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IMPACT OF CLIMATE CHANGE ON GLOBAL ECONOMY

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Abstract:
Global economy interconnects various economic activities of the world. The exchange of market services and between the countries; impact of immigration; tax systems; inflation, the foreign exchange and market trends bring great fluctuations in the global economy. The cultural, regional, social and climatic features widely contribute to the smooth flow of international trade.
This article reviews the economic impacts of climate change and the policy implications. Current estimates indicate that climate change will have a huge impact on the economy and human welfare in the twenty-first century. In fact, the initial impacts of climate change may well be positive. However, in the long run the negative impacts dominate the positive ones. Negative impacts will be substantially greater in poorer, hotter, and low-lying countries.
Poverty reduction complements greenhouse gas emissions leads to reduce climate changes. Although climate change may affect the growth rate of the global economies but may trap more people in poverty. Quantification of these impacts remains difficult. The optimal carbon pricing in the near term is somewhere between few tens and few hundreds of dollars per ton carbon emission, will be a real time solution.
Key words: Global Economy, Climate change, Inflation, Carbon Pricing, Greenhouse Gases, International Agreements.

I. Introduction:

1.1 Climate Change:

Climate Change refers to long-term shifts in temperatures and weather patterns. It denotes a shift in the average weather conditions such as temperature and rainfall in a region over along period of time. These shifts may be natural, but since the eighteenth century onwards, human activities have been the main drivers of these change, primarily due to the burning of fossil fuels (like coal, oil, and gas), produces heat-trapping gases. The fossil fuels burning greenhouse generates gas; that act like a blanket wrapped around Earth, trapping the sun's heat which raises the Earth's temperature.
While the weather can change in just a few hours, climate changes happen over longer time periods. It is the significant variation of average weather conditions. For example, warmer, wetter, drier condition happens over several decades. It is the long-term trend that differentiates climate change from natural weather.
Human activity leads to change in the atmospheric composition either directly (via emissions of gases or particles) or indirectly (via atmospheric chemistry). Anthropogenic emissions have driven the changes in well mixed greenhouse gases concentrations during the Industrial Era. Radioactive forces (RF) measure the net change in the energy balance of the Earth system. This concept is valuable for comparing the influence on global mean surface temperature.
The main greenhouse gases that cause climate change include carbon dioxide and methane. These come from using gasoline for driving vehicles and coal for heating purpose. Clearing land and cutting down forests can also release carbon dioxide. Agriculture, oil and gas operations are major sources of methane emissions. Industry, transport, buildings, agriculture and land use are among the main sectors that causes greenhouse gases emissions.
National Aeronautics and Space Administration (NASA) scientists have observed Earth's surface is warming, and many of the warmest years on record have happened in the past 20 years.

1.2 Global Economy

The world economy (global economy) is the economy of all humans of the world. The global economic system, includes all economic activities which are conducted both within and between nations, that includes production, consumption, economic management, work in general, exchange of financial values and trade of goods and services.

Since 2020, the world has seen two crises that have had a massive impact on the global economy. First, the coronavirus (COVID-19) started spreading in the year 2020; companies and stores around the world were forced to shut down, resulting in a global economic downturn. Then, the economy was slowly starting to recover from the effects of COVID-19, Russia's invasions over Ukraine in February 2022, resulted in rising inflation. At first there were fears of a global recession, but as of March 2023, most countries have fared better than feared, and consumer confidence has been increasing since then.

II. Literature Review

2.1 Effect on Climate Change

As global average temperature increases by 1.1degree centigrade which might not be soundmuch, but it has had a huge effect on the environment. The following are the few impacts:

a) More frequent and intense extreme weather, such as heat waves, drought and floods
b) Rapid melting of glaciers and ice sheets, contributing to sea level rise
c) Ocean warming causing marine heat waves.

