

Leading Causes for Global Climate Change and Possible Remedies

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Conceptualisation

Climate change has become an increasingly pertinent issue in the current globalised world. While we have been ignorant of this phenomenon for the past couple of centuries, its impacts have continued to get compounded, resulting in massive calamities all across the world. Humans' role in engendering and fuelling deviations in climate patterns is undeniably central to the current global climate change discourse. As Crutzen and Stoermer (2000) argue that humans have become a geological force on their own. The global climate research community argues that humans have become so decisive in their influence on the global geophysical cycles of the earth that we now face aberrations in the functioning of the crucial earth systems [1]. There is so much gravity in the argument of the Anthropocene Working Group that human activities have altered the functioning of the earth to the extent that we have left the Holocene Epoch and entered a new geological epoch Anthropocene. We have destabilised the energy balance of our planet by emitting greenhouse gases such as CO₂, NO₂, and CH₄, ruptured the Ozone layer by adding hazardous chlorine derivatives, hindered the biogeochemical cycles including sulphur, nitrogen and phosphorus, and influenced the crucial water cycle by building dams and changing land-use pattern [2]. While it is true that humans have always had a relationship with the environment, since the inception of human civilisation, we have hunted animals, consumed produce from trees, cultivated numerous resources from fields, made tools and discovered fire with the help of nature. However, our relationship with nature has been threatened by the advent of neo-liberal economic societies, which run on the fuel of profits, greed, and selfishness. The industrial revolution has been one of the most detrimental contributors to environmental degradation, mechanization of industries, the rise of urban centres, and ever-increasing consumption have their respective shares in the global climate crisis [3]. In the last century, economies around the world have focussed on rapid development and weaponization by deliberately ignoring environmental considerations. All the aforesaid factors have culminated over time to become a global phenomenon. Although the sphere of global climate change is quite complex and dynamic, we have tried to have a basic conceptualisation of the issue. This essay will highlight the major causes of climate change and the possible silver linings in the dark cloud of the climate crisis.

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Leading Causes

Fossil Fuel Emissions

Humans have always been in pursuit of sources of energy. With time we have vacillated between different sources in the form of wood, coal, and petroleum. The industrial revolution was not possible without an abundant supply of fuels across the global North and West. Once forests were cleared in Europe, industrialists turned to coal- a cheap, energy-dense, and transport-friendly source of energy. As industrialisation spread across the world, fossil fuel emissions began to rise at an unprecedented rate for the first time in the history of the blue planet [4]. The CO₂ emissions were at 276 PPM in 1750, which increased to 311 in 1950. Moreover, the 20th-century political and social structure pushed for rapid industrialization, which resulted in even higher levels of emissions of CO₂, which now stand at 412 PPM [5]. The worrying fact is that past emissions are done by OECD countries which account for 20% of the world population. The 21st century is the time for development in third-world countries in the global East and South-East. Massive countries like India and China have become leading emitters of CO₂, which fuels their economic and development aspirations [6]. The story remains similar for emissions of other climate change-inducing gases like CH₄ and Nitrous Oxide. The atmospheric concentrations of methane and nitrous oxide have increased from approximately 700 PPB to 1700 PPB and 270 PPB to 320 PPB from 1750 levels [7]. The relentless increase in fossil fuel emissions has deviated the earth from its pristine energy balance due to the incorporation of anthropogenic emissions of the aforesaid gases [8].

Population

Despite umpteen negatives, the industrial revolution increased the earnings of people, raising their standard of living and access to better healthcare facilities. This resulted in a massive increase in the human population, from approximately 1 billion to 6 billion in a span of two centuries from 1800-2000. Moreover, during the period from 1950-2000, which the scientific community calls the Great acceleration, the population grew from three to six billion [9]. This has led to an increase in the change in land-use patterns for human activity, which now stands at 25-30% compared to the earlier 10% [10]. The increase in population is problematic in the sense that it requires increased production of food, depletion of natural resources, and vulnerability of livelihood, which all contributes to global climate change. For instance, in the past five to six decades Indian population has increased by approximately three times; however, agricultural land has increased only by a meagre 20%, from approximately 118

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million in 1951 hectares to 141 million hectares in 2011 (*Agricultural Statistics 2016*). As per the Agricultural Statistics 2016, the per-capital availability of forests in India has come down from .124 hectares in 1961 to .064 hectares in 2011, which is significantly lower than the global average of 0.64 hectares. The increase in land use for human activities is done by clearing precious forests, which are determinant in absorbing greenhouse gases, maintaining biodiversity, and mitigating climate change phenomena such as floods and heatwaves. The impact of the population was rightly summed by *Paul R. Ehrlich in 1968*,

"Population growth, along with over-consumption per capita, is driving civilisation over the edge: billions of people are now hungry or micronutrient malnourished, and climate disruption is killing people."

