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Evaluating Climate Change Mitigation Strategies of G20 Countries: Policies, Actions, and Progress Towards Global Emission Reduction Goals

Sonal Devesh*, Anchal Sharma, and Arjun Maheshwari

School of Business and Management, Christ University, Yeshwanthpur Campus, Bangalore, India 560073

Abstract

The G20 countries are responsible for over 75% of the greenhouse gas (GHG) emissions at a global level. The research summarizes the role of G20 countries in combating Climate Change. This research study explores the comprehensive assessment of the G20 nations' policies and the impacts of climate change across the globe. The paper studies the policies of the G20 countries' governments to meet the Nationally Determined Contribution (NDC) target and achieve the global goal of the Paris Agreement (or COP28) and Net Zero Emissions Target of limiting the level of global temperature increase to well below 2 degrees C while pursuing efforts aligning to a global threshold objective of 1.5-degree C. Through the review of existing literature, the researchers aim to provide a better understanding of climate change and the biodiversity and ecosystem. In addition to this, the study provides various strengths and opportunities for the countries to explore soon, reducing the emission levels in the ecosystem and thus, promoting a sustainable future, through an interlinked phenomenon.

Keywords: Greenhouse Gases; Paris Agreement; Net Zero Emissions; G20 Countries; Nationally Determined Contribution Target

1 Introduction

Climate change is the long-term process of variations in weather conditions which can occur naturally or as a result of human activities such as burning fossil fuels, deforestation, and the usage of oil, coal, and gas. As shown in Figure 1, since 1880 human activities have resulted in significant climate change [1]. Industrial activities emit greenhouse gases (GHG) like carbon dioxide, nitrous oxide, methane, and chlorofluorocarbons, which cause "heat-trapping" in the atmosphere. Climate changes can be in the form of intense rainfall, droughts, heatwaves, rising sea levels, melting glaciers, and water scarcity [2]. The rise of global temperatures since 1880 can be distinguished in Figure 1 and it has almost reached 1.2 degrees Celsius, which is a wake-up alarm for all the economies. In 1992, countries came together for an international treaty, the United Nations Framework Convention on Climate Change (UNFCCC), to combat climate change and take necessary actions. The UNFCCC adopted the first agreement, "The Kyoto Protocol," in 1997, after two years of negotiations. The protocol binds developed countries to reduce greenhouse gases in the atmosphere under the principle of "Common but differentiated responsibility and respective capabilities." In 2015, the UNFCCC adopted "The Paris Agreement," marking a new global effort to tackle climate change. The Paris Agreement seeks to accelerate and intensify the actions and investments needed for a sustainable low-carbon future. Its central aim is to strengthen the global response to the threat of climate change by keeping global temperature rise this century well below 2 degrees Celsius above pre-industrial levels, and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. The Agreement also aims to enhance countries' ability to manage the climate change's impact [3].

*Corresponding author: sonaldevesh@gmail.com
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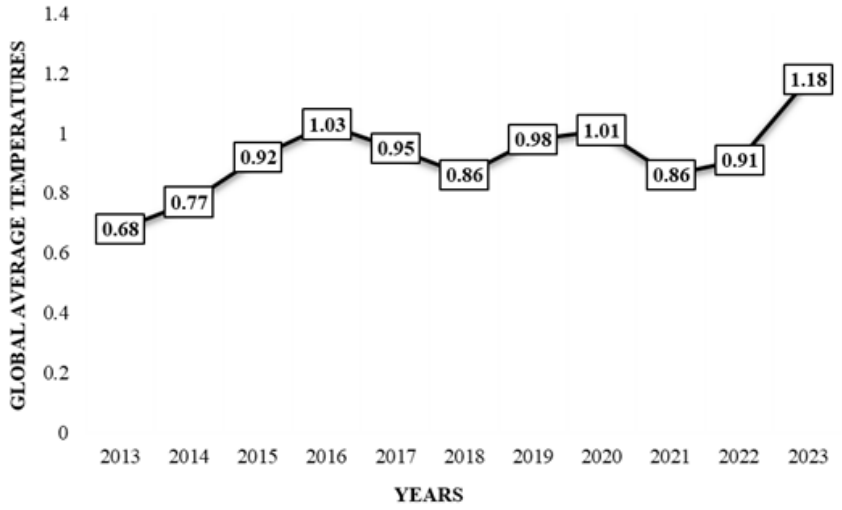

