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Climate Change and the G-20: Opportunities and Challenges

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Date: 17/05/2023

Message

I am pleased to know that Govt. Raza PG College, Rampur organizing a National Seminar on "Climate Change and the G20: Opportunities and Challenges" considering the fact that the changing climate became a major problem across the globe. India's philosophy of "Vasudhaiva Kutumbakam" is in sync with the theme G20 presidency – "One Earth, One Family, One Future". The topic of seminar is need of the day and I hope outcome of the seminar will help the society, policy maker to save the environment.

Management, Principal and all the members of organizing teams deserve a big applause for their efforts.

I am honored to write this message to be included in proceeding and congratulate the team with my heart.

With regards,

Prof. Dinesh C. Sharma
Professor and Head
K.M. Govt. Girls P.G. College
Badalpur, G.B. Nagar

To,
The Principal,
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प्राचार्या की कलम से

जलवायु परिवर्तन आज विश्व के समक्ष सबसे बड़ी चुनौती है जिसके चलते होने वाली प्राकृतिक आपदाओं एवं उनकी गंभीरताओं ने समस्त दुनिया की चिंता को बढ़ा दिया है। जलवायु परिवर्तन के प्रभाव यथा समुद्र का बढ़ता जलस्तर, वर्षा, चक्रवाती तूफान, बाढ़, भूस्खलन, तपमान में वृद्धि, सूखा, पेयजल संकट, गिरता भूजल स्तर, समुद्री जीवन पर संकट, लगातार बढ़ रहे हैं। यही वजह है कि जलवायु परिवर्तन का मुद्दा प्रत्येक मंच पर प्रमुखता से उठाया जाता है।

जी-20, (वैश्विक चुनौतियों और समस्याओं के समाधान का प्रमुख अन्तर्राष्ट्रीय मंच) के द्वारा यद्यपि जलवायु परिवर्तन सम्बंधी मुद्दे पर प्रत्येक शिखर सम्मेलन में प्रमुखता से विचार विमर्श किया जाता है एवं समाधान स्वरूप वैश्विक समझौते भी किये जाते हैं परन्तु परिणाम कम ही दिखाई देते हैं। जी-20 के अन्तर्गत दुनिया के सर्वाधिक जीडीपी एवं सर्वाधिक वैश्विक व्यापार (लगभग 70-80 प्रतिशत) का प्रतिनिधित्व करने वाली प्रमुख अर्थव्यवस्थाएँ शामिल हैं जिनका यह नैतिक दायित्व भी है कि इस समस्या के समाधान हेतु सभी एकजुट होकर प्रयास करें अन्यथा समस्त विश्व को इसके गंभीर परिणाम भुगतने होंगे।

इसी कड़ी में राजकीय रज़ा स्नातकोत्तर महाविद्यालय, रामपुर (उ०प्र०) द्वारा दिनांक 21.05.2023 को “जलवायु परिवर्तन एवं जी-20 (अवसर एवं चुनौतियाँ)” विषय पर एक राष्ट्रीय संगोष्ठी का आयोजन किया जा रहा है। देशभर से संगोष्ठी में प्रकाशनार्थ प्राप्त हुये शोधपत्रों के एक संकलन के रूप में यह पुस्तक प्रकाशित की जा रही है। संगोष्ठी की समन्वयक होने के नाते मैं हृदय से सभी का आभार व्यक्त करती हूँ और आशा करती हूँ कि भविष्य में भी इस प्रकार के आयोजन महाविद्यालय द्वारा किये जाते रहेंगे।

जी-20 शिखर सम्मेलन 2023 की अध्यक्षता का यह स्वर्णिम अवसर भारत को ऐसे समय पर मिला है जब समस्त विश्व भारी उथल-पुथल के दौर से गुज़र रहा है। प्रत्यक्ष एवं अप्रत्यक्ष युद्धों का दौर है। समस्त विश्व पहले ही जलवायु, पर्यावरण, सतत् विकास के लक्ष्यों में गिरावट, बहुपक्षीय राष्ट्रीय उद्देश्यों की प्राथमिकता में कमी, वैश्विक कल्याणकारी नीतियों के प्रति उदासीनता जैसी समस्याओं से जूझ रहा था कि वैश्विक महामारी कोविड-19 ने विश्व के समक्ष अभूतपूर्व संकट पैदा कर दिया एवं अधिकांश अर्थव्यवस्थाओं को मंदी में गर्त में ढकेल दिया। खुलेपन एवं उदारीकरण का समर्थन करने वाली सशक्त अर्थव्यवस्थाओं ने समस्त मानवतावादी दृष्टिकोण को किनारे कर स्वः हिताय की राह पर चलना शुरू कर दिया। ऐसे समय में भारत के द्वारा न केवल कोविड-19 महामारी का मजबूती से सामना किया वरन् संकट की घड़ी में यथासंभव दूसरे देशों की मदद भी की गयी।

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भारत द्वारा जी-20 की अध्यक्षता के अवसर पर “वसुधैव कुटुम्बकम्” अथवा “एक धरती-एक कुटुम्ब-एक भविष्य” के विचार के साथ उपरोक्त समस्त वैश्विक आर्थिक, सामाजिक, राजनीतिक, सामरिक एवं पर्यावरणीय चुनौतियों का समाधान खोजने के साथ-साथ विकासशील राष्ट्रों के मुद्दों को भी समस्त विश्व के समक्ष प्रमुखता से रखते हुए विश्व बन्धुत्व की भावना का विस्तार करने एवं जलवायु परिवर्तन जैसी गंभीर समस्याओं के लिये समावेशी तथा प्रभावी समाधान खोजने की दिशा में भी प्रयास किया जा रहा है।

हम सभी प्रबुद्ध वर्ग का भी यह नैतिक दायित्व है कि जलवायु परिवर्तन जैसे मुद्दे के प्रति हम स्वयं भी जागरूक हों एवं समाज को भी अपने विचारों द्वारा जागरूकता प्रदान करें।

राष्ट्रीय संगोष्ठी के सफल आयोजन हेतु मेरी हार्दिक शुभकामनायें।

From the Desk of Organizing Secretary

Dear Participants,

It gives me immense pleasure to welcome you all to the Seminar on Climate Change and G20: Opportunities and Challenges on 21 May 2023, at Govt. Raza PG College, Rampur.

Climate change is a global challenge that needs to be addressed at a global level. The G20 is a forum for international cooperation on economic and financial issues, which provides an opportunity for the global community to come together and address this issue. The edited book on Climate Change and G20: Opportunities and Challenges is an attempt to provide a platform for researchers, policymakers, and stakeholders to discuss the opportunities and challenges posed by climate change for the G20 countries.

The seminar aims to bring together experts from academia, industry, and government to exchange their views on various aspects of climate change and G20. The seminar will provide an opportunity to discuss the role of G20 countries in addressing climate change, the challenges posed by climate change, and the opportunities for G20 countries to work together to address this issue.

The seminar will be divided into several sessions, each focusing on a different aspect of climate change and G20. The sessions will include keynote speeches, panel discussions, and paper presentations. The seminar will also provide an opportunity for participants to network and interact with each other.

I would like to extend my gratitude to all the participants who have taken time out of their busy schedules to attend this seminar. I am confident that the seminar will provide a valuable platform for all the participants to share their ideas and insights on climate change and G20.

I look forward to your active participation and wish you a successful and fruitful seminar.

Best regards,

[Dr. Baby Tabassum]

Organizing Secretary

From the desk of Editors...

Climate Change is the defining issue of present time. It has shifted weather patterns that threats from food production to rising sea levels. The concentration of greenhouse gas (GHG) emissions in the atmosphere is wreaking havoc across the world and threatening lives, economies, health and food. As per an estimate, approximately 3.3 to 3.6 billion people live in contexts that are highly vulnerable to climate change. Air, water and food are the basic necessities of life. But they are also the carrier of bacterial, viral, and parasitic diseases. The negative effects of climate change like floods, drought, excessive heat, etc, are disturbing the balance of nature, giving these pathogens a breeding ground.

The National Seminar on Climate Change and the G20: Opportunities and Challenges, held recently, brought together experts from various fields to discuss the pressing issue of climate change and the role of the G20 in addressing it. The event was an important platform for exchanging ideas and exploring ways to tackle this global challenge. India hosted the presidency of the G20 - the grouping of the world's 20 biggest economies, which collectively account for 75-80% of global greenhouse gas emissions.

The National Seminar on Climate Change and the G20 provided an opportunity for experts to discuss the challenges and opportunities associated with this global issue. The discussions were wide-ranging, covering topics such as the need for increased investment in renewable energy, the importance of international cooperation, and the role of innovation in addressing climate change. One of the key takeaways from the seminar was the need for a coordinated and integrated approach to tackle climate change. The G20 countries must work together to develop a common understanding of the challenges and opportunities associated with this issue. They must also develop a shared vision of a low-carbon future and work towards achieving it. Another important takeaway from the seminar was the need for increased investment in renewable energy. The experts emphasized that renewable energy is the key to achieving a low-carbon future and reducing greenhouse gas emissions.

Through education, innovation, and adherence to our climate commitments, we can make the necessary changes to protect the environment. We hope that together we will be able to create a better planet.

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Preface

Climate change is one of the most pressing challenges of our time, with the potential to affect the well-being and livelihoods of billions of people worldwide. The G20, comprising the world's 20 largest economies, has a crucial role to play in addressing this challenge. As a forum for international cooperation, the G20 has the power to drive policy change and mobilize resources on a global scale.

This edited volume brings together a diverse range of scholars and experts to explore the opportunities and challenges that climate change presents for the G20. The chapters in this book examine the G20's role in shaping global climate policy, its progress towards meeting its climate commitments, and the potential for cooperation and innovation among its member states.

The book begins with an overview of the G20's history and evolution as a forum for global economic governance, highlighting its growing emphasis on climate change in recent years. Subsequent chapters examine the G20's progress towards meeting its climate commitments, including its efforts to reduce greenhouse gas emissions, promote clean energy, and support climate adaptation and resilience.

Other chapters explore the role of the G20 in fostering international cooperation on climate change, including the potential for collaboration among its member states on key issues such as carbon pricing, technology transfer, and climate finance. The book also examines the challenges facing the G20 in addressing climate change, including political barriers, economic constraints, and competing priorities.

Overall, this edited volume offers a comprehensive and timely analysis of the opportunities and challenges that climate change presents for the G20. It is our hope that this book will inform and inspire policymakers, scholars, and practitioners as they work to address this critical global issue.

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G20 and its role in International Cooperation and Climate Change

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The G20 is a group of the world's largest economies, representing around 85% of global GDP, and is an important platform for international cooperation on a range of issues, including sustainable consumption. While the G20's primary focus has been on economic and financial matters, in recent years, there has been an increasing recognition of the importance of sustainable development and the role of sustainable consumption in achieving it.

The G20 can play a significant role in building climate-resilient communities through its policies, initiatives, and investments. Climate resilience refers to the ability of communities and ecosystems to adapt and recover from the impacts of climate change, such as extreme weather events, sea-level rise, and temperature increases. Here are some ways in which the G20 can promote climate resilience and build more resilient communities:

1. Promoting climate adaptation measures: The G20 can promote climate adaptation measures that increase the resilience of communities to the impacts of climate change. This includes investments in infrastructure, such as water management systems, coastal protection measures, and disaster risk reduction initiatives. The G20 can also support capacity-building initiatives to help communities develop and implement effective adaptation strategies.

2. Supporting sustainable agriculture and food systems: Climate change poses significant risks to global food security, particularly in developing countries. The G20 can support sustainable agriculture and food systems that promote resilience and adaptation to climate change. This includes investments in sustainable agriculture practices, such as conservation agriculture and agroforestry, as well as initiatives to promote food security and nutrition.

3. Encouraging private sector investment: The G20 can encourage private sector investment in climate-resilient infrastructure and businesses. This includes

providing incentives for investments in renewable energy, green infrastructure, and other climate-resilient technologies. The G20 can also promote public-private partnerships to support climate resilience initiatives.

4. Strengthening international cooperation: The G20 can strengthen international cooperation on climate resilience, particularly in developing countries that are most vulnerable to the impacts of climate change. This includes providing financial and technical support to developing countries to help them build climate resilience, as well as promoting knowledge-sharing and capacity-building initiatives.

5. Addressing social justice issues: The G20 can recognize the interconnectedness of climate resilience and social justice issues, such as poverty, inequality, and human rights. This includes promoting a just transition towards climate-resilient economies that prioritize the needs and rights of vulnerable communities.

The G20 can play a critical role in building climate-resilient communities by promoting climate adaptation measures, supporting sustainable agriculture and food systems, encouraging private sector investment, strengthening international cooperation, and addressing social justice issues. By taking these steps, the G20 can help promote sustainable development and ensure that communities are better able to adapt and thrive in a changing climate.

The G20 has taken several steps to promote sustainable consumption, including:

1. Adopting sustainable consumption and production (SCP) as a priority: The G20 has recognized SCP as a key component of sustainable development and has called for its implementation in its communiqués and action plans.
2. Encouraging sustainable practices by businesses: The G20 has encouraged businesses to adopt sustainable practices, including reducing waste and improving energy efficiency.
3. Promoting circular economy: The G20 has recognized the importance of the circular economy in promoting sustainable consumption and production, and has called for the adoption of circular economy principles in its action plans.
4. Supporting sustainable lifestyles: The G20 has recognized the importance of promoting sustainable lifestyles, including through education and awareness-raising campaigns.

5. Addressing food waste: The G20 has recognized the significant impact of food waste on the environment and has called for action to reduce it, including through the development of innovative solutions and better coordination between governments, businesses, and civil society.

We see that the G20 has an important role to play in promoting sustainable consumption, and its actions can have a significant impact on global sustainability. By adopting sustainable consumption and production as a priority, encouraging sustainable practices by businesses, promoting the circular economy, supporting sustainable lifestyles, and addressing food waste, the G20 can help to ensure a more sustainable future for all.

IMPACT OF CLIMATE CHANGE

Climate change has significant impacts on vulnerable communities, including their health and governance. Vulnerable communities, such as low-income communities and indigenous peoples, are more likely to be adversely affected by climate change due to their limited resources, lack of access to healthcare, and exposure to environmental hazards. Here are some of the impacts of climate change on vulnerable communities' health and governance:

1. Increased incidence of infectious diseases: Climate change is expected to increase the incidence of infectious diseases, such as malaria, dengue fever, and cholera, due to changes in temperature and rainfall patterns. Vulnerable communities are more susceptible to these diseases due to their lack of access to healthcare, poor sanitation, and living in areas with higher disease burden.

2. Heat-related illnesses: Climate change is causing more frequent and severe heatwaves, which can lead to heat exhaustion, heatstroke, and other heat-related illnesses. Vulnerable communities, such as the elderly, children, and people with pre-existing medical conditions, are more vulnerable to these illnesses.

3. Food insecurity: Climate change is expected to have significant impacts on food security, particularly in vulnerable communities. Changes in precipitation patterns and extreme weather events can lead to crop failures and food shortages, which can exacerbate malnutrition and health issues.

4. Mental health impacts: Climate change can have significant mental health impacts, particularly on vulnerable communities. Extreme weather events, such as hurricanes and floods, can lead to trauma, anxiety, and depression. Moreover, the uncertainty and fear associated with climate change can also impact mental health.

5. Governance challenges: Climate change can exacerbate governance challenges in vulnerable communities, including lack of access to basic services and resources, displacement due to natural disasters, and conflicts over resources. These challenges can lead to social unrest, political instability, and increased vulnerability to climate change impacts.

It is clear that climate change has significant impacts on vulnerable communities' health and governance. It is important to prioritize the needs of vulnerable communities in climate change adaptation and mitigation efforts to minimize the adverse impacts of climate change on their health and well-being. This includes ensuring access to healthcare, promoting food security, addressing mental health impacts, and improving governance in vulnerable communities.

The G20, as a group of the world's largest economies, has a crucial role to play in addressing climate change through international cooperation. The G20 countries are responsible for a significant proportion of global greenhouse gas emissions and have the resources and capacity to make a meaningful impact on climate change mitigation and adaptation efforts.

Here are some ways in which the G20 can promote international cooperation on climate change:

1. Committing to ambitious emissions reduction targets: The G20 can set ambitious emissions reduction targets and work towards achieving them through international cooperation. This includes sharing best practices, technologies, and policies that can help reduce emissions and promote sustainable development.

2. Investing in clean energy and green infrastructure: The G20 can encourage investment in clean energy and green infrastructure projects through public-private partnerships, financing mechanisms, and capacity building initiatives. This can help promote the transition towards a low-carbon economy and create jobs and economic opportunities in the process.

3. Promoting climate finance and adaptation measures: The G20 can promote climate finance and adaptation measures, particularly for developing countries that are most vulnerable to the impacts of climate change. This includes providing financial support for climate change adaptation and mitigation efforts, as well as capacity building initiatives to support the implementation of these measures.

4. Encouraging multilateral cooperation: The G20 can encourage multilateral cooperation on climate change, including through the United Nations Framework Convention on Climate Change (UNFCCC) and other international

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organizations. This includes promoting dialogue, sharing information and knowledge, and supporting the development and implementation of international agreements and protocols.

5. Addressing climate change and social justice: The G20 can recognize the interconnectedness of climate change and social justice issues, such as poverty, inequality, and human rights. This includes promoting a just transition towards a low-carbon economy that prioritizes the needs and rights of vulnerable communities, particularly in developing countries.

In conclusion, the G20 has a crucial role to play in promoting international cooperation on climate change. By committing to ambitious emissions reduction targets, investing in clean energy and green infrastructure, promoting climate finance and adaptation measures, encouraging multilateral cooperation, and addressing social justice issues, the G20 can make significant contributions to global efforts to mitigate and adapt to the impacts of climate change.

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The role of the G20 in promoting sustainable consumption and production pattern

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The group of G20 is the premier intergovernmental forum for international economic cooperation. The forum plays an important role in shaping and strengthening global architecture and governance on all major international economic issues.

India holds the presidency of the G20 from 1st December to 30th November of 2023 and the theme of India's G20 Presidency is “**vasudhaivakutumbkam**” or “**one earth, one family, one future**”.

- **Green development, climate finance and life**

India's focus on climate change, with a particular emphasis on climate finance and technology, as well as ensuring just energy transitions for developing countries.

Introduction of the Life movement, which promotes environmentally-conscious practices and is based on India's sustainable traditions.

- **Accelerated, Inclusive & Resilient Growth**

Focus on areas that have the potential to bring structural transformation, including supporting small and medium-sized enterprises in global trade, promoting labour rights and welfare, addressing the global skills gap, and building inclusive agricultural value chains and food systems.

- **Technological Transformation & Digital Public Infrastructure**

Promotion of a human-centric approach to technology and increased knowledge-sharing in areas such as digital public infrastructure, financial inclusion, and tech-enabled development in sectors such as agriculture and education.

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- **Women-led Development**

Emphasis on inclusive growth and development, with a focus on women empowerment and representation in order to boost socio-economic development and the achievement of SDGs.

- **Multilateral Institutions for the 21st century**

Efforts to reform multilateralism and create a more accountable, inclusive, and representative international system that is fit for addressing 21st century challenges. Our planet has provided us with an abundance of natural resources. But we have not utilized them responsibly and currently consume far beyond what our planet can provide. We must learn how to use and produce in sustainable ways that will reverse the harm that we have inflicted on the planet.

- **The Targets**

Everyone can help to make sure that we meet the Global Goals. Use these eleven targets to create action for responsible consumption and production.

IMPLEMENT THE 10-YEAR SUSTAINABLE CONSUMPTION AND PRODUCTION FRAMEWORK

SUSTAINABLE MANAGEMENT AND USE OF NATURAL RESOURCES

By 2030, achieve the sustainable management and efficient use of natural resources.

HALVE GLOBAL PER CAPITA FOOD WASTE

By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.

RESPONSIBLE MANAGEMENT OF CHEMICALS AND WASTE

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

SUBSTANTIALLY REDUCE WASTE GENERATION

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse.

ENCOURAGE COMPANIES TO ADOPT SUSTAINABLE PRACTICES AND SUSTAINABILITY REPORTING

Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

PROMOTE SUSTAINABLE PUBLIC PROCUREMENT PRACTICES

Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

PROMOTE UNIVERSAL UNDERSTANDING OF SUSTAINABLE LIFESTYLES

By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

SUPPORT DEVELOPING COUNTRIES' SCIENTIFIC AND TECHNOLOGICAL CAPACITY FOR SUSTAINABLE CONSUMPTION AND PRODUCTION

Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.

DEVELOP AND IMPLEMENT TOOLS TO MONITOR SUSTAINABLE TOURISM

Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.

REMOVE MARKET DISTORTIONS THAT ENCOURAGE WASTEFUL CONSUMPTION

Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

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Role of G 20 in Promoting Sustainable Energy Security

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Energy security, climate change, environmental degradation, habitat and biodiversity loss are some major challenges across the globe. Every government formulated some policies and implemented it to mitigate the adverse conditions which we are facing today. But somehow these are proven not enough, that's why Group of big economies came together to fight the common global challenges. This led to the formation of G 20- a critical forum of economic governance with the common agenda of sustainable development and to encourage the use of renewable resources of energy. Present study focus on the need of international cooperation and how far G 20 able to provide solutions for everyone.

INTRODUCTION

All the developing countries facing almost same challenge in production of economically and ecologically safer energy production, which is the need of today's world. Not only these countries but all the economies across the world is worried in tackling climate change together with social and economic progress. To face the problem of climate change together, Group of 20 (G 20)- a critical forum for global economic governance, came forward, where decisions regarding Global energy transitions are made which must be helpful to all. G 20 includes world's largest economies: Argentina, Australia, Brazil, Canada, China, the European Union (EU), France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, Republic of Korea, Turkey, the United Kingdom (UK) and the United States of America (USA)(G20 Research Group, 2018).

NEED OF GREEN AND CLEAN ENERGY

The fundamental source of development of any society is energy (Dias et.al. 2004) whether it is derived from sun, the ultimate source of energy or by other conventional or non-conventional sources (Costanza and Daly, 1992). Energy consumptions can be divided into : (i) As electricity supply which is the utmost necessities of industrial and household work, (ii) As oil and gas consumption in transportation system (Lund, 2007). To meet the energy consumption for economic needs of our rapidly growing society sources of fossil fuels were utilized badly from

the ancient time (Ghanadan and Koomey, 2005; Lund and Munster, 2006). Due to excessive and unplanned exploitation of resources cause an unbalanced environment (IEA, 2009). Burning of fossil fuels is one of the main causes of increased global greenhouse gases (**GHG**) emission in environment. Consequently, **global warming** (Hansen et. al., 2010), melting of glaciers, landslides, **soil erosion** and barren land production happened (Houghton, 2010). It caused a disbalance in nature. Increased human activities like **deforestation**, urbanisation, roads, railways, industries, mining, etc., increases the threat to habitat loss. Anthropomorphic alternations in the climate also plays an important role in habitat degradation and its loss (Scanes, 2018). **Habitat loss** is the greatest threat and could be the reason for the loss of variety of life forms on earth (Singh 2020).

So there is a need of judicious use of resources arises. Beside non-renewable resources of energy, renewable sources of energy are better for our environment-health (Afgan and Carvalho, 2002, 2004). For environmentally sustainable economic growth renewable energy provide the best solution which is everlasting as well as low maintenance.

Renewable resources are very cost-promising i.e. affordable, so they are economically favours the society and they are eco-friendly too as they provide clean energy. Renewable energy resources include- solar energy, wind energy, hydro-energy and biomass. These renewable resources seems much considerable and interesting because on one handtheystrengthen energy security and on other hand minimise GHG emission (Singh 2018, 2019). This will definitely reduce our dependence on fossil fuels.

CONCLUSION

It is a well-known fact that use of fossil fuel badly impact our environment and due to which several biomes are disrupted with disrupted food chains. There is a significant loss of biodiversity reported worldwide. Now it is well understood that only renewable energy can ensure energy security and restore climate change and biodiversity.

Collective move by the group (G 20) will have substantial effects on global energy markets (Ram et.al., 2018). Members of G 20 are establishing renewable energy sources in their countries and it is interesting to find that China and USA are highly competitive on renewable energy followed by Germany and UK. Canada and Brazil also proving themselves for providing cleaner energy. However, countries like Indonesia, Saudi Arabia, Russia, Argentina, Turkey including India are stands behind, indicating their disadvantages in renewable energy industries (Fang et al.,

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2018). But sooner or later these members also become completely green and clean energy producer as they are already working-on in this direction. Technology and labour factors may play a decisive role in the progress in the area of renewable energy establishment. We are progressing toward a better future.

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Studies on the anthelmintic activity of *Mentha piperita* oil on common poultry worms *Ascaridia galli* and *Heterakis gallinae*

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Fresh leaves of *Mentha* was dried in shade and oil was extracted using petroleum ether as solvent in soxhlet glass extractor for 20 to 24 hrs. The greasy mass obtained after the complete evaporation of solvent is suspended in ethyl alcohol. Different concentration of test solution i.e. 2%, 4% and 6% were prepared by diluting the solution and tested for *In vitro* anthelmintic activity. Different concentration 2%, 4% and 6% caused mortality in *A. galli* and *H. gallinae* after a maximum exposure of 16 hr. and 12 hr. *Mentha* oil reduced significantly the glucose uptake, glycogen content, oxygen consumption and relatively activity of acid and alkaline phosphomonoesterases in both the parasites. The possible mode of action is discussed.

INTRODUCTION

The present investigation aims at evaluating the efficacy of *Mentha piperita* (Mint) against two avian nematode parasites *Ascaridia galli* and *Heterakis gallinae*.

MATERIALS AND METHODS

Fresh leaves of mint is taken and dried in shade and ground with the help of electric grinder. This powder was filtered through a fine muslin cloth. This powder was then transferred to thimbles of whatman no. 1. filter paper in soxhlet glass apparatus. Petroleum ether was used as solvent and this was run for 24 to 30 hrs. The solvent was allow to complete evaporate. Oil thus left was taken out and used for further experiments. For determining its anthelmintic activity diff. conc. viz. 2%, 4% and 6% were tested *in vitro* against *A. galli* and *H. gallinae*. Suitable controls were run simultaneously. The parasites *A. galli* and *H. gallinae* were obtained from the intestine and caecum of the common fowl (*Gallus gallus*) slaughtered in local poultry forms. Worms were incubated at 38°C. Death was assumed to have occurred

when all signs of movement had ceased. Glucose uptake was determined by the method of Ahmad and Nizami (1987). Glycogen was estimated by the method of Good *et al.* (1933) as modified by Montgomery (1957). Lactic acid was measured by the method of Baker and Summerson (1941). Relative activities of the acid and alkaline phosphomonoesterases were determined following Bergmeyer (1971) whereas cholinesterase activity was measured by the method of Huerger *et al.* (1952) using acetylcholine as substrate.

RESULTS AND DISCUSSION

A. Effect of *M. piperita* oil on the parasites incubated *in vitro*

The *in vitro* incubation of parasites in different concentrations of peppermint oil caused mortality after 6-16 hrs. *A. galli* exhibited mortality after 16, 11 and 9 hrs. whereas in *H. gallinae* the mortality was observed after 12, 10 and 6 hrs. in 2, 4 and 6% peppermint oil, respectively.

Table-1

Changes in glucose uptake (mg/g wet weight) and glycogen contents (% wet wt.) in *A. galli* and *H. gallinae* after *in vitro* incubation with different concentrations of *M. piperita* oil.

Parasites	Concentration			
	Control	2%	4%	6%
Glucose uptake				
<i>A. galli</i>	5.5±0.17 ^a	3.5±0.14 (36.36)	2.8±0.1 (49.09)	2.2±0.22 (60%)
<i>H. gallinae</i>	6.2±0.17	4.4±0.72 (29.03)	3.7±0.12 (40.32)	3.0±0.1 (51.61)
Glycogen contents				
<i>A. galli</i>	7.3±0.14	5.3±0.24 (27.39)	4.6±0.14 (36.98)	3.7±0.13 (49.31)
<i>H. gallinae</i>	6.7±0.14	4.7±0.14 (28.35)	3.9±0.17 (41.79)	3.1±0.17 (53.73)

a. Mean ± S.D.

Value in parentheses are percent changes of control values.

Table-2

Changes in the rate of oxygen consumption (il/mg weight/hour) and lactic acid production (i mol/gm wet weight) in *A. galli* and *H. gallinae* exposed to different concentrations of *M. piperita* oil.

Parasites	Concentration			
	Control	2%	4%	6%
Rate of oxygen Consumption				
<i>A. galli</i>	5.5±0.12 ^a	3.8±0.14 (30.90)	3.2±0.14 (41.81)	2.4±0.14 (56.36)
<i>H. gallinae</i>	4.9±0.17	4.1±0.22 (16.32)	3.4±0.1 (30.61)	2.2±0.22 (55.10)
Lactic acid production				
<i>A. galli</i>	4.3±0.13	5.0±0.52 (17.37)	5.9±0.17 (38.49)	6.6±0.12 (54.92)
<i>H. gallinae</i>	6.0±0.19	6.9±0.30 (15.0)	7.7±0.02 (28.33)	8.6±0.13 (43.33)

a. Mean ± S.D.

Value in parentheses are percent changes of control values.

Table-3

Changes in acid and alkaline phosphomonoesterase (phosphatase units) and cholinesterase activity (i moles acetylcholine/hour) in *A. galli* and *H. gallinae* following *in vitro* incubation with different concentrations of *M. piperita* oil.

Parasites	Concentration					
	Control	2%	4%	6%	I ^a _{su}	r ^b
Acid Phosphomonoesterase						
<i>A. galli</i>	4.7±0.12 ^c	3.4±0.13 (27.65)	2.6±0.17 (44.68)	1.7±0.14 (63.82)	4.700	0.9963
<i>H. gallinae</i>	5.8±0.13	4.0±0.55 (31.03)	3.3±0.0 (43.10)	2.8±0.13 (51.72)	5.800	0.9842
Alkaline Phosphomonoesterase						
<i>A. galli</i>	5.3±0.12 ^c	3.3±0.12 (37.73)	2.8±0.1 (47.16)	2.2±0.22 (58.49)	5.129	0.9821
<i>H. gallinae</i>	4.7±0.14	3.5±0.14 (25.53)	2.9±0.12 (38.29)	2.3±0.21 (51.06)	5.875	0.9954
Cholinesterase						
<i>A. galli</i>	7.0±0.12	5.5±0.17 (21.42)	4.8±0.14 (31.42)	3.9±0.12 (44.28)	6.775	0.9821
<i>H. gallinae</i>	6.2±0.13	4.4±0.31 (29.03)	3.6±0 (41.93)	2.7±0.82 (56.45)	5.314	0.9964

- Concentration required for 50% inhibition.
- r = correlation coefficient of the activity of control and treated samples.
- Mean \pm S.D.
Values in parentheses are percent changes of control values.

Table-4

The effect of different concentrations of *M. Piperita* oil on host tissues (intestine and caecum) *in vitro*

	Concentration		
	2%	4%	6%
Glucose uptake	-	-	2.34*
Glycogen content	-	1.16	3.18
Rate of oxygen consumption	-	-	1.13
Lactic acid	-	-	1.34
Acid phosphomonoesterase	-	-	4.11
Alkaline phosphomonoesterase	-	-	1.02
Cholinesterases	-	-	-

- % reduction/enhancement of control values ($n \geq 10$)

B. Effect of *M. piperita* oil on the biochemical activities of the parasites

- Glucose uptake** : on *in vitro* treatment with peppermint oil (6%), glucose uptake was diminished by 60 and 52% in *A. galli* and *H. gallinae*, respectively (Table-1)
- Glycogen contents** : Glycogen contents were reduced by 49 and 54% in *A. galli* and *H. gallinae* when incubated with 6% peppermint oil for 9 and 6 hrs. respectively (Table-1).
- Rate of oxygen consumption** : Changes in the rate of oxygen consumption are given in Table-2. Peppermint oil (6%) reduced the rate of oxygen consumption by 56 and 55% in *A. galli* and *H. gallinae*, respectively.
- Lactic acid production** : When incubated *in vitro* with 6% peppermint oil, lactic acid production was enhanced by 55 and 43% in *A. galli* and *H. gallinae*, respectively (Table -2).
- Acid phosphomonoesterase activity** : Peppermint oil (6%) caused 64 and 52% inhibition in the activity of acid phosphomonoesterase in *A. galli* and *H. galliane*, respectively (Table-3).

- (vi) **Alkaline phosphomonoesterase activity** : As shown in Table-3 on *in vitro* incubation with the peppermint oil (6%), alkaline phosphomonoesterase activity was diminished by 58 and 51% in *A. galli* and *H. gallinae*, respectively.
- (vii) **Cholinesterase activity** : Cholinesterase activity was inhibited by 44 and 56% in *A. galli* and *H. gallinae*, respectively with 6% peppermint oil (Table-3).

C. Effect of *M. piperita* oil on host tissues

As shown in Table-4 no significant ($P>0.05$) change was observed in the biochemical activity of host tissues incubated with 2- 6% peppermint oil. The minor changes observed in various assay systems were not significant statistically.

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जल संसाधन : समृद्धि हेतु उपयोग करें, भविष्य के लिए बचायें

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जल एक अनमोल प्राकृतिक संपदा है जिसके बिना जीवन की कल्पना भी नहीं की जा सकती। किसी भी समाज का विकास वहां उपस्थित जल संसाधनों पर निर्भर करता है। पृथ्वी के 75% भाग पर जलीय आवरण है जो कि नदियों, तालाबों, समन्दर-सागरों के रूप में देखा जा सकता है। पृथ्वी पर कुल जल का 97.6% महासागरों में तथा 2.4% सागर, नदी, झील, तालाब, जलवाष्प, भूजल, हिमखण्ड तथा ग्लेशियरों में पाया जाता है। नदियाँ, तालाबों, तथा जलाशयों में उपस्थित जल, कुल जल का 1% से भी कम भाग है।

पृथ्वी पर जल का वितरण		
1	महासागर	97.6%
2	हिमखण्ड	1.8%
3	भूजल	0.5%
4	नदी, तालाब आदि	0.02%
5	मृदा वाष्प	0.01%
6	वायुमण्डलीय नमी	0.0001%

यह जल पृथ्वी पर उपस्थित जीवधारियों के लिए अत्यंत आवश्यक है और इसी से जीवन संभव है। सौरमंडल में पृथ्वी ही ऐसा ग्रह है जिस पर जल का अथाह भण्डार है। जल-जीवधारियों में जल उपस्थित जीवद्रव्य का प्रमुख घटक है। जीवधारियों में विभिन्न जैविक क्रियाओं को संपन्न करने में जल, द्रव्य का 70% भाग जल होता है। जल एक प्रमुख पारिस्थितिकीय भौतिक संघटक है जो की पारिस्थितिक तंत्र के आकार तथा इस की प्रक्रियाओं को निर्धारित करता है। यही कारण है कि प्राचीन काल में मानव सभ्यता नदियों के किनारे विकसित हुई। मानव ने जमीन और जल के सम्बन्ध को समझ लिया और जल दोहन की अत्याधुनिक तकनीकों का प्रयोग करना शुरू कर दिया।

वाष्पीकरण विधि द्वारा जल निरंतर सागरों से वायुमंडल में तथा वायुमंडल से वर्षा तथा बर्फ के रूप में पुनः सागरों में तथा जमीन पर आ जाता है। जमीन से बहकर तालाबों, जलाशयों, नदियों के रास्ते सागरों में पहुँच जाता है। सौर ऊर्जा का एक तिहाई भाग को कुल जल का 0.004% भाग को जल चक्र में बनाये रखने का खर्च होता है।

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अलवणीयजल एक प्रमुख पदार्थ है। जिस पर मानव जीवन आश्रित है। हिन्दू मान्यता के अनुसार ब्रह्मांड का निर्माण पांच तत्व-भूमि, वायु, अग्नि, आकाश, तथा जल से हुआ है। इनमें से जल प्रमुख है। कुल जल का मात्र 1% भाग ही उपयोग के लिए उपलब्ध है। जिसका 73% भाग कृषि, उद्योग तथा घरेलू व अन्य उपयोग हेतु उपलब्ध है।

अलवणीय जल का वितरण			
1	बर्फ	80 प्रतिशत	—
2	पानी/तरल	20 प्रतिशत	—
	(क) तालाब	0.2 प्रतिशत	1 प्रतिशत
	(ख) मृदा	0.04 प्रतिशत	0.2 प्रतिशत
	(ग) नदियों	0.02 प्रतिशत	0.1 प्रतिशत
	(घ) वायुमंडल	0.02 प्रतिशत	0.1 प्रतिशत
	(ङ) भूजल	19.7 प्रतिशत	98.4 प्रतिशत

भारतीय नदियों में जल का स्रोत मुख्यतः वर्षा जल तथा कुछ भाग बर्फ के पिघलने से आता है। मानसून जो जून से सितम्बर माह तक रहता है, नदियों में जल उपलब्ध कराता है। वार्षिक वर्षा के संदर्भ में भारत भाग्यशाली है। भारत को औसतन 400 (मिलियन हेक्टेयर मीटर) वर्षा जल के रूप में प्राप्त है जिसमें से 187 मिलियन हेक्टेयर मीटर (वार्षिक जल का 47 प्रतिशत) सतही जल के रूप में प्राप्त होता है। इसमें से 69 मिलियन हेक्टेयर मीटर, कुल उपलब्ध सतही जलका 37% भाग ही हम उपयोग कर पा रहे क्योंकि हमारे पास पर्याप्त भंडारण क्षमता नहीं है। भारत के विभिन्न जलाशयों में कुल जल उपलब्धता को सारणी ३ में दर्शाया गया है।

भारत के जलाशयों में कुल वार्षिक जल उपलब्धता		
क्र.सं.	नदियों के नाम	कुल वार्षिक जल क्षमता
1	सिन्धु	73.31
(अ)	गंगा	525.02
(ब)	ब्रह्मपुत्र बेसन व अन्य	585.60
2	गोदावरी	110.5
3	कृष्णा	78.12
4	कावेरी	21.36
5	पेन्नार	6.32
6	पेन्नार और कन्याकुमारी के मध्य पूर्व दिशा में बहने वाली नदियां	16.46
7	महानदी और पेन्नारके मध्य पूर्व दिशा में बहने वाली नदियां	22.52
8	महानदी	66.88
9	ब्राम्हणी और बैतरणी	28.48
10	सुवणरेखा	12.37
11	सबरमती	3.81

12	माही	11.02
13	कच्छ, साबरमती, लूनी सहित पश्चिम में बहने वाली नदियाँ	15.10
14	नर्मदा	45.64
15	तापी	14.88
16	तापी से ताद्री तक पश्चिम में बहने वाली नदियाँ	87.41
17	ताद्री से कन्याकुमारी तक पश्चिम में बहने वाली नदियाँ	113.53
18	राजस्थान के मरुस्थल के प्रवाह क्षेत्र	न्यूनतम
19	बांग्लादेश और बर्मा की ओर की छोटी नदियों के बेसिन	31.00
	योग	186.33

भारत को औसतन 4000 बिलियन क्यूबिक मीटर वार्षिक वर्षा जल उपलब्ध होता है जिसमें से 1100 बिलियन क्यूबिक मीटर जल अरब सागर तथा बंगाल की खाड़ी में बह जाता है। इसमें से 250 बिलियन क्यूबिक मीटर जल को नदियों को जोड़कर रखना प्रस्तावित है।

भारत की जनगणना 1 मार्च 2011 के अनुसार भारत की आबादी 12,100 लाख है। जनसंख्या की वृद्धि पिछले 100 वर्षों में जिस दर से हुई है सारणी 4 में दर्शाया गया है जो एक चिंता का विषय है।

भारत की जनसंख्या 1901 से 2001 तक		
जनगणना का वर्ष	जनसंख्या	दशक में वृद्धि
1901	23,83,96,327	—
1911	25,20,93,390	1,36,97,063
1921	25,13,21,213	7,72,177
1931	27,89,77,238	2,76,56,025
1941	31,86,60,580	3,96,83,342
1951	36,10,88,090	4,24,27,510
1961	43,92,34,771	7,81,46,681
1971	54,81,59,652	10,89,24,881
1981	68,33,29,097	13,51,69,445
1991	84,64,21,039	16,30,91,942
2001	1,02,87,37,436	18,23,16,397
2011	1,21,01,93,422	18,14,55,986

इस बढ़ती मांग को पुरा करने के लिए हमें सभी संसाधनों द्वारा उपलब्ध जल को पूर्ण रूप से उपयोगी जल के बराबर करना होगा। यह तभी संभव है जब देश से जुड़ी सभी प्रमुख नदियाँ एक दूसरे से जुड़ी हों।

जल संसाधन जल के मुख्य स्रोत है। मानव इन संसाधनों का उपयोग कृषि, उद्योग, घरेलू तथा अन्ध उपयोगों में करता है। इन सभी पूर्तियों हेतु मानव को अलवणीय जल की आवश्यकता होती है। अलवणीय जल एक नवीकरण स्रोत है। फिर भी विश्व की स्वच्छ जल आपूर्ति धीरे-धीरे कम होती जा रही है। विश्व की बढ़ती आबादी के कारण विश्व के कई भागों में जल की मांग इस की उपलब्धता से आगे निकल गई है। वही खाद्य मांगों में वृद्धि हो रही है। इस मांग को हमें सीमित जल संसाधनों से पूरा करना है जिसके लिए हमने सिंचाई की नई विकसित तकनीकों का उपयोग किया है। विश्व में कुल उपलब्ध उपयोगी जल का 69% कृषि में उपयोग होता है, 22% उद्योगों में, जिसमें शामिल है ऊर्जा सयंत्र, तेल रिफाइनरियां तथा अन्य उद्योग।

वर्ष 2000 में विश्व की जनसंख्या 6.2 बिलियन पार कर गई। सयुक्त राष्ट्र के अनुमान के अनुसार 2050 तक 3.5 बिलियन की और वृद्धि निश्चित है। यह वृद्धि विकासशील देशों में अनेक होगी जो आज भी जल-संकट की अवस्था से गुजर रहे हैं, भविष्य में क्या होगा?

विश्व व्यापार संघटन के अनुसार यदि कृषि, उद्योग तथा घरेलू आदि उपयोगों के लिए जल प्रयाप्त मात्रा में उपलब्ध न हो तो इस अवस्था को बाटर स्ट्रेस कहते हैं।

2001 की जनगणना के अनुसार भारत के शहरों की जनसंख्या बहुत तेजी से बढ़ी है। 1901 में 238.9 मिलियन आबादी, जो कुल जनसंख्या का 10.84 प्रतिशत था। शहरी आबादी बीते 100 वर्षों में (2001 तक) बढ़कर 1027 मिलियन हो गई जो कुल जनसंख्या का 30.5 प्रतिशत है। बढ़ती आबादी के कारण संसाधनों पर दबाव बढ़ता जा रहा है। जनसंख्या बढ़ती जा रही है लेकिन संसाधन सीमित है। मुंबई में 1995 में 3026 मिलियन ली. जल प्रति दिन की मांग थी जबकि कुल 60 प्रतिशत मांग को ही पूरा करना संभव था। दिल्ली की कुल मांग 3600 मिलियन ली. जल प्रतिदिन की तुलना में कुल 2947.5 मिलियन ली. जल प्रति दिन की पूर्ति हो रही थी। भारत में एक ग्रामीण को लगभग 12 ली. जल प्रति दिन की आवश्यकता हाती है, वही प्रत्येक शहरी प्रति दिन 50-200 ली. जल का उपभोग करता है। तात्पर्य यह है की जीवन स्तर में सुधार के साथ साथ जल की आवश्यकता भी बढ़ती जाती है।

विकासशील देशों की काफी जनसंख्या पर्याप्त जल के अभाव को झेल रही है। भारत के करीब 8000 गावों में पानी है, महिलाएँ तथा बच्चों को लम्बी दूरी तय कर घरेलू उपयोग के लिए जल स्रोतों तक जाना पड़ता है। यह अनुमानित है कि 16 मिलियन हेक्टेयर मीटर भूगर्भ जल हमारे लिए उपलब्ध है जिसमे से 10.5 मिलियन हेक्टेयर मीटर सिंचाई में प्रयोग हो रहा है।

पूरे विश्व में जलवायु-परिवर्तन के कारण जल संसाधनों पर अधिक असर पड़ रहा है क्योंकि जलवायु तथा जल चक्र एक दुसरे के पर्याय है। पृथ्वी के बढ़ते ताप के कारण वाष्पीकरण अधिक हो रहा है तथा वर्षा के पैटर्न में बदलाव आ रहा है। भारत का चेरापूँजी, जहाँ सर्वाधिक वर्षा होती थी, पिछले वर्षों में वर्षा की दर में कमी आई है। अत्यधिक वर्षा होने के कारण बाढ़ तथा सूखे की समस्या मैदानी तथा पहाड़ी क्षेत्रों में अत्यधिक हिमपात की समस्या उत्पन्न हुई है। तापमान अधिक होने के

कारण जल की गुणवत्ता भी प्रभावित होती है तथा सिंचाई की भी आवश्यकता के कारण जल का दोहन अधिक हो रहा है।

विश्व की बढ़ती आबादी के कारण जलाशय खत्म होते जा रहे हैं, लाखों पम्प अंधाधुंध भूगर्भ जल का दोहन कर रहे हैं। घनी आबादी वाले क्षेत्र, जहाँ हर 10-20 मीटर की दूरी पर पम्प की पाइप पड़ी हुई है। जल के अत्यधिक दोहन के कारण, मैक्सिको सिटी, बैंकॉक, मनीला, बीजिंग, शंघाई, चेन्नू आदि शहरों का जल स्तर 10-15 मीटर नीचे खिसक गया है।

भारत, पाकिस्तान तथा बंगलादेश के बड़े क्षेत्रों में ट्यूबवेल से अत्यधिक जल दोहन के कारण अनेक समस्याएँ पैदा हो रही हैं। जल स्तर निरंतर गिरता जा रहा है।

पृथ्वी पर पीने योग्य जल की सीमित मात्रा ही उपलब्ध है। औद्योगिक क्षेत्र का जिस गति से विस्तार हुआ है, उससे भूजल की मांग में अप्रत्याशित वृद्धि के चलते धरती की कोख में समाये पानी का अनियोजित, असीमित एवं अंधाधुंध दोहन हो रहा है। इसके चलते देश के कई क्षेत्रों में भूजल दोहन की स्थिति वहाँ पर वर्षा की वार्षिक प्रतिपूर्ति से अधिक है। जल स्तर में आ रही निरंतर गिरावट के कारण दलदली तथा तराई भूमि का क्षेत्र दिन-ब-दिन कम होता जा रहा है जिसके फलस्वरूप विभिन्न वनस्पतियाँ तथा जंतुओं की अनेक प्रजातियाँ लुप्त हो चुकी है और अनेक लुप्त होने की कगार पर हैं। पारिस्थितिक तंत्र गड़बड़ा रहे हैं।

अस्थिरता की स्थिति उत्पन्न हो रही है। बीसवीं शताब्दी तक हम विश्व के आधे से ज्यादा तराई क्षेत्रों को खो चुके हैं। अलवणीय जल पारिस्थितिकी तंत्र में जैवविविधता की हानि, लवणीयजल तथा मृदा पारिस्थितिकी तंत्र में उपलब्ध जैवविविधता की तुलना में अधिक हुई है।

यूरोप में तराई क्षेत्र के नष्ट होने कारण वहाँ की जैव विविधता खत्म हो गयी है। उनाईटेड नेशन क्लाइमेट रिपोर्ट के अनुसार हिमालय पर्वत श्रृंखला के वर्फीले ग्लेशियर एशिया में बहने वाली प्रमुख नदियों का जल स्रोत है। इन नदियों पर लगभग 2.4 बिलियन आबादी आश्रित है। पृथ्वी के बढ़ते ताप के कारण यह अनुमान लगाया गया है कि 2035 तक हम इन ग्लेशियरों को खो देंगे जिस कारण भारत, चीन, पाकिस्तान, बंगलादेश तह नेपाल में पहले बाढ़ और फिर सूखे की स्थिति उत्पन्न होगी। वर्ष 2035 जनसंख्या को पेयजल संकट का सामना करना पड़ेगा।

धरती का सीना चीरकर लगातार पानी निकालने से मैक्सिको सिटी, बैंकॉक व वेनिस में जमीन धंसने की समस्या उत्पन्न हो गई है। यदि यही स्थिति रही तो धरती की कोख सूख जाएगी। हम तो नवीन प्रौद्योगिकी के बल पर जल प्राप्त कर लेंगे। लेकिन पृथ्वी को प्राणवान वायु देने वाले इन पौधों का क्या होगा? क्या इनके बिना हमारा जीवन संभव है।

जेनिफर वाइट और डेविड वार्गस वर्षा जल संरक्षण के क्षेत्र में कार्य कर रहे हैं। इनके अनुसार मैक्सिको शहर के 36% घरों को प्रयाप्त जल नहीं मिल पा रहा है। इस शहर में हफ्ते में केवल कुछ घंटे

ही पानी की आपूर्ति दी जाती है। इनके प्रयासों से वर्षा जल के संचय के लिए शहर में 110 तंत्र विकसित किये हैं जिनसे 416500 लीटर पानी संचित हो रहा है जिससे 740 घरों में जलापूर्ति हो रही है। संयुक्त राष्ट्र संघ के अनुसार विश्व के विकासशील देशों के 200 मिलियन लोगों के पास स्वच्छ जल का उपलब्ध नहीं है। शहरीकरण तथा औद्योगिकीकरण के कारण स्वच्छ जल स्रोत प्रदूषित हो रहे हैं।

भारत में पीने के लिए 90% जल नदियों से आता है जो मानवीय क्रियाकलापों के कारण प्रदूषित हो गई है। गंगा में 873 मिलियन लीटर प्रति दिन दूषित जल डाला जा रहा है रेनवाटर हार्वेस्टिंग, बम्बू ड्रिप सिंचाई, तालाब, कुण्डों का विकास आदि। जल की बढ़ती आवश्यकता तथा घटती उपलब्धता के कारण देशों की सीमाओं के बीच जल संसाधनों को लेकर तनाव तथा विवाद की स्थिति उत्पन्न हो रही है।

भारत 2005				
विभिन्न क्षेत्रों में जल की बढ़ती				
क.सं.	क्षेत्र	2010	2025	2050
1	सिंचाई	688	910	1072
2	घरेलू उपयोग	56	73	102
3	उद्योग	12	23	63
4	ऊर्जा	5	15	130
5	अन्य	52	72	80
	कुल	813	1093	1447

अर्थ-सम्मित-2002 के अनुसार वर्ष 2025 के मध्य तक आधे पृथ्वीवासियों के पास पर्याप्त जल की उपलब्धता नहीं होगी। कुछ विकसित देश जैसे उत्तरी अमेरिका, यूरोप, रूस आदि में 2025 तक जल की समस्या नहीं होगी क्योंकि इन देशों की जनसंख्या वृद्धि जल संसाधनों के अनुरूप है। केंद्रीय जल आयोग के अनुसार विश्व में भारत ऐसा देश है जहाँ बड़े क्षेत्र की सिंचाई की जाती है जो कि 59 मिलियन हेक्टेयर है। 1997 में इस क्षेत्र की सिंचाई के 501 बिलियन क्यूबिक मीटर जल का उपभोग होता था जो आने वाले वर्षों में और बढ़ा है।

लुधियाना को भारत का मैनचेस्टर कहा जाता है। यह भारत के प्रदेश पंजाब का तेजी से विकसित हो रहा शहर है। यह दिल्ली के 250 कि.मी की दुरी पर स्थिति है। जो पंजाब का सबसे आबादी वाला शहर है। 1991 की जनगणना के अनुसार शहर की आबादी 1 मिलियन को पार कर गई थी बढ़ती आबादी औद्योगिक विकास के कारण शहर जल प्रदूषण व भूगर्भ जल के आभाव से ग्रसित है।

विकासशील देशों में देशवासियों को सुरक्षित जल की आवश्यकता के स्तर में 1970 से 2004 तक लगातार वृद्धि हो रही है विश्व बैंक के अनुसार भारत में प्रति व्यक्ति पेयजल उपलब्धता में 15 से 20% की कमी आई है।

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हाल ही में प्रकाशित एक रिपोर्ट के अनुसार वर्ष 2050 तक भारत के विभिन्न क्षेत्रों में जल की मांग उपलब्ध स्रोत में कुल उपलब्ध जल को पार कर जाएगी। भारत की तेजी से विकसित होती है अर्थव्यवस्था के कारण आने वाले 2 दशकों में भारत में गौर जल संकट उत्पन्न होने वाला है भारत में 21% संक्रामक बीमारियां प्रदूषित जल से फैलती हैं।

भारत का मुंबई शहर इस समय 650 मिलियन लीटर प्रतिदिन जल की कमी झेल रहा है।

विश्व बैंक नए भारत की राजधानी दिल्ली को जल उपलब्धता के पैमाने में एशिया का सबसे संकटग्रस्त शहर माना है जबकि मुंबई दूसरे स्थान पर है।

संयुक्त राष्ट्र संघ ने 22 मार्च को विश्व जल दिवस के रूप में मनाने की घोषणा की है 15 साल से अधिक समय तक चली चर्चा के बाद The Right to safe and clean water and Sanitation Resolution पारित किया के मानव अधिकारों की पूर्ति तथा जीवन के पूर्ण आनंद के लिए आवश्यक है।

भारत सरकार ने सूखा तथा बाढ़ से निपटने के लिए अत्याधुनिक प्रौद्योगिकी और क्षमता का उपयोग करके सभी प्राण धारियों का समन्वय करके भारत के जल संसाधनों के एकीकृत और दीर्घकालीन विकास और प्रबंधन को बढ़ावा देने के उद्देश्य से केंद्रीय जल आयोग का गठन किया गया।

भारतीय कंपनियों जल संकट के समाधान के लिए परमाणु अलवणीकरण रिपक्टर से उम्मीदें बांधे हुई हैं। विश्व नाभिकीय संगठन के अनुसार भारत 1970 से अलवणीकरण अनुसंधान में लगा हुआ है, लवणीय जल को पीने योग्य बनाने के प्रयास किए तो जा रहे हैं लेकिन इस पर लागत इतनी अधिक है कि कुछ देश ही थोड़ी मात्रा में इस विधि से जल उपलब्ध करा रहे हैं। इजरायल लवणीय जल से अलवणीय जल का उत्पादन 53 सेंट प्रति क्यूबिक मीटर कि दर से कर रहा है जबकि सिंगापुर 49 सेंट प्रति क्यूबिक मीटर, भारत तथा चीन जो विश्व के सर्वाधिक जनसंख्या वाले देश हैं इस विधि को विकसित करने में तत्पर हैं। 2007 में पाकिस्तान ने संयंत्र के प्लान की घोषणा की तथा बरमूडा में संयंत्र की खरीद के लिए हस्ताक्षर किए।

भारत का 3.29 मिलियन किलोमीटर क्षेत्रफल जो विश्व के क्षेत्रफल का 2.4% है अनुपात में 1/50 वां विश्व भूमि तथा 1/25 वां विश्व स्रोत जिन पर 1/6 वां विश्व की जनसंख्या आश्रित है, इसलिए जल संसाधनों के संरक्षण तथा इनके नियोजित उपयोग की जिम्मेदारी में हमारी भूमिका मुख्य है, अन्यथा परिणाम बहुत गंभीर होंगे। यह किसी विकसित तथा आदित्य देश की समस्या नहीं बल्कि पूरे विश्व की समस्या है, जिसमें प्रत्येक राष्ट्रवाद व्यक्ति की सक्रियता व सहयोग की आवश्यकता है क्योंकि बूंद-बूंद से सागर भरता है। इस पहले तथा पवित्र प्रयास के लिए हमें खुद से जल बचाने का संकल्प करना होगा।

जलवायु परिवर्तन और जी-20 अवसर एवं चुनौतियाँ

सुनीता जायसवाल

विभागाध्यक्ष-संस्कृत

राजकीय महिला स्नातकोत्तर महाविद्यालय

रामपुर (उ०प्र०) पिन-244901

जलवायु परिवर्तन और जी-20 अवसर एवं चुनौतियाँ विषयक मेरे सम्पूर्ण शोधपत्र में मैने भूमिका, जलवायु शब्द की व्युत्पत्ति एवं अर्थ, जलवायु शब्द का शाब्दिक अर्थ, जलवायु की परिभाषा, जलवायु के आधारभूत घटक तत्त्व, जलवायु की विशेषताएँ, जलवायु का महत्त्वपूर्ण प्रभाव, जलवायु के प्रकार, जलवायु परिवर्तन की परिभाषा, जलवायु परिवर्तन के प्राकृतिक एवं मानवीय कारण, जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणाम, जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणामों के वास्तविक एवं अनुमानित आँकड़े, जलवायु परिवर्तन को नियन्त्रित करने के साधन एवं उपाय, जी-20 क्या है, जी-20 के सदस्य, जी-20 की अध्यक्षता, जलवायु परिवर्तन और पर्यावरण सम्बन्धी जी-20 का शिखर सम्मेलन एवं भारत द्वारा लिये गये निर्णयों की घोषणा, भारत में आयोजित जी-20 शिखर सम्मेलन के नकारात्मक पहलू, जी-20 अवसर की अपार सम्भवनाएँ, जी-20 के समक्ष विद्यमान प्रमुख चुनौतियाँ, चुनौतियों का सामना करने तथा समस्याओं का समाधान करने हेतु सुझाव, निष्कर्ष तथा सन्दर्भसूची आदि बिन्दुओं पर 55 प्रामाणिक सन्दर्भों के आधार पर शोधपरक समीक्षात्मक अध्ययन, विश्लेषण, चिन्तन एवं मनन के उपरान्त निष्कर्ष प्रस्तुत किया है।

भूमिका

परिवर्तन प्रकृति का शाश्वत नियम है। यह कभी तीव्र तो कभी मन्द गति से होता है। कुछ परिवर्तन लाभकारी होते हैं तो कुछ विनाशकारी। ध्यातव्य है कि पृथिवी के उद्भव से लेकर अद्यतन इसमें निरन्तर परिवर्तन हो रहा है। मानव जीवन पर प्रभाव डालने वाले तत्त्वों में जलवायु सर्वाधिक प्रभावशाली है क्योंकि यह पर्यावरण, पारिस्थितिकी एवं प्रकृति के अन्य कारकों को भी सृजित, पल्लवित, पोषित, नियमित एवं नियन्त्रित करता है। सभ्यता के उद्भव एवं विकास का सम्बन्ध जलवायु से रहा है, क्योंकि जलवायु एक शक्तिशाली तत्त्व है।

करोड़ों वर्ष पूर्व जब पृथ्वी का निर्माण हुआ था तब वह एक तपता हुआ गोला थी। शनैः शनैः उस तपते हुए गोले से नदी, सागर, पर्वत और महाद्वीपों आदि का निर्माण हुआ। इसके साथ ही पृथ्वी पर अनुकूल जलवायु ने मानव जीवन तथा अन्य जीव सृष्टि को जीवन प्रदान किया जिससे विविध प्रकार के जीव-जन्तु, पेड़-पौधे, विभिन्न वनस्पतियों और इन सभी का जीवन और अस्तित्व बनाए रखने वाली प्रकृति का सृजन हुआ।

मानव जीवन के उद्भवकाल से ही सृष्टि के क्षिति, जल, पावक, गगन तथा समीर शुद्ध व निर्मल थे। मानव के विचार भी शुद्ध थे। निर्मल एवं हरित प्रकृति में सभी प्राणी, जीव-जन्तु, पेड़-पौधे स्वतन्त्र एवं उन्मुक्त रूप से प्रादुर्भूत, पल्लवित एवं पुष्पित होते थे। चतुर्विक “वसुधैव कुटुम्बकम्” की उदात्त भावना एवं वातावरण परिलक्षित होता था। प्रकृति तथा पर्यावरण सम्यक् रूपेण पूर्णतया स्वस्थ एवं सन्तुलित थे परन्तु शनैः शनैः मानव ने विकास और आवश्यकताओं की पूर्ति के लिए प्राकृतिक तत्त्वों एवं संसाधनों का भरपूर उपयोग एवं दोहन किया है। मनुष्य की प्रत्येक आवश्यकता की पूर्ति एवं समस्या का समाधान प्रकृति ने ही किया है। किन्तु इसके बदले में मनुष्य ने पर्यावरण प्रदूषण जैसी गम्भीर विकट विकराल समस्या उत्पन्न कर दी है तथा जलवायु का विनाशकारी परिवर्तन कर दिया है। आधुनिक शहरीकरण, औद्योगीकरण, सूचना प्रौद्योगिकी, कम्प्यूटर, इन्टरनेट के वैज्ञानिक एवं तकनीकी युग में मानव द्वारा नैसर्गिक संसाधनों का अत्यधिक अपरिमित दोहन, दिशाविहीन विकास, अन्धाधुंध एवं निरन्तर भौतिकवादिता की माँग। निजी आवश्यकताओं की पूर्ति एवं निजी स्वार्थसिद्धि, विलासितापूर्ण जीवन, सुखोपभोग की लालसा, भौतिक सुख-सुविधाओं एवं संयन्त्रों का उपयोग, व्यक्तिवादिता एवं प्रतिस्पर्धा, वाह्य आडम्बर एवं प्रदर्शन की संकीर्ण प्रवृत्ति ने सम्पूर्ण पर्यावरणीय पारिस्थितिकीय गुणवत्ता को अत्यधिक प्रभावित किया है जिसके परिणामस्वरूप जलवायु परिवर्तन में द्वास एवं विनाश की प्रवृत्ति तथा गुणवत्ता में भारी गिरावट परिलक्षित हो रही है। विनाशकारी जलवायु परिवर्तन एक विश्वस्तरीय गम्भीर मुद्दा है। वैश्विक विकट विकराल समस्या, ज्वलन्त विचारणीय विषय है। वैश्विक स्तर पर प्रकृष्ट चुनौती बनी हुई है तथा विश्वस्तरीय जलवायु परिवर्तन की समस्या से सम्पूर्ण विश्व प्रभावित और चिन्तित है।

“जलवायु” शब्द की व्युत्पत्ति एवं अर्थ- “जलवायु” शब्द जल तथा वायु इन दो शब्दों के योग से निष्पन्न हुआ है। जलवायु को अंग्रेजी भाषा में Climate कहते हैं। Climate शब्द की व्युत्पत्ति ग्रीक भाषा के “क्लाइमा” (Klima) से हुई है, जिसका अर्थ होता है झुकाव (Inclination) अथवा सूर्य की किरणों का तिरछापन।

“जलवायु” शब्द का शाब्दिक अर्थ- जलवायु एक विस्तृत एवं व्यापक अर्थों में प्रयुक्त होने वाला शब्द है, जिससे किसी प्रदेश के दीर्घकालीन मौसम का आभास होता है। इस शब्द की व्युत्पत्ति जल तथा वायु शब्द के पारस्परिक योग से हुई है जिसका शाब्दिक अर्थ वायुमण्डल के जल एवं वायु प्रारूप से है। यह शब्द वायुमण्डल के संघटक का द्योतक है।

जलवायु की परिभाषा- एक दीर्घकालावधि तक पृथ्वी एवं वायुमण्डल में ऊर्जा एवं पदार्थ के विनिमय की क्रियाओं का प्रतिफल जलवायु है। अतः जलवायु न केवल सांख्यिकीय औसत से बढ़कर है, अपितु इसके अन्तर्गत ऊष्मा, आर्द्रता तथा पवन संचालन जैसी वायुमण्डलीय दबाओं का योग सम्मिलित है।

एक विशाल क्षेत्र में दीर्घकालावधि अर्थात् 30 वर्षों से भी अधिक समय में मौसम की अवस्थाओं तथा विविधताओं का कुल योग ही जलवायु है। मौसम एक विशेष समय में एक क्षेत्रविशेष के वायुमण्डल की अवस्था को व्यक्त करता है। मौसम और जलवायु के तत्त्व एक ही होते हैं।

किसी क्षेत्रविशेष का किसी एक प्रकार का औसत मौसम यदि दीर्घकालवधि से बना रहता है तो उसे उस क्षेत्रविशेष की जलवायु कहा जाता है। मौसम जहाँ कुछ दिनों में या कुछ घन्टों में परिवर्तित हो सकता है, वहीं जलवायु को परिवर्तित होने में सैकड़ों हज़ारों वर्ष का समय लग जाता है तथा जलवायु में शनैः शनैः परिवर्तन होता है। जलवायु और मौसम की पहचान इनके तापमान, वर्षा और वाष्पीकरण के आधार पर की जाती है।

जलवायु के आधारभूत घटक तत्त्व- जलवायु के आधारभूत घटक प्रमुख तत्त्वों में स्थान विशेष का वायुदाब, तापमान, आर्द्रता, वर्षा, सौरप्रकाश, स्थानविशेष की भौगोलिक स्थिति, अक्षांश-देशान्तर, ऊष्मा, हवाएँ, वायुराशि, जलराशि, जल-थल का आबन्धन, पर्वत, नदियाँ, महासागरीय धाराएँ, निम्न एवं उच्च दाब पट्टियाँ, अवदाब, आँधी, तूफान, अतिवृष्टि, अनावृष्टि आदि की गणना की जाती है।

जलवायु की विशेषताएँ- जलवायु की विशेषताएँ निम्नलिखित हैं-

1. जलवायु दीर्घकालावधि के औसत मौसम की दशाओं का परिचायक है।
2. जलवायु मात्र सांख्यिकीय औसत ही नहीं है अपितु इसके अन्तर्गत दीर्घकालावधि में उत्पन्न वायुमण्डलीय विक्षोभों एवं परिवर्तनों को भी सम्मिलित किया जाता है।
3. जलवायु एक विस्तृत प्रदेश की वायुमण्डलीय दशाओं का प्रतिनिधित्व करती है।
4. जलवायु द्वारा पृथिवी एवं वायुमण्डल में दीर्घकालीन ऊर्जा एवं पदार्थों के विनियम की प्रक्रिया का आभास होता है।
5. जलवायु किसी प्रदेश की स्थायी वायुमण्डलीय विशेषताओं का प्रतिनिधित्व करती है।

जलवायु का महत्वपूर्ण प्रभाव- जलवायु पर्यावरण को विभिन्न प्रकार से प्रभावित करती है। प्राकृतिक वनस्पतियाँ, जीव-जन्तु तथा मनुष्य के क्रिया-कलाप पूर्णतः जलवायु की अवस्था पर ही निर्भर करते हैं। जिन फसलों से मनुष्यों तथा पशु-पक्षियों को भोजन प्राप्त होता है, वे सभी भिन्न-भिन्न प्रकार की जलवायु पर निर्भर होती हैं। प्रत्येक फसल के लिए उचित तापमान, पर्याप्त वर्षा, धूप, मिट्टी में उपलब्ध नमी, हवा आदि का पर्याप्त मात्रा में होना आवश्यक है। जलवायु के आधार पर ही प्राकृतिक वनस्पतियों का निर्धारण होता है तथा उस पर ही मानव जीवन आधृत एवं निर्भर होता है।

जलवायु ही सम्पूर्ण व्यष्टि एवं समष्टि की सृष्टि का सर्जक, पालक, पोषक एवं धारक है तथा प्राणिमात्र के अस्तित्व का आधार, नियामक, नियन्त्रक एवं अधिष्ठाता है। जलवायु के बिना प्राणियों के

अस्तित्व एवं जीवन की कल्पना ही नहीं की जा सकती है। प्राणियों की प्राणवन्तता एवं जीवधारियों की जीवन्तता मूलरूप में जलवायु पर ही आधृत है।

जलवायु के प्रकार- सम्पूर्ण विश्व की जलवायु के वर्गीकरण का सर्वप्रथम प्रयास यूनानियों द्वारा किया गया था। हमारे देश में मानसूनी जलवायु पायी जाती है। 'मानसून' शब्द की व्युत्पत्ति अरबी भाषा के "मौसम" शब्द से हुई है। जिसका अभिप्राय मौसम होता है। एशिया में मानसूनी हवाओं से प्रभावित क्षेत्रों को 'मानसून एशिया' का नाम दिया गया है जिसमें हमारा देश भारतवर्ष भी आता है। बीसवीं शताब्दी के प्रारम्भ से ही तापमान, वर्षा तथा वनस्पतियों के आधार पर जलवायु प्रदेशों को वर्गीकृत किया गया है। तापमान, वर्षा के वितरण और वनस्पतियों के आधार पर कोपेन ने सन् 1918 से सन् 1936 के मध्य विश्व की जलवायु को 06 प्राथमिक तथा प्रमुख भागों में विभाजित किया है, जिनका विवरण निम्नवत् है-

1. **उष्णकटिबन्धीय आर्द्र जलवायु-** यह जलवायु जहाँ पर प्रत्येक माह का तापमान 18 डिग्री सेल्सियस से अधिक रहता है वहाँ होती है। इस जलवायु प्रदेश में वर्ष के अधिकांश भागों में वर्षा होती है।
2. **शुष्क जलवायु-** इस क्षेत्र में वर्षा कम और वाष्पीकरण की मात्रा अधिक पायी जाती है तथा उच्च तापमान रहता है।
3. **समशीतोष्ण जलवायु-** इस जलवायु में सर्वाधिक शीत वाले महीने में तापमान 19 डिग्री सेल्सियस से 0.3 डिग्री सेल्सियस तथा सबसे अधिक उष्ण महीने का तापमान 50 डिग्री सेल्सियस तक रहता है।
4. **भूमध्य सागरीय जलवायु-** इसे मध्य अक्षांशों की आर्द्र सूक्ष्म तापीय अथवा शीतोष्ण आर्द्र जलवायु भी कहते हैं। इसमें सबसे अधिक ठण्डे महीने का तापमान माइनस-03 डिग्री सेल्सियस तथा सबसे उष्ण महीने का तापमान माइनस -10 डिग्री सेल्सियस से कम नहीं रहता है।
5. **ध्रुवीय जलवायु-** इस जलवायु प्रदेश में प्रत्येक महीने औसत तापमान 10 डिग्री सेल्सियस से कम रहता है।
6. **उच्च पर्वतीय जलवायु-** यह जलवायु विश्व के अत्यधिक ऊँचे पर्वतों पर पायी जाती है। यह सर्वाधिक ठण्डे प्रदेशों की जलवायु है।

'जलवायु परिवर्तन' की परिभाषा- किसी क्षेत्र में दीर्घकालाधि के पश्चात् उसके जलवायु का बदलना ही 'जलवायु परिवर्तन' कहलाता है। "जलवायु परिवर्तन" का तात्पर्य लम्बे समय तक जलवायु में होने वाले बदलावों से है। यह वर्तमान समय में सबसे महत्त्वपूर्ण वैश्विक मुद्दों में से एक है। पिछले दो शताब्दियों में पृथिवी के तापमान में लगातार और खतरनाक वृद्धि हुई है।

जलवायु परिवर्तन औसत मौसम पैटर्न में एक दीर्घकालिक परिवर्तन है, जो पृथिवी के स्थानीय, क्षेत्रीय और वैश्विक जलवायु को परिभाषित करता है। औसत तापमान, वर्षा, बर्फबारी आदि मौसम के विभिन्न आयामों में होने वाले दीर्घकालिक परिवर्तन को 'जलवायु परिवर्तन' कहते हैं।

जलवायु परिवर्तन के कारण- पृथिवी की जलवायु के परिवर्तन में अनेक कारणों की प्रमुख भूमिका है। जलवायु परिवर्तन में प्राकृतिक कारकों के अतिरिक्त मानवीय कारकों की भी प्रमुख भूमिका है। उक्त कारकों का विवरण निम्नवत् है-

प्राकृतिक कारण- जलवायु परिवर्तन के प्राकृतिक या नैसर्गिक कारणों के अन्तर्गत स्थलाकृति, पृथिवी का झुकाव, समुद्र का स्तर, सौरचक्र का मॉड्यूलेशन, महासागरीय धाराएँ, हवाएँ, पृथ्वी की कक्षा में परिवर्तन, महाद्वीपीय बहाव, प्लेट टेक्टोनिक्स, तापमान, वर्षा, मानसूनी वर्षा में कभी, ज्वालामुखी क्रियाएँ, ज्वालामुखी विस्फोट, वनाग्नि, भूकम्प, भूस्खलन, भूमि का अपरदन, जलप्लावन, बाढ़, सूखा, अतिवृष्टि, अनावृष्टि नैसर्गिक गति विधियाँ, प्राकृतिक आन्तरिक प्रक्रियाओं एवं बाह्य दबावों की गणना की जाती है।

मानवीय कारण- जलवायु परिवर्तन को मानवीय गतिविधियों ने अत्यधिक प्रभावित किया है। शहरीकरण, औद्योगीकरण, उपभोक्तावाद, पेट्रोल एवं डीजल चालित वाहनों की संख्या में वृद्धि, पावरप्लान्ट, आटोमोबाइल, आधुनिक विद्युत संचालित संयन्त्रों यथा- ए.सी., कूलर, फ्रिज आदि का अत्यधिक प्रयोग, विद्युत का दुरुपयोग, कार्बन उत्सर्जन, कार्बन डाईआक्साइड, मीथेन, क्लोरोफ्लोरो कार्बन जैसी जहरीली ग्रीन हाउस गैसों के उत्सर्जन में वृद्धि, प्राकृतिक गैस, तेल, कोयला आदि जीवांश्म ईंधन का अत्यधिक प्रयोग, भूमि के उपयोग में परिवर्तन, भूमि उत्खनन, बनों के वृक्षों का काटा जाना, पर्यावरण प्रदूषण, जनसंख्यावृद्धि, भूमि का अत्यधिक दोहन, मलमूत्र कूड़ा-करकट, साबुन, डिटर्जेंट, रेडियोएक्टिव पदार्थ, रासायनिक खाद एवं कीटनाशक पदार्थ, कलकारखानों के मलवों एवं अवशिष्ट पदार्थों का नदियों एवं जलाशयों में प्रवाहित किया जाना आदि प्रमुख मानवजनित जलवायु के विनाशकारी परिवर्तन के प्रमुख कारण हैं।

जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणाम- न केवल भारतवर्ष में अपितु समग्र विश्व में जलवायु परिवर्तन के विनाशकारी प्रभाव एवं परिणाम परिलक्षित हो रहे हैं, जिनका विवरण निम्नलिखित है-

