

RESEARCH REPORT



The Business of Climate Change

**FINANCE AND INVESTMENT CELL
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Introduction

"There's one issue that will define the contours of this century more dramatically than any other, and that is the urgent threat of a changing climate."

- Barack Obama

Climate change is one of the most presaging existential crises of our time. It refers to shifts in temperature and weather patterns in a region over a long period. Climate change is a result of multiple human activities that increase the concentration of greenhouse gases in the Earth's atmosphere, thus warming it. Certain gases in the atmosphere prevent the heat from escaping. These gases include water vapour, carbon dioxide, methane, nitrous oxide and chlorofluorocarbons. They contribute to making some regions warmer, which results in increased precipitation and evaporation. This will ultimately lead to the warming of the ocean and rising sea levels. Alaska's Muir Glacier in the US has been a victim of this phenomenon and is melting at an alarming rate. Between 1941 and 2004, the glacier retreated by 12 km, and its thickness decreased by more than 800 metres.



Climate change is one of the biggest threats to mankind's existence. Continuing climate change has had a devastating impact on people, societies and countries. The global average temperature in 2020 was about 1.2 degrees Celsius above the pre-industrial level. 2020 was also one of the three warmest years on record, despite a cooling La Nina event. The COVID-19 pandemic, instead of putting a brake on climate change drivers, debilitated the climate change issue. A complete lockdown for

more than three months and a halt in economic activities resulted in disruption of weather observation and complicated disaster risk reduction efforts. According to experts, a negative trend will continue for decades. To prevent this from happening, we require an investment in early warning services and weather observing networks.

Climate change has resulted in greenhouse gas concentration, sea-level rise, melting ice, increasing land and ocean temperature, glacier retreat, and extreme weather. It has also impacted socio-economic development, migration, land, and the marine ecosystem. Globally averaged mole fractions of carbon dioxide (CO2) have already exceeded 410 parts per million (ppm). If carbon dioxide concentration follows the same pattern, it might reach or exceed 414 ppm in 2021. Over 80% of the ocean area experienced at least one marine heatwave in 2020. The percentage of the ocean that experienced "strong" marine heatwaves (45%) was greater than that which experienced "moderate" marine heatwaves (28%).

Implications of Climate Change

1. Increase in global temperature and sea level

When there are fluctuations in the climate and the average temperature increases, glacier melting comes into the picture. Given below is a table showing the global mean temperature and sea level.

	1961-90	1990s	2020s	2050s
Temperature (°C change)				
HadCM2 Unmitigated Emissions	0	0.3	1.2	2.1
S750	0	0.3	0.9	1.4
S550	0	0.3	0.8	1.1
Sea level (cm change)				
HadCM2 Unmitigated Emissions	0	N/a	12	25
S750	0	N/a	11	20
S550	0	N/a	10	18

In 1995, the Hadley Centre for Climate Prediction and Research in the UK developed the HADCM2 model. HADCM2 predicts future changes in temperature, precipitation and other climate

factors in the coupled atmosphere-ocean region. It was one of the main models used in the Second Assessment Report of the Intergovernmental Panel on Climate Change.

The HadCM2 model generated estimates of the principal characteristics of the climate, including temperature, precipitation, and absolute humidity for each month, at a resolution of 3.75° longitude and 2.5° latitude. The HADCM2 came up with different scenarios for the stabilization of CO₂ concentration.

HadCM2-S550: In this scenario, major policy efforts are taken by the polluting nations. So, we can reach CO₂ stabilization at 550 ppm in 2170.

HadCM2-750: In this scenario, only modest policy efforts are taken up, and hence we reach stabilization of CO₂ emissions at 750 ppm in 2170.

*ppm stands for part per million. It can also be expressed as milligrams per litre (mg/l).

2. Frequent natural calamities

Excessive changes in the climate, such as floods and tsunamis, can overwhelm the existing infrastructure. Scientists have stated events like cyclones will only become more common owing to the increasing heat intensity.

The rising temperatures led to Cyclone Amphan in the India-Bangladesh region. A US report stated Cyclone Amphan of 2020 caused losses of USD 12 billion to India, with 129 deaths in India and Bangladesh. About 2.4 million people were displaced in the states of West Bengal and Odisha, and 2.5 million were displaced in Bangladesh due to the cyclone, it added.

3. Threat to biodiversity

The adaptability and ecosystem of living organisms get destroyed and disturbed by the pace of climate change. Every species has its place in the ecosystem. The extinction of any species can lead to a void in the biosphere. As per the data from IUCN (International Union for Conservation of Nature), climate change currently affects at least 10,967 species on the IUCN Red List of Threatened Species, increasing the likelihood of their extinction.

4. Threat to global security

Climate change poses a great threat because droughts and natural calamities can cause stress on resources in many developing countries. This will lead to an array of problems including the rise of political violence, a war for resources and terrorism. Many countries can also lose their independence because they have to rely on other countries for their basic needs.

In Mali, farmers and herders have been fighting over scarce water and land resources since 2012 and a combination with factors like ethnic tensions, armed groups and population rise, led to the event in 2019 where 160 herders were massacred in the Inner Niger Delta, a central Malian wetland.

5. Food and Water Crisis

Unsustainable development is leading to a bleak future for our future generations. High temperatures not only reduce the availability of food but also reduce its nutritional quality. A report by IPCC states that an increase in temperatures by 4 degree Celsius over pre-industrial levels would reduce rice production in India by 30% and maize production by 70%.

As per the report by Save The Children Organisation in the USA, by 2050, a further 24 million children are projected to be undernourished as a result of the climate crisis.

Arid regions in countries will be facing a more acute shortage of water. As per data by UNICEF, half of the world's population could be living in areas facing water scarcity by as early as 2025. About 700 million people could be displaced due to intense water scarcity by 2030. By 2040, 1 out of 4 children worldwide will be living in an area with extremely high water stress.

Carbon Footprint

The main cause of this man-induced climate change is carbon footprint. Carbon footprint is simply the total greenhouse gas emissions by an organisation, person or event. It should be noted that when the subject is about carbon footprint it is simultaneously referring to all greenhouse gases

including carbon dioxide (76%), methane (16%), nitrous oxide (6%) and fluorinated gases (2%).

The countries with the largest Carbon Footprint in the world are -

- 1. China** - China is the largest contributor to carbon in the world. According to the Union of Concerned Scientists, China had produced a total of 10.06 billion metric tonnes of carbon in 2018. In 2019, energy derived from coal was 58% of the total energy derived. Coal-burning in China's industrial sector releases a lot of carbon dioxide into the atmosphere.
- 2. USA** - The United States of America is the second-largest contributor to carbon in the world. According to the Union of Concerned Scientists, the USA had produced 5.41 billion metric tonnes in 2018. Being a major producer of crude oil, sectors like transportation, industry, and power generations are major contributors to carbon dioxide.
- 3. India** - India is the third-largest contributor to carbon in the world. According to the Union of Concerned Scientists, India had produced 2.65 billion metric tonnes of carbon dioxide in 2018. In India, the consumption of coal has been increasing rapidly every year. It is the main source of electricity and power generation due to factors like easy availability and cheap price.
- 4. Russia** - Russia is the fourth largest contributor to carbon in the world. According to the Union of Concerned Scientists, Russia had produced 1.71 billion metric tonnes of carbon in 2018. Natural gas and coal are major contributors to carbon dioxide as they are extensively used in the chemical and raw materials industry for power generation.
- 5. Japan** - Japan is the fifth-largest contributor to carbon in the world. According to the Union of Concerned Scientists, Japan had produced 1.16 billion metric tonnes of carbon in 2018. Natural gas and coal are used to produce electricity in various industries, and there is an increased dependence on fossil fuels.

Global Trajectory on Climate Change

Since 1970, the global surface temperature has risen faster than it has in any other 50-year period in the last 2000 years. We have failed to meet our targets as per the Emissions Gap Report 2021. The report has clearly stated we have failed to limit global warming to 1.5 degrees Celsius. The global mean temperature for 2021 was about 1.09°C above the 1850-1900 average. Even though the global pandemic had shut down most businesses and production facilities across the globe, we are not in a favourable spot in terms of environmental improvement. As per the United in Science Report 2021, greenhouse gas concentration in the atmosphere has reached a record high. If this situation is not dealt with, it could escalate to become a potentially catastrophic situation that might doom our planet. If the current trend of carbon dioxide emissions is continued, temperature could increase by as much as 4.4°C by the end of the century.

It has been mentioned that 2021 has been declared a fraught year for the planet. The year 2021 witnessed the warmest summer coupled with heatwaves, forest fires and rainfall events. According to the Food and Agricultural Organisation, in the past ten years, the incidence of natural calamities such as floods and droughts has increased, leading to excessive food shortages. In 2020, around 720 to 811 million people faced hunger, and the number in 2021 is expected to be greater. The impact of climate change has worsened with the passing years. The responsibility lies on each of us to save the planet as it is at a critical juncture.

Costs associated with Climate Change

Climate Change inarguably has an immense impact on our life. The implicit cost of climate change ranges from the negative impact on our health to the deterioration of our natural environment. It also affects the economy and leads to a loss of

livelihood. The most disturbing fact about climate change is that the populations of the countries that have contributed the least to global warming are the most vulnerable to the deaths and diseases caused by rising temperatures. The coastlines along the Pacific and Indian oceans and those in Sub-Saharan Africa, as well as those in Sub-Saharan Africa, will be more vulnerable to the health effects of climate change while those most responsible nations are safely located in temperate or continental regions.

According to the World Health Organisation (WHO), climate change causes at least 150,000 deaths per year, a figure that is expected to double by 2030.

The disastrous effects on our lives are as follows:

1. INFECTIOUS DISEASES - According to the IPCC, global warming will worsen human health conditions, particularly in tropical areas. In places like Africa, rising temperatures lead to an increase in mosquito populations, raising the risk of malaria, dengue fever, and other insect-borne diseases. Other areas are also impacted. The United States experienced varying levels of malaria outbreaks; in 2006, the United Kingdom was afflicted by a legionnaires' disease outbreak, a bacterial lung infection that scientists blame on global warming. According to the WHO, global warming will also result in a significant increase in insect-borne diseases in Europe. Countries such as Azerbaijan, Tajikistan, and Turkey may already be at risk of mosquito-borne malaria.