Planetary Boundary

The concept of planetary boundaries assumes the Earth as a single, complex entity whose functioning depends on nine major domains, including climate change, ocean acidification, change in land use etc. Humanity needs to pursue its development aspirations within the safe limits defined by planetary boundaries. Unfortunately, we have transgressed three of the nine planetary boundaries, which means that in spheres of climate change, rate of biodiversity loss and nitrogen cycle, we have left the Holocene limits [13]. For instance, CO₂ levels have crossed the threshold limit of 350 Parts Per Million by volume. The worrying part is the fact that as we further transgress the limits, Tipping Points could be reached, making irreversible changes to our climate globally [14]. It could result in extreme weather calamities like the Europe Heatwaves in the summer of 2022, Pakistan Floods in 2022, and an imminent catastrophic heatwave beyond human survival limits in India [15]. As per the Stockholm Resilience Centre, humanity needs to operate within limits defined by the planetary boundaries else the aforesaid climate change extreme events are going to increase in frequency.

Economic Development

The economic development has its genesis in the industrial revolution, which established industries all around the world, invented new settlements- cities, and instigated a race for developmental hegemony among countries. Moreover, the previous century along with two wars paved the way for the neo-liberal economic system. During the period of 1800-2000, economic production increased by massive 50 times, and petroleum consumption increased by 3.5 times [11]. The economic system was evidently driven by profits, greed, and accumulation of wealth, indifferent to the deleterious impacts on the

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environment. To cite a few examples, towards the end of the 20th-century, paper consumption was approximately 250 million tons, motor vehicles touched the 700 million mark, and international tourists were at a record number of 600 million [12]. The fact that paper production was done at the expense of rich forest reserves of the world, which absorbed significant greenhouse gases, motor vehicles added potentially harmful gases to the atmosphere, and international tourism was mainly via air travel which again added to the burden of greenhouse gas emissions. The practices of the new economic order were incompatible with the environmental concerns since the former was only concerned about the accumulation of wealth, the hunt for profits made these profit-oriented people colonize and wage wars in different parts of the world.

Climate Skepticism

Climate skepticism has been one of the most detrimental factors that contribute to global climate change. It challenges the notion of climate change by questioning its very existence. These sceptics are well organized and patronized by the proponents of neo-classical economic ideologues. These people deny the phenomenon of discernable climate change by funding agencies to establish their agenda. Moreover, they even try to change the very nature of the climate crisis into a technical issue and address it in pursuit of profits [16]. For instance, the New York Manure problem due to horses being used as means of transport led to the first environmental summit in history, called by the Mayor of New York- George E. Waring JR. It was after this summit that cars were introduced as a green solution to the manure problem, ignorant of the damaging impact that the so-called green solution would have in centuries to come [17]. Therefore, there need to be mechanisms to address the damaging notion of climate skepticism which adds a lot to the burden of climate change.

Remedies

Consciousness

Consciousness could become a panacea for the burning issue of global climate change. Researcher community, politicians, and international organizations should leave no stone unturned to stride towards creating awareness about the climate crisis. Consciousness is vital in the sense that it reaches billions of people across the world, making them aware of the impacts of their trivial activities on the

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Earth systems. Fortunately, there has been an unprecedented rise in the information available about climate change to the public all around the world. International organizations like *United Nations Framework Convention on Climate Change (UNFCCC), the Inter-governmental Panel on Climate Change, United Nations Environment Programme (UNEP)* etc., have had umpteen sessions concerning the mitigation strategies for climate change. The COP 27 in Egypt envisaged strategies to ameliorate the climatic conditions and collaborate internationally to address the issue of climate change. In the Indian context, environmentalism has been an outcome of the visible impacts of environmental degradation. Indigenous movements such as *Narmada Bachao Andolan (NBA), and the Silent Valley Movement* against the felling of trees which absorb GHG are a result of the increased consciousness among the people of the country [18]. Therefore, through the path of consciousness, billions of people can be made accountable for the impacts of their activities in worsening climate change.