ग्लोबल वार्मिंग, उच्च तापमान, ग्लेशियर का पिघलना, समुद्र के जलस्तर में वृद्धि, आँधी-तूफान के पैटर्न में परिवर्तन, सौरचक्रों का माड्यूलेशन, समुद्री धाराओं में बदलाव, बर्फ का जमना और पिघलना, भूगिगत जलस्तर का गिरना, ज्वालामुखी विस्फोट, जलप्लावन, एसिड वर्षा, अतिवृष्टि, अनावृष्टि, सूखा, बाढ़ चक्रवात, सुनामी, ओजोन परत का क्षरण, अल्ट्रावायलेट किरणों का आवर्तन, भूकम्प, भूस्खलन, भूमि, अपरदन, भूमि का बंजर होना, भूमि की उर्वरक क्षमता का ह्रास, मरुस्थलीकरण, ग्रीनहाउस प्रभाव, वन्यजीव एवं प्रजातियों का विनष्टीकरण एवं विलुप्तीकरण, असाध्य रोगों, बीमारी एवं

महामारी का प्रकोप एवं प्रसार, वनविनाश, वनाग्नि जैवविविधताक्षय, वनस्पतियों एवं जीवों के जीवनशैली और जीवनचक्र में परिवर्तन, भिन्नता एवं विलुप्तीकरण, महासागरों के तापमान में वृद्धि, डिस्टर्ब फूडवेब, खाद्यसुरक्षा में कमी, खाद्यान्न संकट खाद्य पदार्थों में कमी, कृषि पर प्रतिकूल प्रभाव, खाद्य पदार्थों के उत्पादन में कमी, खाद्य पदार्थों की कीमतों में वृद्धि, खाद्य पदार्थों के पोषण मूल्य में कमी, पर्यावरण प्रदूषण, मानव स्वास्थ्य को खतरा, प्राकृतिक आपदाएँ एवं समस्याएँ, मनुष्यों की असामयिक मृत्युदर में वृद्धि, जनसंख्यावृद्धि, तापमान में निरन्तर वृद्धि, आर्थिक क्षति आदि भयंकर विनाशकारी परिणाम एवं दुष्प्रभाव परिलक्षित हो रहे हैं।

सम्पूर्ण विश्व में ग्लोबलवार्मिंग, कही सुनामी की मार तो कहीं तूफान का कहर, कहीं अत्यधिक वर्षा तो कहीं वर्षा के लिए हॉ हॉकार, खाड़ी की बर्फबारी, स्पेन में शोलों की बारिश इन सभी को जलवायु परिवर्तन की देन माना जा रहा है तथा सृष्टि के विनाश की ओर बढ़ते कदम अर्थात् महाप्रलय के रूप में प्रत्यक्षीकृत किया जा रहा है।

जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणामों के वास्तविक आँकड़े- राष्ट्रीय अन्तरराष्ट्रीय स्तर के जलवायु एवं मौसम विज्ञान विभाग, पर्यावरण विभाग, विश्व स्वास्थ्य संगठन, अन्तरराष्ट्रीय रेटिंग फर्म एस.एण्ड पी. ग्लोबल फर्म, विभिन्न जलवायु विज्ञानी, मौसम विज्ञानी, पर्यावरणविद् एवं मानव स्वास्थ्य विज्ञानियों द्वारा किए गये शोध एवं सर्वेक्षणों के आधार पर जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणामों के वास्तविक दर्ज आँकड़े निम्नवत् हैं-

1. जलवायु परिवर्तन से प्रभावित देशों में भारत 5 वें स्थान पर है।
2. खराब मौसम के कारण भारत में प्रतिवर्ष 36000 लोगों की मृत्यु होती है।
3. पिछले 100 वर्षों में पृथिवी की सतह के निकट वैश्विक वायुमण्डल का तापमान लगभग 2 डिग्री फारेनहाइट तक बढ़ गया है।
4. पिछले 150 वर्षों में वैश्विक औसत तापमान में लगातार वृद्धि हो रही है। वर्ष 2016 को सर्वधिक गर्म वर्ष के रूप में रिकार्ड किया गया।
5. पिछले पाँच वर्ष सर्वाधिक तापमान वाले रिकार्ड किए गए।
6. ग्लोबलवार्मिंग वर्ष 1880 के बाद से पृथिवी के तापमान में लगभग 01 डिग्री सेल्सियस की वृद्धि रिकार्ड की गयी।
7. जलवायु परिवर्तन के कारण एशिया में तापमान 50 डिग्री तक पहुँच चुका है।
8. मौसम विभाग के डाउन टू अर्थ डेटा के अनुसार जलवायु परिवर्तन के कारण बंगाल की खाड़ी और अरब सागर में 13 दबाव के क्षेत्र बने हैं, जिसने 26 वर्षों के रिकार्ड को तोड़ दिया है।

9. औद्योगिकक्रान्ति के पश्चात् कार्बन डाईऑक्साइड की मात्रा में 30 प्रतिशत की वृद्धि अभिलेखबद्ध की गयी।
10. विश्व स्वास्थ्य संगठन ;भूद्ध के आँकड़ों के अनुसार पिछले दशकों से अद्यतन हीट वेक्स के कारण लगभग 150,000 से अधिक लोगों की मृत्यु हो चुकी है।
11. ब्राजील स्थित नेशनल इंस्टीट्यूट फॉर स्पेस रिसर्च एण्ड आई.एन.पी.ई. ;छै-प्लच्छ के आँकड़ों के मुताबिक जनवरी 2019 से अब तक ब्राजील के अमेजन वन कुल 74155 बार वनाग्नि का सामना कर चुका है।
12. वर्ष 2018 से अमेजन के वनों में आग लगने की घटना 85 प्रतिशत तक बढ़ गयी है।
13. विश्व स्वास्थ्य संगठन के अनुसार प्रतिवर्ष 15 लाख लोग कुपोषण के शिकार हो रहे हैं।
14. प्रतिवर्ष 95 हजार लोग डायरिया और 55 हजार लोग मलेरिया रोग से पीड़ित होकर अपनी जान गँवा रहे हैं।
15. प्रतिवर्ष लू के चपेट में आने वाली आबदी 40 प्रतिशत दर्ज की गयी है।

जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणामों के भावी अनुमानित आँकड़े- राष्ट्रीय अन्तर्राष्ट्रीय स्तर के जलवायु विभाग, मौसम विभाग, पर्यावरण विभाग, स्वास्थ्य विभाग, विश्व स्वास्थ्य संगठन, जलवायु विज्ञानी, मौसम विज्ञानी, पर्यावरणवेत्ता, स्वास्थ्य एवं चिकित्सा विज्ञानियों द्वारा किए गए शोध एवं सर्वेक्षणों के आधार पर जलवायु परिवर्तन के दुष्प्रभाव एवं दुष्परिणामों के भावी अनुमानित आँकड़े निम्नवत् हैं-

1. वैश्विक अर्थव्यवस्था पर जलवायु परिवर्तन पर पड़ने वाले प्रभाव को लेकर अन्तर्राष्ट्रीय रेटिंग फर्म एस एण्ड पी. ग्लोबल द्वारा जारी एक रिपोर्ट के अनुसार अगले 28 वर्षों में भारत की सकल घरेलू उत्पाद (GDP) में 15 प्रतिशत की गिरावट आ सकती है।
2. वर्ष 2050 तक दक्षिण एशिया में भारत और बंगलादेश की अर्थव्यवस्था जलवायु परिवर्तन के कारण अपेक्षाकृत ज्यादा प्रभावित हो सकती है।
3. जलवायु के प्रतिनिधि एकाग्रता मार्ग - (Representative Concentration Pathway) RCP 4.5 परिदृश्य के तहत की गयी वर्ष 2050 तक के जलवायु परिवर्तन के प्रभावों की गणना के अनुसार जंगल की आग, बाढ़, तूफान, समुद्रतल में होती वृद्धि से सकल घरेलू उत्पाद (GDP) पर पड़ने वाला सम्भावित प्रभाव 52 प्रतिशत तक हो सकता है।
4. भारत की 62 प्रतिशत कृषि पर जल संकट का प्रभाव पड़ने का अनुमान है।

5. कृषि पर मँडराते जल संकट से सकल घरेलू उत्पाद ;ळक्च्छ में पर पड़ने वाला अनुमानित प्रभाव 10 प्रतिशत हो सकता है।
6. लैंसेट के अनुसार इस सदी के अन्त तक जलवायु परिवर्तन के कारण पृथ्वी का तापमान 2.7 से 3.1 डिग्री सेल्सियस तक बढ़ जाने का अनुमान है।
7. भारत में पाँच करोड़ लोग जलवायु परिवर्तन से इस सदी के अन्त तक प्रभावित हो सकते हैं।
8. धरती के तापमान में अत्यधिक वृद्धि होने के कारण ध्रुवों पर बर्फ एवं ग्लेशियर पिघलेगी और समुद्र का जलस्तर बढ़ने से द्वीपीय शहर डूब सकते हैं।
9. संयुक्त राष्ट्र विकास प्रोग्राम (UNDP) के ह्यूमन क्लाइमेट होरिजन की ताजा रिपोर्ट के अनुसार वर्ष 2039 तक भारत में औसत सालाना तापमान 26.3 डिग्री सेल्सियस और सदी के अन्त तक 29.3 डिग्री सेल्सियस तक चला जायेगा।
10. वर्ष 2020 से वर्ष 2039 तक जलवायु परिवर्तन के कारण वर्ष में 97 दिन 35 डिग्री सेल्सियस से ज्यादा तापमान वाले रहेंगे।
11. सदी के अन्त तक पृथ्वी की सतह का औसत तापमान 3 से 10 डिग्री फॉरेनहाइट तक बढ़ सकता है।
12. विज्ञान एवं पर्यावरण विषयक पत्रिका साइन्स की एक रिपोर्ट के अनुसार तटीय क्षेत्र में रहने वाले दुनिया भर के करीब 1.2 करोड़ लोग समुद्र जलस्तर में वृद्धि के कारण विस्थापित होंगे।
13. विशेषज्ञों के अनुसार तापमान में वृद्धि और वनस्पति पैटर्न में बदलाव ने कुछ पशु-पक्षियों की प्रजातियों को विलुप्त होने लिए मजबूर कर दिया है। पृथ्वी की एक चौथाई प्रजातियाँ वर्ष 2050 तक विलुप्त हो सकती हैं।
14. वर्ष 2008 में ध्रुवीय भालू को उन जानवरों की सूची में सम्मिलित किया गया था जो समुद्र के जलस्तर में वृद्धि के कारण विलुप्त हो सकते हैं।
15. विश्व स्वास्थ्य संगठन की रिपोर्ट के अनुसार जलवायु परिवर्तन से सन् 2030 और 2050 के मध्य प्रतिवर्ष लगभग 250000 अतिरिक्त लोगों की मृत्यु की सम्भावना है।
16. प्रतिवर्ष गर्मी के सम्पर्क में आने के कारण 38000 लोगों की मृत्यु होने की सम्भावना है।
17. डायरिया के कारण 48000 लोगों की मृत्यु की सम्भावना है।
18. मलेरिया से 60,000 लोगों की जाने जा सकती हैं।
19. बचपन के कुपोषण के कारण 95000 लोगों की मृत्यु हो सकती है।

20. हिन्द महासागर में समुद्र की सतह का तापमान ग्लोबलवार्मिंग के कारण 1 से 2 डिग्री सेल्सियस तक बढ़ने की सम्भावना है।

जलवायु परिवर्तन के विनाशकारी प्रभावों को नियन्त्रित करने के साधन एवं उपाय-

जलवायु परिवर्तन के विनाशकारी प्रभावों को नियन्त्रित करने के साधन एवं उपाय निम्नवत् हैं-

1. पर्यावरण का संरक्षण एवं सन्तुलन बनाए रखना चाहिए।
2. जलवायु का संरक्षण किया जाना चाहिए।
3. अधिक से अधिक वृक्षारोपण एवं वृक्ष सिंचन किया जाए।
4. विद्युत ऊर्जा का संरक्षण करना होगा।
5. विद्युत ऊर्जा का कम से कम उपयोग किया जाना चाहिए।
6. जलसंरक्षण एवं वर्षा तथा अन्य स्रोतों से प्राप्त जलसंचय की प्रवृत्ति होनी चाहिए।
7. नदियों, जलाशयों के जल को दूषित नहीं करना चाहिए।
8. वर्षा के जल का संचयन करना चाहिए।
9. कार्बन डाईऑक्साइड नामक दूषित विषैली गैस को शोधित करने वाले पीपल, बरगद, पाकड़, नीम और अशोक के वृक्ष लगाना आवश्यक है।
10. वायु शोधनार्थ यज्ञानुष्ठान किए जाने चाहिए।
11. कार्बन उत्सर्जन की दर में कमी लानी होगी।
12. नवीकरणीय ऊर्जा को बढ़ावा देना होगा।
13. कागज-कपड़ा, काँच, प्लास्टिक, इलेक्ट्रानिक्स आदि कूड़े-कचरे एवं अपशिष्ट पदार्थों का प्रबन्धन एवं पुनर्चक्रण (Recycle) किए जाने की आवश्यकता है।
14. पवनऊर्जा एवं सौरऊर्जा संचालित संयन्त्रों का प्रयोग करें ताकि हाइड्रोकार्बन के उत्सर्ज में कमी आ सके।
15. पेट्रोल एवं डीजल चालित वाहनों तथा इंजन को दुरुस्त रखें।
16. पेट्रोल एवं डीजल चालित वाहनों का कम से कम तथा सामूहिक प्रयोग करना चाहिए।
17. CFL एवं LED उपकरणों का प्रयोग करना चाहिए।

18. प्राकृतिक रोशनी एवं हवादार गृहों का निर्माण किया जाए।
19. पृथिवी को हरा-भरा रखना तथा वृक्षों एवं वनों की कटाई को नियन्त्रित करना होगा।
20. नॉन रिसाइक्लेबल प्लास्टिक का प्रयोग कदापि न करें।
21. रेड लाइट और ट्रैफिक जाम होने पर वाहन के इंजन को बन्द कर देना चाहिए।
22. अनावश्यक बिजली का दुरुपयोग नहीं करना चाहिए।
23. जरूरत से ज्यादा ऊर्जा की खपत नहीं करनी चाहिए।
24. ऊर्जा का संचय एवं बचत की प्रवृत्ति होनी चाहिए।
25. कार्बन क्रेडिट पद्धति का अनुसरण एवं अनुपालन सुनिश्चित किया जाना चाहिए।
26. कार्बन उत्सर्जन पर नियन्त्रण करने के लिए पुनरुपयोगी संसाधनों का उपयोग बढ़ाकर खतरे को कम किया जा सकता है।
27. लघु, कुटीर उद्योगों को बढ़ावा देकर गाँवों को स्वावलम्बी बनाया जाय ताकि नगरीकरण एवं शहरीकरण को रोका जा सके।
28. मनुष्य को प्राकृतिक संसाधनों का सीमित एवं आवश्यकतानुरूप ही प्रयोग करना चाहिए।
29. मनुष्य को अत्यधिक भौतिकवादिता एवं उपभोगवादिता से दूर रहना चाहिए तथा वाह्य आडम्बर एवं प्रदर्शन से बचना चाहिए।
30. फ्रिज, कूलर, एयरकन्डीशनर आदि का प्रयोग कम से कम किया जाना चाहिए।
31. कार्य समाप्त होने के पश्चात् बिजली के उपकरणों को Switch Off कर देना चाहिए।
32. सरकारी संसाधनों का दुरुपयोग नहीं करना चाहिए।
33. सूती वस्त्रों का प्रयोग करना चाहिए।
34. पानी के दुरुपयोग को रोकना चाहिए। कार्य समाप्त हो जाने पर नल की टोटियों को बन्द कर देना चाहिए।
35. प्लास्टिक के बर्तन, सामान, खिलौने तथा प्लास्टिक बैग एवं थैलियों का प्रयोग वर्जित होना चाहिए।
36. समुद्र, नदी एवं तालाब में कूड़े-करकट, मल-मूत्र, मृत जीव-जन्तु, साबुन, डिटर्जेंट, रेडियोएक्टिव तत्त्वों, विषैले अपशिष्ट रासायनिक पदार्थों तथा संयन्त्रों के अवशिष्ट आदि को प्रवाहित नहीं किया जाना चाहिए साथ ही इनके निस्तारण की उचित व्यवस्था की जानी चाहिए।

37. रिफाइन्ड तेल एवं रिफाइन्ड महीन अनाजों का प्रयोग कम से कम करना चाहिए।
38. मोटे अनाजों का उत्पादन एवं प्रयोग अधिक से अधिक किया जाना चाहिए। भारत में वर्ष 2023 को 'अन्तर्राष्ट्रीय मोटे अनाज वर्ष' के रूप में मनाए जाने का प्रस्ताव मोदी जी ने दिया था। भारत मोटे अनाज के सबसे बड़े उत्पादक देशों में से एक है। वर्ष 2015-16 के 14.52 मिलियन टन के मुकाबले वर्ष 2020-21 में मोटे अनाज का उत्पादन बढ़कर 17.96 मिलियन टन हो गया है।
39. ग्रामवासियों के सक्रिय सहयोग के बिना जलवायु एवं पर्यावरण सम्बन्धी समस्या का निदान सम्भव नहीं है। अतः ग्रामवासियों का एतदर्थ सहयोग अपेक्षित है। गाँवों में निवास करने वाले ग्रामवासियों को पर्यावरण एवं जलवायु सम्बन्धी वैज्ञानिक जानकारी देने की आवश्यकता है।
40. प्रत्येक ग्राम पंचायत में दो युवकों या युवतियों को जलवायु प्रबन्धक अर्थात् क्लाइमेट मैनेजर बनाया जाना चाहिए। जिसका मुख्य कार्य अपने गाँवों के लोगों को जलवायु तथा कृषि सम्बन्धी जानकारी प्रस्तुत करना होगा।
41. कृषि विश्वविद्यालय, महाविद्यालय तथा विद्यालयों के विद्यार्थीगण प्रत्येक वर्ष दो महीने के लिए गाँवों में किसानों से मिलकर उन्हें मौसम एवं जलवायु सम्बन्धी व्यावहारिक जानकारी प्रदान करें तभी 'प्रयोगशाला से खेत तक' का नारा सफल हो सकेगा।
42. पर्यावरण एवं जलवायु संरक्षणार्थ प्राचीन वैदिक युग की भाँति प्रकृति से जुड़कर रहना होगा तथा प्रकृति के प्रति आदर-सम्मान, आस्था-श्रद्धा का भाव रखते हुए प्रकृति की पूजा एवं उपासना करनी होगी।
43. प्राथमिक एवं उच्च स्तरीय विद्यालय से लेकर विश्वविद्यालय स्तर तक जलवायु परिवर्तन एवं पर्यावरण विज्ञान विषय को पाठ्यक्रम में अनिवार्य विषय के रूप में सम्मिलित किया जाना चाहिए।
44. सम्भागीय स्तर से लेकर अन्तर्राष्ट्रीय स्तर तक समय-समय पर जलवायु परिवर्तन से सम्बन्धित संगोष्ठियों, परिचर्चाओं, परिसंवादों एवं कार्यशालाओं का आयोजन किया जाना चाहिए।
45. जलवायु परिवर्तन एवं पर्यावरण से सम्बन्धित कार्यक्रमों एवं परिचर्चाओं को टी.वी., रेडियो, इन्टरनेट के माध्यम से प्रचारित-प्रसारित कर इसके दुष्परिणामों एवं दुष्प्रभावों को बताया जाना चाहिए।
46. निजी/सरकारी, गैर सरकारी संगठनों को मिलकर पर्यावरण एवं जलवायु के प्रति जनमानस को सजग, सचेत, शिक्षित एवं जागरूक करने की आवश्यकता है। इसके साथ ही जलवायु परिवर्तन के विनाशकारी दुष्प्रभाव एवं दुष्परिणाम तथा भयावह खतरों से अवगत कराया जाना चाहिए।

47. जनमानस को पर्यावरण एवं जलवायु संरक्षण के उपायों की जानकारी देना होगा तथा दुष्प्रभावों को नियन्त्रित करने हेतु सार्थक सुझाव देकर जागरूक करने की महती आवश्यकता है।
48. जलवायु में हो रहे हानिकारक एवं घातक परिवर्तनों की प्रतिकूल धारा में अनुकूलता लाने का प्रयास किया जाना परमावश्यक है।
49. जलवायु परिवर्तन के विरुद्ध अपनी रणनीति सृजित एवं सुनिश्चित करने के लिए हमें सम्यक् रूपेण अनुकूलित और टिकाऊ प्रणालियों के साथ सतत् विकास का विकल्प चुनना चाहिए।
50. राष्ट्रीय, अन्तर्राष्ट्रीय स्तर पर जलवायु संरक्षण सम्बन्धी नीतियों, योजनाओं परियोजनाओं, नियमों, सिद्धान्तों, आदेशों एवं अध्यादेशों का प्रतिबद्धता के साथ प्रवर्तन, प्रबन्धन, अनुपालन एवं क्रियान्वयन सुनिश्चित किया जाना चाहिए।
51. राष्ट्रीय अन्तर्राष्ट्रीय स्तर पर जलवायु एवं पर्यावरण संरक्षण सम्बन्धी जारी किए गए आदेशों, अध्यादेशों, नीतियों, नियमावलियों, परिनियमावलियों एवं सिद्धान्तों का उल्लंघन, अवज्ञा, अवमानना एवं अनुपालन न करने वालों के विरुद्ध अनुशासनात्मक, दण्डात्मक एवं सवैधानिक कार्यवाही का कड़ाई से अनुपालन एवं क्रियान्वयन सुनिश्चित किया जाना चाहिए।
52. जलवायु परिवर्तन के विनाशकारी प्रभावों के नियन्त्रण के उक्त समस्त उपायों को व्यावहारिक जीवन में पूर्ण ईमानदारी, निष्ठा, तत्परता, सशक्त एवं समर्पित भाव के साथ त्वरित गति से अनुसरण, अनुपालन एवं क्रियान्वयन सुनिश्चित किया जाना चाहिए।

जी-20 क्या है- इसे ग्रुप-20 कहते हैं। यह -19 देशों और 20 वाँ यूरोपीय संघ का एक अनौपचारिक समूह है, जिसमें अन्तर्राष्ट्रीय मुद्राकोष और विश्व बैंक के प्रतिनिधि शामिल हैं। इसका कोई स्थायी सचिवालय या मुख्यालय नहीं है। जी-20 की स्थापना सन 1999 में एशियाई वित्तीय संकट के बाद वित्त मन्त्रियों और केन्द्रीय बैंक के गवर्नरों के लिए वैश्विक आर्थिक और वित्तीय मुद्दों पर चर्चा करने के लिए एक मंच के रूप में की गयी थी। जी- 20 बीस वित्त मन्त्रियों और सेन्ट्रल बैंक के गवर्नर्स का समूह है जो विश्व की 20 प्रमुख अर्थव्यवस्थाओं के वित्त मन्त्रियों और केन्द्रीय बैंक के गवर्नर्स का एक संगठन है।

जी-20 की सदस्यता में विश्व की सबसे बड़ी उन्नत और उभरती अर्थव्यवस्था का मिश्रण शामिल है, जो दुनिया की आबादी का लगभग दो-तिहाई, वैश्विक सकल घरेलू उत्पाद का 85 प्रतिशत, वैश्विक निवेश का 80 प्रतिशत और वैश्विक व्यापार का 75 प्रतिशत से अधिक प्रतिनिधित्व करता है।

जी-20 के सदस्य- जी-20 के सदस्यों में अर्जेन्टीना, आस्ट्रेलिया, ब्राजील, कनाडा, चीन, फ्रांस, जर्मनी, भारत, इन्डोनेशिया, इटली, जापान, कोरिया गणराज्य, मैक्सिको, रूस, सऊदी अरब, दक्षिण अफ्रीका, तुर्की, यूनाइटेड किंगडम, संयुक्त राज्य अमेरिका और यूरोपीय संघ सम्मिलित हैं।

जी-20 की अध्यक्षता- भारत को इण्डोनेशिया से चुनौतियों से परिपूर्ण जी-20 वर्ष 2023 की अध्यक्षता विरासत से प्राप्त हुई है। दुनिया के 20 ताकतवर देशों के समूह जी-20 की अध्यक्षता भारत के पास है। 01 दिसम्बर 2022 को भारत ने जी-20 की अध्यक्षता 30 नवम्बर 2023 तक के लिए ग्रहण की। भारत की जी-20 की अध्यक्षता का थीम “**वसुधैव कुटुम्बकम्**” है। भारत के लिए आगामी एक वर्ष बहुत महत्वपूर्ण हैं। वैश्विक मुद्दों में भारत नेतृत्व कर सकता है, यह सिद्ध करने का स्वार्णम अवसर प्राप्त हुआ है। भारत को बतौर महाशक्ति उभरने में भी जी-20 की अध्यक्षता अहम भूमिका निभा सकती है।

विदेश मन्त्री श्री एस. जयशंकर जी ने कहा कि “भारत अपनी अध्यक्षता के दौरान कई वैश्विक मुद्दों पर जी-20 देशों के बीच आम सहमति बनाने की कोशिश करेगा। भारत इस अवसर का उपयोग ‘श्री डी’ अर्थात् डेमोक्रेसी, डेवलपमेन्ट और डायवर्सिटी (लोकतन्त्र, विकास और विविधता) को रेखांकित करने के लिए करेगा। जी-20 की बैठकों का आयोजन भारत की मेजबानी में होने वाले शीर्ष अन्तर्राष्ट्रीय आयोजनों में से एक होगा। यह बैठक भू राजनीतिक संकट, खाद्य और ऊर्जा असुरक्षा और टिकाऊ विकास लक्ष्य की गति और कर्ज के बढ़ते बोझ के व्यापक सन्दर्भ में आयोजित की जा रही है। हमारा प्रयास जी-20 के भीतर आम सहमति बनाना और विशेषरूप से वैश्विक दक्षिण के मुद्दों को आकार देना और साथ ही इस एजेन्डे को आगे बढ़ाना है।”

“जी-20 कोई सामान्य ग्रुप नहीं है। अन्तर्राष्ट्रीय अर्थव्यवस्था में समन्वय बनाने के लिए यह प्रीमियर फोरम है। दुनिया की 85 फीसदी सकल घरेलू उत्पाद (GDP) इन्हीं 20 देशों से आती है। समूचे विश्व का 75 फीसदी व्यापार जी-20 देशों के बीच होता है। दो तिहाई वैश्विक आबादी इन देशों में रहती है। जाहिर है, जी-20 को साधने का मतलब दुनिया को साधना होगा”।

प्रधानमन्त्री श्री नरेन्द्र मोदी जी ने कहा था कि “जी-20 के लिए भारत का एजेन्डा समावेशी, महत्वाकांक्षी और कार्यवाही उन्मुख होगा। जलवायु परिवर्तन, आंतकवाद और महामारियों जैसी चुनौतियों से आपस में लड़कर नहीं बल्कि साथ मिलकर काम करके ही निपटा जा सकता है।”

“दुनिया की पाँचवी सबसे बड़ी अर्थव्यवस्था-भारत को जी-20 की शान्ति, स्थिरता और साझा समृद्धि को आगे बढ़ाती अध्यक्षता के तौर पर बढ़ते ध्रुवीकरण और गहराते भू-राजनैतिक तनाव के दौर में वैश्विक एजेन्डे को आकार देने का अवसर प्राप्त हुआ है”।

जलवायु परिवर्तन और पर्यावरण सम्बन्धी जी-20 का शिखर सम्मेलन- जी-20 की पर्यावरण और जलवायु परिवर्तन विषयक प्रथम बैठक दिनांक 08 से 10 फरवरी 2023 को बेंगलूर में आयोजित की गयी तथा दूसरी बैठक दिनांक -27 से 29 मार्च 2023 को गुजरात के गाँधीनगर में सम्पन्न हुई। बैठक में 11 आमन्त्रित देशों तथा 14 अन्तर्राष्ट्रीय संगठनों और सदस्य देशों के 130 से अधिक प्रतिनिधियों ने प्रतिभाग किया। इन बैठकों में भूमिक्षरण को रोकने पारिस्थितिकी तन्त्र की बहाली में तेजी लाने, जैवविविधता को प्रोत्साहित करने, एक स्थायी और जलवायु के अनुकूल ब्लू इकोनामी को

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बढ़ावा देने जैसे क्षेत्र परिचर्चा के विचारणीय बिन्दु रहे। बैठक में नमामि गंगे, क्लाइमेट रेजिलिएन्ट इन्फ्रास्ट्रक्चर, पार्टिसिपेटरी ग्राउण्ड वाटर मैनेजमेन्ट, जल जीवन मिशन और स्वच्छ भारत मिशन पर भी प्रतिनिधियों के समक्ष प्रस्तुति दी गयी। उक्त शिखर सम्मेलन में जलवायु परिवर्तन सम्बन्धी लिए गए निर्णय निम्नवत् हैं-

1. सदी के मध्य तक या उसके आस-पास कार्बन तटस्थता तक पहुँचाने की प्रतिबद्धता जतायी गयी।
2. रोम घोषण पत्र को स्वीकार किया गया है।
3. जी-20 क्लाइमेट रिस्क एटलस पूर्व में जारी किया गया था जो जी-20 देशों में जलवायु परिदृश्य, सूचना, डेटा और भविष्य में जलवायु परिवर्तन की सम्भावना की सूचना प्रदान करता है।
4. संयुक्त राष्ट्र जलवायु सम्मेलन COP-26 के लिए रोडमैप ने वैश्विक जलवायु परिवर्तन संकट से निपटने के लिए अपनी कार्ययोजना बनाने का आग्रह दुनिया की सबसे बड़ी अर्थव्यवस्थाओं के नेताओं से किया।
5. कोयला आधारित संयंत्रों को सहायता प्रदान करने पर प्रतिबन्ध लगाने का निर्णय लिया गया। इसके अन्तर्गत वर्ष 2021 के अन्त तक विदेशों में कोयला आधारित बिजली उत्पादन के विल्लपोषण को रोकने की प्रतिज्ञा शामिल थी।
6. विल्ल मोबिलाइजेशन का पी.पी.पी. मॉडल (पब्लिक प्राइवेट पार्टनरशिप) वार्षिक निवेश में खरबों डालर हासिल करने का एकमात्र तरीका है, जो स्वच्छ, टिकाऊ ऊर्जा स्रोतों के संक्रमण के लिए आवश्यक है तथा जो वैश्विक तापमान में वृद्धि को कम करेगा।

जलवायु परिवर्तन विषयक जी-20 शिखर सम्मेलन में भारत द्वारा लिए गए निर्णयों की घोषणा- जलवायु परिवर्तन सम्बन्धी जी-20 शिखर सम्मलेन में भारत द्वारा लिए गए निर्णयों का विवरण निम्नवत् है-

1. **वैक्सीन असमानता को सम्बोधित करना-** सम्पूर्ण विश्व में वैक्सीन की असमानता को दूर करने की आवश्यकता को प्रकाशित करते हुए भारत अगले वर्ष 2022 के अन्त तक 5 बिलियन से अधिक वैक्सीन खुराक का उत्पादन करने के लिए तत्पर है। एतदर्थ भारत ने वैक्सीन रिसर्च, मैनुफैक्चरिंग और इनोवेशन पर भी जोर दिया।
2. **एक पृथ्वी एक स्वास्थ्य-** एक पृथ्वी एक स्वास्थ्य की दृष्टि या महामारी के विरुद्ध लड़ाई में अन्तर्राष्ट्रीय डोमेन में एक सहयोगी दृष्टिकोण की आवश्यकता पर बल दिया।

3. **लचीली वैश्विक आपूर्ति श्रृंखला-** भारत ने लचीली वैश्विक आपूर्ति श्रृंखलाओं की आवश्यकता पर प्रकाश डाला और भारत को आर्थिक सुधार और आपूर्ति श्रृंखला विविधीकरण में अपना भागीदार बनाने के लिए जी-20 देशों को आमन्त्रित किया है।
4. **वैश्विक न्यूनतम कर के लिए समर्थन -** भारत ने वैश्विक वित्तीय संरचना को अधिक न्यायसंगत और निष्पक्ष बनाने के लिए 15 प्रतिशत न्यूनतम कॉर्पोरेट कर ;जगद्ध के साथ आने के जी-20 के फैसले की भी सराहना की।
5. **हिन्द प्रशान्त रणनीति का स्वागत-** भारत ने यूरोपीय संघ की हिन्द प्रशान्त रणनीति और उसमें फ्रांस के नेतृत्व का स्वागत किया है।

भारत में आयोजित जी-20 शिखर सम्मेलन के नकारात्मक पहलू- प्रत्येक योजना, परियोजना , नीतियों , प्रणालियों, नियमों एवं सिद्धान्तों के सकारात्मक एवं नकारात्मक दोनों पक्ष होते हैं। जी-20 शिखर सम्मेलन के नकारात्मक पहलू एवं पक्ष निम्नवत् हैं-

1. जी-20 की विश्वसनीयता पर सवाल उठाया जा रहा है। प्रश्नचिह्न लगाया जा रहा है, क्योंकि पिछले कुछ महीनों से यह एक आन्तरिक संकट में उलझा हुआ है।
2. जी-20 के समस्त सदस्यों की विज्ञप्तियों पर सर्वसम्मति एवं सहमति नहीं बन पा रही है, क्योंकि वे परस्पर सहमति प्रदान करने में असमर्थ हैं।
3. जी-20 के सदस्यों के मध्य और उनके बीच प्रचलित गहन असहमति और लगातार तनाव को देखते हुए अन्के मध्य सहयोग की सम्भावनाएँ धूमिल परिलक्षित हो रही हैं।
4. जी- 20 के सदस्यों की असहमति एवं असहयोग का कार्यों, कार्यप्रणालियों एवं मूल मुद्दों तथा उद्देश्यों पर प्रत्यक्ष नकारात्मक प्रभाव परिलक्षित हो रहा है।
5. जी- 20 शिखर सम्मलेन में अधूरे मन से कदम उठाए गए हैं। यथा-कतिपय उठाए गए ठोस कदमों के अन्तर्गत शुद्ध शून्य कार्बन उत्सर्जन हासिल करने के लिए वर्ष 2050 की किसी तिथि विशेष का कोई सन्दर्भ नहीं दिया गया है।
6. जी-20 वक्तव्य के पिछले मसौदे में कार्बन उत्सर्जन को कम करने के लक्ष्य के सन्दर्भ को हटा दिया गया है।
7. जीवांशम ईंधन, कोयले के प्रयोग को चरणबद्ध तरीके से समाप्त एवं बहिष्कृत करने का कोई लक्ष्य नहीं रखा गया है जबकि यह शीर्ष कार्बन प्रदूषक चीन और भारत के लिए खतरे का स्पष्ट संकेत है।

8. चीन और भारत दोनों देशों ने कोयले की खपत को चरणबद्ध तरीके से समाप्त करने के जी-20 के घोषणा के प्रयासों का पुरजोर विरोध किया है। क्योंकि चीन ने घरेलू कोयला संयंत्रों के निर्माण की अन्तिम तिथि निर्धारित नहीं की है। इसके अतिरिक्त चीन और भारत में कोयला बिजली उत्पादन का मुख्य स्रोत है।
9. G-20 में वैक्सीन पेटेंट छूट पर कोई समाधान प्रस्तुत नहीं किया गया है।
10. अन्य सदस्यों द्वारा भारत की विकासात्मक अनिवार्यता पर जोर दिया गया है ताकि अक्षय ऊर्जा के 450 जी. डब्ल्यू. के अपने लक्ष्य को वर्ष 2030 तक सम्मिलित किया जा सके।

जी-20- अवसर की अपार सम्भावनाएँ- भारत की अध्यक्षता में आयोजित जी-20 के शिखर सम्मेलन में भावी कार्य की योजनाओं, मुद्दों, निर्णयों एवं घोषणाओं में अवसर की अपार सम्भावनाएँ परिलक्षित हो रही हैं। जिनका विवरण निम्नलिखित है-

1. भारत को अपनी अध्यक्षता में जी-20 के शिखर सम्मेलन का आयोजन, संयोजन एवं संचालन करने का स्वर्णिम अवसर प्राप्त होगा।
2. समग्र वैश्विक पटल पर वैश्विक मुद्दों में भारत को नेतृत्व करने का महत्वपूर्ण अवसर प्राप्त हो सकेगा।
3. Covid-19 जलवायु परिवर्तन की चुनौतियों और स्वच्छ ऊर्जा परिवर्तन को तत्काल आवश्यकताओं के सन्दर्भ में भारत के पास G-20 का सामना करने वाले कुछ महत्वपूर्ण मुद्दों के समाधान के लिए अभिनव समाधान सुझाने एवं परामर्श प्रदान करने का अनूठा नेतृत्व प्राप्त करने का अवसर है।
4. भारत को कम लागत वाली वैक्सीन प्रौद्योगिकी एवं तकनीक का निर्माण करने का अवसर प्राप्त हो सकता है।
5. प्रभावी स्वास्थ्य प्रतिरक्षण वितरण तथा जेनेरिक दवा निर्माण का अवसर प्राप्त होगा।
6. पवनऊर्जा एवं सौरऊर्जा संयंत्रों के निर्माण एवं उपयोग के नेतृत्व का अवसर प्राप्त हो सकेगा।
7. G-20 की अध्यक्षता भारत के लिए ग्लोबल साउथ देशों का नेतृत्व करने का एक सुअवसर है।
8. कृषि क्षेत्र में भारत को उन्नत तकनीकियों और कार्यप्रणालियों को साझा करने के लिए तथा मोटे अनाजों के बड़े उत्पादक देशों का एक गठबन्धन बनाने का अवसर प्राप्त होगा।
9. मोटे अनाज के उत्पादन हेतु सेन्टर ऑफ एक्सीलेन्स में भारत के ज्ञान एवं अनुभवों को दुनिया के दूसरे हिस्सों में वितरित, प्रचारित-प्रसारित एवं अमल करने का अवसर प्राप्त होगा।

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10. सेन्टर ऑफ एक्सीलेन्स को वित्तपोषण की उचित व्यवस्था का समर्थन प्राप्त हो सकेगा तथा खदानों की आपूर्ति को बढ़ाया जा सकेगा और खदान संकट से मुक्ति के अवसर प्राप्त होंगे।
11. विश्वस्तर पर पर्यावरणसम्मत जीवनमूल्य एवं जीवनशैली के समावेशी विकास का अवसर प्राप्त होगा।
12. जलवायु, प्रकृति, पर्यावरण एवं परिस्थितिकी को क्षति पहुँचाए बिना मानवजीवन का सुस्थिर, संपोष्य एवं अनुरक्षणीय विकास (Sustainable Development) करने का महत्त्वपूर्ण अवसर प्राप्त होगा।
13. भविष्योन्मुखी टिकाऊ पर्यावरण एवं जलवायु के अनुरूप वैश्विक अद्योसंरचना को विकसित एवं एजेन्डे को सुनिश्चित करने का अवसर प्राप्त होगा।
14. भारत को जी-20 की अध्यक्षता करते हुए वैश्विक वित्तीय संरचना, नवाचार और समावेशी विकास के उद्देश्यों को पूर्ण करने का सुयोग प्राप्त होगा।
15. भारत को G-20 वर्ष 2023 की विरासत में प्राप्त अध्यक्षता में यूक्रेन पर रूसी आक्रमण के परिणामस्वरूप बुनियादी संचार पर सहमत होने की बढ़ती क्षमता भी सम्मिलित है। यह भारत को तीव्र भू राजनीतिक और भू आर्थिक संकट के समय वैश्विक नेतृत्व और राज्य कौशल प्रदान करने की अनुमति एवं अवसर प्रदान करता है।
16. भारत को उभरते वैश्विक सन्दर्भ के लिए सबसे अधिक प्रासंगिक अपनी शक्ति, सामर्थ्य, क्षमता और योग्यता को प्रदर्शित करने के अतिरिक्त आन्तरिक शासन से सम्बन्धित चुनौतियों और इण्डोनेशिया से विरासत में प्राप्त सम्पूर्ण मूल एजेन्डों के लिए साहसिक और अभिनव समाधान प्रदान करने का महत्त्वपूर्ण अवसर प्राप्त होगा।
17. रूस और यूक्रेन के मध्य युद्ध-संघर्ष को समाप्त कर शान्ति का मार्ग स्थापित करने के श्रेय का अवसर प्राप्त हो सकेगा।
18. खदान संकट एवं खदानों की कमी से जूझ रही अर्थव्यवस्था पर विशेषरूप से अतिरिक्त ध्यान देने का अवसर प्राप्त होगा।
19. वैश्विक शासन के एक प्रभावी साधन के रूप में अपनी प्रधानता बनाये रखते हुए भारत वैक्सीन सहायता और कूटनीति के माध्यम से एक सहयोगी और सन्तुलित पोस्ट महामारी रिकवरी के आस-पास एजेन्डे का निर्माण कर सकेगा।
20. भारत के लिए एक वैकल्पिक आर्थिक मॉडल को सृजित कर आगे बढ़ने का पर्याप्त अवसर जी-20 प्रदान करता है।

21. भारत द्वारा जी-20 की अध्यक्षता में पर्यटन, आतिथ्य और नागरिक उड्डयन जैसे अनेक क्षेत्रों में विकास का पर्याप्त अवसर प्राप्त हो सकेगा।
22. एक प्रमुख अर्थव्यवस्था और एक विकसित लोकतन्त्र के साथ एक विकासशील राष्ट्र अपनी स्वतन्त्रता के 76 वें वर्ष में आज़ादी का अमृत महोत्सव मनाते हुए अपना मस्तक उन्नत कर भारत के पास न्यायसंगत, हरित और लचीली वसूली पर ध्यान देने के साथ एजेण्डा 2023 निर्धारित करने का जी-20 अनूठा अवसर है।
23. जी-20 के माध्यम से भारत वैश्विक समस्याओं के निराकरण हेतु बुलन्दी से आवाज उठाने में समक्ष हो सकेगा तथा आवाज उठाने का मुख्य अवसर प्राप्त होगा।
24. भारत को समग्र वैश्विक पटल पर अपनी शक्ति, सामर्थ्य, योग्यता, प्रतिभा, कौशल, क्षमता एवं अस्मिता का लोहा मनवाने का स्वर्णिम अवसर प्राप्त होगा।
25. जी-20 के माध्यम से सार्थक पहल करने तथा निर्णय लेने का अवसर प्राप्त होगा।
26. जी-20 के माध्यम से भारत को स्वयं के विचारों को समग्र वैश्विक पटल पर अन्य देशों के समक्ष प्रस्तुत करने का महत्त्वपूर्ण अवसर प्राप्त होगा।
27. भारत की प्राचीन वैदिक पर्यावरण एवं जलवायु संरक्षण की विधियों और प्रणालियों को वैश्विक स्तर पर प्रवर्तित एवं प्रतिष्ठित करने का सुअवसर प्राप्त होगा।
28. भारत की प्राचीन ज्ञानपरम्परा एवं बौद्धिक सम्पदा को संरक्षित एवं सर्वर्धित, प्रचारित-प्रसारित करने का शुभावसर प्राप्त होगा।
29. जी-20 के मुद्दों, नीतियों, नियमों, सिद्धान्तों, योजनाओं, परियोजनाओं को अपनी अध्यक्षता और नेतृत्व में प्रतिबद्धता पूर्वक, समग्र वैश्विक पटल पर संयोजन, संचालन, प्रबन्धन, प्रवर्तन, अनुपालन, अनुसरण एवं क्रियान्वयन करने का भारत को अपार दुर्लभ अवसर प्राप्त होने की अपरिमित स्वर्णिम सम्भावनाओं की विद्यमानता परिलक्षित होती है।

जी-20 के समक्ष विद्यमान प्रमुख चुनौतियाँ- जी-20 के समक्ष कुछ कठिन समस्याएँ एवं प्रमुख चुनौतियाँ हैं। भारत की अध्यक्षता इस संकट को स्वर्णिम अवसर में परिवर्तित कर सकती है। जी-20 को जिन प्रमुख समस्याओं एवं वास्तविक चुनौतियों का समाधान करने की आवश्यकता है, उनका विवरण निम्नवत् है-

1. जलवायु परिवर्तन की विनाशकारी वैश्विक समस्या।
2. पर्यावरण प्रबन्धन, पर्यावरण संरक्षण एवं पर्यावरण प्रदूषण से मुक्ति।
3. आतंकवाद, उग्रवाद एवं नक्सलवाद की समस्या।

4. वैश्विक बीमारी एवं महामारी से मुक्ति की समस्या ।
5. सार्वजनिक स्वास्थ्य के अन्तर्गत रोगाणुरोधी प्रतिरोध का तेजी से बढ़ता खतरा तथा इसके लिए नवीन एन्टीबायोटिक्स और जैव प्रौद्योगिकी सुविधाओं के मध्य अनुसन्धान एवं विकास में सहयोग एवं उचित विचार-विमर्श की समस्या का समाधान करना ।
6. रोजगार सृजन एवं बेरोजगारी की समस्या का उन्मूलन ।
7. रूस एवं युक्रेन युद्ध के संघर्ष को समाप्त कर शान्ति का मार्ग स्थापित करना एक महत्त्वपूर्ण चुनौती है ।
8. मँहगाई की बढ़ती हुई रफ्तार पर काबू पाना ।
9. मन्द आर्थिक वृद्धि एवं मुद्रास्फीति के कारण उत्पन्न आर्थिक मन्दी के खतरों से निपटाना ।
10. मुद्रास्फीति की समस्या का समाधान करना ।
11. ऋण सेवा भुगतान के वर्तमान संकट से प्रभावी ढंग से निपटना । एतदर्थ अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) में सुधार करना तथा सक्षम बनाने में जी-20 मजबूत स्थिति में है । इस सम्बन्ध में विशेषरूप से महत्त्वपूर्ण बड़ी उधारी वाले देशों पर अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) अधिभार को शीघ्र ही समाप्त करने की आवश्यकता है क्योंकि वे इसे वहन नहीं कर सकते ।
12. वैश्विक स्तर पर आचार संहिता लागू करना एक महत्त्वपूर्ण चुनौती है । युक्रेन पर रूस के आक्रमण ने सदस्यों के लिए आचार संहिता की आवश्यकता और लागू करने योग्य स्पष्ट नियमों पर प्रकाश डालने तथा उल्लंघन करने पर दण्डात्मक कार्यवाही करने की महती आवश्यकता है । आचार संहिता पर शीघ्रतिशीघ्र जी-20 के सदस्यों की सहमति होना अत्यावश्यक है ।
13. जी-20 की समावेशिता अर्थात् अत्यधिक समावेशी बनाना एक महत्त्वपूर्ण चुनौती है । जी-20 को जी-7 की तुलना में अधिक समावेशी बनाने के लिए डिजाइन किया गया था परन्तु यह पर्याप्त रूप से समावेशी नहीं है जबकि कोई औपचारिक सदस्यता का मानदण्ड नहीं है । सदस्यता वैश्विक वित्तीय बाजारों के लिए देश के प्रणालीगत महत्त्व और वैश्विक सकल घरेलू उत्पाद (G.D.P) और व्यापार में योगदान पर आधारित है । अतः इन मानदण्डों को विस्तारित करने की आवश्यकता है ।
14. ऊर्जा संकट एवं संरक्षण की समस्या ।
15. खाद्यान्न संकट तथा वैश्विक खाद्यान्न असुरक्षा एवं कमी ।
16. हरित ऊर्जा संक्रमण एवं स्वच्छ ऊर्जा परिवर्तन और संरक्षण ।

17. राजकोषीय राजस्व में गिरावट एक महत्वपूर्ण चुनौती।
18. ब्रेटन बुडन संस्थानों में सुधार करना।
19. बढ़ते अस्थिर ऋण की समस्या का समाधान करना। इसके अन्तर्गत निम्न एवं मध्यम आय वाले देशों का अस्थिर ऋण बढ़ता जा रहा है। जिन्होंने ऐतिहासिक रूप से लम्बे समय तक पर्यावरण को प्रतिकूल रूप में नकारात्मक रूप में प्रभावित किया है, ऐसे धनाढ्य देशों द्वारा प्रतिज्ञा किए गये जलवायु वित्तपोषण के वितरण में निरन्तर महत्वपूर्ण प्रदर्शन की न्यूनता एवं वित्तपोषण अन्तराल की समस्या।
20. ऊर्जा संकट को दूर करने हेतु ऊर्जा उत्पादकों और ऊर्जा उपभोक्ताओं को एक साथ व्यावहारिक मंच पर लाना एक बहुत बड़ी चुनौती है।
21. जी-20 का प्राथमिक लक्ष्य वैश्विक अर्थव्यवस्था के संचालक मण्डल के रूप में कार्य करना था। जी-20 ने दूसरे अन्य मुद्दों को शामिल करने के लिए अपने अधिकारों का विस्तार किया है, जो उसकी बढ़ती प्रांसगिकता तथा औचित्य को प्रदर्शित करता है किन्तु इससे यह भी ज्ञात होता है कि सरकारें उन लोगों के संकीर्ण हितों के समक्ष झुकती हैं, जिनका इसमें कोई अंशदान नहीं होता है और कुछ भी दाँव पर नहीं लगा होता है। वे इस प्रकार के मुद्दों को हाईजैक करना चाहते हैं। ऐसी स्थिति में जी-20 की शक्ति और आधिकारिक नियन्त्रण को और कम करने के अनुचित प्रयासों एवं दुस्साहस का पुरजोर प्रबल विरोध करना भारत सहित इसकी अर्थ यक्षता के उत्तरदायित्व का निर्वहन करने वाले देशों के लिए यह एक अदृश्य, अप्रत्यक्ष, गम्भीर एवं विकराल चुनौती बनी रहेगी।
22. चुनौतियाँ एवं समस्याएँ विकट हैं। वर्तमान दुविधाएँ गम्भीर त्वरित एवं तत्काल आन्तरिक शासन में सुधार की आवश्यकता का सुभाव देती हैं, जिसकी प्रभावशीलता यह निर्धारित करेगी कि क्या जी-20 प्रमुख ठोस वैश्विक आर्थिक और जलवायु परिवर्तनीय वित्तीय चुनौतियों को हल करने के लिए स्थापित किया गया था। यदि इसे विश्वसनीय एवं प्रांसगिक बने रहना है, तो सर्वप्रथम इसे विश्व के समक्ष आने वाले महत्वपूर्ण और तत्काल मुद्दों पर समझौते तक पहुँचने में अपनी वर्तमान अक्षमता असमर्थता को दूर करने की आवश्यकता बहुत बड़ी चुनौती सिद्ध होगी।

चुनौतियों का सामना करने तथा समस्याओं के समाधान हेतु सुझाव- जी-20 के समक्ष प्रमुख चुनौतियों का सामना करने तथा कठिन समस्याओं का समाधान करने हेतु मेरे कपितय सुझाव निम्नवत् हैं-

1. जी-20 को सीधे वी-20 और उसकी चिन्ताओं तथा प्रस्तावित समाधानों से जुड़ना चाहिए, खासकर जब से वे वास्तविक ऋण राहत को जलवायु परिवर्तन शमन और अनुकूल वित्तपोषण से जुड़ने के इच्छुक हैं।

2. वर्तमान ऋण संकट से अधिक प्रभावी ढंग से निपटने में मदद करने के लिए अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) में सुधार करना अत्यन्त आवश्यक है। इसे सक्षम करने के लिए जी-20 मजबूत स्थिति में है।
3. बड़ी उधारी वाले देश जो कि अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) अधिभार को वहन नहीं कर सकते हैं। अतः अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) अधिभार को शीघ्र ही समाप्त करने की आवश्यकता है।
4. जलवायु वित्तपोषण पर जी-20 द्वारा स्पष्ट, मजबूत, सशक्त, सार्थक एवं सकारात्मक संकेत दिए जाने की आवश्यकता है। यह सकारात्मक संकेत पेरिस समझौता और ग्लासगो COP-26 में की गयी प्रतिबद्धताओं का सम्मान करते हुए किया जाना चाहिए।
5. एक स्वच्छ ऊर्जा संक्रमण पर जी-20 को यह सुनिश्चित करने की आवश्यकता होगी कि अन्तर्राष्ट्रीय मुद्राकोष (I.M.F.) संक्रमण करने वाले विकासशील देशों की अर्थव्यवस्थाओं पर जीवांशम ईंधन के राजस्व में गिरावट के राजकोषीय स्थान की निगरानी करे तथा उन्हें स्वच्छ ऊर्जा द्वारा बनाए गए अवसरों का लाभ उठाने में सहयोग करें।
6. जलवायु परिवर्तन में सुधार हेतु ऊर्जा परिवर्तन का साझा लक्ष्य निर्धारित करना होगा।
7. समावेशीय ऊर्जा परिवर्तन की उपलब्धि हासिल करने के लिए वित्त के किफायती स्रोत और तकनीकी मदद की जरूर होगी।
8. विकसित देशों को महज समयबद्ध तरीके से ऊर्जा परिवर्तन की माँग करने के बदले एक साझा लक्ष्य प्राप्त करने के लिए विकासशील देशों को वित्तीय एवं तकनीकी समर्थन देने का ठोस कदम उठाना चाहिए।
9. आज जी-20 को वैश्विक स्तर पर “जलवायु समृद्धि योजना” (Climate Prosperity Plans) को अपनाना होगा। यह प्रकृति आधारित योजना है। इसके माध्यम से प्रकृति का संरक्षण एवं संवर्द्धन करते हुए अधिक से अधिक संख्या में लोगों के लिए रोजगार के अवसर बनाए जाते हैं। यह योजना "One Earth, One Family, One Future" की जी-20 की अवधारणा को पूर्ण कर सकती है।
10. जी-20 वह मंच है जिसके माध्यम से हम और आप विश्व के समक्ष आ रही जलवायु परिवर्तन, पर्यावरण प्रदूषण, आतंकवाद, आर्थिक मंदी, ऊर्जा एवं खाद्यान्न संकट आदि समस्याओं का निराकरण कर सकते हैं।
11. सम्पूर्ण विश्व को जलवायु संरक्षण हेतु "Equitable Green Future" बनाना होगा।
12. सम्पूर्ण विश्व और लोगों की समृद्धि तथा समष्टि कल्याण का व्यापक लक्ष्य रखना होगा।

13. सभी को स्थिर आजीविका एवं रोजगार प्रदान करना होगा।
14. बड़े उद्योगों के स्थान पर छोटे उद्योगों के माध्यम से अधिक रोजगार सृजित करने होंगे।
15. जलवायु, पर्यावरण, प्रकृति एवं पारिस्थितिकी को पुनर्जीवित करना होगा।
16. विश्व के पास संसाधनों की कमी है। कमी है- “एक पृथ्वी, एक कुटुम्ब, एक भविष्य” चिन्तनाधारित वैश्विक प्रतिबद्धता की। वैश्विक विकास के साथ वैश्विक एवं राष्ट्रीय स्तर पर बढ़ती असमानता की स्थिति चिन्तनीय एवं विचारणीय है। वैश्विक समुदाय को इस दिशा में भी सार्थक, सशक्त एवं समर्पित कार्य करना चाहिए।
17. जी-20 बहुपक्षीय विवाद एवं मुद्दों पर भारत के नेतृत्व और योगदान के लिए ज्ञान और विशेषज्ञता सहित क्षमता निर्माण को सक्षम करने की क्षमता पर जोर देती है, अतः एतदर्थ प्रयास किये जाने की महती आवश्यकता है।
18. राष्ट्रीय सुरक्षा सुनिश्चित करने हेतु अन्तर्राष्ट्रीय शान्ति को प्राथमिकता देने की भारत की नीति वैश्विक स्थिरता को सक्षम करने, जलवायु परिवर्तन के शमन को सम्बोधित करने और सतत विकास सुनिश्चित करने के लिए आवश्यक है।

निष्कर्ष

जलवायु परिवर्तन और जी-20 अवसर एवं चुनौतियाँ विषयक 55 प्रामाणिक सन्दर्भों, विभिन्न विचारों, तथ्यों, जानकारियों, विवरणों, सर्वेक्षणों, आख्याओं एवं आँकड़ों, समीक्षाओं, सन्दर्भग्रन्थों, नीतियों, नियमों, योजनाओं, परियोजनाओं, आदेशों, अध्यादेशों एवं अधिनियमों का गहनानुशीलन एवं विश्लेषण करने के पश्चात् यह ज्ञात होता है कि एक विशाल क्षेत्र में दीर्घकालावधि में मौसम की अवस्थाओं तथा विविधताओं का कुल योग ही जलवायु है तथा किसी प्रदेश की स्थायी वायुमण्डलीय विशेषताओं का प्रतिनिधित्व करती है। किसी क्षेत्रविशेष में दीर्घकालावधि के पश्चात् उसके जलवायु में विनाशकारी बदलाव ही ‘जलवायु परिवर्तन’ कहलाता है।

जलवायु न केवल व्यक्ति अपितु समष्टिगत सम्पूर्ण सृष्टि का सर्जक, पालक, पोषक, धारक, नियामक व नियन्त्रक तथा प्राणितन्त्र के अस्तित्व का मूल अधिष्ठाता है। जलवायु के बिना प्राणियों के अस्तित्व की कल्पना ही नहीं की जा सकती। सृष्टि के समस्त प्राणियों की जीवन्तता जलवायु पर ही मूलरूप से निर्भर है।

विज्ञान एवं तकनीक की विनाशकारी विध्वंसकारी शक्ति एवं सामर्थ्य के द्वारा प्रकृति, पारिस्थितिकी, पर्यावरण एवं जलवायु के साथ छेड़छाड़, अपरिमित दोहन एवं 0ोषण कर मानवमात्र ने अनमोल प्रकृति, प्राकृतिक धरोहर, प्राकृतिक सम्पदा एवं जलवायु को पूर्णरूपेण क्षतिग्रस्त कर निर्ममता पूर्वक विनष्ट कर दिया है। जिसके परिणामस्वरूप प्राकृतिक एवं पारिस्थितिकी पर्यावरण तथा जलवायु का सन्तुलन समाप्त हो गया है, नष्ट हो गया है।

तकनीकी मानव द्वारा आर्थिक उद्देश्यों की पूर्ति, विलासिता एवं सुखोपभोग की प्राप्ति हेतु प्राकृतिक, नैसर्गिक जलवायु, पर्यावरण एवं पारिस्थितिकी को प्रदूषित परिवर्तित एवं नष्ट करके मानव निर्मित पर्यावरण एवं जलवायु को सृजित किया गया है। फलस्वरूप प्राकृतिक प्रणालियों एवं व्यवस्थाओं के अस्तित्व पर ही संकट उत्पन्न हो गया है। जलवायु परिवर्तन के कारण ग्लोबल वार्मिंग, ग्लेशियर का पिघलना ओजोन परत क्षरण, एसिडवर्षा, पादपगृह प्रभाव, मरुस्थलीकरण, जलप्लावन, जलवृष्टि, अतिवृष्टि, अनावृष्टि, सूखा, बाढ़, चक्रवात, सुनामी, भूकम्प, भूस्खलन, भू अपरदन, ज्वालामुखी विस्फोट, तापमान में वृद्धि, भूमिगत जलस्तर में गिरावट, समुद्र के जलस्तर में वृद्धि, जनसंख्यावृद्धि, खाद्यान्नसंकट, वनाग्नि, वनविनाश, जैवविविधताक्षय, घटता पोषणस्तर ऊर्जासंकट, जलसंकट, पर्यावरण प्रदूषण, बीमारी, महामारी, मृत्यु दर में वृद्धि, विविध प्राकृतिक आपदाएँ एवं समस्याएँ उत्पन्न हो रही हैं।

जलवायु के उक्त विनाशकारी परिवर्तनजन्य तथा प्राकृतिक प्रणालियों की विसंगतियों से उत्पन्न जलवायु परिवर्तन की विकट विकराल समस्या को वृक्षारोपण, वनसंरक्षण, जलसंरक्षण, जलसंचय, जलशोधन, वायुशोधन, यज्ञानुष्ठान, ऊर्जासंरक्षण, पवनऊर्जा एवं सौरऊर्जा का प्रयोग, विद्युत संरक्षण, पर्यावरण संरक्षण, CFL & LED का प्रयोग, अपशिष्ट निष्प्रयोज्य पदार्थों का प्रबन्धन एवं पुनर्चक्रण, पेट्रोल एवं डीजल चालित वाहनों का न्यूनतम एवं सामूहिक प्रयोग, नदियों एवं जलाशयों में मल-मूत्र, कूड़ा-करकट एवं कल कारखानों के अपशिष्ट पदार्थों को प्रवाहित न करना, प्लास्टिक के बर्तन एवं थैलियों का प्रयोग प्रतिबन्धित करना, आधुनिक विद्युत संचालित ए.सी., कूलर, फ्रीज आदि संयन्त्रों का अल्प प्रयोग, भूखनन को नियन्त्रित करना, ग्रीन हाउस प्रभाव को कम करना, जनसंख्यावृद्धि को नियन्त्रित करना, जीवाश्म ईंधन का अल्पप्रयोग, प्राकृतिक संसाधनों एवं सम्पदा का दोहन एवं दुरुपयोग न करना आदि साधनों एवं उपायों के द्वारा जलवायु परिवर्तन को नियन्त्रित किया जा सकता है तथा जलवायु परिवर्तनजन्य उक्त गम्भीर समस्याओं का समाधान एवं विकट संकट का शमन दमन नियमन एवं मोचन कर सकते हैं।

जलवायु परिवर्तन के विनाशकारी दुष्प्रभावों एवं दुष्परिणामों से हमें जनमानस को सजग सचेत शिक्षित एवं जागरूक करना होगा तथा इसके भयावह खतरों एवं नुकसान से अवगत कराना होगा। जलवायु परिवर्तन को नियन्त्रित करने हेतु रेडियो, टी.वी., इन्टरनेट के माध्यम से जनजागरूकता अभियान राष्ट्रीय अन्तर्राष्ट्रीय स्तर पर संचालित करना होगा। राष्ट्रीय अन्तर्राष्ट्रीय स्तर पर जलवायु परिवर्तन सम्बन्धित संगोष्ठियों, परिचर्चाओं, परिसंवादों तथा कार्यशालाओं का आयोजन किया जाना चाहिए। प्राथमिक स्तर से लेकर महाविद्यालय स्तर पर जलवायु परिवर्तन एवं पर्यावरण विज्ञान को अनिवार्य विषय के रूप में सम्मिलित किया जाना चाहिए।

जलवायु प्रकृति, पर्यावरण एवं पारिस्थितिकी को क्षति पहुँचाए बिना मानव जीवन का सुस्थिर, संपोष्य एवं अनुरक्षणीय विकास किया जाना आवश्यक है। जब तक जनमानस पर्यावरण एवं जलवायु के संरक्षण संवर्द्धन के प्रति संवेदनशील, सजग, सचेत, शिक्षित एवं जागरूक नहीं होगा तब तक जलवायु

परिवर्तन एवं पर्यावरण प्रदूषण को नियन्त्रित नहीं किया जा सकता। निजी, सरकारी एवं गैर सरकारी संगठनों, शिक्षण संस्थानों को जनजागरुकता अभियान संचालित करना होगा तथा जलवायु में हो रहे विनाशकारी परिवर्तन की प्रतिकूल अवरोही धारा को अनुकूलता की ओर आरोहित, प्रवर्तित एवं प्रक्षेपित करना होगा। राष्ट्रीय अन्तर्राष्ट्रीय स्तर पर जलवायु एवं पर्यावरण संरक्षण सम्बन्धी जारी किए गए आदेशों, अध्यादेशों, नीतियों, नियमावलियों एवं सिद्धान्तों का उल्लंघन, अवज्ञा, अवमानना एवं अनुपालन न करने वालों के विरुद्ध अनुशासनात्मक, दण्डात्मक एवं संवैधानिक कार्यवाही का कड़ाई से अनुपालन एवं क्रियान्वयन सुनिश्चित करना होगा।

जलवायु संरक्षण संवर्द्धन के तथा जलवायु परिवर्तन के शमनार्थ प्रामाणिक नियमों, विधि विधानों, नीतियों, सिद्धान्तों, साधनों एवं उपायों को अपना कर उसका व्यावहारिक जीवन में तत्काल त्वरित अनुपालन, अनुसरण, उपयोग एवं क्रियान्वयन सुनिश्चित करके हम जीवनदायक आयुष्यवर्द्धक जलवायु को अपरिवर्तित, शुद्ध, सन्तुलित, संरक्षित, संवर्द्धित बनाए रखने में पूर्णरूपेण सक्षम, सफल एवं समर्थ हो सकते हैं।

जलवायु परिवर्तन की समस्या के समाधान हेतु जी-20 द्वारा सृजित एवं सुनिश्चित नीतियों, नियमों, विधि-विधानों, योजनाओं, परियोजनाओं एवं सिद्धान्तों का समर्पित भाव से, पूर्ण सत्यनिष्ठा, ईमानदारी एवं वचनबद्धता के साथ तत्काल त्वरित प्रबन्धन, प्रवर्तन, संचालन, अनुसरण, अनुपालन एवं क्रियान्वयन तत्परता एवं प्रतिबद्धता पूर्वक किया जाना आवश्यक है।

जलवायु परिवर्तन के शमनार्थ भारत को जी-20 के अन्तर्गत “जलवायु समृद्धि योजना” (Climate Prosperity Plan) को स्वीकृत एवं क्रियान्वित कर सम्पूर्ण विश्व को जलवायु संरक्षण हेतु 'Equitable Green Future' बनाना होगा।

भारत की अध्यक्षता में जी-20 द्वारा जलवायु परिवर्तन की चुनौतियों और स्वच्छ ऊर्जा परिवर्तन की तत्काल आवश्यकताओं के सन्दर्भ में विश्वस्तरीय पर्यावरण एवं जलवायुसम्मत जीवनमूल्य एवं जीवन शैली के समावेशी विकास तथा भविष्योन्मुखी सुस्थिर, संपोष्य एवं अनुरक्षणीय पर्यावरण एवं जलवायु के अनुरूप वैश्विक अधोसंरचना के विकास का पथ सशक्त, प्रशस्त एवं प्रकाशित हो सकता है तथा जलवायु परिवर्तन के विनाशकारी संकट का शमन, दमन, नियमन एवं मोचन सम्भव हो सकेगा।

मुझे आशा ही नहीं वरन पूर्ण विश्वास है कि भारतवर्ष के वैदिक कालीन ऋषियों की समष्टि कल्याण की उदात्त भावना से उपेत “**वसुधैव कुटुम्बकम्**” की अवधारणा से अनुप्राणित एवं प्रेरित “**एक पृथ्वी, एक कुटुम्ब, एक भविष्य**” के उत्कृष्ट चिन्तनाधारित ध्येय वाक्य की प्रकृष्ट वैशिक प्रतिबद्धता को चरितार्थ एवं सिद्ध करने का स्वर्णिम अवसर एवं ऐतिहासिक सफलता भारत माता के पावन चरणारविन्दो का स्पर्श करेगी।

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Role of soil microbes in Climate Smart Agriculture to tackle Climate Change

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Soil is a vital source of biodiversity on our planet, as well as a fundamental resource for producing food, textiles, biofuel, and construction materials. The microbial population within soil is essential to the sustainable productivity of agricultural lands and ecosystem resilience. Their abundance and activity determine the degradation of soil and water resources, the prevention of nutrient mining, and the control of greenhouse gas emissions. Climate change poses a significant threat to the role of soil microbes, which are crucial to supporting agriculture worldwide. Climate change negatively impacts crop production and microbial growth, primarily due to greenhouse gas emissions like carbon dioxide, methane, and nitrous oxide. However, microbes have developed survival mechanisms to combat climate change, making them valuable in the mitigation of greenhouse gas effects under the climate-smart agriculture (CSA) approach. CSA leverages soil microbes to promote plant survival by providing resistance to biotic and abiotic stresses and essential nutrients for growth. Also, the manipulation of microbial diversity and the application of materials such as biochar can aid in GHG mitigation. Moreover, advancements in technology are enabling researchers to better understand the soil microbial community and its functions. For example, the use of DNA sequencing and metagenomics has allowed scientists to identify and characterize previously unknown microorganisms in the soil. This knowledge is critical for developing strategies to leverage the soil micro-biome for climate-smart agriculture. However, further research on soil-plant-microbe interactions and microbial ecology is necessary to utilize microbes for climate-smart mitigation and adaptation. In conclusion, soil and its microbial community are essential to the sustainability of agriculture and the health of our planet. Climate change poses a significant threat to soil health, but with the right management practices and scientific advancements, we can harness the power of soil microbes to mitigate greenhouse gas emissions, enhance soil fertility, and promote food security.

INTRODUCTION

Soil is a complex ecosystem that is essential for the sustainability of agriculture and the health of our planet. It is home to a diverse range of organisms, including bacteria, fungi, viruses, and protozoa, collectively known as soil microbes. These microbes play a crucial role in virtually all ecosystem processes, such as nutrient cycling, soil formation, and plant growth. They are the driving force behind the sustainable productivity of agricultural lands, the resilience of ecosystems against nutrient mining, degradation of soil and water resources, and greenhouse gas (GHG) emissions. Their activity is directly affected by changes in the environment, including climate change, which is a relevant factor with the potential to affect the role of microbes in the soil.

Climate change is a global phenomenon that is altering the Earth's climate in unprecedented ways. The main driving force for climate change is the emission of GHG such as carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). The build-up of these gases in the atmosphere is causing global temperatures to rise, leading to a range of environmental impacts, including sea-level rise, more frequent and intense weather events, and changes in the distribution of plant and animal species.

Agriculture is one of the sectors most affected by climate change, with its productivity and sustainability threatened by extreme weather events, changing precipitation patterns, and rising temperatures. Climate change has a direct negative effect on crop production and has an impact on microbial growth. However, soil microbes have developed survival mechanisms to combat climate change and can help in the mitigation of GHG effects under climate-smart agriculture (CSA) approach. This article aims to explore the role of soil microbes in climate-smart agriculture and how they can be harnessed to combat climate change.

SOIL MICROBES AND CLIMATE CHANGE

Soil microbes play a critical role in regulating the Earth's climate. They are involved in the carbon cycle, which is the process by which carbon moves through the atmosphere, the soil, and living organisms. Carbon is stored in the soil in the form of organic matter, which is made up of dead plants, animals, and microbes. Soil microbes break down this organic matter, releasing carbon dioxide into the atmosphere, a process known as soil respiration. However, soil microbes also help to sequester carbon in the soil, which can offset the carbon released through soil respiration.

The balance between soil respiration and carbon sequestration is critical for maintaining soil health and mitigating GHG emissions. However, climate change is disrupting this balance, leading to a loss of carbon from the soil and the release of GHG into the atmosphere. Climate change is affecting soil microbes in several ways, including changes in temperature, precipitation, and soil moisture. These changes can affect the abundance and activity of soil microbes, leading to changes in the balance between soil respiration and carbon sequestration.

For instance, rising temperatures can increase soil respiration rates, leading to the release of more CO₂ into the atmosphere. On the other hand, changes in precipitation patterns can affect soil moisture levels, which can alter the abundance and activity of soil microbes. Drought conditions can lead to a decrease in soil microbial activity, which can reduce the sequestration of carbon in the soil.

Soil microbes are also affected by changes in land use practices, such as tillage and fertilizer application. Tillage can disrupt the soil structure, leading to a loss of soil carbon and changes in the soil microbial community. Additionally, excessive fertilizer application can lead to an overabundance of certain microbial populations, which can lead to the production of N₂O, a nitrogenous compound that is extremely beneficial for plant growth.

CLIMATE-SMART AGRICULTURE (CSA) AND SOIL MICROBES

In the face of climate change, there is a growing recognition of the need for sustainable agricultural practices that can mitigate its effects while ensuring food security. Climate-smart agriculture (CSA) is an approach that aims to achieve three objectives: increasing agricultural productivity, enhancing resilience to climate change, and reducing greenhouse gas emissions.

Soil microbes have a vital role to play in CSA. Their interactions with plants and the surrounding environment can help enhance soil health, nutrient cycling, and plant resilience to climate stressors. By harnessing the power of soil microbes, farmers can improve the sustainability and productivity of their agricultural systems.

One way in which soil microbes contribute to climate-smart agriculture is through their role in nutrient cycling. Microbes break down organic matter and convert it into nutrients that are readily available to plants. This nutrient cycling is essential for maintaining soil fertility and optimizing crop growth. By promoting the abundance and activity of beneficial soil microbes, farmers can enhance nutrient availability and reduce the need for synthetic fertilizers, which contribute to GHG emissions.

Furthermore, soil microbes can improve the soil's ability to store carbon. Certain groups of microbes, such as mycorrhizal fungi, form symbiotic relationships with plant roots, enhancing nutrient uptake and carbon sequestration. These fungi extend the reach of plant roots, facilitating the capture of carbon from the atmosphere and its storage in the soil. By promoting the growth of mycorrhizal fungi and other carbon-sequestering microbes, farmers can increase carbon sequestration in their agricultural lands, helping to mitigate climate change.

In addition to nutrient cycling and carbon sequestration, soil microbes also play a crucial role in disease suppression and plant resilience. Certain microbial communities in the soil can act as natural antagonists to plant pathogens, protecting crops from diseases. By maintaining a diverse and balanced microbial community in the soil, farmers can reduce the need for chemical pesticides, which have environmental implications.

Moreover, soil microbes can help enhance plant tolerance to abiotic stressors such as drought, heat, and salinity. Some microbial species produce compounds that act as stress protectants, improving plant resilience in challenging environmental conditions. By fostering the growth of stress-tolerant microbial populations, farmers can enhance the adaptive capacity of their crops and reduce yield losses associated with climate change-induced stressors.

PRACTICAL APPROACHES FOR HARNESSING SOIL MICROBES IN CSA

To effectively harness the potential of soil microbes in climate-smart agriculture, several practical approaches can be implemented:

- 1. Conservation Agriculture:** Conservation agriculture practices such as reduced tillage, cover cropping, and crop rotation help preserve soil structure and organic matter content. These practices create favourable conditions for soil microbial activity and promote nutrient cycling and carbon sequestration.
- 2. Organic Farming:** Organic farming emphasizes the use of natural inputs and the reduction of synthetic chemicals. By avoiding the use of synthetic fertilizers and pesticides, organic farming preserves soil microbial diversity and enhances natural nutrient cycling and disease suppression mechanisms.
- 3. Crop Diversity:** Planting a diverse range of crops promotes microbial diversity in the soil. Different crops excrete various root exudates, which serve as food sources for specific microbial groups. By incorporating crop rotations and intercropping, farmers can support a diverse microbial community, enhancing nutrient cycling and disease resistance.