2. HEATWAVES - Prolonged periods of unusually high temperatures can have serious health consequences for vulnerable populations like the elderly and the sick. This was seen during Europe's 2003 heatwave, which claimed approximately 35,000 lives. In a study conducted by the Hadley Centre for Climate Prediction and Research in the United Kingdom, researchers used computer models to demonstrate how greenhouse gas emissions have increased the likelihood of heat waves. The most common health effect is hyperthermia, also known as heat stroke, which can be fatal if not treated. Global warming, according to the IPCC, will result in scorching days followed by hot nights.

3. ASTHMA AND OTHER RESPIRATORY DISEASES - People with heart problems are more vulnerable to rising temperatures, especially those who live in already hot climates, because their cardiovascular systems must work harder to keep their bodies cool. Hot temperatures raise ozone levels, which can injure lung tissue and cause issues for asthmatics and those with other respiratory disorders.

4. IMPACT ON THE HEALTH OF FUTURE GENERATIONS- Extreme weather can also have an impact on child health by unexpectedly and unusually raising the stress levels of the pregnant mother. For example, the 2011 La Nia extreme climate event in Colombia, with its torrential rain and floods, destroyed household infrastructure and temporarily displaced populations. There is some evidence that this extreme weather shock may have caused stress in some people, particularly pregnant women. According to a study conducted in Kenya, a one-millimetre decrease in annual rainfall results in a 0.9 per cent increase in cortisol levels (the body's major stress hormone that is released in response to both psychological and physiological strain on the organism). Chronic cortisol elevations contribute to the development of certain diseases.

Finally, weather events can have an impact on the health of pregnant women and their children by changing the environment, which leads to a faster spread of diseases. During floods, for example, waterborne diseases (such as cholera) are more easily transmitted. In the case of rural Colombia, we discovered that heatwaves, which had previously been largely ignored by the literature, hurt the health of the newborn baby. This implies that pregnant women cannot fully protect their children in the event of a heatwave. Heatwaves can affect the likelihood of a full-term birth and a healthy newborn, as measured by the Apgar score (a test that quickly assesses a newborn's physical condition, including factors such as heart rate, reflexes, muscle tone, and breathing rate). For example, being exposed to higher-than-average temperatures for at least one month during pregnancy reduces the likelihood of giving birth at full term by 0.5 percentage points.

According to a study conducted in the United States, exposing a pregnant woman to extremely high temperatures during the second or third trimester of pregnancy results in a 7 to 11-gram decrease in the baby's weight. Another study conducted in Northeast Brazil found that a 31% decrease in rainfall reduces birth weight by 1.9 grams and the likelihood of full-term pregnancies by 0.6 percentage points. A study in rural Mexico, on the other hand, found no effect of excessive rainfall on children's height and weight.

Loss of Livelihood

Climate change imposes costs that traverse the entire spectrum of human existence and which are difficult to be quantified for the objective understanding of the human race. However, some costs, like the economic costs, can be approximated based on certain assumptions and relative measurements.

Economic costs that form part of the overall climate change domain include-

- Agricultural production loss because of frequent weather disasters and unpredictable weather patterns
- Loss arising out of damage to infrastructure by weather disasters in turn incensed by the climate change
- Increased expenditure on healthcare and insurance
- Loss of productivity because of heat-related issues and climate change-related diseases
- Income lost from the tourism sector, because of the non-existence of earlier state of nature and extinction of biodiversity
- Impact of climate change on the profitability and costs (including costs of increased compliance expenditure) of the businesses.

Psychological Impact

Climate change has been linked to several negative health effects. Global climate change is likely to have a significant impact on health. Mental health is an important component of overall health and is likely to be impacted by global climate change. The current narrative review examines the mental health consequences of global climate change from the perspective of a developing country.

Temperature, Aggression and Criminality

With the rise in global temperatures, increased heat exposure is likely to become more common. It has been proposed that there is a link between rising temperatures and aggressive behaviour. During the hot summer months, there is an increase in criminality and aggression, implying a link between aggressive behaviours and temperatures. Aggression rates may rise as a result of global warming. An association has also been observed between suicide rates and temperature. With the recent rise in temperatures, it has been observed that suicides, particularly violent ones, have become more common.

Heatwaves and Mental Health

Heatwaves have been linked to a variety of mental and behavioural disorders. According to an Australian study, heat waves are associated with increased rates of admissions for mental disorders, as well as other disorders such as cardiovascular and renal illness. Heatwaves like this have been linked to mood disorders, anxiety disorders, dementia and anxiety-related disorders, among other things. Excessive heat can cause both physical and psychological exhaustion. According to a Thai study, occupational heat stress is associated with increased psychological distress among workers. Other studies have found a link between higher workplace temperatures and higher levels of psychological distress.

Climatic Disasters and PTSD

Climate-related disasters such as floods, hurricanes and bushfires are frequently associated with stress-related psychiatric disorders. Individuals who have been exposed to potentially lethal situations are at a high risk of developing post-traumatic stress disorder (PTSD). PTSD symptoms include flashbacks to the event, increased arousal and avoidance of cues to the memory of the event. In many cases, the symptoms of PTSD may appear months or years after experiencing a threatening disaster situation. The onset of PTSD is associated with diminished quality of life and significant distress.

Individuals who have experienced climate-related natural disasters are not only more likely to develop PTSD, but they are also more likely to develop acute stress reaction and adjustment disorder. These are anxiety spectrum disorders that can be alleviated with rehabilitation and/or treatment over time. Another stress-related disorder is the development of acute and transient psychosis, as well as the relapse of bipolar disorder. When faced with the loss of one's home, environment, social structures, or loved ones, one may experience bereavement (grief reaction) or depression. People who live in small rural communities are more likely to suffer from depression than those who live in big cities. As the impact of climate change appears to be increasing over time, a larger proportion of the population is likely to be impacted by the mental health consequences of climate-related disasters.

Gender and Climate Change

Climate change isn't gender-neutral. Women in developing countries are especially vulnerable to climate change because they count heavily on local natural resources for a living. Women face ordeals in obtaining water, food and fuel for cooking and heating. In rural areas, women have unequal access to resources and decision-making processes, as well as limited mobility.

As a result, it is critical to developing gender-sensitive strategies for responding to these crises for women. An interplay of factors contributes to the disparity in women's and men's differentiated exposure and vulnerability to climate change risks. First, women's opportunities are limited by gender differences in time use, access to assets and credit, and treatment by markets and formal institutions (including the legal and regulatory framework).

As a result, there is a wide global gender gap in earnings and productivity, with women earning 30 to 80% of what men earn annually. According to a World Bank survey of 141 countries, 103 countries continue to impose legal differences based on gender, which may limit women's economic opportunities. Furthermore, women account for two-thirds of the world's 743 million illiterate adults. Although women make up 43% of the agricultural labour force overall, percentages vary by region and country. Women make up half of the agricultural labour force in the least developed countries, and they own between 10% and 20% of the land in developing countries. Women will often be disadvantaged in coping with the adverse effects of climate change due to the cumulative effects of poverty and social, economic and political barriers.

Second, in comparison to men, women face significant barriers to participation in all levels of policy and decision-making processes. As a result, they are less able to influence policies, programs and decisions that affect their lives. Third, socio-cultural norms can prevent women from acquiring the knowledge and skills needed to escape or avoid danger (e.g. swimming and climbing trees to escape rising water levels). Similarly, women's dress codes, as well as their responsibility for small children who cannot swim or run, can limit their mobility in times of disaster. Women are disproportionately vulnerable to disasters and the negative effects of climate change as a result of such social influences.

Fourth, a lack of gender-disaggregated data in all sectors (for example, livelihoods, disaster

preparedness, environmental protection, health and well-being) frequently leads to an underestimation of women's roles and contributions. This condition could lead to gender-blind climate change policy and programming that ignores men and women's diverse roles (i.e. their distinct needs, constraints and priorities). As a result, such policies and programming may have the unintended consequence of increasing gender-based vulnerability.

Contribution of Women to the Climate Effort

Women play an integral role in the management of natural resources, as well as other productive and reproductive activities at the household and community levels. This qualifies them to contribute to livelihood strategies that are designed to change environmental realities. Their extensive knowledge and expertise, which can be applied, to mitigate climate change, disaster mitigation, and adaptation strategies, enable them to be proactive actors and change agents. Numerous examples show that when communities are prepared, they fare better during natural disasters. Women take the lead in early warning systems and reconstruction. Women tend to share community-related information, choose less-polluting energy sources, and adapt when their family's survival is at stake. They are more susceptible to environmental changes.

A study published in 2000 discovered that women in South Asia demonstrated tremendous strength, and capacity throughout the disaster, preparing for hazards, managing after a disaster, and rebuilding damaged livelihoods. Among the activities were ensuring food and water for the family, as well as securing seed and other production materials, as well as caring for the sick and elderly.

It is estimated that raising women's paid employment rates to the same level as men's would increase the gross domestic products of the United States, the European Union and Japan by 9, 13, and 16 percentage points, respectively. Increased female engagement in climate change programmes and

policy is also likely to boost their effectiveness and long-term viability. Women, for example, are very effective at mobilising communities in the event of disasters, as well as disaster risk management and reduction, and have a clear understanding of what strategies are required at the local level. The international community is becoming more aware of the importance of empowering women and promoting gender equality by the day. For example, between 2002 and 2006, the Organisation for Economic Cooperation and Development's official development assistance for the advancement of gender equality tripled (from \$2.5 billion to \$7.2 billion). Nonetheless, significant gender-based barriers persist across the major pillars of international and national climate change policy processes.