In recent years, there have been a number of notable examples of this trend. For example, California, faced its worst drought (2022) in this millennium. What is causing these rapid shifts from drought to heavy rain? Many factors can contribute to sudden changes in weather –including El Nino, and La Niña [1]. As a result, people's lives are changing. For example, at the end of 2022, the African continent experienced the longest and most severe drought on record, threatening millions of people with starvation. Relentless drought and highfood prices, undercut many people’s ability to grow crops, livestock.

2.2 Green House Gas Emissions Causing Major Changes in Climate

Greenhouse gas (GHG) emissions have resulted in significant global climatic change, which has increased the frequency of extreme weather events, including heat waves and intense summers. Europe experienced its hottest season of summer during 2022. Intense heat waves resulted in droughts and fire across many regions. The European statistical office, (Eurostat) reporting unusually high mortality during 2022, leading to an abnormal increase in deaths [2].

Observed changes over the 20th century include increases in global air & ocean temperature that caused rising global sea levels. Long-term sustained widespread reduction of snow and ice cover, changes in atmospheric of ocean circulation as well as regional weather patterns, that influences seasonal rainfall. These changes are caused by extra heat in the climate systemdue to the addition of greenhouse gases to the atmosphere. These additional greenhouse gasesare primarily coming out by human activity such as the burning of fossil fuels; coal, oil, and natural gas; deforestation and agriculture, land-use changes. These activities increase the amount of ‘heat-trapping’ greenhouse gases in the atmosphere. The pattern of observed changes in the climate is consistent with an increased greenhouse effect.

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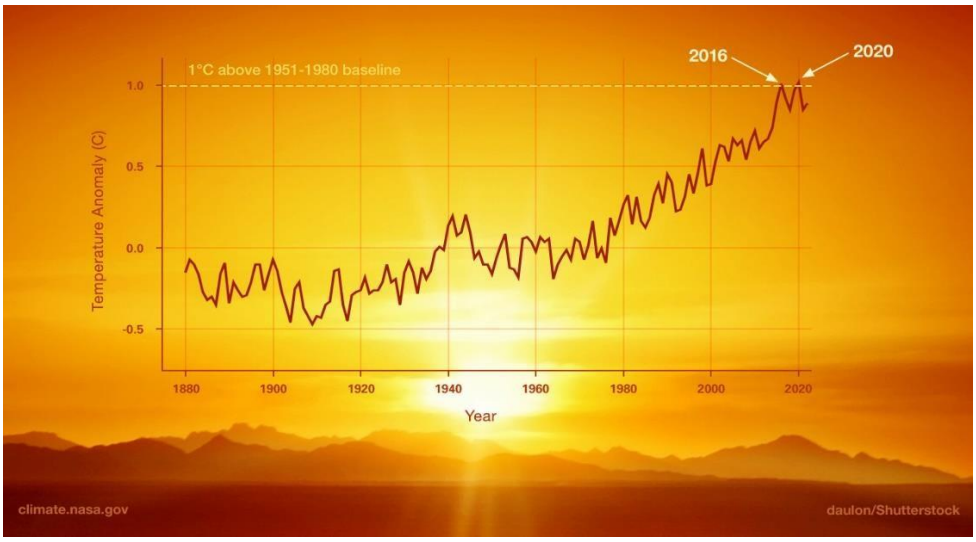

Figure 1: Changes noted by NASA in Global Surface Temperature

The above graph illustrates the change in global surface temperature relative to 1951-1980 average temperatures, with the year 2020 statistically tying with 2016 for hottest on record (Source: Nasa's Goddard Institute For Space Studies).

III. Impact of climate change on the Global Economy

The Conference on the Changing Atmosphere held in Canada (1988) raised awareness about environmental responsibility, leading the Inter-governmental Panel on Climate Change (IPPCC) to present its first assessment report in 1990. Later, in 1992, the Economic Cooperation Organization-92 Convention on Climate Change held in Rio de Janeiro created the agenda 21. This agenda gives direction for governments to implement local and nationwide goals to create sustainable development. The ECO-92 also fostered the negotiations between developed countries about the Kyoto Protocol held in Japan in 1997[3]. The 55 industrialized countries that signed the agreement committed to reduce greenhouse gas emissions and implement flexibility mechanisms, such as joint implementation, clean development mechanisms, and international emissions. In 2013 the agreement was ratified by 191 countries.