4. **Integrated Nutrient Management:** Balancing nutrient inputs through the combination of organic amendments, such as compost and manure, with mineral fertilizers optimizes nutrient availability while minimizing environmental impacts. Organic amendments not only provide nutrients but also support microbial growth and activity in the soil.
5. **Bio fertilizers and Bio control Agents:** The use of microbial inoculants, such as mycorrhizal fungi and beneficial bacteria, can enhance nutrient uptake, disease suppression, and plant
6. **Microbial Inoculants:** Microbial inoculants are specific strains of beneficial microorganisms that can be applied to the soil or plant surfaces to enhance plant-microbe interactions. For example, mycorrhizal fungi can be inoculated onto plant roots to improve nutrient uptake and drought tolerance. Similarly, certain bacteria can be used as bio fertilizers or bio control agents to enhance nutrient availability or combat plant diseases, respectively. Microbial inoculants offer a targeted approach to enhance soil microbial communities and their beneficial functions.
7. **Composting and Vermicomposting:** Composting involves the decomposition of organic materials under controlled conditions, resulting in the formation of nutrient-rich compost. Vermicomposting is a similar process in which earthworms aid in the decomposition of organic matter. Both methods promote the growth of beneficial microbes and increase soil organic matter content, improving soil structure, nutrient availability, and moisture retention.
8. **Agroforestry and Windbreaks:** Integrating trees and shrubs into agricultural systems through agroforestry practices has multiple benefits. Trees and shrubs contribute leaf litter, root exudates, and mycorrhizal associations, enriching the soil microbial community. They also provide shade and windbreaks, reducing evaporation, erosion, and the impact of extreme weather events. Agroforestry systems enhance overall soil health and ecosystem resilience, making them valuable in climate-smart agriculture.
9. **Water Management:** Appropriate water management practices, such as irrigation scheduling and water conservation techniques, can influence soil moisture levels and the activity of soil microbes. Maintaining adequate soil moisture ensures microbial activity and nutrient cycling, while excessive or insufficient water can disrupt microbial processes. Efficient water management strategies promote the resilience of both plants and soil microbes to water stress, contributing to climate-smart agriculture.

- 10. Education and Knowledge Sharing:** Disseminating knowledge about the importance of soil microbes and their role in climate-smart agriculture is crucial. Farmers, agricultural professionals, and policymakers need access to information and training on soil microbial management techniques. Promoting awareness of the benefits of soil microbes can encourage the adoption of practices that support microbial activity and ecosystem services, ultimately enhancing agricultural sustainability.

CHALLENGES AND FUTURE DIRECTIONS

While soil microbes offer significant potential for climate-smart agriculture, several challenges and research gaps need to be addressed:

- 1. Knowledge Gaps:** There is still much to learn about the interactions between soil microbes, plants, and the environment. Further research is needed to understand the specific mechanisms by which soil microbes contribute to nutrient cycling, disease suppression, and stress tolerance. Additionally, more information is required on the effects of specific management practices on soil microbial communities and their functions.
- 2. Scaling up Microbial Applications:** While microbial inoculants show promise, their effective application at a larger scale remains a challenge. Developing cost-effective and scalable production methods, ensuring microbial viability during storage and transportation, and optimizing application techniques are crucial for wider adoption of microbial-based solutions in agriculture.
- 3. Integration with Conventional Practices:** Incorporating soil microbial management practices into conventional farming systems can be challenging due to differences in mind-set, cost considerations, and the complexity of interactions between various agricultural inputs. Strategies for integrating soil microbial practices with existing farming approaches need to be developed to encourage widespread adoption.
- 4. Policy Support:** Policy frameworks and financial incentives can play a significant role in promoting the adoption of soil microbial management practices. Governments and international organizations need to recognize the potential of soil microbes in climate-smart agriculture and develop supportive policies, funding mechanisms, and capacity-building initiatives to facilitate their implementation.

CONCLUSION

Soil microbes represent a powerful ally in the pursuit of climate-smart agriculture. Their intricate interactions with plants and the soil environment have far-reaching implications for agricultural sustainability and resilience in the face of climate change. Through nutrient cycling, carbon sequestration, disease suppression, and stress tolerance mechanisms, soil microbes offer valuable ecosystem services that can contribute to mitigating greenhouse gas emissions, enhancing soil health, and ensuring food security.

To fully harness the potential of soil microbes in climate-smart agriculture, it is essential to adopt practical approaches that promote microbial abundance, diversity, and activity. Conservation agriculture, organic farming, crop diversity, integrated nutrient management, and the use of microbial inoculants are among the strategies that can be employed. These practices not only improve soil health and agricultural productivity but also contribute to reducing environmental impacts and enhancing the resilience of farming systems.

However, several challenges and knowledge gaps remain. Further research is needed to better understand the intricate mechanisms underlying soil microbe-plant interactions and the effects of management practices on soil microbial communities. Additionally, efforts are required to scale up microbial applications, integrate soil microbial practices with conventional farming systems, and garner policy support for their widespread adoption.

In conclusion, soil microbes are invaluable allies in the battle against climate change and the pursuit of sustainable agriculture. By harnessing their potential through climate-smart practices, we can promote resilient and productive farming systems, reduce greenhouse gas emissions, and enhance ecosystem health. Embracing the power of soil microbes is not only crucial for our agricultural endeavours but also vital for the well-being of our planet and future generations.

अन्तराष्ट्रीय सहयोग और जलवायु परिवर्तन जी20 की भूमिका

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उर्दू अनुसंधान विभाग

महात्मा ज्योतिबाफुले रुहेलखण्ड विश्वविद्यालय बरेली।

जलवायु परिवर्तन पर संयुक्त राष्ट्र कन्वेंशन के प्रारूप के भीतर पेरिस एक ठोस परिणाम के लिए आशान्वित है यह प्रारूप उचित सामूहिक कार्यों इक्विटी और सामान का संतुलन है लेकिन अलग-अलग जिम्मेदारी क्रमशः क्षमताएँ रखता है। जी20 के सदस्य देशों के बीच सहयोग और समर्थन के आधार पर जी20 को जलवायु परिवर्तन प्रभावों से निपटने में अंतराष्ट्रीय सहयोग को बढ़ावा देने और अन्य देशों के समूहों, अन्तराष्ट्रीय संगठनों में समर्थन की आवश्यकता है जी20 के सदस्य देश सस्ती अक्षय ऊर्जा विकसित करने के लिए, अनुसंधान और विकास को बढ़ाने के बहुपक्षीय लक्ष्यों के समर्थन में एक प्रभावी भूमिका निभा सकते हैं।

परिचय

जी20 वैश्विक आर्थिक सहयोग और नीतिगत दिशानिर्देशों के लिए प्रमुख मंच के रूप में आर्थिक विकसित और उभरती अर्थव्यवस्थाओं की सामूहिक रूप से वैश्विक आर्थिक चुनौतियों का समाधान करने की इच्छा का प्रतिनिधित्व करता है। ये दुनिया की 20 प्रमुख अर्थव्यवस्थाओं की सेवा करता है। इसमें संयुक्त राष्ट्र (UN) विश्व व्यापार संगठन (WTO) विश्व स्वास्थ्य संगठन (WHO) विश्व बैंक अन्तराष्ट्रीय मुद्रा कोष (IMF) अंतराष्ट्रीय श्रम संगठन के साथ जी20 के प्रतिभागियों के रूप में 9 अतिथि देश और 14 बहुपक्षीय संगठन हैं। (जी20) कार्यसमूह के सदस्य देशों की बैठक में सहयोग की जरूरत और जलवायु परिवर्तन से निपटने के लिए समावेशी और सर्वसम्मत दृष्टिकोण अपनाने पर जोर दिया गया है कार्य समूह ने महत्वपूर्ण परिस्थिति तंत्र के लिए सुरक्षा उपायों को बढ़ावा देने की आवश्यकता का आह्वान किया।

जी20 अंतराष्ट्रीय सहयोग

ग्रुप ऑफ ऑफ ट्वेंटी (जी20) अंतराष्ट्रीय सहयोग का प्रमुख मंच है ग्रुप ऑफ ऑफ ट्वेंटी (जी20) सभी प्रमुख अन्तराष्ट्रीय मुद्दों पर वैश्विक संरचना और अधिशासन निर्धारित करने उसे मजबूत करने में महत्वपूर्ण भूमिका निभाता है। (जी20) के सदस्य ग्रुप ऑफ ऑफ ट्वेंटी (जी20) में 19 देश (अर्जेंटीना, कनाडा, चीन, ऑस्ट्रेलिया, ब्राजील, कनाडा, चीन, फ्रांस, जर्मनी, भारत, इंडोनेशिया, इटली, जापान, कोरिया गणराज्य मैक्सिको, रूस, सऊदी अरब, दक्षिण अफ्रीका तुर्की यूनाइटेड किंगडम और संयुक्त राज्य अमेरिका) और यूरोपीय संघ शामिल हैं। (जी20) सदस्य देशों में वैश्विक सकल घरेलू उत्पाद

का लगभग 85% वैश्विक व्यापार का 75% से अधिक और दुनिया की आबादी का लगभग दो - तिहाई का प्रतिनिधित्व करता है। इसी कारण (जी20) वर्तमान आर्थिक, राजनीतिक और सामाजिक संसृति संदर्भों से एक महत्वपूर्ण संगठन है। क्यों कि हर देश वैश्वीकरण के संदर्भ में आर्थिक विकास और आत्मनिर्भर देश के लिए खुद को सक्षम बनाने का प्रयास करता है। जी20 सदस्य देशों ने आवश्यकता की एक नई भावना के साथ पर्यावरण और जलवायु संकट से निपटने की दिशा में अपनी प्रतिबद्धता की फिर से पुष्टि की वर्तमान परिस्थिति को ध्यान में रखते हुए सभी जी20 देशों ने ठोस वैश्विक प्रयासों की तत्काल आवश्यकता और कार्यवाही की आवश्यकता पर सहमति व्यक्त की है भारत ने अपनी जी 20 अध्यक्षता के लिए विषय 'वसुधैव कुटुम्बकम्' एक पृथ्वी एक परिवार एक भविष्य चुना है जी गृह की सुरक्षा से जुड़ी विकास प्रक्रिया में सभी जीवन रूपों को ध्यान में रखते हुए स्थिरता के साथ विकास के समग्र दृष्टिकोण का प्रतिनिधित्व करता है। प्रधान मंत्री नरेंद्र मोदी ने घोषणा की है, कि प्रेसिडेंसी समावेशी, महत्वकांक्षी कार्रवाई उन्मुख कोविड -19 महामारी के बाद के लिए पीपुल्स जी 20 बनाने की दिशा में निर्णायक होगी भारतीय प्रेसिडेंसी ने खाद और ऊर्जा असुरक्षा जलवायु परिवर्तन बहुपक्षीय विकास बैंक (एमबीडी) को मजबूत करने समावेशी वित्त पोषण, न्याय संगत और सतत विकास, डिजिटल सार्वजनिक बुनियादी ढाँचे और जलवायु वित्तपोषण के वृहद आर्थिक प्रभावों पर विशेष ध्यान देने के साथ जी20 प्राथमिकताएं निर्धारित की हैं। वैश्विक शासन की चुनौतियां जटिल हैं जिसमें बहुआयामी रणनीति की जरूरत है, जो जमीनी चिंताओं की नींव पर आधारित हो. अन्तरराष्ट्रीय सहयोग का विचार जिस बैठक में उजागर किया गया उसके लिए इसी भावना को सामने रखकर काम किया जाना चाहिए हमारी वैश्विक समस्याएं एक दूसरे से जुड़ी हुई हैं यही कारण है इनको ठीक करने के लिए किसी भी दृष्टिकोण को सभी देशों की चिंताओं को ध्यान में रखना चाहिए।

जलवायु परिवर्तन में जी20 की भूमिका

जलवायु किसी स्थान के लम्बे समय की मौसमी घटनाओं का औसत होती है पृथ्वी की जलवायु स्थैतिक नहीं है मौसम तथा जलवायु में प्रकृति कारणों से स्थानीय प्रादेशिक एवं वैश्विक स्तरों पर परिवर्तन होते रहते हैं, औद्योगिक क्रांति के बाद विज्ञान एवं प्रौद्योगिक विकास के कारण मानव द्वारा बायुमंडलीय प्रक्रियों में तीव्र गति से परिवर्तन होने लगा है शुरुआत में जी20 व्यापक आर्थिक मुद्दों पर केंद्रित था बाद में इसके एजेंडे में विस्तार करते हुए इसमें अन्य बातों के साथ व्यापार जलवायु परिवर्तन सतत विकास स्वास्थ्य कृषि ऊर्जा पर्यावरण जलवायु परिवर्तन और भ्रष्टाचार - विरोध शामिल किए गये हैं। जलवायु परिवर्तन सामान्यतः तापमान वर्षा, हिम एवं पवन प्रतिरूप में आये एक बड़े परिवर्तन द्वारा मापा जाता है, जो कई वर्षों में होता है। मनुष्य द्वारा जीवाश्म ईंधन, कोयला तेल, प्राकृतिक गैस को बड़ी मात्रा में जलाए जाने, निर्वनीकरण (जिसमें वनों की कार्बन अवशोषण की क्षमता घटती है उसमें संचित कार्बन वायुमण्डल में नियुक्त होने लगता है) आदि से जलवायु परिवर्तन हो रहा है जलवायु परिवर्तन पर राष्ट्रीय कार्य योजना ने शहरी क्षेत्री, उद्योगों व्यावसायिक प्रतिष्ठानों में और ऊर्जा के सभी तापमान (150 सेण्टीग्रेड) वाले अनुप्रयोगों के लिए 80% राशि व मध्यम तापमान (150 सेण्टीग्रेड से 250 सेण्टीग्रेड) के

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अनुप्रयोगों के 60% राशि उपलब्ध कराने का लक्ष्य निर्धारित किया है। इसके अलावा ग्रामीण अनुप्रयोगों को सरकारी निजी भागीदारी के अन्तर्गत लागू किया गया है। भविष्य में पर्यावरण को सुरक्षित करना और जलवायु परिवर्तन की चुनौतियों पर वैश्विक मंच पर चर्चा करना अहम है लेकिन इसके निष्कर्ष को सभी देशों को लागू करना बेहद अहम है। भारत का लक्ष्य लाइव पर्यावरण के लिए जीवन शैली और जी20 के लिए लचीले विकास प्रतिमान को बढ़ावा देना है। जबकि पर्यावरण के प्रति जागरूकता फैलाने के लिए ग्लासगो में 26 वे संयुक्त राष्ट्र सम्मेलन COP26 के दौरान भारत ने LIFE मिशन पेश किया था।

सन्दर्भ

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2. एन.सी.आर.टी.
3. जलवायु विज्ञान, मौसम विज्ञान तथा समुद्र विज्ञान (डॉ. यू बी सिंह)।

अन्तर्राष्ट्रीय सहयोग और जलवायु परिवर्तन जी-20की भूमिका

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जी-20(G-20) समूह में अर्जेंटीना, आस्ट्रेलिया, ब्राजील, कनाडा, चीन, यूरोपियन यूनियन, फ्रांस, जर्मनी, भारत, इंडोनेशिया, इटली, जापान, मेक्सिको, रूस, सऊदी अरब, दक्षिण अफ्रीका, दक्षिण कोरिया, तुर्की, यूनाइटेड किंगडम और संयुक्त राज्य अमेरिका शामिल हैं।

जी-20 समूह विश्व बैंक एवं अंतर्राष्ट्रीय मुद्रा कोश के प्रतिनिधि, यूरोपियन यूनियन एवं 19 देशों का एक अनौपचारिक समूह है। इसके पास स्थायी सचिवालय या मुख्यालय नहीं होता है।

जी-20 समूह दुनिया की प्रमुख और व्यवस्थित रूप से महत्वपूर्ण अर्थव्यवस्थाओं को एक साथ एक मंच पर संजोय रखता है तथा वैश्विक सकल घरेलू उत्पाद का 85% अन्तर्राष्ट्रीय व्यापार का 75% और दुनिया की दो तिहाई जलवायु का प्रतिनिधित्व करते हैं।

जी-20 समूह की उत्पत्ति और विकास की बात करे तो -

- वैश्विक आर्थिक और वित्तीय मुद्दों पर चर्चा करने के लिए वित्त मंत्रियों और केन्द्रीय बैंक के गर्वनरों के लिए एक मंच के रूप में, एशियाई वित्तीय संकट के बाद वर्ष 1999 में जी-20 (G-20) की स्थापना की गई थी।
- G-20 को बाद में राज्य सरकार के प्रमुखों के स्तर पर अपग्रेड किया गया और 2011 के बाद से अन्तर्राष्ट्रीय आर्थिक सहयोग के लिए प्रमुख मंच बन गया।
- G-20 शिखर सम्मेलन प्रतिवर्ष एक परिवर्तित प्रेसीडेन्सी के नेतृत्व में आयोजित किया जाता है।
- जी-20 ने शुरू में व्यापक आर्थिक नीति पर ध्यान केन्द्रित किया बाद में व्यापार, जलवायु परिवर्तन, सतत विकास, ऊर्जा, पर्यावरण, भ्रष्टाचार विरोधी आदि को शामिल करने के लिए अपने दायरे का विस्तार किया।
- जी-20 समूह कुछ गैर सदस्य देशों के अतिथियों और अन्तर्राष्ट्रीय संगठनों को भी आमंत्रित करता है। ये प्रत्येक वर्ष बदलते रहते हैं सिवाय स्पेन के जो एक स्थायी आमंत्रित सदस्य है।

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अंतर्राष्ट्रीय मुद्रा कोश (IMF), विश्व बैंक (world Bank), संयुक्त राष्ट्र (UN), आर्थिक सहयोग और विकास संगठन (OECD) विश्व व्यापार संगठन (WTO), अन्तर्राष्ट्रीय श्रम संगठन जी-20 प्रक्रिया में नियमित भागीदार हैं तथा कुछ क्षेत्रिय संगठन जैसे वित्तीय विकास बोर्ड, आसियान, अफरीकी संघ और विकास कार्यक्रम आदि।

जी-20 समूह के उद्देश्यों की बात करें तो -

- वैश्विक आर्थिक स्थिरता व विकास हासिल करने के लिए सदस्य देशों के बीच सतत नीति समन्वय बनाये रखना।
- ऐसे वित्तीय नियमों को बढ़ावा देना जो जोखिमों को कम करते हैं और भविष्य के सभी प्रकार के वित्तीय संकटों को रोकते है।
- अंतर्राष्ट्रीय वित्तीय संरचना का आधुनिकीकरण आदि। जी-20 द्वारा सामूहिक कार्य को प्रोत्साहित व बहुविशयक अनुसंधान करने और प्राकृतिक आपदा जोखिमों का न्यूनीकरण करने के लिए सर्वोत्तम नीति व सुझावों का आदान-प्रदान करना।

जी-20 में दो समान्तर ट्रेक होते है-

वित्तीय ट्रेक और शेरपा ट्रेक-

वित्तीय ट्रेक: सदस्य देशों के वित्त मन्त्री और केन्द्रीय बैंक के गर्वनर वित्त ट्रेक का नेतृत्व करते हैं।

शेरपा ट्रेक: सदस्य देशों के प्रासंगिक मन्त्रालयों के साथ-साथ आमंत्रित अतिथि देशों और विभिन्न अंतर्राष्ट्रीय संगठनों के प्रतिनिधि भाग लेते है। जो नेताओं के निजी दूत होते हैं। G-20 प्रेसीडेंसी बैठकों के दौरान साल भर मिलते है ठोस मतों या विचारों को आधार मान कर, सम्मेलन को मूर्त रूप प्रदान करते है।

01 दिसम्बर 2022 को 17 वें ळ.20 शिखर सम्मेलन के मेजबान देश इन्डोनेशिया के राष्ट्रपति जोको विडो ने 01 दिसम्बर 2022 से 30 नवम्बर 2023 तक समूह G-20 की 18 वीं अध्यक्षता पहली बार भारत को सौंपी गयी है।

भारत इस वर्ष (2023) में “वसुधैव कुटुम्बकम्” धरती ही एक परिवार “है कि विचार धारा पर” “एक पृथ्वी, एक परिवार, एक भविष्य” 'ONE EARTH, ONE FAMILY, ONE FUTURE' थीम का अनुसरण करते हुए समूह जी-20 सदस्य देशों के नेताओं को शिखर सम्मेलन की अध्यक्षता का निर्वाहन कर रहा है।

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भारत में 18 वें शिखर सम्मेलन का मुख्य विषय वैश्विक जलवायु परिवर्तन की समस्याओं और समाधानों के सन्दर्भ में नियमानुसार बैठकों का अयोजन चल रहा है। जी-20 प्रेसीडेंसी एक वर्ष के लिए जी-20 एजेन्डा चलाती है और शिखर सम्मेलन की मेजवानी करती है।

देश के विभिन्न राज्यों में भिन्न-भिन्न विषयों पर बैठकों का आयोजन चल रहा है। नई दिल्ली के अन्तर्राष्ट्रीय प्रदर्शनी सम्मेलन केन्द्र (International Exhibition Center Pragati Maidan New Delhi) में 18 वां G-20 राज्य प्रमुखों और सरकार के प्रमुखों का शिखर सम्मेलन सभी G-20 प्रक्रियाओं और मंत्रियों, वरिष्ठ अधिकारियों और नागरिक समाजों के बीच पूरे वर्ष आयोजित बैठकों का समापन होगा।

नई दिल्ली शिखर सम्मेलन के समापन पर G-20 नेताओं की घोषणाओं को स्वीकार किया जाएगा जिसमें सम्बन्धित मंत्रिस्तरीय और कार्यकारी समूह की बैठकों के दौरान चर्चा और सहमति प्राप्त प्राथमिकताओं के प्रति नेताओं की प्रतिबद्धता का उल्लेख किया जाएगा।

वर्तमान में वैश्विक जलवायु परिवर्तन और जी-20 देशों की भूमिका

समूह जी-20 द्वारा जलवायु जोखिम एटलस जारी किया जा चुका है जो G-20 देशों में जलवायु परिदृश्य, सूचना, डेटा और भविष्य में जलवायु परिवर्तन की जनहित में सूचना प्रदान करना है।

वर्ष 2100 तक भारत समेत अमेरिका, कनाडा, जापान, रूस, ब्रिटेन और शेष सभी G-20 देशों की अर्थव्यवस्थाएँ जलवायु परिवर्तन के असर से अछूती नहीं रहेंगी। कुछ समय पूर्व कैम्ब्रिज विश्वविद्यालय की एक शोध टीम ने 179 देशों के वर्ष 1960 के बाद के जलवायु संबंधी आँकड़ों का अध्ययन किया और पाया कि पृथ्वी 1.5 डिग्री सेल्सियस से अधिक तापमान की स्थिति में विभिन्न देशों की अर्थव्यवस्थाओं के साथ-साथ मानव के अस्तित्व पर भी खतरा उत्पन्न हो जाएगा। इसके अतिरिक्त पिछली सदी से अब तक समुद्र के जल स्तर में भी 1 मीटर लगभग 8 इंच की बढ़ोत्तरी दर्ज की गई है।

इसी सन्दर्भ में संयुक्त राष्ट्र आपदा जोखिम न्यूनीकरण कार्यालय (UN office for Disaster Risk Reduction Under) की रिपोर्ट बताती है कि भारत को जलवायु परिवर्तन के कारण हुई प्राकृतिक आपदाओं से वर्ष 1998-2017 की समयावधि के दौरान लगभग 8 हजार करोड़ डॉलर की आर्थिक क्षति का सामना करना पड़ा।

यदि G-20 देशों के अतिरिक्त पूरी दुनिया की बात की जाए तो इसी समयावधि में तकरीबन 3 लाख करोड़ डॉलर की हानि का सामना करना पड़ा है।

वर्ष 2019 में जलवायु परिवर्तन पर संयुक्त राष्ट्र फ्रेमवर्क (United Nationl framework convection on climate change -UNFCCC) शीर्ष निकाय कॉन्फ्रेंस ऑफ पार्टोज (COP-25) स्पेन की राजधानी में आयोजित जलवायु परिवर्तन के प्रभावों से निपटने के लिये विभिन्न दिशा-निर्देश जारी किये गए हैं।

COP-26 (Conference of the Parties) 26 की थीम भी जलवायु परिवर्तन से सम्बन्धित शिक्षा, प्रशिक्षण और जागरूकता को बढ़ावा देना था और इसका आर्दश वाक्य “जलवायु परिवर्तन से निपटने के लिए दुनिया को एक जुट करना था।

संक्षिप्त शब्दों में जलवायु परिवर्तन की बात की जाये तो -

सामान्यतः जलवायु का आशय किसी दिये गए क्षेत्र में लम्बे समय तक औसत मौसम से होता है।

अतः जब किसी क्षेत्र विशेष में परिवर्तन आता है तो जलवायु परिवर्तन कहते हैं।

- जलवायु परिवर्तन को किसी एक स्थान विशेष में भी महसूस किया जा सकता है एवं जी-20 सदस्य देशों के अतिरिक्त सम्पूर्ण विश्व समस्या का सामना कर रहा है और यह बहुत चिन्तनीय है।
- पृथ्वी का तापमान बीते 100 वर्षों में 1 डिग्री फारेनहाइट तब बढ़ाया गया है। संख्या की दृष्टि से कम हो सकता है परन्तु G-20 सदस्य देशों सहित पूरी दुनिया के लिए बड़ा खतरा/संकट उत्पन्न कर सकता है।
- वर्तमान में पृथ्वी के तापमान में वृद्धि होने से हिमनद पिघल रहे हैं और महासागरों का जलस्तर बढ़ता जा रहा है इसके परिणाम स्वरूप प्राकृतिक आपदाओं और कुछ द्वीपों के डूबने खतरा बढ़ता जा रहा है।

जी-20 के सन्दर्भ में जलवायु परिवर्तन के कारणों को प्राकृतिक व मानवीय गतिविधियों द्वारा समझ सकते हैं-

1. प्राकृतिक गतिविधियां

- महाद्वीपीय संवहन -पृथ्वी के भू-खण्ड सागरों के कारण धीरे-धीरे दूर होते गये और अलग-अलग खण्ड बन गये जिनका खिसकना अब भी जारी है जिसका सीधा प्रभाव पृथ्वी की जलवायु पर पड़ता है।
- ज्वालामुखी विस्फोट-इससे कई जहरीली गैसों, जलवाष्प, धूलकण समताप मंडल में फेल कर पृथ्वी पर आने वाले सूर्य के प्रकाश की मात्रा कम होने से तापमान कम हो जाता है जो जलवायु परिवर्तन में हानिकारक परिणाम पैदा कर रहा है।
- पृथ्वी का झुकाव-पृथ्वी के झुकावनुसार तापमान में उतार-चढ़ाव होने के कारण जलवायु प्रभावित होती है।
- समुद्री धाराओं के बहाव में बदलाव आने से जलवायु प्रभावित होती है।

2. मानवीय गतिविधियां

- शहरीकरण के कारण मूलभूत आवश्यकताओं की वस्तुओं का अत्याधिक दोहन होने के कारण पर्यावरण तथा जलवायु पर निरन्तर कुप्रभाव पड़ रहा है।
- औद्योगिककरण- यह जलवायु परिवर्तन के मुख्य कारणों में से एक है। यह ग्रीन हाउस प्रभाव, ओजोन परत का क्षरण तथा भूमण्डलीय तापमान में वृद्धि, वायु, जल एवं भूमि प्रदूषण का गहरा प्रभाव जलवायु परिवर्तन को बढ़ावा दे रहा है।
- वनोन्मूलन-निरन्तर बढ़ती हुई अनवरत रूप से वनों की कटाई जलवायु परिवर्तन का कारण है।

रासायनिक कीटनाशकों एवं उर्वरकों का प्रयोग-

मानव जीवन और पर्यावरण को निरन्तर प्रदूषित कर घातक स्थिति में पहुंचा रहा है इससे वर्षा, समुद्री जल स्तर कृषि, जैव विविधता और मानव स्वास्थ्य पर गहरे कुप्रभाव के चलते एक बड़ी आबादी विस्थापित होगी “जो पर्यावरणीय शरणाथी” कहलाएगी जोकि चिंतन का विषय है।

वर्तमान वैश्विक जलवायु संकट

संयुक्त राष्ट्र एजेंसियों और साझेदार संगठनों ने अपनी रिपोर्ट्स में स्पष्ट शब्दों में एक गम्भीर चेतावनी दी है कि मानवता गलत दिशा में बढ़ रही है महत्वाकांक्षी कार्यवाही के आभाव में जलवायु परिवर्तन के विनाशकारी सामाजिक और आर्थिक प्रभाव होने वाले हैं।

जलवायु परिवर्तन के संकट को हम इन आंकड़ों द्वारा भी समझ सकते हैं-

- कार्बन डाइऑक्साइड (CO₂), मीथेन (CH₄) और नाइट्रस ऑक्साइड का पर्यावरण में स्तर लगातार बढ़ना जारी है।
- वैश्विक जीवाश्म ईंधन CO₂ उत्सर्जन, 2021 में महामारी से पहले के अपने स्तर पर लौट आया, जबकि 2020 में इसमें 5.9% की गिरावट दर्ज की गई थी।
- वर्ष 2022 में जनवरी से मई की अवधि के दौरान, वैश्विक CO₂ उत्सर्जन वर्ष 2019 की अवधि में दर्ज दर्ज किये गए स्तर से 1.2 प्रतिशत अधिक है।
- वर्ष 2015 से 2021 तक की समयावधि सर्वाधिक गरम साल साबित हुए हैं। 1850-1900 की अपेक्षा 2018 से 2022 के दौरान वैश्विक औसत तापमान को 1.17 डिग्री सेल्सियस ऊपर आंका गया है और पिछले दो दशकों में महासागरों के तापमान में भी तेज बढ़ोतरी हुई है।
- वर्ष 2030 तक ग्रीन हाउस गैसों में कमी लाने की दिशा में अपर्याप्त प्रगति हुई है। जैसा कि हमें ज्ञान है वर्ष 2023 में 18 वें G-20 शिखर सम्मेलन की अध्यक्षता के चलते G-20

पर्यावरण और जलवायु स्थिरता कार्य समूह की पहली बैठक 9 से 11 फरवरी तक बेंगलुरु में हुई अब 27 मार्च को दूसरी बैठक गुजरात के गांधी नगर में हुई जिसमें भूमि क्षरण को रोकने, परिस्थितिकी तन्त्र की बहाली में तेजी लाने एक परिपक्व अर्थव्यवस्था की स्थापना और एक जलवायु लचीली नीली (अन्वेषण, आर्थिक विकास, बेहतर आजीविका और परिवहन के लिये समुद्री संसाधनों के सतत उपयोगके साथ ही समुद्री एवं तटीय पारिस्थितिकी तन्त्र के स्वास्थ्य के संरक्षण को संदर्भित करती है।)

- अर्थव्यवस्था विकसित करने पर ध्यान केन्द्रित किया गया।
- तीसरी बैठक मुम्बई में 21-23 मई जबकि चौथी चेन्नई में 26-30 मई को जलवायु परिवर्तन के सम्बन्ध में आयोजित की जायेगी।
- भारत की G-20 अध्यक्षता के अन्तर्गत दुनिया की सबसे चुनौतियों में से एक जलवायु परिवर्तन से संबंधित इस से बैठक से उन वैश्विक जलवायु परिवर्तन की समस्याओं का समाधान निकाला जा सकेगा। जिसकी वजह से दुनिया भर के पर्यावरण को गम्भीर नुकसान हो रहा है।

जलवायु परिवर्तन के वैश्विक प्रभाव

- जलवायु परिवर्तन के परिणाम स्वरूप दुनिया के मानसूनी क्षेत्रों में वर्षा में वृद्धि हो रही है जिससे बाढ़, भूस्खलन तथा भूमि अपरदन जैसी समस्या पैदा हो रही है। जल की गुणवत्ता में गिरावट आ रही है तथा पीने योग्य जल की आपूर्ति पर भी गम्भीर प्रभाव पड़ रहा है। वर्तमान में भारत भी जलवायु परिवर्तन के दुष्परिणामों का सामना कर रहा है।
- ग्लेशियरों के पिघलने के कारण विश्व का औसत समुद्री जल स्तर इक्कीसवीं शताब्दी के अन्त तक 9 से 88 सेमी तक बढ़ने की संभावना है, जिससे दुनिया की आंधी से अधिक आबादी जो समुद्र से 60 किमी० की दूरी पर रहती है उस पर विपरीत प्रभाव पड़ेगा।
- जलवायु परिवर्तन का प्रभाव वैश्विक कृषि पैदावार पर भी पड़ रहा है जिसके फलस्वरूप फसलों की उत्पादकता में कमी आ रही है।
- विश्व स्वास्थ्य संगठन (WHO) की रिपोर्ट के अनुसार जलवायु में उष्णता के कारण श्वास तथा हृदय सम्बन्धी बीमारियों में वृद्धि होने लगी है जिसके परिणाम स्वरूप वैश्विक मानव जीवन अस्त व्यस्त होता जा रहा है।

जलवायु परिवर्तन सम्बन्धी G.20 देशों के प्रयास

जैसा पूर्व विदित है 1 दिसम्बर 2022 को इंडोनेशिया में आयोजित 18 वें शिखर सम्मेलन 2023 की मेजबानी का दायित्व भारत ने ONE EARTH, ONE FAMILY, ONE FUTURE थीम के

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साथ मुख्य विषय वैश्विक जलवायु परिवर्तन की समस्याओं और समाधानों के सन्दर्भ में ग्रहण करके जलवायु और पर्यावरण संरक्षण की दिशा में नियमानुसार G-20 सदस्यों देशों के प्रतिनिधियों की बैठकों का आयोजन चल रहा है शिखर सम्मेलन का समापन महत्वपूर्ण और अन्तिम बैठक के साथ अन्तर्राष्ट्रीय प्रदर्शनी सम्मेलन केन्द्र प्रगति मैदान नई दिल्ली में होगा।

G-20 पर्यावरण और जलवायु स्थिरता कार्य समूह (ECSWG) की बैठक में पर्यावरण और जलवायु सम्बन्धी उन सभी मुद्दों को चर्चा में शामिल किया जाएगा जिससे पर्यावरण संरक्षण की दिशा में बेहतर तरीके से कार्य किया जा सके।

- त्वरित पारिस्थितिकी तन्त्र बहाली और समृद्ध जैव विविधता।
- एक सतत और जलवायु लचीली नीती अर्थव्यवस्था को बढ़ावा देना।
- संसाधन दक्षता और चक्रीय अर्थव्यवस्था को प्रोत्सहित करना।
- भूमि क्षरण, जैव विविधता हानि, समुद्री प्रदूषण व जल का बढ़ता स्तर, संसाधनों की अत्याधिक खपत और अपशिष्ट अवशोषण जैसी प्रमुख पर्यावरणीय चिंताओं पर गम्भीरतापूर्ण विचार विमर्श करके समस्याओं का समाधान खोजना।
- भारत का लक्ष्य जैव विविधता और भूमि निम्नीकरण थीम के तहत 2040 तक निम्नीकृत भूमि में 50% की कमी प्राप्त करने के लिये G-20 योगदान में वृद्धि करना अनिवार्य होगा।

जलवायु परिवर्तन के लिए वैश्विक प्रयास

आई.पी.सी.सी.(Intergovernmental panel for climate change) की स्थापन 1988 में विश्व मौसम विज्ञान संगठन और संयुक्त राष्ट्र पर्यावरण कार्यक्रम द्वारा संयुक्त रूप से की गयी थी इसका मुख्यालय स्विट्जरलैण्ड के जेनेवा में है, वर्तमान में 195 राष्ट्र इसके सदस्य है। आईपीसीसी जलवायु नीतियों को तैयार करने के लिए दुनिया भर में विभिन्न सरकारों को जानकारी और सहायता प्रदान करता है। और साथ ही यह जलवायु परिवर्तन, इसके प्रभावों, कारणों और प्रतिक्रिया रिपोर्ट तैयार करता है।

वैश्विक जलवायु परिवर्तन से निपटने के लिए अन्तर्राष्ट्रीय पेरिस समझौता कार्यशील है। अन्तर्राष्ट्रीय सौर संगठन की शुरुआत भारत और फ्रांस ने 30 नवम्बर, 2015 को पेरिस जलवायु सम्मेलन के दौरान की थी जो जी-20 के लक्ष्यों को पूर्ण करने में सहायता प्रदान कर रही है।

18 वें G-20 शिखर सम्मेलन (थीम-वसुधैव कुटमकम- धरती ही एक परिवार है के साथ एक पृथ्वी, एक परिवार एक भविष्य) की अध्यक्षता में जलवायु परिवर्तन के कारण और समाधान विषय पर लोगो, विश्वविद्यालयों, चिंतकों, गैर-लाभकारी संस्थाओं आदि को जलवायु सम्बन्धी, पारम्पारिक एवं

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अभिनव, उत्कृष्ट प्रथाएं व समाधान पेश करने के लिए जलवायु-अनुकूल उत्पादन व रोजगार-सृजन को बढ़ावा देने के लिए जी-20 के सदस्य और गैर सदस्य देशों के प्रतिनिधियों को भी आमंत्रित किया गया है।

जिससे वैश्विक जलवायु परिवर्तन से उत्पन्न सभी प्रकार की समस्याओं पर गहन चर्चा करके जनकल्याण के लिए सर्वोत्कृष्ट हल निकाला जा सके। जी-20 सदस्य देशों के प्रतिनिधियों का मुख्य उद्देश्य है कि सभी G-20 देश एक मंच पर मिलकर प्रत्यक्ष व अप्रत्यक्ष रूप से विश्व कल्याण के लिए कार्यरत है।

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Role of G20 In Climate Sustainability: An Amazing Challenge

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WHAT IS CLIMATE SUSTAINABILITY: Climate sustainability is a very crucial & challenging term throughout the world in the present scenario of environmental pollution. It is concerned with protecting the planet, halting climate change, promoting social richness & development without endangering life on earth. It is a challenging demand in the world to make our choices sustainable to maintain our earth's ecosystem. We have to change our life style dramatically & make a check on harmful processes which are disturbing our environment. If we get late to understand the demand of time, we will run out of fossil fuels and drought & water scarcity problems will arise & a huge number of animal species will become extinct and the atmosphere will be irreparably damaged.

WHAT IS G20? G20 is a gathering of world's most developed economies & emerging ones which together account for more than 80% of global GDP, 75% of international trade and two-third of global population. The members of G-20 are Argentina, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the U.K. and the U.K., as well as the European Union represented by the rotating council presidency and the European Central Bank. G20 is the premier intergovernmental forum for international economic co-operation and plays an important role in shaping & strengthening global architecture & plays a significant role in governance on all major international issues. India holds the Presidency of the G-20 from 1st December 2022 to 30 November 2023. The theme of India's G-20 Presidency is 'Vasudhaiva Kutumbakam' or 'One Earth, One Family, One Future'. G20 countries account for the majority of the world economy along with significant global exports, energy consumption & play a major role in environmental pollution & are responsible for 75 to 80% of global greenhouse gases emissions.

ROLE OF G20 IN CLIMATE SUSTAINABILITY: The G20 countries have recognized the importance of collective action in controlling & managing the

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climate change problems arisen as a result of environment pollution & other environmental challenges. Nowadays G20 is promoting transitions towards more flexible, cleaner & transparent energy systems & has achieved extensive expertise in green growth, clean & climate -resilient infrastructure, fossil fuel subsidies and are playing an important role in environmental taxation as well as in environmental & social governance. The G20 is committed to further aligning its work with the 2030 Agenda for climate sustainability as it is the urgent need to combat climate change & its terrible impacts. 2022 Climate Transparency Report shows that G20 members are undermining climate efforts and fossil fuels production subsidies surge to highest levels ever in 2021.

G20: COMBINED ACTION FOR CLIMATE SUSTAINABILITY: G20 countries can achieve strong and inclusive action by reorienting their economies towards development pathways with low greenhouse gas emissions and high resilience to the effects of climate change. Climate change is an urgent challenge and a climate friendly development pathway will lay foundation for strong & inclusive growth. G20 countries have shown keen interest and commitment to constructively work towards the areas of Arresting Land Degradation & Accelerating Ecosystem. G20 countries are reaffirming their commitment towards combatting environment & climate crisis with a renewed sense of urgency. The commitments adopted by the G20 members in the domain of climate change revolve around the following issues: Energy access; energy efficiency and security & markets; energy efficiency & renewables: rationalizing and phasing out of fossil fuels subsidies; adoption of advanced and clean technologies & resilient infrastructure. At the G20 Joint Environment and Climate Ministerial Meeting held in August 2022, the member countries acknowledged the severity of the climate crisis and declared that 3 crucial issues will be prioritized towards fulfilling the goals set by the Paris Agreement: A sustainable global Economic recovery; land-based and ocean-based climate action and resource mobilization for environment protection. Data from the Climate Action Tracker (CAT) shows that of the G20 countries, only the UK has put in place climate action targets and policies that could help the global community to achieve the goal of limiting global warming to 1.5 degree celsius. The 2017 Hamburg Summit possibly signalled a new era in the G20's global climate change governance. It made a historic high of 22 climate change commitments, demonstrating a display of unity among 'G19' that left US president Donald Trump alone with his anti-environment views. The first meeting of Environmental and Climate Sustainability Working Group marks the beginning of constructive discussions within G20 countries for a sustainable future, led by India's G20 presidency. The 3-day meeting of the ECSWG from 9-11 February, 2023 was led by the Ministry of Environment, Forests and Climate Change,

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Government of India. In the recently concluded G20 summit, the leaders made a commitment to reach carbon neutrality by or around mid-century. G20 Climate Risk Atlas was released which provides climate scenarios, information, data and future changes in climate across the G 20 countries.

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जलवायु परिवर्तन एवं जी-20 : अवसर एवं चुनौतियाँ

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प्रस्तावना

ग्रुप ऑफ टूवेंटी एक अन्तर्राष्ट्रीय आर्थिक सहयोग का प्रमुख मंच है। यह अन्तर्राष्ट्रीय आर्थिक मुद्दों, वैश्विक संरचना अधिशासन निर्धारित करने तथा उसे मजबूत बनाने में महत्वपूर्ण भूमिका निभाता है।

हाल ही में जी-20 के 17 वें वार्षिक शिखर सम्मेलन की मेजबानी की गई, जिसे इंडोनेशिया की अध्यक्षता में “रिकवर टुगेदर रिकवर स्ट्रॉन्गर” विषय के तहत आयोजित किया गया।

भारत भी 1 दिसंबर 2022 से 30 नवंबर 2023 तक जी-20 की अध्यक्षता करेगा। जी-20 समूह विश्व बैंक एवं अन्तर्राष्ट्रीय मुद्रा कोष के प्रतिनिधि यूरोपियन यूनियन एवं 19 देशों का एक अनौपचारिक ग्रुप है। जी-20 के सदस्य विश्व सकल घरेलू उत्पाद के 80 प्रतिशत से अधिक, अन्तर्राष्ट्रीय व्यापार के 75 प्रतिशत और विश्व की 60 प्रतिशत आबादी का प्रतिनिधित्व करते हैं। जी-20 शिखर सम्मेलन में सभी नेता हर साल जुटते हैं और वैश्विक अर्थव्यवस्था को कैसे आगे बढ़ाया जाए? इस विषय पर चर्चा करते हैं। यह एक मंत्री स्तरीय मंच है जिसे जी-7 द्वारा विकसित एवं विकासशील दोनों अर्थव्यवस्थाओं के सहयोग से 1999 में इसका गठन किया गया था। इसमें वित्त मंत्रियों और केन्द्रीय बैंक के गवर्नरों का एक सम्मेलन आयोजित किया जाता है। यह 20 देशों का समूह है जो जी-20 के नाम से जाना जाता है।

जी-20 क्या है?

यह अपने सदस्यों के अन्तर्राष्ट्रीय आर्थिक सहयोग और निर्णय करने के लिए प्रमुख मंच है, जी-20 के नेता वर्ष में एक बार बैठक करते हैं देश के वित्त मंत्री और केन्द्रीय बैंक के गवर्नर वैश्विक अर्थव्यवस्था को मजबूत बनाने, अन्तर्राष्ट्रीय वित्तीय संस्थानों में सुधार लाने और प्रत्येक सदस्य देश में जरूरी प्रमुख आर्थिक सुधारों पर चर्चा करने के लिए नियमित रूप से बैठक करते हैं। भारत जी-20 के अध्यक्ष के तौर पर बांग्लादेश, मिश्र, मॉरीशस, नीदरलैण्ड, नाइजीरिया, ओमान, सिंगापुर, स्पेन, संयुक्त अरब को अतिथि देशों के रूप में आमंत्रित करेगा। इसकी कुछ मुख्य प्राथमिकताएँ हैं जैसे -

- समावेशी न्यायसंगत और सतत विकास।
- नारी सशक्तीकरण।
- स्वास्थ्य, कृषि और शिक्षा से लेकर वाणिज्य तक के क्षेत्रों में डिजिटल सार्वजनिक अवसंरचना एवं तकनीक सक्षम विकास।
- कौशल मानचित्र, संस्कृति और पर्यटन जलवायु वित्तपोषण चक्रीय अर्थव्यवस्था, वैश्विक खाद्य सुरक्षा, ऊर्जा सुरक्षा ग्रीन हाइड्रोजन, आपदा जोखिम में कमी तथा अनुकूलन।
- विकासात्मक सहयोग, आर्थिक, अपराध के विरुद्ध लड़ाई और बहुपक्षीय सुधार आदि।

जी-20 शिखर सम्मेलन के सदस्य हैं:- अर्जेन्टीना, ऑस्ट्रेलिया, ब्राजील, कनाडा, रूस, चीन, फ्रांस, जर्मनी, इंडोनेशिया, इटली, जापान, कोरिया गणराज्य, मेक्सिको, सऊदी अरब, दक्षिण अफ्रीका, तुर्की, युनाइटेड किंगडम, संयुक्त राज्य अमेरिका, यूरोपीय संघ।

यह शिखर सम्मेलन वर्तमान में आर्थिक राजनीतिक और सामाजिक, सांस्कृतिक, सन्दर्भों से एक महत्वपूर्ण संगठन विकसित करने और उसे आत्मनिर्भर बनाने के लिए सक्षम प्रयास है। जी-20 में जो लोगो है वह भारत के सार और स्वदेशी ज्ञान के लिए डिजाइन किया गया है। यह मानव अस्तित्व “वसुधैव कुटुम्बकम्” की व्यापक दृष्टि को दर्शाता है। यह लोगो भारत के राष्ट्रीय ध्वज के जीवंत रंगों - केसरिया, सफेद, हरा, नीले रंग से बनाया गया है। यह पृथ्वी ग्रह को कमल भारत के राष्ट्रीय फूल के साथ जोड़ता है जो चुनोटियों के बीच विकास को दर्शाता है। यह थीम सभी के जीवन के मूल्यों की पुष्टि करता है चाहे वह मानव हो पशु, पौधे और सूक्ष्म जीव हों।

जी-20 समूह के सदस्यों के कार्यों को विभिन्न अन्तरराष्ट्रीय संगठनों द्वारा सहयोग प्रदान किया जाता है जो नीतियों के निर्माण में सलाह देते हैं। इसमें दुनिया के लिए एक सन्देश शामिल है। विश्व एक परिवार है एक साथ रहने और दूसरों के साथ रहने की आवश्यकता है।

2008 में अमेरिका से शुरू हुआ वित्तीय संकट पूरे विश्व में भयानक संक्रमण की तरह फैला तब अमेरिकी राष्ट्रपति जार्ज डब्लू बुश ने ऐसे समय में जी-20 के स्वरूप को विस्तृत और वृहद करने के लिए इस समूह को और उच्चस्तरीय बनाने का प्रयास किया और जी-20 के माध्यम से भिन्न देशों की मौद्रिक राजकोषीय और व्यापार नीतियों में समन्वय के कारण ही 2008 में आए कठोर वित्तीय संकट से निजात पाने में काफी हद तक सफलता भी मिली। भारत के लिए 2023 एक ऐतिहासिक साल होने जा रहा है जिसमें भारत जी-20 देशों के नेताओं की मेजबानी करेगा। भारत ने 1 दिसम्बर 2022 को इंडोनेशिया से जी-20 की अध्यक्षता ग्रहण की है। भारत पहली बार इस साल जी-20 देशों के शिखर सम्मेलन की मेजबानी करेगा। भारत एक ऐसा देश है जो न केवल लोकतन्त्र और लोकतांत्रिक मूल्यों को समर्पित किए हुए है बल्कि अनेकता में एकता के लिए प्रसिद्ध राष्ट्र है। ऐसे में भारत के लिए जी-20

की अध्यक्षता करना किसी भी मायने में ऐतिहासिक क्षण से कम नहीं है। इस साल भारत में होने जा रही 18वीं जी-20 शिखर सम्मेलन की थीम “वसुधैव कुटुम्बकम्” (एक धरती एक परिवार एक भविष्य) रहेगी। इस थीम के पीछे का मकसद दुनिया को यह बताना है कि भारत यू.एन. प्रिंसिपल में भरोसा रखता है और उसकी नीति सम्पूर्ण विश्व को साथ लेकर चलने के साथ वैश्विक समस्याओं का समाधान ढूँढने की है। इस सम्मेलन के प्रतीक चिन्ह में यह बात देखने को मिलती है कि पूरी दुनिया एक परिवार की तरह है और भारत हमेशा से ही इस बात का पालन करता आ रहा है और आगे भी करता रहेगा। भारत हमेशा से विश्व के सामूहिक विकास प्रगति की बात करता है। भारत का यह मानना है कि कोई भी देश अपने आप में इतना सक्षम नहीं होता कि सभी परिस्थितियों और मुद्दों का हल खुद से निकाल पाए। इसलिए अन्य देशों के साथ बात करने इस थीम को एक उन्नत तरीके से सम्पन्न करने का फैसला किया गया है। भारत अपनी जी-20 अध्यक्षता के दौरान इंडोनेशिया और ब्राजील के साथ मिलकर जी-20 ट्रोइका का गठन करेगा। यह पहली बार सम्भव हो सकेगा कि जब ट्रोइका में विश्व तीन उभरती हुई विकासशील अर्थव्यवस्थाएं शामिल होंगी और यह उम्मीद की जा सकती है कि भारत जी-20 और विकासशील देशों के हितों में परस्पर सन्तुलन बनाए रखने में सफल होगा। जी-20 की अध्यक्षता भारत के लिए इसलिए भी जरूरी है कि जो लम्बे समय से चली आ रही विसंगतियों खासतौर पर कृषि और खाद्य सप्लाई को दूर करने का अवसर भी प्रदान कर सकेगा।

उद्देश्य

वैश्विक आर्थिक स्थिरता और सतत विकास हासिल करने के लिए अपने सदस्यों के बीच नीति समन्वय करना इस सम्मेलन का उद्देश्य है। यह थीम शिक्षा को नई ऊँचाइयों पर ले जाने और रिसर्च व इनोवेशन पर केन्द्रित है। भारत के लिए जी-20 जलवायु परिवर्तन, गरीबी और असमानता जैसे वैश्विक मुद्दों को साबित करने का एक महत्वपूर्ण मंच है। यह सम्मेलन अन्तर्राष्ट्रीय वित्तीय स्थिरता को बढ़ाने में अहम भूमिका निभाता है। इस सम्मेलन में सभी देशों के नेता जलवायु संकट से निपटने अन्तर्राष्ट्रीय व्यापार प्रणाली को मजबूत करने और अन्तर्राष्ट्रीय वित्तीय को बढ़ाने के तरीकों पर भी चर्चा करेंगे।

जी-20 (2023) शिखर सम्मेलन में चर्चा के प्रमुख विषयों में से एक कोविड-19 टीकों का रोल आउट और महामारी से निपटने के लिए चल रहे प्रयास होने की उम्मीद है नेता इस महामारी को दूर करने की दिशा में किए गए प्रयासों और अन्य प्रावधान सहित कई बिन्दुओं पर विचारों का आदान-प्रदान करेंगे। जी-20 शिखर सम्मेलन अर्थिक विकास और रोजगार स जन को बढ़ावा देते हुए हरित अर्थव्यवस्था की ओर बढ़ने, ग्रीन हाउस गैस उत्सर्जन को कम करने के संभावित तरीकों पर चर्चा करेगा। यह वैश्विक समुदाय के सामने आने वाली चुनौतियों का समाधान करने वाल एक महत्वपूर्ण कार्यक्रम है। इसमें विश्व की अर्थव्यवस्था को प्रभावित करने वाले मुद्दों पर बात की जायेगी। प्रत्येक जी-20 अध्यक्ष देश हर वर्ष कई अतिथि देशों को आमंत्रित करता है।

जी-20 के कार्यों को दो ट्रैक में बाँटा गया है :- जी-20 में दो सामानान्तर ट्रैक पर बात चलती है।

1. फाइनैस ट्रैक
2. शेरपा ट्रैक

1. फाइनैस ट्रैक :- इसमें वैश्विक आर्थिक दृष्टिकोण एवं वैश्विक आर्थिक जोखिमों की निगरानी के लिए फाइनैस ट्रैक पर बात की जाती है फाइनैस ट्रैक, वित्तीय समावेशन, वित्तीय क्षेत्र में सुधार करना, महामारी जैसी स्थितियों के वित्तपोषण के लिए एक सुसंगठित तैयारी है।

2. शेरपा ट्रैक :- यह नाम हिमालय की वादियों से आया है। यहाँ के लोगों को शेरपा कहा जाता है जो कुली की तरह काम करते हैं। ठीक उसी तरह जी-20 में शेरपा अपने देश की तरफ से बातचीत चलाते हैं। शेरपा नेगोशिऐंस संभालते है और शिखर सम्मेलन का एजेंडा तय करते हैं। कार्यकारिणी समूह के जरिए शेरपा अपने देशों के हितों के पक्ष में महौल बनाते है। शेरपा लोग पर्वरोहियों के लिए खासे मददगार होते हैं। हिमालय की ऊँची - ऊँची चोटियों पर फतह कराने में शेरपा बड़ी मदद करत हैं। जी-20 शिखर सम्मेलन में पर्यावरण तथा जलवायु परिवर्तन पर भी विशेष रूप से चर्चा की जाती है

मानव का जीवन और पर्यावरण एक दूसरे के पर्याय हैं। मानव का अस्तित्व ही पर्यावरण के विनाश से हमें भविष्य की चिंता सताने लगी है हमारे प्राचीन वेदों ऋग्वेद, सामवेद, यजुर्वेद एवं अथर्ववेद में भी पर्यावरण के विषय में बताया गया कि पर्यावरण का मानव जीवन में क्या महत्व है? इन्हीं सब बातों को ध्यान में रखते हुए जी-20 शिखर सम्मेलन में जलवायु परिवर्तन विषय को भी शामिल किया गया है। हिन्दी साहित्य में आदिकाल से आधुनिक काल तक प्रकृति को हमेशा विशेष स्थान दिया गया है। पर्यावरण चेतना की समृद्ध परम्परा हमारे साहित्य में रही है, वह आज भी उतनी ही प्रासंगिक है। काशीनाथ सिंह की कहानी “जंगल जातकम” पर्यावरण को बचाने को लेकर एक अच्छी कोशिश कही जा सकती है जिस परिवेश में बैठकर इस कहानी को लेखक ने लिखा, वह चिपको आन्दोलन के आसपास का समय माना जाता है। जंगल का मानवीकरण करते हुए लेखक ने बरगद, बांस पीपल सभी वृक्षों की भूमिका को सही दिशा दी है। आज का पर्यावरण जनसंख्या वृद्धि से अभिशापित हो गया है। यह जनसंख्या दिन-प्रतिदिन पर्यावरण प्रदूषण का कारण बनती जा रही है। ग्रीन हाउस गैसों के बढ़ने का मुख्य कारण ही मानव है। मानव ने औद्योगिकरण को बढ़ावा देकर ग्रीन हाउस गैसों में वृद्धि की है। जनसंख्या की वर्तमान विस्फोटक वृद्धि के कारण खाद्यान्न एवं औद्योगिक फसलों की सघन कृषि पर बल दिया जा रहा है। इन्हीं सब मुद्दों पर चर्चा की बातों को जी-20 शिखर सम्मेलन में शामिल किये जाने का प्रावधान किया गया है।

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हिन्दी में पर्यावरण के विभिन्न पहलुओं, प्रकृति के सौन्दर्य चित्रण व मानवीकरण से लेकर पर्यावरण प्रदूषण तथा जलवायु परिवर्तन, ग्लोबलाइजेशन व अन्य और भी महत्वपूर्ण समस्याओं पर चिन्तन किया गया है। चिन्तन करने के साथ-साथ उन सभी समस्याओं पर तार्किक व एक उपयुक्त समाधान प्रस्तुत करने का विचार किया गया है। मानव का पूरा जीवन ही प्रकृति पर निर्भर है अतः इसे नष्ट कर व स्वयं भी सुरक्षित नहीं रह सकता इसलिए पर्यावरण की सुरक्षा के मुद्दों पर बातचीत करने की अति आवश्यकता है। पर्यावरण और जलवायु परिवर्तन की चुनौतियों के समाधान की वैश्विक स्तर पर सतत विकास को और अधिक विकसित करने की आवश्यकता है।

उपसंहार

जी-20 अन्तर्राष्ट्रीय आर्थिक सहयोग का एक प्रमुख मंच है। भारत 1 दिसम्बर 2022 से 30 नवम्बर 2023 तक जी-20 की अध्यक्षता करेगा। भारत जी-20 की अध्यक्षता 18 वां शिखर सम्मेलन के रूप में करेगा। पर्यावरण को मद्देनजर रखते हुए इसमें जलवायु परिवर्तन विषय को भी लिया गया है। जी-20 शिखर सम्मेलन में आंतकवादी वित्तपोषण को अवरूद्ध करने पर चर्चा की जायेगी। इसके द्वारा आमंत्रित देशों के बीच बेहतर समन्वय स्थापित करके अन्तर्राष्ट्रीय वित्तीय विनियामक प्रणाली को मजबूत करना होगा। इसमें यह निर्णय लिया जाता है कि देश का विकास किस तरह से किया जाए।

अतः भारत को आक्रामक व्यापार बाधाओं/प्रतिबन्धों, अंतर्देशीय संघर्षों और वैश्विक शांति और सहयोग की वाकालत जैसे मुद्दों पर चर्चा करने के लिए एक मंच के रूप में जी-20 2023 शिखर सम्मेलन का उपयोग करने पर ध्यान केन्द्रित करना चाहिए।

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G20 Alliance: Environmental Issues and Sustainable Development

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Achieving Economic progress and development is crucial for every country, but it has no worth or value, if it come at the cost of environmental degradation. In India and also in many countries included in G2, factors like rapid growth of population, Urbanization, Industrialization, Luxury life style of human being and Poverty, among others are responsible for harming the environment. While the cooperation and contribution of every citizen of the country is essential for safeguarding the environment. Government has the major role to play in helping find solutions to the problems. Sustainable development may be option for economic progress and development without harming the environment and nature. The aims and objectives of G20 alliance can be achieved by following the path of sustainable development.

BACKGROUND OF G20 ALLIANCE

G20 (Group of Twenty) comprises 19 countries like Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Russia, Saudi Arabia, South Africa, Turkiye, United Kingdom and Unites States. 20th member of G20 alliance is European Union. The G20 countries represent around 85% of the global GDP, over 75% of global trade with about 70% of word population. G20 is the premier alliance for international economic cooperation and it plays an important in shaping and strengthening global infrastructure and governance of all major international economic issues.

The G20 alliance does not have a permanent secretariat or staff. Instead, the G20 Presidency rotates annually among the members of it and is selected from a different regional grouping of countries. The 19 member countries are therefore divided up into five groups comprising a maximum of four countries each. Most of

the groups are formed on a regional basis. Countries with same region are usually put in the same group. Only Group 1 (Australia, Canada, Saudi Arabia and the United States) and Group 2 (India, Russia, South Africa and Türkiye) do not follow this pattern. Group 3 includes Argentina, Brazil, and Mexico; Group 4 includes France, Germany, Italy, and United Kingdom; and Group 5 includes China, Indonesia, Japan, and Republic of Korea. The EU, the 20th member, is not a member of any of these regional groups. Each year another country from a different group assumes the G20 Presidency. The countries in a group are each equally entitled to take on the Presidency when it is their group's turn, though. India, from Group 2, holds the current Presidency of the G20 from 1 December 2022 to 30 November 2023. The G20 Presidency is responsible for bringing together the G20 agenda in consultation with other members and in response to developments in the global economy. To ensure continuity, the Presidency is supported by a "troika" made up of the current, immediate past and next host countries.

The G20 was founded in 1999 in the perspective of Asian financial crisis of 1997-98 as an informal forum for the Finance Ministers and Central Bank Governors of the most important industrialized and developing economies to discuss international economic and financial stability. The G20 was upgraded for the level of Heads of State/Government in the wake of the global economic and financial crisis of 2007, and in 2009, when it became apparent that the necessary crisis coordination would only be possible at the highest political level. Since then, the G20 Leaders have met regularly, and the G20 has become the premier forum for international economic cooperation. The G20 Summit is held annually, under the leadership of a rotating Presidency. The forum initially focused largely on broad macroeconomic issues, but it has since expanded its agenda to inter-alia include trade, climate change, sustainable development, health, agriculture, energy, environment, climate change, and anti-corruption.

In addition to the member countries, i.e. 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 the European Union, each G20 Presidency invites other guest countries and international organizations (IOs) to participate in the G20 meetings and Summit. India has invited Bangladesh, Egypt, Mauritius, the Netherlands, Nigeria, Oman, Singapore, Spain and UAE as guest countries during its G20 Presidency. For Guest IOs, India has invited ISA, CDRI and ADB in addition to the regular G20 International Organizations (UN, IMF, WB, WHO, WTO, ILO, FSB and OECD) and Chairs of Regional Organizations (AU, AUDA-NEPAD and ASEAN).

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The group of G20 is headed by Sherpa who is the representative of the Leader. Socio-economic issues such as agriculture, anti-corruption, climate, digital economy, education, employment, energy, environment, health, tourism, trade and investment are main focus areas of G20. The Working Groups under this track include:

- Agriculture Working Group
- Anti-corruption Working Group
- Culture Working Group
- Development Working Group
- Digital Economy Working Group
- Disaster Risk Reduction Working Group
- Education Working Group
- Employment Working Group
- Energy Transitions Working Group
- Environment and Climate Sustainability Working Group
- Health Working Group
- Tourism Working Group
- Trade and Investment Working Group

ENVIRONMENTAL ISSUES IN G20 COUNTRIES

Today, the human population of world is increasing rapidly and due to drastic growth in population, many environmental issues are facing by human civilization. All type of progress and development are deeply associated with environment because the existence of fauna and flora depends of health of environment. Human civilization is witness that many environmental disasters have come in the world and it destroyed the development. So, it is clear that the development cannot do on cost of environment degradation. Some common issues are discussed below which are facing G20 and all over the world.

1. Global Warming From Fossil Fuels

As of May 2023, CO₂ PPM (parts per million) is at 420.00 and the global temperature rise is 1.15C compared to pre-industrial levels. The last time carbon dioxide levels on our planet were as high as today was more than 4 million years

ago. Increased emissions of greenhouse gases have led to a rapid and steady increase in global temperatures, which in turn is causing catastrophic events all over the world – from Australia and the US experiencing some of the most devastating bushfire seasons ever recorded, locusts swarming across parts of Africa, the Middle East and Asia, decimating crops, and a heat wave in Antarctica that saw temperatures rise above 20C for the first time. Scientists are constantly warning that the planet has crossed a series of tipping points that could have catastrophic consequences, such as advancing permafrost melt in Arctic regions, the Greenland ice sheet melting at an unprecedented rate, accelerating sixth mass extinction, and increasing deforestation in the Amazon rainforest, just to name a few. The climate crisis is causing tropical storms and other weather events such as hurricanes, heat waves and flooding to be more intense and frequent than seen before.

2. Poor Governance

According to economists the climate crisis is a result of multiple market failures. Economists and environmentalists have urged policymakers for years to increase the price of activities that emit greenhouse gases (one of our biggest environmental problems), the lack of which constitutes the largest market failure, for example through carbon taxes, which will stimulate innovations in low-carbon technologies. To cut emissions quickly and effectively enough, governments must not only massively increase funding for green innovation to bring down the costs of low-carbon energy sources, but they also need to adopt a range of other policies that address each of the other market failures. A national carbon tax is currently implemented in 27 countries around the world, including various countries in the EU, Canada, Singapore, Japan, Ukraine and Argentina. However, according to the 2019 OECD Tax Energy Use report, current tax structures are not adequately aligned with the pollution profile of energy sources.

3. Food Waste

A third of the food intended for human consumption – around 1.3 billion tons – is wasted or lost. This is enough to feed 3 billion people. Food waste and loss account for a third of greenhouse gas emissions annually, if it was a country, food waste would be the third highest emitter of greenhouse gases, behind China and the US. Food waste and loss occurs at different stages in developing and developed countries; in developing countries, 40% of food waste occurs at the post-harvest and processing levels, while in developed countries, 40% of food waste occurs at the retail and consumer levels. At the retail level, a shocking amount of food is wasted because of aesthetic reasons; in fact, in the US, more than 50% of all produce thrown

away in the US is done so because it is deemed to be “too ugly” to be sold to consumers- this amounts to about 60 million tons of fruits and vegetables. This leads to food insecurity, another one of the biggest environmental problems on the list.

4. Biodiversity Loss

The past 50 years have seen a rapid growth of human consumption, population, global trade and urbanization, resulting in humanity using more of the Earth’s resources than it can replenish naturally. A recent WWF report found that the population sizes of mammals, fish, birds, reptiles and amphibians have experienced a decline of an average of 68% between 1970 and 2016. The report attributes this biodiversity loss to a variety of factors, but mainly land-use change, particularly the conversion of habitats, like forests, grasslands and mangroves, into agricultural systems. Animals such as pangolins, sharks and seahorses are significantly affected by the illegal wildlife trade, and pangolins are critically endangered because of it. More broadly, a recent analysis has found that the sixth mass extinction of wildlife on Earth is accelerating. More than 500 species of land animals are on the brink of extinction and are likely to be lost within 20 years; the same number was lost over the whole of the last century. The scientists say that without the human destruction of nature, this rate of loss would have taken thousands of years.

5. Plastic Pollution

In 1950, the world produced more than 2 million tons of plastic per year. By 2015, this annual production swelled to 419 million tons and exacerbating plastic waste in the environment. A report by science journal, Nature, determined that currently, roughly 14 million tons of plastic make their way into the oceans every year, harming wildlife habitats and the animals that live in them. The research found that if no action is taken, the plastic crisis will grow to 29 million metric tons per year by 2040. If we include micro-plastics into this, the cumulative amount of plastic in the ocean could reach 600 million tons by 2040. Shockingly, National Geographic found that 91% of all plastic that has ever been made is not recycled, representing not only one of the biggest environmental problems of our lifetime, but another massive market failure. Considering that plastic takes 400 years to decompose, it will be many generations until it ceases to exist. There’s no telling what the irreversible effects of plastic pollution will have on the environment in the long run.

6. Deforestation

Every hour, forests the size of 300 football fields are cut down. By the year 2030, the planet might have only 10% of its forests; if deforestation isn’t stopped,

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they could all be gone in less than 100 years. The three countries experiencing the highest levels of deforestation are Brazil, the Democratic Republic of Congo and Indonesia. The Amazon, the world's largest rainforest – spanning 6.9 million square kilometers (2.72 million square miles) and covering around 40% of the South American continent – is also one of the most biologically diverse ecosystems and is home to about three million species of plants and animals. Despite efforts to protect forest land, legal deforestation is still rampant, and about a third of global tropical deforestation occurs in Brazil's Amazon forest, amounting to 1.5 million hectares each year.

7. Air Pollution

One of the biggest environmental problems today is outdoor air pollution. Data from the World Health Organization (WHO) shows that an estimated 4.2 to 7 million people die from air pollution worldwide every year and that nine out of 10 people breathe air that contains high levels of pollutants. In Africa, 258,000 people died as a result of outdoor air pollution in 2017, up from 164,000 in 1990, according to UNICEF. A cause of air pollution mostly comes from industrial sources and motor vehicles, as well as emissions from burning biomass and poor air quality due to dust storms. In Europe, a recent report from the EU's environment agency showed that air pollution contributed to 400 000 annual deaths in the EU in 2012 (the last year for which data was available).

8. Melting Ice Caps and Sea Level Rise

The climate crisis is warming the Arctic more than twice as fast as anywhere else on the planet. Today, sea levels are rising more than twice as quickly as they did for most of the 20th century as a result of increasing temperatures on Earth. Seas are now raising an average of 3.2 mm per year globally and they will continue to grow up to about 0.7 meters by the end of this century. In the Arctic, the Greenland Ice Sheet poses the greatest risk for sea levels because melting land ice is the main cause of rising sea levels.

9. Ocean Acidification

Global temperature rise has not only affected the surface, but it is the main cause of ocean acidification. Our oceans absorb about 30% of carbon dioxide that is released into the Earth's atmosphere. As higher concentrations of carbon emissions are released thanks to human activities such as burning fossil fuels as well as effects of global climate change such as increased rates of wildfires, so do the amount of carbon dioxide that is absorbed back into the sea. The smallest change in the pH

scale can have a significant impact on the acidity of the ocean. Ocean acidification has devastating impacts on marine ecosystems and species, its food webs, and provokes irreversible changes in habitat quality. Once pH levels reach too low, marine organisms such as oysters, their shells and skeleton could even start to dissolve.

10. Food and Water Insecurity

Rising temperatures and unsustainable farming practices has resulted in the increasing threat of water and food insecurity and taking the mantle as one of the biggest environmental problems today. Globally, more than tons of top-soil is eroded every year at a rate 100 times faster than it can naturally be replenished. Laden with biocides and fertilizer, the soil ends up in waterways where it contaminates drinking water and protected areas downstream. Furthermore, exposed and lifeless soil is more vulnerable to wind and water erosion due to lack of root and mycelium systems that hold it together. A key contributor to soil erosion is over-tilling: although it increases productivity in the short-term by mixing in surface nutrients (e.g. fertilizer), tilling is physically destructive to the soil's structure and in the long-term leads to soil compaction, loss of fertility and surface crust formation that worsens topsoil erosion.

11. Fast Fashion and Textile Waste

The global demand for fashion and clothing has risen at an unprecedented rate that the fashion industry now accounts for 10% of global carbon emissions, becoming one of the biggest environmental problems of our time. Fashion alone produces more greenhouse gas emissions than both the aviation and shipping sectors combined, and nearly 20% of global wastewater, or around 93 billion cubic meters from textile dyeing, according to the UN Environment Program.

We can secure our economic progress and infrastructure development followed by sustainable development.

SUSTAINABLE DEVELOPMENT

Sustainable Development is the development that meets the needs of the present generation without compromising with the needs of future generations. This definition was put forward by the Brundtland Commission in its report "Our Common Future" in 1987. It calls for a concerted effort to build an inclusive, sustainable, and resilient ecosystem for the people and the planet. The main features of sustainable development include-

- Increase in per capita income

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- Judicious use of natural resources
- Preserving the resources for future generations

As an affirmative action towards tackling the global environmental crisis that involves global warming, climate change, and ozone layer depletion, the United Nations adopted 17 Sustainable Development Goals (SDG) and 169 targets as part of the United Nations 2030 Agenda. The 17 Sustainable Development Goals are-

- End poverty in all its forms everywhere.
- End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- Ensure healthy lives and promote well-being for all at all ages.
- Ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all.
- Achieve gender equality and empower all women and girls.
- Ensure availability and sustainable management of water and sanitation for all.
- Ensure access to affordable, reliable, sustainable, and modern energy for all.
- Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
- Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- Reduce inequality within, and among, countries.
- Make cities and human settlements inclusive, safe, resilient, and sustainable.
- Ensure sustainable consumption and production patterns.
- Take urgent action to combat climate change and its impacts.
- Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
- Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

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- Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
- Strengthen the means of implementation and revitalize the global partnership for sustainable development.

NITI (National Institution for Transforming India) Aayog, the newly-formed commission that replaced the 65-year old Planning Commission in India, is entrusted with the task of coordinating SDGs in India. States are also advised to undertake similar mapping, including visioning, planning, budgeting, and developing implementation & monitoring systems for the state-sponsored schemes that are being implemented to fulfill the SDGs. In addition to that, the Ministry of Statistics & Program Implementation is engaged in the process of building key indicators to monitor the implementation of SDGs. Since 2015 (when the United Nations, along with other countries, adopted the SDGs) the Indian government has launched several flagship programs that are at the heart of SDGs. Some of these include Swachchh Bharat Mission, Skill India, Make in India, Digital India, etc.

SDGs are guiding principles for G20 and all over the world for ensure environment health and healthy human lives. Environment related issues are major agenda of G20 alliance. G20 countries also trying to solve the problems related to environmental problems. It is hope so that the agenda will be broadly discussed in the chairmanship of India also.

CONCLUSION

G20 is most reliable and representative alliance of world countries to discuss all type global issues. The goodness of human societies should be of any representative alliance of countries rather than ensure their personal benefits. It is ever expected to G20 nations that they will form a general agreement to follows and implement the SDGs in the welfare of human civilization. Economic and infrastructure development only may be beneficial for all humans if they follow the guideline to ensure environment protection. The development on the cost of environment degradation never would be in the favor of mass.

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Economic Impacts of Climate Change: Risks and Opportunities for G20 Economies

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India is one of the fastest growing economies of the world and is a member of the G20 group of nations. The G20 comprises some of the world's largest economies, accounting for more than 80% of global GDP. The GDP growth of these countries has a significant impact on the global economy and can affect the growth of other countries including India. It is important for policy makers and businesses in India to understand the correlation between GDP growth of g20 countries and India's economy.

At the same time, the G20 climate change is exerting pressure on the development trajectories of countries around the world, with visible economic, social and environmental impacts.