Recommendations

- Conduct an in-depth and evidence-based analysis of women's and men's roles in climate-impacted sectors, as well as their coping strategies. A deeper understanding of their knowledge, roles and abilities will serve as a solid foundation for policies and programs crafted to address and combat the effects of climate change.
- Integrate gender perspectives into climate change programming to effectively address both men's and women's needs and priorities, ensure women's full and meaningful participation, and achieve gender-equitable outcomes. Climate change actions must include consultation with women, the development of their skills and knowledge, and the provision of opportunities for improving health, education and livelihoods. Enlarged female participation would ripple into greater environmental and productivity gains, as well as mutual benefits across the Millennium Development Goals.
- Similarly, increased participation of women in adaptation and mitigation efforts would improve the efficacy and sustainability of such endeavours. Gender issues, needs, and contributions of women should be integrated throughout the planning and implementation cycle of climate change policies and projects.

- Ensure that mitigation and adaptation efforts address the root causes of gender-based vulnerability, inequality and poverty. Climate change responses must address women's historical and current disadvantages because economic, legal, and socio-cultural constraints can lead to capacity gaps. As a result of their central role in environmental, social and economic development, women's empowerment and gender equality are crucial for family and community well-being. They are key driving factors in promoting the resilience of economies and communities. In their design, implementation, monitoring, and evaluation, actions, technologies, and strategies must be pro-poor and gender-responsive.
- Looking ahead, the Nationally Appropriate Mitigation Actions and National Adaptation Plans (established under the United Nations Framework Convention on Climate Change) provide opportunities to develop climate change policy and implement projects that benefit women and the poor. It can go miles in stoking the larger effort of responding to the negative effects of climate change.
- Gender perspectives should be incorporated into national and international climate finance mechanisms and strategies. Gender must play an important role in informing all policies and programming for financing to be efficient, effective and inclusive. Gender-sensitive structures, guidelines, projects and tools must be developed as part of this effort for all climate change financing mechanisms supporting adaptation and mitigation actions at all levels. Furthermore, gender-based criteria for fund allocation, including project identification, design and performance objectives, should be developed to help address the historical, political and socioeconomic constraints faced by many women, as well as larger sustainable development objectives.

Politicisation of Climate Change

The importance of climate change as an international issue has resulted in a high degree of politicisation in the geopolitical arena at the national and international levels of many developed and developing countries. This politicisation majorly exists due to the large-scale public support for climate security policies and the relative popularity of the issue amongst many people in the world.

Climate Colonialism

Ever since the UNFCCC (United Nations Framework Convention on Climate Change) was signed into existence in 1992 at the Rio Conference, many climate change mitigation policies and treaties like the Paris Agreement have been enacted and carried out. However, many of these underline a common and "shared" responsibility for climate change action through the adoption of net-zero emission goals amongst developed and developing nations equally, although many developing regions like Central America and Sub-Saharan Africa have to bear the socio-economic burden of implementing international climate change policies.

Climate colonialism is the overlooked "dark" aspect of the global climate change movement. The underlying theory behind it is heterogeneous and largely variable, which connects many dimensions of climate change politics. It is essentially the exploitation of the natural resources of developing nations with the justification of fostering climate change mitigation and environmental protection at the hands of industrialised Western nations like the U.S, the United Kingdom and the EU-27 countries.

Scientific evidence shows that the negative consequences of global warming will strongly impact the developing regions of the Global South, which includes the Latin American countries, Sub-Saharan Africa and Southeast Asia. Many developing countries, especially Saharan African countries like Uganda, Kenya and Nigeria, lack the requisite economic and industrial development to successfully adapt to the heightened challenges of climate change.

Thus, the determinants of anthropogenic climate change and its adverse impacts are distributed inequitably across various regions in the world.

Climate colonialism is primarily practised through carbon offsetting by developed nations, and the purchase of emission credits generated is the primary way that most developed nations use to show action on international commitments towards reducing GHG emissions but enables large carbon emitters like the USA, China, and European nations to circumvent their own domestic GHG reduction goals by exporting pollution to the developing bloc, and to facilitate the ongoing consumption and production of fossil fuels in their nations.

The rationale for carbon offsetting is based on two assumptions: One, GHG emissions are not localised and diffuse uniformly in the atmosphere, which makes them independent of the geographical source of the emissions. The second is that reduction in GHG emissions through investment in CDM projects is more cost-effective than targeting the domestic drivers of GHG emissions.

CDM (Clean Development Mechanism) was a flexible mechanism that was an efficient way to reduce emissions by gathering foreign capital and encouraging the participation of developed and developing countries and the private sector to help reduce emissions. The use of CDM credits to meet climate targets, on the other hand, has increased world greenhouse gas emissions.

The usage of CDM credits in the EU Emissions Trading System increased emissions by around 580 million tonnes of CO₂ in the EU alone. This is because an overwhelming majority of CDM projects essentially issue 'junk' credits that do not lead to real-world emission reductions, and only 2% of such projects have a significant impact on the same. The degraded quality of these credits can be attributed to the fact that the offset project type most commonly used to issue the carbon credits are REDD+ projects, which aim to lower deforestation in developing countries and these credits lack quality as the real impact of these projects is incredibly difficult to compute accurately. Carbon sequestration through trees is temporary, while the CO₂ emitted from the combustion of fossil fuels can

remain in the atmosphere for centuries.

The UN definition of "forests" doesn't differentiate between "primary rainforests" and "tree plantations", which allows plantation companies across the world, especially in nations like Indonesia, Brazil, Uganda, etc., to engage in illegal land encroachment and using carbon offsetting and the Clean Development Mechanism as legal justification for illegally displacing local communities and utilising the domestic governments as puppets to do the same.

In retrospect, carbon offsetting is selling indulgences, which directly undermines the responsibility of industrialised nations to reduce their domestic CO₂ emissions. Carbon offsetting projects also disrupt food security and natural ecosystems. This was the case with a private Norwegian company, Green Resources, that planted eucalyptus and pine trees on the lands of the Kachung Forest Reserve in Uganda. The project had received international certification from the Forest Stewardship Council and the CDM Executive Board and sold \$4 million worth of carbon credits to the Swedish Energy Agency. Before the establishment of this plantation, local communities had possessed ancestral land access and use rights, including for animal grazing, fishing, and the collection of water and firewood.

With the establishment of the plantation, about 8000 villagers were forcefully evicted and arrested as "illegal encroachers" and "trespassers" on licensed areas by both the Ugandan government and Green resources staff. Community members reported the destruction of crops, housing, and trading centres alongside the arrival of the company's plantation activities, all in the name of carbon sequestration and afforestation.

Some researchers extend criticism and argue that carbon offsetting projects that create local socio-economic problems and ecological disturbances confirm the assumptions of climate colonialism. These projects are outsourcing the adverse side-effects of certain climate protection policies where the ruling and wealthy elites of developing nations and industrialised western powers are leading the

global movement on climate change on the back of millions of indigenous and tribal communities whose ancestral land rights and access to sustainable livelihoods are being crushed.

Greenwashing of Global Climate Action

As mentioned earlier, many international climate protection treaties and agreements like the Paris Agreement of 2015, Kyoto Protocol, and the Annual UNFCCC summits outline the aim of reducing the average increase in global temperatures to below 1.5 degrees by 2100 through domestic reductions in GHG emissions. However, critics have argued since the enactment of the Paris Agreement, approximately 147 nations have submitted NDCs (Nationally Determined Contributions) that are inadequate and insufficient for addressing global warming by the end of this century, and it is estimated that with the current policies and action average global temperatures would soar by 2.7 degrees Celsius.

The Paris agreement is the latest treaty in a long-running series of international agreements that have a limited impact on emission reductions. From the first World Climate Conference in 1979 to the COP26 summit in 2021, agreements have become more specific and binding over time, and all the while, the atmospheric CO2 concentrations have continued to increase beyond the benchmark of 400ppm annually, as shown by the figure.

It could be suggested that this is a very extreme form of “greenwashing” undertaken at a global level. Greenwashing is a term, typically associated with corporations, especially fossil fuel firms which engage in misrepresentation of a company’s service or product as environment-friendly. The extreme scenario is rampant in countries like India, China, and Brazil which are trying to appease the international community and their environmentally-conscious citizens by advocating for climate change mitigation and proposing national policies which are economically unfeasible for them.

Many nations and international groups are indirectly backtracking on their pledges as shown below:

- The G20 nations vowed to eliminate “inefficient” fossil fuel subsidies by 2020 in the 2009 Pittsburgh Summit and reaffirmed this in 2012. In 2020, the IMF reported that the global fossil fuel subsidies are \$5.9 trillion in 2020, and with current policies, it is projected to rise 7.4 per cent of the global GDP in 2025.
- In 2019, Brazil observed over 1 million hectares being deforested in the Amazons and 120% larger than the historic low that Brazil reached in 2012, with the prediction of an even greater area to be deforested by 2020, leaving Brazil far off-track from meeting its National Policy for Climate Change (PNMC) commitment to reduce deforestation by 80% from 1996-2005 levels by 2020 and it removed any specific action about deforestation in its updated NDC.
- In the COP15 summit of 2009, the developed nations collectively pledged to mobilise \$100 billion per year towards climate action in developing countries by 2020 and OECD reported that in 2019, the total climate finance mobilisation was at most \$80 billion and that developed nations consecutively missed this target after the pledge was undertaken, annually from 2013.
- China pledged in the COP26 to phase “down” the coal for energy purposes by 2025-26 and become carbon neutral by 2070. On the flipside, IEA estimates that China’s coal consumption forecast in 2024 will increase slightly on average by 1.1% annually. This can be attributed to

Which Countries Are Meeting Their Paris Agreement Goals?