According to the United Nations Framework Convention on Climate Change (2018b), the UNFCCC Convention (1994), developed from the Montreal Protocol (1987; one of the most successful multilateral environmental treaties at that time), binds member states to act in the interests of human safety, facing scientific uncertainty. The Convention aims to stabilize GHG emissions at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system.

As such, targeted GHG emission levels "should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner". Following this Convention, the industrialized country members, and the countries belonging to the Organization for Economic Cooperation and Development, from Central and Eastern Europe, which are major sources of GHG emissions, are mandated to do the most to cut emissions. By the year 2000, the developed countries were expected to reduce emissions to 1990 levels (United Nations Framework Convention on Climate Change, 2018b).

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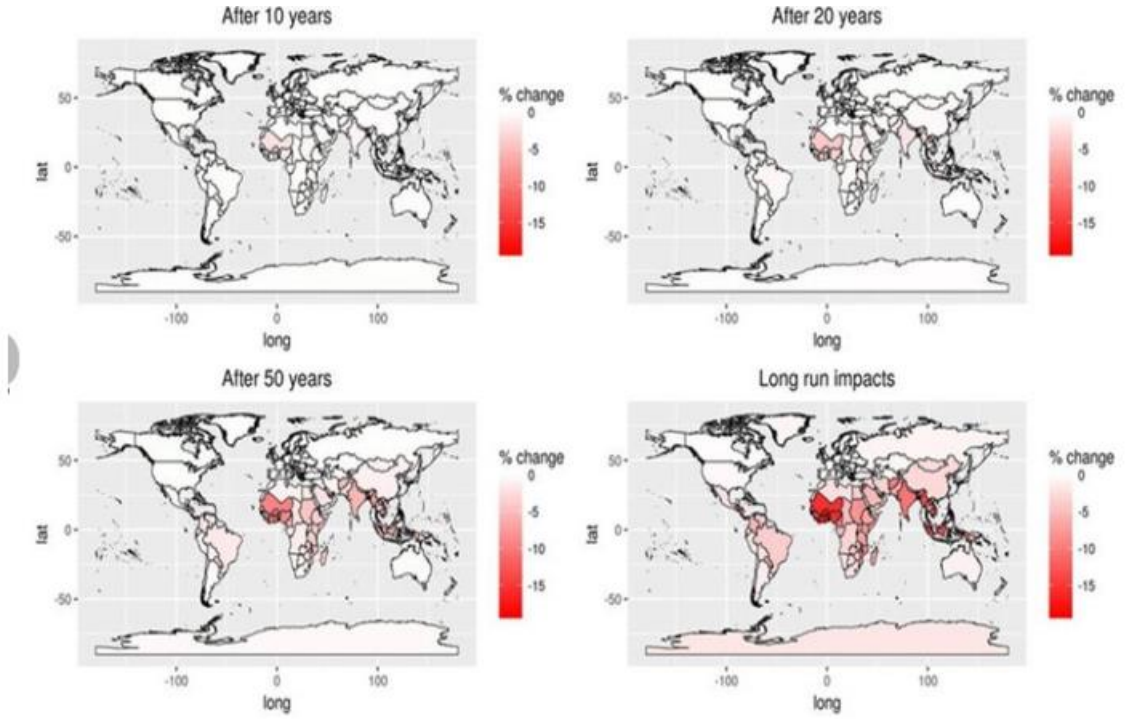

Figure 2: Dynamic impacts of global warming (3degrees centigrade) on the world GDP (%change/year)

The diagrams represent global warming the shades of color in the graph on the GDPin a long run, mapping all the effected countries.