According to the world economic forum's (WEF) global risks report (2020), all of the top 5 risks in the next decade could be climate related. These risks include anthropogenic environmental disasters, climate action failure, natural disasters, biodiversity loss and extreme weather events. While the whole world is grappling with the challenges posed by climate change, developing economies like India are particularly vulnerable to it. Thus, climate risk as a material factor is going to play a significant role in shaping national level policies, business strategies and reconfiguration of finance in an emerging economy like India.

The G20 is a grouping of twenty major industrialized and emerging economies, comprising 19 countries and the European union. G20 countries agree to halt land degradation, restore ecosystems and enrich biodiversity

Positive discussions on accelerating work, promoting a sustainable and climate-resilient blue economy, and encouraging resource efficiency and the circular economy. G20 member states to tackle environmental and climate crisis with a new sense of urgency reaffirmed its commitment to the direction. Keeping in view the current scenario, all the g20 countries agreed on the urgent need for concerted global efforts and the need for immediate action.

INTRODUCTION

The **economic impacts of climate change** vary geographically and are difficult to forecast exactly. Researchers have warned that current economic forecasts may seriously underestimate the effects of climate change, and point to the need for new models that give a more accurate picture of potential damages. Nevertheless, one 2018 study found that potential global economic gains if countries implement mitigation strategies to comply with the 2 °c target set at the Paris agreement are in the vicinity of us\$17 trillion per year up to 2100 compared to a very high emission scenario.

Global losses reveal rapidly rising costs due to extreme weather events since the 1970s. Socio-economic factors have contributed to the observed trend of global losses, such as population growth and increased wealth. Part of the growth is also related to regional climatic factors, e.g., changes in precipitation and flooding events. It is difficult to quantify the relative impact of socio-economic factors and climate change on the observed trend. The trend does, however, suggest increasing vulnerability of social systems to climate change.

A 2019 modeling study found that climate change had contributed towards global economic inequality. Wealthy countries in colder regions had either felt little overall economic impact from climate change, or possibly benefited, whereas poor hotter countries very likely grew less than if global warming had not occurred. Part of this observation stems from the fact that greenhouse gas emissions stem mainly from high-income countries while low-income countries are affected by it negatively. So, the high-income countries are producing tremendous amounts of greenhouse emissions, but the impacts of these emissions are unequally threatening low-income countries, who do not have access to the right resources to be able to recover from such impacts. This further deepens the inequalities within the poor and the rich, hindering sustainability efforts. Impacts of climate change could even push million of people into poverty. This study represents how crucial it is to take immediate action towards climate change, as failing to do so will exacerbate the economic inequality gap worldwide.

The total economic impacts from climate change are difficult to estimate, but increase for higher temperature changes. For instance, total damages are estimated to be 90% less if global warming is limited to 1.5 °c compared to 3.66 °c, a warming level chosen to represent no mitigation. One study found a 3.5% reduction in global GDP by the end of the century if warming is limited to 3 °c, excluding the potential effect of tipping points. Another study noted that global economic impact

is underestimated by a factor of two to eight when tipping points are excluded from consideration. In the oxford economics high emission scenario, a temperature rise of 2 degrees by the year 2050 would reduce global GDP by 2.5% – 7.5%. By the year 2100 in this case, the temperature would rise by 4 degrees, which could reduce the global gdp by 30% in the worst case.

Studies in 2019 suggest that economic damages due to climate change have been underestimated, and may be severe, with the probability of disastrous tail-risk events being nontrivial. Carbon-intensive industries and investors are expected to experience a significant increase in stranded assets with a potential ripple affect throughout the world economy.

The economic impacts of climate change also include any mitigation (for example, limiting the global average temperature below 2 °c) or adaption (for example, building flood defenses) employed by nations or groups of nations, which might infer economic consequences.

➤ **Distribution Of Impacts**

Climate change impacts can be measured as an economic cost (smith *et al.*, 2001:936-941). This is particularly well-suited to market Impacts, That is impacts that are linked to market transactions and directly affect GDP. Monetary measures of non-market impacts, e.g. impacts on human health and ecosystems, are more difficult to calculate. Other difficulties with impact estimates are listed below:

- **Knowledge Gaps:** Calculating distributional impacts requires detailed geographical knowledge, but these are a major source of uncertainty in climate models.
- **Vulnerability:** Compared with developed countries, there is a limited understanding of the potential market sector impacts of climate change in developing countries.
- **Adaptation:** The future level of adaptive capacity in human and natural systems to climate change will affect how society will be impacted by climate change. Assessments may under- or overestimate adaptive capacity, leading to under- or overestimates of positive or negative impacts.
- **Socioeconomic Trends:** Future predictions of development affect estimates of future climate change impacts, and in some instances, different estimates of development trends lead to a reversal from a predicted positive, to a predicted negative, impact (and *vice versa*).

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- **Climate Change** would increase income inequalities between and within countries.
- **A Small Increase** in global mean temperature (up to 2 °c, measured against 1990 levels) would result in net negative market sector in many developing countries and net positive market sector impacts in many developed countries.

With high confidence, it was predicted that with a medium (2-3 °c) to high level of warming (greater than 3 °c), negative impacts would be exacerbated, and net positive impacts would start to decline and eventually turn negative.

➤ **Non-Market Impacts**

Smith *et al.* (2001:942) predicted that climate change would likely result in pronounced non-market impacts. Most of impacts were predicted to be negative. The literature assessment by smith *et al.* (2001) suggested that climate change would cause substantial negative health impacts in developing countries. Smith *et al.* (2001) noted that few of the studies they reviewed had adequately accounted for adaptation. In a literature assessment, confalonieri *et al.* (2007:415) found that in the studies that had included health impacts, those impacts contributed substantially to the total costs of climate change.

➤ **Market Sector**

In 2019 the international labour organization published a report titled: “working on a warmer planet: the impact of heat stress on labour productivity and decent work”, in which it claims that even if the rise in temperature will be limited to 1.5 degree, by the year 2030, climate change will cause losses in productivity reaching 2.2% of all the working hours, every year. This is equivalent to 80 million full-time jobs, or 2,400 billion dollars. The sector expected to be most affected is agriculture, which is projected to account for 60% of this loss. The construction sector is also projected to be severely impacted and accounts for 19% of projected losses. Other sectors that are most at risk are environmental goods and services, refuse collection, emergency, repair work, transport, tourism, sports and some forms of industrial work.

In 2020 Mckinsey & company issued a report about the current and future impacts of climate change on the economy. The report says that trillions of dollars and hundreds of millions of lives are at risk. Climate change should strongly influence the decisions of the business and governmental leaders. The report, for example, found that socioeconomic impacts can increase by 2 - 20 times compare to today level by 2050.

➤ **Agriculture**

Depending on underlying assumptions, studies of the economic impacts of a doubling in atmospheric carbon dioxide (CO₂) from pre-industrial levels conclude that this would have a slightly negative to moderately positive aggregate effect (i.e., total impacts across all regions) on the agricultural sector (Smith *et al.*, 2001:938).^[20] This aggregate effect hides substantial regional differences, with benefits mostly predicted in the developed world and strongly negative impacts for populations poorly connected to regional and global trading systems. Poorer countries are more exposed to the weather because of the important role of agriculture and water resources in the economy.

➤ **Other Sectors**

A number of other sectors will be affected by climate change, including the livestock, forestry, and fisheries industries. Other sectors sensitive to climate change include the energy, insurance, tourism and recreation industries. The aggregate impact of climate change on most of these sectors is highly uncertain (Schneider *et al.*, 2007:790).

➤ **Other Systems and Sectors**

- **Freshwater Resources:**
- **Industry, Settlements And Society:**
- **Infrastructure:**

➤ **Aggregate Impacts**

Aggregating Impacts Adds Up The Total Impact Of Climate Change Across Sectors And/ Or Regions (IPCC, 2007a:76). In Producing Aggregate Impacts, There Are A Number Of Difficulties, Such As Predicting The Ability Of Societies To Adapt Climate Change, And Estimating How Future Economic And Social Development Will Progress (Smith *Et Al.*, 2001:941). It Is Also Necessary For The Researcher To Make Subjective Value Judgments Over The Importance Of Impacts Occurring In Different Economic Sectors, In Different Regions, And At Different Times. In 2020 The World Economic Forum Ranked Climate Change As The Biggest Risk To Economy And Society.

A United States Government Report In November 2018 Raised The Possibility Of US GDP Going Down 10% As A Result Of The Warming Climate, Including Huge Shifts In Geography, Demographics And Technology.

➤ **Marginal Impacts**

The social cost of carbon (SCC) is an aggregate measure of the impacts of climate change. It is defined as the incremental (or marginal) social cost of emitting one more tone of carbon (as carbon dioxide) into the atmosphere at any point in time (yohe *et al.*, 2007:821).different GHGS have different social costs. For example, due to their greater physical capacity to trap infrared radiation, HFCS have a considerably higher social cost per tone of emission than carbon dioxide. Another physical property that affects the social cost is the atmospheric lifetime of the GHG.

Estimates of the SCC are highly uncertain and cover a wide range (Klein *et al.*, 2007:756).the discrepancies in estimates can be broken down into normative and empirical parameters (fisher *et al.*, 2007:232).key normative parameters include the aggregation of impacts across time and regions. The other parameters relate to the empirical validity of SCC estimates. This reflects the poor quality of data on which estimates are based, and the difficulty in predicting how society will react to future climate change.

➤ **Sensitivity Analysis**

Sensitivity analysis allows assumptions to be changed in aggregate analysis to see what effect it has on results.

- **Shape Of The Damage Function:** this relates impacts to the change in atmospheric greenhouse gas (GHG) concentrations. There is little information on what the correct shape (e.g., linear or cubic) of this function is. Compared with a linear function, a cubic function shows relatively small damages for small increases in temperature, but more sharply increasing damages at greater temperatures.
- **Rate Of Climate Change:** This is believed to be an important determinant of impacts, often because it affects the time available for adaptation.
- **Discount Rate And Time Horizon:** Models used in aggregate studies suggest that the most severe impacts of climate change will occur in the future. Estimated impacts are therefore sensitive to the time horizon (how far a given study projects impacts into the future) and the discount rate (the value assigned to consumption in the future versus consumption today).
- **Welfare Criteria:** aggregate analysis is particularly sensitive to the weighting (i.e., relative importance) of impacts occurring in different regions and at different times. Studies by fankhauser *et al.* (1997) and Azar (1999) found

that greater concern over the distribution of impacts lead to more severe predictions of aggregate impacts.

- **Uncertainty:** Usually assessed through sensitivity analysis, but can also be viewed as a hedging problem. EMF (1997) found that deciding how to hedge depends on society's aversion to climate change risks, and the potential costs of insuring against these risks.

➤ **Relative Impacts**

The effects of climate change can be compared to other effects on human society and the environment. Future socio-economic development may strongly affect climate change impacts. For example, projections of the number of people at risk of hunger vary significantly according to assumptions over future socio-economic development.

Some ecosystems are likely to be especially affected by climate change (e.g., coral reefs). In the long-term (beyond 2050), climate change may become the major driver for biodiversity loss globally.

The socio-economic impacts of climate change are likely to be greatest in communities that face other stresses. For example, poor communities are vulnerable to extreme weather events, and are likely to be especially affected by climate change. In general, however, other changes (e.g., demographic and technological) are likely to have a greater effect on human society than climate change. On the other hand, major ("non-marginal") impacts could occur with abrupt changes in natural and social systems. Scientific understanding of abrupt changes is limited.

Another consideration is how vulnerability to climate change varies with scale. At local scales, extreme weather events can have a significant impact, especially in vulnerable locations. Another potentially significant impact is the long-term effect of sea-level rise on low-lying coastal areas.

OPPORTUNITIES FOR ALL G20 COUNTRIES

Challenge 1. Enhance access to opportunities for youth.

- 1- Good-quality early childhood education and care provides a wide range of benefits but the most disadvantaged students are less likely to participate.
- 2- Schooling outcomes are closely linked to socio-economic background. High levels of social and ability stratification between schools can have an impact on learning opportunities available to students and on students' education outcomes.

- 3- Young people struggle to gain a solid foothold in the labour market upon leaving school. On average around 19% of young people aged 15 to 29 are not in employment, education or training (neet) in g20 countries. Young people without an upper secondary qualification and from disadvantaged families are overrepresented among neets.
- 4- Growing inequality in parents' resources due to the covid-19 pandemic and spending more time in home environments, which can differ widely across youth, is increasing the number of environmental risk factors. Concurrently, the pandemic is reducing the number of protective factors, such as extra-curricular activities, the opportunity to interact with supportive adults and reducing access to family and care systems.
- 5- Improve access to, and the quality of, early childhood education and care by ensuring high staff-child ratios, qualified educational staff, national curriculum guidelines and frameworks and standards for monitoring facilities.
- 6- Reduce child poverty by supporting low-income parents to improve their skills and access better quality jobs and by providing well-targeted family and housing benefits for poor families with children that ensure sufficient coverage. Maintain or expand conditional cash transfer programmes.
- 7- Improve the quality of the educational system by investing in high quality school leaders and teachers, targeting resources to disadvantaged schools and students and identifying low performers early. Provide professional help with social or health issues for students who require it.
- 8- Promote good-quality and attractive vocational education and training with relevant work-based training by developing apprenticeship systems together with the social partners and permitting smaller firms to share the responsibility for a trainee's practical training.
- 9- Provide effective employment and social support for young people not in employment, education or training through collaboration between schools and the public employment service and targeted interventions including reintegration into schooling, second-chance educational programmes, work experience programmes, short training courses, job search assistance and counseling as well as subsidies for private businesses to hire low-skilled jobseekers and the long-term unemployed.

Challenge 2. Enhance access to opportunities for women through good-quality employment.

- 1- Most g20 economies have made significant progress towards reaching the brisbane goal of reducing the gender gap in labour force participation by 25 per cent by the year 2025 compared to 2012. This progress reflects rising participation rates for prime-age women in all g20 economies for which recent data are available and stable participation rates for men.
- 2- Considerable gender gaps in job quality remain across g20 economies. On average employed women work in jobs of poorer quality, with lower earnings and a greater incidence of part-time work and informality. Traditionally, women have been the primary caregivers for young children and sick or elderly family members, and many societies and labour markets continue to function largely on this assumption. In all g20 countries, women spend substantially more hours than men performing domestic chores and caring responsibilities.
- 3- Women are leading the health response to the covid-19 pandemic while confinement measures are likely to lead to increased demand for unpaid work at home, a burden that typically falls more on women. Women are likely to be more vulnerable than men to any crisis-driven loss of income and face increased risks of violence, exploitation, abuse or harassment.
- 4- Reduce women's unpaid care burden and encourage a more equal sharing of unpaid care between women and men by expanding access to quality formal childcare, ensuring that mothers have access to (well)-paid employment-protected maternity leave and incentivizing father's care giving and improving access, affordability and quality of long-term care services.
- 5- Tackle gender disparities across occupations by fighting and eliminating gender biases and stereotypes, attracting more women into careers in science, technology, engineering and mathematics (stem), increasing the representation of women in leadership positions, and informing employers about the benefits of a diverse workforce.
- 6- Implement gender budgeting to help ensure that budget decisions systematically take gender equality considerations into account. Key elements for an effective and enduring budgeting practice include a strong strategic framework, effective implementation tools and a strong and supportive enabling environment.

- 7- Improve the evidence base on gender gaps in the labour market by improving the availability of timely and comparable data, particularly for unremunerated work.

Challenge 3. Enhance access to opportunities for SME'S and entrepreneurs and tackle informality to ensure good-quality job opportunities.

- 1- Important Progress has been made to reduce regulatory Barriers for SME'S And Job Formalization Although Regulatory Procedures Remain An Obstacle. The Take-Up Of Structural Reforms Has Moderated In Recent Years. In Some Areas, Progress Is Slow Or Uneven Across Countries, Including For Insolvency Regimes, Enforcement Of Competition Laws And Civil Justice Systems.
- 2- Women Face Particular Barriers in Entrepreneurship, Including Institutional Barriers, Such As Family and Tax Policies, Negative Social Attitudes and Difficulty Accessing Finance. Youth Often Struggle With A Lack Of Entrepreneurial Skills And Role Models, Few Financial Resources And Limited Business Networks.
- 3- Informal Jobs Are Of Lower Quality. While Informal Work Can Provide Valuable Income Earning, Informal Jobs Tend To Be Of Lower Quality And Associated With A Significantly Higher Incidence Of Extreme Low Pay. Informal Workers Earn Significantly Less On Average. Low Skilled, Young People And Women Are Overrepresented In Informal Work.
- 4- Informal Workers Have Fewer Opportunities To Invest In Their Skills And Build A Career. Working In The Informal Sector Can Negatively Affect Future Labour Market Prospects.
- 5- Access To Finance Is Crucial For SME'S And Informal Workers. Informality Is an Important Barrier To Financial Inclusion For Individuals And Micro, Small And Medium Enterprises. However, The Digital Transformation Is Offering New Opportunities To Improve SME Access To Finance And Access To Formal Financial Services, Although Financial Literacy Is Important To Fully Benefit From Digitalization.
- 6- Informal Sector Workers Are Facing A Dilemma Of Protecting Themselves From The COVID-19 Virus, A Concern Compounded By Limited Access To Social Protection Measures, And Maintaining An Income. SME'S Are Experiencing A dramatic Loss In Revenue Due To The COVID-19 Pandemic And/ Or Severe Liquidity Shortages That Will Quickly Become Solvency Problems.

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- 7- Create A Business-Friendly Environment That Provides An Equal Playing Field For SME'S And Encourages Formal Job Creation By Continuing To Reduce Regulatory Barriers. Implement A User-Centric Approach To Regulation And Policy Making, Continue To Enact Reforms To Strengthen Public Sector Integrity And Transparency And Continue To Strengthen E-Government Functions And Leverage Digital Technologies. To Encourage Job Formalization, Ensure A Legal System That Enforces Property Rights. , Reduce Overly Strict Employment Protection Rules And High Minimum Wages, And Promote The Uptake Of Digital Payment Tools.
- 8- Support Women And Youth Entrepreneurship Through The Use Of Role Models And Ambassadors Help Reduce The Influence Of Negative Social Attitudes, Provide Training Courses And Mentoring To Build Entrepreneurial Skills And Provide Grants Or Microcredit To Help Improve Access To Financing. To Support Youth, Provide Entrepreneurship Training, Financial Support for Business Start-Up, Coaching And Mentoring And Support In Network Building.
- 9- Ensure Effective Labour Market Regulation Through The Careful Use Of Regulation That Avoids Unnecessarily Adding To The Cost Of Formal Employment. Keep Labour Taxes Moderate. Strengthen Compliance By Increasing The Perceived Benefits Of Formalization Through Improved Quality Of Public Services And Stronger Links Between Social Protection Contributions And Benefits. Strengthen Enforcement Of Labour, Tax And Social Security Regulations.
- 10- Improve Access to Financing for SME'S And Entrepreneurs By Implementing The G20/OECD High-Level Principles Of SME Financing, Which Identifies Obstacles To SME Financing, Calls For Strengthening SME Access To Credit While Supporting The Diversification Of Financing Sources.
- 11- Improve The Evidence Base On The Extent Of Informal-Sector Activities Through Further Improvements In The Availability Of Comprehensive And Comparable Data To Enable Closer Monitoring Of Evolutions And The Effectiveness Of Policy Intervention.

Challenge 4. Help workers make best use of their skills in a changing world of work.

- 1- New Technologies Have Replaced Workers in Many Middle-Skill Routine Occupations And Created New Jobs At Both The High And Low Ends Of The Skills Spectrum.

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- 2- Automation Will Likely Continue To Make Some Workers' Skills Redundant While Requiring New Skills.
- 3- Across G20 Economies, There Is A Mismatch In Skills, With Some Workers Under-Qualified And Others Over-Qualified For Their Occupation.
- 4- Skills Matter for Accessing Opportunities In The Labour Market. Access To Adult Learning Ensures That People Can Up skill And reskill. Building The Right Skills Is Also Important.
- 5- The COVID-19 Pandemic Is Resulting In Many Workers Becoming Unemployed And May Speed Up Some Of The Transformations Occurring In Labour Markets, Shifting The Demand For Labour Across Sectors And May Increase The Demand For Higher-Level Skills.
- 6- Reduce Financial Barriers To Adult Learning Through Subsidies, Savings Mechanisms, Tax Incentives, Loans And Study/Training Leave. Reduce Time And Flexibility Barriers Through Facilitating Part-Time Learning, Distance Learning Or In A Modular And /Or Credit-Based Format.
- 7- Make Adult Training Worker-Centered By Linking It To Individuals Rather Than Jobs Through Individual Learning Schemes.
- 8- Ensure That Education And Training Programmes Respond Better To The Demand For Skills By Estimating The Skills Likely To Be In Demand And Collecting And Providing Data On The Skills Available.
- 9- Improve Certification Of Prior And Current Learning By Defining Standards And Good Practices And Through Regular And Systematic Quality Assessments And Monitoring And Evaluating Programmes.
- 10- Provide Effective Re-Employment Support To Jobseekers Through Labour Market Information, Job Search Assistance, Direct Placement Or Active Job Brokering, Training And Rehabilitation Services And Subsidized Employment.

RISKS FOR ALL G20 COUNTRIES

- 1- The socioeconomic impacts of climate change will likely be nonlinear as system thresholds are breached and have knock-on effects.
- 2- Climate change is already having substantial physical impacts at a local level in regions across the world; the affected regions will continue to grow in number and size.

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- 3- The global socioeconomic impacts of climate change could be substantial as a changing climate affects human beings, as well as physical and natural capital.
- 4- Financial markets could bring forward risk recognition in affected regions, with consequences for capital allocation and insurance.
- 5- Countries and regions with lower per capita GDP levels are generally more at risk.
- 6- Addressing physical climate risk will require more systematic risk management, accelerating adaptation, and decarbonization.

REVIEW OF LITERATURE:

This review is being prepared by looking at a review of the literature on the economic impacts of climate change. This review has been made on the basis of previous G-20 countries. Literature review is presented after studying the past and present research papers. This review externalities that are unprecedentedly large, complex and uncertain. Based on the literature review of economists and researchers on the economic risks caused by climate change, the details are as follows-

1- Smith et al (2001:943): he research analyzed the vulnerability and exposed the risks from the economic effects of climate change. Said that the effects in future will take a toll on the economy.

2- Kompas, Tom; Pham, Vanha; che, Tuony Nhu (2018): The study found that the potential global economic benefits from climate change impacts on GDP by country and compliance with the Paris Agreement would be enormous. This research paper shows the global economic benefits.

3- Diffenbaugh, Noh S.; Burke, Marshall (2019): A modeling study found that climate change contributed to global economic inequalities. The study of research work focuses on global economic inequalities resulting from global warming.

4- IMF Retrieved 2023-04-27: This study shows how important it is to act urgently on climate change, as failure to do so will only widen economic inequalities around the world.

5- Hoegh- Guldberg (2018): Studies focus on natural and human systems. The effects of 1.5 degrees of global warming have been found to reduce global GDP by 3.5% by the end of the century. This study work provides information on global warming and GDP and explains the impacts and risks.

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6- Koning , Beals: Economists say unchecked climate change will result in at least a 3% loss of global GDP by 2050, and a 2 degree increase in temperature will reduce global GDP by 2.5% to 7.5%. In this case, by 2100 the temperature will increase by 4 degrees. Which in the worst case can reduce global GDP by 30%. The research paper creates awareness about GDP, effects and challenges caused by climate change etc.

7- DeFries, Ruth: The research work explains the economic risks missing in climate change impacts assessments. Through which the missing economic risks are detected and economists assessed the risks and reviewed the comprehensive economic literature of climate change.

8- Stevens, Pippa (16 January 2020): MacKinsey said that there is a need for immediate arrangements to adapt to the growing threats from climate change, so that the threats can be dealt with. The 2020 report also said that trillions of dollars and millions of lives are at risk regarding the current and future effects of climate change on the economy.

OBJECTIVE

The aim of the study is to create awareness about the economic and social impacts and risks of climate change, and thus to take the G20 India and other countries to a different level of climate change, while giving a different perspective on global warming and inequalities. Also helps in understanding the role, purpose, risks and opportunities.

RESEARCH METHODOLOGY

The study uses secondary data from previous years research papers, journals, newspapers, currently ongoing G20 summit and books, Social networking sites etc. The data includes the growing impact and risks of climate change on the economy for G20 countries and India, as well as opportunities for India's economy and data on exports, GDP and TDP flows. The study uses regression analysis to examine the economic impacts of climate change on G20 countries' GDP growth rates and India's economic growth as well.

DISCUSSION AND CONCLUSION

This paper reviews what is known and what is not known about the economic effects of climate change. What is known suggests that climate change is a problem that requires serious effort to reduce greenhouse gas emissions. However, impact estimates do not support drastic mitigation; instead, climate policy the emphasis should be on adaptation.

Such a tax would encourage energy efficiency improvements but only minor fuel switching. Require high estimates the discount rate is lower than normal, or it is an involuntary emphasis has been placed on the plight of developing countries. There are three policy implications. First, short-term emissions reduction is economically justified, but only to a limited extent. Second, in the long run, deep emissions reductions are not economically justified. Policy response to climate change should be dominated by adaptation, not mitigation. Third, deeper emissions cuts can be justified as a matter of equity and justice but it will have a dramatic impact on other policies (pension, education, business, development aid) too. What is known is only a small part of the significance. Many climate change effects have been identified but not estimated, and are undoubtedly still the effects should also be identified. Some of these effects are clearly negative, and some clearly positive. It is impossible to say with any kind of certainty whether the present effect estimates have a positive or negative bias. However, countries like Canada, Finland, Iceland, Norway and Sweden are cold but prosperous. Will be warming reduce costs and lift barriers and thus accelerate economic growth, but it is it's hard to imagine that warming would lead to much faster growth. In the same time, tropical countries obviously suffer from violent storms, prolonged droughts, and the presence of tropical diseases. Further warming will not be good, and offering more places for such situations may also not be positive. Although not quantified, one can easily imagine a scenario in which warming dramatic result compared to a scenario in which warming has a large positive effect. So, at the very least, that many unknowns means that uncertainty is skewed to negative; and those are, if anything, estimates of the current effects positive bias. This suggests that greenhouse gas emissions should decrease be more stringent than suggested by the cost-benefit analysis. The policy implications are twofold. First, in the short term, greater emissions reductions may be economically justified than suggested by the cost-benefit. Analysis. Second and more importantly, we need to build the technological and institutional capacity to respond rapidly to climate change – whether in climate change forms of reduction of greenhouse gas emissions, adaptation (including international adaptation assistance), or geoengineering. However, the policy should not fly blind. If the above diagnosis of the state if the knowledge is correct, it will demand the most vigorous research programme.

Although some countries propose spending billions of dollars on emissions reductions, and others pretend that climate change is a problem that can be safely ignored, little effort is made to support these courses of action.

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Role of G-20 to the Path Toward Zero Emission

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Governments all over the World have a crucial role to play to bring about a transition from a high to a low-carbon emission path, including through investing in catalytic green infrastructure, providing research and development incentives and carbon price signals, and ensuring a just transition. A front-loaded green infrastructure push would also help economies recover from the COVID-19 crisis. This paper outlines a pathway of achieving this policy mix in the G-20 over the next several years. In this paper we focus on present status and future challenges of Climate change and role of G-20 to achieve net zero emission target.

INTRODUCTION

India will hold the G20 Presidency from 1 December 2022 to 30 November 2023 and host the 18th G20 Summit on 9-10 September 2023. This Presidency is a key opportunity for India to showcase its leadership and to make efforts to strengthen multilateral cooperation at a time when the world is increasingly witnessing challenges like debt crisis, looming recession, slowing down of the agenda for Sustainable Development Goals, conflict in Europe and intensifying great power competition [1-3]. This paper seeks to contribute to the ongoing conversations to enhance understanding about the G20, its working, objectives and impact and on what should constitute India's G20 priorities.

G-20 is not just a diplomatic event but it should be turned into a historic event of public participation where one can witness the spirit of 'Atithi Devo Bhava'. All the overseas Indians are the brand ambassadors of India on foreign soil.

Narendra Modi, Prime Minister of India.

EVOLUTION OF THE G20 AND INDIA'S UPCOMING PRESIDENCY

With a population of 1.4 billion, India has become the most populous country in the world. India is changing and changing fast. In 2019, it became a 3 trillion-dollar economy. However, COVID-19 pandemic impacted this growth trajectory. Despite this, India overcame the challenges and became the fastest growing big economy in the world. As a result, India became the world's 5th largest and is on

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way to become 3rd largest economy by 2030 [2]. It aspires to become the 2nd largest economy by 2047, when it will be celebrating 100 years of its independence.

India's G20 Presidency strives to be inclusive, ambitious, action-oriented, and decisive. India has long held the tradition of active public participation at the core of its policy formulations. Our development models hold inclusivity at the core, and our G20 ambitions are in line with a human-centric approach to development. The same is reflected in our theme 'Vasudhaiva Kutumbakam: One Earth, One Family, One Future'.

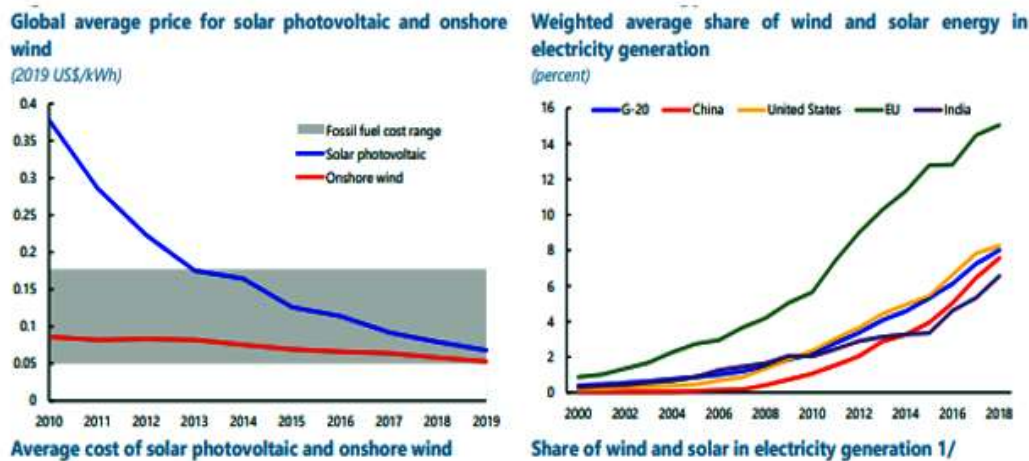
India's G20 Presidency, India will host over 200 meetings in more than 50 cities across its vast and varied landscape, including remote places. The rationale behind this undertaking is that besides furthering the substantive agenda of the G20, India aims to project its strengths and potential as a favourable destination for tourists and businesses[1-2]. Additionally, it also provides us with a window to showcase our rich cultural, civilisational, and historical legacy.

The three consecutive G20 Chairs viz., Indonesia, India and Brazil are developing countries presents a unique opportunity to push the interests on healthcare as also reinforcing multilateral economic governance, climate change, trade and investment as key themes.

KEY POINTS TO BE FOCUSSED

Aligning infrastructure with net zero emissions requires additional public investments in the range of 0.5 to 4.5 percent of GDP cumulatively over the next decade[5]. Investment has to shift away from the extraction and combustion of fossil fuels toward renewable energy, electricity networks and storage, electrification of end-uses, and energy efficiency. While the bulk of investment will come from the private sector in most countries, the public sector has a catalytic role to play through direct infrastructure investment and also through other support measures. Almost all countries have defined Nationally Determined Contributions (NDCs) are insufficient to reduce global warming to 2°C or below, being more compatible with 3°C warming by 2100[3-4]. A growing number of countries (58 to this day, covering 53 percent of global emissions) includes the G20 members Argentina, Brazil, Canada, China, the EU, France, Germany, Japan, South Africa, Korea, UK, and US. However, few G20 countries have put these targets into policy or law. To implement the net zero emissions commitments, countries will need to ramp up action significantly and quickly on carbon pricing and investment in clean technologies from current level.

Decarbonization of the electricity sector, which generates 32% of carbon emissions globally, is a low-hanging fruit because alternative technologies have become competitive with fossil fuel technologies. The cost of adding new wind and solar energy capacity is below the upper end of the cost range for new fossil fuel capacity in all G20 countries, offering attractive investment opportunities shown in Figure [6].



In fact, in most G-20 countries, the cost is at the lower end of the fossil fuel cost range. This steady downward trend in the price of these technologies, more countries can be expected to see the cost of new renewable energy capacity falling below any possible new fossil fuel power capacity additions in the near future. So far, the share of renewable energy has increased rapidly in the G20. Integrating renewable energy into the electricity system is a challenge, but so far, several European countries have pushed the limit continuously [5]. The share of wind and solar energy in electricity generation has recently surged upwards in the UK, Spain, and Germany, exceeding 20%. Carbon pricing is an efficient option to increase the share of renewable in electricity generation.

In ground transportation decarbonization is possible through public transportation and electrification. In 2018, almost 17 percent of global greenhouse gas emissions were emitted by the transportation sector. In road transportation, electrification is developing dynamically, while the use of hydrogen in road transportation would exceed the production capacity, given that the green hydrogen production capacity is needed for aviation and shipping until 2050. In an important policy tax is collected for highly emitting vehicles and the revenue is used to subsidize low-emission vehicles. Another option is to impose a ban on vehicles after a definite

span of time from purchase. Green hydrogen and ammonia are viable options to decarbonize aviation and maritime transport [8].

Land use change and forestry can be used to withdraw emissions from the atmosphere. Afforestation has a large potential to create negative emissions by withdrawing carbon from the atmosphere. This explains why the sector contributed a negative amount to emissions (- 1.7 %) in the G20 in 2018. One study estimated the potential to be as high as 200Gt, which is more than four times the global emissions of 48.9Gt in 2018. This amount can be absorbed only once because forests absorb carbon as they grow, but mature forests are carbon neutral. Using the negative emission potential requires stopping deforestation and using available land to increase afforestation [6-8]. In addition to conservation policy, fiscal instruments can be very effective in protecting and expanding forests.

CONCLUSION

Green investment push can help lead the economy out of the COVID-19 crisis and make progress on mitigating climate change. Moving to net zero emissions will require a scaling-up of investment over the next years and a reallocation away from fossil fuels and toward clean energy. The public sector has a catalytic role to play by providing critical public infrastructure and other support measures. Carbon pricing is a very effective tool to reduce carbon emission. It also generates revenues which can be used to finance green public investments and support measures for households and workers affected by the transition. Stabilizing the global temperature by mid-century requires both immediate and global climate action, supported by financial and technology support for developing economies.

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जी-20 : पर्यावरण संरक्षण और हिन्दी साहित्य

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भारत का वसुधैव कुटुम्बकम् एवं पर्यावरणीय सुरक्षा सम्बन्धी संदेश जी-20 के लोगो में अंतर्निहित है- इसके रंगों में भारतीय तिरंगा का रंग और उद्देश्य सन्निहित है। जी-20 लोगो भारत के राष्ट्रीय ध्वज के रंगों- केसरिया, सफेद, हरा और नीला रंग से प्रेरणा लेता है। ये रंग शान्ति, क्रान्ति, समृद्धि और स्वतन्त्रता के प्रतीक हैं। कमल भारत को राष्ट्रीय पुष्प है। जी-20 के लोगो में कमल को पृथ्वी के दिखाया गया है, जो प्रत्येक चुनौतियों के मध्य विकास की प्रतिबद्धता को सुनिश्चित करता है। यह लोगो ही विश्व पटल पर भारत के दर्शिकोण को प्रकट कर देता है। यह दृष्टिकोण प्रकृति और मानवता के मध्य समन्वय और संतुलन स्थापित करने का है।

हम सभी प्रकृति की सन्तान हैं। हमारी उत्पत्ति ही प्राकृतिक तत्त्वों से हुई है। हम इसी पर्यावरण में पैदा होते हैं, बड़े हाते हैं, सांस लेते हैं, जीवित रहते हैं और पुनः इसी की गोद में समा जाते हैं। महाकवि तुलसीदास ने रामचरित मानस के किष्किन्धाकाण्ड में बताया है कि मनुष्य का शरीर पांच तत्त्वों से निर्मित है-

क्षिति जल पावक गगन समीरा।

पंच रचित यह अधम शरीरा।।

किन्तु यही जन्मदाता प्रकृति आज मनुष्य से अपनी सुरक्षा का आह्वान कर रही है और यदि मनुष्य ने उसकी आवाज नहीं सुनी तो अपने रौद्र रूप आगाह भी कर रही है-

“हलो मनुष्य

मैं आकाश हूँ।

कल सृजन था, निर्माण था,

आज प्रलय हूँ, विनाश हूँ

मेरी छाती में जो छेद हो गये हैं काले-काले

ये तुम्हारे भालों के घाव हैं

ये कभी नहीं भरने वाले।” (ऋशभदेव शर्मा: ताकि सनद ज़िन्दा रहे, मैं आकाश बोल रहा हूँ कविता से)

आज मनुष्य को इसी प्रकृति के घाव को भरने की आवश्यकता है। इसके लिए वैश्विक स्तर पर प्रयास किये जा रहे हैं।

अतः आज मनुष्य को सावधान होकर प्रकृति की सुरक्षा के लिए वैश्विक स्तर पर पुरजोर प्रयास करना होगा। इसी क्रम में जी-20 सहित अनेक वैश्विक संगठन एवं संस्थाएँ सम्मिलित रूप से कार्य कर रही हैं।

प्रस्तावना

मानव प्रवृत्ति सतत् सहयोग के साथ समग्र विकास की संकल्पना से संपृक्त है। इतिहास साक्षी है कि सभ्यताओं का क्रमिक व समानान्तर विकास परस्पर सहयोग एवं समन्वय से ही संभव हुआ। सिंधु सभ्यता, मेसोपोटामिया सभ्यता, मिस्र सभ्यता आदि सभ्यताएँ समानांतर रूप से विकसित हुईं। इन सभ्यताओं के परस्पर सार्थक सहयोग से ही सामाजिक, आर्थिक एवं सांस्कृतिक उन्नति की और मानवीय मूल्यों का उत्थान हुआ।

वर्तमान वैश्वीकरण के युग में विज्ञान ने निरंतर उन्नति की है। विज्ञान-प्रौद्योगिकी और तकनीकी विकास की होड़ में और आर्थिक समृद्धि की प्रत्याशा में मनुष्य ने पर्यावरण को अभूतपूर्व क्षति पहुंचाई। बड़े-बड़े उद्योग-धंधों एवं विलासिता संबंधी आवश्यकताओं ने प्राकृतिक शुद्धता को नष्ट किया है। फलस्वरूप उन्नति का दंभ भरने वाला मनुष्य आज स्वयं उसी उन्नति के जाल में उलझ कर अपनी सुरक्षा एवं अस्तित्व पर प्रश्नचिन्ह खड़े कर लिए हैं।

किंतु मनुष्य स्वयं की सुरक्षा के प्रति सजग होने के कारण इन प्राकृतिक हानियों से बचने का भी उपाय ढूंढता रहा है। इसी क्रम में विश्व के अनेक संगठन एवं संस्थाएँ स्थापित की गईं। संयुक्त राष्ट्र संघ (UNO), गैट(GATT), दक्षिणी पूर्वी एशियाई राष्ट्रों का संघ (ASEAN), जकार्ता, नाटो(NATO), रेडक्रास, सार्क(SAARC), विश्व व्यापार संगठन(WTO), विश्व वन्य जीव संरक्षण कोश (WWF), एशिया और प्रशांत क्षेत्र का आर्थिक और सामाजिक आयोग, यूनिसेफ, यूनेस्को, विश्व बैंक, जी-20 आदि संस्थाएँ वैश्विक कल्याण हेतु स्थापित की गईं। ये संस्थाएँ विश्व के लोगों को राजनीतिक, सामाजिक, धार्मिक, शैक्षिक और सांस्कृतिक सुरक्षा सुनिश्चित करती हैं, समग्र विकास की रणनीतियां बनाती हैं, और अनुपालन करवाने के लिए प्रतिबद्धता व्यक्त करती हैं।

‘जी-20 वैश्विक स्तर पर बनाई गई एक ऐसा संगठन है जिसमें 19 देश और यूरोपीय संघ में शामिल हैं। इसकी स्थापना 1999 ई0 में की गयी। इसके सम्मेलनों में 20 प्रमुख अर्थव्यवस्थाओं के वित्त मंत्री और केंद्रीय बैंक के गवर्नर सम्मिलित होते हैं। इन देशों में अर्जेंटीना, ऑस्ट्रेलिया, ब्राजील, कनाडा, फ्रांस, जर्मनी, चीन, यूरोपीय संघ, इंडोनेशिया, भारत, जापान, मेक्सिको, इटली, दक्षिण अफ्रीका, सऊदी अरब, रूस, तुर्की, दक्षिण कोरिया, यूनाइटेड किंगडम और संयुक्त राज्य अमेरिका आदि सम्मिलित हैं।’¹

यह संगठन वैश्विक स्तर पर आर्थिक विकास संबंधी महत्वपूर्ण मुद्दों पर औद्योगिक रूप से उभरते हुए बाजार वाले देशों के बीच खुली और रचनात्मक चर्चा करने के लिए प्रतिवर्ष सम्मेलन का आयोजन करता है। यह समूह विश्व को समुन्नत बनाने के लिए एवं विकासोन्मुख अर्थव्यवस्थाओं को एक मंच पर लाकर एक नई रणनीति बनाता है। इसका अध्यक्ष प्रत्येक वर्ष चक्रीय रूप से परिवर्तित होता रहता है।

समग्र विश्व को आर्थिक रूप से समानता के स्तर पर लाने के लिए जी 20 देशों द्वारा अनेक उपायों पर ध्यानाकर्षित किया जाता है- रोजगार, कृषि, वित्तीय, ढांचागत सुधार, कार्य एवं राजस्व नीतियों का निर्धारण, विश्वव्यापार को खुले रूप में विनियमित करना, अनेक प्रकार के भ्रष्टाचार पर नियंत्रण करना, महिला सुरक्षा, वैश्विक स्तर पर जलवायु परिवर्तन संबंधी विचार विमर्श, विश्व स्तर पर स्वास्थ्य की सुरक्षा को सुनिश्चित करना, आतंकवाद के विरुद्ध एकजुट होकर उससे निजात दिलाने के लिए रणनीति तैयार करना आदि। इस प्रकार इस संगठन के माध्यम से समग्र विश्व के कल्याण हेतु विचार-मंथन किया जाता है और उसे क्रियान्वित करने के लिए रणनीति बनाई जाती है।

कुपोषण और भुखमरी को दूर करने के लिए खाद्य उत्पादन, सुरक्षा एवं समान रूप से जन-जन तक वितरण संबंधी नीतियों को बनाना, विश्व युद्ध को रोकने संबंधी उपायों पर चर्चा करके विश्व की महाशक्तियों में सन्तुलन स्थापित करना, समग्र विश्व के भविष्य की सुरक्षा सुनिश्चित करने के लिए जलवायु परिवर्तन एवं तापमान वृद्धि पर नियंत्रण सम्बन्धी विशयों पर विचार-विमर्श करना तथा तापमान वृद्धि को 5 डिग्री सेल्सियस तक सीमित करने संबंधी प्रयास करना इसका प्रमुख लक्ष्य है। वर्तमान में तापमान वृद्धि एवं जलवायु परिवर्तन विश्व की प्रमुख समस्याओं में से एक है। यदि इस पर समय रहते ध्यान ना दिया गया तो पृथ्वी का अस्तित्व खतरे में पड़ जाएगा और सृष्टि पर संकट के बादल मंडराने लगेंगे। आज ग्लेशियर पिघल रहे हैं, समुद्र का जल स्तर निरंतर बढ़ रहा है, पृथ्वी की सुरक्षा कवच ओजोन परत में छिद्र लगातार बढ़ता जा रहा है, जंगल कम हो रहे हैं, कंक्रीट के मकान बढ़ते जा रहे हैं, जनसंख्या के भार से धरती कराह रही है। विकास और प्रौद्योगिकी की उन्नति का दंभ भरता मनुष्य नित उद्योग धन्धों, कल-कारखानों, से बड़े पैमाने पर प्रदूषण उत्पन्न करके नदियों के शुद्ध जल, पकृति के शुद्ध वायु और वातावरण की शांति को प्रदूषित कर रहा है। एक ओर मनुष्य भौतिक जीवन जीने के लिए भौतिक संसाधनों का दोहन कर रहा है तो दूसरी ओर प्राणवायु 'आक्सीजन' और 'जीवन का पर्याय जल' दोनों की शुद्धता पर प्रश्न चिन्ह लगाकर सृष्टि को संकट में डाल रहा है। इन संकटों को हमारे प्राचीन ऋषि-मुनि भली-भाँति समझते थे। तभी तो प्रकृति को देवी मानकर उसकी पूजा की जाती गंगा को माता प्रकृति के कण-कण में ईश्वर का वास माना जाता था। लोग नदियों का जल पीते थे और तालाब में नहाते थे। वे सैकड़ों वर्षों तक स्वस्थ प्राकृतिक जीवन जीते थे। आधुनिक कृत्रिम जीवन ने लोगों को रोबोट बना दिया है। स्वार्थ लोलुपता और कृत्रिम जीवन शैली के कारण वर्तमान में मनुष्य न केवल मनुष्य से अपित प्रकृति से भी दूर होकर जीने के लिए अभिशप्त है।

भारतीय साहित्य में प्र ति की सुरक्षा, संरक्षा एवं उसके प्रति प्रेम के अनेक उदाहरण मिलते हैं। न केवल संस्कृत साहित्य अपितु हिंदी कवियों ने भी प्रकृति को देवी माता, प्रेयसी, कन्या आदि विभिन्न

रूपों में समा त किया है। 'कठिन काव्य के प्रेत' कवि केशव भी प्रकृति की गोद में बैठकर कोमल हृदय वाले एवं मधुर वाणी वाले हो जाते हैं। वे अपनी प्रसिद्ध रचना कवि प्रिया में कहते हैं-

देस, नगर, बन, बाग, गिरि, आश्रम सरिता ताल।

रवि, ससि, सागर, भूमि के भूषण, रितु सब काल।^१

'मैथिल कोकिल' विद्यापति ने प्रकृति की सुरम्यता को उद्दीपन के रूप में चित्रित किया है-

फुटल कुसुम नव कुंज कुटीर वन कोकिल पंचम गावे रे।

मलयानिल हिम् सिखर, सिधारल, पिया निज देस न आवे रे।^२

रीतिकालीन कवि देव का प्रकृति-चित्रण तो अत्यंत हृदय ग्राही बन जाता है-

डार द्रुम पलना, बिछौना नाव पल्लव के, सुमन झंगोला सोहै, तन छवि भारी दै।

पवन झुलावै, केकी कीर बहरावै, देव कोकिल हलावै, हुलसावै करतारी दै।

पूरित पराग सौं उतारौ करै राईबलों, कंजकली नायिका लतानि सिर सारी दै।।

मदन महीप जू को बालक बसन्त, ताहि प्रताही जगावत गुलाब चटकारी दै।^३

प्रकृति के सुकुमार कवि सुमित्रानंदन पंत को प्रकृति के सौंदर्य में वसुधा रोमांचित सी लगती है। चारों तरफ फैली हुई हरियाली मानो धारा को विभिन्न रूपों में सुसज्जित कर रही हो, अरहर, सनई, सरसों आदि के पुष्पों से वह सुसज्जित होकर स्वयं को आह्लादित कर रही हो।

रोमांचित सी लगती वसुधा, आई जौ, गेहूं में बाली।

अरहर, सनई की सोने की किंकिनियाँ हैं, शोभाशाली।।

उड़ती भीनी तैलाक्त गंध, फूली सरसों पीली पीली।

लो हरित धरा से झाँक रही, नीलम की कलि, तीसी नीली।^४

पर्यावरण को लेकर विश्व का सर्वाधिक संवेदनशील देश भारत 1 दिसंबर 2022 से 30 नवंबर 2023 तक जी-20 की अध्यक्षता कर रहा है। पर्यावरण के संदर्भ में यह ऐसा संक्रमण कालीन समय है जबकि विश्व कोविड-19 जैसी वैश्विक महामारी की चोट से उबरने का प्रयास कर रहा है ऐसे समय में भारत से न केवल विश्व को सृष्टि की जीवन रेखा प्रकृति को भी सुखद अपेक्षाएँ हैं। भारत ने समग्र विश्व की एकता को बढ़ावा देने के लिए यह सूक्ति देकर विश्व पटल पर अपना मंतव्य स्पष्ट कर दिया है कि-

“एक पृथ्वी, एक परिवार, और एक भविष्य”

भारत का संदेश जी-20 के लोगो में भी अंतर्निहित है- इसके रंगों में भारतीय तिरंगा का रंग और उद्देश्य सन्निहित है। जी-20 लोगो भारत के राष्ट्रीय ध्वज के रंगों- केसरिया, सफेद, हरा और नीला रंग से प्रेरणा लेता है। ये रंग शान्ति, क्रान्ति, समृद्धि और स्वतन्त्रता के प्रतीक हैं। कमल भारत को राष्ट्रीय पुष्प है। जी-20 के लोगो में कमल को पृथ्वी के दिखाया गया है, जो प्रत्येक चुनौतियों के मध्य विकास की प्रतिबद्धता को सुनिश्चित करता है। यह लोगो ही विश्व पटल पर भारत के दृष्टिकोण को प्रकट कर देता है। यह दृष्टिकोण प्रकृति और मानवता के मध्य समन्वय और संतुलन स्थापित करने का है। जी-20 के लोगो के नीचे देवनागरी लिपि में 'भारत' और रोमन लिपि में इण्डिया लिखा हुआ है। यह इस बात की ओर संकेत करता है कि भारत वास्तव में 'वसुधैव कुटुम्बकम्' का सन्देश विश्व को देना चाहता है।

वसुधैव कुटुम्बकम् का शाब्दिक अर्थ है -“धरती ही परिवार है”। व्यापक अर्थों में इस उक्ति में अनेक आध्यात्मिक, नैतिक, सांस्कृतिक, राजनीतिक, दार्शनिक एवं मानवीय मूल्यों के विविध आयामों का संदेश समाहित हैं। यह उक्ति उदार हृदय से युक्त मानवीय मूल्यों का समर्थन करता है और व्यक्ति, समाज, समुदाय, धर्म, जाति, क्षेत्र से ऊपर उठकर सह अस्तित्व, संतुलन एवं समन्वय के माध्यम से केवल मनुष्य के ही नहीं अपितु समस्त प्राणी जगत के सहअस्तित्व तथा विकास का भाव जागृत करता है।

‘वसुधैव कुटुम्बकम्’ की संकल्पना भारतीय ज्ञान-परंपरा और सनातन धर्म के मूल में सन्निहित है। महोपनिषद के अध्याय -6 में उल्लिखित है कि-

अयं निज परो वेति गणनालघुचेतसां

उदार चरितनाम तु वसुधैव कुटुम्बकम्।⁶

निष्कर्षतः हम कह सकते हैं कि सम्पूर्ण पृथ्वी को एक परिवार मानना हमारे मनीशियों का मौलिक चिंतन रहा है। सनातन धर्म में समस्त जीव-जंतु, पेड़-पौधे मनुष्य आदि के अस्तित्व को सृष्टि संरक्षण के लिए समान स्थान प्राप्त है। यदि भारत अपने स्वतंत्रता के अमृत काल (75 वर्ष पूरे होने) के अवसर पर विश्व को यह संदेश देने में समर्थ हो पाया और विश्व में पर्यावरण को लेकर जन-जन को जागृत कर सका तो जी-20 और जी-20 में भारत के नेतृत्व की सार्थकता सिद्ध हो जाएगी।

सन्दर्भ

1. <http://pib-gov-in>
2. केशवदास : कविप्रिया
3. विद्यापति : विद्यापति पदावली
4. कवि देव कवित्तः रस विलास
5. सुमित्रा नन्दन पन्त : ग्राम श्री कविता
6. महोपनिषद, अध्याय-6, लोक-71

Uses of Different Pesticides and Their Effect on Environment and Human Health in Arunachal Pradesh

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In Arunachal Pradesh the native farmers used to believe in organic way of farming, but with developing lifestyle and introduction of modern equipment, the farmers have started adapting uses of modern technological equipments and usage of chemical substances which is also economically convenient. With the advancement of technology, it permeated positive impact on farmers to achieve the highest potential in whatever farming activity they choose to undertake and paved unprecedented access to a wealth of valuable resources and tools to make farming easier. Nowadays technology has become indispensable part of every commercial farm. On the other hand it leads resulting in vigorous deterioration of environment and human health. Local farmers routinely use a large number of pesticides. The common ones include Gamaxin, Roundrup, D-amine salt 22.5% SL, Karate Zeon, Phoskill, Kapiq, Mastamite etc. A number of studies on the occurrence of POPs confirm their presence in various environmental compartments and human body. It has been extensively highlighted in the media including public, research journals, and attracted wider debate and sharp focus among the interested groups in India. It is obvious that indiscriminate and excessive use of pesticides pollutes not only environment and agriculture but also food chain, thereby affecting health of farmers, public, and the end users. The present study is an attempt to review research studies focusing on the pesticide use and its impact on environment and health focusing in Arunachal Pradesh. This study infers that pesticide use has increased manifold, obviously due to many complex factors. This research work reveals that pesticide residues have been found

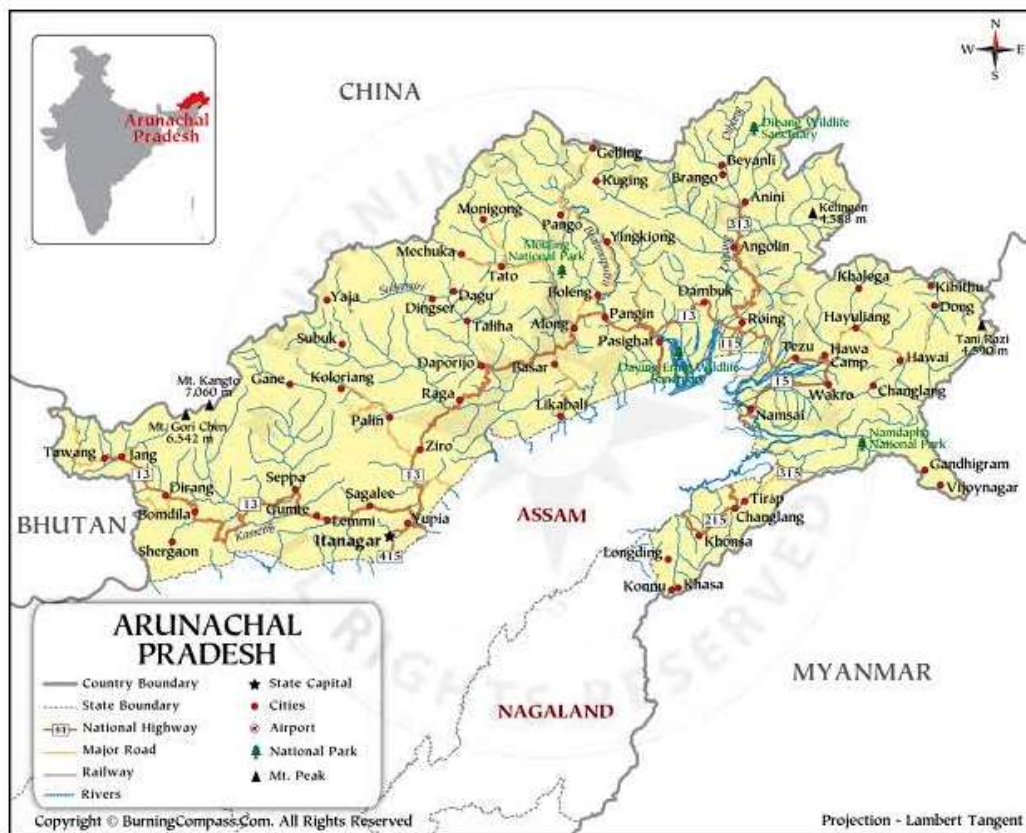
much higher in the environment than the maximum permissible limit. It is also suggests that the pesticides studied tend to persist in the soil and surface water bodies. Interactions with local farmers show that they are aware of the harmful nature of chemical pesticides, but in a general way. They are, however, not well informed about the alternatives and human health effects.

INTRODUCTION

Arunachal Pradesh is located in north eastern india and called as “Land of the Rising sun”. It is divided into twenty five district. It is known for its natural beauty and has a strong agriculturaleconomy. Pulses, sugarcane, rice, wheat, maize being its main crops. Its has a considerableamount of forest cover which ensures that the forest products also contribute to its economy. Thetourism sector of the state, however, has not been fully utilized.Arunchal Pradesh with a massive 94% rural population is the largest state in the North-EastIndia consequently, the economy of the state is based of agriculture. The climate of the state varies in accordance with the attitude which is affected by Himalayas to a large extent. The upper regions of the state experience alpine or tundra climate, which themiddle himalayan portions of the have temperate climate. Humid conditions prevail in the lowerregions of the state. The mean annual rainfall in Arunachal Pradesh is between 2000-5000 mm with a small zone of heavy rainfall of the border 3000-5000 mm along the foothills of Himalayasnorth of the Brahmaputra river. It appears that this is the region of highest rainfall in the country.Undulating topography and varied agro-climatic conditions offer vast potential for the development of horticulture for growing varieties of tropical, sub-tropical and temperate fruits, vegetable including off season vegetables, spices, aromatic and medicinal plants flowers and mushrooms. The fruits being perennial in nature help in checking soil erosion. Arunachal Pradesh is primariky an agricultural state. The main crops are rice, pulses,sugarcane, wheat, millets, oilseeds and ginger. Arunachal is also ideal for horticulture and fruitorchards.The mountain slopes and hills are covered with alpine, temperate and sub- tropical forests ofdwarf rhododendron, oak, pine, maple, fir, juniper, sal and teak are the main economicallyvaluable species. The soil in the valleys are rich in organic content and clayey- alluminus. Soilsare highly acidic which may be ascribed to thr high rainfall and heavy run off soils. The soil looksred, black and white (pure sand). It may be mentioned that red soils is considered to be fit forgrowing root crops like radish, carrot, turnip, potato, beet root, tapioca, yams, etc. in addition tocrops like millets and maize. At the same time black soils with clay is recognised suitable for paddy and loamy soils are suitable for wheat, barley, potato cultivation.

MATERIALS AND METHODS

The farmers in Arunachal use pesticides mostly on cash crops. These are few examples of plant diseases that has been reported in anjaw, lohit and eastern region of Arunachal Pradesh. A detailed survey was made in study areas where Mulberry and Musterd are grown chiefly. The farmers, Insecticide and pesticide suppliers were visited and asked about crop diseases and the pesticides used for their treatment. Health survey was done in local villages and towns to know the various disesses couosed by Insecticides and pesticides.



Map Showing study regions of Arunachal Pradesh.

1. Itanagar
2. Pashighaat
3. Lohit
4. Anjaw

5. Eastern Region

APPLICATIONS AND HEALTH EFFECTS OF PESTICIDES COMMONLY USED IN ARUNACHAL PRADESH, INDIA

1. Endosulfan It is used as a broad spectrum non systemic, contact and stomach insecticide, and acaricide against insect pests on various crops. Effects kidneys, developing foetus, and liver Immuno-suppression, decrease in the quality of semen, increase in testicular and prostate cancer, increase in defects in male sex organs, and increased incidence of breast cancer. It is also mutagenic.
2. Aldrin Effective against wireworms and to control termites Lung cancer, liver diseases.
3. Dieldrin used against ectoparasites such as blowflies, ticks, lice and widely employed in cattle and sheep dips. Also used to protect fabrics from moths, beetles and against carrot and cabbage root flies/ Also used as seed dressing against wheat and bulb fly Liver diseases, Parkinson's & Alzheimer's diseases.
4. Heptachlor It controls soil inhabiting pests. Reproductive disorders, blood dyscrasias
5. Chlordane It is a contact, stomach and respiratory poison suitable for the control of soil pests, white grubs and termites. Reproductive disorders, blood dyscrasias, brain cancer, Non Hodgkin's lymphoma.
6. Lindane It is used against sucking and biting pest and as smoke for control of pests in grain stores. It is used as dust to control various Chronic liver disorders.

Most of diseases were reported by villagers and local people those use pesticides or occasionally come in contact while selling, transporting or passing through crop fields during dusting or spraying by farmers.

CROP SPECIES AND PESTICIDES USED

MULBERRY PLANTS (FOLIAR DISEASES)

1. Leaf Spot

Pathogen : *Cercospora moricola*

Occurrence : It is more prevalent during rainy season followed by winter. The disease starts progressing 35-40 days after pruning (DAP)/leaf harvesting and becomes severe on the 70th DAP.

Crop loss : 10-12 %

Symptoms : Brownish necrotic, irregular spots appear on the leaf surface. Spots enlarge, extend and join together leaving characteristic 'shot hole'. Leaves become yellow and wither off as disease becomes severe. (leaf spot)

Factors responsible for spreading of the disease:

- The disease is air borne spreading by conidia primarily through rain droplets.
- Temperature of 24-26 °C and 70-80 % relative humidity are most congenial for
- the disease development.
- Control measures to be adopted:
- Spraying of 0.2 % Bavistin (Carbendazim 50% WP) solution on the leaves.
- Safe Period: 5 days.

2. Powdery Mildew

Pathogen : *Phyllactinia corylea*

Occurrence : Disease is prevalent during winter and rainy seasons and progresses 40th DAP/leaf harvest becoming severe on 70th DAP.

Crop loss : 5-10%

Symptoms : White powdery patches appear on the lower surface of the leaves. The corresponding portions on the upper surface develop chlorotic lesions. When severe, the white powdery patches turn to brownish-black; the leaves become yellow, coarse and lose their nutritive value. (Powdery mildew)

Factors responsible for spreading of the disease:

- The disease is air borne spreading by conidia primarily through wind current.
- Temperature of 24 – 28° C and high relative humidity (75-80 %) are responsible
- for infection and disease development.
- Control measures to be adopted:
- Follow wider spacing of plantation (90 cm x 90 cm) or paired row planting

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- system [(90 +150) × 60 cm]
- Spraying of 0.2 % Karathane (Dinocap 30% EC) / Bavistin on the lower surface
- of the leaves. Safe period 5 days. Or spray Sulfex (80WP) 0.2%.

MUSTARD PLANTS

Alternaria blight

Disease symptoms

- The disease attacks on the lower leaves as small circular brown necrotic spots
- which slowly increase in size.
- Many concentric spots coalesce to cover large patches showing blighting and
- defoliation in severe cases.
- Circular to linear, dark brown lesions also develop on stems and pods, which are
- elongated at later stage.
- Infected pods produce small, discolored and shriveled seeds.
- Survival and spread
- The disease is externally and internally seed born.
- The pathogen survives through spores (conidia) or mycelium in diseased plant
- debris or weed.

White rust

Disease symptoms

- Both local and systemic infections are observed.
- In case of local infection, white creamy yellow raised pustules appear on the leaves which later coalesce to form patches.

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- In systemic infection and during humid weather, mixed infection of white rust and downy mildew cause swelling and distortion of the stem and floral parts due to hypertrophy and hyperplasia and develop “stag head” structure.
- Survival and spread
- The pathogen survives through oospores in affected host tissues and soil.
- Secondary infection is carried out by sporangia and zoospores which produce new infection.
- Downy mildew
- Disease symptoms
- Grayish white irregular necrotic patches develop on the lower surface of leaves.
- Later under favourable conditions brownish white fungal growth may also be seen on the spots.
- The most conspicuous and pronounced symptom is the infection of inflorescence causing hypertrophy of the peduncle of inflorescence and develop stag head structure.
- Survival and spread
- The pathogen survives as oospores on the affected plant tissues in soil and on Weed Host.

RESULTS

Agriculture is the essential component of the Indian economy and as per the Indian Pesticides Industry- Business Market Report (2012); agriculture contributes nearly 18% to country's Gross Domestic Production (GDP). This report says that India has achieved a five-fold increase in food grain production, to an all-time record of 257.4 million tons in 2011-12. Ensuring food security for more than 1.27 billion Indian populations with diminishing cultivable land resource is a herculean task. This necessitates use of high yielding variety of seeds; balance use of fertilizers, judicious use of quality pesticides along with education to farmers and the use of modern eco-friendly farming techniques. From the study of Shetty (2010), it is found that the greater number of the literate farmers have strong perceptions on the negative impacts of pesticides on soil, water, air and beneficial organisms. It is well known that a number of factors take a heavy toll on the agricultural produce including

insect pests, diseases, weeds, fungi, Chemicals informed the India's parliamentary panel as cited in a media report to justify pesticide production: "Every year in India, pests and diseases eat away, on an average, 20-30% of food, worth about Rs. 45,000 crore, produced by the farmers.

In order to protect the crops from such damages and achieving the target, pesticides play an important role in Indian agriculture. Studies that documented the serious consequences of the indiscriminate use of pesticides for the health of farmers while those of Bhardwaj et. al. (2013). It is estimated that on an average, one rupee spent on pesticide use gives the yield of approximately five rupees (Indian Agricultural Research Institute, 2008). Now, as the cultivable land becomes a scarce and inelastic commodity, due to population growth, the situation will be aggravated in the years to come especially in highly populated countries like India as far as the use of pesticides is concerned. In this context, another significant aspect i.e. consumption rate of pesticides and its trends over the years in India becomes important to be considered. According to the Department of Agriculture and Cooperation, Govt. of India statistics a peculiar trend in the consumption of pesticides is noticed. According to Annual report Department of Pesticides and fertilizers (2012-13) in the year 1991, the pesticides consumption was 72130 tones. The consumption of pesticides gradually decreased till 2006. But surprisingly in the year 2011, it again increased (52980 tones) and remained more or less similar (56091 tones) till 2012. Although the overall consumption of pesticides exhibits decreasing trend over the 22 years time period. This can be considered as a good sign that Indian agriculture is by and large consuming less quantity of pesticides and indirectly it means that our country is gradually becoming less dependent on pesticides. The reasons of such an interesting trend needs to be studied. One of such reasons may be that the people have understood the consequences of excessive use of pesticide and hence they are now exploring other methods of crop protection from pests and diseases.

THE DEGRADED ENVIRONMENT AND HUMAN HEALTH IN ARUNACHAL PRADESH

The three component of the environment which includes the Atmosphere(air), the Hydrosphere(water) and the Lithosphere(land) plays very important role in the survival of man. Therefore, the desecration of these spheres of life impacts negatively on human health. Taking water as case study Centre for Science and environment (2003) says that world's fresh waters are closely linked to human beings. They further stated that 25,000 people die everyday because of water quality. Over 17,00 million people lack clean water, over 1200 million people lack sanitation, over 3 million people die of diarrhea and 200 million people suffers from schistosomiasis each

year. As many other states of India, water pollution in Arunachal Pradesh results from urbanization, industrialization, intensification of agriculture, etc. There is a wide spread pollution by sewage, nutrients, toxic metals, industrial and agricultural chemicals as well as domestic sewages. The land component of the environment is not left out. As the population increases and agriculture developed, the human impact on land is accelerated as natural vegetation is being destroyed and replaced with cultivated species. The impact agricultural development on the environment includes activities which contribute to soil erosion, land salinization and loss of nutrients. The third component of the environment which is the air has two sources of pollutants i.e, the natural as well as human related sources. However, it is human component that is most abundant in urban areas and leads to the most severe air pollution problems for human health. These air pollutants include those from smokestacks of industries at industrial sites, agricultural areas sprayed with insecticides and herbicides as well as these trucks, buses and other form of vehicles (Gupta and Kanaujia, 2014). Air pollutants affect human health in various ways, for instance sulphur oxide (SO₂) causes severe damage to human and other animal lungs. Nitrogen oxides cause irritation of eyes, nose, throat, and lungs increase susceptibility to viral infection including influenza (which can cause bronchitis and pneumonia).

EFFECTS ON HUMAN HEALTH

Arunachal Pradesh is 80% covered by the forest and the tribal people living there are dependent on this forest for food and survival. As per the research, it is seen that even though the local farmers are adopting modern ways of farming, pesticides are mostly used in cash crops as it helps in better yield and growth of these crops which ultimately boost the economy. According to IMA (Itanagar market committee and Department of Agriculture, 2013), people living in capital complex prefer local vegetables (green leaves, bamboo shoots, etc) over the vegetables such as brinjal, potato, etc. It is also seen that people living in city area like Itanagar and Pasighat grow their own mini vegetable gardens to avoid buying chemical induced vegetables as much as possible. So far, no major pesticide related diseases have been reported yet. (Yadav et. al., 2013)

Arunachal Pradesh, in particular, is known for using the traditional system of cultivation i.e primitive subsistence farming. The subsistence system is an indigenous practice which uses the "cut and burn" technique. Jhum cultivation and terrace farming are two major forms of farming practices commonly used by the farmers. In jhum cultivation, lands are composed by cutting down or burning the unwanted cultivation. Once the crops are grown and harvested.

The farmers burn the land. They then move to a clear patch of land for new batch of cultivation and as a result, the land gains back its fertility naturally. While in terrace farming, multiple cultivated steps or terraces are shaped on the slopes of hills and mountains to prevent soil erosion and washing away of soil nutrients.

Because no fertilizers are used for cultivation, the primitive subsistence method yields good quality crops and also retains the properties of the soil. (Arunachal Pradesh Human Development Report, 2006). While most tribes in Arunachal practice subsistence and shifting cultivation, the Apatani tribes of Ziro valley practice follow a distinctive system of canal irrigation of paddy cum agriculture with an intricate network of canals and channels laid across the entire fields. The paddy fields in the entire valley are irrigated by a small river through a network of irrigation channels. The idea of this system is to make certain that the water is reinstated back to river to irrigate more fields in the valley. Paddy cum fish culture is also popular with the Apatani tribes. While paddy is being cultivated, fish is also reared on the fields. Domestic waste is used to enrich the soil thereby enhancing ecological sustainability.

DISCUSSION

Pesticides are chemical substances that are meant to kill pests. In general, a pesticide is a chemical or a biological agent such as a virus, bacterium, antimicrobial, or disinfectant that deters, incapacitates, kills, pests. This use of pesticides is so common that the term pesticide is often treated as synonymous with plant protection product. It is commonly used to eliminate or control a variety of agricultural pests that can damage crops and livestock and reduce farm productivity. The most commonly applied pesticides are insecticides to kill insects, herbicides to kill weeds, rodenticides to kill rodents, and fungicides to control fungi, mould, and mildew. The major advantage of pesticides is that they can save farmers. By protecting crops from insects and other pests. However, below are some other primary benefits of it.

1. Controlling pests and plant disease vectors.
2. Controlling human/livestock disease vectors and nuisance organisms.
3. Controlling organisms that harm other human activities and structures.

THE EFFECTS OF PESTICIDES USES ARE

The toxic chemicals in these are designed to deliberately released into the environment. Though each pesticide is meant to kill a certain pest, a very large percentage of pesticides reach a destination other than their target. Instead, they enter the air, water, sediments, and even end up in our food. Pesticides have been

linked with human health hazards, from short-term impacts such as headaches and nausea to chronic impacts like cancer, reproductive harm. The use of these also decreases the general biodiversity in the soil. If there are no chemicals in the soil there is higher soil quality, and this allows for higher water retention, which is necessary for plants to grow.

CONCLUSION

Data on the occurrence of pesticide-related illnesses among defined populations in developing countries are scanty. Generation of base-line descriptive epidemiological data based on area profiles, development of intervention strategies designed to lower the incidence of acute poisoning and periodic surveillance studies on high risk groups are needed. Our efforts should include investigations of outbreaks and accidental exposure to pesticides, correlation studies, cohort analyses, prospective studies and randomised trials of intervention procedures. Valuable information can be collected by monitoring the end product of human exposure in the form of residue levels in body fluids and tissues of the general population. The importance of education and training of workers as a major vehicle to ensure a safe use of pesticides is being increasingly recognised.

Because of the extensive benefits which man accrues from pesticides, these chemicals provide the best opportunity to those who juggle with the risk-benefit equations. The economic impact of pesticides in non-target species (including humans) has been estimated at approximately \$8 billion annually in developing countries. What is required is to weigh all the risks against the benefits to ensure a maximum margin of safety. The total cost-benefit picture from pesticide use differs appreciably between developed and developing countries. For developing countries it is imperative to use pesticides, as no one would prefer famine and communicable diseases like malaria. It may thus be expedient to accept a reasonable degree of risk. Our approach to the use of pesticides should be pragmatic. In other words, all activities concerning pesticides should be based on scientific judgement and not on commercial considerations. There are some inherent difficulties in fully evaluating the risks to human health due to pesticides. For example there is a large number of human variables such as age, sex, race, socio-economic status, diet, state of health, etc. – all of which affect human exposure to pesticides. But practically little is known about the effects of these variables. The long-term effects of low level exposure to one pesticide are greatly influenced by concomitant exposure to other pesticides as well as to pollutants present in air, water, food and drugs.

Pesticides are often considered a quick, easy, and inexpensive solution for controlling weeds and insect pests in urban landscapes. However, pesticide use comes at a significant cost. Pesticides have contaminated almost every part of our environment.

Pesticide residues are found in soil and air, and in surface and ground water across the countries, and urban pesticide uses contribute to the problem. Pesticide contamination poses significant risks to the environment and non-target organisms ranging from beneficial soil microorganisms, to insects, plants, fish, and birds. Contrary to common misconceptions, even herbicides can cause harm to the environment. In fact, weed killers can be especially problematic because they are used in relatively large volumes.

The best way to reduce pesticide contamination (and the harm it causes) in our environment is for all of us to do our part to use safer, non-chemical pest control (including weed control) methods. The exercise of analysing the range and nature of benefits arising from pesticide use has been a mixture of delving, dreaming and distillation. There have been blind alleys, but also positive surprises. The general picture is as we suspected: there is publicity, ideological kudos and scientific opportunity associated with ‘knocking’ pesticides, while praising them brings accusations of vested interests. This is reflected in the imbalance in the number of published scientific papers, reports, newspaper articles and websites against and for pesticides. The colour coding for types of benefit, economic, social or environmental, reveals the fact that at community level, most of the benefits are social, with some compelling economic benefits. At national level, the benefits are principally economic, with some social benefits and one or two issues of environmental benefits. It is only at global level that the environmental benefits really come into play.