Selected national emission reduction goals and projected achievements by 2030, by associated limit on global warming

	Target	Projected achievement
Saudi Arabia	>+4°C	>+4°C
Indonesia	>+4°C	+3°C
India	>+4°C	+2°C
Kenya	>+4°C	+1.5°C
Russia	+4°C	+4°C
Brazil	+4°C	+3°C
Argentina	+3°C	+4°C
Mexico	+3°C	+4°C
Australia	+3°C	+3°C
China	+3°C	+3°C
Canada	+2°C	+4°C
Japan	+2°C	+3°C
U.S.	+2°C	+3°C
European Union	+2°C	+2°C
Nigeria	+2°C	+1.5°C
UK	+1.5°C	+2°C

- Capacity expansions and investment, China's reliance on coal as an energy source are predicted to decrease at an extremely slow pace by experts.
- The net-zero targets proposed by 40 nations studied under Climate Action Tracker are considered to be inadequate as the design of net-zero targets covering a total of 73% of global emissions remains insufficient, and only four of the 40 countries covered by the CAT, responsible for 6% of global GHG emissions, have defined their net-zero targets in an 'acceptable' way in terms of scope and strategy whereas another four countries, responsible for 17% of global emissions, are 'average'.

These instances go on to show that for the "ambition" that countries display over climate change commitments, there is no significant and real action on behalf of governments of the world. Additionally, many of these NDCs and their updated versions mention targets but lack transparency, clarity, and proper pathways required to abide by the Paris Agreement's goal of limiting global warming to below 1.5 degrees by 2100.

UN climate negotiations are becoming more and more complex as many governments' proposed emissions reduction goals are less and less likely to address any runaway climate change. So it can be said that governments are greenwashing their global commitments toward climate change mitigation by announcing long-term pledges and proposals that are riddled with diplomatic wording and ambiguity, making it difficult to interpret any positive reaction of these toward impacting climate change and global warming.

Climate change as an election promise

Although climate change plans and policies form a significant part of the international environmental agenda and form a priority for incumbent governments at national levels, the significant impact of future climate action in elections varies widely across the world. In developed nations like the USA, Australia, Germany, and member nations of the EU, climate change action is a vital election issue that has been raised since the 2000s, following the adoption of the Kyoto Protocol and increasing political awareness of climate change amongst people.

In the People Climate Vote, which polled 1.22 million people from 50 countries, nearly 64% voted on the belief that climate change is a global emergency presenting a clear and convincing mandate for politicians to increase ambition in climate change commitment.

Voters are becoming increasingly perceptive and aware of the importance of climate protection strategies at the national level. For instance, in 2021, in the German Federal elections, the German Green Party - which promised to phase out fossil fuel consumption by 2035- secured 15% of the vote share, the largest for any Green political party

in Europe. The result matched the sentiments of the German electorate as a survey by the European Commission carried out in 2021, showed that 28% of respondents who were German voters considered climate change the most serious problem facing the world- a higher proportion than the EU average of 18%. Additionally, voters' surveys conducted by IPSOS in 11 EU states indicated a growing recognition of climate change as a voting determinant in the context of 2019. For e.g. in European Union (EU) Parliament elections, 77 % of potential voters saw global warming as an important criterion for casting their vote.

Thus, the climate justice discourse formulates climate change as essentially an ethical issue. Climate change will affect everyone. However, these effects are not evenly distributed and thus raising issues of social justice. Climate Justice is an offshoot of environmental justice. Environmental justice argues that the disproportionate impact of environmental degradation on the already poor and vulnerable is not 'random' but a reflection and a consequence of the lopsided development. This asymmetric historical development translates into differential capacities of the developed and the developing countries to be able to adapt to climate change.

A Brief Timeline

Even when the environmental issues received global recognition in the first-ever international environmental summit held in 1972 in Stockholm, Sweden, climate change was just mentioned as a footnote. This was largely because of the mindset of the people that climate change was a scientific phenomenon. The magnitude at which climate change affects us was recognised in the late 1980s when the Intergovernmental Panel on Climate Change (IPCC) was established with 195 member countries, to provide policymakers with regular assessments on climate change along with its impact and risks. IPCC warned the member countries about the increasing level of greenhouse gases in the atmosphere due to human activities, which led to a call for a global treaty.

The UN General Assembly launched the UN Framework Convention on Climate Change (UNFCCC) in 1992 with a membership of 197 countries. The objective of the treaty was to stabilise greenhouse gas concentrations in the atmosphere, and it gave the industrialised countries the major responsibility for combating it. It was enforced in 1994 after receiving 50 ratifications. The Conference of Parties (COP) is the apex decision-making body of the UNFCCC. In 28 years of COPs, new elements such as adaptation to climate change, technological transfer, etc., have been introduced into the international structure to tackle specific challenges. In 1997, the first-ever legally binding climate treaty, the Kyoto Protocol, was adopted, which came into force in 2005. Developed countries had to reduce emissions by an average of 5 per cent below the 1990 levels and set up a system to monitor progress. The Kyoto Treaty was ratified by countries that accounted for approximately 55 per cent of global emissions. However, this did not include the United States, the world's leading carbon emitter.

2015 was a significant year for climate politics because of the Paris Agreement and the establishment of the International Solar Alliance (ISA). The most significant global climate agreement in history had support from 196 countries. Countries had to choose their own emission reduction goals and submit these targets known as Nationally

Determined Contributions. This agreement will aim at keeping the global temperature rise below 2 degrees Celsius and pursue efforts to keep it below 1.5 degrees Celsius. In 2018, a set of guidelines implementing the agreement, the Paris Rulebook, was accepted. At COP 21, the launch of ISA was announced in Paris, France, by the Hon'ble Prime Minister of India and the former Hon'ble President of France. Heads of more than 120 nations affirmed their participation in the Alliance to contribute their part to the promotion of solar energy.

International Solar Alliance

1. Introduction

Solar technology helps in generating electricity by converting sunlight into electrical energy either through photovoltaic panels or mirrors that concentrate solar radiation. This energy can also be stored in batteries or thermal storage. Solar panels do not emit GHGs while generating electricity serving a dual motive. First, it reduces our dependency on fossil fuels and can mitigate the adverse effects of climate change. It is also beneficial in the sense that it is cost-effective and has user-friendly technologies. There was a need for a specialised agency under the UN to promote renewable energy.

The ISA was born as a result of joint efforts of India and France to minimise the emissions of GHGs. The Alliance was launched by the Hon'ble Prime Minister of India, Narendra Modi, and the former Hon'ble President of France, Francois Hollande, in November 2015 at the 21st Conference of Parties held in Paris, France. The UN General Assembly has granted Observer Status to ISA, allowing well-defined cooperation between the Alliance and the UN. This would lead to global energy growth and development, along with mitigating global solar emissions to the extent of 1,000 million tonnes of CO2 every year. ISA promotes, disseminates, and deploys solar energy, which is set to make greater strides among various forms of renewable energy. The main focus is on the 121 countries that lie between the Tropic of Cancer and the Tropic of Capricorn.

Currently, more than 100 countries are signatories to the ISA framework agreement, of which 80 countries have ratified to become full members of the ISA. Membership in the Alliance is open to all countries of the United Nations. The Assembly of the Alliance is the apex decision-making body, while the operations and functions are the responsibility of the Secretariat. The source of funding is the member countries, partner countries, the UN, and the private sector, while revenue is generated from activities provided by the Assembly.

2. Basic Objective

The International Solar Alliance was conceived to achieve the objective of increasing the deployment of solar energy technologies by creating a collaborative platform and switching to a low-carbon growth path. It involves working towards energy security and sustainable development, improving access to energy and providing opportunities for better livelihoods in rural and remote areas, and increasing the standard of living of the population of the member countries. Increased deployment has manifold benefits. This will generate direct and indirect employment opportunities, and it will boost economic activity because of electricity access to rural and semi-urban areas. As far as social benefits are concerned, effective utilisation of solar energy would improve educational outcomes and improve the reach of health facilities to remote areas.

Countries lying between the Tropic of Cancer and the Tropic of Capricorn are endowed with approximately 300 days of sunny days in a year. This makes cost-effective solar power available to them but its potential remains largely untapped. To accelerate the development and deployment of existing solar energy technologies, ISA will work with partner countries in the identification of national opportunities. ISA has set three short-term goals for itself:

- Since most of the member nations are largely agrarian, develop integrated solar or solar hybrid-based cold chain solutions that deliver economic value to farmers and producers, including post-harvest in-field technology that can ensure an extended shelf-life of perishable commodities.

- Encourage the use of sustainable, low global warming potential solar-based cooling technologies through financing and incentives for small and medium-sized farms and enterprises. Micro, small, and medium businesses generate the majority of economic activity in developing countries, and they are the ones who will benefit the most from access to electricity because they will be able to function later into the evening and raise their turnover.
- Encourage industry participation in applied research to develop cheap refrigeration solutions for small and medium-sized growers, with a focus on post-harvest processing and transportation.

3. Progress-Analysis

ISA entered into an agreement with the World Bank to mobilise funding of USD 1 trillion, in investments, for making solar energy available to member countries at affordable prices by 2030. In 2018, at the World Future Energy Summit (WFES) Indian government announced the setting up of a USD 350 million solar development fund to finance solar projects.

The Alliance will assist India in reaching its target of generating 100 GW of solar energy and 175 GW of renewable energy by 2022. In the wake of COVID-19, ISA has been working towards providing 24x7 electricity to some member countries to power cold storage that will store the vaccines.

COP 26 - The COP 26 (The Conference of the Parties) UN Climate Change Conference was hosted by the UK in partnership with Italy and took place from October 31 to November 12, 2021, at the Scottish Event Campus (SEC) in Glasgow, UK. At the COP26 summit, the nations adopted the Glasgow Climate Pact, aiming to turn the period from 2020 to 2030 into a decade of climate action and support to control the rise in the global average temperature to 1.5 degrees. The main actions include strengthening efforts to build resilience to climate change; preventing greenhouse gas emissions; and providing the required finance for both.

Key moments at COP26.