Figure 1: Trend Analysis of Global Average Temperature across Years

The Group of Twenty (G20) is the premier forum for international economic cooperation. It plays an important role in shaping and strengthening global architecture and governance on all major international issues [4]. The G20 incorporates 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom, and the United States) and two regional bodies, the European Union and the African Union. The G20 countries represent around 85% of the global GDP, over 75% of global trade, and about two-thirds of the world population. India chaired the recent G20 summit in September 2023. The theme of the G20 presidency was "Vasudhaiva Kutumbakam" or "One Earth, One Family, One Future." The summit was attended by over 100,000 participants from 135 nations, 9 invitee countries (Bangladesh, Egypt, Mauritius, Netherlands, Nigeria, Oman, Singapore, Spain, UAE), and 14 International Organisations (United Nations, International Monetary Fund, World Bank, World Health Organisation, World Trade Organisation, International Labour Organisation, Financial Stability Board, Organisation for Economic Cooperation and Development, African Union, African Union Development Agency-NEPAD, Association of Southeast Asian Nations, International Solar Alliance, Coalition for Disaster Resilient Infrastructure, and Asian Development Bank). The African Union became the second regional organisation to join the G20 as a full member at the 2023 Summit, after the European Union. During the 2023 summit, nations committed to increasing renewable energy by 2030 to about three times the present level, increasing climate funding from billions to trillions, and boosting the production of zero and low-emission hydrogen [5].

This paper aims to explore G20 countries' current climate change policies, understand the government initiatives towards Paris Agreement targets, identify the strengths, weaknesses, opportunities, and challenges faced by G20 countries in combating climate change, and provide recommendations for a comprehensive decarbonisation policy mix.

2 Related Work

The literature review signifies the urgent need to address climate change and CO2 emissions among G20 nations. Initiatives like the Paris Agreement might not help reduce carbon emissions sufficiently; hence, stronger policies are needed. The pandemic's temporary reduction in emissions underscores the potential impact of policy. A gap exists between national policies and NDC targets in Organisation for Economic Co-operation and Development (OECD) countries. Economic growth has also been linked to CO2 emissions, emphasizing the necessity of collective action. Effective solutions are crucial for meeting Intergovernmental Panel on Climate Change (IPCC) recommendations and combating climate change. There is an established connection between G20 countries' financial policies and climate change, specifically CO2 emissions. Research seeks to provide insightful information about the intricate dynamics of CO2 emissions and climate change [6]. Thus, introducing and implementing policies related to climate change and reducing carbon emissions is necessary. The Paris Agreement (COP21) set a goal of keeping the average world temperature rise to 1.5°C [7]. Most countries are attempting to achieve this target, but the influence of climate change on the economy of any country is significant. Studies show that while worldwide countries are trying to achieve the set goals of The Paris Agreement, enough is not being done to achieve the determined target. Hence, there is a need for international bodies to set standards to achieve the goal of zero carbon emissions [8]. Environmental degradation is one of the biggest concerns globally. The Intergovernmental Panel on Climate Change (IPCC) report stated an increase in average temperature by 1.5°C globally [9]. Thus, countries must align themselves with the NDC targets to minimize carbon emissions and achieve the goals of the Paris Agreement. Crafting strong and integrated policies, such as Zero Emission Vehicle (ZEV) incentives, heavy-duty vehicle emissions standards, and pricing mechanisms, is essential for achieving climate targets [10]. Many countries are emphasizing the increased use of electric vehicles to implement ZEV policies effectively. A study suggests the impact of the pandemic on emission projections for individual G20 members and the potential overachievement of Cancun Pledges by certain countries [11].