There is a need to convey the message that prevention of adverse health effects and promotion of health are profitable investments for employers and employees as a support to a sustainable development of economics. To sum up, based on our limited knowledge of direct and/or inferential information, the domain of pesticides illustrates a certain ambiguity in situations in which people are undergoing life-long exposure. There is thus every reason to develop health education packages based on knowledge, aptitude and practices and to disseminate them within the community in order to minimise human exposure to pesticides.

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Economic Impacts of Climate Change: Risks and Opportunities for G20 Economies

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Climate change has an impact on the global economy. Global warming influences various economic factors. Extreme weather has the potential to weaken economic growth. The increasing temperature affect income via agricultural yields, the physical and cognitive performance of workers, demand for energy as well as the incidence of crime, unrest and conflict .The overview is represented that there are some signs that the G20 might become a new global strategic directorate. The G20 focused on the impact of the crisis of jobs, the real economy, Climate Change and energy policy. It also designated that the G20 is the premier forum for our international economic Cooperation. Multi lateral forums like the group of twenty play crucial role in bolstering Global collective action against climate change. Global average impacts would be comparable to the welfare loss of a few percent of income, but substantially higher in poor countries. There are over 200 estimates of the marginal damage cost of carbon dioxide emissions (1). From a welfare perspective the impact of climate change is problematic because population is endogenous and policy analyses should separate impatience, risk aversion, and inequity aversion between and within countries.

INTRODUCTION

Assessing the impact of climate change is extremely complex exercise. Long-term shifts in temperatures and Weather Pattern causes climate change, Such shifts can be natural, due to changes in sun's activity or large volcanic eruptions, but since the 1800s, human have been the main driver of climate change. Due to the burning of fossil fuels like coal, oil and gas generates green- house gas emissions that act as a blanket around earth and trapping heat raising temperature. In fact, it is not only our economy influencing the climate but the changing climate is also causing serious economic risks. (2)

Many people think climate change mainly means warmer temperature but the rising of temperature is only the beginning of the story, because the Earth is a

system where everything is connected, changes in one area can influence in all others. The consequences of climate change now include, among others intense droughts, water scarcity, rising sea levels, flooding, melting of Glaciers, catastrophic storms and declining biodiversity. These risks impose a threat on economic and financial stability through several channels such as labor productivity, reduce output and growth, disrupt our infrastructure and put pressure on our financial system.

Science advances also give us more detailed spatial information to say which assets and operations are harmful with climate change for example say, how many buildings will be inundated due to sea level rise, But the indirect economic impacts may be felt long before an actual disaster.

HOW DOES CLIMATE CHANGE AFFECT THE ECONOMY?

Climate change can entail significant risks to macrofinancial stability. Nonfinancial corporate sectors face risks from climate damages and stranded assets - such as coal reserves that become uneconomic with Carbon pricing and disruption could affect corporate balance sheet quality.

The overall aggregate effect of climate change on economic growth will most likely negative in the long run. Global warming primarily influences economic growth through damage to property and infrastructure, lost productivity, mass migration and security threats. Global warming is expected to increase the frequency and severity of extreme weather events, bringing with it property and infrastructure loss.

AGRICULTURE

The sector most vulnerable to climate risk is agriculture. There are about dozen states in the Midwest that are very dependent on agriculture and they could take quite a big hit. Extreme rainfall events have increased 37% in the Midwest since the 1950s, and this year the region has experienced above normal amounts of rain and snowmelt that have caused historic flooding (2). Agricultural yields are sensitive to weather conditions and as our climate becomes ever more extreme, more frequent droughts may reduce crop yields. Higher global food prices will likely thus squeeze consumers' income.

Rising inflation also materialize through reduced land availability. It causes some areas of the world to become uninhabitable and leads to mass migration.

INFRASTRUCTURE

Much of our infrastructure is at risk from flooding. "Sea level rise could potentially cause a loss of value of assets in the trillions of dollars probably anywhere

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from two to five trillion dollars by the end of the century” said Heal. That’s loss from damage to housing, damage to docks, the railway line etc. Much of these infra structure will likely need to be repaired or replace. Inland military installations near rivers are also vulnerable, because they can overflow with heavy precipitation, which is expected to become more common as the atmosphere warms.

TOURISM

Two billion dollars could be lost in winter recreation due to less snow and ice. As water temperatures increase, water quality could suffer due to more frequent and more intense algae blooms, which can be toxic, thus curtailing recreational water activities and freshwater fishing.

More frequent and severe wildfires will worsen air quality and discourage tourism. Sea level rise could submerge small islands and coastal areas, while deforestation and its destructive impacts on biodiversity could make some tourist destinations less attractive.

BUSINESSES AND THE FINANCIAL MARKET

Climate change and its impacts across the globe will threaten the bottom line of business in a variety of ways. The frequency and intensity of extreme weather, both in U.S. and in other countries, can damage factories, supply chain operations and other infrastructure, and disrupt transport. The insurance companies bear much of the risk of climate change because they have felt the force of extreme weather events on profits. Insurance companies pay out to cover the cost of property damage due to unseasonal floods or other natural disasters. Bank have less experience modeling the financial impacts of climate events, so have more work to do, to develop their management of these financial risk.

REGIONAL EFFECT

The effects of climate change will not be uniformly distributed across the globe. Many developing countries have naturally warmer climates. The increased frequency and severity of extreme weather will weigh on governmental budgets. Due to natural disasters, there are forced to spend vast amounts on clear-up operations and healthcare costs that come with experiencing extreme weather. Revenue reductions may also be experienced by countries heavily dependent on tourism or on selling fishing rights. The time required to recover from natural disasters will be prolonged and if longer than the frequency with which such disasters occur many developing economies could remain in a constant state of reconstruction.

THE G20

G20 forum for international economic cooperation, the group of twenty plays a critical role in steering the global economy through the significant Challenges it faces. The members of G20 are: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, The United Kingdom, The United States and Europe. The G20 brings together the world's major and systemically important economies. Its members represent 85% of global GDP, 75% of international trade and two-thirds of the world's population. (3) Recently a report named G20 climate risk Atlas from the Euro-Mediterranean center on climate change has said that G20, countries including the wealthiest like the US, European countries, and Australia will bear extremes impacts of climate change over the coming years. The first study of its kind, it provides climate Scenarios, information, data and future, changes in climate across the 120 countries. The report came two days ahead of the G20 summit in Rome at the end of October 2021.

ROLE OF G20

The core purpose of the G20 has always been to recognize the importance of collective action and inclusive collaboration among major developed, countries and emerging economies around the world. The objectives of the G20 are:

- a) Policy coordination between its members in order to achieve global economic stability,
- b) Sustainable growth,
- c) To promote financial regulations that Reduce risks and prevent future financial crisis.

The G20 economies are responsible for about 75 to 80% of global greenhouse gas emissions. (*D'SOUZA R.-2023*)

HOW INDIA'S G20 PRESIDENCY CAN HELP TO FIGHT CLIMATE CHANGE

India's G20 presidency, presents us with unique opportunities to seize. India's proposal at G20 presidency to phase out of all fossil fuels, including gas and oil, sustainably and equitably, construes the much needed step away from planet scale extinction of habitats and destruction of livelihood. The presidency of G20 has shifted from Indonesia to India and will then go to Brazil, bringing an opportunity to a more inclusive world order. We must recognize that climate change most severely impacts

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the lives of indigenous peoples, women and majorities of our working peoples, who already face multiple problems. (4)The G20 emerged at the center stage of global economic governance in 2008. At the time, it was designed to be an inclusive and effective Intergovernmental body However, we find evidence of a slowdown of the G20's development by tracing the evolution of the G20 agenda during the seven summits held to date.

THE G20 AND EMERGING ECONOMIES

The impact of the G20 on emerging economies could go one of two ways. The G20 may provide a forum in which the emerging economies can enjoy more power and influence in global agenda setting. It runs by a small group of industrialized countries who use it to build greater support for their preferences. G20 finance network shows emerging economies have used the last decade of G20 summits to learn how to use a forum of this nature to their advantage. Over time emerging economies have adapted, to the rhythm of G20 summitry and have built up specialized capacity in their ministries of finance and central banks to deal with G20 issues.

THE G20 AND DEVELOPING COUNTRIES, AND WHAT THEY CAN DO

Climate change is a global responsibility. The emerging economies have been focusing on problems of special concern to them such as increasing their voice and participation in the IMF and the World Bank. India and Italy are the frontrunners in climate mitigation among the G20. Network of influence highlights that emerging, and developing countries will need to strengthen own networks. The leaders and finance officials of emerging economies should form a caucus of own within the G20 to coordinate in a counterbalancing way. However, to fully G20's agenda - setting power, developing countries need parallel networks. At the same time the G20 economies account for the largest share of global wealth. Moreover the G20 countries are home to many of the world's most significant carbon sinks, such as the Brazilian Amazon rainforest, the marshes in the United Kingdom and Sundarbans in India (5). At the G20 Joint Environment and Climate Ministerial Meeting held in August 2022, the member countries acknowledged the severity of the climate crisis and declared that three crucial issues will be Prioritized towards fulfilling the goals set by the Paris Agreement: a sustainable global economic recovery; land-based and ocean-based climate action; and resource mobilization for environmental protection.(6)

Data from the Climate Action Tracker (CAT) shows that of the G20 countries, only the UK has put in place climate action targets and policies that could help the global community achieve the goal of limiting global warming to 1.5 degrees Celsius. (Prior to the negotiations at COP27 in Egypt in 2022, participating countries were expected to submit revised or updated targets with renewed pledges; but they hardly delivered. While 19 out of the 20 countries have updated their pledges, only 11

submitted targets that are stronger than their previous ones. These targets must be strengthened and suitable policies carefully planned and implemented to meet them.
(7)

This report offers a unique Climate Performance Index (CPI) to evaluate the performance of the G20 countries in climate change mitigation. Guided by the principle of 'Common but Differentiated Responsibilities (CBDR)', this assessment demarcates individual countries' responsibilities towards collective climate action commensurate with historical emissions, demographic factors like population, deficits in economic and human development, and their financial and technical wherewithal to undertake a green transition

CONCLUSION

The general consensus, which is supported by a growing amount of evidence, suggests we should act sooner rather than later to avoid potential future costs. Successful mitigation policies will necessitate actions from all parties. The insurance industry is already moving to incorporate some of these costs, but without a broader coordinated correct policy response, the world economy is unlikely to factor one of the greatest negative externalities ever faced. Bank and funds need to analyze where their investments are and see if they are vulnerable to climate change. Have they invested in someone who has coastal property, or given a loan to a fossil fuel company or in agriculture operations that might be affected by Climate change. Government should proactively think about the risks their communities face before strikes. Societies and economies must take action today to thrive in the future. The collective economic power of these countries gives a unique ability to leverage their resources and influence to address global challenges and achieve common goals.

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International Cooperation and Climate Change: The Role of G 20

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This paper analyses how G20 as a global forum of leading economics has addressed the issues of climate change over the year .The global community has underscored that climate change affects our environment, process of economics growth and well-being of the population. G20 being the representation of major global, power can possibly set the direction for the adaptation and mitigation of climate change impacts. It is equally important to examine how G20 countries can support solution to climate change as envisaged in Paris agreements and promotes sustainable living. Building on the cooperation and support among the member countries, G20 needs to foster international cooperation in tackling climate change impacts and impacts and mobilise support from other country grouping and international organization.

INTRODUCTION

Humanity has been facing climate change, since the beginning of its very existence. However, it has been only in the past century that we started to observe significant negative effect of our actions on the climate is an integral part of our survival and should be our main concern. India has achieved some key success at the G20 summits being, held in Rome. India along with other developing countries was able to introduce on what action need to be taken, included by developing nation to achieve climate and energy goals. This is also the first time that G20 has identified sustainable responsible consumption and production. World leaders are charged to bring real solution in tackling climate change. Assorted international conferences were held to negotiate strategic plans to keep the rising level of the earth's temperature below 1.5 !. Currently, study revealed that heat and cold contributed to the global mortality rate of 9.43%. As we know those phenomena are causes by climate change. Whereas, In Indonesia, climate change triggers 2.062 disaster in 2022. .

OBJECTIVE OF THE STUDY

- A. To analyze the role of G20 on climate change.
- B. To analyze the international cooperation to restore the climate.

CLIMATE CHANGE AND ITS CAUSES

Global warming, the main result of climate change, has a major impact on our environments, but also on economic growth of countries and well-being of their population. As per the International Monetary Fund (IMF) world economic outlet, January 2020 and 2021 has been downgraded. To quotes the report “Climate change” the driver of the frequency and intensity of weather-related disaster, already endangers health and economic outcomes, and not only in the directly affected regions. Climate change affects everyone without distinction, but the most vulnerable are usually those most exposed to its harmful effects to fight climate change, it is necessary to use international cooperation and come up with global solutions. One of the most significant initiatives in efforts to fight climate change has been the Paris Agreements that was adopted in December 2015.

THE ROLE OF G20 ON THE CLIMATE CHANGE

The G20 plays an important role in leading efforts to address climate change. The commitment has been agreed upon and outlined in several road action strategies.

The G20 comprises 19 countries and 1 European Union.

1. Australia	2. Germany	3. Italy	4. Mexico	5. Argentina
6. Brazil	7. Saudi Arabia	8. Russia	9. Turkiye	10. U.K.(United Kingdom)
11. India	12. Japan	13. South Africa	14. Indonesia	15. South Korea
16. Canada	17. France	18. China	19. U.S.A.	20. E.U.(European Union)

The impact of climate change have worsened in some countries, as they suffer from more severe hydrometeorological hazards.

The G20 countries are demanded a big responsibility to be more ambitious in creating climate management solutions for the high carbon emissions produced.

The G20 summits held in Indonesia produced several agreements to deal with climate change. The solution prioritized by state leaders is to increase the applications of new renewable energy transitions. In addition, the G20 will focus on land use management and restoration. This policy was issued to restrain deforestation which increase carbon emissions. This policy also aims to protect biodiversity.

IMPORTANCE OF G20

- (i) With only 20 members, the G20 is agile enough to make prompt decision and to adopt to new challenges.

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- (ii) The inclusion every year of invited countries international organization and civil society organization ensure engagement of international players.
- (iii) Major achievements of the G20 include quick deployments of emergency funding during the 2008 financial crises.
- (iv) G20 played a critical role in the ratification of the trade facilitation agreements of the WTO (World Trade Organization), India also finally signed the agreements in 2016.
- (v) G20 brings world's top developed and developing countries together to bring consensus and reasoning into decision making through discussion.

LIMITATIONS OF G20

- (i) No enforcement mechanism: The G20's toolkit ranges from simple exchanges of information and best practices to agreeing common, measurable targets to coordinated action. None of this is achieved without consensus, nor is it enforceable, except for the incentive of the peer review and public accountability.
- (ii) Not legally Bindings: The decision are based on discussion and consensus which culminates in the form of declaration. These declaration are not legally bindings. It's just an advisory or consultative group of 20 members.

INTERNATIONAL COOPERATION ON CLIMATE CHANGE

- (i) The Paris Agreements came into force in 2016. It was a major step forward in international efforts to address climate change. Other international treaties are the: United Nations Framework Convention on Climate Change. (UNFCCC) and Kyoto protocol.
- (ii) The Paris Agreement aim to strengthen the global response to the threat of climate change by: Holding the increase in the global average temperature to well below 2! above pre-industrial levels. And pursuing efforts to limit temperature increase to 1.5 !.
- (iii) The G20 also regularly engages with non-government sectors. Engagement groups from Business(B20), Civil society(C20), labour (I20), Think tank(T20), and

Youth(Y20) are holding major events during the year, the outcomes of which will contributes to the deliberations of G20 leaders.

POLICIES IN SUPPORT OF CLIMATE CHANGE SOLUTION:

G20 is a strongly influential international forum of the world's largest

economies with potential to set the direction on main issues that challenge world today. Meetings serve as the unique platform and premier global forum to exchange ideas on the higher levels, resulting in proposals of potential solutions to the most urgent concern, with climate change being one of the most critical ones at present. Knowing that G20 members account for around 85% of global Gross Domestic Product (GDP), 75% of world trade and also for 80% of Global Carbon dioxide emission (CO₂) and 70% of Global plastic production, as well as two third of the world's population and more than half of the world's poor, the commitments made by them on climate. As demonstrated in the previous section, in the years since the Paris Agreement, G20 has placed solution to climate change among their top priorities. Solar alliances, an alliances on 121 partner countries that was launched during the COP21 in Paris in 2015. Some might argue that renewable sources are not affordable for everyone.

CONCLUSION

Corporate climate change disclosure forms part of the infrastructure for providing decision-makers with information that will enable them to integrated climate consideration into their analyses, and to help better align business practice with climate change mitigation and adaptation plans and sustainable development goals. The analysis of mandatory corporate climate change reporting schemes in G20 countries shows that there are some commonalities, but also significant divergence between the reporting requirements, the scope and quality of the reported information, and the measures used by governments to enforce the schemes.

The main difference between G20 country schemes relate to the thresholds, measurements approaches, for example by estimation or direct methods, calculation formulae, units and emission factors, verification or assurance requirements, and penalties for non-compliance.

The analyses evidences the multiplicity of requirements under the different schemes, which may render the evaluation and comparison, and thereby the use of the information.

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Climate Resilience And Adaptation: G20's Role in Building Climate –Resilient Communities

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We continue to work to reduce carbon emissions. The increasing frequency of more extreme weather like hurricanes, droughts, and floods is affecting people across the world. For many developing countries, economics prospects will be significantly threatened without effective adaptation to climate change. And many small island states are particularly vulnerable. In some countries, disaster- related economic losses have exceeded 200 percent of gross domestic products (GDP) – for examples when hurricane Maria struck Dominica in 2017. Analysis of appropriate adaptation policies must be inherently local and customized to the evolving climate impact on specific region or sectors, including resilience building strategies to help prepare for and rebound from disasters. It is clear nonetheless, that developing country governments can face very large adaptation costs: importantly the need for growth-enhancing scales up infrastructure provides an opportunity for climate –resilient, low carbon infrastructure spending. to be successful, the management of spending, and of financial assistance for it, should be undertaken within a medium term financial framework consistent with available resources, macro stability, and dept sustainability.

INTRODUCTION

Resilience is an increasing common word in the climate vernacular extreme weather actions have shown that resilience is essential component of any detailed climate action program because climate change is both a global and a hyper local issue

The causes and the broad impacts affect everyone on the planet but resilience efforts must be executed at the asset neighborhood or individual level it will take a combined and co ordinate efforts like non ever seen before to address this issue the good news is that addressing these risk can not only protect people and property but also generate economic activity that will create domestic jobs and drive safety

Adaptation and Resilience are often used interchangeably in policy and academic discourse and while they are complementary concepts these are important difference in these terms. At its most basic adaptation refers to the processes or Action that change a living thing so that it is better able to survive A New Environment Whereas Resilience To anticipate and Cope With Shocks And To Survive From Impact. Adapting to climate consequences protects people, homes, business, livelihood, infrastructure and natural ecosystem it cover current impacts and those likely in the future. Adaptation will be required everyone, but must be prioritized no for the most vulnerable people with the fewest resources to cope with climate hazards.

OBJECTIVE

1. To identify the main cause of climate resilience and adaptation
2. To identify the role of G20 in building climate and resilience

CLIMATE RESILIENT PATHWAY (CRP)

Climate resilient Pathway Are development route that combine adaptation and mitigation to realize the goal of sustainable development They can be seen as internative continually evolving processes for managing change within complex systems. CRP-outcomes of evolutionary processes of managing change in order of reduce disruption and enhance opportunities.

COMPONENTS OF CLIMATE RESILLIENCE

Climate resilience is defined in this book as consisting of 5 capacities or pillars Thresholds Capacity, Coping Capacity, Recovery Capacity, Adaptive Capacity and Transformative Capacity

Threshold capacity –threshold capacity is a society’s ability to prepare and build up a threshold against variation in order to prevent damage. In flood risk management, examples include building river dikes and increasing flow capacity to set a threshold against high river flows. For water supply, examples include constructing storage reservoir to increase the damage threshold by preventing loss of service in the event of droughts. The objective of building threshold capacity is damage prevention. In addition to physical infrastructures, natures based solution – our ecosystem – are very well equipped with this threshold capacity but are in rapid decline.

Adaptive Capacity –adaptive capacity is a society’s capacity to anticipate uncertain future development. The Includes catastrophic, infrequently occurring disturbances like extreme floods and severe drought. The orientation of adaptive capacity lies in the future. a system may be functioning well at present, human and environmental developments. From both inside and outside the considered system can put a system under strain and threaten its future functioning.

GOAL OF CLIMATE RESILIENCE

Reducing U.S. greenhouse gas emission 50-52% below 2005 levels in 2030 reaching 100% carbon pollution free electricity by 2035 achieving a net zero emissions economy by 2050 delivering 40% of the benefits from federal investment in climate and clean energy to disadvantaged communities

ADAPTATION

Adaptation is a critical component of the long term global response to climate change to protect people livelihood and ecosystems parties acknowledge that adaptation action should follow a country-driven gender responsive participatory and fully transparent approach considering vulnerable groups communities and ecosystems adaptation should be based on and guided by the best available science and as appropriate traditional knowledge of indigenous peoples and local knowledge systems with a view to integrating adaptations policies and adaptation. process of adjustment to actual or expected climate and its effects. In human system, adaptation seeks to moderate or avoid harm or benefits opportunities. Climate change adaptation related to many interconnected field and sectors including: interpretation of climate science and its uncertainties, climate risk and adaptation development of policy formulation. This is where climate adaptation becomes critical. While mitigation involves cutting the pace of global emissions and slowing down warming, adaptation also helps in building long- term resilience to the impacts of climate change.

GLOBAL GOAL ON ADAPTATION (GGA)

The global goal on adaptation was established under the Paris agreement to enhance climate change adaptation by increasing awareness of and funding towards countries' adaptation need in the context of the 1.5/2C goal of the Paris agreement. However, unlike the clear 1.5C target for global mitigation, adaptation is primarily a local activity and as such, a global target has been challenging to establish. At COP26 parties established the 2022-2023. On the global adaptation to define the key elements of the goal, including the methodologies, indicators, metrics and data sources to support the assessment progress. Negotiations around the global goal on adaptation currently focus on what metrics and indicators can be used at both global and local levels to effectively monitor collective progress. countries at the 27th conference of parties (COP27) to the United Nations Framework Convention on Climate Change (UNFCCC) at Sharm El – Sheikh finally decided on the establishment of a framework for achieving the global goal on adaptation. The framework will be considered and adopted at the COP28 in 2023. It will also review the progress that is going on next year. We made progress on GGA and established a framework to guide the achievement of the goal as well as the review of overall progress in achieving it and enhancing adaptation action and support Collins Nzovu, Zambia's minister of green

economy and environment, representing the African group of Negotiators said at the closing plenary of COP27 on November 20, 2022.

NATIONAL ADAPTATION PLANE

National adaptation plane established in 2010 the adaptation committee (AC) is the global voice on adaptation working to drive forward coherent UNFCCC action on adaptation world wide by providing expert guidance enhancing outreach and supporting the implementation of the Paris agreement since 2018 the Facilitate Working Group further the operationalization of the local communities and indigenous people platform the report lays out six universal “principles of adaptations and resilience” and 26 concrete actions that government can use to develop effective strategies to support that development and design of these action it also includes 12 toolboxes with methodologies and data sources that can ensure that strategies are evidence based .build resilient foundation with rapid and inclusive development poverty and the lack of access to basic services including infrastructure financial services health care and social protection are strong predictors of vulnerability to climate change to put in another way the poorer communities are the more climate change will affect them No Adaptation Strategy Can Be Successful Without Ensuring High Vulnerability Population Have The Financial Technical And Institutional Resources They Need To Adapt help people and firms do their part its critical to boost the adaptive capacity of household and firms many already have incentives to adapt but they need help overcoming obstacles ranging from a lack of information and financing to behavioral biases and imperfect markets government can make information on climate risk availability clarify responsibilities and liabilities support innovation and access to the best technologies and ensure financing is available to the especially for solutions that come with high upfront cost who cannot afford to invest in adaptation

G20 S ROLE IN BUILDING CLIMATE RESILIENT COMMUNITIES

G20 delegates graced several Indian cities this past week as India took over the G20 presidency once again placing us at the global center stage climate finance energy security and food security rank high on India G20 agenda and this increased focus will surely provide a multifold impetus to this emerging climate dialogue innovation and business models in India it will also strengthen the roots of India as a global climate leader green solution must balance people profits and the planet a vision also reflected in the underlying theme of India s presidency Vasudhavia Kutumbakam Or One Earth One Family One Future for the global south financing climate reaction must be encompass adaptation and resilient in adaptation to migration as we connective to grow population from the worst effects of climate change the current G20 TROIKA of developing countries presents a unit opportunities to steward global climate dialogue to focus on a sustainable and inclusive net zero transition.

RESILIENT COMMUNITIES

Communities' resilience is the sustained ability of a community to use available resources (energy communication transportation etc.) to respond to, withstand, and recover from adverse situations. This allows for the adaptation and growth of a community after disaster strikes. Communities that are resilient are able to minimize any disaster making the return to normal life as effortless as possible. By implementing a community resilience plan, a community can come together and overcome any disaster, rebuilding physically and economically. Due to its high complexity, the discussion on resilient societies has increasingly been considered from an inter and transdisciplinary scope.

CONCLUSION

Global warming is increasing day by day if we cannot prevent it as soon as possible, our world will face undesirable consequences. Climate change describes a change in the average condition such as temperature and rainfall. NASA scientists have observed that Earth's surface is warming and many of the warmest years on record have happened in the past 20 years. Artificial intelligence and machine learning, which have been quite advanced recently, is our immense weapon in the fight against climate change. Recently, studies have been carried out to tackle climate change with these subjects. Governments, non-profit organizations, and companies also have the responsibility to implement and contribute to these studies. Global warming is the most crucial existential problem of our age, which requires significant societal change to mitigate it. Although we have been raising public awareness on climate change for years, this is not enough; the global temperature increases day by day.

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जी-20 के विशेष सन्दर्भ में पर्यावरण चेतना एवं हिन्दी साहित्य

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जी-20 अर्थात् ग्रुप ऑफ ट्वेन्टी अन्तर्राष्ट्रीय आर्थिक सहयोग का प्रमुख मंच है। 1999 में एशियाई वित्तीय संकटोपरान्त वित्त मन्त्रियों एवं केन्द्रीय बैंक के गवर्नरों के लिए वैश्विक आर्थिक तथा वित्तीय मुद्दों पर विमर्श करने के उद्देश्य से जी-20 की स्थापना की गई थी। तदुपरान्त इसके एजेंडे में विस्तार करते हुए इसमें जलवायु परिवर्तन, पर्यावरण, सतत विकास, स्वास्थ्य, कृषि, ऊर्जा एवं भ्रष्टाचार विरोध सरीखे अन्य ज्वलन्त मुद्दे भी सम्मिलित किए गए। जी-20 समूह में 19 देश शामिल हैं। 1 दिसम्बर, 2022 से 30 नवम्बर, 2023 तक भारत को जी-20 की अध्यक्षता सौंपी गई है। भारत 'वसुधैव कुटुम्बकम्' की अवधारणा को केन्द्र में रखकर पर्यावरण को संरक्षित कर सुन्दर भविष्य की ओर कदम बढ़ाने हेतु प्रतिबद्ध है। प्रस्तुत शोधपत्र में जी-20 के विशेष सन्दर्भ को दृष्टिगत रखते हुए हिन्दी साहित्य की व्यापक, समृद्ध एवं बहुविविधता सम्पन्न साहित्यिक धरोहर में अति महत्वपूर्ण ज्वलन्त मुद्दे - पर्यावरण संरक्षण को सूक्ष्मता से विश्लेषित करने का प्रयास किया गया है। सर्वप्रथम जी-20 की अवधारणा को स्पष्ट करते हुए उसके प्रमुख बिन्दुओं, एजेंडे, कार्यप्रणाली और रूपरेखा को प्रस्तुत किया गया है।

उक्त शोधपत्र में हिन्दी साहित्य के प्रारम्भिक काल से लेकर वर्तमान समय तक सतत रूप से प्रवाहमान प्राकृतिक सौन्दर्य के विभिन्न पक्षों को उद्घाटित करते हुए पर्यावरण संरक्षण के प्रत्यय को व्यापक रूप से स्थापित करने का प्रयास किया गया है। साथ ही प्रकृति के प्रति सुप्त हो रही मानवीय संवेदना को जागृत कर सुन्दर-सुरक्षित भविष्य की संकल्पना को साकार करने हेतु हिन्दी साहित्य द्वारा किए गए सकारात्मक प्रयासों को भी रेखांकित किया गया है।

प्रस्तावना

प्रकृति और पर्यावरण ऐसे बेहद अहम मुद्दे हैं जो दशकों से वैश्विक स्तर पर चर्चा के केन्द्र में रहे हैं। आज मानव सभ्यता इस तथ्य को पुनर्स्थापित करने को प्रतिबद्ध है कि अनादिकाल में जिस तरह प्रकृति के साहचर्य में मानव ने अपना जीवन व्यतीत किया था, उसी प्रकार वर्तमान समय में भी भयावह प्राकृतिक संकटों से बचने के लिए मानव को प्रकृति के साहचर्य में जीने की नितान्त आवश्यकता है। क्षिति, जल, अग्नि, आकाश एवं वायु उक्त पंचभूतों से निर्मित मानव के जीवन का आधार प्रकृति ही है-

“क्षिति जल पावक गगन समीरा ।

पंच रचित अति अधम सरीरा ।।”¹

पर्यावरण और मनुष्य का एक-दूसरे से बहुत घनिष्ठ एवं अन्योन्याश्रित सम्बन्ध है। पर्यावरण दो शब्दों से मिलकर बना है- पर्यावरण। परि यानी बाहरी और आवरण का अर्थ है घेरा। पर्यावरण अपने व्यापक अर्थ में जल, वायु, पृथ्वी, आकाश सबको समेटे हुए है। मनुष्य जीवन का कोई भी पक्ष पर्यावरण से अछूता नहीं है। महाकवि कालिदास ने ‘अभिज्ञानशाकुन्तलम्’ में जल, वायु तथा अग्नि आदि पर्यावरण के तत्वों को ईश्वर का प्रत्यक्ष स्वरूप कहा है- “प्रत्यक्षाभिः प्रपन्नस्तनुभिरवस्तुवस्ता भिरष्टाभिरीश ।” प्राचीन काल से ही पर्यावरण भारतीय चिन्तन पद्धति का बेहद जरूरी विषय रहा है।

आचार्य शुक्ल के शब्दों में, “कविता वह साधन है जिसके द्वारा शेष सृष्टि के साथ मनुष्य के रागात्मक सम्बन्ध की रक्षा और निर्वाह होता है।”¹ भारतीय दर्शन व साहित्य में आरम्भ से ही साहित्यकारों ने प्रकृति के साथ अपने रागात्मक सम्बन्धों को बनाए रखने, उसे सृजनात्मक अभिव्यक्ति प्रदान करने तथा अपनी रचनाओं के माध्यम से पर्यावरणीय जन-जागृति उत्पन्न करने का प्रयास किया है। “प्रकृति और परिवेश के प्रति जागरूकता कवि का अनिवार्य युगधर्म है। यही जागरूकता प्रकृति निरीक्षण में उसका साथ देती है और काव्य में उसके उचित प्रतिनिधान के लिए प्रेरित भी करती है।”² अर्थात् प्रत्येक युग का साहित्यकार तत्कालीन ज्वलन्त समस्याओं को अपने साहित्य में न सिर्फ स्थान देता है अपितु उसके प्रति सोचने-विचारने को सुदृढ़ धरातल भी उपलब्ध कराता है।

आदिकाल से वर्तमान समय तक हिन्दी साहित्य के प्रत्येक काल में पर्यावरण चेतना दृष्टिगोचर होती है। सम्भवतः समस्त हिन्दी साहित्यकार अपनी रचनाओं में प्रकृति के अनावश्यक दोहन-शोषण का मुखरता से विरोध करता है। कबीर, तुलसी, रविदास, नानक, हजारीप्रसाद द्विवेदी, आचार्य शुक्ल, पन्त, प्रसाद, अज्ञेय आदि ने पर्यावरण जागृति उत्पन्न कर मनुष्य को आत्मानुभूति की ओर प्रेरित किया। रासो काव्य प्रणेताओं ने अपने काव्य में प्रकृति चित्रण के अन्तर्गत ऋतुओं एवं बारहमासा का वैविध्यपूर्ण वर्णन किया है। इनमें प्रकृति के आलम्बन व उद्दीपन दोनों रूपों का बखूबी चित्रण हुआ है। चन्द्रवरदाई कृत ‘पृथ्वीराजरासो’ में प्रकृति के कोमल एवं रौद्र दोनों रूपों का वर्णन किया गया है। पावस ऋतु वर्णन के अन्तर्गत प्रकृति का रौद्र रूप देखने योग्य है-

“धुमड़ि घोर घन गरजि । करत आडम्बर अम्पर ।

पूरत जब्रधर धसत । धार पथ थकित दिगम्बर ।।”⁴

हिन्दी साहित्य के भक्तिकालीन कवियों ने भी प्रकृति के प्रति मानवीय संवेदना को जागृत कर पर्यावरण चेतना को अपनी मुखर एवं अक्खड़ शैली में अभिव्यक्त किया है। तुलसीदास द्वारा रचित ‘रामचरितमानस’ में कई उद्धरण प्राप्त होते हैं जहां राम गंगा आदि नदियों की पूजा करते और सीता पेड़-पौधों को सींचती दिखाई पड़ती हैं। एक प्रसंग में उद्धृत है कि समुद्र द्वारा रास्ता न दिए जाने पर

लक्ष्मण राम से समुद्र को सुखा देने के लिए कहते हैं, किन्तु राम उनको यह कहकर मना कर देते हैं कि ऐसा करने से समुद्र के समस्त जीव और वनस्पतियां नष्ट हो जाएंगे तथा पर्यावरण को क्षति पहुंचेगी। भक्तिकालीन प्रायः सभी कवियों ने प्राकृतिक उपादानों का आश्रय लेकर गहन रहस्यात्मक एवं दार्शनिक तत्वों को उजागर करते हुए प्रकृति के प्रति मानवीय संवेदना जागृत करने का प्रयास किया है- “बकरी पाती खात है, ताकी काढ़ी खाल। जो नर बकरी खात है, ताको कौन हवाल।।” सूफी कवियों की मान्यतानुसार प्रकृति में ईश्वर का रूप-सौन्दर्य प्रतिबिम्बित होता है तथा प्रकृति परमात्मा की दिव्य ज्योति से आलोकित होती है। कतिपय इसी कारण सूफी काव्य में प्रकृति अपने सजीव रूप में विद्यमान दिखाई देती है।

कहना न होगा कि हिन्दी साहित्य में आदिकाल से लेकर रीतिकाल तक साहित्यकारों ने किसी न किसी रूप में प्रकृति को वर्णित करते हुए पर्यावरणीय चेतना को अभिव्यक्त किया गया है। आधुनिक काल में आकर छायावादी कवियों में पर्यावरण के प्रति गहन संवेदनशीलता एवं जागरूकता दृष्टिगोचर होती है। प्रसिद्ध आलोचक नामवर सिंह के शब्दों में, “यह परम्परा हिन्दी में पहली बार लगभग शताधिक वर्षों के बाद हिन्दी के छायावाद में दिखाई पड़ी। हिमालय की तराई के कवि सुमित्रानन्दन पन्त पहले कवि नहीं हैं। उनके पहले ‘एकान्तवासी योगी’ में भी यह आपको मिलेगी। कृष्णायाम के बाद और उस दौर के सहृदय समालोचकों में गिने जाने वाले आचार्य रामचन्द्र शुक्ल के आलेखों में मिर्जापुर की पहाड़ियों, झाड़ियों, झरनों के अनेक दृश्य आपको मिल जाएंगे।”⁵ छायावादी काव्य में प्रकृति सम्बन्धी कविताओं के बाहुल्य तथा उसमें प्रतिफलित प्रकृतिपरक दृष्टिकोण को देखकर कतिपय विचारकों ने छायावाद को ‘प्रकृति काव्य’ का नाम भी दे दिया है। सुमित्रानन्दन पन्त, मुकुटधर पाण्डेय, निराला, जयशंकर प्रसाद, महादेवी वर्मा, हरिवंशराय बच्चन आदि ने अपनी रचनाओं में प्राकृतिक सौन्दर्य एवं पर्यावरणीय चेतना का मुखरता से वर्णन किया है। प्रसाद ने अपने महाकाव्य ‘कामायनी’, झरना, लहर, आंसू, चन्द्रगुप्त, एक घूंट आदि में पर्यावरण के महत्व को दर्शाते हुए पर्यावरण के प्रति जनजागृति लाने का प्रयास किया है। ‘कामायनी’ में इड़ा की निम्न पंक्तियों द्वारा प्रसाद इस सत्य को वर्णित करते हुए कहते हैं कि मानव के जीवन में व्याप्त निराशा का कारण वह स्वयं है। जो प्रकृति हमारी निराशा को आशा में परिवर्तित कर सुख-शान्ति का संचार कर जीवन को आनन्दमय बनाती है, मनुष्य उसे ही नष्ट करने में लगा हुआ है-

“इस दुखमय जीवन का प्रकाश- नभ नील लता की

डालों में उलझा अपने सुख से हताष कलियां

जिनको मैं समझ रहा वे कांटे बिखरे आस-पास

.....

पवस रजनी में जुगनू गण को दौड़ पकड़ता

मैं निराश उन ज्योति कणों का कर विनाश।।”⁶

हजारीप्रसाद द्विवेदी के निबन्धों में भी पर्यावरणीय चेतना बखूबी दर्ज हुई है। उन्होंने न केवल पर्यावरण के अनुचित दोहन एवं प्रदूषण के भयावह रूप को वर्णित किया है, अपितु पर्यावरणीय स्त्रोतों के यथासम्भव उचित उपयोग और संरक्षण हेतु महत्वपूर्ण सुझावों को भी रेखांकित किया है। 'आम फिर बौरा गए', 'अशोक के फूल', तथा 'मनुष्य का भविष्य' आदि द्विवेदी जी के निबन्धों में जल एवं वायु प्रदूषण, जलवायु परिवर्तन तथा ग्लोबल वॉर्मिंग जैसे वैश्विक पर्यावरणीय सम्बन्धित मुद्दों पर उनका चिन्तन गौरतलब है।

अज्ञेय ने भी अपनी रचनाओं के माध्यम से पर्यावरण जागरूकता फैलाने का कार्य किया। उनकी 'असाध्य वीणा' शीर्षक कविता पर्यावरण चेतना का अप्रतिम उदाहरण है। नामवर सिंह के शब्दों में, "असाध्य वीणा से जो ध्वनियां निकलती हैं, उनसे जो चित्र उभरते हैं, वे सारे चित्र प्रकृति के हैं।" उदाहरण के तौर पर निम्न पंक्तियां देखी जा सकती हैं- "हां, मुझे स्मरण है/बदली-कौंध-पल्लियों पर वर्षा-बूंदों की पट-पट/घनी रात में महुए का चुपचाप टपकना/चौंके खग-शावक की चिहुंक/द्रुत लहरीले जल का कल-निनाद/कुहरे में छन कर आती /पार्वती गांव के उत्सव-ढोलक की थाप।" प्रकृति को मनुष्य ने कल-कारखानों एवं अपने स्वार्थपूर्ण रवैए से दूषित कर दिया है। सहज-संतुलित वातावरण सर्वत्र नष्ट हो गया है तथा इसके स्थान पर कृत्रिमता आ गई है। 'हरी घास पर क्षण भर' कविता में अज्ञेय कहते हैं- "नहीं सुने हम वह नगरी के नागरिकों से/जिनकी भाषा में अतिशय चिकनाई है साबुन की/किन्तु नहीं है करुणा।"

वहीं आज के दौर के हिन्दी साहित्यकारों में भी पर्यावरण के प्रति गहरी संवेदनात्मक अनुभूति अपने चरम पर दिखाई दे रही है। मदन कश्यप की 'चाहते' शीर्षक कविता एक बेहतर जीवन के लिए प्रयत्नशील कवि मन की ईमानदार अभिव्यक्ति कही जा सकती है-

कितनी छोटी-छोटी हैं उनकी चाहतें
मानो वे कुछ नहीं चाहते।
वे पेड़ों को काटना नहीं चाहते
उनका हरापन चूस लेना चाहते हैं।
वे पहाड़ों को रौंदना नहीं चाहते
उनकी दृढ़ता निचोड़ लेना चाहते हैं।
वे नदियों को रोकना नहीं चाहते
उनका प्रवाह रोक देना चाहते हैं।
अगर पूरी हो गई उनकी चाहतें
तो न जाने कैसी लगेगी यह दुनिया?*

आज पारिस्थितिक शोषण अपने चरम पर है। भूमंडलीकरण की प्रक्रिया, नव उपनिवेशवादी एवं बहुराष्ट्रीय निगमों के स्वार्थपूर्ण खैए वैश्विक स्तर पर पर्यावरण की समस्या को बढ़ाने वाले कारक हैं। नदी के गीच पुल बांध-पुल-सड़क बनाना, जंगल के बीच सड़क बनाना और पेड़ों को निर्ममता से काटना आदि के कारण मनुष्य के अस्तित्व को संकट में ले आया है। हिन्दी साहित्य में प्राकृतिक संसाधनों के शोषण के प्रति प्रतिरोध के स्वर दिखाई पड़ते हैं। चन्द्रकान्त देवताले की कविताएं जैसे - 'पुल बनेगा तो', 'मजे ले रहे होंगे', 'पेड़', 'बाई दर्द ले!', 'तीसरा विश्व युद्ध', 'सवाल-जवाब' आदि पारिस्थितिक शोषण के विरुद्ध बोलने वाली कविताएं हैं। देवताले अपनी कविता 'पुल बनेगा तो' शीर्षक कविता में कहते हैं- "पुल बनेगा सोच-सोचकर/दोनों बूढ़ों के चेहरों पर/भावी दुर्दिनों की परछाईयां तैरने लगीं।"⁹

कवि प्रकृति और मनुष्य के भावी दुर्दिनों की परछाईयां देखकर चिन्तित है। यदि मानव इस प्रकार प्राकृतिक संसाधनों का दुरुपयोग करता रहा तो भविष्य में जल प्रपात, नदी, पहाड़, जंगल व निर्झर जैसे प्रकृति के सौन्दर्य स्रोत स्वप्न बनकर ही रह जाएंगे।

वर्तमान में वैश्विक समुदाय के समक्ष एक प्रमुख संकट पारिस्थितिक संकट है। विकास के नाम पर होने वाली विभिन्न परियोजनाओं जैसे- जनसंख्या वृद्धि, औद्योगीकरण, बाजारीकरण आदि इको-सिस्टम ध्वस्त हो रहा है। वहीं प्रतिदिन शोषण करने वाले प्राकृतिक संसाधनों के पुनर्निर्माण की गति अतिक्षीण है। वनों का काटा जाना, जलवायु परिवर्तन, ओज़ोन के परत क्षरण एवं वैश्विक तापमान में अत्यधिक वृद्धि आदि पर्यावरण के सामने मुंह बाहे खड़े खतरों के प्रति हिन्दी साहित्यकार अत्यन्त सचेत है। उदाहरण के तौर पर वृक्षों के कटान पर उद्वेलित होकर श्रीकान्त वर्मा वन संरक्षण के प्रति जागरूकता का प्रसार करते कहते हैं-

“अब मनुष्य के जंगलीपन से

बचाकर रखना है

जंगलों का हरापन।”¹⁰

उदय प्रकाश, अरुण कमल, श्रीकान्त वर्मा, निर्मला पुतुल, लीलाधर मण्डलोई एवं ज्ञानेन्द्रपति आदि रचनाकारों की पर्यावरण के प्रति बहुत गहरी चिन्ता है। अरुण कमल अपनी 'इक्कीसवीं शताब्दी की ओर' शीर्षक कविता में बदलते परिवेश के प्रति संवेदना शून्य हो रहे मनुष्य को जागृत करने का प्रयास किया गया है। यथा- "हर नदी का घाट शमशान/ हर बगीचा कब्रिस्तान बन रहा है/ और हम इक्कीसवीं शताब्दी की ओर जा रहे हैं।"¹¹

उपसंहार

निष्कर्षतः कहा जा सकता है कि अनादिकाल से ही साहित्य का मूल स्वर प्रकृति प्रेम रहा है। हिन्दी साहित्य के प्रायः प्रत्येक काल के रचनाकार में प्रकृति एवं पर्यावरण के प्रति सूक्ष्म संवेदना के दर्शन होते हैं। आदिकाल के रासो ग्रन्थों में प्रकृति चित्रण करते हुए शट्क्रतुओं एवं बारहमासा का वैविध्यपूर्ण वर्णन किया गया है। उल्लेखनीय है कि उक्त दौर के साहित्यकारों ने प्रकृति का चित्रण सौन्दर्यपूर्ण दृष्टि से आसक्त होकर प्राकृतिक दृश्यों द्वारा रसास्वादन मात्र हेतु किया। पर्यावरण के प्रति जन चेतना जागृत करने वाली रचनाओं का इस काल में प्रायः अभाव है। भक्तिकाल की चारों प्रमुख काव्यधाराओं के साहित्यकारों ने अद्भुत एवं रमणीय प्राकृतिक दृश्यों के अंकन का आश्रय लेते हुए प्रकृति पर मनुष्य की निर्भरता तथा उसके संवेदनात्मक सम्बद्धता को स्थापित किया है। हिन्दी साहित्य का आधुनिक काल प्रकृति के समक्ष मुंह बाहे खड़े संकट से रु-ब-रु कराकर पर्यावरणीय जागरुकता का प्रसार करने के प्रति संवेदना से सम्बद्ध है। जीवन के आधारभूत तत्व के रूप में प्रकृति को समझने और पर्यावरण के प्रति संवेदनशीलता को जाग्रत करने में हिन्दी कथा साहित्य का उल्लेखनीय योगदान रहा है। इस सन्दर्भ में हजारीप्रसाद द्विवेदी का निम्न कथन उल्लेखनीय है जिसमें वह धरती को अपनी माता तथा प्रकृति को परमात्मा से जोड़ने वाली वैदिककालीन परम्परा को नया आयाम देते दिखाई देते हैं-“यह धरती मेरी माता है और मैं इसका पुत्र हूँ। इसीलिए मैं सदैव इसका सम्मान करता हूँ और मेरी धरती माता के प्रति नतमस्तक हूँ।”¹² आधुनिककालीन हिन्दी गद्य की विभिन्न विधाओं में भी पर्यावरण के प्रति झुकाव, जल-जंगल-जमीन को दूषित कर रहे कारकों के प्रति भर्त्सना एवं विकास के नाम पर स्वाथपूर्ण मानवीय कृत्यों के कारण अंधकारमय भावी भविष्य की चिन्ता को बखूबी प्रदर्शित किया गया है। वहीं छायावादी साहित्यकारों ने अपनी रचनाओं में पर्यावरण चेतना को आत्मीयतापूर्ण भाव से सम्पृक्त कर प्रतीकात्मक शैली में और कहीं-कहीं सीधे व्यंग्यात्मकता प्रधान शब्दावली में मनुष्य के अन्तस को झकझोरने का प्रयास किया। छायावादी साहित्यकारों की परम्परा को आगे बढ़ाते हुए अद्यतन अधिकांश कवियों और साहित्यकारों ने वर्तमान दौर की सर्वाधिक महत्वपूर्ण समस्या - पारिस्थितिक संकट को न सिर्फ सच्चाई के साथ अपनी रचनाओं में अभिव्यक्त किया है, अपितु पर्यावरण को नष्ट करने वाले कारकों का बड़ी बेबाकी से प्रतिरोध भी किया। वर्तमान साहित्यकार अपने समय के रोदन के प्रति संवेदनशील हैं और सांस्कृतिक शून्यता की ओर उन्मुख प्रगति का विरोध करते हैं। कहना न होगा कि प्रकृति को संवेदना से और पर्यावरण जागरुकता को सांस्कृतिक धरोहर से जोड़कर जनजागृति का प्रसार करने में हिन्दी साहित्यकारों का प्रदेय अप्रतिम है।

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The Impact of Climate Change Along With the Role of G20

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One of the most urgent concerns these days is preventing the future under the effect of climate change, which is the subject of the special section in this issue of Science. Protecting natural systems is necessary not only as a matter of good stewardship but also so that they can continue to provide us with essential services like oxygen, clean water, food, storm and erosion protection, natural products, and the potential for new genetic stocks for cultivation. Climate change will result in rapid environmental changes that many species won't be able to adapt to, which will cause mass extinctions. Even species that may adapt to the new environment risk extinction as the ecosystems on which they depend deteriorate. Such ecosystem issues would have a significant impact on humanity if they materialized. We are not only seeing an increase in greenhouse gas emissions, but also eutrophication, water and air pollution, extensive land conversion, and many other offences, all of which will interact with one another and have cumulative impacts. G20 as a form of global summitry emphasizes that the G20 has transnational aspects to its operation which are interlaced with the deliberations and determinations of world leaders. A significant challenge facing the G20's capacity to contribute to climate change is in regards to its ability to provide coherent leadership. It is clear that the host country plays an important function in setting the agenda of a G20 summit. In this context of transnational engagement, there are three interrelated reasons that the G20 is a form of global summitry which could support future efforts to address climate change.

INTRODUCTION

Traditional development indices share a common problem of neglecting the effects of economic activities on the natural environment. However, mounting evidence suggests that economic growth at the expense of the natural environment is unlikely to be sustainable. To examine the sustainability of economic development, the United Nations has developed a new sustainability index, the Inclusive Wealth Index, which provides a comprehensive examination of the capital asset foundation

of a country's economic activities. Natural disasters and climate change pose serious threats to sustainable development and stocks of natural capital. These natural disasters include: Drought, Earthquake, Epidemic, Extreme temperature, Flood, Insect outbreak, Landslide, Mass circulation (dry), Hurricane, Volcanic activity, Forest fire, etc. More impact on developed countries than on developing countries. Climate change also directly affects the economic development and stability of countries. According to estimates, the average amount of carbon released into the atmosphere per hectare as a result of global deforestation is about 100 tons, and each ton of carbon dioxide released costs the economy \$50. It is a serious threat to human health, food security, terrestrial and marine ecosystems. The paper focuses on changes in natural capital due to natural disasters and climate change in G20 countries.

Existing literature has looked at how natural disasters negatively affect nations with different levels of wealth. It is argued that with poor levels of food security in low-income countries, catastrophic weather events such as droughts and floods can lead to production chain disruptions, asset depreciation, declining demand, and slower rates of economic growth and poverty alleviation. Are. Natural disasters cause more economic damage to high-income countries in terms of money amounts but more economic damage to low-income countries relative to their GDP. From 2006 to 2010, economic losses due to natural disasters exceeded 1% of GDP in low-income countries of the Asia-Pacific region, compared to only 0.1% in developed countries. The negative effects of natural disasters on different regions within the same country have also been examined.

CLIMATE CHANGE AND G SYSTEM

The term G system is used to suggest that various iterations of the G6, G7/8, and G20 summits informed by historically developed forms of exercises involving leaders of powerful states in response to different problems and contexts. There are different sizes of conference forms. Importantly, various iterations of the G system have attempted to keep formality to a minimum. They are developed outside the normal protocols of international law and have no constitution, ongoing secretariat or budget and thus no ability to act independently of member states. The G system is important because it facilitates world leaders of powerful states to meet in a fairly informal context to share views and approaches to global problems. While the G system is heavily focused on economic and financial issues, non-economic issues have been discussed by the leaders in various meetings. The informal nature of discussions means that issues related to terrorism, corruption, global warming and global health have been discussed in many meetings of the G system (Cooper and Thakur, 2013). This approach to the G20 as a form of global summit emphasizes

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that there are international aspects to the operation of the G20 which are intertwined with the deliberations and determination of world leaders. With regard to the issue of climate change, it is the case that outreach processes are a way to bring public and expert perspectives to bear on the G20 and to make global governance more publicly accountable for efforts to address them. For this, forms of transparency and accountability can be promoted. Environmental consequences of global decision making.

The G20 operates without a permanent secretariat or staff. The group's chair rotates annually among members and is selected from a different regional group of countries. The compulsory chair establishes a momentary secretariat for the period of its term of office, which organizes the work of the group and organizes its meetings. The 2021 summit was to be held in Italy. The 2022 summit is being held in Bali, Indonesia. The current chair is with India. The 2023 and 2024 summits will be presented by India and Brazil correspondingly. In 2010, French President Nicolas Sarkozy proposed the establishment of a permanent G20 secretariat similar to the United Nations. Paris and Seoul have been suggested as possible locations for its headquarters. Brazil and China supported the establishment of the secretariat, while Italy and Japan opposed the proposal. South Korea projected a "cyber secretariat" as an substitute.

The G20 or Group of 20 is an intergovernmental forum consisting of 19 countries and the European Union (EU). It works to address major issues related to the global economy, such as international financial stability and sustainable development. By 2023, the group has 20 members: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, South Korea, Japan, Mexico, Russia, Saudi Arabia, Turkey, United Kingdom, United States, and the European Union. Guest invitees include, among others, Spain, the United Nations, the World Bank, the African Union and ASEAN. Representatives include, at leaders' summits, the leaders of nineteen countries and the European Union, and at ministerial meetings, finance ministers and central bank governors of nineteen countries and the EU. The membership of the G20 does not exactly reflect the world's 20 largest economies in any given year.

ROLE OF ASIAN COUNTRIES

A 2011 report out by the Asian Development Bank (ADB) forecast that large Asian economies such as China and India would play a more important role in global economic governance in the future. The report claimed that the rise of emerging market economies ushered in a new world order, in which the G20 would become

the global economic steering committee. ADB also said that Asian countries led the global recovery after the recession of the late 2000s. It predicted that the region would have a greater presence on the global stage, shaping the G20's agenda for balanced and sustainable growth through strengthening intra-regional trade and stimulating domestic demand. A broad consensus to curb climate change has led to initiatives at the country and global levels through platforms such as the United Nations Framework Convention on Climate Change (UNFCCC). Industrialization, responsible for anthropogenic emissions of greenhouse gases (GHGs), is characterized by the introduction of new technologies and the widely discussed view is that if the introduction of technologies has created the problem, other new technologies will solve it. will help to do. India's approach also reflects some flexibility within the hedging framework. In the framework of both the G20 and BRICS, India's leadership had a special focus on issues of economic development.

In the G20, India has showed a far greater willingness than China to pursue some very specific forms of active engagement. India co-chaired the functionally oriented working group. Further, at the 2010 Seoul G20 summit, India advocated a more ambitious commitment to infrastructure development. However, India's overall commitment to the G20 has been weaker than that of China, mainly because of India's underlying solidarity with the United Nations. Unlike China, India has not moved forward to host the G20 summit process at the leaders' level. While China's defensive base was focused on the United States and the rest of the West, India's response to China was on the defensive. India found itself at a clear disadvantage in terms of diplomatic means and material advantage as China took ownership of the initiative. G20 leaders must acknowledge that climate change will increase forced displacement within states and borders. Climate-induced migration is a extensive phenomenon that defies current definitions. Climate-induced disasters can cause sudden flight; Desertification, sea level rise, ocean acidification and livelihoods can be gradually destroyed by frequent flooding; And conflicts exacerbated by climate change also create "climate refugees," or migrants. Some dislocations will last longer and may be permanent. There will be people who are unable to return, but also unable to move, a "stranded people" (Findlay 2011). In some cases, planned rehabilitation or resettlement may be the only strategy to save lives.

Migration is a form of adaptation to the long-term effects of climate change, and will increase as climate change accelerates and its effects become more severe and widespread. The G20 needs to prepare global institutions and mechanisms to deal with waves of climate-induced migration and rising sea level rise, desertification and loss of ecosystem services, including water supplies and food production, across

large regions can be prepared. Given that there is no international mechanism or institution to perform this role, the responsibility for preparing the world for large numbers of people in long-term or permanent displacement as a result of climate change falls on the G20.

More recently, the New York Declaration for Refugees and Migrants adopted by the United Nations General Assembly (2016) highlighted the importance of environmental factors, climate change and natural disasters as drivers of migration but again failed to provide specifics. International climate diplomacy has also taken up the issue. For example, the twenty-first session of the Conference of the Parties to the United Nations Framework Convention on Climate Change resulted in the Paris Agreement, building on decisions adopted in Cancun in 2010 and Doha in 2012 (Martin et al. 2015). (UNFCCC), in its section on loss and damage (UNFCCC 2015) addresses “displacement related to the adverse effects of climate change”. It calls for the creation of a task force to complement and build on the work of existing bodies and experts with the aim of developing recommendations, and to report on progress in its annual report.

CLIMATE POLICIES AND CHALLENGES

Several factors have resulted as an increase in the number of climate policies (Bassi et al, 2017; Le Quere et al.,2019; Mundaca & Markandya, 2016). First, the world has seen two international agreements in the past twenty years that have helped build momentum for climate change mitigation (Iacobuta et al., 2018). Second, the path of climate policies in specific countries is reinforced by international policy diffusion, as countries copy policies implemented elsewhere. (Fankhauser et al., 2016). Finally, as seen over the past thirty years, the evolution of ideas about the relationship between economic growth and climate change mitigation has resulted in a wider consideration of policy options. (Meckling & Allan, 2020). A recent study finds that adopting more climate policies helps reduce emissions (Eskander & Fankhauser, 2020).

The G20 has adopted a variety of policy instruments over the past twenty years. All G20 countries have adopted at least one policy instrument in each area. Codes and standards, and fiscal and financial incentives, were more prevalent than other instruments at the start of the period analysed, particularly in energy demand sectors. They are considered important means of addressing market failures or barriers to the adoption of effective technologies. (Somanathan et al., 2014). The prevalence of voluntary approaches is particularly high in industry (usually negotiated agreements) and buildings (usually public private partnerships or labelling initiatives).

Market based devices experienced slower speeds as compared to other devices. Research indicates that they elicit high levels of civic opposition (Rhodes et al., 2017), but also that their absence hinders efforts to raise ambition (Meckling et al., 2017).

DISCUSSION

The economic impacts of climate change and natural disasters have been increasing over the past few years. It has attempted to understand the effects of disasters in the hope of better policy recommendations to reduce their losses. So far, there is abundant research literature on the effects of natural disasters on economic development, but little has been done on natural disasters with respect to natural capital stocks that are essential for sustainable development.

The G-20 countries must recognize that harnessing natural resources for short-term gains and economic growth will sacrifice long-term stability and future growth. Second, the impact of natural disasters and climate change on sustainable development should be considered for better management of sustainable natural capital. It is essential to develop regular preventive measures for small and medium sized natural disasters. In particular, the experience and technology of developed countries should be better used by developing countries to reduce the effects of climate change, including the number of deaths and economic losses. Emphasis should be given on emergency planning for major natural calamities. Furthermore, given the impact of trade openness on a country's inclusive wealth, there is a need for cooperation among countries to jointly address the impact of climate change on sustainable development.

The G20 has adopted a variety of policy instruments over the past twenty years. All G20 countries have accepted at least one policy instrument in each area. Standards and codes, and fiscal and financial incentives, were more prevalent than other tools at the start of the period analysed, particularly in energy demand sectors. They are considered important means of addressing market failures or barriers to the adoption of effective technologies (Somanathan et al., 2014). We define a matrix of options for regional climate policy adoption and identify policy gaps by region. These options represent sector-level measures that have been recognized to reduce emissions, but may not be widely adopted in the G20. The matrix provides a comprehensive tool for policy analysts and policy makers, allowing a systematic comparison of policy adoption across countries and the identification of national policy adoption gaps.

Filling the identified policy gaps will be challenging and will require a strong coalition to reduce dynamic delivery barriers and reduce technology costs (Meckling et al., 2015; Pahle et al., 2018).

Currently adopted climate change mitigation policies are insufficient to reduce emissions at the rate needed to meet the climate goals of the Paris Agreement. Slow progress toward closing the global emissions gap calls for all hands-on deck. We argue that sector policies present an important entry point for raising ambition. Reducing inconsistencies and improving the coverage of existing policy options, in parallel with efforts to strengthen individual policies, will help advance regional, national and global mitigation efforts and realize the full potential of regional climate policy.

CONCLUSION

This report has made an effort to assess how the G20 countries were doing on climate change. Its conclusions can help the G20 countries review their climate policy and upsurge their mitigation efforts. The report emphasises the existence of major modifications in the G20 countries' collective performance on climate action. The majority of the G20 members from emerging economies have outperformed the established economies in terms of resource use efficiency and targeted emissions reduction for climate mitigation. The G20 presidency of India comes at a very crucial time for international climate action. The nation has the chance to lead global climate governance in a way that would effectively address issues that are crucial for effective climate action but were previously disregarded. India has the potential to become a leader in international cooperation on climate issues. Concerns about climate justice and equity are not sufficiently taken into account by global climate governance as it currently exists. Each nation has assets it may use to further its climate goals as well as critical stress areas that must be resolved if it is to enhance its long-term climate performance. Some of these relative strengths and shortcomings of the G20 nations are highlighted by the thorough examination that was conducted here. These suggestions can help shape the G20 Climate Sustainability Working Group's agenda and play a key role in creating a voluntary framework that will strengthen efforts to combat climate change by creating specific institutional arrangements that will guarantee targets and commitments are consistently met.

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Global Warming and the Green Paradox: An Overview

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This article examines the possible adverse effects of well-intended climate policies. A weak Green Paradox arises if the announcement of a future carbon tax or a sufficiently fast rising carbon tax encourages fossil fuel owners to extract reserves more aggressively, thus exacerbating global warming. We argue that such policies may also encourage more fossil fuel to be locked in the crust of the earth, which can offset the adverse effects of the weak Green Paradox. We show that a subsidy on clean renewables has similar weak Green Paradox effects. Green welfare (the complement of environmental damages) drops (i.e., the strong Green Paradox) if the beneficial climate effects of locking up more fossil fuel do not outweigh the short-run weak Green Paradox effects. Neither the weak nor the strong Green Paradox occurs for the first-best Pigouvian carbon tax. We also pay attention to dirty backstops, spatial carbon leakage and green innovation.

INTRODUCTION

Global warming is a consequence of the accumulation of CO₂ in the atmosphere. To a large extent, the accumulation of atmospheric carbon results from manmade emissions caused by burning a finite stock of fossil fuels. Because emissions of greenhouse gases mix uniformly throughout the atmosphere, it does not matter where the CO₂ emissions take place on the globe. Thus, the world faces the challenge of addressing a global negative externality. Since all countries benefit from fighting global change, each country wants to be a free-rider and leave the costs of combating climate change to other countries. This is the main obstacle to a successful climate policy. The other main obstacle is that current generations have to make sacrifices to switch away from using cheap fossil fuel to more expensive renewable energy, but the benefits of these sacrifices in terms of less global warming accrue to generations far in the future, many of them yet unborn. We will see that these spatial and

intergenerational obstacles to climate policy will also play a big role in why climate policy may be counterproductive or less successful than what might have been hoped.

The best way to fight global warming is to charge a price for the global warming damages done by burning fossil fuel. This price should be set to the social cost of carbon, which is the present value of all current and future marginal damages done to the economy of burning one ton of carbon today. The carbon price internalizes the global warming externality and can be realized either via a global carbon tax or via a global emissions market. Pricing carbon mitigates global warming in the following ways: (i) curbing fossil fuel demand as it is more attractive to increase energy efficiency; (ii) switching demand from relatively CO₂-intensive fossil fuels such as coal and tar sands to other less CO₂-intensive fossil fuels such as gas, which are less harmful from a climate perspective; (iii) substituting carbon-free renewables for CO₂-intensive fossil fuels; (iv) locking more fossil fuel in the crust of the earth as the price of carbon makes it more costly to explore marginal oil and gas fields; (v) capturing, storing and sequestering CO₂ as this becomes more attractive as this is a way to avoid having to pay the price for CO₂ emissions; and (vi) moving the direction of technical progress from dirty to clean or green growth. Each of these ways are attractive for private enterprises and households once a price for carbon is implemented, since they cut the bill of CO₂ charges. Pricing carbon thus incentivizes the economy to cause less CO₂ emissions in all these different ways.

A credible announcement of a time path for future carbon taxes that are differentiated according to the carbon content of different types of fossil fuel can achieve the first four mitigation measures. However, if there are network externalities that lead to insufficient pipelines for transporting CO₂, then subsidies will be needed in addition to the carbon price to capture, store and sequester the optimal amount of CO₂ [25]. In addition, if markets fail to deliver sufficient green R&D due to badly functioning patent markets and large-scale learning-by-doing spill-over effects, investment subsidies will be necessary on top of the price of carbon too [1]. Of course, if politicians fail to implement the appropriate price of carbon, climate change will be mitigated insufficiently and then climate adaptation measures (e.g., dykes) are necessary to better cope with the adverse effects of global warming.

One of our contentions is that well-intended climate policies such as a postponed carbon tax or a subsidy on carbon-free alternative for fossil fuel are often counterproductive. Of course, such policies yield worse outcomes than the socially optimal outcome. Moreover, they may even lead to worse outcomes than a no-policy scenario. Before we discuss why climate policies can be counterproductive, it helps to define a *weak* Green Paradox and a *strong* Green Paradox. A *weak* Green Paradox

occurs if fossil fuel is extracted more quickly and thus global warming accelerates in the short run in anticipation of a gradual tightening of climate policy (e.g., steeply rising carbon taxes in the coming decades or much cheaper renewables). A *strong* Green Paradox occurs if the present value of the costs of global warming in terms of reduced output, which is the converse of green welfare, falls in anticipation of a gradual tightening of climate policy [13]. Social welfare is private welfare (the present discounted value of the utility of consumption) minus green welfare (the present value the cost of global warming). Of course, when evaluating climate policies such as carbon taxes or renewable subsidies, it is *social* welfare rather than green welfare that matters.

This article, which is part of a symposium on the Green Paradox and Climate Policy Design, seeks to improve our understanding of why well-intended climate policies such as carbon taxes and renewable subsidies might at best be less effective than thought at first blush and at worst may be counterproductive. In order to understand the various forms and implications of potentially misguided climate policies, it helps to have a good benchmark. For this we choose the socially optimal climate policies and the corresponding fossil fuel extraction paths, leading to carbon stocks remaining in the crust of the earth or the complete exhaustion of fossil fuel reserves. We focus here on the key role played by so-called energy backstops, which are perfect substitutes for fossil fuel, are unconstrained by exhaustibility, and are infinitely elastically supplied at constant cost [52]. In our context we think of carbon-free backstops such as wind or solar energy which might eventually replace CO₂-intensive fossil fuel energy sources such as coal, oil and gas. The world today relies mostly on fossil fuel, which will have to be phased out in the coming decades and replaced by carbon-free backstops in order to tackle the problem of global warming. Even though there are in principle unlimited amounts of fossil fuel, it is too costly to keep on using them all the time as deeper and less accessible reserves have to be explored and as carbon priced they become relatively less competitive compared with the carbon-free backstops. The optimal use of fossil fuel and of carbon-free backstops over time is driven to a large extent by cost developments and any adverse effects fossil fuel use might have on global warming.

THE HOTELLING RULE AND THE GREEN PARADOX

A crucial concept in the theory of the exploitation of fossil fuel is the Hotelling rule. In this section we define the Hotelling rule and indicate its relevance for the occurrence of Green Paradox effects. To start with, we assume that the cost of extracting one barrel of fossil fuel is constant and the initial stock of fossil fuel reserves is given. We assume there is also a carbon-free backstop which is a perfect

substitute for fossil fuel and that can be produced in unlimited amounts at a constant unit cost. This cost of the renewable exceeds the initial unit extraction cost of fossil fuel, because otherwise fossil fuel would never be used. A competitive energy market requires that energy demand and supply are equal in equilibrium. Renewables supply will eventually become profitable if the prices of oil and other fossil fuel rise high enough. The [24].rule states that if the supply of fossil fuel is positive, the rent on fossil fuel (i.e., the market price of fossil fuel minus the per unit extraction cost) will grow at a rate equal to the (exogenous and constant) interest rate. The Hotelling rule is based on an arbitrage condition, which states that the return on keeping fossil fuel in the ground (the capital gains) must equal the return from taking it out of the ground, selling it and getting a return. Fossil fuel and renewables are never supplied at the same time because renewables are supplied at a constant price. Fossil fuel use will end when the price of energy reaches the exogenous backstop cost at some future moment in time.

EFFECT OF A CARBON TAX

What is the effect of a carbon tax on oil and other fossil fuel producers? During periods where there is a positive supply of fossil fuel, the after-tax fossil fuel rent will grow at a rate equal to the rate of interest.[48] Thus, if the carbon tax is not prohibitively high, the equilibrium price path will not be affected if the tax rate itself increases at a rate equal to the interest rate. However, if the carbon tax rate grows at a rate higher than the interest rate, the equilibrium price path for fossil fuels will become steeper, which implies that (with the same total amount of fossil fuel extracted) there will be more extraction and thus carbon emissions initially and less extraction and emissions later during the fossil-fuel only phase. This means that global warming will be accelerated and green welfare will fall (i.e., there will be both a weak and a strong Green Paradox). If the carbon tax grows at a rate smaller than the rate of interest, then oil extraction and global warming will occur less quickly.

EFFECT OF A REDUCTION IN THE COST OF THE BACKSTOP

What happens if at some point before the transition to renewables, the cost of the backstop is reduced? To simplify, we assume that innovation takes place at the outset and that the cost of new renewables production technology will still be higher than the unit extraction cost of fossil fuel. In this case, a new equilibrium will emerge with a new fossil fuel price path in the fossil fuel-only phase, and the new price path for fossil fuel will lie below the old one throughout. Indeed, the new price will be below the old one at the time of the new transition to renewables. Moreover, the two price paths will never cross

This discussion of the Hotelling rule and the Green Paradox has been conducted within the context of the simplest analytical framework. We will in the remainder address similar questions in more realistic frameworks. We will also address the following additional issues: when will climate change policies induce higher initial extraction rates of fossil fuel and higher CO₂ emission rates?; what kinds of policies can depress cumulative CO₂ emissions and leave more oil untapped in the crust of the earth?; what are the green and overall welfare consequences of climate policies?; how should climate policy be designed in order to avoid welfare losses and Green Paradox effects?

DO STOCK-DEPENDENT EXTRACTION COSTS MATTER FOR CLIMATE POLICY?

In our discussion of the Hotelling rule and Green Paradox effects so far, all oil is fully extracted unless the carbon tax or the renewables subsidy is prohibitively high. Here we emphasize that with stock-dependent extraction costs that rise as more fossil fuel has been extracted from the earth and global warming damages that increase with the stock of atmospheric CO₂ at an increasing rate, this is no longer the case because the amount of fossil fuel left untapped can be increased by lowering the cost of renewables. To illustrate, let damages enter welfare separately from or independent of the utility from the consumption of energy. This means that overall welfare equals the utility of energy use minus damages from climate change minus expenditures on fossil fuel extraction and production of the backstop. Let us also assume that emissions are proportional to fossil fuel use, there is no natural decay of atmospheric CO₂,⁸ and per unit extraction costs rise as fewer reserves remain untapped and less accessible wells have to be exploited. Finally, in social welfare a higher weight is given to present generations over future generations (a positive rate of pure time preference).

THE FIRST-BEST OUTCOME

The first-best outcome maximizes social welfare under the constraint that cumulative fossil fuel extraction cannot exceed initial reserves.[50] If at some point in time renewable energy is used, its marginal utility should equal its marginal cost.

At the time of the transition to renewables, which is the start of the carbon-free era, the scarcity rent of fossil fuel is zero [19]. Thus, in the case of partial exhaustion, the marginal cost of extracting the last unit of fossil fuel plus the social cost of carbon¹⁰ must equal the cost of the renewable energy source.

DIRTY BACKSTOPS AND THE GREEN PARADOX

Some substitutes for oil and natural gas are dirty and abundant and might also function as backstops. For example, coal is dirty and available in large amounts at a low cost. Global warming depends on the emissions from burning oil and coal, but coal has higher emissions per unit of energy burnt. It is of interest to see what role such dirty backstops play for possible Green Paradox effects [15]. To illustrate this role, we assume that coal has a constant marginal cost of production, whereas extraction cost of oil increases as the stock of oil reserves diminishes. The most empirically relevant case occurs when the marginal utility of energy is high enough to warrant energy use (oil or coal) forever [42]. Moreover, suppose the production cost of coal plus the social cost of carbon for coal exceeds the initial extraction cost of oil plus the social cost of carbon for oil. This means that it is optimal to start off with using only oil. But since burning coal emits more per unit of energy, the social cost of coal grows faster than the social cost of oil and thus the transition to simultaneous use of oil and coal in the production process will have to take place at some point in time.

IMPACT OF SUBSTITUTABILITY OF ENERGY SOURCES ON THE GREEN PARADOX

So far, we have discussed the Green Paradox in frameworks where fossil fuel and renewable energies are perfect substitutes but to be more realistic this assumption needs to be relaxed too. Due to problems of intermittence wind energy will never be a perfect substitute in production for oil, coal or gas [12,31]. Similar issues arise for solar energy, which can be a reasonably good substitute for coal in electricity generation but not necessarily in other parts of the economy. Renewable energy is still at best a complement to traditional forms of fossil fuel and our arguments need to reflect this [28]. Therefore allows for *imperfect* substitutability of fossil fuels and renewables in the utility function.

CARBON LEAKAGE AND THE GREEN PARADOX

So far most of our discussion has been directed at the intertemporal effects of climate policies. Here we focus on the combination of intertemporal and spatial effects of climate policy in a multi-country setting, and, more particularly, on the effects of unilateral climate policy on carbon emissions elsewhere in the world economy. So, we address the question what happens if countries' unilateral efforts to curb CO₂ emissions with a carbon tax cause before-tax oil prices to decline, thereby causing CO₂ emissions to increase elsewhere in the world. In this sense, carbon leakage is a *spatial* version of the weak Green Paradox.