- The pledge by Prime Minister Narendra Modi to cut emissions to net-zero by 2070, reduce carbon emissions by one billion tonnes by 2030 and raise the share of renewable energy to 50%. The United States of America and China, two major emitters of carbon dioxide, have pledged to take steps to control change. The United Kingdom has pledged 165 million pounds to address the issues of gender inequality and climate change. The United Kingdom, South Africa, France, Germany, the European Union, and the United States of America announced the 'Just Energy Transition Partnership' to promote the use of clean energy in South Africa. More than 100 nations signed up to a pledge to end world deforestation by 2030. More than 100 national governments and states signed a declaration to shift to 100% electric vehicles. More than 30 nations have agreed to cut methane emissions by 30%. However, the top three methane emitters, China, the USA, and India, did not take part in the pledge. More than 40 nations have pledged to cut down on coal usage before the 2030s and 2040s. However, the highest coal-consuming nations like India, China, and the US did not take part in the pledge.
- Developed nations will finance \$100 billion in developing nations by 2023. Prime Minister Boris Johnson and Prime Minister Narendra Modi jointly launched the Green Grids Initiative: One Sun, One World, One Grid. It aims to facilitate a faster transition to the consumption of renewable energy by connecting energy grids across borders.

Paris Agreement

What was the agreement?

The Paris Agreement on climate change is a legally enforceable international treaty. It is an international agreement that brings all nations together for a common cause to make consistent efforts to control climate change and adapt to its effects. The agreement was adopted by 196 parties at COP21 in Paris on 12 December 2015, which was brought into force on 4 November 2016. It works on a 5-year cycle of the ambitious climate action plan.

The agreement aims to keep the global average temperature and limit global warming to well below 2 degrees above pre-industrial levels, ideally 1.5 degrees. It also aims to align all financial flows with a pathway towards low greenhouse gas emissions and climate-resilient development.

The Paris Agreement has a bottom-up approach where countries are allowed to decide by themselves whether they want to reduce their emissions by a certain year. The targets are to be communicated to the UNFCCC in the form of "nationally determined contributions" or "NDCs."

Objectives and Support by Countries

- Finance- According to the Paris Agreement, developed countries should take the opportunity to provide finance to countries that are less equipped and more vulnerable. It also encourages voluntary contributions by other parties. Climate finance is needed not only for mitigation but also for adaptation. It is needed for mitigation because large-scale investments are required to significantly reduce emissions. It is also important for adaptation because a significant number of financial resources are

needed to adapt to the adverse effects and reduce the impacts of a changing climate.

2. Technology: The Paris Agreement speaks of the importance of technology and the significance of its application in the future. It will be used to both improve resilience to climate change and reduce GHG emissions. It establishes a technology framework to provide sincere guidance to the well-functioning technology mechanism. The mechanism is increasing the speed of technology development and transfer through its policy and implementation arms.

3. Capacity Building: Developing countries do not have sufficient funds and capacity to deal with the challenges pertaining to climate change. Due to this, the Paris Agreement places great emphasis on capacity-building for developing countries and requests all developed countries to enhance support for capacity-building actions in developing countries.

Progress-Analysis

"The Paris Agreement is not enough. Even at the time of negotiation, it had been recognised as not being enough," says Alice C. Hill, CFR senior fellow for energy and the environment.

"It was only a primary step, and thus the expectation was that as time went on, countries would return with a greater ambition to cut their emissions." CFR (Council on Foreign Relations) is a think-tank based in the US that specialises in foreign policy and international relations.

Countries' pledges are insufficiently ambitious and cannot be implemented quickly enough to limit global temperature rise to 1.5 degrees Celsius. Current policies could result in a 2.7°C (4.9°F) rise by 2100.

Dozens of nations submitted bolder pledges before the COP26 summit in November 2021, the deadline for countries to revisit their NDCs. For example, President Biden announced in April 2021 that the United States will aim to cut emissions by 50 to 52 percent below its 2005 level by 2030, doubling President Barack Obama's commitment. In addition, the ultimate agreement from COP26, the Glasgow Climate Pact, urged countries to submit new, more ambitious NDCs by the top of 2022, rather than waiting for five years.

But the world's average temperature will still rise 2.1°C (3.8°F) by 2100 even if countries fully implement their pledges for 2030 and beyond. If the more than 90 countries that have set or are considering net-zero targets follow through, warming might be limited to 1.8°C (3.2°F). According to experts, there is a lot of climate control happening outside the Paris Agreement. Some have been calling for the creation of a 'climate club'. It will aim to penalise countries that do not meet obligations or do not take them apart. The experts believe that progress should first start in smaller groups and should gradually happen globally. Many investors are investing in climate-friendly funds. More than 450 banks, insurers, pension funds, and other businesses that collectively manage \$130 trillion have committed to using their funds to reach net-zero emissions by 2050.

Carbon Credits

In the course of business, companies consume a lot of energy. The energy derived from fossil fuels such as coal and gas releases carbon and other greenhouse gases like methane, ozone, and water vapour into the atmosphere. The carbon markets provide an infrastructure for carbon trading. Carbon trading is the process of buying and selling credits that allow a company to emit a limited amount of carbon dioxide. The World Bank's State and Trends of Carbon Pricing 2016 reports estimate that the carbon market can decrease the emission of carbon dioxide by more than 50% by mid-century.

In 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was created to increase awareness and instil knowledge to mitigate climate change. In 1997, more than 160 countries adopted the Kyoto Protocol to the Convention.

To achieve the targets set within this protocol, three financial mechanisms are created:

- Emissions Trading: The international transfer of emission allocations between developed (Annex 1) countries.
- The Clean Development Mechanism (CDM) generates carbon credits known as Certified Emission Reductions (CERs) by reducing emissions in developing nations.
- Any Annex I country can invest in any other Annex I country in emission reduction projects as an alternative to reducing emissions domestically.

The emissions reduction generated by such mechanisms is referred to as "carbon credits." A carbon credit is a permit that allows a company to emit a certain amount of carbon dioxide and other greenhouse gases into the atmosphere. The above three mechanisms are put in place to meet Kyoto's target and they make up the largest market in the world for carbon credit trading.

PROGRESS

1) Investment in the Renewable Energy Sector

The news about the global investment in the renewable energy sector made the headlines when the investment surpassed USD 2.5 trillion for the decade 2010-2019. The projected impact of this investment is that it would quadruple renewable energy capacity from 414 gigawatts (GW) to 1650 gigawatts (GW). Renewable energy has become one of the cheapest options, with the cost of generating electricity reduced by 81 per cent for solar photovoltaic and 56% for wind since 2009.

2020 witnessed a concentration of spending on wind power by some of the largest emitters, notably the People's Republic of China, the United States, and Europe. The economies that have a larger fiscal budget and get credit at low-interest rates have an edge in boosting investment in infrastructure and renewable energy technologies. Owing to the renewed economic growth, spending on energy efficiency improvements are bound to increase by 10% in 2021. Low prices of fuel become attractive to economies, except for the ones that have clear government policies, like the building sector in Europe. Between 2014 and 2019, India attracted investments of USD 64.4 billion for its renewable energy programmes. The country is expected to boom with an investment of USD 15 billion in 2022 as the government's main focus stays on EVs and green hydrogen manufacturing of solar equipment. India also plans to achieve an ambitious target of 175 GW of renewable capacity. With the onset of the second wave of COVID-19, the implementation of various renewable energy projects has been impacted due to restrictions and lockdowns.

2) Subsidies in the EV sector

The availability of EV models has been expanded, and new battery technologies have been launched. A growing awareness of EVs has made them widely popular, accounting for 4.6% of total car sales in 2020, amid the COVID-19 pandemic. Mass adoption of EVs is needed for it to unleash its true potential. Supportive policies of different governments are crucial to mitigating emissions and taking strides toward climate goals. In China, the New Electric

Vehicle (NEV) Subsidy was planned to be terminated in 2020, but due to the pandemic, it has been continued till 2022 with a gradual reduction in subsidies over time. NEV has been a major driver for EV sales because it sets annual zero-emission vehicle (ZEV) credit targets for manufacturers as a percentage of their annual vehicle sales. A vehicle price cap and a NEV sales limit of 2 million per year were added to the subsidy programme in 2020. The United States did not extend its support for EVs at a federal level. In 2020, a federal tax credit of USD 7,500 was available for the purchase of an EV, excluding General Motors and Tesla because they had reached their 200,000 sales limit in 2018. However, only 30% of the electric cars sold were eligible for the tax benefits. India's efforts to promote EVs moved into high gear in April 2020 with the Bharat Stage VI standards. BS-VI forces manufacturers to make changes to vehicle design in a short period. The scheme for Faster Adoption and Manufacturing of Electric Vehicles II (FAME II) allocates USD 1.4 billion for 1.6 hybrid and electric vehicles between 2019 and 2022. It also focuses on the promotion of domestic manufacturing of EVs and their parts.

3) Financial and Economic Instruments

The most important global mission that everyone is working on together is reaching carbon neutrality by the middle of the century, 2050. Countries that together make up 70% of the world economy are responsible for causing 65% of the total harmful greenhouse gas emissions. Many of these countries have been at the helm in the fight against climate change.

Financial incentives and economic mechanisms play a large role in reducing carbon emissions and, at times, making them shift to more efficient processes or cleaner fuels. The most successful of these financial tools is the carbon tax. A carbon tax is a form of tax levied by the government on greenhouse gas emissions (per tonne) produced by companies or industries. 27 countries implement carbon taxes: Argentina, Canada, Chile, China, Colombia, Denmark, the European Union (10/27 countries), Japan, Kazakhstan, Korea, Mexico, New Zealand, Norway, Singapore, South Africa, Sweden, the UK, and Ukraine.

The most popular economic mechanism is the emissions trading scheme (ETS). Governments would cap the amount of greenhouse gas emissions released into the atmosphere every year based on carbon credits in the ETS. This would help create a market for carbon since emitting companies and agencies will have the ability to sell their extra allowances to large polluters, and thus these companies won't exceed their pre-allocated carbon budget, reducing overall emissions as a result.