This may be due to low vehicle emissions resulting from lockdowns during the pandemic. It was found that OECD countries tend to implement policy packages that lead to more rapid progress in improving energy intensity and GHG intensity compared to emerging economies and developing countries [12]. OECD countries follow certain policies such as increasing renewable electricity, limiting coal-fired power plants, reducing oil and gas production, and implementing fuel efficiency standards for light-duty and heavy-duty vehicles. The Organisation for Economic Co-operation and Development (OECD) is an international organization where governments work together to find solutions to common challenges, develop global standards, share experiences, and identify best practices to promote better policies for better lives. There are possible reductions in greenhouse gas emissions that can be attained by fully implementing the objectives of a few chosen International Cooperative Initiatives (ICIs) [13]. The global non-state and subnational climate action (NSA) could contribute overall to achieving the climate goals outlined in the Paris Agreement. It focuses on GHG mitigation commitments made by cities, regions, and companies [14]. The research found a discrepancy between the NDCs and national policies effects and between the NDCs and far below 2°C emission paths effects [15]. There is a connection between metropolitan climate and human behavior. Because of increased AC usage, QF marginally increased [16]. Of the G20 nations, only India is making quick progress towards meeting the climate targets outlined in the Paris Agreement. Researchers call for collective action by nations to reduce CO2 and GHG emissions [17]. Research indicates that a possible 1% increase in the GDP of G20 members will lead to a 0.167% rise in CO2 levels. Moreover, if GDP remains constant, CO2 levels will rise by 0.244% [18]. According to IPCC's special report, global net CO2 emissions would need to drop by roughly 45% from 2010 levels by 2030 to reach net zero emissions by 2050, maintaining the temperature rise threshold at 1.5°C. If global warming is kept to 2°C, there will be a roughly 25% decrease by 2030 and net zero warming by 2070 [19]. A study outlined the potential and challenges of G20 countries for disaster risk reduction (DRR) through the newly established Working Group [20]. Another study focused on factors influencing household-level mitigation and adaptation actions in Nuevo Leon, Mexico. It found that environmental concern, perceived knowledge, and social capital influenced climate change action at the household level [21]. Most G20 countries produce significant greenhouse gas emissions, which are constantly increasing. Less than half of the G20 countries have adopted policies to address non-energy GHG emissions [22]. India is advancing rapidly towards achieving its climate goals mentioned under the Paris Agreement. The presidency of India can assist nations struggling to recover from the COVID-19 pandemic and be open to various opinions and ideas regarding pressing challenges [23]. Another report focuses on the decommissioning of coal-based capacities in India. Optimized decommissioning of these assets is expected to reduce electricity costs for consumers. The poor performance of coal-based assets has led to significant stress in the financial sector's power portfolio [24]. Table **??** provides the summary of the studies investigated.

Table 1: Summary of Previous Studies

Title	**Authors**	**Year**	**Outcomes**
A review of successful climate change mitigation policies in major emitting economies and the potential of global replication	Fekete, H., Kuramochi, T., Roelfsema, M., Elzen, M. D., Forsell, N., Höhne, N., Luna, L., Hans, F., Sterl, S., Olivier, J., Van Soest, H., Frank, S., & Gusti, M.	2021	This paper suggests the need for stronger policies and initiatives to be undertaken by the G20 countries. These policies will result in reduced levels of greenhouse gases.
Taking stock of national climate policies to evaluate the implementation of the Paris Agreement	Roelfsema, M., Van Soest, H. L., Harmsen, M., Van Vuuren, D. P., Bertram, C., Elzen, M. D., Höhne, N., Iacobuta, G., Krey, V., Kriegler, E., Luderer, G., Riahi, K., Ueckerdt, F., Després, J., Drouet, L., Emmerling, J., Frank, S., Fricko, O., Gidden, M., & Vishwanathan, S. S.	2020	The paper concludes that without additional action, the GHG emissions are likely to increase by 2030, and that there is a major gap between what the policies suggested and what the current emissions levels are.
Exploring the effects of climate-related financial policies on carbon emissions in G20 countries: a panel quantile regression approach	D'Orazio, P., & Dirks, M. W.	2021	This study provides insights into the complex dynamics of CO2 emissions and climate change, and suggests the importance of the relationship between CO2 emissions and climate-related financial policies.