[22] Analyzes global warming in a two-country context. His main aim is to show that with countries implementing different climate policies the effects of a change in policies might differ essentially from the case with identical countries (or a single economy). He assumes that the representative consumer in each country derives utility from the use of energy, oil extraction is costless, renewables are available at constant unit cost, oil and renewables are perfect substitutes in consumption, and preferences are identical in the two countries.

EFFECT OF A BREAKTHROUGH TECHNOLOGY FOR RENEWABLE ENERGY

[51] Considers the effect of the sudden arrival of a breakthrough backstop technology that will at some yet uncertain moment of time render oil worthless. In such situations the oil profit margin grows at the market rate of interest plus the (exogenous) probability that oil becomes obsolete. Using linear demand functions, a marginal drop in the cost of the existing backstop brings forward the expected moment of time when oil extraction ceases. Furthermore, it also increases total expected extraction of fossil fuel and thus increases total cumulative carbon emissions. The higher the probability that the new technology will arrive, the faster oil extraction will take place. This is akin to the Green Paradox effect.

[6]. Also examines the effects of a pending breakthrough in renewable energy, but allows for monopolistic resource owners to invest in the exploration of new fossil fuel reserves. In this case, what matters for efficiency is not *whether* a carbon-free substitute will arrive, but rather what matters is the uncertainty about *when* the breakthrough substitute will arrive on the market. In this scenario, reserves are depleted too rapidly before the carbon-free substitute has come to the market. Subsidizing R&D to accelerate the introduction of breakthrough renewable technologies will also accelerate oil extraction before the breakthrough occurs which is a manifestation of the weak Green Paradox. However, more oil will be left in the ground because investment in exploration will be lower [10,32]. This latter effect curbs cumulative CO₂ emissions and thus reduces global warming. [53]also studies the impact of a breakthrough technology for renewable energy, but allows for stock-dependent extraction cost of fossil fuel, which has an effect that is similar to endogenous exploration investment. He finds that prior to the arrival of the breakthrough technology there is more oil extraction than when there is no possibility of innovation. If innovation is possible but does not occur before oil extraction stops, oil extraction is always higher and oil extraction ceases earlier. If the breakthrough discovery is made before oil extraction stops, oil extraction is also higher, but it stops earlier and more of the oil reserves remains untapped. Global warming will be

curbed if the fall in cumulative emissions outweighs the short-run increase in emissions that is due to the accelerated oil extraction resulting from the fear of oil reserves possibly being made obsolete at some future moment in time. In that case the weak Green Paradox is merely a short-run nuisance.

STRATEGIC INTERACTIONS: KEEPING OUT RENEWABLE ENERGY

So far, we have ignored any conflicting interests in the formulation of climate policy. However, strategic interactions between oil exporters (who must decide how fast to extract their finite reserves in the face of the risk that if they wait too long their reserves may become economically obsolete due to the arrival of abundant carbon-free substitutes) and oil importers (who are trying to reduce their oil dependence by investing in the development of alternatives) may be important in the real world. [14]. Therefore examine the strategic interaction between the sellers and buyers of oil and find that fossil fuel producers try to delay the introduction of the renewable energy substitute by supplying more oil to the market and lowering the oil price. This way the incentives to develop the perfect substitute for fossil fuel are weakened, especially if the required investments are costly and take time to develop. Effectively, buyers are compensated for postponing the introduction of the renewable energy substitute.

[25]argues convincingly that it pays to invest in carbon-free energy substitutes while the economy still relies on oil because this curbs the development costs of the substitute.¹⁷ Although initially oil prices are determined by the Hotelling rule, eventually they are driven by the carbon-free energy substitute, which is becoming cheaper all the time. Thus, the supply of oil falls before it is forced up by competition from the renewable energy substitute. A gradually improving carbon-free substitute forces the monopolist to sell more oil, temporarily increasing carbon emissions, before oil is driven out of the market (i.e., a weak Green Paradox). If oil extraction becomes more expensive as oil reserves are depleted, oil importers will switch to clean fuels once oil is priced out of the market [11,16,33] [16]. As a result of technological developments in the production of renewable energy oil becomes more quickly obsolete and thus more oil is locked up in the ground and cumulative carbon emissions are curbed. This latter effect can reverse the effect of the higher short-term damages that are associated with the weak Green Paradox and thus avoid the strong Green Paradox. An interesting conclusion of this analysis is that the development of the clean substitute will slow if global warming becomes more acute because further development of the carbon-free substitute for oil will trigger more oil extraction and this is highly undesirable if global warming has already reached unacceptable proportions.

DIRECTED TECHNICAL CHANGE AND KICK-STARTING GREEN INNOVATION

The direction of technical change is endogenous and can be shaped by the right type of R&D. Subsidizing green R&D is a crucial supplement to pricing carbon in this view. Green R&D can thus kick-start green innovation away from more conventional directions of economic growth that rely heavily on traditional fossil fuels. Although the literature on subsidizing R&D for green technologies and directed technical change [1,3,17] . typically does not refer explicitly to the Green Paradox, a recent study by [7] does refer to the Green Paradox. He investigates the determinants of endogenous growth in a setting, where final good are produced with intermediate goods and energy. He assumes that energy is generated by oil and renewable energy which are imperfect substitutes; production of intermediate goods requires only labor; labor is also used for producing renewable energy and creation of new intermediate goods; and knowledge accumulated in the R&D sector spills over to the productivity of oil and renewable energy. Van der[30]. Shows that the availability of renewable energy boosts initial oil use and carbon emissions which corresponds to a weak Green Paradox. If an invention increases the substitutability between oil and renewable energy, the initial oil supply and carbon emissions are reduced so that there is no weak Green Paradox effect. The reason is that with higher substitutability, although the supply of energy is predominantly oil, it is spread more evenly over time. Furthermore, higher substitutability leads to more growth, which boosts future demand for energy and demand for fossil fuel. Thus, we find that climate policy can be counterproductive in the short run due to the presence of renewable energy despite such policy boosting growth.

It should be realized, however, as has been argued by [23] that a credible high future carbon tax does not necessarily imply more oil use today, nor does it necessarily trigger additional investments in renewable technology. He assumes that once the investment is made, renewable energy is available without cost. This means that total energy use in production in period one consists of oil, but part of the initial investment in the renewable energy yields energy in period one. In the second period, energy use consists of oil and energy from the rest of the initially installed renewable energy capacity. This is the reason why [23] is able to show that a high future carbon tax does not boost investments in renewable technology and is yet another example of why climate policy is less productive than what might have thought at first blush.

CONCLUSIONS

Well-intended climate policies can have adverse consequences. There are three main reasons for this. The first is carbon leakage which occurs if a carbon tax

induces countries that do not levy a carbon tax to consume more fossil fuel and renders climate policy less effective. The second is the weak Green Paradox which occurs when credibly announcing a future carbon tax or a too rapidly rising carbon tax as this quickens fossil fuel extraction and accelerates global warming. However, this does not necessarily lead to a strong Green Paradox because green welfare might increase if it is optimal to leave more fossil fuel reserves untapped. The third is subsidizing renewables as these also speed up extraction of fossil fuel and accelerate global warming. Such policies depress future prices by more than current prices, thus cutting into the expected capital appreciation of fossil fuel reserves. Owners of these reserves avert this by accelerating extraction and putting sales revenue into investments in the capital markets, thus obtaining higher yields. Such policies thus operate as an announced expropriation which provokes owners to accelerate extraction of their reserves and exacerbate global warming.

If extraction becomes more costly as less accessible fields are explored, the stock of fossil fuel to be left untapped follows from the condition that the cost of extracting the last unit of fossil fuel including the social cost of carbon equals the cost of the renewable. A renewables subsidy then not only brings forward the carbon-free era but also encourages the market to leave more fossil fuel untapped. Global warming is then ultimately mitigated despite short-run Green Paradox effects. A renewables R&D subsidy makes it less attractive to explore new reserves in which case the resulting reduction in cumulative CO₂ emissions offsets short-run increases in emissions as well.

We highlighted that coal and shale oil have very high CO₂ emissions per unit of energy and are abundant and relatively cheap. If oil and gas are phased out in favor of such backstops, this accelerates global warming [35,44,47] Other backstops, such as the tar sands, are both very bad for global warming and expensive. Such dirty backstops should not be used if one wishes to attain the target of a maximum of 2 degrees Celsius global warming. In fact, there is a lot to be said for a moratorium of coal.

Green Paradox effects highlight the short-run costs of second-best policies. However, further research is needed in order to assess the empirical magnitude of these effects and the associated welfare consequences. To test the weak Green Paradox effect one needs to identify a policy and see whether or not it leads to more extraction in the short run. Ideally, one then has mine of well level data on the Hotelling rent before and after the policy but such data are hard to get. One rare study finds that the announcement effects of the 1990 Clean Air Act Amendments (CAAA) has led to

large drops in the price of high sulfur program up to the implementation of the Acid Rain Program in 1995 but this has not led to increased production of coal-fired plants [7,8,9]. Hence, the empirical evidence on the Green Paradox is at best mixed. The challenge for future research is to provide sound micro evidence on the counterproductive nature of certain climate policies.

We have neglected two important aspects of the Green Paradox. The first is imperfect competition in resource markets, which may lead dominant fossil fuel producers to price fossil fuel just below the price of renewables to keep them out and maintain and reinforce their monopoly power on the fossil fuel market [20,21,43,2]. This might also shed light on the role of monopoly power in oil or gas markets and its implications for addressing the global climate challenge [18]. The second concerns the announcement effects and the potentially long implementation lags of climate policy. Such time lags may cause the Green Paradox to arise, even without fossil fuel scarcity [6,7,49]. for a discussion of these issues.

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Global Climate Changing In Current Scenario and Mitigation Action: An Overview

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Climate changing is a global threat to the world. There are so many reasons behind this problem. One of the major reasons is carbon emissions in atmosphere. The causes for this global threat are many, among them GHG (green house gas emission) is one of them. Also deforestation, land use change, sulfate aerosol and black carbon are the other major reason leading to the ozone layer depletion and changing climate. Due to the carbon emission atmosphere is being polluted and also so many disasters happen routinely. Atmosphere is getting hot day by day. Due to this unnatural and sudden temperature rise, glaciers are melting, so sudden flash floods occur. Agricultural sector is also suffering due to the global warming effects. This will also affect the productivity of grains world wide. Climate changing increases land and as well as sea temperature and alters precipitation quantity and patterns. As a result increasing the global average sea level, risk of coastal erosions, etc. climate change will be an added stress for the fisheries and aquaculture sectors. Effects will also be severe on coasts and marine ecosystems. Extreme events like drought, flood may also happen due to these impacts.

INTRODUCTION

Global climate change is now occurring since long and that its manifestations threaten the stability of societies as well as natural and managed ecosystems. Increases in ambient temperature and changes in related processes are directly linked to rising anthropogenic greenhouse gas (GHG) concentrations in the atmosphere [1]. The potential related impacts of climate change on the ability of agricultural systems, which include soil and water resources, to provide food, feed, fiber, and fuel, and maintenance of ecosystem services (e.g., water supply and habitat for crop landraces, wild relatives, and pollinators) as well as the integrity of the environment, are major

concerns. Climate is defined as long term weather pattern that describe a region. "Climate change" [2,3] refers to a change in the state of the climate that can be identified by changes in the mean and variability of its properties and persists for extended periods decades or longer [4]. Climate change [5,6] could occur naturally as a result of a change in the Sun's energy or as a result of persistent anthropogenic forces such as greenhouse gases, sulfate aerosol or black carbon [7] to the atmosphere or through land use change. Climate change considerations call for such major policies as the reduction of GHG emissions [8], including lowering carbon intensity of economies with less fossil fuel (such as oil and coal) mined, burned, traded, introducing cleaner technologies, climate change mitigation and adaptation. Global climate change poses serious threats to the region's environment, ecological and socio-economic systems. Agricultural production has already decreased in some commodity groups and quantities and qualities of water resources are at risk of severe effects of climate change. Shifting weather patterns, for example, threaten food production [9] through increased unpredictability of precipitation, rising sea levels contaminate coastal freshwater reserves and increase the risk of catastrophic flooding, and a warming atmosphere aids the pole-ward spread of pests and diseases once limited to the tropics.

CAUSES OF CLIMATE CHANGE

Climate change is a major threat in world. There are several reasons for global climate change. Among them green house gas emission is the major cause for climate change. Unsustainable consumption patterns of the rich industrialized nations are responsible. Rapid transportation of goods causes the emissions of carbon dioxide, nitrogen dioxide, sulfur dioxide, non methane hydrocarbon. These harmful gases are the cause for climate change. Also energy consumption, land use, noise, water and soil pollution may be the cause of climate change.

The greenhouse effect [10] is a warming process that balances Earth's cooling processes. During this process, sunlight passes through Earth's atmosphere as short-wave radiation. Some of the Solar radiation [10]. radiation is absorbed by the planet's surface. As Earth's surface is heated, it emits long wave radiation toward the atmosphere. In the atmosphere, some of the long wave radiation is absorbed by certain gases called greenhouse gases [11]. Greenhouse gases include carbon dioxide (CO₂), chlorofluorocarbons (CFC's), methane (CH₄), nitrous oxide (N₂), troposphere ozone (O₃) [12], and water vapor. Each molecule of greenhouse gas becomes energized by the long wave radiation. Fig. 1 shows the green house effect due to solar radiation and infrared emission. The energized molecules of gas then emit heat energy in all directions. By emitting heat energy toward Earth, greenhouse gases

increase Earth's temperature. The greenhouse effect [13] is a necessary phenomenon that keeps all Earth's heat from escaping to the outer atmosphere. They are now and the existence of life on this planet would not be possible. However, too many greenhouse gases in Earth's atmosphere could increase the greenhouse effect

SULFATE AEROSOL AND BLACK CARBON

Sulfate aerosols and black carbon [5] are two important additional examples of anthropogenic forcing. Sulfate aerosols, which enter the atmosphere naturally during volcanic eruptions, are tiny airborne particles that reflect sunlight back to space. Industrial activity has recently increased their concentration in the atmosphere primarily through the burning of fossil fuels containing sulfur. Anthropogenic emissions of sulfate aerosols have been associated with a net cooling effect. Black carbon [14,15] is soot generated from industrial pollution, traffic, outdoor fires, and the burning of coal and biomass fuels. Black carbon [16] is formed by incomplete combustion especially

LAND-USE CHANGE

The combustion of fossil fuels is not the only anthropogenic source of carbon dioxide [17]. When ecosystems are altered and vegetation is either burned or removed, the carbon stored in them is released to the atmosphere as carbon dioxide. The principal reasons for deforestation are agriculture and urban growth as well as harvesting timber for fuel, construction, and paper. Currently, up to a quarter of the carbon dioxide emissions to the atmosphere can be attributed to land-use [48] change.

EMISSIONS FROM FREIGHT TRANSPORT

The climatic impacts of emissions from freight transport [18] are more than the direct impacts from carbon dioxide. In case of air transport it includes the direct effects of water vapor, the indirect forcing on climate resulting from changes in the distributions and concentrations of ozone and methane as a consequence of aircraft nitrogen oxide emissions, the direct effects from emitted aerosols and the climate effects associated with cirrus cloud formation.

IMPACTS OF CLIMATE CHANGE

In the energy sector, climate change will have a direct effect on both the supply and demand of energy. The projected impact of climate changing on precipitation and glacier melt indicates that hydropower production could increase by 5% and decrease by 25%. Climate changing will also have profound effects on human health and on animal and planet health. Weather-related deaths and diseases

could rise. The effects of climate change are majorly depends on temperature rising, due to that icecaps and glaciers are melting; extreme weather events are becoming more frequent and more intense. Global climate change has physical, socio economic impacts [5] of which major impacts are mentioned below. The impacts on human cycle and systems of the climate change will probably be distributed unevenly. Some regions and sectors are expected to experience benefits from these while others will experience the costs of these changes. With greater levels of warming (more than 2–3 °C, relative to 1990 levels), it is likely that benefits will decline for the benefactors and costs increase for the sufferers. Low-latitude and under developed areas [19] are probably at a higher risk from the climate change. With human system cycle, adaptation potential for climate change impacts is considerably expensive, although the costs of adaptation are largely unknown and potentially large. Climate change results in decreased diversity of ecosystems, adding many more species to the rare category each year and making many extinct. Adaptation potential for biological and geophysical systems is much lower than that for human systems cycle as a whole. The major impacts of global climate changes are manifested in gradual rise in global surface temperature (i.e. global warming), melting of ice-bergs and concomitant rise in sea-levels [20], continuous build-up of greenhouse gases [17] leading to ‘greenhouse effect’, depletion of ozone concentration/layers, catastrophic natural disaster and calamities (e.g., hurricane, typhoons, earthquakes, landslides, Tsunami), loss of vegetation, plant, animal lives, biodiversities, marine flora & fauna, etc. The widespread retreat of glaciers and icecaps in the 21st century will also lead to higher surface temperatures on land and increasing water stress [21].

Temperature rise and global warming Greenhouse effects increase mean global temperatures as well as changes precipitation patterns. The real threat of climate change lies how rapidly the change occurs. For example, over the past 140 years [22], the mean global temperature appears to have risen to 1.6 °F (0.9 °C). These temperatures changes are depicted in the graph below. The increasing steepness of the curve [22] suggests that changes in mean global temperature have occurred at greater rates over time. Further evidence suggests that future increases in mean global temperature may occur at a rate of 0.4 °F (0.2 °C) each decade. Abrupt rise in atmospheric temperature causes disappearance of snows and glaciers which increases the mean sea level [23] (Fig. 2). 3.2. Increased freshwater flow Research based on satellite observations, published in October, 2010, shows an increase in the flow of freshwater into the world’s oceans, partly from melting ice and partly from increased precipitation driven by an increase in global ocean evaporation [24]. The increase in global freshwater flow, based on data from 1994 to 2006, was about 18%. Much of the increase is in areas which already experience high rainfall. One effect, as perhaps

experienced in the 2010 Pakistan floods, is to overwhelm flood control infrastructure.

3.3. Marine ecology Global warming has complex impact on marine ecology. The oceans serve as a sink for carbon dioxide, taking up much that would otherwise remain in the atmosphere, but increased levels of CO₂ have led to ocean acidification [12]. Furthermore, as the temperature of the oceans increases, they become less able to absorb excess CO₂. The amount of oxygen dissolved in the oceans may decline, with adverse consequences for ocean life [8].

3.4. Health impact Global climate change also leads occurrence of infectious diseases like malaria, dengue, etc. Due to the excessive temperature rise we are getting higher temperature. Higher temperature brings more extreme weather events. Drought, floods, and storms may increase death and injury rates as well as prevalence of psychological disorders and infectious diseases like vector borne disease, diseases from unsanitary water and food [13].

EXTREME EVENTS

The climate change would increase the extreme natural events such as floods and weather disasters, Heat waves, drought, forest fires, etc. [5]. In developing countries like India, China and other south Asian countries [25] climate change could represent an additional stress on environmental and socioeconomic systems that are already facing tremendous pressures due to rapid urbanization, industrialization and economic development. With its huge and growing population, a over 7500 km long densely populated and low lying coastline, and an economy that is closely tied to its natural resource base, India and China are considerably vulnerable to the impacts of climate change [7] in south Asian countries.

RISK OF LOWER PRODUCTION IN AGRICULTURE SECTOR

Higher soil temperatures alter nutrient and carbon cycling by modifying the habitat of soil biota, which in turn affects the diversity and structure of species and their abundance. Heavier downpours in some regions will lead to increased soil erosion [20]. In addition increased precipitation will result in water-logging of soils, thereby limiting oxygen supply to crop roots and increasing emissions of nitrous oxide and methane. Altered rainfall, whether through increased or decreased precipitation, will affect soil chemistry and biology. Prolonged spells of heat and drought between rainy periods may cause wilting, desiccation, and soil salinization, which may in combination reduce crop yields. In agriculture projected climatic changes [9] will affect crop yields, live stock management and the location of production. The increasing severity of extreme weather patterns will increase the risk of crop failure. The effects of climate change on forests are changes the health of the forest and productivity and changes to the geographic range of certain free species.

GLACIER RETREAT, RISE OF SEA LEVELS AND TEMPERATURE

Various studies going on in the direction, i.e. the impact due to climate change. As per the United Nation climate report [4], the Himalayan glaciers [26] that are the sources of Asia's biggest rivers Ganges, Indus, Brahmaputra, Yangtze, Mekong, Salween and Yellow could disappear by 2035 as temperatures rise. Approximately, 2.4 billion people live in the drain age basin of the Himalayan Rivers. India, China, Pakistan, Bangladesh, Nepal and Myanmar could experience floods followed by droughts in coming decades. In India alone, the Ganges provides [3] water for drinking and farming for more than 500 million people. It has to be recognized, however, that increased seasonal runoff of Himalayan glaciers led to increased agricultural production in northern India throughout the 20th century. The role of the oceans in global warming is a complex one. The oceans serve as a sink for carbon dioxide, taking up much that would otherwise remain in the atmosphere, but increased levels of CO₂ have led to ocean acidification. Furthermore, as the temperature of the oceans increases, they become less capable to absorb excess CO₂. Global warming is projected to have a number of effects on the oceans. Ongoing effects include rising sea levels due to thermal expansion and melting of glaciers and ice sheets, and warming of the ocean surface, leading to increased temperature stratification. The temperature of the Antarctic Southern Ocean [24] rose by 0.17 °C (0.31 °F) between the 1950s and the 1980s, nearly twice the rate for the world's oceans as a whole.

REMEDIAL AND MITIGATION ACTION

Climate change mitigation action is to decrease the potential effects of global warming and also it involves reduction in the concentration of green house gases emissions and wasteland development. Reforestation and avoid deforestation. Based on the opportunity costs of the land use that would no longer be available for agriculture if deforestation were avoided, also we can save the emissions of carbon dioxide. By the afforestation and reforestation we can control the entire temperature of the atmosphere.

4.1. Population Various organizations promote population control as a means for mitigating global warming. The proposed plan including access of family planning and reproductive health care and information, reducing complicated politics, public education about the population growth [3].

4.2. Greenhouse gas remediation and carbon sequestration It has been proposed as a method of reducing the amount of radioactive forcing. Carbon sequestration [14] is a term that describes processes that remove carbon from the atmosphere. The meanings of artificially capturing and storing carbon, as well as of enhancing natural sequestration processes, are being explored.

4.3. Bio-energy with carbon capture and storage During its growth,

biomass traps carbon dioxide [16] from the atmosphere through photosynthesis. When the biomass decomposes or is combusted, the carbon is again released as carbon dioxide. This process is part of the global carbon cycle. Through the use of biomass for energy and materials, e.g. in biomass fuelled power plants, parts of this cycle are controlled by man. Combining these biomass systems with carbon capture and storage technologies, so-called bio-energy with carbon capture and storage, BECCS, is achieved. BECCS systems result in net-negative carbon dioxide emissions, i.e. the removal of carbon dioxide from the atmosphere. In comparison with other geo engineering options, BECCS has been suggested as a low-risk, near-term tool to effectively remove carbon from the atmosphere [11].

4.4. Carbon capture and storage
Carbon capture and storage (CCS) [27] is a plan to mitigate climate change by capturing carbon dioxide (CO₂) from large point sources such as power plants and subsequently storing it away safely instead of releasing it into the atmosphere. The Agency says CCS is “the most important single new technology for CO₂ savings” in power generation and industry. It requires up to 40% more energy to run a CCS coal power plant than a regular coal plant [12].

4.5. Eliminating waste methane
Methane [28] is a significantly more powerful greenhouse gas than carbon dioxide. Burning one molecule of methane generates one molecule of carbon dioxide. Accordingly, burning methane which would otherwise be released into the atmosphere (such as at oil wells, landfills, coalmines, waste treatment plants, etc.) provides a net greenhouse gas emissions [29] benefit. However, reducing the amount of waste methane produced in the first place has an even greater beneficial impact, as might other approaches to productive use of otherwise-wasted methane [30].

4.6. Energy efficiency and conservation
Efficient energy use, sometimes simple.

Climate changing and mitigation action in developing countries
Climate change and its impact on our environment, our economies and our security, is the defining issue of our era. But every day of inaction makes its consequences more irreversible, so we need to act now. Identification and selection of actions to mitigate GHG emissions [47] will be a great challenge because these emissions are strongly tied to living activities that support human life systems. However, these activities cover a wide range, from ones crucial to human well-being to those leading to affluence and over-consumption. This broad activity range provides opportunity to search for possible replacement of high emission intensive activities with less emission intensive ones and even provide room for innovation. Developing countries actions [39] to solve the climate problem will be difficult because the likely impact of the problem is global and no one country or group of countries can provide its own remedy. The cooperation of countries and coordination of national efforts will be central in any solution to this problem. It is therefore necessary that countries

world-wide cooperate through regional and international mechanisms such as the Framework Convention on Climate Change (FCCC) which recently came into force to tackle the global climate problem [40]. GHG emissions associated with the provision of energy services are a major cause of climate change. The IPCC Fourth Assessment Report (AR4) concluded [35,41] that “Most of the observed increase in global average temperature since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.” Concentrations of CO₂ have continued to grow and by the end of 2010 had reached 390 ppm CO₂ or 39% above pre-industrial levels.

MITIGATION ACTION TAKEN BY DEVELOPING COUNTRIES

As mentioned previously, the threat of climate instability will have global impacts and no single country can solve it. However, its solution lies on the coordination of national actions within regional and international frameworks. The solution will need to involve countries world-wide because the impact of GHG emitted in one location may be felt in a completely different location. Hence, countries should develop a plan of action to cope with this problem. Such plan should be long-term [50] in nature, be capable to respond to uncertainties and un-planned events, and can be adjusted to suit new information as they become known. Despite the plan will be primarily based on national actions, but international concerns will be important because as trade between countries get more intensified, actions by one country will affect the other. Further, actions to reduce GHG emissions will have serious economic implications due to its link with human activities, so involve restructuring of economic sectors. In addition, the growing inter relationships among countries especially in world trade means that certain national actions will have economic and financial impacts globally. Such price change of certain commodities may affect the competitive position of a country in global markets. Therefore, developing countries needs plans and require adequate action.

INVESTIGATING CARBON OR ENERGY PRICING

Many developed and developing countries have introduced, or are seriously considering introducing, market based measures to help meet their emissions reduction targets. Emissions trading schemes already operate in 31 European countries [44] and New Zealand, and in 10 US states. They are under active consideration in other countries, including China, South Korea and in several Canadian provinces. Carbon taxation is in place in the United Kingdom, Denmark, Finland, Norway, Sweden, the Netherlands and Canada and under discussion or proposed elsewhere, including in the EU, Japan and South Africa

IMPLEMENTATION OF GHG FRIENDLY POLICIES

GHG emissions associated with the provision of energy services are a major cause of climate change. The IPCC Fourth Assessment Report (AR4) [19] concluded that “Most of the observed increase in global average temperature since the mid 20th century [26,42] is very likely due to the observed increase in anthropogenic greenhouse gas concentrations.” Concentrations of CO₂ have continued to grow and by the end of 2010 had reached 390 ppm CO₂ or 39% above pre-industrial levels. India has for quite some time pursued GHG friendly policies in her own interest. India’s obligation to minimize energy consumption particularly oil consumption and to deal with its environmental problems prompt it to follow many such policies. Directly or indirectly these efforts are made by Government [3] as well as by people to reduce energy consumption. These include: (a) Importance on renewable energy conservation. (b) Promotion of renewable energy sources. (c) Abatement of air pollution. (d) A forestation and wasteland development. (e) Economic reforms, subsidy removal and joint ventures in capital goods. (f) Fuel substitution policies.

All of the above save energy at the cost of human welfare. Clearly, it is not recommended to continue the existing state of affairs. If India is committed to human development; poverty eradication should take place with control on carbon emissions. The poverty eradication may result in an increased energy use. This may be considered a due right of the poor, though it increases India’s GHG emissions.

IMPLEMENTATION OF RENEWABLE ENERGY SOURCES

Renewable energy sources play a role in providing energy services and security in a sustainable manner and, in particular, in mitigating climate change. Various researches going on in the field of Renewable Energy Sources and Climate Change Mitigation explore the current contribution and potential of renewable energy (RE) sources to provide energy services for a sustainable social and economic development path. These research works give the information about the availability of RE resources and technologies, costs and co-benefits, barriers to up-scaling and integration requirements, future scenarios and policy options. While the RE share of global energy consumption is still relatively small, deployment of RE has been increasing rapidly in recent years. Of the approximately 300 GW of new electricity generating capacity added globally over the two-year period from 2008 to 2009, 140 GW came from RE additions. Collectively, developing countries hosted 53% of global RE power generation [46] capacity in 2009. Under most conditions, increasing the share of RE in the energy mix will require policies to stimulate changes in the energy system.

CONCLUSION

The rapid use of human hydrocarbon or increasing atmospheric carbon dioxide and other green house gases are causing unfavorable changes in global temperatures, weather patterns and landscape. This can be mitigated majorly by various types of renewable energy sources. To avoid the worst predicted impacts of climate change, institutions and individuals must act now. So-many remedial, we have discussed here to avoid climate change have to be implemented strategically. We have to use more electric vehicles and bio-fuels vehicles to prevent the emissions of carbon in atmosphere. We have to use more fluorescent lamp instead of traditional incandescent light bulbs to save the energy. We have to be careful of plantation to remove more carbon dioxide from the atmosphere. We have to adapt proper planning to save our climate from changing. Compared with burning coal or gas in conventional power generating plant designs, there are several alternative technological ways to generate electricity and reduce green house gas emissions cost effectively. Renewable energy sources and carbon dioxide sequestrate on, these new concept gives future opportunity for costs to be reduced with further experience. Each and every goods transport must be more environmentally friendly and reduces logistics costs as it focuses on reducing energy consumption and on improving the overall supply chain.

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मानव स्वास्थ्य पर जलवायु परिवर्तन के प्रभाव और जी 20 सम्मेलनों से अपेक्षा

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विभाग - हिन्दी

राजकीय स्नातकोत्तर महाविद्यालय नोएडा, गौतमबुद्ध नगर

एक बड़े भू-क्षेत्र में लम्बे समय तक रहने वाले मौसम की औसत स्थिति को जलवायु की संज्ञा दी जाती है। वर्तमान में जलवायु परिवर्तन की स्थिति गम्भीर दशा में पहुँच रही है और पूरे विश्व पर इसका असर देखने को मिल रहा है। मौसम विज्ञानी और पर्यावरणविद् विगत कई वर्षों से पूरे विश्व में बढ़ती पर्यावरणीय धटनाओं एवं मौसम परिवर्तन से काफी चिन्तित हैं। ग्लोबल वार्मिंग के कारण औसत तापमान में निरन्तर वृद्धि हो रही है जिससे मानव स्वास्थ्य पर गम्भीर प्रभाव दिखाई दे रहा है। जलवायु परिवर्तन का प्रभाव मानव स्वास्थ्य पर भारी पड़ रहा है। विश्व स्वास्थ्य संगठन की रिपोर्ट के अनुसार, जलवायु में उश्णता के कारण प्वास तथा हृदय सम्बन्धी बीमारियों में वृद्धि होने लगी है। जलवायु परिवर्तन के फलस्वरूप न सिर्फ रोगाणुओं में बढ़ोत्तरी हो रही है।

परिचय

एक बड़े भू-क्षेत्र में लम्बे समय तक रहने वाले मौसम की औसत स्थिति को जलवायु की संज्ञा दी जाती है। किसी भू-भाग की जलवायु पर उसकी भौगोलिक स्थिति का सर्वाधिक असर पड़ता है। यूरोपीय देशों में जहाँ गर्मी का मौसम कम होता है और कड़ाके की ठंड पड़ती है, जबकि शरत में अधिक गर्मी वाले मौसम की प्रधानता रहती है। शरत के समुद्र तटीय क्षेत्रों में तो सर्दियों की ऋतु का तापमान औसत स्तर का रहता है। इस तरह किसी क्षेत्र की जलवायु उसकी स्थिति पर निर्भर करती है।

वर्तमान में जलवायु परिवर्तन की स्थिति गम्भीर दशा में पहुँच रही है और पूरे विश्व पर इसका असर देखने को मिल रहा है। जलवायु परिवर्तन के कारण को दो श्रेणियों में बाँटा जा सकता है- मानवीय और प्राकृतिक। जलवायु परिवर्तन के प्राकृतिक कारणों में ज्वालामुखी, महासागरीय धाराओं, महाद्वीपों के अलगाव प्रमुख हैं। ग्लोबल वार्मिंग के मानवजनित कारणों में जीवाश्म ईंधन और ग्रीनहाउस गैसों का प्रभाव जलवायु परिवर्तन में अहम भूमिका निभाता नजर आ रहा है।

मानसून अपनी गति परिवर्तित कर रहा है उसकी परिवर्तित चाल ने मानव और जीव-जन्तुओं के साथ-साथ प्रकृति के समस्त घटकों को प्रभावित किया है। आज हर मौसम अपने निर्धारित समय से कहीं आगे तो कहीं पीछे चल रहा है परिणामस्वरूप कहीं बाढ़, कहीं सूखा, कहीं सुनामी तो कहीं बेमौसमी चक्रवात नित नयी बिमारियों को जन्म दे रहा है। भूमंडलीय परिवर्तन ने पृथ्वी पर जीवन में परिवर्तन लाना शुरू कर दिया है।

मौसम विज्ञानी और पर्यावरणविद् विगत कई वर्षों से पूरे विश्व में बढ़ती पर्यावरणीय घटनाओं एवं मौसम परिवर्तन से काफी चिन्तित हैं। मौसम विज्ञानी और पर्यावरणविद् विगत कई वर्षों से पूरे विश्व में बढ़ती पर्यावरणीय घटनाओं एवं मौसम परिवर्तन से काफी चिन्तित हैं। तिब्बत के पारचू झील के हिमखण्डों के पिघलने से हिमालय से आयी बाढ़, कश्मीर तथा उत्तराखण्ड में आशातीत बर्फबारी, गुजरात, मुंबई और राजस्थान जैसे मरुस्थलीय क्षेत्रों में अभूतपूर्व बारिश, लेह में बादल फटने की घटना से आयी बाढ़ और फलस्वरूप जलभराव से जनजीवन ठप्प पड़ जाने के साथ साथ पलायन और मानव स्वास्थ्य पर गम्भीर प्रभाव दिखाई देने लगा है। कुछ वर्षों पूर्व बादल फटने के बाद आयी बारिश से उत्पन्न हालात और जन धन की हानि का दृश्य अभी भी हमारी आँखों से ओझल नहीं हुआ है। आखिर क्या कारण है कि मौसम अपनी चाल बदल रहा है। क्या यह पहली बार है कि जब मानव पर्यावरण से कुछ अधिक ही छेड़छाड़ कर खुद को सर्वशक्तिमान सिद्ध करने का प्रयास कर रहा है। परिवर्तन मौसम का हो या मानव की मानसिकता और कार्यप्रणाली का, सबसे पहला असर मानव के स्वास्थ्य पर ही दिखाई देता है।

ग्लोबल वार्मिंग के कारण औसत तापमान में निरन्तर वृद्धि हो रही है जिससे मानव स्वास्थ्य पर गम्भीर प्रभाव दिखाई दे रहा है। भारतीय आर्युविज्ञान अनुसंधान परिषद् के नयी दिल्ली स्थित 'राष्ट्रीय मलेरिया अनुसंधान संस्थान' द्वारा जलवायु परिवर्तन और मलेरिया पर सामान्य अध्ययनों में देखा गया कि जम्मू कश्मीर, हिमाचल प्रदेश, पंजाब, हरियाणा, हिमाचल प्रदेश, उत्तराखण्ड तथा पूर्वोत्तर क्षेत्र जलवायु परिवर्तन के प्रति अधिक संवेदनशील हैं। मलेरिया के अलावा डेंगू, चिकनगुनिया जैसे रोगवाहकजन्य रोग भी जलवायु परिवर्तन के प्रति अधिक संवेदनशील हैं। विगत 50 वर्षों में डेंगू की व्यापकता में वृद्धि हुई है।

मानव शरीर रुपी मशीन को प्राकृतिक रूप से चलाने के लिए पंच भूतों अग्नि, वायु, पृथ्वी, आकाश और हवा को संतुलित करने की आवश्यकता होती है। इन तत्वों का असन्तुलन मनुष्य के शरीर में व्याधियों को उत्पन्न करता है। जलवायु की जब हम बात करते हैं तो मुख्य रूप से दो तत्वों की बात होती है पहला जल और दूसरा वायु। इन दोनों का संतुलन मानव स्वास्थ्य के लिए आवश्यक है।

जलवायु परिवर्तन पर अन्तर सरकारी पैनल ने सन् 2001 में 21वीं सदी में इसके प्रभाव को लेकर आशंका जाहिर की थी। इस रिपोर्ट के कुछ प्रमुख तथ्य इस तरह हैं-

जलवायु परिवर्तन से मिट्टी पर पड़े प्रभाव का सीधा असर मानव स्वास्थ्य पर पड़ता है। इस के कारण तापमान में वृद्धि होती है और वाष्पीकरण का संतुलन खराब हो जाता है, जिससे हमारी मिट्टी की आर्द्रता असन्तुलित हो जाती है। इसके परिणामस्वरूप हमें सूखे की मार झेलनी पड़ती है। अगर यह स्थिती लगातार बनी रहे तो मिट्टी मरुस्थल में परिवर्तित हो जाती है जिसका सीधा असर हमारी फसलों पर पड़ता है। जो प्रत्यक्ष अप्रत्यक्ष रूप से मानव स्वास्थ्य को प्रभावित करता है।

जलवायु परिवर्तन के बढ़ते स्तर का मानव स्वास्थ्य पर खतरा दिन- प्रतिदिन बढ़ता जा रहा है जिससे अनेक बीमारियाँ उत्पन्न हो रही हैं। 'अमेरिकी मीटीऑरलाजिकल सोसाइटी' के बुलेटिन में प्रकाशित "स्टेट ऑफ द क्लाइमेट इन 2016" रिपोर्ट के अनुसार 2016 अब तक का सबसे गर्म व रहा है। कुल 58 देशों के 413 वैज्ञानिकों के योगदान से तैयार रिपोर्ट में कहा गया है- विश्व यदि इसी रफ्तार से चलता रहा तो आने वाले 80 व वर्षों में सतह के तापमान में 4 डिग्री सेल्सियस तक की वृद्धि की आशंका है।¹

गत वर्ष भारत में जिस तरह से गर्म हवाओं को महसूस किया वो हजारों लोगों की मौत का कारण बना। आने वाले समय में हमें इससे भी ज्यादा गर्म हवाओं से जूझना पड़ेगा। समुद्री तूफान, चक्रवात, बाढ़, जंगलों की आग जैसे जलवायु परिवर्तनीय कारकों ने पहले ही जीवन दुश्कर कर दिया है अगर समय रहते हम सचेत नहीं हुए तो मानव सभ्यता को विनाश की कगार पर पहुँचने में देर नहीं लगेगी।

जलवायु परिवर्तन के स्वास्थ्य पर पड़ने वाले दुष्परिणामों को रेखांकित करते हुए 'लांसेट कमीशन ऑन हेल्थ एंड क्लाइमेट चेंज-2015' ने अपनी रिपोर्ट में कहा कि जलवायु परिवर्तन से 9 अरब लोगों की वैश्विक आबादी के लिए पिछली आधी सदी में मिले विकास एवं वैश्विक स्वास्थ्य संबंधी लाभों के नष्ट होने का खतरा है। जलवायु परिवर्तन जलजनित बीमारियों से पूरा विश्व परेशान है। प्रदूषित जल के कारण संक्रामक रोगों एवं कई खतरनाक रोगों जैसे हैजा, पीलिया, टाइफाइड का शिकार होना पड़ता है। पारायुक्त जल से मीनामाटा रोग, नाइट्रेट की अधिकता से ब्लू बेबी सिण्ड्रोम का खतरा बढ़ जाता है। साथ ही प्रदूषित जल मिट्टी की उर्वरकता को प्रभावित करते हुए फसलों को जहरीला होने तक खराब कर देता है। एक तरह से देखा जाये तो शरीर में होने वाली तमाम तरह की बीमारियों का प्रत्यक्ष जुड़ाव ग्लोबल वार्मिंग से है। विश्व भर में निरन्तर नयी-नयी बीमारियों का प्रकोप दिन प्रतिदिन बढ़ता जा रहा है। कोविड 19 जैसी महामारी को शायद ही कभी भूला जा सकता है। कोविड ने जिस तरह मानव स्वास्थ्य को प्रभावित किया है उसका प्रभाव आने वाले कई व वर्षों तक देखा जाना तय है। इसकी गम्भीरता को इस तरह समझा जा सकता है कि यह मानव जीवन को खोखला बना रहा है।

जलवायु परिवर्तन का सबसे ज्यादा असर गरीब लोगों पर पड़ रहा है पहले से ही खाद्य व आवास की समस्या से जूझ रहे लोगों के लिए बदलती जलवायु त्रासदपूर्ण है। जलवायु परिवर्तन को लेकर भारत हमेशा से सचेत रहा है। यह बात भारत के प्रधानमंत्री द्वारा पृथ्वी दिवस पर दिये गये उस बयान से स्पष्ट होती है, जिसमें उन्होंने कहा था कि 'भारत विश्व को जलवायु परिवर्तन से निबटने के रास्ते दिखा सकता है। क्योंकि पर्यावरण की देखभाल करना देश की मान्यताओं का अभिन्न अंग है। हमारा नाता हमारी ऐसी संस्कृति से है जो इस मंत्र में विश्वास रखती है कि धरती हमारी माता है।' अपनी बात को दोहराते हुए उन्होंने कहा कि 'विश्व के सामने अभी वर्तमान में दो प्रमुख समस्याएँ हैं। एक आतंकवाद और दूसरा जलवायु परिवर्तन।'

जलवायु परिवर्तन के क्षेत्र में भारत विश्व को बहुत कुछ दे सकता है। अपनी उर्जा जरूरतों को पूरा करने के लिए भारत सौर उर्जा को बढ़ावा दे रहा है, निश्चित ही इससे कार्बन उत्सर्जन में कमी

आयेगी। जलवायु परिवर्तन के मुद्दे को वैश्विक मंच पर लाने के लिए जी 20 सम्मेलन का सही प्रयोग करा जा सकता है।

जलवायु परिवर्तन को रोकने के लिए निम्नलिखित कार्य किये जाने चाहिए-

- 1- मानव स्वास्थ्य पर जलवायु परिवर्तन के दुष्प्रभावों पर अनुसंधान किये जाये।
- 2- जनजागरुकता कार्यक्रम चलाये जाये।
- 3- स्वास्थ्य सम्बंधी क्षमता को बढ़ाने के उपाय किये जाये।
- 4- सरकार और समाज मिलकर एक ओर शिक्षा, जैविक खेती सार्वजनिक वाहन के बेहतर संरक्षण में लगे तो दूसरी ओर फसल उत्पादन के बाद उत्पाद की बर्बादी, जल की बर्बादी पर नियंत्रण लगाये।

मानव जीवन को निरोगी और दीर्घायु बनाने के लिए सर्वप्रथम जलवायु परिवर्तन के विभिन्न पहलुओं को समझकर सामूहिक प्रयास करना होगा। जलवायु परिवर्तन के समाधान के लिए जी 20 की विभिन्न बैठकों में भारत की अध्यक्षता में निरन्तर मंथन किया जा रहा है।

संयुक्त राज्य एजेंसियों और साझादार संगठनों ने अपनी कई रिपोर्ट्स में स्पष्ट शब्दों में गम्भीर चेतावनी जारी करते हुए कहा है कि मानवता गलत दिशा में आगे बढ़ रही है। वातावरण में कार्बन डाइऑक्साइड, मीथेन और नाइट्रस ऑक्साइड का स्तर लगातार बढ़ना जारी है। 2015 से 2021 तक पिछले सात वर्ष रिकॉर्ड स्तर पर सर्वाधिक गर्म साल साबित हुए हैं। डरने वाली बात यह है कि वैश्विक औसत तापमान 1.17 डिग्री उपर आँका गया है। पिछले दो दशकों में महासागरों के तापमान में भी तेज बढ़ोत्तरी हुई है। इन सबका सीधा असर मानव स्वास्थ्य पर पड़ रहा है।

वर्ष 2030 के लिए राष्ट्रीय स्तर पर कार्बन उत्सर्जन में कटौती के नये संकल्पों में ग्रीन हाउस गैसों में कमी लाने की दिशा में कुछ प्रगति दर्ज की गयी है, मगर ये अप्रत्याप्त है।

जलवायु परिवर्तन का प्रभाव मानव स्वास्थ्य पर भारी पड़ रहा है। विश्व स्वास्थ्य संगठन की रिपोर्ट के अनुसार, जलवायु में उष्णता के कारण श्वास तथा हृदय सम्बन्धी बीमारियों में वृद्धि होने लगी है। जलवायु परिवर्तन के फलस्वरूप न सिर्फ रोगाणुओं में बढ़ोत्तरी हो रही है बल्कि कल जब मानव स्वास्थ्य पर जलवायु परिवर्तन के प्रभाव के चलते एक बड़ी आबादी विस्थापित होगी तो वह पर्यावरणीय शरणार्थी कहलायेगी।

भारत ने स्थानीय, राष्ट्रीय, अन्तर्राष्ट्रीय सर्वोत्तम प्रथाओं को बढ़ावा देकर संयुक्त राष्ट्र की अनेक एजेंसियों की साझेदारियों में 'लाइफ' नामक एक आन्दोलन शुरू करते हुए प्रधानमंत्री जी ने कहा कि समय की आवयशकता है कि टिकाउ विकास को बढ़ावा देने वाले मानव केन्द्रित सामूहिक प्रयासों और मजबूत कार्यवाही से पृथ्वी के सामने मौजूद इस संकट का सामना किया जाये।

श्री पुरुशोत्तम रुपाला ने जी 20 की बैठक के उद्घाटन भाषण में जलवायु परिवर्तन और स्वास्थ्य की चुनौतियों का समाधान: एक पृथ्वी, एक परिवार, एक भविष्य पर अपने विचार रखते हुए कहा कि 'भौगोलिक सीमाओं के बावजूद सम्पूर्ण मानवता एक ही ब्रह्मांड का हिस्सा है। कोविड 19 ने दिखाया कि कैसे स्वास्थ्य और जलवायु परिवर्तन आपस में जुड़े हुए हैं।'²

स्वास्थ्य और परिवार कल्याण मंत्रालय के साथ साझेदारी में एशियाई विकास बैंक 'वन हेल्थ' की थीम पर जी 20 आयोजन कर रहा है जो जलवायु और स्वास्थ्य पर जी 20 नेत्रत्व दुनियाँ की 7.84 अरब आबादी के कल्याण के लिए महत्वपूर्ण है, विशेष रूप से मध्यम और निम्न वर्ग के आय वाले देशों के लिए।

जलवायु परिवर्तन हीट वेव (गर्मी की लहरें) बाढ़ और सूखे जैसे चरम मौसम के माध्यम से संक्रामक रोगों के बढ़ते प्रसार और गैर संचारी रोगों के अतिरिक्त बोझ के साथ सही हवा और पानी की आपूर्ति के माध्यम से मानव को प्रभावित करता है। उदाहरण के लिए पाकिस्तान में हाल ही में विनाशकारी फ्लैश फ्लड अचानक आई बाढ़ ने लगभग 10 मिलियन बच्चों को तत्काल जीवन रक्षक सहायता की आवश्यकता और जलजनित बीमारियों, डूबने और कुपोषण के खतरे में डाल दिया है।

स्वास्थ्य के पर्यावरणीय निर्धारक जैसे की स्वच्छ हवा, सुरक्षित पेयजल, और स्वच्छता, जलवायु परिवर्तन से प्रभावित होते हैं जो हृदय रोग, कैंसर, श्वसन स्वास्थ्य, मानसिक विकार और कुपोषण सहित संचारी रोगों और गैरसंचारी रोगों को बढ़ा सकते हैं। दिन प्रतिदिन बढ़ता हुआ तापमान दुनियाँ में जीवन के लिए असंभव है यानि ग्लोबल वार्मिंग के चलते दुनियाँ में अगर औद्योगिक काल से पूर्व के औसत तापमान में +1.5 डिग्री सेल्सियस से ज्यादा गर्म हो जाता है तो ऐसी दुनियाँ में सभी के स्वास्थ्य की रक्षा असंभव है। इस असलियत का सामना करने के लिए सभी देशों को तत्काल भूमिका निभाने की आवश्यकता है।

सन्दर्भ

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Climate Change and the G20 Stand

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This paper examines the role of G20 countries in addressing climate change and coordinating global efforts. As we know Climate change affects people's lives and health in many ways. It jeopardizes the key elements of good health – clean air, safe drinking water, a healthy food supply, and safe shelter – and could undermine decades of progress in global health. Countries throughout the world have developed programs and policies to address the significant problem of climate change.

1. INTRODUCTION

The G20 is a group of the world's 20 largest economies which includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Türkiye, United Kingdom, United States, and the European Union. Together, the G20 comprises of the world's richest and emerging economies that account for about 90% of the world's total GDP, 80% of world trade, and two-thirds of the world's population. Following the Asian financial crisis, the G20 was founded in 1999 to bring together the finance ministers and central bankers of twenty of the greatest developed and developing nations. The G20 leaders gather annually to coordinate policies on several other areas of shared concern in addition to discussing economic and financial challenges(1). About 75 to 80 % of global GHG emissions are accounted by the G20 economies, which gave rise to Climate change. Thus, endangering the lives of humans as well as wildlife.

The G20's goals are to: i) Coordinate policies among its members in order to promote sustainable growth and global economic stability; ii) To support financial rules that lower risks and avert future financial crises and iii) To develop a new global financial system.

2. CLIMATE CHANGE

Globally, extreme weather events are becoming more severe, endangering lives and livelihoods. Communities and ecosystems both nationally and globally are currently being impacted. In regions like Siberia, warmer temperatures also mean that frozen land will melt, releasing greenhouse gases that have been trapped for decades into the atmosphere and aggravating climate change.

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According to the World Bank, by 2030, 130 million additional people will be exposed to poverty as a result of climate change. Intergenerational inequalities between children in health, education, and long-term development outcomes are exacerbated by climate-related shocks and risks. Climate change threatens livelihoods, and competition for scarce resources puts millions of children at risk of violence. Because of pre-existing gender inequities and societal norms, women and girls are more vulnerable to climate change. If climate change is not addressed, droughts will get worse, farmland degradation and desertification will increase. And the problem of food scarcity will become more severe. There is also a great humanitarian impact of climate change. Already high levels of need in the world are being exacerbated by the increasing frequency and severity of disasters.

The Major impacts are summarised as under

- i. The glaciers have been impacting freshwater ecosystems in the mountain regions. These glaciers provide drinking water, sanitation, agriculture, and hydroelectric power to over a billion people.
- ii. Rising temperatures can increase the frequency, intensity, and duration of heat waves, posing health risks, especially for young children and the elderly.
- iii. Changes in rainfall patterns and rainfall, as well as changes in the timing and amount of river flow, can affect water supply and quality, as well as hydroelectric power generation(2).
- iv. Climate warming is affecting ecosystems from the poles to the tropics. Even a seemingly minor temperature change can produce major changes in food webs and the ecosystem.

3. GLOBAL INITIATIVES

Climate initiatives are bringing together governments, corporations, and members of civil society in order to accelerate climate action. These initiatives, which began with the Climate Action Summit held at the UN in February 2019, focus on reducing emissions, tackling critical problems such as employment and gender equality, unlocking finance, building a sustainable infrastructure using natural resources, and improving adaptation and resilience to climate change.(3)

The International Carbon Action Partnership (ICAP) is a climate change initiative designed to facilitate the exchange of information and assistance in reducing carbon emissions and implementing emissions trading systems(4). The overall objective of the ICAP program is to reduce greenhouse gas emissions through the

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introduction of a policy allowing the industry to exchange carbon credits effectively on the international market.

4. G20'S INITIATIVE

The G20 largely refers to the UN Framework Convention on Climate Change in its climate change commitments. There was no reference to an international institution in its clean, renewable energy commitments. The US has referred to the Organization of Petroleum Exporting Countries, the International Securities Commission, the International Energy Agency, the Organisation for Economic Cooperation and Development, the World Bank, and the International Economic Forum as part of its non-renewable energy commitments.

Indonesia was given the opportunity to host the G20 Summit in 2022, where the energy transition played an important role. The Bali roadmap and the Bali Compact were among the most important energy documents put forward at the summit. Even after Indonesia's Presidency of the G20, these two documents are to serve as a basis for countries in the G20 to achieve a clean energy transition.

4.1 UNFCCC

UNFCCC(*United Nations Framework Convention on Climate Change*) which aims at stabilizing greenhouse gas concentrations in the atmosphere and avoiding dangerous anthropogenic interference with the climate system and has set out key legal mechanisms and principles for International Cooperation(5)

4.2. PARIS AGREEMENT

The Paris Agreement is an agreement in the framework of the UN Framework Convention [UNFCCC] on Climate Change with a view to reducing greenhouse gas emissions, adapting, and financing from 2020, adopted by consensus in December 2015. It shall seek to mitigate the risks of climate change by preventing world temperature increase from more than 2 degrees C higher than before industrial times and pursue efforts with a view to limiting it.

4.3. KYOTO PROTOCOL

The Kyoto Protocol was enacted in 1997 in Kyoto, Japan which is a multilateral agreement to reduce CO₂ emissions and the presence of GHG in the air. It was made at the time when greenhouse gases were endangering our climate, life on Earth, and the whole planet. The Protocol requires detailed monitoring of real emissions in the countries concerned and precise records of trading activity undertaken by them. It facilitates the development and deployment of technologies that may

assist in increasing resilience to climate change impacts. Besides, it was intended to help countries deal with the negative impacts of climate change.

5. MAJOR SUMMIT OF G20

The first summit was held on climate issues in 2008, Washington, U.S. It played a significant role in discussions of the G20 leaders. The G20 meets in Washington where the members raised their concerns on this issue of climate change for the first time. Following year, the topic took on a higher profile in 2009 London, UK Summit, leaders renewed their commitment to addressing this issue.

The leaders reaffirmed their commitment to inexperienced recovery and sustainable international growth in 2010 at the G20 Summit in Toronto, Canada. The marine environment protection initiative (GMEP) was created in the worldwide concerning numerous recent offshore drilling injuries. It offered a platform for leaders to percentage best practices shield the marine environment, save accidents related to offshore exploration, and improvement, as well as marine transportation, and increase strategies for responding to the consequences of such incidents. G20 Summit in South Korea maintained its commitment to climate change, and the key issues were mitigation, transparency, financing, technology, adaptation, and conservation of forests. Several discussions and exchanges of ideas with businesses also included leaders on cooperation in research and development.

The focus of the 2011 Summit in Cannes, France has been in favour of low carbon in order to optimize the development strategies and the potential for progressive green growth, to ensure that development does not become unsustainable.

CONCLUSION

The climate change agenda has been set out from the very beginning, of the G20. It has over time, it became an overarching topic because of the increased need to act. The general public is more aware of the crisis. The consequences of inaction could be very severe for all of us. Cooperation and support of the G20 It is important, but it should not be limited only to this selected group of the world's largest, economies. Because of their position, they are responsible for the most vulnerable people who will never be able to fight the degradation of the environment and often face the consequences they did not cause. There are a wide range of policies and measures for governments that are used to fight climate change and reduce CO2 emissions. The effects of climate change affect everyone. Regardless of wealth, age, or race. Therefore, the key is international cooperation, which must aim for the highest possible goals, knowing that limiting global warming to 1.5 Celsius compared to 2

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degrees Celsius has clear and significant benefits not only economically but also help significantly in reducing the risks of water scarcity, ill health and food security, flood and drought, extreme heat, Tropical storms, biodiversity loss, and the sea level rise (6).

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जलवायु परिवर्तन एवं जी-20: अवसर एवं चुनौतियां

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प्रकृति जल, जंगल और जमीन के तीनों तत्वों के बिना अधूरी है। इस पृथ्वी पर प्राकृतिक रूप से सबसे समृद्ध देश वही है जहां यह तीनों अत्यधिक मात्रा में उपलब्ध हैं। जलवायु में परिवर्तन अपरिहार्य है तथा पृथ्वी के विभिन्न ताप कटिबंध क्षेत्र में जलवायु परिवर्तन सीमित गति से लगातार जारी है। औद्योगीकरण और विकास की बढ़ती रफ्तार के कारण विभिन्न ताप कटिबंध क्षेत्रों में जो परिवर्तन देखने में आ रहे हैं उनसे इन क्षेत्रों के समूचे पारिस्थितिक तंत्र पर कहर टूट पड़ा है। यही नहीं इस तीव्र परिवर्तन ने इन देशों की जीवन शैली, समाज और समुदाय को झकझोर कर रख दिया है।

संसार की रचना भले ही कैसे ही हुई हो लेकिन धरती किसी एक की नहीं है। पंछी, मानव, पशु, नदी, पर्वत, समुद्र आदि की इसमें बराबर की हिस्सेदारी है। मनुष्य इस धरती पर ईश्वर की रचनाओं में से एक है। ईश्वर ने प्रकृति में व्याप्त समस्त जीवों की तुलना में मनुष्य को ज्ञान का अतुलित भंडार दिया है। यह अलग बात है कि इस हिस्सेदारी में मानव जाति ने अपनी बुद्धि से बड़ी-बड़ी दीवारें खड़ी कर दी हैं। अपने श्रेष्ठ मस्तिष्क के बल पर मानव पृथ्वी पर सबसे सफलतम जीव है। इस ज्ञान का उपभोग कर मनुष्य ने प्राचीनतम पाषाण युग से लेकर आज के औद्योगिक युग की यात्रा तक पृथ्वी पर वह सब साधन जुटा लिए हैं जो मनुष्य के दैनिक जीवन को सरल बनाने के साथ-साथ मनोरंजन एवं अन्य इच्छाओं की पूर्णता में अहम भूमिका निभाते हैं। क्योंकि हम सभी यह जानते हैं कि प्राणियों के लिए जल, प्रकृति प्रदत्त एक अनमोल उपहार है। इस प्रगति के लिए मनुष्य ने प्राकृतिक संसाधनों का अत्याधिक दोहन प्रारंभ कर दिया। प्रकृति एवं पर्यावरण पर मनुष्य ने इतना अधिक हस्तक्षेप किया है कि पर्यावरण का रूप दिन प्रतिदिन भयावह होता जा रहा है। अपने स्वार्थ के लिए मनुष्य ने प्रकृति के संतुलन को इतना अधिक बिगाड़ दिया है कि आज इसका सीधा प्रभाव जलवायु परिवर्तन के रूप में देखा जा सकता है। यदि हमने समय रहते जलवायु परिवर्तन के कारणों का निवारण नहीं किया तो कहीं ऐसा ना हो कि इस धरा से जीवन ही लुप्त हो जाए।

मानव समाज पर मंडराते खतरे को ध्यान में रखते हुए दुनियां भर में निर्विवाद रूप से जलवायु परिवर्तन को वर्तमान समय की सबसे प्रमुख समस्या के रूप में माना गया है। पर्यावरणविदों तथा विज्ञान के विभिन्न क्षेत्रों से जुड़े वैज्ञानिकों के समक्ष जलवायु परिवर्तन तथा विभिन्न क्षेत्रों में इसके प्रभाव का आंकलन सबसे बड़ी चुनौती है। आजीविका के लिए संघर्षरत सामान्य मनुष्य के लिए जलवायु परिवर्तन जहां एक चर्चा का विषय मात्र है, वहीं वास्तविकता यही है कि प्रत्यक्ष या अप्रत्यक्ष रूप से पृथ्वी पर

विद्यमान सभी जीवों का जीवन इससे प्रभावित हो रहा है। इसी कारण दुनियां के अधिकांश देश उन कारणों को गंभीरता से लेने लगे हैं जो धरती के जलवायु परिवर्तन के मुख्य कारक हैं। हमारे देश में भी जलवायु परिवर्तन की समस्या के कारणों के अध्ययन और निवारण के लिए विभिन्न कार्यक्रम संचालित किए गए हैं। वैसे तो जलवायु परिवर्तन का प्रभाव जीवन के सभी क्षेत्रों में देखने को मिलता है। दुनियां की 20 सबसे बड़ी अर्थव्यवस्थाओं और जी-20 के नेताओं के शिखर सम्मेलनों में 2008 में अपनी यात्रा शुरू की थी। तब उनका उद्देश्य दुनिया को जकड़ रही आर्थिक मंदी से निपटना और भविष्य के लिए ऐसी चुनौतियों से निपटने के लिए एक तंत्र बनाना था। तब तक जलवायु परिवर्तन को बड़े आर्थिक निहितार्थ वाली एक बड़ी वैश्विक चुनौती के रूप में स्पष्ट रूप से पहचान लिया गया था और यहां तक कि मानव जाति के लिए एक अस्तित्ववादी आयाम भी था। तत्काल कार्रवाई समय की आवश्यकता थी फिर भी वाशिंगटन डीसी में 2008 में आयोजित जी-20 शिखर सम्मेलन में जलवायु परिवर्तन और दुनियां के लिए कई महत्वपूर्ण मुद्दों पर अपनी घोषणा में कहना था कि हम ऊर्जा और जलवायु परिवर्तन, खाद्य सुरक्षा, कानून का शासन, आतंकवाद, गरीबी और बीमारी के खिलाफ लड़ाई जैसी अन्य महत्वपूर्ण चुनौतियों से निपटने के लिए प्रतिबद्ध हैं। 2008 से लेकर अब तक प्रत्येक जी-20 शिखर सम्मेलनों की घोषणा में जलवायु परिवर्तन पर राष्ट्रीय एवं अंतर्राष्ट्रीय कार्य योजना के अंतर्गत राष्ट्रीय सौर मिशन को महत्व दिया गया है।

भारत को वैश्विक समूह जी-20 की अध्यक्षता एक ऐसे समय में मिली है जब दुनियां अलग-अलग मुद्दों पर विभाजित नजर आ रही है। ऐसे में जरूरी है कि भारत 'वसुधैव कुटुंबकम्' के मंत्र के साथ वर्तमान समय में सभी देशों को एक मंच पर लाकर वैश्विक चुनौतियों के समाधान निकाले। क्योंकि आज के आपाधापी से भरे और आपस में जुड़े इस संसार में 'वसुधैव कुटुंबकम्' का संदेश पहले से कहीं अधिक प्रासंगिक है। हम एक ऐसे वैश्विक गांव में रहते हैं जहां राष्ट्रों, संस्कृतियों और लोगों के बीच की सीमाएं तेजी से धुंधली होती जा रही हैं इसलिए यह हम सभी को इस तथ्य की याद दिलाता है कि एक बेहतर दुनियां के निर्माण में प्रत्येक व्यक्ति की अहम भूमिका है। भारत की अध्यक्षता में बड़े देश जो आमतौर पर दुनियां के सबसे बड़े आर्थिक समूह जी-20 के सदस्य भी हैं, वह अपने मध्य के विवादों का हल निकालते हुए एक स्वर में जलवायु परिवर्तन, आतंकवाद, आर्थिक निम्नीकरण और असमानता जैसे संकटों का समाधान निकालें। भारत की अध्यक्षता में विश्व को इस बात की उम्मीद है कि वर्तमान वैश्विक विभाजन में कमी आएगी क्योंकि भारत की विदेश नीति दुनियां में संतुलन के साथ मिलकर कार्य करने पर जोर देती है, और भारत ग्लोबल साउथ देशों और दुनियां के मध्य एक सेतु के रूप में अपनी भूमिका निभाता है। वर्तमान में भारत विश्व के लगभग सभी मंचों पर अपनी उपस्थिति दर्ज करा रहा है और अधिकांश बहुपक्षीय संस्थानों में उसकी स्थिति मजबूत हो रही है और साथ ही साथ अनेकों क्षेत्रों में अवसर भी मिल रहे हैं और इसने 'थर्ड वर्ल्ड' की एकजुटता पर नए विचारों और उद्देश्यों को सामने ला दिया है। भारत का मॉडल इस मामले में बेहद अद्वितीय है और ग्लोबल साउथ के देशों का मार्गदर्शन करने में वर्तमान में सबसे बेहतर और सुसंगत है। जी-20 के माध्यम से भारत कोविड

महामारी के बाद आई दिक्कतों से दुनियां भर के विकासशील और अल्प विकसित देशों की रुकी हुई नकारात्मक विकास को आगे बढ़ाने का आह्वान कर रहा है। वैश्वीकरण और अन्य कारणों की वजह से समस्याएं आज वैश्विक स्तर पर हैं और उनका समाधान कुछ देशों के प्रयासों से संभव नहीं है। वहीं दूसरी ओर एक राष्ट्र की समस्याएं न केवल उस अकेले देश को प्रभावित करती हैं बल्कि पूरी दुनियां में उसका प्रभाव पड़ता है। संयुक्त राष्ट्र के महासचिव एंटोनियो गुटेरेस के शब्दों में “महामारी से लड़ने के लिए सभी को जागृत होना चाहिए। घातक वैश्विक खतरों से उबरने के लिए नई एकता और समन्वय की आवश्यकता है।” क्योंकि दुनियां को संतुलित करने के प्रयास में और उत्तर पर नजर रखते हुए भारत दक्षिण को साधने की उम्मीद कर रहा है। हाल ही में आयोजित दो दिवसीय वर्चुअल ‘वॉइस ऑफ द ग्लोबल साउथ 2023’ शिखर सम्मेलन की थीम “आवाज की एकता-उद्देश्य की एकता की थी। यह वैश्विक व्यवस्था के संवाद में भारत द्वारा एक और पहलू जोड़ने का प्रयास है। जी-20 की एकवर्षीय अध्यक्षता भारत के लिए वैश्विक दक्षिण को एकजुट करने का अवसर है जहां भारत और वैश्विक दक्षिण के अन्य देश एक साथ आने तथा साझा समस्याओं एवं चुनौतियों के साथ ही सहयोग एवं सहभागिता के अवसरों पर चर्चा करने के लिए एक मंच का उपयोग कर सकते हैं। भारत की अध्यक्षता दुनियां के लिए कई सारे अवसर लेकर आई है जिसके माध्यम से उन वैश्विक समस्याओं का हल करने का मौका है जो अभी तक लंबित पड़ी हुई थीं। महाशक्ति के रूप में आगे बढ़ते भारत के पास यह सामर्थ्य है कि वह इन चुनौतियों से निपटते हुए सभी देशों को एक मंच पर लाकर वैश्विक समस्याओं का समाधान करने की पहल करे। ग्लोबल साउथ के अनेकों देश अभी भी गरीबी और आर्थिक समानता से जुड़ रहे हैं जिससे उनके लिए विकास संबंधी पहलुओं को लागू करना कठिन सिद्ध हो सकता है, क्योंकि यह गरीबी एवं असमानता की मौजूदा स्थिति को और गंभीर बना सकती हैं तथा विकास के लिए नई चुनौतियां उत्पन्न कर सकती हैं। इन चुनौतियों का कैसे समाधान हो इस विषय पर विकास और जलवायु परिवर्तन पर जी-20 में प्रधानमंत्री ने अपने संबोधन में कहा कि “यह हमारे समय की एक प्रमुख वैश्विक चुनौती है इससे ना सिर्फ जीवन का दुखद अंत होता है बल्कि यह व्यापक आर्थिक लागत के साथ हमारे जीवन जीने के तरीकों के लिए भी खतरा उत्पन्न करता है। इसके लिए एक सत्र का समय निर्धारण के लिए मैं तुर्की को धन्यवाद देता हूं। महानुभाव हम दो अन्य प्रमुख वैश्विक चुनौतियों विकास और जलवायु परिवर्तन पर चर्चा करने के लिए उपस्थित हैं। हमारे पास अपने युवाओं के लिये रोजगार पैदा करने के कौशल में वृद्धि और निवेश को बढ़ावा देने को दुनियां के सबसे बड़े वित्तीय समावेशन कार्यक्रम है। मैं प्रस्ताव करता हूं कि हम इस बात पर विचार करें कि कैसे जी-20 को ऐसे समर्थन प्रणाली से सक्षम बनाया जाए जो अधिकतम विकास क्षमता वाले देशों पर ध्यान केन्द्रित करने के अतिरिक्त सभी बाधाओं को कैसे दूर करे। इस बिंदु पर गहनता से विचार करना होगा आदि “चुनौतियों को कैसे दूर किया जा सकता है” विषय पर अपने विचार रखे। यह भारत के लिए बहुत बड़ी उपलब्धि है। जलवायु परिवर्तन और ग्लोबल वायुमय पर रेडियो धारावाहिक का शुभारंभ विज्ञान प्रसार और आकाशवाणी के संयुक्त उपक्रम में 2019 को जलवायु परिवर्तन और ग्लोबल वायुमय पर 52 कड़ियों का एक रेडियो धारावाहिक का शुभारंभ किया गया।

वैश्विक स्तर पर जलवायु में अनुमानित बदलाव के कारण एक बड़े खतरे को स्वीकार करते हुए भारत ने अंतरराष्ट्रीय और क्षेत्रीय मंचों पर काफी सक्रियता से काम किया है। जलवायु परिवर्तन पर भारत की राष्ट्रीय कार्ययोजना में 8 राष्ट्रीय मिशन शामिल है। धारावाहिक प्रारंभ करने का मुख्य उद्देश्य जलवायु परिवर्तन की चुनौतियों के बारे में जागरूकता उत्पन्न करना और जलवायु परिवर्तन विज्ञान, अनुकूलन अल्पीकरण, ऊर्जा, दक्षता और प्राकृतिक संसाधन संरक्षण की समझ को बढ़ावा देना है। 19 भाषाओं में धारावाहिक एक साथ कई मोर्चों पर जलवायु परिवर्तन की चुनौतियों से निपटने के लिए भारत द्वारा विकसित किए जा रहे उपयुक्त तंत्र को बढ़ावा देंगे। धरती पर लगातार हो रहे जलवायु परिवर्तन मौसम के अत्यधिक बदलाव और मानवीय गतिविधियों के कारण वन्यजीवों की संख्या निरंतर कम होती जा रही है। दुनियां भर में शहरीकरण और औद्योगीकरण के कारण लोगों के जीने का तरीका बहुत बदल गया है। दुनियां भर में सड़कों पर वाहनों की संख्या में लगातार काफी वृद्धि हो रही है। जीवन शैली में इस बदलाव को वायुमंडल में खतरनाक गैसों के उत्सर्जन के रूप में देखा जा सकता है, क्योंकि मानव समाज पर मंडराते खतरे को ध्यान में रखते हुए दुनियां भर में निर्विवाद रूप से जलवायु परिवर्तन को वर्तमान समय की सबसे प्रमुख समस्या के रूप माना गया है। पर्यावरणविदों तथा विज्ञान के विभिन्न क्षेत्रों से जुड़े वैज्ञानिकों के समक्ष जलवायु परिवर्तन तथा विभिन्न क्षेत्रों में उसके प्रभाव का आंकलन सबसे बड़ी चुनौती है। सामान्य मनुष्य के लिए जलवायु परिवर्तन जहां एक चर्चा का विषय मात्र है वहीं वास्तविकता यही है कि प्रत्यक्ष या अप्रत्यक्ष रूप से पृथ्वी पर विद्यमान सभी जीवों का जीवन इससे प्रभावित हो रहा है। इसी कारण दुनियां के अधिकांश देश उन कारणों को गंभीरता से लेने लगे हैं जो धरती के जलवायु परिवर्तन के मुख्य कारक हैं। हमारे देश में भी जलवायु परिवर्तन की समस्या के कारणों के अध्ययन और निवारण के लिए विभिन्न कार्यक्रम संचालित किए गए हैं। वैसे तो जलवायु परिवर्तन का प्रभाव जीवन के सभी क्षेत्रों में जलवायु परिवर्तन का जल संसाधन और जनजीवन पर पड़ने वाले प्रभाव विषय पर हर स्तर पर जनमानस तक जागरूकता फैलाई जा रही है। जल जीवन का आधार है के महत्व को दर्शाने के लिए ही रहीम दास जी ने भी ठीक ही लिखा है 'रहीमन पानी राखिए-बिन पानी सब सूने'। बूंद-बूंद से घड़ा भरता है यह कहावत कहीं समाप्त न हो जाए। क्योंकि जब हम अपनी प्रकृति का दोहन कम करेंगे तभी तो अपनी आने वाली पीढ़ी के भविष्य को संवार सकेंगे और बूंद-बूंद जल को बचाएंगे तभी तो घड़ा भरेगा। जलवायु पर अभियान को लेकर चर्चा में भारत एक विशिष्ट स्थिति में है जहां वह व्यापक राहत, अनुकूलता और बहाली को सुनिश्चित करने में असर डाल सकता है। वैसे तो जलवायु से जुड़े मुद्दे और चुनौतियां लंबे समय से जी-20 की जानकारी में रही हैं। जैसा कि चीन और जापान के पास जी-20 की अध्यक्षता के समय देखा जा चुका है। जीवाश्म ईंधन के दहन और प्राकृतिक संसाधनों के अत्याधिक दोहन के कारण जलवायु परिवर्तन की गंभीर समस्या उत्पन्न हुई है। यदि जलवायु परिवर्तन को समय रहते न रोका गया तो लाखों लोग भुखमरी, जल संकट और बाढ़ जैसी विपदाओं का शिकार होंगे। यह संकट पूरी दुनियां को प्रभावित करेगा। यद्यपि जलवायु परिवर्तन का असर सबसे अधिक गरीब देशों पर पड़ेगा। इसके साथ ही इसका सबसे ज्यादा असर ऐसे देशों को भुगतना पड़ेगा जो जलवायु परिवर्तन के लिए सबसे कम जिम्मेदार हैं। पिछले विकासशील देशों पर

जलवायु परिवर्तन से उत्पन्न समस्याओं का खतरा अधिक होगा। जलवायु परिवर्तन जनित सूखे और बाढ़ के कारण बड़े पैमाने पर पलायन होने से सामाजिक संतुलन बिगड़ेगा। मनुष्य प्राकृतिक संसाधनों का अपनी आवश्यकता के अनुरूप ही प्रयोग करता है तो इसका संतुलन नहीं बिगड़ेगा लेकिन अगर लोभवष इनका अपनी आवश्यकता से अधिक दोहन करने का प्रयास करता है तो उससे होने वाले पर्यावरण असंतुलन के भयावह परिणाम होंगे जिसका दुष्प्रभाव हमें ही झेलना होगा। इसलिए आज हमें सबसे ज्यादा जरूरत है जलवायु परिवर्तन के मुद्दे पर आम जनता को जागरूक करने की। क्योंकि अब वैज्ञानिकों द्वारा प्रतिपादित कर दिया गया है कि वैश्विक वातावरण परिवर्तन सत्य है इसके विपरीत परिणामों से लोहा लेने के लिए भारत में सदियों से प्रचलित तालाबों और जल संग्रहण संरचनाओं से अभूतपूर्व मदद ली जा सकती है। आज आवश्यकता है इस बात की कि हमारे देश के सभी व्यक्ति संरचनाओं के महत्व को फिर से पहचाने और तन मन धन से उनके नवीनीकरण, संरक्षण और संवर्धन का प्रयास करें। मेरा मानना है कि यदि हम सभी भारतवासी मिलकर प्रयास करें तब आने वाले समय में जलवायु परिवर्तन से निपटने के लिए यह एक अच्छी पहल साबित होगी। लेकिन यह ध्यान रहे कि जहां अब तक मिली प्रतिक्रिया हौंसला बढ़ाने वाली है वहीं चुनौतियां भी कहीं ज्यादा बड़ी हैं। अपनी कोशिशों को सतत बरकरार रखकर हम सभी चुनौतियों पर जीत हासिल कर सकते हैं। जरूरत है बस आपके साथ की।

संदर्भ

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जलवायु परिवर्तन: चुनौतियाँ और समाधान

अब्दुल लतीफ

असि० प्रोफेसर, हिन्दी विभाग

राजकीय रज़ा स्ना० महाविद्यालय, रामपुर (उ०प्र०)

इस आलेख में जलवायु परिवर्तन, जलवायु परिवर्तन के कारण, उससे उत्पन्न चुनौतियों पर विश्लेषण किया गया है। इसके साथ ही जलवायु परिवर्तन से उत्पन्न चुनौतियों से निपटने के उपायों पर भी विचार विमर्श किया गया है।

जलवायु एक ऐसा पहलू है जो विश्व के हर इंसान के जीवन से जुड़ा हुआ है और जलवायु की दशा हमारे जीवन को बहुत प्रभावित करती है। इस तथ्य को इस बात से समझा जा सकता है कि अनुकूल जलवायु के कारण ही पृथ्वी पर जीवन संभव हो पाया है लेकिन मानवीय और कुछ प्राकृतिक गतिविधियों के कारण जलवायु की दशा बदल रही है इस स्थिति को जलवायु परिवर्तन (Climate Change) की संज्ञा दी जाती है।

जलवायु परिवर्तन क्या है?