Micro-Action

We won't be able to fight climate change to our full potential until every individual holds themselves accountable. Adopting sustainable practises in everyday life is the need of the hour for ourselves, our community, and our future generations. Carbon neutrality means through a combination of reducing and setting off one's carbon emissions, the net contribution of GHG emissions in the atmosphere is zero. The first step would be to measure one's carbon footprint, which describes the amount of impact an individual or an organisation has on the environment in terms of tonnes of GHGs produced by their activities in a year. Globally, the average person's carbon footprint is 4.5 tonnes per year.

This might sound overwhelming to some, but there are simple and affordable steps to start with, like driving efficiently and as little as possible, avoiding air travel for destinations accessible by other modes of transport, ensuring that one's house has proper insulation, using cold water setting while doing laundry, adopting sustainable shopping practices, eating fewer animal products, reducing food wastage, etc. Even after incorporating all the suggestions into one's lifestyle, they will still have a carbon footprint and won't be able to achieve the 2030 goal of reducing emissions below 2 tonnes per year. An important aspect of becoming carbon neutral is contributing financially to projects that decrease GHG levels in the atmosphere. Carbon offsetting is an easy and affordable option, costing less than USD 15 per tonne.

Corporate Action

1) Alphabet- They became a carbon-neutral company in 2007. ten years, in 2017, Alphabet was

the first company to consume completely renewable energy. According to the statement by the chief executives of the company, Alphabet will power all its data centres and other offices with carbon-free electricity by 2030. The company contributed immensely to the environment by cutting down on 5 million tonnes of carbon dioxide in the atmosphere. It has been a part of more than 55 projects and has contracted 5.5 GW of renewable energy projects.

2) HP - HP has been investing in the development of energy-efficient products and services over the years. The company is actively shifting from plastic foam packaging cushions to recycled and moulded pulp. This will eliminate the disposal of over 900 tonnes of plastic every year. To support forest restoration, the company has launched the "HP Sustainable Forest Collaborative"- a collaboration with the World Wildlife Fund to protect and restore 200,000 acres of forests in Brazil and China. HP is also engaged in recycling plastics in printers and other machines. In 2019, post-consumer recycled plastics in its printers amounted to 25,000 tons. It aims to reach 85,500 tonnes by 2025.

3) Johnson & Johnson- Being a healthcare company, Johnson & Johnson understands climate change and how it affects everybody. The company has undertaken measures to eliminate greenhouse gas emissions. It aims to source 100% of its electricity from renewable sources by 2025. It also aims to achieve carbon neutrality for its operations, going beyond science-based targets to reduce absolute Scope 1 and 2 emissions by 60% from 2016 levels. The company has avoided nearly 30,000 metric tonnes of carbon emissions over the past 15 years. Currently, 50% of its electricity is sourced from renewable technologies, and they are also developing renewable heat systems.

4) Tesla - Tesla, the electric car manufacturer, is playing an active role in environmental sustainability. Being the first car company to produce over half a million electric cars, it has claimed to have prevented approximately 4 million tonnes of carbon dioxide from entering the atmosphere. Most of the company's facilities consume 50% renewable energy. The Nevada Gigafactory has achieved the target of consuming 100% renewable energy. Tesla has been sourcing

quite a lot of its raw materials through an "environmentally responsible and human supply chain". Through its Supercharger network, the company has delivered over 595 Gigawatt hours of energy.

5) Apple- Apple has contributed a lot to the environment over the years. Its products are made with recycled content, including 100% recycled rare earth elements in the iPhone Taptic engine. The company is carbon neutral for its global corporate operations, and it aims to have a net-zero climate impact by 2030. To support renewable energy development, Apple has invested around \$300 million in its China Clean Energy Fund. In 2020, the company had invested in energy efficiency upgrades to over 6.4 million square feet of buildings, which resulted in lowering electricity needs by 20%. Furthermore, Apple also engages with NGOs, government agencies, and other businesses to strengthen environmental protection. The company's one lakh employees are dedicated to making the best products and making the world a better place to live in.

Carbon Neutral Targets set by Largest Emitters

The 5 countries that contribute the most to carbon emissions:

Rank	Country	Share of World
1	China	29.18%
2	United States	14.02%
3	India	7.09%
4	Russia	4.65%
5	Japan	3.47%

Since these five countries contribute the most to carbon emissions, the governments in these countries must take adequate steps to become

carbon neutral in the coming years. China, the world's largest carbon emitter, is looking for renewable energy sources and reducing waste. It aims to become carbon neutral by 2060. The US President, Joe Biden, released an executive order to produce net-zero carbon emissions by the year 2050. The IMF has recommended carbon pricing, feebates, and a carbon price floor that could help to meet the targets.

India is the third-largest carbon emitter. PM Modi announced that India will become carbon neutral by 2070 and that it also plans to reduce carbon emissions by 50% in the year 2030. Experts have recommended that India needs to explore renewable sources for energy generation, electrification of fossil-fuel dependent industries, commercial manufacturing of green hydrogen, and promote electric vehicles to achieve the targets. In Budget 2022, there was an announcement regarding the EV sector, and a new battery swapping policy was announced. This policy will help promote the electrification of public transport.

Russia has announced 2060 as the year when the country will achieve net-zero carbon targets. To achieve this target, Russia plans to reduce the number of coal and oil industries while simultaneously tapping more sources of green energy. targets to achieve carbon-neutral targets by the year 2050. To achieve this, Japan has created a legal framework, joined a collaboration of public and private sectors, and adopted electric vehicles and renewable sources of energy.

Are the Targets set feasible?

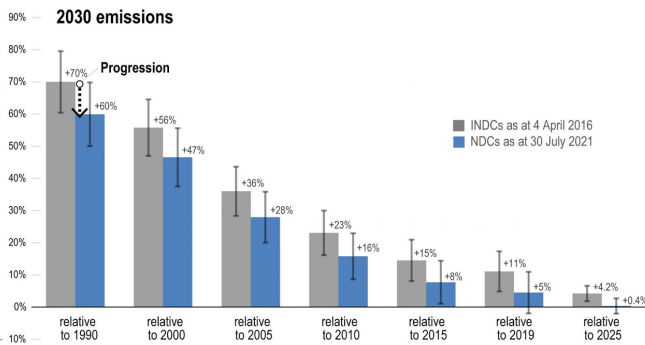
Country	Targets
China	2060
United States	2050
India	2070
Russia	2060
Japan	2050

Impact of Climate Action

The present movement for climate action has been more in the form of lip-service and paper-rustling than in the form of robust action and rapid implementation. But as the deadline for cutting emissions in half and limiting the temperature rise to 1.5 degrees is fast approaching, the underlying forces of activism and accountability are rising and forcing countries to take meaningful action. The biggest impact of the climate action agenda has been the widespread awareness of climate change. Discussions on ways to protect the environment

have found their way into the policy-making rooms from the activists' clamour in the open. Climate change has leaked into the conversations of all forms of commercial and institutional activities as a result of the unification of countries on a global stage, prompting increased research and interest in addressing humanity's doom.

Even though an increase in climate change action is required to meet the Paris Agreement's goals, the years since its coming into effect have already spawned low-carbon solutions and new markets. Carbon neutrality objectives are being set by an increasing number of governments, regions, cities and businesses. In a range of economic sectors that account for 25% of total emissions, zero-carbon solutions are becoming more competitive. This trend is especially obvious in the electricity and transportation sectors, and it has opened up a slew of new business opportunities for those who get in early. Zero-carbon solutions may be competitive in industries that account for over 70% of global emissions by 2030.



Global greenhouse gas emissions and warming scenarios



- Each pathway comes with uncertainty, marked by the shading from low to high emissions under each scenario.
 - Warming refers to the expected global temperature rise by 2100, relative to pre-industrial temperatures.

Annual global greenhouse gas emissions in gigatonnes of carbon dioxide-equivalents

150 Gt

100 Gt

50 Gt

Greenhouse gas emissions up to the present

0

1990 2000 2010 2020 2030 2040 2050 2060 2070 2080 2090 2100

No climate policies
4.1 - 4.8 °C

→ expected emissions in a baseline scenario if countries had not implemented climate reduction policies.

Current policies
2.7 - 3.1 °C

→ emissions with current climate policies in place result in warming of 2.7 to 3.1°C by 2100.

Pledges & targets (2.4 °C)

→ emissions if all countries delivered on reduction pledges result in warming of 2.4°C by 2100.

2°C pathways
1.5°C pathways

A report published by Nature Communications shows that if national climate policies continue as they have been implemented around the globe, greenhouse gas emissions would continue to increase substantially till 2030, when they would be just 5.3% lower than the level of GHGs. If the 2-degree Celsius goal is met, current climate policies would leave a median emission gap of 22.4 gigatonnes CO2 equivalent (roughly twice China's current annual emissions). This points to the need for increased ambition by countries while setting NDCs and better implementation on the part of the consistently undershooting countries.

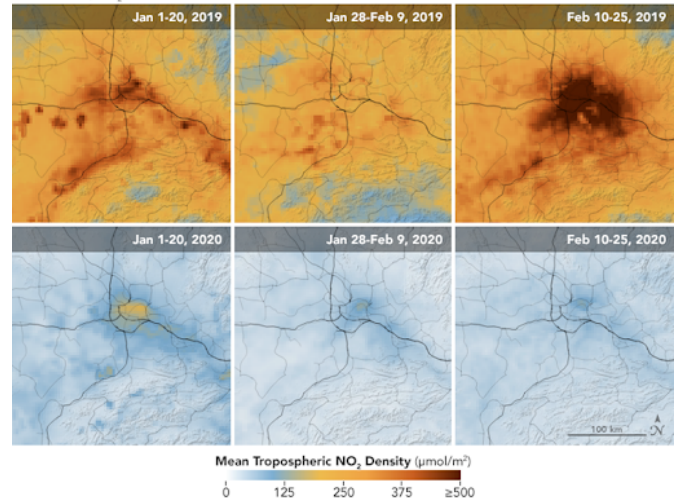
Covid-19 Pandemic - A Global Simulation

The outbreak of the COVID-19 pandemic in the year 2020 disrupted the entire global ecosystem, crippled economies, brought businesses to a grinding halt, and turned our lives upside down.