Title	Authors	Year	Outcomes
A review of the global climate change impacts, adaptation, and sustainable mitigation measures	Raihan, A.	2023	The study concluded that climate change affects food security due to irregular food supply from various channels, leading to high prices, inflation, and compromised quality. Factors like human and environmental sustainability are also affected on a large scale.
Climate risk disclosures and global sustainability initiatives: A conceptual analysis and agenda for future research	Ngo, T., Le, T., Ullah, S., & Trinh, H. H.	2022	G7 nations are putting efforts to prepare common guidance to address differences among countries' frameworks. The highlights of the Task Force on Climate-Related Financial Disclosures (TCFD) require detailed climate-related information disclosed and sustainability reporting by firms.
Twenty years of climate policy: G20 coverage and gaps	Nascimento, L., Kuramochi, T., Iacobuta, G., Michel, D. E., Fekete, H., Weishaupt, M., Laura, V. S. H., Roelfsema, M., De Vivero-Serrano, G., Lui, S., Hans, F., De Villafranca Casas Maria, J., & Höhne, N.	2022	While many G20 nations promote renewable energy, many countries still subsidise fossil fuels instead of taxing them. Moreover, fewer G20 countries are actively implementing policies to phase out fossil fuels and biofuels. A recent study highlights that adopting more policies effectively reduces emissions, yet the inconsistent application of these policies remains a challenge.
Human behaviour change and its impact on urban climate: Restrictions with the G20 Osaka Summit and COVID-19 outbreak	Nakajima, K., Takane, Y., Kikegawa, Y., Furuta, Y., & Takamatsu, H.	2021	The relationship between human behaviour and urban climate is evident, with increased QF due to greater air conditioning usage. In Tokyo, weekday temperatures are 0.2–0.3°C higher compared to weekends and holidays, reflecting reduced human activity. Similarly, Osaka experiences a 1.0°C lower temperature on weekends compared to weekdays, with a general weekday-weekend temperature difference of 0.1–0.2°C. These findings underscore a positive and direct relationship between human activities and urban climatic conditions.
Analysis of Economic Growth on Carbon Dioxide Gas Emissions in G20 Countries	Ramadhan, H. K., Marselina, N., Nirmala, T., Aida, N., & Ratih, A.	2023	An increase in the GDP of G20 countries by 1% leads to a 0.167% rise in CO2 emissions, while a 1% increase in Gross Fixed Capital Formation (GFCF) results in a 0.244% rise, assuming ceteris paribus. CO2 emissions in developed countries are primarily driven by industrial activities linked to economic growth. G20 nations, responsible for 75% of global GHG emissions, play a crucial role in mitigating these emissions to combat climate change. The study concludes that economic growth in G20 countries significantly contributes to CO2 emissions, exacerbating climatic conditions.

Title	Authors	Year	Outcomes
Factors that Influence Climate Change Mitigation and Adaptation Action: A Household Study in the Nuevo Leon Region, Mexico	Hernández, L. G., Meijles, E., & Vanclay, F.	2019	The study concluded that perceptions and socio-demographic characteristics play crucial roles in climate resilience actions at the household level. It emphasised the importance of policies and campaigns to enhance climate change awareness and action within households. The study on household-level climate change actions in Nuevo Leon, Mexico, utilised online surveys and paper questionnaires from August 2016 to January 2017. Findings indicated that environmental concern, perceived knowledge, and social capital significantly influenced household mitigation and adaptation measures. Social capital, such as family and friend support, facilitated adaptation, while education and financial resources had varied impacts.

A study has found six G20 nations (China, India, Indonesia, Japan, Russia, and Turkey) are estimated to reach their set NDC Goal. In contrast, eight countries (Argentina, Australia, Canada, the European Union, the Republic of Korea, South Africa, and the United States) of the group are required to take corrective measures to meet the targets. The emission projections for Brazil and Mexico still need to be determined. The United Kingdom and France will likely miss their set targets [20].

Some studies did not address the relationship between CO2 emissions and climate-related financial policies within the G20 countries. It emphasises the importance of more thorough research into the effects of different initiatives and unclear climate consequences of COVID-19 stimulus measures. Many studies concentrate on particular areas and industries rather than taking deeper national and international actions, lack primary data collection, and give no attention to pollutants other than CO2. Thus, additional research is required to determine the effectiveness and cost-efficiency of policies and other factors influencing activities at the household level, particularly in developing countries. Another study focused on the lack of international collaboration in reducing emissions. Another limitation found was the lack of more focused international measures to slow down climate change.