जलवायु परिवर्तन को समझने से पहले यह समझ लेना आवश्यक है कि जलवायु क्या होता है? सामान्यतः जलवायु का आशय किसी दिये गए क्षेत्र में लम्बे समय तक औसत मौसम से होता है। अतः जब किसी क्षेत्र विशेष के औसत मौसम में परिवर्तन आता है तो उसे जलवायु परिवर्तन कहते हैं।

जलवायु परिवर्तन सतत् विकास के लिये एकमात्र सबसे बड़ा खतरा बन कर खड़ा है। इसका प्रभाव गरीब और कमज़ोर लोगों पर पड़ता है। जीवाश्म ईंधन के दोहन और प्राकृतिक संसाधनों के अत्यधिक दोहन के कारण जलवायु परिवर्तन की गम्भीर समस्या उत्पन्न हुई है। यदि जलवायु परिवर्तन को समय रहते न रोका गया तो लाखों लोग भूखमरी, जल संकट और बाढ़ जैसी विपदाओं का शिकार होंगे। यह संकट पूरी दुनिया को प्रभावित करेगा। जलवायु परिवर्तन अन्तर्राष्ट्रीय शान्ति और सुरक्षा के लिये एक बड़ा खतरा है। जलवायु परिवर्तन का प्रभाव भूमि, भोजन और पानी जैसे संसाधनों के लिये प्रतिस्पर्धा को बढ़ाते हैं। सामाजिक और आर्थिक तनावों को बढ़ावा देते हैं और प्रायः बड़े पैमाने पर विस्थापन का कारण बनते हैं। जैसे-जैसे जलवायु परिवर्तन बिगड़ता जा रहा है, खतरनाक मौसम की घटनाएं गंभीर होती जा रही हैं। पिघलते ग्लेशियर और गर्म होते महासागर जानवरों को सीधे नुकसान पहुंचा सकते हैं। उनके रहने के स्थानों को नष्ट कर सकते हैं और लोगों की अजीबिका पर कहर बरपा सकते हैं।

जलवायु परिवर्तन के कारण

जलवायु परिवर्तन के निम्नलिखित कारण हो सकते हैं:-

1. प्राकृतिक गतिविधियां
2. मानवीय गतिविधियां

1. प्राकृतिक गतिविधियां:

प्राकृतिक गतिविधियों में निम्नलिखित कारण हो सकते हैं:-

1. ज्वालामुखी विस्फोट:- ज्वालामुखी विस्फोट होने पर बड़ी मात्रा में विभिन्न गैसें जैसे कार्बन डाइऑक्साइड, सल्फर डाइऑक्साइड, जलवाष्प आदि तथा धूलकण वायुमंडल में उत्सर्जित होते हैं जोकि वायुमंडल की ऊपरी परत, समतापमंडल में जाकर फैल जाते हैं तथा पृथ्वी पर आने वाले सूर्य प्रकाश की मात्रा घटा देते हैं जिससे पृथ्वी का तापमान कम हो जाता है। एक अनुमान के अनुसार प्रतिवर्ष लगभग 100 लाख टन कार्बन डाइऑक्साइड गैस ज्वालामुखी विस्फोट द्वारा वायुमंडल में फैल जाती है।

2. पृथ्वी का झुकाव:- पृथ्वी के झुकाव के कारण ऋतुओं में परिवर्तन होता है। अधिक झुकाव अर्थात् अधिक गर्मी तथा अधिक सर्दी और कम झुकाव अर्थात् कम गर्मी तथा कम सर्दी का मौसम। इस प्रकार पृथ्वी के झुकाव के कारण जलवायु प्रभावित होती है।

3. समुद्री धाराएँ:- जलवायु को संतुलित रखने में सागरों का बड़ा योगदान रहता है। पृथ्वी के 71 प्रतिशत भाग में समुद्र व्याप्त है जोकि वातावरण और जमीन की तुलना में दोगना सूर्य का प्रकाश का अवशोषण करते हैं। सागरों को कार्बन डाइऑक्साइड का सबसे बड़ा सिंक कहा जाता है। वायुमंडल की अपेक्षा 50 गुना अधिक कार्बन डाइऑक्साइड गैस समुद्र में होती है समुद्री बहाव में बदलाव आने से जलवायु प्रभावित होती है।

2. मानवीय गतिविधियाँ

मानवीय गतिविधियों के निम्नलिखित कारण हो सकते हैं-

1. शहरीकरण:- 19वीं सदी में हुई औद्योगिक क्रांति की ओर सभी का ध्यान आकर्षित हुआ। रोजगार पाने के लिये गांवों में स्थित आबादी शहरों की तरफ प्रस्थान करने लगी और शहरों का आकार दिन-प्रतिदिन बढ़ने लगा। शहरों में बढ़ती आबादी से शहरों के संस्थानों का असीमित दोहन हो रहा है। जैसे-जैसे शहर बढ़ रहे हैं वहां पर उपलब्ध भू-भाग दिन-प्रतिदिन ऊँची-ऊँची इमारतों से ढंकते जा रहे हैं जिससे उस स्थान की जल संवर्धन क्षमता कम हो रही है तथा बारिश के पानी से प्राप्त होने वाली शीतलता में भी कमी हो रही है जिससे वहां के पर्यावरण तथा जलवायु पर निरंतर प्रभाव पड़ रहा है।

2. औद्योगिकीकरण:- जलवायु में औद्योगिकीकरण की बड़ी भूमिका है विभिन्न प्रकार की मिलें वातावरण में सल्फर डाइऑक्साइड, नाइट्रोजन डाइऑक्साइड, कार्बन डाइऑक्साइड तथा अनेक प्रकार की अन्य जहरीले गैसें और धूलकण हवा में छोड़ती हैं, जो वायुमंडल में काफी वर्षों तक विद्यमान रहती हैं। यह ग्रीन हाउस प्रभाव, ओजोन परत का क्षरण तथा भूमंडलीय तापमान में वृद्धि जैसी समस्याओं का कारण बनते हैं। वायु, जल एवं भूमि प्रदूषण भी औद्योगिकीकरण की ही देन है।

3. वनोन्मूलन:- निरंतर बढ़ती हुई आबादी की ज़रूरतों को पूरा करने के लिये वृक्ष काटे जा रहे हैं। आवास, खेती, लकड़ी और अन्य वन संसाधनों की चाह में वनों की अंधाधुंध कटाई हो रही है, जिससे पृथ्वी का हरित क्षेत्र तेज़ी से घट रहा है और साथ ही जलवायु के परिवर्तन में तेज़ी आ रही है।

4. रसायनिक कीटनाशकों एवं उर्वरकों का प्रयोग:- पिछले कुछ दशकों में रसायनिक उर्वरकों की मांग इतनी तेज़ी से बढ़ी है कि आज विश्वभर में 1000 से भी अधिक प्रकार की कीटनाशक दवायें उपलब्ध है। जैसे-जैसे इनका उपयोग बढ़ता जा रहा है, वैसे-वैसे वायु, जल तथा भूमि में इनकी मात्रा भी बढ़ती जा रही है जोकि पर्यावरण को निरंतर प्रदूषित कर घातक स्थिति में पहुंचा रहे हैं।

जलवायु परिवर्तन के प्रभाव

जलवायु परिवर्तन का प्रभाव निम्नलिखित क्षेत्रों पर पड़ रहा है-

1. कृषि पर प्रभाव:- जलवायु परिवर्तन का प्रभाव कृषि पैदावार पर पड़ रहा है। भारत में जलवायु परिवर्तन के परिणामस्वरूप गन्ना, मक्का, ज्वार, बाजरा तथा रागी जैसी फसलों की उत्पादकता दर में वृद्धि होगी जबकि इसके विपरीत मुख्य फसलों जैसे गेहूँ, धान तथा जौ की उपज में गिरावट दर्ज होगी। आलू के उत्पादन में भी अभूतपूर्व गिरावट दर्ज होगी।

2. वर्षा पर प्रभाव:- जलवायु परिवर्तन के परिणामस्वरूप दुनिया के मानसूनी क्षेत्रों में वर्षा में वृद्धि में होगी जिससे बाढ़, भूस्खलन तथा भूमि अपरदन जैसी समस्याएं पैदा होगी। जल की गुणवत्ता में गिरावट आएगी तथा पीने योग्य जल की आपूर्ति पर गंभीर प्रभाव पड़ेगा। जहां तक भारत का प्रश्न है मध्य तथा उत्तरी भारत में कम वर्षा होगी जबकि इसके विपरीत देश के पूर्वोत्तर तथा दक्षिण-पश्चिमी राज्यों में अधिक वर्षा होगी। परिणामस्वरूप वर्षा जल की कमी से मध्य तथा उत्तरी भारत में सूखे जैसी स्थिति होगी जबकि पूर्वोत्तर तथा दक्षिण पश्चिमी राज्यों में अधिक वर्षा के कारण बाढ़ जैसी समस्या होगी।

3. जैव विविधता पर प्रभाव:- जलवायु परिवर्तन का प्रभाव जैव विविधता पर भी पड़ेगा। किसी भी प्रजाति को अनुकूल समय की आवश्यकता होती है। जलवायु परिवर्तन का सर्वाधिक प्रभाव समुद्र की तटीय क्षेत्रों में पाई जाने वाली दलदली क्षेत्र की वनस्पतियों पर भी पड़ेगा।

4. मानव स्वास्थ्य पर प्रभाव:- विश्व स्वास्थ्य संगठन की रिपोर्ट के अनुसार, जलवायु में उष्णता के कारण वास तथा हृदय संबंधी बीमारियों में वृद्धि होगी। जलवायु परिवर्तन के फलस्वरूप न सिर्फ रोगाणुओं में बढ़ोत्तरी होगी अपितु इनकी नई प्रजातियों की भी उत्पत्ति होगी जिसके परिणामस्वरूप फसलों की उत्पादकता पर विपरीत प्रभाव पड़ेगा। मानव स्वास्थ्य पर जलवायु परिवर्तन के प्रभाव के चलते एक बड़ी आबादी विस्थापित होगी जो “पर्यावरणीय शरणार्थी” कहलाएगी। इससे स्वास्थ्य संबंधी और भी समस्याएं पैदा होगी।

5. समुद्री जलस्तर पर प्रभाव:- जलवायु परिवर्तन के फलस्वरूप ग्लेशियरों के पिघलने के कारण विश्व का औसत समुद्री जलस्तर 21वीं शताब्दी के अंत तक 9 से 88 सेमी0 तक बढ़ने की संभावना है जिससे दुनिया की आधी से अधिक आबादी जो समुद्र से 60 किमी0 की दूरी पर रहती है,

पर विपरित प्रभाव पड़ेगा। जलवायु परिवर्तन के परिणामस्वरूप भारत के उड़ीसा, आन्ध्र प्रदेश, तमिलनाडू, केरल, कर्नाटक, महाराष्ट्र, गोवा, गुजरात और पश्चिमी बंगाल राज्यों के तटीय क्षेत्र जलमग्नता के शिकार होंगे। परिणामस्वरूप आसपास के गांवों और शहरों में 10 करोड़ से भी अधिक लोग विस्थापित होंगे। समुद्रिका जलस्तर बढ़ने से मीठे जल के स्रोत दूषित होंगे, परिणामस्वरूप पीने के पानी की समस्या होगी।

जलवायु परिवर्तन से निपटने हेतु वैश्विक प्रयास

समय-समय पर जलवायु परिवर्तन से निपटने के लिए वैश्विक स्तर पर निम्न प्रयास किये गये हैं-

1. पेरिस समझौता:- जलवायु परिवर्तन से निपटने के लिये पेरिस समझौता एक अन्तर्राष्ट्रीय समझौता है। ग्रीन हाउस गैसों के उत्सर्जन को कम करने के लक्ष्य के साथ सम्पन्न 32 पृष्ठों एवं 29 लेखों वाले पेरिस समझौते को ग्लोबल वार्मिंग को रोकने के लिये एक ऐतिहासिक समझौते के रूप में मान्यता प्राप्त है।

2. COP-25:- इस सम्मेलन में लगभग 200 देशों के प्रतिनिधियों ने उन गरीब देशों की मदद करने के लिये एक घोषणा का समर्थन किया जो जलवायु परिवर्तन के प्रभावों से झूझ रहे हैं।

3. जलवायु परिवर्तन पर अंतर सरकारी पैनल (IPCC):- इसका उद्देश्य जलवायु परिवर्तन, इसके प्रभाव और भविष्य के संभावित जोखिमों के साथ-साथ अनुकूलन तथा जलवायु परिवर्तन को कम करने हेतु नीति निर्माताओं को रणनीति बनाने के लिये नियमित वैज्ञानिक आकलन प्रदान करना है। IPCC आकलन सभी स्तरों पर सरकारों को वैज्ञानिक सूचनाएं प्रदान करता है जिसका इस्तेमाल जलवायु के प्रति उदार-नीति विकसित करने के लिये किया जा सकता है।

4. G20:- जी20 सदस्य देशों द्वारा पर्यावरण और जलवायु संकट से निपटने के लिये अपनी प्रतिबद्धता की नए सिरे से पुष्टि की है। वर्तमान परिदृश्य को ध्यान में रखते हुये सभी जी20 देशों ने ठोस वैश्विक प्रयासों की तत्काल आवश्यकता और तत्काल कार्यवाही की आवश्यकता पर सहमति व्यक्त की है। अगस्त 2022 में आयोजित संयुक्त पर्यावरण और जलवायु मंत्री स्तरीय बैठक में, सदस्य देशों ने जलवायु संकट की गंभीरता को स्वीकार किया और घोषणा की कि पेरिस समझौते द्वारा निर्धारित लक्ष्यों को पूरा करने के प्रयास किये जायेंगे।

जलवायु परिवर्तन से निपटने हेतु भारत के प्रयास

जलवायु परिवर्तन पर राष्ट्रीय कार्ययोजना का शुभारम्भ वर्ष 2008 में किया गया था। इसका उद्देश्य जनता के प्रतिनिधियों, सरकार की विभिन्न एजेंसियों, वैज्ञानिकों, उद्योग और समुदायों को जलवायु परिवर्तन से उत्पन्न खतरों और इससे मुकाबला करने के उपायों के बारे में जागरूक करना है। इस कार्ययोजना में निम्न मिशन शामिल हैं:-

1. राष्ट्रीय सौर मिशन

2. विकसित ऊर्जा दक्षता के लिये राष्ट्रीय मिशन
3. सुस्थिर निवास पर राष्ट्रीय मिशन
4. राष्ट्रीय जल मिशन
5. हरित भारत हेतु राष्ट्रीय मिशन
6. सुस्थिर कृषि हेतु राष्ट्रीय मिशन
7. जलवायु परिवर्तन हेतु रणनीतिक ज्ञान पर राष्ट्रीय मिशन

निष्कर्ष रूप में हम कह सकते हैं कि ऐसे समय में जब ज्यादातर देश अपनी अर्थव्यवस्था ठीक करने के लिये भीतर की तरफ देख रहे हैं तब जलवायु परिवर्तन में अनुकूलता के लिये बहुपक्षीय प्रयास की ज़रूरत है। जलवायु परिवर्तन हमारे समय की एक प्रमुख वैश्विक चुनौती है इससे न सिर्फ जीवन का दुखद अन्त होता है बल्कि यह व्यापक आर्थिक लागत के साथ और हमारे जीवन जीने के तरीकों के लिये भी खतरा उत्पन्न करता है। इसके लिये एक व्यापक वैश्विक प्रतिक्रिया की आवश्यकता है। इससे मुकाबला करना जी-20 के लिये प्रमुख प्राथमिकता होनी चाहिये।

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G20 Alliance: Environmental Issues and Sustainable Development

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Achieving Economic progress and development is crucial for every country, but it has no worth or value, if it come at the cost of environmental degradation. In India and also in many countries included in G20, factors like rapid growth of population, Urbanization, Industrialization, Luxury life style of human being and Poverty, among others are responsible for harming the environment. While the cooperation and contribution of every citizen of the country is essential for safeguarding the environment. Government has the major role to play in helping find solutions to the problems. Sustainable development may be option for economic progress and development without harming the environment and nature. The aims and objectives of G20 alliance can be achieved by following the path of sustainable development.

BACKGROUND OF G20 ALLIANCE

G20 (Group of Twenty) comprises 19 countries like Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Russia, Saudi Arabia, South Africa, Turkiye, United Kingdom and Unites States. 20th member of G20 alliance is European Union. The G20 countries represent around 85% of the global GDP, over 75% of global trade with about 70% of word population. G20 is the premier alliance for international economic cooperation and it plays an important in shaping and strengthening global infrastructure and governance of all major international economic issues.

The G20 alliance does not have a permanent secretariat or staff. Instead, the G20 Presidency rotates annually among the members of it and is selected from a different regional grouping of countries. The 19 member countries are therefore divided up into five groups comprising a maximum of four countries each. Most of

the groups are formed on a regional basis. Countries with same region are usually put in the same group. Only Group 1 (Australia, Canada, Saudi Arabia and the United States) and Group 2 (India, Russia, South Africa and Türkiye) do not follow this pattern. Group 3 includes Argentina, Brazil, and Mexico; Group 4 includes France, Germany, Italy, and United Kingdom; and Group 5 includes China, Indonesia, Japan, and Republic of Korea. The EU, the 20th member, is not a member of any of these regional groups. Each year another country from a different group assumes the G20 Presidency. The countries in a group are each equally entitled to take on the Presidency when it is their group's turn, though. India, from Group 2, holds the current Presidency of the G20 from 1 December 2022 to 30 November 2023. The G20 Presidency is responsible for bringing together the G20 agenda in consultation with other members and in response to developments in the global economy. To ensure continuity, the Presidency is supported by a "troika" made up of the current, immediate past and next host countries.

The G20 was founded in 1999 in the perspective of Asian financial crisis of 1997-98 as an informal forum for the Finance Ministers and Central Bank Governors of the most important industrialized and developing economies to discuss international economic and financial stability. The G20 was upgraded for the level of Heads of State/Government in the wake of the global economic and financial crisis of 2007, and in 2009, when it became apparent that the necessary crisis coordination would only be possible at the highest political level. Since then, the G20 Leaders have met regularly, and the G20 has become the premier forum for international economic cooperation. The G20 Summit is held annually, under the leadership of a rotating Presidency. The forum initially focused largely on broad macroeconomic issues, but it has since expanded its agenda to inter-alia include trade, climate change, sustainable development, health, agriculture, energy, environment, climate change, and anti-corruption.

In addition to the member countries, i.e. 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 the European Union, each G20 Presidency invites other guest countries and international organizations (IOs) to participate in the G20 meetings and Summit. India has invited Bangladesh, Egypt, Mauritius, the Netherlands, Nigeria, Oman, Singapore, Spain and UAE as guest countries during its G20 Presidency. For Guest IOs, India has invited ISA, CDRI and ADB in addition to the regular G20 International Organizations (UN, IMF, WB, WHO, WTO, ILO, FSB and OECD) and Chairs of Regional Organizations (AU, AUDA-NEPAD and ASEAN).

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The group of G20 is headed by Sherpa who is the representative of the Leader. Socio-economic issues such as agriculture, anti-corruption, climate, digital economy, education, employment, energy, environment, health, tourism, trade and investment are main focus areas of G20. The Working Groups under this track include:

- Agriculture Working Group
- Anti-corruption Working Group
- Culture Working Group
- Development Working Group
- Digital Economy Working Group
- Disaster Risk Reduction Working Group
- Education Working Group
- Employment Working Group
- Energy Transitions Working Group
- Environment and Climate Sustainability Working Group
- Health Working Group
- Tourism Working Group
- Trade and Investment Working Group

ENVIRONMENTAL ISSUES IN G20 COUNTRIES

Today, the human population of world is increasing rapidly and due to drastic growth in population, many environmental issues are facing by human civilization. All type of progress and development are deeply associated with environment because the existence of fauna and flora depends of health of environment. Human civilization is witness that many environmental disasters have come in the world and it destroyed the development. So, it is clear that the development cannot do on cost of environment degradation. Some common issues are discussed below which are facing G20 and all over the world.

1. Global Warming From Fossil Fuels

As of May 2023, CO₂ PPM (parts per million) is at 420.00 and the global temperature rise is 1.15C compared to pre-industrial levels. The last time carbon dioxide levels on our planet were as high as today was more than 4 million years

ago. Increased emissions of greenhouse gases have led to a rapid and steady increase in global temperatures, which in turn is causing catastrophic events all over the world – from Australia and the US experiencing some of the most devastating bushfire seasons ever recorded, locusts swarming across parts of Africa, the Middle East and Asia, decimating crops, and a heat wave in Antarctica that saw temperatures rise above 20C for the first time. Scientists are constantly warning that the planet has crossed a series of tipping points that could have catastrophic consequences, such as advancing permafrost melt in Arctic regions, the Greenland ice sheet melting at an unprecedented rate, accelerating sixth mass extinction, and increasing deforestation in the Amazon rainforest, just to name a few. The climate crisis is causing tropical storms and other weather events such as hurricanes, heat waves and flooding to be more intense and frequent than seen before.

2. Poor Governance

According to economists the climate crisis is a result of multiple market failures. Economists and environmentalists have urged policymakers for years to increase the price of activities that emit greenhouse gases (one of our biggest environmental problems), the lack of which constitutes the largest market failure, for example through carbon taxes, which will stimulate innovations in low-carbon technologies. To cut emissions quickly and effectively enough, governments must not only massively increase funding for green innovation to bring down the costs of low-carbon energy sources, but they also need to adopt a range of other policies that address each of the other market failures. A national carbon tax is currently implemented in 27 countries around the world, including various countries in the EU, Canada, Singapore, Japan, Ukraine and Argentina. However, according to the 2019 OECD Tax Energy Use report, current tax structures are not adequately aligned with the pollution profile of energy sources.

3. Food Waste

A third of the food intended for human consumption – around 1.3 billion tons – is wasted or lost. This is enough to feed 3 billion people. Food waste and loss account for a third of greenhouse gas emissions annually, if it was a country, food waste would be the third highest emitter of greenhouse gases, behind China and the US. Food waste and loss occurs at different stages in developing and developed countries; in developing countries, 40% of food waste occurs at the post-harvest and processing levels, while in developed countries, 40% of food waste occurs at the retail and consumer levels. At the retail level, a shocking amount of food is wasted because of aesthetic reasons; in fact, in the US, more than 50% of all produce thrown

away in the US is done so because it is deemed to be “too ugly” to be sold to consumers- this amounts to about 60 million tons of fruits and vegetables. This leads to food insecurity, another one of the biggest environmental problems on the list.

4. Biodiversity Loss

The past 50 years have seen a rapid growth of human consumption, population, global trade and urbanization, resulting in humanity using more of the Earth’s resources than it can replenish naturally. A recent WWF report found that the population sizes of mammals, fish, birds, reptiles and amphibians have experienced a decline of an average of 68% between 1970 and 2016. The report attributes this biodiversity loss to a variety of factors, but mainly land-use change, particularly the conversion of habitats, like forests, grasslands and mangroves, into agricultural systems. Animals such as pangolins, sharks and seahorses are significantly affected by the illegal wildlife trade, and pangolins are critically endangered because of it. More broadly, a recent analysis has found that the sixth mass extinction of wildlife on Earth is accelerating. More than 500 species of land animals are on the brink of extinction and are likely to be lost within 20 years; the same number was lost over the whole of the last century. The scientists say that without the human destruction of nature, this rate of loss would have taken thousands of years.

5. Plastic Pollution

In 1950, the world produced more than 2 million tons of plastic per year. By 2015, this annual production swelled to 419 million tons and exacerbating plastic waste in the environment. A report by science journal, Nature, determined that currently, roughly 14 million tons of plastic make their way into the oceans every year, harming wildlife habitats and the animals that live in them. The research found that if no action is taken, the plastic crisis will grow to 29 million metric tons per year by 2040. If we include micro-plastics into this, the cumulative amount of plastic in the ocean could reach 600 million tons by 2040. Shockingly, National Geographic found that 91% of all plastic that has ever been made is not recycled, representing not only one of the biggest environmental problems of our lifetime, but another massive market failure. Considering that plastic takes 400 years to decompose, it will be many generations until it ceases to exist. There’s no telling what the irreversible effects of plastic pollution will have on the environment in the long run.

6. Deforestation

Every hour, forests the size of 300 football fields are cut down. By the year 2030, the planet might have only 10% of its forests; if deforestation isn’t stopped,

they could all be gone in less than 100 years. The three countries experiencing the highest levels of deforestation are Brazil, the Democratic Republic of Congo and Indonesia. The Amazon, the world's largest rainforest – spanning 6.9 million square kilometers (2.72 million square miles) and covering around 40% of the South American continent – is also one of the most biologically diverse ecosystems and is home to about three million species of plants and animals. Despite efforts to protect forest land, legal deforestation is still rampant, and about a third of global tropical deforestation occurs in Brazil's Amazon forest, amounting to 1.5 million hectares each year.

7. Air Pollution

One of the biggest environmental problems today is outdoor air pollution. Data from the World Health Organization (WHO) shows that an estimated 4.2 to 7 million people die from air pollution worldwide every year and that nine out of 10 people breathe air that contains high levels of pollutants. In Africa, 258,000 people died as a result of outdoor air pollution in 2017, up from 164,000 in 1990, according to UNICEF. A cause of air pollution mostly comes from industrial sources and motor vehicles, as well as emissions from burning biomass and poor air quality due to dust storms. In Europe, a recent report from the EU's environment agency showed that air pollution contributed to 400 000 annual deaths in the EU in 2012 (the last year for which data was available).

8. Melting Ice Caps and Sea Level Rise

The climate crisis is warming the Arctic more than twice as fast as anywhere else on the planet. Today, sea levels are rising more than twice as quickly as they did for most of the 20th century as a result of increasing temperatures on Earth. Seas are now raising an average of 3.2 mm per year globally and they will continue to grow up to about 0.7 meters by the end of this century. In the Arctic, the Greenland Ice Sheet poses the greatest risk for sea levels because melting land ice is the main cause of rising sea levels.

9. Ocean Acidification

Global temperature rise has not only affected the surface, but it is the main cause of ocean acidification. Our oceans absorb about 30% of carbon dioxide that is released into the Earth's atmosphere. As higher concentrations of carbon emissions are released thanks to human activities such as burning fossil fuels as well as effects of global climate change such as increased rates of wildfires, so do the amount of carbon dioxide that is absorbed back into the sea. The smallest change in the pH

scale can have a significant impact on the acidity of the ocean. Ocean acidification has devastating impacts on marine ecosystems and species, its food webs, and provokes irreversible changes in habitat quality. Once pH levels reach too low, marine organisms such as oysters, their shells and skeleton could even start to dissolve.

10. Food and Water Insecurity

Rising temperatures and unsustainable farming practices has resulted in the increasing threat of water and food insecurity and taking the mantle as one of the biggest environmental problems today. Globally, more than tons of top-soil is eroded every year at a rate 100 times faster than it can naturally be replenished. Laden with biocides and fertilizer, the soil ends up in waterways where it contaminates drinking water and protected areas downstream. Furthermore, exposed and lifeless soil is more vulnerable to wind and water erosion due to lack of root and mycelium systems that hold it together. A key contributor to soil erosion is over-tilling: although it increases productivity in the short-term by mixing in surface nutrients (e.g. fertilizer), tilling is physically destructive to the soil's structure and in the long-term leads to soil compaction, loss of fertility and surface crust formation that worsens topsoil erosion.

11. Fast Fashion and Textile Waste

The global demand for fashion and clothing has risen at an unprecedented rate that the fashion industry now accounts for 10% of global carbon emissions, becoming one of the biggest environmental problems of our time. Fashion alone produces more greenhouse gas emissions than both the aviation and shipping sectors combined, and nearly 20% of global wastewater, or around 93 billion cubic meters from textile dyeing, according to the UN Environment Program.

We can secure our economic progress and infrastructure development followed by sustainable development.

SUSTAINABLE DEVELOPMENT

Sustainable Development is the development that meets the needs of the present generation without compromising with the needs of future generations. This definition was put forward by the Brundtland Commission in its report "Our Common Future" in 1987. It calls for a concerted effort to build an inclusive, sustainable, and resilient ecosystem for the people and the planet. The main features of sustainable development include-

- Increase in per capita income

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- Judicious use of natural resources
- Preserving the resources for future generations

As an affirmative action towards tackling the global environmental crisis that involves global warming, climate change, and ozone layer depletion, the United Nations adopted 17 Sustainable Development Goals (SDG) and 169 targets as part of the United Nations 2030 Agenda. The 17 Sustainable Development Goals are-

- End poverty in all its forms everywhere.
- End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
- Ensure healthy lives and promote well-being for all at all ages.
- Ensure inclusive and equitable quality education, and promote lifelong learning opportunities for all.
- Achieve gender equality and empower all women and girls.
- Ensure availability and sustainable management of water and sanitation for all.
- Ensure access to affordable, reliable, sustainable, and modern energy for all.
- Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all.
- Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation.
- Reduce inequality within, and among, countries.
- Make cities and human settlements inclusive, safe, resilient, and sustainable.
- Ensure sustainable consumption and production patterns.
- Take urgent action to combat climate change and its impacts.
- Conserve and sustainably use the oceans, seas, and marine resources for sustainable development.
- Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.

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- Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.
- Strengthen the means of implementation and revitalize the global partnership for sustainable development.

NITI (National Institution for Transforming India) Aayog, the newly-formed commission that replaced the 65-year old Planning Commission in India, is entrusted with the task of coordinating SDGs in India. States are also advised to undertake similar mapping, including visioning, planning, budgeting, and developing implementation & monitoring systems for the state-sponsored schemes that are being implemented to fulfill the SDGs. In addition to that, the Ministry of Statistics & Program Implementation is engaged in the process of building key indicators to monitor the implementation of SDGs. Since 2015 (when the United Nations, along with other countries, adopted the SDGs) the Indian government has launched several flagship programs that are at the heart of SDGs. Some of these include Swachhh Bharat Mission, Skill India, Make in India, Digital India, etc.

SDGs are guiding principles for G20 and all over the world for ensure environment health and healthy human lives. Environment related issues are major agenda of G20 alliance. G20 countries also trying to solve the problems related to environmental problems. It is hope so that the agenda will be broadly discussed in the chairmanship of India also.

CONCLUSION

G20 is most reliable and representative alliance of world countries to discuss all type global issues. The goodness of human societies should be of any representative alliance of countries rather than ensure their personal benefits. It is ever expected to G20 nations that they will form a general agreement to follows and implement the SDGs in the welfare of human civilization. Economic and infrastructure development only may be beneficial for all humans if they follow the guideline to ensure environment protection. The development on the cost of environment degradation never would be in the favor of mass.

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जलवायु परिवर्तन का भारत में प्रभाव : 'एक अध्ययन'

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¹मनोविज्ञान विभाग, राम रतन सिंह मैमोरियल डिग्री कॉलेज, रामपुर (उ.प्र.)

²मनोविज्ञान विभाग, राजकीय रजा पी.जी. कॉलेज, रामपुर (उ.प्र.)

हमारा देश आदिकाल से देवालय रहा है जहाँ देवस्थान, देवोत्थान एवं देव जन्म हुए जिस कारण इसे देव भूमि भी कह सकते हैं, तब जल, वायु, अग्नि, धरा अर्थात् पृथ्वी एवं आकाश सब अपना-अपना कार्य बखूबी कर रहे थे; जैसे

- पृथ्वी- इसका कार्य था खाना अर्थात् अन्न उत्पादन करना ।
जल- स्वस्थ रहने के लिए स्वच्छ जल सबसे जरूरी है ।
अग्नि- शरीर को स्वस्थ रखने के लिए अग्नि को बने रखना ।
वायु- वायु अर्थात् ऑक्सीजन प्राणियों के लिए जीवन दायिनी है ।
आकाश- इस तत्व का अर्थ आयुर्वेद में वृत्त या तप बताया गया है ।

जब ये सब अपने कार्य के प्रति समर्पित थे तब कोई समस्या नहीं थी, किन्तु आज समस्या..... ।

जब से मानव जाति ने इन पांच तत्वों में हस्तक्षेप आरम्भ कर दिया तब से उसका दुष्परिणाम भी शनै-शनै मानव समाज और मानव सम्पदा भोग रही है, किन्तु सब झूठे मुगालते में जी रहे है और हम अपने बचाव में कहते हैं कि यह कलयुग है कलपुर्जों का युग! थोड़ा तो सामंजस्य बनाना पड़ेगा । जब सामंजस्य बनाना ही है तो जलवायु को ही दोष क्यों दें ? जब आप किसी के क्षेत्र में बिना अनुमति के जाते हैं तो क्या वहाँ आपको सम्मान मिलता है? नहीं न । जब आपकी आपस में यह स्थिति है तो प्रकृति में बे-वजह क्यों प्रवेश किया ? और जब प्रवेश किया है तो प्रकृति का कोप भी भोगो रोककर या हँसकर ।

यह जलवायु भी कोई एक नहीं है जिस तरह किसी भी क्रिया में एक उद्दीपक होता है और एक प्रयोगकर्ता होता है । किन्तु यहाँ तो दो नहीं तीन हो गए जल, वायु एवं प्रयोगकर्ता (मानव) । तो फिर एक प्रचलित लोकोक्ति सटीक है "तीन तिगाड़ा काम बिगाड़ा" यह कहीं तो सही सिद्ध हुई होगी तभी तो आज पूरे लोक में प्रचलित हो गई ।

मानव का प्रकृति में हस्तक्षेप इतना नहीं की वह हस्तक्षेप तक सीमित रहता । यह हस्तक्षेप इतना बढ़ गया कि इसे एक नया नाम दिया - प्रदूषण । यह प्रदूषण एक नहीं दो नहीं पाँचों तत्वों में प्रवेश

कर गया है। जिसका प्रमाण हर क्षेत्र में आज दुष्परिणाम सहर्ष देखने और सहने पड़ रहे हैं। हम किसी भी क्षेत्र को यह नहीं कह सकते कि यहां या वहां प्रदूषण नहीं है बस प्रदूषण को देखने समझने की परख हो। विकास की दौड़ में हम यह न भूल जाएं कि इससे पर्यावरण को भी क्षति पहुंच रही है वह पूरे विकास की कल्पना को प्रश्नचिन्हित कर सकती है। राष्ट्रपिता महात्मा गांधी भी ऐसे विकास के पक्षधर नहीं थे, जो पर्यावरण को प्रदूषित करें। गांधीजी कुटीर उद्योग के पक्षधर में थे।

जलवायु परिवर्तन के दुष्परिणामों की एक झलक मेरे अनुसार जिसे आप भी देखें-

(अ) जलवायु परिवर्तन के साक्ष्य

- 1- बीसवीं शताब्दी के उत्तरार्ध में उत्तरी गोलार्ध का औसत तापमान विगत 500 वर्षों की तुलना में काफी बढ़ा था।
- 2- हिमांक मंडल लगातार सिकुड़ रहा है पुराने दशक में देखें अंटार्कटिका में बर्फ पिघलने की दर तीन गुना हो गई है। विगत शताब्दी में वैश्विक समुद्रस्तर में लगभग आठ इंच की बढ़ोतरी देखी गई है।
- 3- महासागरों में अम्लीकरण बढ़ा, जिस कारण ऊपरी परत द्वारा अवशोषित ऑक्सीजन की मात्रा में प्रतिवर्ष लगभग दो बिलियन टन की बढ़ोतरी हो रही है।
- 4- वर्ष 1900 से वर्तमान में हमारे देश का तापमान दो डिग्री सेंटीग्रेड बढ़ चुका है।

(ब) जलवायु परिवर्तन के कारण

इसके लिए प्रकृति और मानव दोनों कारण बराबर हैं किंतु मानवीय कारणों का महत्व अधिक है।

मानवीय कारण

इनमें सबसे प्रमुख है ग्रीनहाउस गैस - कार्बन डाइऑक्साइड, मीथेन, नाइट्रस ऑक्साइड एवं सल्फर डाइऑक्साइड के उत्सर्जन में वृद्धि जिसके परिणाम स्वरूप पृथ्वी के औसत तापमान में वृद्धि प्रमुख कारण है।

- भूमि उपयोग में परिवर्तन के लिए जिम्मेदार है इससे सतह के एल्बिडो में वृद्धि हुई है।
- वनोन्मूलन, पशुपालन, कृषि में वृद्धि, नाइट्रोजन उर्वरकों का कृषि में उपयोग।
- प्राकृतिक कारणों में सौर विकिरण में बदलाव में बदलाव, टेक्टोनिक संचलन एवं ज्वालामुखी विस्फोट आदि।
- भूमंडलीय उष्मन

(स) कृषि पर जलवायु परिवर्तन का प्रभाव

- तापमान 1 डिग्री सेंटीग्रेड की वृद्धि मध्यम आय वाले उभरते बाजारों के आर्थिक विकास को वर्ष में 0.9% तक घटा सकता है।
- मध्यम-निम्न आय वाली अर्थव्यवस्था पर सबसे अधिक प्रभाव पड़ेगा।
- विश्व बैंक की रिपोर्ट के अनुसार जलवायु परिवर्तन 15 वर्षों में 45 मिलियन भारतीयों को अत्यधिक निर्धन बना सकता है जिससे आर्थिक प्रगति बाधित हो सकती है।
- समुद्र का बढ़ता तापमान कोरल रीफ के लिए खतरा उत्पन्न कर सकता है।
- जलवायु परिवर्तन आय असमानता में वृद्धि करेगा।

(द) महाद्वीपीय बहाव

- यह जल निकायों और भूभाग की भौतिक विशेषताओं को बदल देता है, जो भविष्य में समुद्र की धाराओं और हवाओं के प्रभाव को भी बदल देता है।

(य) ज्वालामुखीय गतिविधियों के कारण प्रदूषण

- ज्वालामुखी विस्फोट के दौरान, गैसों और धूल के कणों का प्रकोप सूर्य कि आने वाली किरणों को बाधित करता है।
- ज्वालामुखी से उत्पन्न सल्फर डाइऑक्साइड पानी के साथ मिलकर सल्फ्यूरिक अम्ल की छोटे-छोटे बुंदों का निर्माण करता है जो कई वर्षों तक पर्यावरण में रह सकता है।

(र) प्लेट टैक्टोनिक्स

- महाद्वीपों का स्थानांतरण भी महासागरीय धाराओं के प्रारूप को प्रभावित करता है क्योंकि यह महासागरों की ज्यामिति को भी बदलता है।

(ल) पर्यावरण की तुलना में औद्योगिकी के लिए नीति प्राथमिकता

- आज औद्योगिकरण की दौड़ में दुनिया भर की सरकारें अधिक औद्योगिकरण की ओर झुकाव के साथ नीतियां तैयार कर रही हैं। वही पर्यावरणीय प्रभावों को नजरअंदाज किया जा रहा है।

(व) कार्बन डाई ऑक्साइड का अत्यधिक उत्सर्जन

- अधिक वाहन और औद्योगिकीकरण से कार्बन डाई ऑक्साइड का उत्सर्जन बढ़ रहा है।

जलवायु परिवर्तन के प्रभाव

- चरम मौसम की घटनाओं का खतरा बढ़ना।
- जंगल की आग का खतरा बढ़ना।
- बाढ़ का खतरा बढ़ना।
- सूखे का खतरा बढ़ना।
- रोग और बीमारी का खतरा बढ़ना।
- चरम मौसमी घटनाओं के कारण आर्थिक नुकसान में वृद्धि होना।
- समुद्र के स्तर में वृद्धि होना।
- वैश्विक तापमान में वृद्धि होना।
- परिस्थितिकी तंत्र और आर्भूमि के लिए खतरा होना।
- कृषि उत्पादकता में कमी।

जलवायु परिवर्तन से होने वाली बीमारियां

- जलवायु परिवर्तन में जब बाढ़ आती है तो उससे अतिसार रोग, हैजा, पेचिश और टाइफाइड के रोगियों में वृद्धि होती है। श्वसन संक्रमण भारत में ही रोटावायरस और लेप्टोस्पायरोसिस के प्रकोप से मानव पीड़ित होता है।
- डायरिया की बीमारियां मुख्य रूप से अशुद्ध पेयजल और बुनियादी स्वच्छता की कमी के कारण होती है।
- मीठे पानी की कमी के कारण यह सब बीमारियां होती हैं।

जलवायु परिवर्तन में सुधार के उपाय

- जलवायु परिवर्तन से मुख्यतः जनजीवन ही प्रभावित होता है क्योंकि जनप्रतिनिधियों के जलवायु में हस्तक्षेप के कारण जलवायु आज परिवर्तित होकर पूर्णतः दूषित हो गई है। यदि मानव समूह इन निम्न सावधानियों को अपनाएं तो जलवायु परिवर्तन का रूप काफी हद तक संभल सकता है-
- नवीकरणीय ऊर्जा में संक्रमण अर्थात् जीवाश्म ईंधन से दूर जाकर अक्षय ऊर्जा स्रोतों जैसे कि पवन, सौर और जलविद्युत में संक्रमण से जी एच जी (ग्रीन हाउस गैस) उत्सर्जन में काफी कमी आ सकती है।

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- अक्षय ऊर्जा प्रौद्योगिकियां लगातार आगे बढ़ रही हैं और उनकी लागत घट रही है।
- वन संरक्षण- कार्बन सिंक के रूप में कार्य करने वाले वनों एवं वायुमंडलीय कार्बन डाई ऑक्साइड सांति को कम कर सकते हैं वनों की कटाई, क्षरण से बचाव करके।
- कार्बन कैप्चर एंड स्टोरेज - ऐसी तकनीकें जो बिजली संयंत्रों और औद्योगिक प्रक्रियाओं से कार्बन डाईऑक्साइड उत्सर्जन को कैप्चर करती हैं और इसे भूमिगत स्टोर करती है, उत्सर्जन को भी कम कर सकती हैं।
- सतत कृषि और भूमि उपयोग- कृषि प्रथाओं में परिवर्तन, जैसे कि मांस की खपत को कम करना, पुनर्योजी कृषि को अपनाना और आर्बूमि एवं घास के मैदानों की रक्षा करना।
- फसल चक्र-प्रत्येक मौसम में एक खेत में विभिन्न फसलें लगाना ताकि मिट्टी को पोषक तत्व मिलते रहे और मिट्टी का कटाव कम हो।
- आई पी एम में रसायनों के उपयोग को कम करते हुए कीटों और बीमारियों का प्रबंधन करने के लिए फसलों का रोटेशन, विविधता, जैविक नियंत्रण और लक्षित कीटनाशक उपयोग जैसी तकनीकों का उपयोग करके।

संदर्भ

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सतत् ऊर्जा संक्रमण: स्वच्छ ऊर्जा, हरित ऊर्जा को बढ़ावा देने में G-20 की भूमिका

आभिर खॉन

एम0एस0सी0 वनस्पति विज्ञान तथा एम0ए0
राजकीय रज़ा स्नातकोत्तर महाविद्यालय, रामपुर (उ0प्र0)

इस आलेख में जलवायु परिवर्तन, जी-20, सतत् ऊर्जा संक्रमण, स्वच्छ ऊर्जा तथा हरित ऊर्जा को बढ़ावा देने में जी20 की भूमिका, भारत के ऊर्जा क्षेत्र से सम्बन्धित चुनौतियों के बारे में विश्लेषण किया गया है। इसके साथ ही जलवायु परिवर्तन और जी-20 के बारे में बताया गया है।

जलवायु क्या है?

जलवायु एक ऐसा पहलू है जो दुनिया के हर व्यक्ति के जीवन से जुड़ा हुआ है और जलवायु की दशा हमारे जीवन को बहुत प्रभावित करती है। इस तथ्य को इस बात से समझा जा सकता है कि अनुकूल जलवायु के कारण की पृथ्वी पर जीवन संभव हो पाया है, लेकिन मानवीय और कुछ प्राकृतिक गतिविधियों के कारण जलवायु की दशा परिवर्तित हो रही है। इस स्थिति को जलवायु परिवर्तन की संज्ञा दी गयी है। हॉल के वर्षों में गर्मी के सारे रिकार्ड टूट गए हैं। इन सब कारणों से जलवायु में परिवर्तन आ रहा है, जिसे जलवायु परिवर्तन की संज्ञा दी जा रही है। इसमें कोई गलत नहीं है कि जलवायु में हो रहे नकारात्मक परिवर्तन पृथ्वी पर रहने वाले जीवों के लिए बहुत ही घातक होंगे। जलवायु परिवर्तन से जुड़े खतरों की प्रति सरकारें जागरूक हो रही हैं और लोगों को भी जलवायु परिवर्तन से जुड़े खतरों के प्रति आगाह करने की आवश्यकता है।

G-20 क्या है?

द ग्रुप ऑफ ट्वेंटी जी-20 अंतर्राष्ट्रीय आर्थिक सहयोग का मंच एक प्रमुख मंच है। यह सभी प्रमुख अंतर्राष्ट्रीय आर्थिक मुद्दों पर वैश्विक वास्तुकला और शासन को आकार देने और मज़बूत बनाने में महत्वपूर्ण भूमिका निभाता है। भारत 1 दिसंबर 2022 से 30 नवंबर 2023 तक जी-20 की अध्यक्षता करेगा।

सतत् ऊर्जा संक्रमण

एक ऊर्जा संक्रमण प्रौद्योगिकियों और व्यवहारों में एक व्यापक परिवर्तन है जो एक स्रोत से दूसरे स्रोत में ऊर्जा को बदलने के ज़रूरी है। पिछले दशक में अगर देखा जाये तो मानव जाति ने अपने अतीत में कई ऊर्जा संक्रमणों का अनुभव किया है। जलवायु परिवर्तन एक अस्तित्व संबंधी संकट है जो

मानव इतिहास के क्रम को बदतर दिशा की ओर बदल देने की क्षमता रखता है। जीवाष्म ईंधन पारंपरिक ऊर्जा स्रोत हैं जो जलवायु परिवर्तन में सबसे बड़े योगदानकर्ता हैं। वे वैश्विक ग्रीनहाउस गैस उत्सर्जन के 75 प्रतिशत से अधिक भाग के लिये और सभी कार्बन डाइऑक्साइड उत्सर्जनों के लगभग 90 प्रतिशत भाग के लिये जिम्मेदार हैं। बेहतर भविष्य के लिये, हरित ऊर्जा एक प्रमुख समाधान है जिसके माध्यम से वर्ष 2070 तक भारत के शुद्ध शून्य उत्सर्जन के लक्ष्य को भी पूरा किया जा सकता है।

स्वच्छ ऊर्जा तथा हरित ऊर्जा को बढ़ावा देने में जी-20 की भूमिका

हरित ऊर्जा (Green energy) नवीकरणीय स्रोतों से प्राप्त ऊर्जा के लिये प्रयुक्त शब्द है। हरित ऊर्जा को प्रायः स्वच्छ, सतत या नवीकरणीय ऊर्जा के रूप में भी जाना जाता है।

हरित ऊर्जा का उत्पादन वायुमंडल में जहरीली ग्रीनहाउस गैसों का उत्सर्जन नहीं करता, जिसका अर्थ है कि यह बहुत कम (या नगण्य) पर्यावरणीय प्रभाव डालता है। कुछ महत्वपूर्ण हरित ऊर्जा स्रोतों में सौर, पवन, भूतापीय, बायोगैस, निम्न-प्रभाव पनबिजली और कुछ योग्य बायोमास स्रोतों द्वारा उत्पादित बिजली शामिल हैं। भारत दुनिया का तीसरा सबसे बड़ा ऊर्जा उपभोगकर्ता देश है। वर्ष 2000 के बाद से ऊर्जा का उपयोग दोगुना हो गया है, जहाँ 80% मांग अभी भी कोयला, तेल और ठोस बायोमास द्वारा पूरी की जा रही है। प्रति व्यक्ति आधार पर देखें तो भारत का ऊर्जा उपयोग और उत्सर्जन वैश्विक औसत के आधे से भी कम है। वर्ष 2019 में भारत ने घोषणा की कि वह वर्ष 2030 तक नवीकरणीय ऊर्जा की अपनी स्थापित क्षमता को 450 तक ले जाएगा।

उत्पादन-संबद्ध प्रोत्साहन योजना (PLI) नवीकरणीय ऊर्जा के लिये कच्चे माल के उत्पादन हेतु विनिर्माण क्षेत्र के संवर्धन के संबंध में भारत सरकार की एक और पहल है। पीएम-कुसुम (प्रधानमंत्री-किसान ऊर्जा सुरक्षा एवं उत्थान महाभियान) का लक्ष्य वर्ष 2022 तक 25,750 मेगावाट की सौर ऊर्जा क्षमता का दोहन कर किसानों को वित्तीय एवं जल सुरक्षा प्रदान करना है। जल पंपों का सोलराइजेशन उपभोक्ता के दरवाजे पर उपलब्ध बिजली वितरण की दिशा में एक कदम है। नवीन और नवीकरणीय ऊर्जा मंत्रालय अपनी वेबसाइट पर अक्षय ऊर्जा पोर्टल और इंडिया रिन्यूएबल आइडिया एक्सचेंज (IRIX) पोर्टल की भी होस्टिंग करता है। IRIX एक ऐसा मंच है जो ऊर्जा के प्रति जागरूक भारतीयों और वैश्विक समुदाय के बीच विचारों के आदान-प्रदान को बढ़ावा देता है। भारत हमेशा प्रकृति के अनुकूल जीवन शैली को बढ़ावा देने में विश्वास करता रहा है। रिड्यूस, रियूजिंग और रिसाइकल हमेशा से भारत के जीवन की अवधारणा रही है और इसी रास्ते पर चलते हुए सर्कुलर इकॉनोमी तेजी से इस संस्कृति का एक अभिन्न अंग बनती जा रही है। सरकार द्वारा चलाए जा रही विभिन्न ऊर्जा-बचत योजनाओं के कारण प्रति वर्ष 267.9 मिलियन टन CO₂ में कमी आई है, जिसके परिणामस्वरूप 18.5 बिलियन डॉलर की अनुमानित लागत की बचत हुई है। जलवायु परिवर्तन प्रदर्शन सूचकांक में शीर्ष पांच प्रदर्शन करने वाले देशों में स्थान प्राप्त करना भी देश के लिए एक उत्कृष्ट उपलब्धि है। हरित ऊर्जा की दिशा में निरंतर प्रयासों के कारण ही देश का प्रति व्यक्ति ग्रीनहाउस गैस उत्सर्जन विश्व औसत से काफी नीचे रहा है।

भारत के ऊर्जा क्षेत्र से संबंधित चुनौतियाँ

ऊर्जा निर्धनता एवं असमानता: भारत में ऊर्जा तक पहुँच एक बड़ी समस्या है और पहुँच की वृहत असमानताओं से देश ग्रस्त है। भारत में लगभग 77 मिलियन परिवार अभी भी रोशनी के लिये मिट्टी के तेल या केरोसिन का उपयोग करते हैं। ग्रामीण भारत में यह समस्या और भी विकट है, जहाँ लगभग 44% तक घरों में बिजली की सुविधा नहीं है। जबकि भारत ने ऊर्जा निर्धनता को दूर करने के लिये विभिन्न कार्यक्रमों और पहलों की शुरुआत की है, उन्हें स्थानीय स्तर पर तार्किक समस्याओं एवं अपर्याप्त कार्यान्वयन की स्थिति का सामना करना पड़ा है।

आयात पर निर्भरता और आपूर्ति शृंखला का शस्त्रीकरण: भारत का कच्चा तेल आयात बिल वर्ष 2022-23 की पहली छमाही में 76% बढ़कर 90.3 बिलियन अमेरिकी डॉलर तक पहुँच गया और कुल आयात मात्रा में 15% की वृद्धि हुई। आयातित तेल पर बढ़ती निर्भरता के साथ भारत की ऊर्जा सुरक्षा गंभीर दबाव में है, जबकि संकटग्रस्त भू-राजनीति के कारण वर्तमान में बाधित वैश्विक आपूर्ति शृंखला इस समस्या को और बढ़ा रही है। नवीकरणीय ऊर्जा के मामले में भी भारत सौर मॉड्यूल जैसी वस्तुओं के लिये व्यापक रूप से चीन जैसे अन्य देशों पर निर्भर है। सौर मूल्य शृंखला में पश्चगामी एकीकरण (Backward integration) अनुपस्थित है क्योंकि भारत में वर्तमान में सौर वेफर्स और पॉलीसिलिकॉन के निर्माण की कोई क्षमता नहीं है। यह परिदृश्य स्वच्छ ऊर्जा संक्रमण में बाधक है।

जलवायु परिवर्तन प्रेरित ऊर्जा संकट: जलवायु परिवर्तन प्रत्यक्ष रूप से ईंधन की आपूर्ति, ऊर्जा की आवश्यकता के साथ-साथ वर्तमान और भविष्य की ऊर्जा अवसंरचना के भौतिक लचीलेपन को प्रभावित करता है। जलवायु परिवर्तन से प्रेरित ग्रीष्म लहर (Heatwaves) और अनियमित मानसून पहले से ही मौजूदा ऊर्जा उत्पादन को दबाव में ला रहे हैं, जिससे जीवाश्म ईंधन उत्सर्जन को कम करना और भी महत्वपूर्ण हो गया है।

महिला स्वास्थ्य के लिये जोखिम: महिलाएँ घरेलू गतिविधियों में सक्रिय रूप से भाग लेती हैं और स्वास्थ्य जोखिम का सामना करती हैं जब दीर्घकालिक घरेलू ऊर्जा जलावन लकड़ी, कोयला एवं गोबर के उपले जैसे गैर-स्वच्छ स्रोतों से प्राप्त की जाती है। गैर-स्वच्छ ऊर्जा स्रोतों के उपयोग से महिलाओं में श्वसन, हृदय और मनोवैज्ञानिक रोगों का खतरा बढ़ जाता है तथा मातृ एवं शिशु मृत्यु दर की भी वृद्धि होती है।

कोयले की मांग एवं आपूर्ति के बीच बढ़ता अंतर: कोयला मंत्रालय के 2021 के आँकड़ों से पता चलता है कि कोयले की मांग और घरेलू आपूर्ति के बीच का अंतर बढ़ रहा है। पर्याप्त भंडार की उपलब्धता के बावजूद बड़े कोयला उत्पादक राज्यों में कोयले की निकासी में कमी आई है। बढ़ती कीमतों और बिजली संयंत्रों के साथ अनसुलझे लंबित अनुबंध संबंधी मुद्दों के कारण यह समस्या और भी गंभीर होती जा रही है।

बढ़ती मांग, बढ़ती ऊर्जा लागत: शहरीकरण और औद्योगीकरण की बढ़ती दर के साथ अंतर्राष्ट्रीय ऊर्जा एजेंसी (IEA) ने अपनी विश्व ऊर्जा आउटलुक रिपोर्ट में कहा है कि अकेले भारत की ऊर्जा आवश्यकता में ही प्रतिवर्ष 3% की वृद्धि होगी। इसके साथ ही, वैश्विक स्तर पर पेट्रोलियम की कीमतों में तेज वृद्धि हुई है।

आगे की राह हरित ऊर्जा के साथ महिला सशक्तिकरण को जोड़ना: ऊर्जा क्षेत्र में महिला सशक्तिकरण और उनका नेतृत्व स्वच्छ ऊर्जा को बढ़ावा देकर निम्न कार्बन अर्थव्यवस्था की ओर संक्रमण को गति देने में मदद कर सकता है। उपयुक्त संक्रमण (Just Transition) एक लैंगिक परिप्रेक्ष्य भी शामिल होना चाहिये ताकि कार्यबल में पुरुषों और महिलाओं दोनों के लिये हरित रोजगार अवसरों में समान अवसरों की गारंटी दी जा सके। विशेष रूप से घरों में जिम्मेदार माता, पत्नी और बेटी की तरह महिलाएँ उद्यमिता और नीति निर्माण में योगदान कर हरित ऊर्जा संक्रमण में भी महत्वपूर्ण भूमिका निभा सकती हैं।

हरित आपूर्ति शृंखला में विविधता लाना: स्वच्छ ऊर्जा की आपूर्ति शृंखलाओं को केवल विकसित देशों तक सीमित रखने के बजाय अधिकाधिक देशों तक विविधता करने की आवश्यकता है। इस संबंध में, COP27 के जलवायु वित्त एजेंडे को एक वाहक के रूप में इस्तेमाल किया जा सकता है। जैसे-जैसे पारंपरिक ऊर्जा स्रोतों को प्रतिस्थापित किया जाएगा, राजस्व एवं रोजगार कुछ भौगोलिक क्षेत्रों से दूसरे क्षेत्रों में स्थानांतरित होते जाएंगे और इसे सावधानी से प्रबंधित करने की आवश्यकता होगी।

न्यूनतम लागत ऊर्जा समाधानों में प्रोत्साहन प्रदान करना: भारत विश्वविद्यालय स्तर के नवाचारों को प्रोत्साहित कर सकता है जो भारत को आर्थिक रूप से व्यवहार्य स्वच्छ ऊर्जा संक्रमण को आगे बढ़ाने में मदद करेगा। इस प्रकार, भारत के जनसांख्यिकीय लाभांश का भी उपयोग किया जा सकता है और छात्रों को पारंपरिक शिक्षा की तुलना में अनुसंधान एवं नवाचार की ओर अधिक बढ़ावा दिया जाएगा। उदाहरण के लिये, उजाला कार्यक्रम ने एलईडी बल्बों की इकाई लागत में 75% से अधिक की कमी को संभव किया है। पर्यावरण, वानिकी और जलवायु परिवर्तन मंत्रालय ने संयुक्त राष्ट्र विकास कार्यक्रम (UNDP) के साथ संयुक्त रूप से 'इन अवर लाइफटाइम' (In Our Life Time) अभियान शुरू किया है, जो 18 से 23 वर्ष आयुवर्ग के युवाओं से संवहनीय जीवनशैली के अनुकूल बनने और इसे बढ़ावा देने का आग्रह करता है और उन्हें प्रोत्साहित भी करता है। यह इस दिशा में एक अच्छा कदम है।

हरित परिवहन पर ध्यान केंद्रित करना: सार्वजनिक परिवहन की पुनर्कल्पना करने और इसके प्रति भरोसे की पुनर्बहाली की आवश्यकता है। इस क्रम में अधिक बसों की खरीद, ई-बसों को अपनाने, बस गलियारों एवं रैपिड ट्रांजिट सिस्टम के निर्माण के साथ ही सार्वजनिक परिवहन के डिजिटलीकरण जैसे प्रयास किये जा सकते हैं।

जैव ईंधन द्वारा जीवाश्म ईंधन को प्रतिस्थापित किये जाने के साथ ही उत्सर्जन मानदंडों को कठोर बनाया जाना चाहिये। विद्युतीकरण को बढ़ावा देने के लिये विभिन्न इलेक्ट्रिक फ्रेट कॉरिडोर का विकास भी इलेक्ट्रिक वाहनों के लाभों को प्राप्त कर सकने के लिये महत्वपूर्ण है। ऊर्जा संक्रमण के प्रति बहुक्षेत्रीय शिटकोण: भारत में भविष्य का विकास विभिन्न मोर्चों पर प्रत्यास्थता की मांग करेगा, जैसे ऊर्जा प्रणाली डिजाइन, शहरी विकास, औद्योगिक विकास एवं आंतरिक आपूर्ति-शृंखला प्रबंधन और गरीबों की आजीविका। वितरित ऊर्जा प्रणालियों और घरेलू विनिर्माण को बढ़ावा देकर भारत कमोडिटी आयात एवं विदेशी आपूर्ति शृंखलाओं के लिये अपने जोखिम को धीरे-धीरे कम कर सकता है।

भारत की विनिर्माण क्षमता और प्रौद्योगिकीय नेतृत्व उसे अवसर दे रहा है कि वह 'मेक इन इंडिया' का लाभ उठाते हुए देश को एक अधिक आत्मनिर्भर हरित अर्थव्यवस्था और वैश्विक स्तर पर प्रतिस्पर्धी हरित ऊर्जा निर्यात केंद्रों में बदल दे। हरित ऊर्जा से संबद्ध चक्रीय अर्थव्यवस्था समाधान भारत की भविष्य की अर्थव्यवस्था की एक प्रमुख विशेषता बननी चाहिये।

जलवायु परिवर्तन एवं जी-20

जी-20 एनर्जी ट्रांजिशन वर्किंग ग्रुप के सामूहिक प्रयास प्राथमिकता वाले क्षेत्रों में काफी उत्पादक साबित होने की क्षमता रखते हैं। ग्लोबल वार्मिंग और जलवायु परिवर्तन की चुनौतियों का सामूहिक रूप से मुकाबला करते हुए सदस्य देशों ने ऊर्जा सुरक्षा प्राप्त करने और नए ऊर्जा स्रोतों की आपूर्ति शृंखलाओं में विविधता लाने पर सहमति व्यक्त की है। ऊर्जा दक्षता और परिवर्तन के लिए कम लागत वाले वित्तपोषण सहित सभी महत्वपूर्ण मुद्दों पर भाग लेने वाले सभी प्रतिनिधियों ने अच्छी प्रतिक्रियाएं दी हैं। निःसंदेह सुझाव और सिफारिशें हरित ऊर्जा के क्षेत्र में एक नए युग का मार्ग प्रशस्त करेंगी। हरित क्षेत्र में आगे आकर लीड करने के लिए पीएम मोदी ने E20 ईंधन लॉन्च किया, जो पेट्रोल के साथ 20% इथेनॉल का मिश्रण है। भारत का लक्ष्य 2025 तक इथेनॉल के पूर्ण 20% सम्मिश्रण को प्राप्त करना है और और तेल विपणन कंपनियां 2जी-3जी इथेनॉल संयंत्र स्थापित कर रही हैं, जो इस क्षेत्र में आगे बढ़ने में और सहायक सिद्ध होगी। भारत ने पहले ही 2030 तक उत्सर्जन की तीव्रता को 45% तक कम करने और 2030 तक गैर-जीवाश्म ईंधन-आधारित ऊर्जा संसाधनों से 50% संचयी विद्युत शक्ति स्थापित क्षमता प्राप्त करने की अपनी प्रतिबद्धता व्यक्त की है। ये लक्ष्य COP 26 में घोषित दुनिया के लिए भारत के 'पंचामृत' का एक हिस्सा हैं।

केंद्रीय बजट 2023 में हरित औद्योगिक और आर्थिक परिवर्तन की शुरुआत करने के लिए 2070 तक 'पंचामृत' और नेट-जीरो कार्बन उत्सर्जन पर स्पष्ट रूप से बता करते हुए बहुत अधिक जोर दिया गया है। इसके साथ ही विशेष रूप से हरित ऊर्जा क्षेत्र को मजबूत करने और विस्तार देने पर फोकस किया गया है। भारत विजन 'LiFE' के लिए 'हरित विकास' पर ध्यान केन्द्रित करके पर्यावरण के प्रति जागरूक जीवन शैली के आंदोलन को बढ़ावा देना चाहता है। बजट में हाल ही में घोषित राष्ट्रीय हरित हाइड्रोजन मिशन का उल्लेख किया गया है, जो निश्चित रूप से अर्थव्यवस्था को कम कार्बन

तीव्रता के संक्रमण की सुविधा प्रदान करेगा और जीवाश्म ईंधन आयात पर निर्भरता कम करेगा। भारत इस उभरते क्षेत्र में बाजार का नेतृत्व कर 2030 तक 5 MMT के वार्षिक उत्पादन तक पहुंचना चाहता है। इसके अलावा, बजट में ऊर्जा संक्रमण नेट-जीरो उद्देश्यों और ऊर्जा सुरक्षा की दिशा में प्राथमिकता वाले पूंजी निवेश के लिए 35,000 करोड़ रुपये का प्रस्ताव किया गया है। इसके तहत 4,000 MWH की क्षमता वाली बैटरी एनर्जी स्टोरेज सिस्टम का समर्थन किया जाएगा। बजट में निकासी के लिए इंटर स्टेट ट्रांसमिशन सिस्टम और लद्दाख से 13 GW अक्षय ऊर्जा का ग्रिड एकीकरण भी 20,700 करोड़ रुपये के निवेश के साथ प्रस्तावित किया गया है, जिसमें 8,300 करोड़ रुपये की केंद्रीय सहायता शामिल है। कंपनियों, व्यक्तियों और स्थानीय निकायों द्वारा पर्यावरण की दृष्टि से स्थायी कार्यों को प्रोत्साहित करके व्यवहार परिवर्तन को प्रोत्साहित करने के लिए एक ग्रीन क्रेडिट कार्यक्रम की रूपरेखा भी तैयार की गई है। साथ ही धरती को बचाने के लिए वैकल्पिक उर्वरकों और रासायनिक उर्वरकों के संतुलित उपयोग को भी बढ़ावा दिया जा रहा है।

सर्कुलर इकॉनोमी को बढ़ावा देने के लिए गोबरधन योजना के तहत 500 नए 'कचरे से धन' संयंत्रों की स्थापना केंद्र की अत्यधिक फ्यूचरिस्टिक योजना की ओर इशारा करता है, जिसमें 200 कंप्रेस्ड बायोगैस संयंत्र, शहरी क्षेत्रों में 75 संयंत्र, और 10,000 करोड़ रुपये के कुल निवेश पर 300 समुदाय या क्लस्टर आधारित संयंत्र शामिल हैं। दुनियाभर में मृदा संरक्षण के पहल में एक सक्रिय भागीदार होने के नाते, भारत अगले तीन वर्षों में एक करोड़ से अधिक किसानों को प्राकृतिक खेती अपनाने में मदद करेगा। इसके अलावा, राष्ट्रीय स्तर पर वितरित सूक्ष्म उर्वरक और कीटनाशक निर्माण नेटवर्क बनाने के लिए 10,000 जैव-इनपुट संसाधन केंद्र स्थापित करने के प्रस्ताव की घोषणा, 'मैंग्रोव इनिशिएटिव फॉर शोरलाइन हैबिटैट्स एंड टैजिबल इनकम' और अमृत धरोहर योजना, पर्यावरण संरक्षण, जैव-विविधता, कार्बन स्टॉक और इको-टूरिज्म के माध्यम से स्थानीय समुदायों के लिए आय सृजन को बढ़ावा देना सुनिश्चित है।

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Psychological Impacts of Climate Change on Human Health

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Climate change is one of the great challenges of 21st century. The consequences of climate change on exposed biological subjects as well as on vulnerable societies are a concern for the entire scientific community. Rising temperatures, heat waves, floods, hurricanes, droughts, fires, loss of forest and glaciers, along with disappearance of rivers and desertification can directly and indirectly cause human pathologies that are physical and mental. Climate change is negatively affecting the mental health and emotional wellbeing of people around the world. Researches shows that there is a clear relationship between increased temperatures and number of suicides, severe distress, depression, PTSD and many more psychological problems. People who meet criteria for mental illness are more vulnerable to the effects of climate change on physical as well as mental health. The climate crisis threatens to disrupt the provision of care for people with a mental illness diagnosis. Climate change exacerbates mental distress, particularly among young people, even for individuals who are not directly affected (e.g. ‘eco-anxiety’).

INTRODUCTION

Climate is commonly defined as the weather averaged over a long period. In other words, it is the long-term weather pattern in a region, typically averaged over 30 years. More rigorously, it is the mean and variability of meteorological variables over a time spanning from months to millions of years. Some of the meteorological variables that are commonly measured are temperature, humidity, atmospheric pressure, wind, and precipitation. In a broader sense, climate is the state of the components of the climate system, including the atmosphere, hydrosphere, cryosphere, lithosphere and biosphere and the interactions between them. Sometimes we used the word ‘climate’ and ‘weather’ interchangeably but the difference between climate and weather is usefully summarized by the popular phrase “**Climate is what you expect, and weather is what you get.**”

Over historical time span, there are a number of nearly constant variables that determine climate, including latitude, longitude, terrain, altitude, land use and

nearby water bodies , proportion of land to water, and proximity to oceans and mountains. All of these variables change only over periods of millions of years due to processes such as plate tectonics. Other climate determinants are more dynamic in nature. The variables which determine climates are numerous and the interactions complex, but there is general agreement that the broad outlines are understood, at least insofar as the determinants of historical climate change are concerned.

Climate change refers to long-term fluctuations in temperature and weather patterns. Variations in the solar cycle are generally responsible for such fluctuations. But, since the 1800s human activities such as burning of fossil fuels and coal have been the drivers for such changes. (1) When fossil fuels are burned, it causes combustion which increases the heat and light leading to rise in the temperature of the earth, also known as Greenhouse effect. For E.g.: Deforestation is one of the major reasons for increased emission of Carbon-Dioxide, Garbage landfills are primary source for methane emissions and if we look around the waste production has tremendously increased over the years. Also, Industrialization, fuel- based transportation and rampant construction are other major contributors for increased greenhouse gas emissions.

Greenhouse gas concentrations are at their highest levels in 2 million years. Emissions are continuing to rise. As a result, the Earth is presently around 1.1 degrees Celsius warmer than it was in the late 1800s. The most recent decade (2011-2020) has been the warmest on record. It is perceived that climate change mainly entails higher temperatures. However, the temperature rise is merely the beginning of the narrative. As everything is interconnected in the ecosystem, thus, shifts in one aspect will equally impact others. Research has shown that, if the global average surface temperatures rise between 1.5-2 degrees, then world's wealthiest countries will experience fewer changes in their local climate as well as crop yields due to well-built information systems in place whereas low income or less developed countries will suffer more in terms of food security and food safety due to climate change and lesser resilient crop infrastructure.

Warmer temperatures over time are changing weather patterns and disrupting the usual balance of nature, posing many risks to human beings and all other forms of life on earth. Nearly all land areas are seeing more hot days and heat waves; 2021 was one of the hottest years on record. Higher temperatures increase heat-related illnesses and can make it more difficult to work and move around. Wildfires start more easily and spread more rapidly when conditions are hotter. The consequences of climate change now include:

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- Intense Droughts
- Water Scarcity
- Severe Fires
- Rising Sea Levels
- Flooding
- Melting Polar Ice
- Catastrophic Storms
- Declining Biodiversity
- Loss Of Species
- Not Enough Food
- Poverty And Displacement
- More Health Risks and many more

Climate change is the single biggest health threat facing humanity. Climate impacts are already harming health, through air pollution, disease, extreme weather events, forced displacement, and increased hunger and poor nutrition in places where people cannot grow or find sufficient food. Every year, environmental factors take the lives of around 13 million people. Changing weather patterns are expanding diseases, and extreme weather events increase deaths and make it difficult for health care systems to keep up. Climate change does not only affect people physically but also gives a pressure on their mental health.

Mental Health impacts of climate change are significant sources of stress for individuals and communities. The social and mental health consequences of extreme and slow-moving weather events are well documented, ranging from minimal stress and distress symptoms to clinical disorder, including depression, anxiety, post-traumatic stress, and suicidal thoughts (Arnberg et al., 2013; Fullerton et al., 2013; North et al., 2004). High risk coping behavior, such as alcohol use, has been associated with climate related weather events (Flory et al. 2009; Rohrbach et al., 2009). Intimate partner violence may increase as well, with women being particularly affected (Harville et al., 2011; Fisher, 2010). Suicidal thoughts and behavior have been shown to increase following extreme weather events (Kessler et al., 2008; Larrance et al., 2007). In addition, population displacement and migrations, breakdown of community infrastructure, food scarcity, loss of employment, and poor sense of social support

and connectedness have serious consequences for mental health (Chan et al., 2015; Benight et al. 1999; Ursano et al., 2014).