Climate Justice

Climate change is a multi-dimensional issue which is to be addressed on umpteen strata. The impacts of climate change vary in different regions of the world based on the capacity of the vulnerable population. The global North and West are better equipped financially and socially to cope with climate change disruptions. For instance, historically, OECD countries have been prime culprits of climate change, yet the impacts are more severely felt in poor African countries and south Asian countries. For instance, excessive monsoon rains and melting glaciers caused the catastrophic *Pakistan Flood in 2022*, which caused massive destruction of lives, and 3.2 trillion damage to the country [23]. Droughts have become more frequent in the horn of Africa. The recent *COP27* agreed on a milestone agreement for the *Loss and Damage Fund*, which will ensure funding to the countries vulnerable to climate change calamities [24]. Therefore, climate justice could become a promising remedy to the menacing issue of global climate change.

Geo-Engineering

Since the issue of climate change has become one of the most frequent topics of discussion, it has attracted a plethora of research and development in its domain. Numerous innovations have been taking place in the sphere of mitigating climate change. For instance, the addition of *sulphate particles* in the stratosphere has been on the list. Scientists advocate this method as sulphate particles scatter the incoming solar radiation and increase the cloud cover by making water vapour condense around them, reducing the amount of sunlight reaching the troposphere, which lowers the temperature of the earth

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[19]. **Carbon Capture and Storage (CCS)** is another much-talked-about technology which reduces the CO₂ emissions from industrial processes by storing gases in deep pits and geological formations. Another innovation is putting iron into the oceans so that CO₂ in oceans can be absorbed, which helps in reducing ocean acidification and reducing the quantity of carbon dioxide in the atmosphere. Although these technologies aim to help in controlling factors that add to climate change, much more research should be employed in developing technologies with greater clarity about their functioning [20]. The aforesaid geoengineering projects depict the increasing amount of research and development that is being put into alleviating global climate change.

Sustainable Development

The current world order is witnessing a race between nations in terms of economic development. Amidst this chaos, environmental concerns have gone in the background. Therefore, sustainable development is the way to go forward in order to have development and climate change mitigation hand-in-hand. Sustainable development envisages economic activity without hindering **ecological and social sustainability** [21]. It fights against irrational development and consumption, which affects the ecosystem as a whole. For instance, if the whole world were to match the American level of development and consumption, we would need five earth to produce the goods and ecological services we use [22]. Practically, it is not impossible to resist development; however, there is a need for a kind of development which leads to progress that recognizes the impacts of human activities on climate, such as GHG emissions. Thus, if sustainable development is adopted in a top-bottom approach, climate change could be addressed around the world.

Conclusion

The realm of global climate change has umpteen roots to it, and each root brings with it new challenges. Therefore, to address the issue of climate change, we need to reconsider our path in various domains. There needs to be regular efforts to reduce emissions of gases like carbon dioxide, nitrous oxide, and Sulphur dioxide, and develop sustainable models of international economic exchanges, find technologies to be within the premises of planetary boundaries. We also need to consider the rising population against means of subsistence which takes a heavy toll on the climate crisis (***Thomas Robert Malthus, 1798***). As the **Club of Rome Report**, 1970, by MIT researchers showed that with current levels of emissions, population growth, and industrial output, humanity will not be able to sustain itself beyond 2100. Despite worrying aspects of climate change, there are still hopes in the form of large public participation to address climate change, increased accountability of political systems via

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elections, heavy funding by corporates in research and development in the field of climate change, and a sense of empathy in helping poor countries fight climate change. In all, global climate change is going to be one of the integral predicaments for humanity to fight in order to secure its very existence on the planet earth.

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Name – Mohd Yasir Jamal Kidwai

Enrollment Number- M2022ECCSS017

Course – M.Sc. Environment, Climate Change, and Sustainability Studies
(1st Year)

Department – School of Habitat Studies

University – Tata Institute of Social Science, Mumbai

HOD- Prof. B. Manjula

Email- Manjula@tiss.edu

Contact Number - +919349761488