3 Methods

A systematic literature review was employed, utilizing secondary data from various reports and websites. The sources directly address the climate change mitigation efforts by G20 countries. The articles, reports, and studies discuss policies, actions, and strategies implemented or proposed by G20 nations to mitigate climate change. The majority of the sources were from reputable academic journals, government agencies, international organisations (such as the United Nations, World Bank, or International Energy Agency), and peer-reviewed publications to ensure the reliability and accuracy of the information. Climate change is a rapidly evolving field, so recent sources were taken to capture the latest developments and initiatives undertaken by G20 countries. However, historical perspectives may also be valuable for understanding the evolution of climate policies over time. G20 countries span different regions and have varied socio-economic and environmental contexts. Sources that provide insights into the climate change mitigation efforts of both developed and developing G20 nations were referred to capture a broad spectrum of experiences and challenges.

4 Results

The Developed G20 Countries should contribute towards developing and underdeveloped countries in combating climate change. Countries can also collaborate with International Bodies such as the World Bank, UNFCCC etc. The World Bank stands forward to help Türkiye with an additional $2 Billion in finance to work towards combating Climate Change. It should apply the same strategy to the other countries of the Global Climate Coalition (GCC). Exploring the efforts of governments to meet the goals set by the Paris Agreement entails examining the policies, regulations, and measures implemented by nations to combat climate change and lower emissions of greenhouse gases. The following goals are the key aspects of the Paris Agreement which the G20 countries should adhere to mitigate the ill effects of climate change:

- **Nationally Determined Contribution (NDCs):** Each country that is a party to the Paris Agreement is required to submit a Nationally Determined Contribution (NDC), outlining its climate actions and targets. These NDCs vary widely in ambition and scope, covering emissions reduction targets, adaptation measures, financial commitments, and contributions to international climate finance.

- **Policy Frameworks:** Governments develop and implement various policy frameworks to support their NDCs and achieve their climate goals. These may include renewable energy targets, carbon pricing mechanisms, regulations to improve energy efficiency, support for sustainable transportation, land-use policies, and measures to protect forests and biodiversity.
- **International Cooperation**: Many governments engage in international cooperation to enhance their climate efforts. This includes participating in initiatives such as the G7, G20, and regional climate partnerships to share best practices, mobilise financial resources, and coordinate actions.
- **Investment and Finance:** Governments mobilise public and private investment to support climate action. This includes funding for clean energy projects, research and development initiatives, climate-resilient infrastructure, and programs to support vulnerable communities affected by climate change.
- **Monitoring, Reporting, and Verification (MRV):** Governments establish systems for monitoring, reporting, and verifying their greenhouse gas emissions and progress towards their climate targets. Transparency and accountability are crucial for tracking the effectiveness of policies and ensuring compliance with international commitments.
- **Adaptation and Resilience**: In addition to mitigation efforts, governments also prioritise adaptation and resilience measures to address the impacts of climate change. This includes strengthening infrastructure, improving water management, enhancing disaster preparedness, and supporting vulnerable populations.
- **Public Awareness and Engagement:** Governments undertake efforts to raise public awareness about climate change and the importance of collective action. This includes education campaigns, public consultations, stakeholder engagement, and partnerships with civil society organisations, businesses, and academia.
- **Long-Term Strategies:** Many governments are developing long-term low-emission development strategies (LT-LEDS) to guide their transition to a sustainable, low-carbon economy. These strategies outline pathways to achieve net-zero emissions by mid-century or sooner, aligning with the long-term goals of the Paris Agreement.

Overall, understanding government initiatives towards the Paris Agreement targets requires analysing a complex interplay of policies, actions, and international cooperation efforts aimed at addressing the urgent challenge of climate change. People lack awareness about the prevailing policies and strategies such as Nationally Determined Contributions (NDC targets are set by countries to mitigate the impact of greenhouse gases), Climate Neutrality, and the risks involved in climate change on humans and the environment. The environmental concerns may be addressed through various Renewable Energy Initiatives such as the installation of Solar and Wind Panels, setting ambitious renewable targets, green energy corridors, Agriculture Solar pumps, etc. Green Products such as Vegan Leather totes, paper towels, Electric Vehicles (EVs), Solar Speakers, Eco-friendly dishwashers, etc. must be promoted. The G20 countries should strive towards achieving the 13th Sustainable Development Goal which aims to mitigate risks related to climate change. Human behaviour of every individual is more inclined towards their comfort rather than stressing the risks caused by an increase in the usage of fossil fuels and the negligence of nature's cycle effects. There is a need to educate humans to change their behaviour towards combating climate change.