Climate change has tremendous potential to do significant economic harm, and poses worrying tail risks. It is a global externality one country's emissions affect all countries by adding to the stock of heat-warming gases in the Earth's atmosphere from which theirtemperature raises.

The process of climate change is set to have a significant economic impact on many countries, with a large number of lower income countries being particularly at risk. Macroeconomic policies in these countries will need to be calibrated to accommodate more frequent weather shocks, including by building policy space to respond to shocks. Infrastructure needs to be upgraded to enhance economic resilience. Nonfinancial corporate sectors face risks from climate damages and stranded assets such as coal reserves that become uneconomic with carbon pricing and its disruption could affect corporate balance sheet. The climate policy choices, conclude solutions that offer growth opportunities, driven by technological innovation, sustainable investment, and a dynamic private sector participation [4].

New securities and investment structures are emerging with each passing year. The question is whether such creativity is fostering a market in which risks and rates of return are fully transparent, comparable, and accessible in ways that can be consistently monetized [5]. The risk- return conundrum for those investing in green finance is pervasive and challenging. Should investors accept a lower return on green bonds from a given issuer than on that issuer's "brown" offerings? Should issuers expect lower financing costs—a so-called greenium?Should they accept lower internal rates of return on green private equity or infrastructure investments? Fiduciaries' initial reaction has, in many cases, been "no," but this is changing [6]. A great deal of effort is going into better quantifying long-term risks and returns associated with climate, and the United Nations Sustainable Development Goals, versus short-term profits.

Green bonds, launched by the World Bank and the European Investment Bank more than a decade ago, blazed a trail for investments that could eventually reach into trillions of dollars in climate-related projects, including renewable energy, energy efficiency, and ecosystem protection and

restoration. Their central, foundational role provides lessons and warnings for the global community as it expands sustainable finance with ever-greater urgency into diverse areas such as complex collateralized loan obligations, loan and local currency guarantees, and subordinated debt [7]. The initial challenge was far more daunting than developing a bond prototype tied to environmental impact. It was to create a new class of securities that would be credible, replicable, and attractive to institutional investors and environmental organizations alike.

The impact of the climate change on the global economy is a continuous process. According to the fourth national climate assessment published in 2018, warned that if we do not curb greenhouse gas emissions and start to adapt, climate change could seriously disrupt the U.S. economy [8]. Warmer temperatures, sea level rise and extreme weather will damage property and critical infrastructure, impact human health and productivity, and negatively affect sectors such as agriculture, forestry, fisheries and tourism. The demand for energy will increase as power generation becomes less reliable, and water supplies will be stressed. Damage to other countries around the globe will also affect U.S. business through disruption in trade and supply chains.

3.1 Climate Change and Inflation

Climate change is accelerating inflation in dozens of countries around the world, and the trend is expected to continue as the world heats up. A report published recently by the European Central Bank, the researchers set out to examine the impacts of global warming on inflation in 121 countries [8]. They found that higher than average temperatures are driving up the cost of food, cost of goods and services. The uptick in prices, ripples across the global economy.

Global warming will significantly influence economic growth through damage to property, infrastructure, lost productivity, mass migration, security threats and it is also expected to increase the frequency and severity of extreme weather events.

Agricultural yields are sensitive to weather conditions and as our climate becomes more extreme, more frequent droughts, may reduce crop yields in areas where food production is vital. Higher global food prices will likely squeeze consumers' income in the process.

However, in aggregate, as the level of warming becomes even greater, food price inflation should rise. Rising inflation may also materialize through reduced land availability. The surge in global temperatures may eventually cause some areas of the world to become uninhabitable and with this will come mass migration [9].

Alongside the political and socioeconomic implications of these moves will be higher demand for an ever-decreasing amount of land. In essence, the world's population will be forced to live in an increasingly concentrated space.

2.5 Regional effects

The burden of climate change will be felt most by the developing world. The effects of climate change will not be uniformly distributed across the globe and there are likely to be winners and losers as the planet warms. Applying a broad brush to climate effects, developing countries are more likely to disproportionately experience the negative effects of global warming. Not only do many developing countries have naturally warmer climates than those in the developed world, they also rely more heavily on climate sensitive sectors such as agriculture, forestry and tourism industries.