With countries in full lockdown and citizens confined to their homes, overall public activity and mobility plummeted. Owing to the complete closure of offices, schools, and public places like movie halls, gyms, etc, the pandemic directly affected the daily level of activity in society, and consequently, the climate as a whole. The world witnessed a fall in the emission of nitrogen oxides (NOx) by 15% globally, with local reductions as high as 50%, according to a study led by scientists at NASA's Jet Propulsion Laboratory in Southern California. Following this, there was a 2% drop in ozone, which, to put it in context, is what would have otherwise been realised in not less than 15 years had economies functioned as usual. Reductions in GHG emissions, air pollutants, and pollution levels have had a positive impact on fighting climate change. The NASA global modelling also provides solid evidence of how the pandemic induced lower levels of pollution than a COVID-free 2020 would have.

Pollutant Drops in Wuhan—and Does not Rebound

Unlike 2019, NO_x levels in 2020 did not rise after the Chinese New Year.



Research by a team of international researchers led by scientist Kazuyuki Miyazaki found that there was a direct correlation between the stringency of the imposed lockdowns and emissions reduction. For instance, China's lockdown in early February 2020 produced a 50% drop in NOx emissions, while most U.S. states achieved a 25% drop only later in the spring. Even in Delhi, there was a more than 55% decrease in particulate matter pollution due to decreased vehicle exhaust and industrial output. The European Space Agency (ESA) and the National Aeronautics and Space Administration (NASA) published new documentation that indicated the quality of the environment improved and NO2 emissions turned down by up to 30%.

Agency	Location	Reduction (%)	Satellite	Source
NASA and ESA	Wuhan	30	Aura and Sentinel-5P	NASA 2020
ESA	China	20 to 30	Sentinel-5P	ESA 2020
ESA	Europe	20 to 30	Sentinel-5P	ESA 2020
NASA	USA	30	Aura	NASA 2020
ESA	Italy	20 to 30	Sentinel-5P	ESA 2020
ESA	France	20 to 30	Sentinel-5P	ESA 2020
ESA	Spain	20 to 30	Sentinel-5P	ESA 2020

This points to the fact that a global simulation of quarantine would majorly contribute towards pollution control. The question is whether these effects will sustain over the long term? Not really. That is corroborated by the World Meteorological

Organisation report stating that overall levels of carbon dioxide in the atmosphere still increased in 2020 compared to 2019.

To analyse this question deeply, researchers at the MIT Joint Program on the Science and Policy of Global Change compared two estimates of global economic activity through 2035: one projecting economic recession and recovery from COVID-19, the other estimating economic growth, had COVID-19 not occurred. Assuming that employment will return to pre-pandemic levels by 2035, the study finds that COVID-19 produces a steep, 8.2 percent reduction in the global gross domestic product (GDP) in 2020, but only a 2 percent reduction in 2035. Despite economic disruption, assuming that Paris Agreement targets through 2030 are fulfilled, the lower GDP numbers result in a 3.4 per cent reduction in annual greenhouse gas emissions in 2020 but only a 1 per cent reduction in 2030.

Climate change compounds the catastrophic nature of already existing crises such as the pandemic and increases the cost of damage and recovery by 20%. For instance, it threatens health systems and their functioning. In turn, COVID-19 has also derailed climate financing goals and put its agenda on the backburner. The World Economic Forum predicts that \$5.7 trillion in annual funding is required for successful climate change mitigation and adaptation, yet the International Monetary Fund estimates that COVID-19 will cost the global economy more than \$28 trillion in production over the next five years. However, the pandemic did lower the cost of climate targets, which makes it easier for countries to commit to the targets set. Nations should now concentrate on rebuilding better and stronger than before.

Recommendations

1. Changes in Ecosystem

Incentives for green actions

- Proper delineation of green bond issuance procedures and the disclosure requirements by SEBI in 2017 and the laying down of the requisite regulatory and monitoring framework by the Government of India in 2011. SEBI also mandated the implementation of sustainability disclosure norms for the top 100

listed entities on the BSE and NSE since 2012. This has ensured the focus on the environmental performance of the company and its efforts to promote social progress.

- government subsidy on the installation cost of solar rooftops for institutional or residential purposes. The Discom credits the householder with a 40% subsidy for systems up to 3kW capacity and a 20% subsidy for systems up to 10kW within 30 days of receiving a written notification or website request from the specific monitoring authority. The solar panels need not be installed by registered vendors to avail the subsidy. Just a photograph of the installed system is enough to claim the benefit. This flexibility in the installation system is of prime importance and can help in incentivising the population to a large extent for the efficient installation of solar panels. However, for the maintenance of uniform and acceptable quality products, the solar panels and inverters need to be bought from the centre's published list of vendors only.
- If an installation unit can generate more than 1100kWh-1500kWh per year, the government will give them Rs 2 per unit of power generated. Excess power generated can also be sold to the connected state grid at tariffs set by the government at the end of the financial year, made possible by the net metering connection, offering a further incentive for solar power adoption.
- Vehicular emissions contribute 20-30% of the particulate matter found in the air. A study by the International Council on Clean Transportation (ICCT), George Washington University, and the University of Colorado Boulder in the USA, has attributed 2/3rds of total deaths in India because of air pollution, primarily to vehicular exhaust emissions. Another report by the Lancet put the number of deaths because of air pollution in India at 1.7 million in 2019. This has made the government push aggressively for the adoption of electric vehicles.
- E-mobility has been touted as the future of transportation, and there has been an increased focus by the government on incentivizing all the

stakeholders (manufacturers, raw suppliers, buyers) in this sector. Some major developments in this sector have been in the form of favourable policies, subsidies, tax exemptions, and loan facilities (for both buyers and sellers). Specific measures include-

- i. Exemption from payment of fees for the issuance of renewal registration certificates.
- ii. The launch of the National Electric Mobility Mission Plan is to promote faster adoption and manufacturing of electric vehicles in India. This plan is to be launched in phases, with the first having already concluded in April 2019. The second phase of the plan has been initiated with an outlay of Rs. 10,000 crores for 3 years, to be spent as an upfront benefit to electric vehicle buyers and on the establishment of necessary charging infrastructure.
- iii. Under the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) Phase II, a subsidy of Rs 15,000 per kWh on the purchase of electric two-wheelers, three-wheelers, and four-wheeler passenger and goods transport vehicles, all these vehicles need to meet certain prescribed ranges of performance and price to become eligible for inclusion under the scheme, and the cap on this subsidy has been fixed at 40% of the cost.
- iv. Inclusion of electric vehicles in the 12% GST slab with no cess, as opposed to the 28% GST levied on traditional automobiles with a cess of up to 22%.
- v. The Ministry of Power's move to consider the sale of electricity as a service to charge electric vehicles will do away with the need to obtain licences for setting up charging infrastructure.
- vi. Removing the need to obtain permits for electric vehicles which will be used as commercial vehicles, provided they specify their area of operation on the online Vahan portal of the Ministry of Road Transport & Highways.

vii. large-scale procurement of electric buses by state transport departments. Under the budgetary allocation for FAME-Phase II, the government has earmarked 35% for the procurement of electric buses and aims to achieve a fleet of 7,000 by 2023.

viii. The government has brought in a Production Linked Incentive (PLI) scheme of Rs 26,058 crores to stimulate the development of the supply side of the electric mobility and renewable energy market. The biggest outlay has been on the development of the Advanced Chemistry Cell Battery, to the tune of Rs 18,100 crores, which will enable the efficient and cost-effective manufacturing of battery cells in India. These battery cells belong to the most advanced class of battery storage and have immense potential for application in electric vehicles, advanced energy grids, solar power generation, and consumer electronics.

ix. The establishment of charging infrastructure that covers a large geographical area with the requisite number of charging stations is a gargantuan task, fraught with the reorganisation of a lot of already established structures and mechanisms, more so in a densely populated country like India. Moreover, range anxiety in an electric vehicle is recurrent and can never be completely resolved. To overcome this, the government introduced the battery-swapping policy in 2022. This swapping policy will primarily be implemented for two- and three-wheeler electric vehicles, with a uniform battery build to do away with the hassle of recharging and facilitate interoperability among vehicles of different brands.

2. Green Finance

With increased focus on climate change, various measures in the form of establishment of requisite renewable energy infrastructure, incentivising private investment in greener sectors, and offering subsidies and benefits for the adoption of climate-conscious measures at a micro-level, require a huge amount of funding, which may not be easily available, without an additional incentive or mark of genuineness. To overcome this

problem, green, social, and sustainable bonds have emerged, backed by the certification agencies specialising in reviewing and maintaining reporting standards for the subscriber's satisfaction.

- Green bonds are guided by certain directing principles, which differentiate them from the conventional classes of bonds. These include the area where the proceeds are to be utilised, the process for project evaluation, management of proceeds, and the reporting system. The first area, the use of proceeds, includes some major categories that meet the prescribed norms and make a bond green, at least in the definition. These include projects in the renewable energy sector; energy-efficient infrastructures like smart grids; pollution prevention and control (including soil remediation measures and waste recycling); sustainable agriculture promotion; biodiversity preservation; climate-friendly transportation; wastewater management; climate observation systems; and circular economy-related products, processes, and technologies.
- The second and third areas of project evaluation and progress management incorporate analysing the objectives of various projects on a case-to-case basis and how they fit within the earlier mentioned categories. This area, concerning other areas of green bonds, is of utmost importance because it signifies the real mobilisation space for the resources and ensures their bonafide application. The reporting area is of regulatory significance and helps investors in assessing the use of their contributions. This mandatory disclosure system ensures a check on the use of resources and prevents instances of green-washing. As was also acknowledged by RBI in its bulletin, "it is possible to ensure a steady flow of finance into sustainable projects only if there is a reliable source of information on the entities' overall management of environmental and social risks and a track record on entities' identification of opportunities that bring both a decent rate of return and environmental benefits."
- Green finance has become the new buzz in the financial world and companies and governments around the world are running towards it with big bags to collect as much money as they can. Just to put things into perspective, the global sustainable debt market (inclusive of green, sustainable, and social bonds) has grown at a CAGR of 50% over the last 5 years and reached \$1.71 trillion in 2020. The total number of issuers for just green bonds has been 634 from across 55 countries, where the average size per issue was \$171 million. However, most of this growth has been in the developed regions, with they constituting almost four-fifths of the total raised.

