more energy efficient, or altering management procedures are all examples of mitigation measures. It can be as intricate as a plan for a brand-new metropolis or as straightforward as changes to the design of a cook stove. Around the world, initiatives include everything from cutting-edge subway systems to bike lanes and sidewalks. For policymakers, reducing climate change presents numerous difficulties(Pasimeni et al., 2019). All economic sectors must swiftly produce rapid and sustained reductions in carbon emissions. Some countries have committed to reducing emissions to the levels needed to keep global average temperature rises below 2°C, implying very major reductions from current emission levels in developed countries. For instance, the UK has set a legally enforceable goal of cutting national greenhouse gas (GHG) emissions by 80% by 2050. This suggests a reduction in emissions of almost 4% annually to 2050, a rate of change much faster than anything thus far accomplished. See in Figure 2 below.

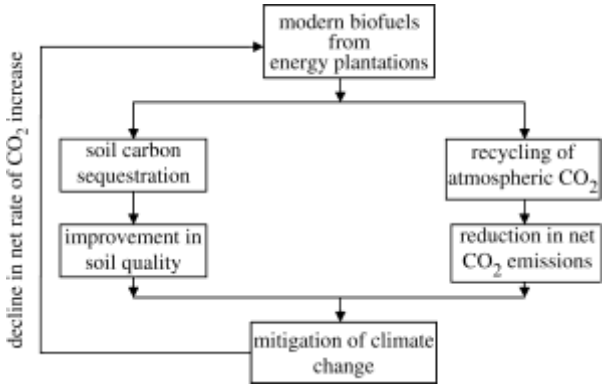


Figure 2**.** The path way of decline in net rate of CO_2 increase

5. CONCLUSION

There is an urgent need to comprehend and facilitate societal engagement in mitigation to achieve national and international greenhouse gas (GHG) emission reduction targets. The greenhouse effect is caused by a number of atmospheric gases, with carbon dioxide, methane, nitrous oxide, and hydrofluorocarbons all playing a substantial part. The amount of a gas released and, its warming potential, and the amount of time a gas remains in the atmosphere before it breaks down (light causes these gases to break down into their component parts) determine the warming effect of any one gas. The industrial revolution was one of the most significant forces that shaped our current social and economic structures as well as the pattern of human behavior. A key aspect of this revolution was the utilization of fossil fuels in creating the energy to drive industrialization. Coal, gas, oil, and peat are examples of fossil fuels, which are carbon-based materials that were formed in the memorable past of the earth's history. In the past, society relied on carbon that could be obtained from the biosphere (for instance, in the form of wood) and energy that could be obtained from the environment, such as water, wind, and sunlight. Industrialization has produced both beneficial and harmful effects. While there is concern about the environmental consequences of industrialization, it has also resulted in deteriorating the quality of life that has never been known in human history (for a relatively tiny number of people alive today). Therefore, carbon trade should be promoted even today. Larger emitters must comply to carbon trade agreements and resources should be channeled accordingly. Sub-Sahara African countries to receive funds as budgeted in the carbon trade programs and projects. Lastly,

carbon trading is a super mitigation strategy for climate change upshots.

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