4.1 Strengths

The governments of G20 countries are supporting the purchase of EVs. Among G20 countries, France has the best EV Policy and also the Russian government came forward to promote the purchase of EVs followed by Türkiye as it plans to launch its first domestically produced EV. Installation of Wind and Solar panels meets the renewable energy demands, and as of now, it is one of the best achievements of China which ensures their commitment to goals. The emissions of Australia are also expected to decrease to half by 2030 as a result of a 73% increase in the proportion of generation from renewable resources by 2030 which will be largely due to the installation of Solar and Wind Panels. The developed countries and international bodies i.e. The IMF, World Bank, and WTO must collaborate with developing countries and finance them to meet climate goals. The World Bank was prepared to increase its climate support to Türkiye by up to $2 billion. The United Nations flies on 100% sustainable fuel in the aviation sector. Some G20 countries are also producing carbon-free electricity. Therefore, each G20 country also sets a climate budget to meet the goals and combat climate change.

4.2 Weaknesses

Most G20 Countries rely on fossil fuels to meet their electricity demands. Türkiye relies on the production of electricity by investing in fossil fuels, China also relies on gas which has to be phased out, in Australia 114 fossil fuels projects are in the pipeline, India and Canada are also continuing to support fossil fuels to meet the electricity demands. There is no set of decarbonisation policies in many sectors. Cement, steel and chemical sectors are very tough to decarbonise due to the large proportion of carbon emissions. Most of the G20 countries are facing instability which minimises the allocation of budget towards climate change.

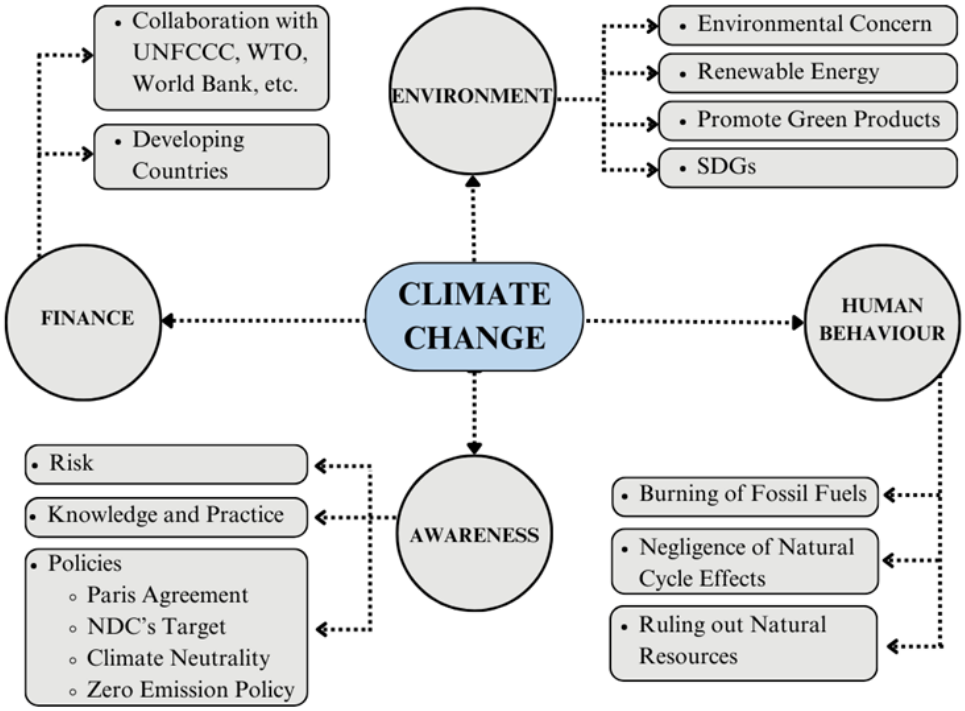

Figure 2: Conceptual Model to Combat Climate Change- Derived by Researchers

4.3 Opportunities

There are various policies and support programmes launched by governments to support the advancements from non-renewable energy to renewable energy. In India, there is support for Research and Development in carbon capture and utilisation, installation of green energy corridors, promotion of hydropower etc. G20 countries have set a Zero Emissions Policy which aims at zero emissions by a particular period. India has committed to achieving the Zero Emission target by 2070. The European Union and its 27 countries accepted the "Fit for 55 packages" to reduce and cut carbon footprints by 2030. The tie-up with the Private Sector can reduce carbon emissions by investing in Research and Development, managing sustainable supply chains, Green Finance and Investment etc.