As temperatures rise further, regions such as Africa will face declining crop yields and will struggle to produce sufficient food for domestic consumption, while their major exports will likely fall in volume. This effect will be made worse for these regions. If developed countries are able to offset the fall in agricultural output with new sources, potentially from their own domestic economies as their land becomes more suitable for growing crops [10]. Developing countries may also be less likely to create drought resistant harvests given the lack ofresearch funding.

The effects on the developing world are two-fold. Firstly, as developed countries face an increasing strain on domestic budgets, fewer resources in the form of aid and economic development funds will flow to developing countries. Secondly, the governments of these nations will be forced to channel

resources away from productive and growth-enhancing projects towards countering the costs of extreme weather [11]. Such effects will damage near-termgrowth prospects of developing countries.
Furthermore, developing countries are likely to have less capacity to rebuild. The time required to recover from natural disasters will be prolonged and if longer than the frequency with which such disasters occur, many developing economies could remain in a constant stateof friction to develop.

3.2 Policy responses

Climate change calls for a collective effort from governments, firms, shareholders and individuals to both adapt and implement measures to mitigate its effects. As carbon dioxide emissions are the main culprit for global warming, any policy response must effectivelytarget to reduce emissions. Since free markets fail to incorporate and price the negative externality of global warming, government intervention is required to realign resource allocation [12].
Without public policy looking to change, private sector behavior, economies run the risk of continuing to pollute to a point where it is too late and the economic costs are catastrophic. Intergovernmental agreements that encompass all major economies will be the most effective in tackling climate change. Without a collective policy response, the efforts of only a handful of countries looking to reduce carbon dioxide emissions will fall short of what is needed to make a material impact on a global level [13].
Decarbonizing the world's energy supply through a rapid energy transition will reduce the risks of climate change. The use of biofuels, hydrogen and clean energy can speed up decarbonization alongside reducing demand through energy efficiency measures. Governments may offer subsidies to green energy providers to promote innovation andreduce the cost of energy from these sectors.
One of the most widely proposed measures is carbon pricing. Placing a price on each tonne ofcarbon dioxide emitted, or distributing tradable permits that license a stated level of carbon dioxide emissions, is believed to be an effective measure to combat global warming [14]. Economically speaking, this internalizes the negative externality (in other words, ensures that the company/entity that is emitting the carbon dioxide pays for the social costs) associatedwith burning fossil fuels.

IV. Conclusion

Climate change will have an impact on the global economy. Attempting to understand, let alone quantify, these impacts, however, is a difficult exercise, subject to great error. Despite this, from what we know today, we are able to make inferences about how global warming will influence various economic factors.
More extreme weather has the potential to weaken economic growth through damage to the capital stock, labour supply and labour productivity will weaken as the world economy adjusts to higher temperatures. Inflation will rise through the growing cost of food, energyand insurance.
Monetary policy will be limited as it attempts to combat the stagflation of climate change. The general consensus, which is supported by a growing amount of evidence, suggests we should act sooner rather than later to avoid potential future costs. Successful mitigation policies will necessitate actions from all parties.
In conclusion as regards to carbon neutrality, the targets for India are projecting net zero emissions by 2070 [15]. National strategies to counter climate change are necessary, a collective action approach should be implemented to pave way for

a. More stringent monitoring and accountability of GHG emissions.
b. Transparency in reporting
c. Adequate and pertinent financing mechanisms that keep divergent interests in check.

As an ultimate resort, a body similar to WTO (world trade organization), that can enforce rules to govern multilateral action on climate change is a significant need. Developed nations need to undertake binding commitments to cut emissions and provide finance to less developed nations for their low-carbon endeavors. This the developing countries would keep up with the developed nations

in balancing the impact of climate change on their economies.

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