India's share and growth have been meagre in absolute terms when compared to the global markets.

- However, recently, growth has picked up as the focus on climate action has increased.
- According to Climate Bonds Initiative data, \$16.5 billion worth of green bonds were issued in India in 2021. However, 94% of these bonds were issued by corporates (non-financial), thus signalling a huge potential for growth by the entry of other issuers like the government and financial corporates, as well. The Indian government has expressed its intent in Budget 2022 to issue sovereign green bonds for funding climate-conscious infrastructure projects, and this will hopefully lead to India's being able to gather \$10.2 trillion by 2070, to become a carbon-neutral economy.
- The Reserve Bank of India has tried to ensure adequate financing space for the purchase of electric vehicles, installation of solar panels, and other climate-friendly activities by the financial institutions in the country. To that end, the State Bank of India offered green car loans with interest rates 20 basis points lower and longer repayment terms than conventional auto financing. The small renewable energy sector has also been included under the priority sector lending purview, thus mandating banks to focus on climate finance. While investing in renewable energy, firms would be able to borrow up to Rs 30 crores, and households would be able to borrow Rs 10 lakhs. Green financing institutions like Indian Renewable Energy Development

Agency (IREDA) have also been initiated by the government to promote cleaner investments. This facilitative regulatory initiative has panned out positively for the sustainable financing sector, with an RBI report corroborating that the “aggregate outstanding bank credit to the non-conventional energy sector was around \$4.8 billion, constituting 7.9% of the outstanding bank credit to the power generation sector as of March 2020.

3. Carbon tax and Carbon Credits

India does not explicitly have a carbon tax per se, but it does heavily tax the use of fossil fuels like coal. A compensation cess on coal production exists at the rate of Rs 400 per tonne of coal produced. Charging carbon tax in a developing country like India can become an impediment to growth, more so when there is not a robust plan for the application of the proceeds from such taxation. The case for adopting a carbon tax has been made on the premises of discouraging the emission of greenhouse gases and not primarily for generating revenue. However, if these taxes are indeed implemented, they will become a negative externality in the overall economy, which will accentuate the existing wealth and income divide. Carbon-intensive businesses would simply pass on the tax burden to consumers, negatively impacting lower and middle-class budgets.

- Carbon credits represent an allowance to emit a certain amount of carbon by the holding party, which can also be traded or held for consideration. These credits have been given to entire carbon markets where companies can trade carbon emissions into the atmosphere in a financial instrument form. The global carbon market size in 2020 grew 20% over the previous year and reached a value of \$272 billion, with G7 countries and the EU dominating the market.
- India has also released a consultation draft on the National Carbon Market in October 2021, to move toward a greener economy, where private stakeholders can inclusively contribute to the rapid decarbonisation of the economy. This paves the way for India’s inclusion in the International Carbon Market Platform as well.

4. Enforcement Mechanism

Despite more than 20 years of climate change dialogue and advocacy, global action on this front has remained bleak. Policies have been debated and implemented on paper. However, we’re yet to see concrete initiatives in this direction. This lackadaisical approach of nations can be attributed to the lack of an enforcement mechanism for climate change agreements. Excessive politicisation of this extremely important issue has left us with rising sea levels, devastating floods and forest fires, and mistrust in governments.

Is there any existing penalties built into these agreements to act as a deterrent?

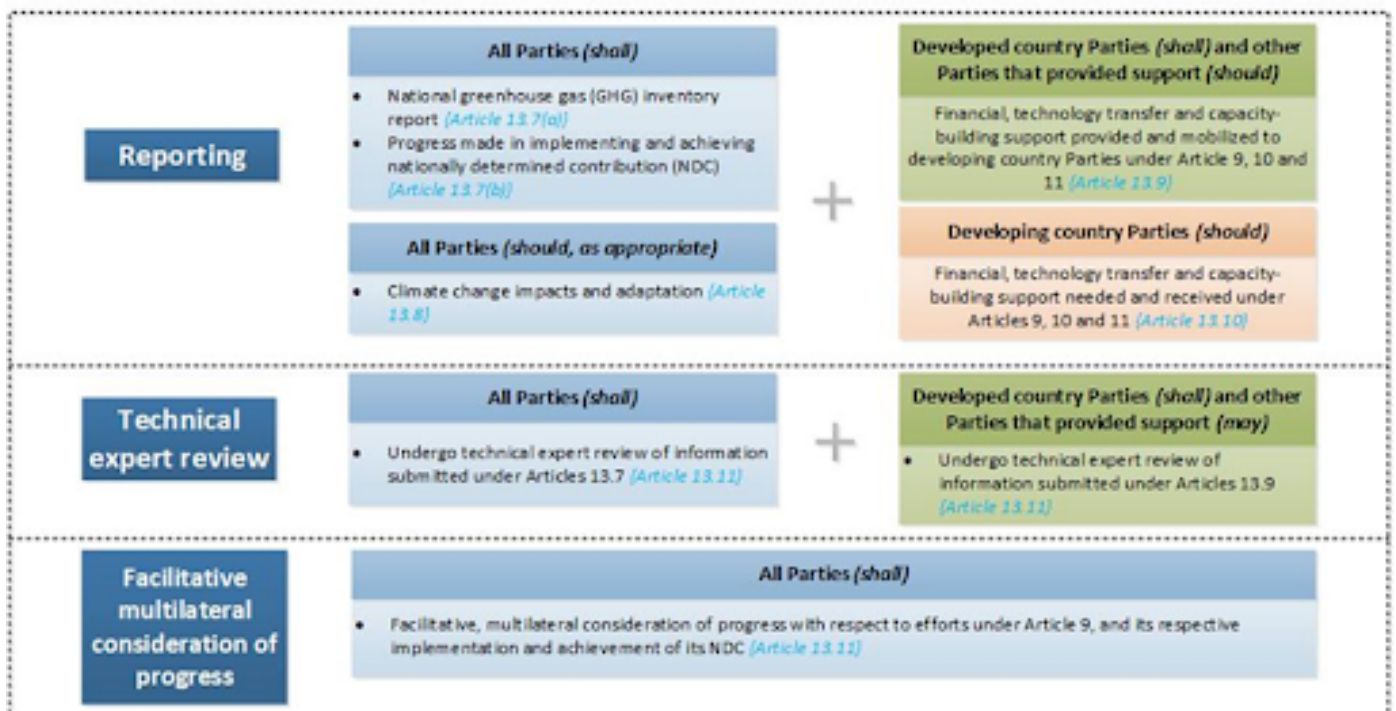
As of now, there are no penalties for countries not meeting their nationally determined commitments. This gives countries a free hand to shirk their targets and not take any real action. The Paris Agreement is not a legally binding agreement, unlike what is largely claimed. This is because, while framing, countries chose to make the treaty’s specified processes legally enforceable rather than the commitment to fulfil predetermined objectives. That is, the agreement legally binds countries to develop and revise nationally determined contributions (NDCs) every five years to the collective effort to achieve net-zero emissions by 2050 and keep global warming below 2 degrees Celsius. On the other hand, they are merely urged or expected to set more ambitious goals and objectives for reducing emissions; technically, they can change their NDCs in any direction without being kicked out of the global initiative. Thus, the agreement resorts to political pressure as its only enforcement mechanism.

However, the Paris Agreement does have a robust monitoring and reporting system in place to regularly track the progress of climate goals, which is termed the Enhanced Transparency Framework (ETF). It has a framework that has adopted a detailed set of modalities, procedures, and guidelines (MPGs) that make it operational. In this way, countries’ action plans and actual steps can be compared and contrasted to analyse the disparity between the two. Each country has

agreed to a common reporting standard procedure for national GHG inventories, as well as common tabular formats (CTF) for tracking progress toward NDCs and climate finance, as well as outlines for the biennial transparency report (BTR), national inventory document, and technical expert review report. This will enhance the trust between nations, establish confidence in climate plans and spearhead the globe to a possibly better future.

The best solution to this problem would be to simply make the emission reduction targets legally binding. Having only partially legally binding parts and others based on voluntary actions takes away the power of the global fight against climate change and blatantly ignores the possible ramifications of a full-fledged climate disaster.

Article 13 of the Paris Agreement: transparency of action and support



The United Nations Framework Convention on Climate Change (UN Climate Change) is the United Nations entity tasked with supporting the global response to the threat of climate change. However, it can not take any legal action if countries fail to meet their goals. Having a global body for strict implementation or making every part of the agreement legally binding might not be the best solution to this loophole, because it creates the unfortunate possibility of highly reduced participation and ambition from member countries, as happened with the 1997 Kyoto Protocol. Countries would opt out of the agreement if they felt it was too legally arbitrary. The reasons why the Paris Agreement received universal participation were its flexibility and reporting mechanisms.

Political will and pressure can only go so far in creating a real impact; it's just a drop in the ocean. Making these targets binding would compel countries to pursue climate change, not just as lip service to greenwash themselves, but as a fundamental drive to protect the habitability of Earth. Global climate agreements need to reconfigure their focus toward reducing the large-scale dependency on fossil fuel consumption, especially coal, by investing in greener technologies. Such climate agreements should be uniformly applied across all geographies so that there's no loophole for negligent parties to take advantage of.

In conclusion, we need to form policies within the framework of these principles as outlined in the World Bank report,



"The Adaptation Principles: A Guide for Designing Strategies for Climate Change Adaptation and Resilience":

- Climate policies should internalise the political and socio-economic realities faced by the most vulnerable communities and function within the

framework of climate equity. The populations must be insured in order for development to be inclusive.

- Governments must help people and firms boost their capacity to rapidly adapt to climate change by providing all possible resources and support.

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