4.4 Challenges

The high path of carbon emissions can lead to an increase in temperature above 1.5 Degrees C. It can trigger an increase in sea temperature and ocean acidification which can gradually reduce fish catching. The increase in temperature steered the increase in water demand due to longer droughts and its effect on agriculture. It can also adversely impact the health of people and tourism in the country. All these factors can impact the economic growth of the nation.

5 Discussion

The G20 countries, with the notable exception of Mexico, have set targets for achieving net-zero emissions, reflecting a strong commitment to mitigating climate change. The EU aims to cut greenhouse gases by at least 55% by 2030 and reach net zero by 2050. Turkey plans to increase its renewable energy share to 23.7% by 2035, and Russia is promoting electric vehicle production and use. Canada and Australia have enhanced their climate finance commitments, with Canada aiming to double its contribution and Australia on track to deliver $3 billion by 2025. Additionally, Turkey has made significant strides in renewable energy and waste management, exemplified by the Zero Waste initiative, which has led to substantial waste reduction and recycling efforts. These actions illustrate the diverse and multi-faceted approaches G20 nations are taking to address climate change and support global sustainability goals.

Comparing G20 policies in their effectiveness toward meeting international climate targets requires a nuanced analysis that considers various factors such as ambition, implementation mechanisms, and alignment with scientific recommendations. Evaluating G20 policies in terms of how well they achieve global climate targets requires a detailed analysis that takes into account a number of factors. First, it entails closely examining the emission reduction goals set forth in the G20 countries' Nationally Determined Contributions (NDCs) under the terms of the Paris Agreement, assessing the degree of ambition and timeliness with respect to the necessity of keeping global warming to 1.5°C or less. Second, it involves evaluating how well the G20 countries' policy tools—such as carbon pricing schemes, subsidies for renewable energy, and rules governing the use of fossil fuels—drive emissions reductions and the shift to a low-carbon economy. To determine their effect on emission reduction trajectories, it is also necessary to evaluate the distribution of resources between investments in fossil fuels and renewable energy technologies like solar, wind, and nuclear power.

Furthermore, it is critical to assess efforts to gradually phase out subsidies for the production and use of fossil fuels as well as to closely examine contributions to global climate finance and programs that support innovation and technology transfer. In addition, it is critical to manage climate-related risks by looking at infrastructure investments, disaster preparedness, and adaptation and resilience strategies. In conclusion, it is critical to evaluate how the G20 nations are leading the global climate movement, cooperating on diplomatic initiatives, and bolstering international climate action. Comparisons along these dimensions can provide light on the G20's advantages, disadvantages, and areas for improvement in terms of coordinated efforts to address the climate catastrophe.

Some studies did not address the relationship between CO2 emissions and climate-related financial policies within the G20 countries. It emphasises the importance of more thorough research into the effects of different initiatives and unclear climate consequences of COVID-19 stimulus measures. Many studies concentrate on particular areas and industries rather than taking deeper national and international actions, lack primary data collecting, and give no attention to pollutants other than CO2. Thus, additional research is required to determine the effectiveness and cost-efficiency of policies and other factors influencing activities at the household level, particularly in developing countries. Another study focused on the lack of international collaboration in reducing emissions. Another limitation found was the lack of more focused international measures to slow down climate change. The G20's linkage to climate change has not been discussed as part of any particular studies. Rather, a major source of information for most of this field's research has been an analysis of numerous reports. The Climate Change study can be enriched by focusing exclusively on the ASIAN Countries, BRICS, and the G7 Countries and also on the perception of the people related to Climate Change.

6 Recommendations

Every nation contributes significantly to carbon emissions, greatly impacting the biosphere as addressed in the weaknesses in the SWOC analysis. To mitigate this, governments must enact policies while supporting the adoption of Electric Vehicles (EVs), reducing reliance on fossil fuels in the transportation sector. While France has framed policies encouraging the use of electric vehicles, other GCC countries may follow this best practice. With over 50% of electricity generated from coal and thermal plants, countries should transition to renewable sources like solar, wind, and tidal power following the footsteps of China. A US airline pioneering the use of 100% biofuel in flights demonstrates a viable solution, reducing carbon emissions by 70%. Airlines across G20 countries are recommended to follow identical steps. Both countries and international organisations need comprehensive sector-specific policies, currently lacking in many nations. Enforcement of these policies is crucial, as governmental formulation often lacks effective execution. Developed nations should offer financial assistance to developing and underdeveloped nations, aiding their transition away from fossil fuels. Allocating a portion of national budgets towards climate finance, sustainability initiatives, and low-carbon strategies is essential. Increased investment in renewable energy sectors facilitates the shift away from non-renewable sources. Collaboration between nations is vital, enabling resource-sharing and collective efforts towards decarbonisation. The journey towards decarbonisation is influenced by a complex interplay of trends across technological, political, economic, social, and environmental realms. Each of these factors plays a crucial role in guiding the global community towards a future that emphasises sustainability and reduces carbon emissions. Technological advancements are leading the way by offering innovative solutions to decrease greenhouse gas emissions and improve energy efficiency. The shift away from fossil fuel industries in favour of renewable energy sources signifies a significant transformation in this regard. Political endeavours are increasingly focused on creating an enabling environment for decarbonisation through the implementation of stringent environmental regulations and policies that support green initiatives. Social trends reflect a growing awareness and demand for environmental sustainability, with consumers increasingly gravitating towards eco-friendly products. Environmental initiatives concentrate on mitigating the effects of climate change and safeguarding natural ecosystems. Like India, other G20 countries should encourage Research and Development in carbon capture and utilisation, installation of green energy corridors, promotion of hydropower, etc.

The loss of habitat, species extinctions, range shifts, and mismatches in interactions between the flora and fauna are some of the ways through which climate change disturbs ecosystems. Furthermore, ocean acidification is harmful to marine life in most countries, and forest fires significantly impact habitats, with low genetic variety forcing some species to become easy targets for extinction. In essence, such effects threaten essential ecosystem services and biodiversity, thereby highlighting the need for special intervention as far as global warming is concerned. The efforts to mitigate climate change can boost the overall economy of the countries as well. The installation of wind and solar renewable resources and the production of EVs can create millions of jobs. The technological advancement in renewables will not only reduce the cost but also boost economic growth. Also, with the developing sector, many individuals would earn through investment in the stock markets of the related companies.

7 Conclusion

The research analyzed the performance of G20 countries in combating climate change. It has been observed that the climate finance of the G20 countries is not sufficient to satisfy the demand and is insufficient. Every nation has plans and policies to reduce greenhouse gas emissions and eliminate the use of fossil fuels, but there is no proper execution of policies. The countries should implement policies aligning with the NDC's target to curb the emission of greenhouse gases and reach the goal of The Paris Agreement.

The study aimed to address the issue of climate change with the recent changes across the world. The world has also faced 2023 as the warmest year in the past 174 years. Climate changes across the globe have caused water scarcity, increased heat stroke cases, ocean acidification, forest fires, etc. Therefore, it is the need of the hour to attend to such issues to lead to a sustainable future.

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Declaration of Competing Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data Availability

The data that support the findings of this study are available from publicly accessible sources, including reports and databases from reputable academic journals, government agencies, and international organizations. Specific datasets can be provided by the corresponding author upon reasonable request.

Ethical Considerations

The research project prioritised ethical considerations at every stage to ensure ethical integrity and soundness of the study. Ethical approval was obtained from the authorities of CHRIST (Deemed to be University), ensuring that all the activities comply with ethical guidelines and standards.

Author Contributions

Sonal Devesh: Conceptualization, Supervision, Writing - Review & Editing; **Anchal Sharma**: Data Collection, Analysis, Writing - Original Draft; **Arjun Maheshwari**: Data Collection, Visualization, Writing - Original Draft.

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