The threat of climate change can be a significant psychological and emotional stressor. Individuals and communities are affected both by direct experience of local events attributed to climate change, and by exposure to information regarding climate change and its effects (Leiserowitz et al., 2013; Reser et al., 2014). Communication and media messages about climate change can affect perceptions of physical and societal risks and projected consequences that may subsequently affect the public's understanding, mental health, climate and change-related behaviors (Schmidt et al., 2013; O'Neill and Nicholson-Cole, 2009). Climate change is experienced by some as a distant phenomenon without tangible impact on themselves or their loved ones and, for others, climate change may be seen as so powerful and overwhelming, the response is denial and avoidance (Smith & Joffe, 2013). A lack of understanding regarding climate change and its implications for human health can result in behaviors marked by passivity and continuation of actions that worsen climate change (Koh, 2016). The perception of risk regarding climate change, belief in the ability to effect change, and the etiology attributed to extreme weather events are important factors impacting the decisions people make regarding climate change related behaviors (Spence et al., 2012).

Various populations are particularly vulnerable to the mental health effects of climate change and warrant special consideration. Among those at increased risk are children, elderly, the chronically ill including those with mental illnesses and mobility impairments, and women especially pregnant and post-partum women (Norris et al., 2002; Rahman, 2013; La Greca et al., 1996; Xiong et al., 2010; Bei et al., 2013; Somasundaram & van de Put, 2006). Those from lower socio-economic status, including many minority populations and as well as migrants, refugees and the homeless, are also disproportionately impacted by climate change as a result of disparities in infrastructure, health resources, and social and economic mobility (Berry et al., 2010; Ramin et al., 2009; Fritze et al., 2008; Rhodes et al., 2010). These populations are at increased risk of developing psychiatric and psychological symptoms. Those working as first responders to climate-related natural disasters also experience significantly higher rates of adverse psychological effects (Benedek et al., 2007; Alexander & Klein, 2009). Individuals with pre-existing mental illness may be particularly vulnerable due to cognitive impairment associated with many psychiatric disorders as well as reduced motivation that may negatively impact self-care under stress (Berry et al., 2010; Sullivan et al., 2013). The effects of climate changes on mental health and well-being are not isolated but interact with other

social and environmental stressors. The added burden of higher incidences of poverty, poor community infrastructure, sub-standard housing or homelessness, and coincidence of substance abuse all contribute to amplifying the risks for the mentally ill. Individuals taking psychotropic medications may experience diminished heat regulation and impaired fluid homeostasis, resulting in adverse medical events (Martin-Latry et al., 2007; Berko et al., 2014). Severe weather events can damage community support systems and the infrastructure that patients rely upon, leaving those most vulnerable even more isolated and alone, further diminishing their ability to cope (Galea et al., 2008).

The 2022 Intergovernmental Panel on Climate Change (IPCC) also stated that there is a very high confidence that climate change has adversely affected mental health. With mental health problems holding back millions of people every day, it's crucial we understand how climate change might affect our mental health.

EXTREME WEATHER EVENTS AND MENTAL HEALTH

Climate change is leading to more frequent and extreme weather events such as floods and storms. People living through these can be exposed to potentially traumatic events such as witnessing serious injury or death. As a result, many people will experience higher levels of psychological distress and a minority may develop more serious mental health problems, such as post-traumatic stress disorder (PTSD), depression, or substance use disorders. Extreme weather events can also have impacts on some of the social and economic determinants of mental health by leading to unemployment, homelessness, or food and water insecurity. This can, in turn, also detrimentally affect mental health.

TRACKING THE HEALTH EFFECTS OF CLIMATE CHANGE AROUND THE WORLD

Heat and mental health

Climate change is causing temperatures around the world to rise, which can have a variety of detrimental impacts on mental health. For example, hospitalizations for psychiatric disorders and emergency psychiatric visits tend to increase during heat waves. Rates of suicides have also been shown to be higher during heat waves and are expected to increase with rising temperatures, although evidence on the link between heat and suicide remains mixed.

Heat can also disrupt sleep, and poor sleep can worsen mental health problems. One very large study that analyzed ten billion sleep observations found that warming nights are eroding human sleep globally and unequally, with this effect being three times larger for residents of lower- income countries.

Air pollution and mental health

Climate change and increasing temperatures have been shown to increase levels of allergens and pollutants present in the air, leading to worsened air quality. Emerging evidence suggests that poor air quality can negatively impact mental health, in particular depression and anxiety. One large study among all people aged over 65 years enrolled in Medicare in the US showed that short-term exposure to pollutants (PM2.5 and NO2) was associated with higher risk of acute hospital admission for psychiatric disorders.

Similarly, higher levels of air pollution have been linked with increased mental health service use among people living with psychotic or mood disorders in the UK. Exposure to air pollution during childhood and adolescence has also been shown to be associated with the development of mental health problems as young people transition into adulthood. It's suggested that this is due to air pollution impairing the normal development of the central nervous system.

Infectious disease and mental health

Climate change is a major factor in the emergence of infectious diseases in new parts of the world, such as malaria, dengue, and zika. The survival, reproduction, abundance and distribution of pathogens, vectors and hosts can be influenced by the changes associated with global heating.

A failure to slow global warming is providing many deadly diseases with the opportunity to expand their reach, putting the health of millions of people at risk. Physical and mental health is intrinsically intertwined. Being exposed to higher rates of infectious diseases can have significant detrimental impacts on mental health due to being hospitalized or living with the long-term consequences of severe infection. People living with certain conditions, such as neglected tropical diseases, can also face stigma and discrimination.

Climate anxiety and other emerging psychological reactions due to climate change

As well as direct exposure to climate hazards, a growing number of people report psychological reactions related to confronting the prospect of climate change. There is not a clinical diagnosis for these experiences, but there have been several attempts to capture them with new terms. These include (among others):

Solastalgia – the inability of finding solace in a familiar landscape due to environmental degradation

Ecological grief – the sense of loss emerging from experiencing environmental degradation

Climate anxiety – a feeling of anxiety in the face of climate change

One large study of 10,000 children and young people in 10 countries found that 45% of respondents said their feelings about climate change negatively impacted their daily functioning. Another study found that negative, climate-related emotions were associated with more symptoms of insomnia and poor mental health. Some argue that these represent adaptive and constructive psychological reactions to climate change, and that we should not pathologise them. There is emerging evidence that higher levels of climate anxiety can be, in some cases, linked to higher levels of pro-environmental behaviours.

Who is most at risk on the mental health impacts due to climate change?

Although climate change is a global phenomenon, its impacts are felt unequally across the world. The same is true for the effects of climate change on mental health, with communities and groups of people that are less able to adapt to climate change more likely to experience the brunt of its mental health consequences.

North America, and Australia, many of the places that are most vulnerable to climate change are in low- and middle-income settings. These communities are often most at risk to climate change exposures such as droughts and with fewer resources to adapt to them. One study conducted among Ethiopian pastoralists found that water insecurity contributed to extreme worry and fatigue.

Another small study in Tuvalu, a small island developing state in the Pacific Ocean highly vulnerable to climate change, found that a high proportion of respondents experienced psychological distress in relation to climate change stressors to a degree that caused impairment in one or more areas of daily life.

Indigenous communities can be particularly connected and dependent on the natural environment surrounding them, putting them at a higher risk of experiencing poor mental health due to climate change. These communities also possess important forms of local knowledge and expertise that can contribute to their resilience and inform climate change responses in other areas of the world.

LAND BODY ECOLOGIES

Land Body Ecologies (LBE) is a global trans disciplinary network exploring solastalgia, a concept that sheds light on mental distress specifically caused by environmental change. They bring together land-dependent and indigenous

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communities at the forefront of today's environmental crisis and land rights issues, and connect collaborators in a range of fields – from human rights, medicine or psychology to arts, design, sociology and ecology – across a network located in Finland, India, Kenya, Thailand, Uganda and the UK.

Other groups considered to be particularly at risk of experiencing poor mental health due to climate change include:

- young people
- women
- older adults
- people experiencing homelessness
- people living with severe mental and physical health problems

How can we prevent and manage the impacts of climate change on mental health?

To avoid the worst impacts of climate change on health we must transition away from our dependence on fossil fuels towards clean, renewable energy, stop deforestation and restore our natural habitats. Different forms of climate change mitigation strategies can have multiple co- benefits with mental health. Shifting to more active modes of transport where possible, such as cycling or walking, can have positive impacts on mental health given the link between physical activity and mental health. Similarly, increasing access to green spaces can also have positive mental health impacts. Research has shown that being in a green space such as a forest or a park, even if just for 15 minutes, can immediately and momentarily improve mood and reduce feelings of anxiety for young people.

Even if we reduce emissions and meet global targets of zero emissions by 2050, many of the impacts of global warming are now irreversible. So, to protect the health of populations into the future it is essential that we also adapt to ongoing climate change.

Multiple effective evidence-based interventions for different mental health disorders exist. Some have been tested in settings that may be particularly relevant to climate change, such as disasters or with migrant and refugee populations. However, more research is needed on how to intervene as early as possible to promote mental health and prevent and manage mental health problems in the context of climate change.

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Many NGO's work envisions a world where catastrophic climate breakdown is averted in a way that allows human health to flourish. This includes a future in which no one is held back by mental health problems in the context of climate change.

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Economic Impacts of Climate Change: Risks and Opportunities for G-20 Economies

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Climate change is one of the most significant challenges facing the world today and its economic impacts are felt across various sectors, industries, and countries. The G-20 countries, which represent the world's largest economies, are particularly vulnerable to the economic risks and opportunities of climate change. This paper examines the economic risks and opportunities of climate change for the G-20 countries. The economic risks associated with climate change include physical risks, transition risks, liability risks, and financial risks. The opportunities presented by the transition to a low-carbon economy include job creation, innovation, cost savings, and improved public health. Governments and businesses must take action to mitigate the economic risks of climate change and capitalize on the opportunities presented by the transition to a low-carbon economy. The G-20 countries must work together to create a more sustainable and resilient future.

1. INTRODUCTION

Climate change is a global problem that has significant economic implications for countries around the world. The G-20 countries, which include the world's largest economies, are particularly vulnerable to these impacts. This paper will examine the economic risks and opportunities of climate change for the G-20 countries.

Climate change is one of the most significant challenges facing the world today, and its economic impacts are felt across various sectors, industries, and countries. The G-20 countries, which represent the world's largest economies, are particularly vulnerable to the economic risks and opportunities of climate change. As the global population continues to grow, and greenhouse gas emissions continue to rise, the economic impacts of climate change will become more severe.

This paper will explore the economic risks and opportunities of climate change for the G-20 countries. The paper will begin by outlining the potential economic risks associated with climate change, including physical risks, transition risks, liability risks, and financial risks. It will then discuss the opportunities presented by the

transition to a low-carbon economy, including job creation, innovation, cost savings, and improved public health.

The paper will conclude by emphasizing the need for governments and businesses to take action to mitigate the economic risks of climate change and capitalize on the opportunities presented by the transition to a low-carbon economy. The G-20 countries have a critical role to play in addressing the economic impacts of climate change, and they must work together to create a more sustainable and resilient future.

2. ECONOMIC RISKS

The economic risks of climate change for G-20 countries are significant and varied. They include:

- 1. Physical Risks:** These risks arise from the direct impacts of climate change, such as extreme weather events, sea-level rise, and droughts. These events can damage infrastructure, reduce productivity, and increase the cost of goods and services.
- 2. Transition Risks:** These risks arise from the transition to a low-carbon economy. As countries reduce their greenhouse gas emissions, there will be winners and losers. Companies that rely on fossil fuels will be negatively impacted, while those that invest in renewable energy will benefit.
- 3. Liability Risks:** These risks arise from the legal liability associated with climate change. For example, companies may be held responsible for the damages caused by their emissions.
- 4. Financial Risks:** These risks arise from the potential for stranded assets, as companies that rely on fossil fuels become obsolete. This could lead to financial instability and market disruptions.

3. OPPORTUNITIES

While there are significant economic risks associated with climate change, there are also opportunities for the G-20 countries. These opportunities include:

1. Job Creation: The transition to a low-carbon economy will create new jobs in sectors such as renewable energy, energy efficiency, and sustainable agriculture.

2. Innovation: The need to reduce greenhouse gas emissions will drive innovation in new technologies and processes, creating opportunities for companies that can develop and commercialize these innovations.

3. Cost Savings: Investing in energy efficiency and renewable energy can reduce costs for households and businesses, providing economic benefits.

4. Improved Public Health: Reducing greenhouse gas emissions can also lead to improvements in public health, as air pollution is a significant contributor to respiratory illness.

5. Policy Responses: Economic risks and opportunities of climate change require policy responses that are both effective and equitable. Carbon pricing, through taxes or emissions trading schemes, can provide a financial incentive for companies to reduce their greenhouse gas emissions.

6. Renewable Energy Incentives: Government incentives for renewable energy, such as subsidies or feed-in tariffs, can encourage investment in renewable energy projects.

7. Energy Efficiency Standards: Energy efficiency standards for buildings and appliances can reduce energy demand and lower costs for consumers.

8. Green infrastructure investment: Investment in green infrastructure, such as public transportation and renewable energy infrastructure, can create jobs and stimulate economic growth.

9. Case Studies: Including case studies of specific G-20 countries could help illustrate the economic risks and opportunities of climate change in practice. For example, examining the impact of sea-level rise on coastal infrastructure in a country like Indonesia, or the economic benefits of renewable energy investment in Germany.

10. Equity Considerations: Climate change is likely to have a disproportionate impact on vulnerable populations, including low-income communities and Indigenous people. An analysis of the economic risks and opportunities of climate change should consider equity considerations and ways to ensure that the benefits of the transition to a low-carbon economy are shared fairly.

11. International Co-operation: Climate change is a global problem that requires international cooperation to address. The G-20 countries have an important role to play in global climate governance, and the economic impacts of climate change must be considered in the context of international cooperation and coordination.

12. Business Responses: Businesses also have a critical role to play in addressing the economic risks and opportunities of climate change. An analysis of

the economic impacts of climate change could include an examination of business responses, such as corporate social responsibility initiatives, green procurement policies, and investments in renewable energy.

13. Public Opinion: Public opinion is an important factor in shaping policy responses to climate change. An analysis of the economic impacts of climate change could include a discussion of public attitudes towards climate change and their potential impact on policy responses.

14. Agriculture and Food Security: Climate change can have significant impacts on agriculture and food security. An analysis of the economic impacts of climate change for G-20 economies should consider the potential effects on food production, prices, and trade, as well as the economic opportunities associated with climate-smart agriculture and sustainable food systems.

15. Health Impacts: Climate change can also have significant impacts on human health, including through the spread of disease, heat-related illnesses, and mental health impacts. An analysis of the economic impacts of climate change for G-20 economies should consider the potential costs associated with these health impacts, as well as the economic benefits associated with investing in public health measures to mitigate these risks.

16. Energy Transition and Resource Extraction: The transition to a low-carbon economy will require significant changes to the energy mix of G-20 economies, including a shift away from fossil fuels towards renewable energy. An analysis of the economic impacts of climate change for G-20 economies should consider the potential costs and benefits associated with this transition, including the impacts on resource extraction industries and their workers.

17. International Trade and Competitiveness: Climate change and the transition to a low-carbon economy can have significant implications for international trade and competitiveness. An analysis of the economic impacts of climate change for G-20 economies should consider the potential impacts on trade flows, the competitiveness of different industries, and the potential for cooperation or conflict between countries.

18. Financing The Transition: The transition to a low-carbon economy will require significant investments in new technologies and infrastructure. An analysis of the economic impacts of climate change for G-20 economies should consider the potential financing mechanisms available to support this transition, including public and private investment, international climate finance, and carbon pricing mechanisms.

By considering these additional factors, a comprehensive analysis of the economic impacts of climate change for G-20 economies can provide a more nuanced and complete understanding of the risks and opportunities associated with this global challenge.

The economic impacts of climate change for G-20 economies are significant and wide-ranging, with risks and opportunities for both developed and developing countries. This paper has reviewed the existing literature on this topic and identified several key findings:

1. Economic Risks: Climate change poses significant economic risks for G-20 economies, including damage to infrastructure and property, disruptions to supply chains and trade, and increased costs associated with extreme weather events and sea level rise. These risks are likely to have the greatest impact on developing countries, which are often the most vulnerable to climate-related impacts.

2. Economic Opportunities: While climate change presents significant economic risks, it also offers opportunities for G-20 economies to transition to a low-carbon economy and take advantage of new markets and industries. This includes investments in renewable energy, energy efficiency, and sustainable infrastructure, which can create new jobs and spur economic growth.

3. Policy Responses: G-20 countries have implemented a range of policy responses to address the economic impacts of climate change, including carbon pricing mechanisms, renewable energy subsidies, and regulations on emissions. However, the effectiveness of these policies varies depending on a range of factors, including policy design, political will, and technological readiness.

4. Need for International Co-operation: Climate change is a global challenge that requires international co-operation to effectively address. G-20 countries have a key role to play in driving international action on climate change, including through participation in the United Nations Framework Convention on Climate Change and other multilateral climate agreements.

5. Knowledge Gaps: Despite significant research on the economic impacts of climate change for G-20 economies, there are still significant knowledge gaps in understanding the complex interactions between climate change and the economy. Future research is needed to better understand the effectiveness of different policy responses, the role of innovation and technology, and the implications of climate change for international development and global economic governance.

Overall, this paper highlights the need for continued research and action on the economic impacts of climate change for G-20 economies. By understanding the risks and opportunities presented by climate change, policymakers can develop effective strategies to mitigate risks and capitalize on opportunities, while working towards a more sustainable and resilient future for all.

4. FUTURE SCOPUS

The future of research on the economic impacts of climate change for G-20 economies will likely continue to focus on identifying and evaluating effective policy responses to mitigate the risks and capitalize on the opportunities presented by this global challenge. Here are some potential future directions for research in this area:

1. Integration of Climate Change and Economic Models: To better understand the complex interactions between climate change and the economy, future research may explore the integration of climate change and economic models. This could involve the development of new integrated models that incorporate both economic and climate data, or the adaptation of existing models to include climate change scenarios.

2. Assessing the Effectiveness of Policy Responses: As G-20 countries continue to implement policies to address climate change, future research may focus on evaluating the effectiveness of these responses in mitigating economic risks and capitalizing on opportunities. This could involve assessing the economic impacts of specific policies, such as carbon pricing or renewable energy subsidies, and identifying best practices for policy design and implementation.

3. The Role of Innovation and Technology: Innovation and technological advancements will play a critical role in the transition to a low-carbon economy. Future research may explore the potential economic impacts of different technological solutions, such as carbon capture and storage, electric vehicles, or advanced renewable energy systems. Additionally, research may explore the factors that drive or inhibit technological innovation in the context of climate change.

4. Climate Change and International Development: Climate change is likely to have significant impacts on developing countries, which are often the most vulnerable to its effects. Future research may explore the economic impacts of climate change on developing countries, and identify strategies for supporting economic development while mitigating climate risks.

5. Implications For Global Economic Governance: As G-20 countries continue to address the economic impacts of climate change, future research may

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explore the implications of these efforts for global economic governance. This could involve analyzing the role of international organizations, such as the United Nations Framework Convention on Climate Change, in shaping global economic policy in the context of climate change.

Overall, the future of research on the economic impacts of climate change for G-20 economies will likely continue to be interdisciplinary and collaborative, bringing together insights from economics, climate science, political science, and other fields to inform effective policy responses.

5. CONCLUSION

The economic impacts of climate change are significant and varied, and the G-20 countries are particularly vulnerable. However, there are also opportunities for these countries to benefit from the transition to a low-carbon economy. Governments and businesses must take action to mitigate the economic risks of climate change and capitalize on these opportunities. This will require significant investment in new technologies and processes, as well as policy changes to support the transition to a low-carbon economy. The G-20 countries have a critical role to play in addressing the economic impacts of climate change, and they must work together to create a more sustainable and resilient future.

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The role of the G20 in promoting sustainable consumption and production patterns

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“The best way to predict the future is to create it.” - Peter Drucker

The Group of Twenty (G20) is an international forum comprising 19 countries and the European Union. These 19 countries are Argentina, Australia, Brazil, Canada, China, Germany, France, India, Indonesia, Italy, Japan, the Republic of Korea, Mexico, the Russian Federation, Saudi Arabia, South Africa, Turkey, the UK, and the US. India holds the Presidency of the G20 from 1 December 2022 to 30 November 2023.

“The 18th Heads of State and Government Summit of the Group of 20 (G20) will take place in September 2023 in New Delhi, India. Under the Indian Presidency, the G20 in 2023 will focus on the theme, ‘One Earth, One Family, One Future’. The theme affirms the value of human, animal, plant, and microorganisms and their interconnectedness on planet Earth and in the wider universe”. (IISD September 2023)

The G20 brings together the world’s major economies to discuss and coordinate on global economic issues. The G20 aims to promote global economic stability, sustainable development, and inclusive growth. Its primary objectives are:

1. Economic Cooperation: The G20 seeks to enhance cooperation among its member countries to address global economic challenges. This includes promoting open trade, investment, and financial market stability, as well as coordinating macroeconomic policies to achieve strong, sustainable, and balanced growth.

2. Financial Stability: The G20 focuses on strengthening the international financial system to prevent future financial crises. It aims to improve financial regulation and supervision, enhance transparency and accountability in financial markets, and promote measures to mitigate systemic risks.

3. Development: The G20 recognizes the importance of inclusive and sustainable development worldwide. It works to promote policies that support poverty

reduction, job creation, and infrastructure investment in both advanced and developing economies. Additionally, the G20 supports efforts to achieve the United Nations Sustainable Development Goals (SDGs).

4. Global Governance: The G20 aims to enhance global governance by fostering dialogue and cooperation among its member countries. It seeks to improve the effectiveness and legitimacy of international institutions and promote a more inclusive and representative global governance framework.

5. Addressing Global Challenges: The G20 recognizes the need to tackle pressing global challenges that go beyond economic issues. These challenges include climate change, energy security, food security, digitalization, health crises, and other issues of common interest. The G20 strives to promote international cooperation and develop policy responses to these challenges.

It is important to note that the specific focus areas and priorities of the G20 may vary from year to year, depending on the global economic and geopolitical context. The G20 convenes annual summits where leaders discuss these objectives and work towards consensus on key issues.

“The Indian Presidency will also spotlight Lifestyle for Environment (LiFE), with an emphasis on environmentally sustainable and responsible choices at both the individual lifestyle and the national development level, with the aim of achieving a cleaner, greener, and bluer future. The Working Groups will focus on the following tracks: agriculture, anti-corruption, culture, digital economy, disaster risk reduction, development, education, employment, environment and climate sustainability, energy transitions, health, trade and investment, and tourism”. (IISD September 2023)

The role of the G20 in promoting sustainable consumption and production patterns is primarily centered around policy coordination, knowledge sharing, and fostering international cooperation. Here are some key aspects of the G20’s role in this context:

1. Policy Dialogue and Coordination: The G20 provides a platform for member countries to engage in dialogue and share experiences on sustainable consumption and production policies. This includes discussions on best practices, policy frameworks, and regulatory approaches that can promote sustainability across sectors.

2. Setting Agendas and Commitments: The G20 can set agendas and promote commitments to address sustainable consumption and production patterns. Through its declarations, communiqués, and action plans, the G20 encourages

member countries to adopt and implement measures that contribute to sustainable development goals, including those related to consumption and production.

3. Encouraging Resource Efficiency: The G20 aims to enhance resource efficiency by promoting the sustainable use of resources, reducing waste, and improving production processes. This includes efforts to develop and deploy cleaner technologies, promote circular economy approaches, and encourage sustainable supply chains.

4. Encouraging Green Finance and Investment: The G20 recognizes the importance of financial resources in supporting sustainable consumption and production. It encourages the mobilization of green finance and investment to support sustainable projects and technologies, including initiatives related to renewable energy, energy efficiency, and sustainable infrastructure.

5. Collaboration with International Organizations: The G20 collaborates with international organizations, such as the United Nations, World Bank, and International Monetary Fund, to promote sustainable consumption and production. This collaboration involves sharing expertise, coordinating efforts, and aligning policies to achieve common sustainability objectives.

6. Addressing Global Challenges: The G20 recognizes that sustainable consumption and production patterns are closely linked to broader global challenges, such as climate change, biodiversity loss, and social equity. By addressing these challenges collectively, the G20 aims to contribute to the overall sustainability agenda and create a positive impact on consumption and production patterns.

It's important to note that while the G20 plays a significant role in promoting sustainable consumption and production, the actual implementation of policies and actions lies with individual member countries. The G20 provides a platform for collaboration, knowledge exchange, and policy coordination, but it is up to the participating countries to translate these efforts into concrete actions within their own jurisdictions.

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भारत में जलवायु परिवर्तन के कारण, प्रभाव, चुनौतियां एवं जी - 20

सुनीति लता

सहायक प्रोफेसर, शिक्षा विभाग
गोकुलदास हिन्दू गर्ल्स डिग्री कॉलेज, मुरादाबाद

परिचय

भारत देश हमारा एक कृषि प्रधान देश है, जिसमें सम्पूर्ण संसार एक ही देश भारत है जहां पर अत्याधिक उत्पादन होता है और उत्पादन के लिए हमें जलवायु पर निर्भर रहना पड़ता है। जलवायु परिवर्तन को समझने से पूर्व यह समझ लेना आवश्यक है कि जलवायु क्या होती है? सामान्यतः जलवायु का आशय किसी दिये गए क्षेत्र में लंबे समय तक औसत मौसम से होता है। अतः जब किसी क्षेत्र विशेष के औसत मौसम में परिवर्तन आता है तो उसे जलवायु परिवर्तन (Climate Change) कहते हैं। जलवायु परिवर्तन को किसी एक स्थान विशेष में भी महसूस किया जा सकता है एवं संपूर्ण विश्व में भी। यदि वर्तमान संदर्भ में बात करें तो यह इसका प्रभाव लगभग संपूर्ण विश्व में देखने को मिल रहा है। पृथ्वी के समग्र इतिहास में यहाँ की जलवायु कई बार परिवर्तित हुई है एवं जलवायु परिवर्तन की अनेक घटनाएँ सामने आई हैं।

पृथ्वी का अध्ययन करने वाले वैज्ञानिक बताते हैं कि पृथ्वी का तापमान लगातार बढ़ता जा रहा है। पृथ्वी का तापमान बीते 100 वर्षों में 1 डिग्री फारेनहाइट तक बढ़ गया है। पृथ्वी के तापमान में यह परिवर्तन संख्या की दृष्टि से काफी कम हो सकता है, परंतु इस प्रकार के किसी भी परिवर्तन का मानव जाति पर बड़ा असर हो सकता है। जलवायु परिवर्तन के कुछ प्रभावों को वर्तमान में भी महसूस किया जा सकता है। पृथ्वी के तापमान में वृद्धि होने से हिमनद पिघल रहे हैं और महासागरों का जल स्तर बढ़ता जा रहा, परिणामस्वरूप प्राकृतिक आपदाओं और कुछ द्वीपों के डूबने का खतरा भी बढ़ गया है।

जलवायु परिवर्तन और भारत की चुनौतियां

न्यूयॉर्क में जलवायु परिवर्तन के मुद्दे पर हाल ही में आयोजित बैठक में स्वीडिश छात्रा ग्रेटा थनबर्ग ने सौ से भी अधिक देशों के प्रतिनिधियों को दो तीखे बयान दिए। पहला, “आपने अपनी खोखली बातों से मुझसे मेरा बचपन छीन लिया।” और दूसरा, “आप सभी, हम युवाओं के पास (पर्यावरण को पहुंचे नुकसान को कम करने की...) उम्मीद लेकर आए हैं। आप लोगों की हिम्मत कैसे हुई?” जैसा कि ग्रेटा के वक्तव्य पर दी हिंदू के 1 नवंबर के अंक में कृष्ण कुमार का संवेदनशील विश्लेषण कहता है, वहां मौजूद (देश के प्रतिनिधि) श्रोताओं ने यह नहीं स्वीकारा कि जलवायु परिवर्तन के लिए उनके उद्योग जिम्मेदार हैंय इसकी बजाय वे इस बात पर सहमत हुए कि वे आने वाले दशक

में कार्बन उत्सर्जन में कमी लाने के लिए सुविधाजनक लक्ष्यों को पूरा करेंगे। कृष्ण कुमार अपने लेख में आगे बताते हैं कि ना सिर्फ हर अमीर देश, बल्कि सभी देशों में रहने वाले प्रत्येक अमीर व्यक्ति को अब भी यह लगता है कि वे अपने और अपनी संतानों के लिए जलवायु परिवर्तन की समस्याओं से राहत खरीद सकते हैं और उन्हें जलवायु परिवर्तन के परिणामों से बचा सकते हैं।

कार्बन-प्रचुर जीवाश्म ईंधन को जला-जलाकर, जो 1750 के दशक में औद्योगिक क्रांति के साथ शुरू हुआ था, ही पृथ्वी का तापमान 2 डिग्री सेल्सियस बढ़ गया है। तापमान में यह वृद्धि मानव जीवन, जानवरों, पेड़-पौधों और सूक्ष्मजीवों को प्रभावित कर रही है। समुद्र गर्म हो रहे हैं, बर्फ पिघल रही है, और इसलिए ग्रेटा का यह आरोप पत्र है।

भारत की चुनौतियां

2015 में दुनिया भर के देश पेरिस में इकट्ठे हुए थे और तब 197 देशों ने इस समझौते पर हस्ताक्षर किए थे कि वे साल 2030 तक वैश्विक तापमान को उद्योग-पूर्व स्तर से 1.5 डिग्री से अधिक नहीं होने देंगे। इन हस्ताक्षरकर्ता देशों में भारत भी शामिल था। विष्णु पद्मनाभन ने अपने ब्लॉग में भारत के समक्ष तीन बड़ी जलवायु चुनौतियों का जिक्र किया है। भारत ने वादा किया है कि वह साल 2015 की तुलना में, साल 2030 तक अपने कार्बन उत्सर्जन को 33-35 प्रतिशत तक कम करेगा। ऐसा लगता है कि यह जरूरी है और इसे पूरा भी किया जा सकता है। लेकिन इसे पूरा करने में भारत के सामने पहली चुनौती यह है कि भारत का ज्यादातर कार्बन उत्सर्जन (लगभग 68 प्रतिशत) ऊर्जा उत्पादन से होता है, जो अधिकतर कोयला आधारित है। इसके बाद उद्योगों (लगभग 20 प्रतिशत) और खेती, खाद्य और भूमि उपयोग (10 प्रतिशत) का नंबर है। इसलिए यह महत्वपूर्ण हो जाता है कि हम ऊर्जा के अन्य साधनों या स्रोतों का उपयोग करें, जैसे पनबिजली, पवन, सौर, नाभिकीय ऊर्जा वगैरह आदि। भारत को उम्मीद है कि वह अपनी 40% ऊर्जा इस तरह के गैर-कोयला स्रोतों से प्राप्त कर पाएगा।

दूसरी चुनौती

खेती, भूमि उपयोग और जल संसाधनों की बात करें तो ये भी जलवायु परिवर्तन में योगदान देते हैं। कैसे? न्यूनतम समर्थन मूल्य, सब्सिडी (रियायतें), 24 घंटे मुफ्त बिजली प्रदाय और अधिक पानी की जरूरत वाली फसलें इसके कुछ कारण हैं। समय आ गया है कि हमें इन्हें रोकें और जांचे-परखे तरीकों को अपनाएं और नवाचारी तरीकों पर काम करें। इनमें से कुछ तरीके हैं ड्रिप या टपक सिंचाई (जैसा कि इस्राइल ने किया है), एयरोबिक खेती (जो पानी की बचत के लिए खेती का एक तरीका है और इसमें खास गुणधर्मों के विकास पर शोध किया जाता है ताकि जड़ें अच्छे से फैलें और जमीन में गहराई तक जाएं (जैसा कि बैंगलुरु की युनिवर्सिटी ऑफ एग्रीकल्चर साइंस ने किया है), बेहतर और अधिक पौष्टिक अनाज। भारत की सबसे अधिक पानी की खपत करने वाली फसल धान पर इस तरीके को आजमा कर पानी की बचत की जा सकती है। किसानों के बीच अधिक पौष्टिक किस्मों (जैसे

सीसीएमबी और एनआईपीजीआर द्वारा विकसित साम्बा मसूरी) को बढ़ावा देना चाहिए। इत्तफाकन इस किस्म में कार्बोहाईड्रेट भी कम है तो यह डायबिटीज के मरीजों के लिए अच्छी भी है। नरवाई (पराली) जलाना पूरी तरह बंद होना चाहिए, हमें इसके बेहतर रास्ते तलाशने होंगे। इसके लिए किसी रॉकेट साइंस की जरूरत नहीं है, भारतीय वैज्ञानिक और तकनीकी विशेषज्ञ यह कर सकते हैं। उन्हें इससे निपटने के बेहतर और सुरक्षित तरीके ढूंढने चाहिए।

तीसरी चुनौती है प्राकृतिक तरीकों से वायुमंडल में कार्बन डाईऑक्साइड के स्तर को कम करना। इसके लिए वनीकरण और स्थानीय किस्मों के पौधारोपण बढ़ाना चाहिए। यहां फिलीपींस सरकार द्वारा उठाए गए कदमों का अनुसरण करना फायदेमंद होगा। फिलीपींस में प्रत्येक छात्र/छात्रा को अपना स्कूली प्रमाण पत्र या कॉलेज की डिग्री प्राप्त करने के पहले 10 स्थानीय पेड़ लगाकर उनकी देखभाल करनी होती है। दरअसल स्थानीय पेड़ पानी सोखकर उसे जमीन में पहुंचाते हैं। भारत ने वृक्षारोपण और वनीकरण के माध्यम से अतिरिक्त 'कार्बन सोखा' बनाने की योजना बनाई है ताकि ढाई से तीन अरब टन कार्बन डाईऑक्साइड कम की जा सके।

जलवायु परिवर्तन के कारण

महाद्वीपीय संवहन-

सृष्टि के प्रारम्भ में सभी महाद्वीप एक ही बड़े धरातल के रूप में पृथ्वी पर विद्यमान थे, किंतु सागरों के कारण धीरे-धीरे वे एक दूसरे से दूर होते गए और आज उनके अलग-अलग खंड बन गए हैं। महाद्वीपीय संवहन अर्थात् महाद्वीपों का खिसकना अब भी जारी है जिसकी वजह से समुद्री धाराएँ तथा हवाएँ प्रभावित होती हैं और इनका सीधा प्रभाव पृथ्वी की जलवायु पर पड़ता है। हिमालय पर्वत की श्रृंखला प्रतिवर्ष एक मिलीमीटर की दर से ऊँची हो रही है, जिसका मुख्य कारण भारतीय उपखंड का धीरे-धीरे एशियाई महाद्वीप की ओर खिसकना माना जाता है।

ज्वालामुखी विस्फोट-

ज्वालामुखी विस्फोट होने पर बड़ी मात्रा में विभिन्न गैसों जैसे कार्बन डाईऑक्साइड, सल्फर डाईऑक्साइड, जलवाष्प आदि तथा धूलकण वायुमंडल में उत्सर्जित होते हैं, जो कि वायुमंडल की ऊपरी परत, समतापमंडल में जाकर फैल जाते हैं तथा पृथ्वी पर आने वाले सूर्य प्रकाश की मात्रा घटा देते हैं। जिससे पृथ्वी का तापमान कम हो जाता है। एक अनुमान के अनुसार, प्रतिवर्ष लगभग 100 लाख टन कार्बन डाईऑक्साइड गैस ज्वालामुखी विस्फोट द्वारा वायुमंडल में फैल जाती है। वर्ष 1816 में इंग्लैंड, अमेरिका तथा पश्चिमी यूरोपीय देशों में ग्रीष्म ऋतु में जो अचानक ठंड आई थी, जिसे "Killing Summer Frost" कहा गया, उसका कारण वर्ष 1815 में इंडोनेशिया में हुए अनेक ज्वालामुखी विस्फोटों को माना जाता है।

औद्योगिकीकरण-

जलवायु परिवर्तन में औद्योगिकीकरण की बड़ी भूमिका है। विभिन्न प्रकार की मिलें वातावरण में सल्फर डाइऑक्साइड, नाइट्रोजन डाइऑक्साइड, कार्बन डाइऑक्साइड तथा अनेक प्रकार की अन्य जहरीली गैसों और धूलकण हवा में छोड़ती हैं, जो वायुमंडल में काफी वर्षों तक विद्यमान रहती है। यह ग्रीन हाउस प्रभाव, ओजोन परत का क्षरण तथा भूमंडलीय तापमान में वृद्धि जैसी समस्याओं का कारण बनते हैं। वायु, जल एवं भूमि प्रदूषण भी औद्योगिकीकरण की ही देन हैं।

वनोन्मूलन-

निरंतर बढ़ती हुई आबादी की जरूरतों को पूरा करने के लिये वृक्ष काटे जा रहे हैं। आवास, खेती, लकड़ी और अन्य वन संसाधनों की चाह में वनों की अंधाधुंध कटाई हो रही है, जिससे पृथ्वी का हरित क्षेत्र तेजी से घट रहा है और साथ ही जलवायु के परिवर्तन में तेजी आ रही है।

रासायनिक कीटनाशकों एवं उर्वरकों का प्रयोग-

पिछले कुछ दशकों में रासायनिक उर्वरकों की माँग इतनी तेजी से बढ़ी है कि आज विश्व भर में 1000 से भी अधिक प्रकार की कीटनाशी उपलब्ध हैं। जैसे-जैसे इनका उपयोग बढ़ता जा रहा है वैसे-वैसे वायु, जल तथा भूमि में इनकी मात्रा भी बढ़ती जा रही है, जो कि पर्यावरण को निरंतर प्रदूषित कर घातक स्थिति में पहुँचा रहे हैं।

जलवायु परिवर्तन से प्रभाव

वर्षा पर प्रभाव-

जलवायु परिवर्तन के परिणामस्वरूप दुनिया के मानसूनी क्षेत्रों में वर्षा में वृद्धि होगी जिससे बाढ़, भूस्खलन तथा भूमि अपरदन जैसी समस्याएँ पैदा होंगी। जल की गुणवत्ता में गिरावट आएगी तथा पीने योग्य जल की आपूर्ति पर गंभीर प्रभाव पड़ेंगे। जहाँ तक भारत का प्रश्न है, मध्य तथा उत्तरी भारत में कम वर्षा होगी जबकि इसके विपरीत देश के पूर्वोत्तर तथा दक्षिण-पश्चिमी राज्यों में अधिक वर्षा होगी। परिणामस्वरूप वर्षा जल की कमी से मध्य तथा उत्तरी भारत में सूखे जैसी स्थिति होगी जबकि पूर्वोत्तर तथा दक्षिण पश्चिमी राज्यों में अधिक वर्षा के कारण बाढ़ जैसी समस्या होगी।

समुद्री जल स्तर पर प्रभाव-

जलवायु परिवर्तन के फलस्वरूप ग्लेशियरों के पिघलने के कारण विश्व का औसत समुद्री जल स्तर इक्कीसवीं शताब्दी के अंत तक 9 से 88 सेमी. तक बढ़ने की संभावना है, जिससे दुनिया की आधी से अधिक आबादी जो समुद्र से 60 कि.मी. की दूरी पर रहती है, पर विपरीत प्रभाव पड़ेगा। जलवायु परिवर्तन के परिणामस्वरूप भारत के उड़ीसा, आँध्र प्रदेश, तमिलनाडु, केरल कर्नाटक, महाराष्ट्र, गोवा,

गुजरात और पश्चिम बंगाल राज्यों के तटीय क्षेत्र जलमग्नता के शिकार होंगे। परिणामस्वरूप आसपास के गाँवों व शहरों में 10 करोड़ से भी अधिक लोग विस्थापित होंगे जबकि समुद्र में जल स्तर की वृद्धि के परिणामस्वरूप भारत के लक्षद्वीप तथा अंडमान निकोबार द्वीपों का अस्तित्व समाप्त हो जाएगा। समुद्र का जल स्तर बढ़ने से मीठे जल के स्रोत दूषित होंगे परिणामस्वरूप पीने के पानी की समस्या होगी।

कृषि पर प्रभाव-

जलवायु परिवर्तन का प्रभाव कृषि पैदावार पर पड़ेगा। संयुक्त राज्य अमरीका में फसलों की उत्पादकता में कमी आएगी जबकि दूसरी तरफ उत्तरी तथा पूर्वी अफ्रीका, मध्य पूर्व देशों, भारत, पश्चिमी ऑस्ट्रेलिया तथा मैक्सिको में गर्मी तथा नमी के कारण फसलों की उत्पादकता में बढ़ोत्तरी होगी। वर्षा जल की उपलब्धता के आधार पर धान के क्षेत्रफल में वृद्धि होगी। भारत में जलवायु परिवर्तन के परिणामस्वरूप गन्ना, मक्का, ज्वार, बाजरा तथा रागी जैसी फसलों की उत्पादकता दर में वृद्धि होगी जबकि इसके विपरीत मुख्य फसलों जैसे गेहूँ, धान तथा जौ की उपज में गिरावट दर्ज होगी। आलू के उत्पादन में भी अभूतपूर्व गिरावट दर्ज होगी।

जैव विविधता पर प्रभाव-

जलवायु परिवर्तन का प्रभाव जैवविविधता पर भी पड़ेगा। किसी भी प्रजाति को अनुकूलन हेतु समय की आवश्यकता होती है। वातावरण में अचानक परिवर्तन से अनुकूलन के प्रभाव में उसकी मृत्यु हो जाएगी। जलवायु परिवर्तन का सर्वाधिक प्रभाव समुद्र की तटीय क्षेत्रों में पाई जाने वाली दलदली क्षेत्र की वनस्पतियों पर पड़ेगा जो तट को स्थिरता प्रदान करने के साथ-साथ समुद्री जीवों के प्रजनन का आदर्श स्थल भी होती हैं। दलदली वन जिन्हें ज्वारीय वन भी कहा जाता है, तटीय क्षेत्रों को समुद्री तूफानों में रक्षा करने का भी कार्य करते हैं। जैव-विविधता क्षरण के परिणामस्वरूप पारिस्थितिक असंतुलन का खतरा बढ़ेगा।

मानव स्वास्थ्य पर प्रभाव-

जलवायु परिवर्तन का प्रभाव मानव स्वास्थ्य पर भी पड़ेगा। विश्व स्वास्थ्य संगठन की रिपोर्ट के अनुसार, जलवायु में उष्णता के कारण श्वास तथा हृदय संबंधी बीमारियों में वृद्धि होगी। जलवायु परिवर्तन के फलस्वरूप न सिर्फ रोगाणुओं में बढ़ोत्तरी होगी अपितु इनकी नई प्रजातियों की भी उत्पत्ति होगी जिसके परिणामस्वरूप फसलों की उत्पादकता पर विपरीत प्रभाव पड़ेगा। मानव स्वास्थ्य पर जलवायु परिवर्तन के प्रभाव के चलते एक बड़ी आबादी विस्थापित होगी जो 'पर्यावरणीय शरणार्थी' कहलाएगी। इससे स्वास्थ्य संबंधी और भी समस्याएँ पैदा होंगी।

जलवायु परिवर्तन से निपटने हेतु वैश्विक प्रयास

जलवायु परिवर्तन पर अंतर-सरकारी पैनल (IPCC) का उद्देश्य जलवायु परिवर्तन, इसके प्रभाव और भविष्य के संभावित जोखिमों के साथ-साथ अनुकूलन तथा जलवायु परिवर्तन को कम करने

हेतु नीति निर्माताओं को रणनीति बनाने के लिये नियमित वैज्ञानिक आकलन प्रदान करना है। IPCC आकलन सभी स्तरों पर सरकारों को वैज्ञानिक सूचनाएँ प्रदान करता है जिसका इस्तेमाल जलवायु के प्रति उदार नीति विकसित करने के लिये किया जा सकता है।

संयुक्त राष्ट्र जलवायु परिवर्तन फ्रेमवर्क सम्मेलन (UNFCCC) एक अंतर्राष्ट्रीय समझौता है। जिसका उद्देश्य वायुमंडल में ग्रीनहाउस गैसों के उत्सर्जन को नियंत्रित करना है। वर्ष 1995 से लगातार UNFCCC की वार्षिक बैठकों का आयोजन किया जाता है। इसके तहत ही वर्ष 1997 में बहुचर्चित क्योटो समझौता (जलवज्रव च्त्वजवववस) हुआ और विकसित देशों (एनेक्स-1 में शामिल देश) द्वारा ग्रीनहाउस गैसों को नियंत्रित करने के लिये लक्ष्य तय किया गया। क्योटो प्रोटोकॉल के तहत 40 औद्योगिक देशों को अलग सूची एनेक्स-1 में रखा गया है।

जी-20

अंतरराष्ट्रीय आर्थिक सहयोग का प्रमुख मंच है। यह सभी प्रमुख अंतरराष्ट्रीय आर्थिक मुद्दों पर वैश्विक संरचना और अधिशासन निर्धारित करने तथा उसे मजबूत करने में महत्वपूर्ण भूमिका निभाता है। भारत 1 दिसंबर 2022 से 30 नवंबर 2023 तक जी-20 की अध्यक्षता करेगा।

जी-20 का गठन वर्ष 1999 के दशक के अंत के वित्तीय संकट की पृष्ठभूमि में किया गया था, जिसने विशेष रूप से पूर्वी एशिया और दक्षिण-पूर्व एशिया को प्रभावित किया था। इसका उद्देश्य मध्यम आय वाले देशों को शामिल करके वैश्विक वित्तीय स्थिरता को सुरक्षित करना है। 17 नव. 2022

सहभागी समूह, जिसमें प्रत्येक G20 सदस्य देश के गैर-सरकारी प्रतिभागी शामिल होते हैं, G20 नेताओं को सिफारिशें प्रस्तुत करते हैं और नीति-निर्माण प्रक्रिया में योगदान देते हैं।

बिजनेस 20 (B20) वैश्विक व्यापार समुदाय का प्रतिनिधित्व करने वाला आधिकारिक G20 संवाद मंच है। 2010 में स्थापित, B20 G20 में सबसे प्रमुख सगाई समूहों में से एक है, जिसमें कंपनियां और व्यावसायिक संगठन भागीदार हैं। G20 वैश्विक व्यापार जगत के नेताओं को वैश्विक आर्थिक और व्यापार शासन के मुद्दों पर उनके विचारों के लिए प्रेरित करने की प्रक्रिया का नेतृत्व करता है और पूरे G20 व्यापार समुदाय के लिए एक स्वर में बोलता है।

भारतीय उद्योग परिसंघ (CII) को भारत के G20 प्रेसीडेंसी के लिए बिजनेस 20 (B20) सचिवालय के रूप में नामित किया गया है। B20 इंडिया पूरे भारत में चर्चाओं और नीति समर्थन मंचों की एक शृंखला की मेजबानी करेगा, जिसमें पहचानी गई उद्योग प्राथमिकताओं को शामिल किया जाएगा, जिसका उद्देश्य B20 रणनीतिक दृष्टि को साकार करना और इसे ठोस और कार्रवाई योग्य नीतिगत सिफारिशों में बदलना है। इस प्रकार जलवायु परिवर्तन के नुकसान की भरपाई के लिए अथवा उसके संरक्षण हेतु G20 संघ एवं सरकारी तंत्र शासन, प्रशासन, शिक्षा, शिक्षक, संस्थाएं आदि इस पर विचार कर समाधान निकाल सकते हैं।

निष्कर्ष

जीवन और आजीविका बचाने के लिए महामारी और जलवायु आपातकाल दोनों को संबोधित करने के लिए तत्काल कार्रवाई की आवश्यकता है। हमारे ग्रह पृथ्वी का तापमान लगातार बढ़ रहा है। सरकारों को इसमें नागरिकों की सहभागिता सुनिश्चित करने के लिए उपयुक्त व मजबूत कदम उठाने होंगे। जलवायु परिवर्तन को नियंत्रित करने के लिए सरकारों को सतत विकास के उपायों में निवेश करने, ग्रीन जॉब, हरित अर्थव्यवस्था के निर्माण की ओर आगे बढ़ने की जरूरत है। पृथ्वी पर जीवन को बचाए रखने, पृथ्वी को स्वस्थ रखने और ग्लोबल वार्मिंग के खतरों से निपटने के लिए विश्व के सभी देशों को एकजुट होकर व पूरी ईमानदारी के साथ काम करना होगा। यह बात ज्ञात हो कि कोई देश अकेले ही ग्लोबल वार्मिंग के खतरे से निपटने में सक्षम नहीं है।

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Climate Change And G20 : Opportunities and Challenges

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INTRODUCTION

Over the course of the last century, global humanity has been experiencing environmental pollution and climate change. Since the 1990s, global efforts to address this challenge and reduce greenhouse gas emissions have focused on low greenhouse gas from energy systems through greater shares of clean energy sources. Reducing emissions of greenhouse gases, while retaining continued economic growth and sustained social development, requires stepped-up endeavours in different sectors over a long time span. On average, the energy sector contributes two-thirds of the global greenhouse gas emissions, the largest source of which is from fossil-fuelled power generation, transport and industry. This is the key rationale behind the call for a cleaner and low greenhouse gas emission energy system, in particular, the power system. Renewable energy, inter alia, has made, and will continue to make, significant contributions on this front, due to its zero or near zero emissions of greenhouse gases and reduction of other conventional pollutants. Besides contributing to climate change mitigation, renewables also contribute to enhancing energy access and energy security, both for rural and urban populations in off- and on-grid settings.

In this context, the G20 Energy Sustainability Working Group has proposed a G20 Voluntary Action Plan on Climate change, developed under India's presidency in 2023, for adoption by the G20 Energy Ministers at the Ministerial Meeting in 2022-23 Vasudhaiva Kutumbakam, which translates to "One Earth, One Family, One Future," is the theme of India's G20 presidency. Under the leadership provided by the G20 members, the goal is to unlock the potential of climate change through developing and deploying it globally. The action plan, participated on a voluntary and flexible basis, for the development of positive change. Like many countries around the world, India is facing water security issues, and at the same time, widespread flooding.

India's agricultural sector relies on the monsoon season. However, over the last century, there have been more days with extremely heavy rains with longer dry spells in between. This has heavily impacted India's central belt running from western Maharashtra State to the Bay of Bengal, which has seen extreme rainfall events increase threefold over the last 70 years, but has also had a decrease in total annual rainfall.

The Himalayas, a long-time protector against drought in India, are at risk, too. A 2019 report predicted that by 2100, at least one-third of the glaciers in the region will be gone. Glacial melting as a result of rising temperatures has also exacerbated both flooding and drought, especially in agricultural mountain communities that rely on seasonal snowmelt.

Flooding impacts India's urban areas, too. This fall, torrential rain flooded Bengaluru, known as India's Silicon Valley, where it disrupted water supplies and left many stranded in their homes. In some areas of the city, rapid urbanisation and a lack of sustainable infrastructure is thought to have contributed to the flooding.

In 2005, 37 inches of rain hit Maharashtra state in under 24 hours, flooding the city of Mumbai and killing almost 900 people. The heavy rain was traced back to warming in the Arabian Sea, which is thought to have contributed to the moisture surge. In the past decade, flooding attributed to extreme rain events resulted in losses of approximately \$3 billion each year.

Moreover, geography has made the Maldives especially vulnerable to the consequences of climate change. Being land scarce and low lying, the country is exposed to the risks of intensifying weather events such as damage caused by inundation, extreme winds, and flooding from storms.

With the melting of polar ice caps, the Maldives is also exposed to the risks of sea-level rise. Future sea level is projected to rise within the range of 10 to 100 centimetres by the year 2100, which means the entire country could be submerged in the worst-case scenario.

INTERNATIONAL COOPERATION AND CLIMATE CHANGE :

If the world continues to burn fossil fuels at current rates, earth average temperatures may rise to catastrophic levels. Climate change resulting from a world 3 to 8 degrees °C warmer than pre-industrial levels will cause changes in rainfall patterns, the disappearance of glaciers, droughts, a rise in sea levels, the loss of islands and coastal wetlands, as well as increased flooding. COVID-19, if not a direct result of climate change, may have been caused by one of its main contributors — deforestation.

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Although climate change will not affect all countries in the same manner, it poses a security and existential threat to all. While some (island) countries may disappear entirely, many others will lose a substantial portion of their territory and large cities. Climate change will also likely exacerbate political instability, migration crises, and intrastate warfare, in addition to increased military spending to repair or rebuild existing infrastructure.

Because the effects of climate change cannot be attributed to each specific country that causes greenhouse emissions, all countries are at the same time culprits and victims of the problem, albeit to different degrees. If this is the case, international cooperation should be the obvious pathway to address this collective problem.

However, international cooperation has so far obtained modest results, as global temperatures and fossil fuel emissions continue to rise globally despite years of negotiations aimed at reducing greenhouse gases. In tackling the climate crisis, international cooperation should involve holding regular discussions with other countries on issues bordering on climate change; to co-create and share knowledge and technology, as well as develop best practices and build joint efforts. The problems and needs of each partner country will be recognized through the bolstering of partnerships with various actors and dialogue with experts, NGOs, research organisations, companies, industries, local and national governments in the partner country. Adequate and specific support can therefore be provided to countries in creating decarbonization markets, developing new systems and actualizing adaptation and mitigation. Through bilateral initiatives, international cooperation will hasten climate action.

THE ROLE OF G20 IN ADDRESSING CLIMATE CHANGE

Climate is a global common, and the task of reversing the worsening climate change is a global responsibility.

Multilateral forums like the Group of Twenty (G20) play a crucial role in bolstering global collective action against climate change. The G20 gathers the world's most developed economies and emerging ones, which together account for more than 80 percent of global GDP, 75 percent of international trade, and 60 percent of global population. The G20 economies are responsible for about 75 to 80 percent of global greenhouse gas emissions. All but one of the top 10 carbon-emitting countries are G20 members.

At the same time, the G20 economies account for the largest share of global wealth and therefore possess the financial wherewithal to spearhead the green

transition required to limit the rise in global temperature to 1.5 degrees Celsius. Moreover, the G20 countries are home to many of the world's most significant carbon sinks, such as the Brazilian Amazon Rainforest, the Steart Marshes in the United Kingdom (UK), and the Sundarbans in India. At the G20 Joint Environment and Climate Ministerial Meeting held in August 2022, the member countries acknowledged the severity of the climate crisis and declared that three crucial issues will be prioritised towards fulfilling the goals set by the Paris Agreement: a sustainable global economic recovery; land-based and ocean-based climate action; and resource mobilisation for environmental protection.

OPPORTUNITIES IN LEVERAGING G20 PLATFORM FOR CLIMATE CHANGE

India took over the presidency of the G20 forum in December 2023. Prime Minister Narendra Modi called it a “ huge opportunity for India” in his monthly radio address, Mann Ki Baat. Modi had also strongly pitched for defending India's energy security at the G20 Summit held in Bali in November 2022.

Over the last few years, India has successfully augmented its renewable energy resource base and is in a better position to utilise its experience to understand the needs of other developing nations. With India taking over the presidency, the country must give primacy to energy security while focusing on better governance, strategy and calibrated measures to deal with climate risks. However, in order to achieve concrete results, it is imperative for both developed and developing nations to collaborate cohesively and implement large-scale structural reforms to augment their renewable energy base. Developing countries should take up the task of regulating and reorganising the power sector, whereas developed nations must share the responsibility of financing the change. As a responsible member of the G20, India is obliged to streamline climate finance initiatives for emerging and developing nations during its presidency. In addition to this, green hydrogen has emerged as an important arena for decarbonising refining, fertiliser, steel and cement sector in many economies. In order to emerge as a green hydrogen/green ammonia export hub, India could use the G20 platform to bring out the issues pertaining to green hydrogen supply chain among the member nations. The pandemic and ongoing geopolitical tensions have exposed G20 countries to volatile fossil fuel prices, threatening their energy security. Most G20 governments have begun to lag on their announced net-zero targets and commitment to mitigate climatic changes. Having faced the dilemma for a long time, India has a challenging role in drawing a consensus on the green

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energy agenda to ensure energy security and sustainability in consonance with the Sustainable Development Goals (SDG). To achieve this, India should try to build a consensus on promoting private investment in green infrastructure projects within the G20 nations and facilitate the transition from fossil fuels to renewable energy sources. In addition, the country should hold concrete discussions on enhancing cooperation between the developed and emerging market economies to support green growth and a circular economy. Nevertheless, there are whispers in the corridors of power and several sections that India's presidency will also try to build a consensus on climate finance and green hydrogen in the energy sector. These issues have been actively under discussion during Indonesia's G20 presidency and have gained prominence in the prior presidencies too. India is the only G20 nation achieving its climate mitigation commitments in accordance with the Paris Agreement without any external funding for climate finance, according to the Climate Transparency Report, 2020.

IMPACTS OF G20 OVER AN INDIAN ECONOMY CHANGE

The G20, an organisation rooted in the concept of international governance and the need for cooperation among states to address global challenges, is a key platform for promoting international economic cooperation and addressing global economic challenges. India's presidency of the G20 is seen as an important platform for advancing its interests and for promoting the country's profile on the global stage.

India, being the only major global economy slated to have 6+% GDP growth figures in the years ahead, outpaced Britain last year to become the fifth-largest economy in nominal GDP terms. In these times of global challenges, the G20 Presidency gives India a unique opportunity to strengthen its role in the world economic order. With the theme of 'Vasudhaiva Kutumbakam,' India is steering an ambitious, people-centric agenda to address global challenges and facilitate sustainable economic development.

In conclusion, the G20 Presidency gives India a unique opportunity to strengthen its role in the world economic order and become a global soft power. As India sets an ambitious, people-centric agenda to address global challenges and facilitate sustainable economic development, it is expected to contribute to the international community and build bridges between different countries and regions. The Indian presidency of G20 is undoubtedly creating a path towards becoming a major global soft power.

POLICIES AND PRACTICE TO PROMOTE CLEAN ENVIRONMENT WITH REFERENCE OF G20 FRAMEWORK

- The G20 called for action on protecting, conserving, sustainably managing and restoring degraded lands, water, oceans and seas; renewing efforts to eliminate marine plastic litter and promoting the efficient and circular use of resources.
- Emphasised the importance of the One Health approach and the need to address risks emerging from the human animal environment interface , particularly zoonotic diseases;
- Committed to ‘strengthen actions to halt and reverse biodiversity loss by 2030’ and called on ‘CBD Parties to adopt an ambitious, balanced, practical, effective, robust and transformative post 2020 Global Biodiversity Framework at COP15 in Kunming’;
- Referred to the Leaders’ Pledge for Nature and the 30by30 target (at least 30 % of global land and at least 30 % of the global ocean and seas conserved or protected by 2030), stating that they will ‘help to make progress towards this objective in accordance with national circumstances’;
- Underlined the ‘many synergies in financial flows for climate, biodiversity and ecosystems’ and committed to strengthening those synergies so as to maximize benefits;
- Committed to scale up and encourage the implementation of Nature-based Solutions or Ecosystem-based Approaches;
- Recognized that ‘water resources are globally at risk due to anthropogenic pressure’ and confirmed the role of the G20 Dialogue on Water adopted in 2020 under the Saudi Presidency in sharing best practices;
- Highlighted the importance of making progress ‘as soon as possible’ on Marine Biodiversity in Areas Beyond National Jurisdiction, repeated the Environment Ministers’ language on marine protected areas in the Southern Ocean, and reaffirmed their commitment to address marine litter by developing ‘a new global agreement or instrument’;
- Committed to increase resource efficiency and enhance efforts towards achieving sustainable consumption and production patterns and management and reduction of emissions, including through the adoption of circular economy approaches (though it did not mention the ‘G20 vision’ set out by the Environment Ministers);

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- Recognised the importance of gradually expanding the Roadmap of the G20 Sustainable Finance Working Group to ‘include additional issues, such as biodiversity and nature’ (even if subject to a ‘mutual agreement by G20 members in the coming years’).
- Urged other countries to join forces with the G20 to reach the aspirational goal of planting 1 trillion trees by 2030, with the involvement of the private sector and civil society.

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G20 की अध्यक्षता, जलवायु परिवर्तन भारत के लिए चुनौतियाँ व अवसर

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भारत के पास अब वैश्विक नेताओं को एक साथ लाने और अर्थव्यवस्था से संबंधित मुद्दों को हल करने का अवसर है लेकिन आगे की राह चुनौतियों से भरी है। भारत की G20 अध्यक्षता 1 दिसंबर, 2022 को शुरू हुई। और यह अध्यक्षता जिम्मेदारियाँ और चुनौतियाँ भी लेकर आती है। भारत की बारी उपयुक्त समय पर आई है, जब विश्व युद्ध, एक ऊर्जा संकट, कोविड-19 महामारी और जलवायु संबंधी अत्यावश्यकता से उबर रहा है।

G20 की स्थापना 1997-1998 के एशियाई वित्तीय संकट के बाद की गई थी और इसमें आर्थिक और वित्तीय मुद्दों पर अंतर्राष्ट्रीय सहयोग प्राप्त करने के उद्देश्य से 19 देशों और यूरोपीय संघ सहित विकसित और विकासशील दोनों देशों को शामिल किया गया था, इस प्रकार, 20 का एक समूह बनाया गया था। वैश्विक चिंता के मामले, जैसे कि जलवायु परिवर्तन, खाद्य सुरक्षा, और लैंगिक मुद्दे, समूह का उद्देश्य निकट भविष्य में एक और वित्तीय संकट के जोखिम को कम करने के लिए आर्थिक विकास और वर्तमान वित्तीय संस्थानों को आधुनिक बनाने के लिए नीति समन्वय करना है।

आज की दुनिया में, हिंद महासागर विश्व अर्थव्यवस्था का 84% और विश्व व्यापार का 79% हिस्सा है, इसलिए G20 की अध्यक्षता को कई उम्मीदों के साथ देखा जाएगा। वर्तमान भू-राजनीतिक परिदृश्य के संदर्भ में इसकी अधिक महत्वपूर्ण भूमिका है। ग्लोबल साउथ की ओर से भारत 'पीसमेकर' की भूमिका निभा सकता है। इस बहुध्रुवीय दुनिया में भारत ने अपनी नीति के कारण हमेशा एक संतुलित और वस्तुनिष्ठ दृष्टिकोण बनाए रखा है। इस प्रकार G20 प्रेसीडेंसी भारत को दुनिया में खुद को स्थापित करने और एक जिम्मेदार शक्ति के रूप में नेतृत्व करने की अनुमति देती है।

भारत की G20 अध्यक्षता के लिए चुनौतियाँ

- रूस-यूक्रेन युद्ध
- ग्लोबल साउथ और नॉर्थ के बीच की खाई को कम करना

➤ **जलवायु परिवर्तन से निपटना**

यह स्थिति भारत को विकासशील दुनिया, विशेष रूप से अपने क्षेत्रीय ब्लॉक में अर्थव्यवस्थाओं के हित का प्रतिनिधित्व करने के लिए कहती है। रूस-यूक्रेन युद्ध ने विकासशील अर्थव्यवस्थाओं को प्रभावित किया और उन्हें और अधिक कमजोर बना दिया। रूस से खाद्य और ऊर्जा के आयात पर प्रतिबंध ने मुद्रास्फीति पैदा की, जिसने कई विकासशील देशों को और अस्थिर कर दिया, इसलिए भारत अपनी क्षमताओं का लाभ उठाकर और वैश्विक आपूर्ति श्रृंखला में एक आवश्यक भागीदार के रूप में उभर कर अपने पक्ष में अराजनीतिकरण की मांग कर सकता है। इसके अलावा, वर्ष 2023 को संयुक्त राष्ट्र महासभा द्वारा बाजरा का अंतर्राष्ट्रीय वर्ष घोषित किया गया है, और भारत, सबसे बड़ा बाजरा उत्पादक, वैश्विक खाद्य आपूर्ति श्रृंखला में एक खिलाड़ी के रूप में अपनी पैठ स्थापित करने के लिए इस अवसर का फायदा उठा सकता है।

जलवायु परिवर्तन ने लाखों लोगों को प्रभावित किया है। विकासशील और विकसित दोनों देशों को इसका समाधान खोजने के लिए कार्बन उत्सर्जन में कटौती करने की आवश्यकता है। जबकि पूर्व को जलवायु परिवर्तन के मुद्दे पर तत्काल ध्यान केंद्रित करने और उत्सर्जन को कम करने की आवश्यकता है, बाद वाले को वित्तीय सहायता और विशेषज्ञता प्रदान करनी चाहिए ताकि उभरते हुए देश जलवायु परिवर्तन के प्रभावों को कम कर सकें। भारत के सामने जलवायु परिवर्तन पर पहली और तीसरी दुनिया के बीच सहमति बनाने की चुनौती है। वैश्विक उत्तर से वैश्विक दक्षिण तक प्रौद्योगिकी हस्तांतरण और जलवायु वित्त की मांग भारत को अपने आर्थिक लाभ को प्रभावित किए बिना अपने कार्बन उत्सर्जन को कम करने में मदद करती है, इसलिए 2070 तक पहले शुद्ध शून्य प्राप्त करने के अपने लक्ष्य को पूरा करती है।

G20 की अध्यक्षता भारत के लिए सुअवसर के रूप में

भारत कई बहुपक्षीय संबंधों का हिस्सा रहा है, हालांकि, कई दावे, हालांकि, भारत वास्तव में कभी भी वैश्विक व्यापार के मामले में बाहर नहीं निकला है, यह अभी भी एक आंतरिक दिखने वाली व्यापार नीति का पालन करता है और अपनी बहुपक्षीय गतिविधियों का पूरी तरह से फायदा उठाने में सक्षम नहीं है। इस प्रकार, यह क्षण भारत के लिए बाहर की ओर मुड़ने और अपने बहुपक्षीय और क्षेत्रीय संबंधों की पूरी क्षमता का लाभ उठाने का अवसर प्रस्तुत करता है।

भारत आईटी क्षेत्र में एक वैश्विक खिलाड़ी है। इसलिए, जैसे-जैसे दुनिया डिजिटल व्यापार नियम बनाने की ओर बढ़ रही है, भारत, G20 समूह के अध्यक्ष के रूप में, इसमें एक आवश्यक भूमिका निभा सकता है। सही दृष्टिकोण के साथ, यह नियमों को अपनी आवश्यकताओं के अनुसार संशोधित कर सकता है और शक्तिशाली और शोषक अर्थव्यवस्थाओं द्वारा इन नियमों के हुकम को कम कर सकता है। ये अवसर अपनी चुनौतियों के सेट के साथ आएंगे। महत्वपूर्ण चुनौतियों में से एक दुनिया में चीन के शक्ति प्रक्षेपण को रोकना होगा। भू-राजनीतिक परिदृश्य में चीन और रूस की धुरी ने मामले को

जटिल बना दिया है। भारत भी अपनी सीमाओं पर चीन की दबंगई का सामना कर रहा है। इसलिए चीनी प्रभाव और शक्ति का प्रबंधन भारत के लिए सबसे कठिन कार्य होगा। इसके अलावा, G20 सदस्यों की विविध स्थितियाँ और उनके विविध हित भी चर्चाओं और निर्णय लेने को प्रभावित करेंगे।

भारत की अध्यक्षता उन सबसे कमजोर देशों की पहचान करने में भी सहायक साबित हो सकती है जो जलवायु संकट का खामियाजा असमान रूप से भुगतते हैं। इसके अलावा, भारत जीवाश्म ईंधन और अन्य कार्बन-गहन उद्योगों पर कर लगाने का प्रस्ताव करके G20 में बातचीत कर सकता है ताकि कोष के लिए राजस्व उत्पन्न किया जा सके। वर्तमान जलवायु नीतियों का समर्थन और अनुपालन करने, उनके कार्यान्वयन को तेज करने और एसडीजी के अनुरूप लक्ष्य प्रस्तावित करने के लिए विकसित और विकासशील देशों के बीच आम सहमति बनाने की तत्काल आवश्यकता है।

यह समावेशी और सतत विकास के लिए जलवायु परिवर्तन कार्यों का लाभ उठाने के लिए अपनी अध्यक्षता में भारत के लिए एक अवसर है। इस प्रकार भारत की अध्यक्षता को जलवायु वित्त प्रतिबद्धताओं के अनुसार वित्त वितरण में तेजी लानी चाहिए, निजी क्षेत्र की साझेदारी को सुगम बनाना चाहिए और यह सुनिश्चित करना चाहिए कि वित्त की सुविधा में बहुपक्षीय विकास बैंकों की बढ़ती भागीदारी के साथ जी20 सदस्य देशों की पर्यावरण, सामाजिक और शासन पूंजी तक पहुंच हो।

चुनौतियों का स्वीकार्य समाधान निकालने के साथ-साथ जिन महत्वपूर्ण क्षेत्रों से निपटने की आवश्यकता है, उनमें शामिल हैं:-

समावेशी दृष्टिकोण :

अध्यक्षता की अवधि में और 2023 जी20 शिखर सम्मेलन के लिए मेजबान के रूप में, भारत को उन देशों के विचारों को सामने लाना चाहिए जिनका जी20 में प्रतिनिधित्व नहीं है। भारत को आगे बढ़ने के तरीके के रूप में विश्वव्यापी मुद्दों को हल करने के लिए मानव-केंद्रित व्यवस्था के साथ एक व्यापक दृष्टिकोण को प्रोत्साहित करना चाहिए।

बहुपक्षीय सहयोग :

भारत को न केवल जी-20 समूह को मजबूत करने और भू-राजनीतिक स्थिति के कारण पैदा हुए मतभेदों को कम करने का नेतृत्व करना चाहिए, बल्कि समूह के बहुआयामी एजेंडे के विभिन्न क्षेत्रों में बहुपक्षीय सहयोग के भविष्य की गति भी तय करनी चाहिए।

भारत-केंद्रित दृष्टिकोण :

भारत को भारत-केंद्रित दृष्टि को एक साथ लाने का प्रयास करना चाहिए, वैश्विक दक्षिण की महत्वपूर्ण चिंताओं के क्षेत्र का विस्तार करना चाहिए, और चीन, यूएसए को शामिल करने वाले शक्ति के प्रतिस्पर्धी केंद्रों की स्थिति को साझा करने और व्यवस्थित करने के लिए राजनयिक लाभ का लाभ उठाना चाहिए- वेस्ट ब्लॉक और रूसी ब्लॉक का नेतृत्व किया।

सुदृढ़ीकरण प्रणालियाँ :

G20 के अध्यक्ष के रूप में, भारत को IMF, OECD, WHO, विश्व बैंक और WTO जैसे अंतर्राष्ट्रीय संगठनों के साथ अपनी साझेदारी को मजबूत करने का लक्ष्य रखना चाहिए और इसमें शामिल राज्यों के लिए धन को नियंत्रित करने के लिए सख्त मानदंडों पर अपना ध्यान केंद्रित करने का प्रयास करना चाहिए।

अफ्रीकी संघ को ऊपर उठाना :

एक और महत्वपूर्ण उद्देश्य अफ्रीकी संघ (एयू) की स्थिति को जी20 के सदस्य की स्थिति के लिए एक स्थायी पर्यवेक्षक होने से बढ़ावा देकर, यूरोपीय संघ के स्तर पर लाकर अफ्रीकी राष्ट्रों को दरकिनार करना होना चाहिए।

भारत-केंद्रित दृष्टिकोण :

भारत को भारत-केंद्रित दृष्टि को एक साथ लाने का प्रयास करना चाहिए, वैश्विक दक्षिण की महत्वपूर्ण चिंताओं के क्षेत्र का विस्तार करना चाहिए, और चीन, यूएसए को शामिल करने वाले शक्ति के प्रतिस्पर्धी केंद्रों की स्थिति को साझा करने और व्यवस्थित करने के लिए राजनयिक लाभ का लाभ उठाना चाहिए- वेस्ट ब्लॉक और रूसी ब्लॉक का नेतृत्व किया।

सुदृढ़ीकरण प्रणालियाँ :

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अर्थात् भारत “एक पृथ्वी, एक परिवार, एक भविष्य” विषय के साथ G20 की अपनी अध्यक्षता शुरू करता है, उसे विशेष रूप से उन देशों के साथ एक गहन नीतिगत जुड़ाव होना चाहिए जो इसके समर्थन और मार्गदर्शन के लिए इसे देखते हैं।

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indianexpress-com/article/opinion/columns/during&its&g20&presidency&india&can&be&a&voice&for&developing&world&8256876/ से लिया गया।

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The Role of G20 In International Cooperation And Climate Change

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As a global problem, climate change requires a fast and decisive response from all nations. In order to confront the multi-faceted problem and curb its effects, each country must act boldly within its borders. In fact, addressing climate change requires a multidimensional approach that encompasses working together to mobilize climate finance, develop and implement policies, ensure the engagement of civil society in the climate policy-making process, and reduce greenhouse gas emissions at all scales. The aim is to reflect the national situation of the efforts of the group of 20 largest economies, the G20 countries, using a multidimensional perspective. Country performances are investigated from the perspectives of finance, emissions, policy and legislative and non-governmental organizations, utilizing the balanced scorecard approach and the dataset collected to reflect these perspectives for the related countries. The Group carries great weight in international energy governance, and accounts for 80 percent of the world's total primary energy consumption and 82 percent of global energy-related CO₂ emissions. Thus, decisions and actions of the G20 and its members have the capacity to significantly impact global energy systems.

INTRODUCTION

India occupies an intriguing dual position in global climate politics—a poor and developing economy with low levels of historical and per capita emissions, and a large and rapidly growing economy with rising emissions. Indian climate politics has substantially been shaped around the first perspective, and increasingly, under international pressure, is being forced to grapple with the second. This review of Indian climate politics examines the initial crystallization of Indian climate positions and its roots in national climate politics, and then examines the modest ways in which climate politics have been revisited in domestic debates. The Industrial

Revolution has permanently changed the economies and the society in terms of consumption and production patterns inter alia mass production, fossil fuel combustion and a variety of manufactured goods while improving the welfare of the society. However, it resulted in a massive growth in energy consumption, mainly due to the burning of fossil fuels including coal, oil, and natural gas, which is the main source of global air pollution and greenhouse gas (GHG) emissions. It is extremely likely that anthropogenic activities are responsible for the climate changes observed since the industrial revolution, including climate changes identified with disaster scenarios such as melting of the ice mass at the poles, rising sea levels, droughts, fires, the extinction of animal and plant species, etc. The impacts of climate change are already felt in communities across the world. To prevent the adverse effects of climate change at a global level, nations must take urgent, holistic action. The developed countries take the leading role in global efforts to combat climate change. Comprised by developed countries, economies in transition and developing countries, the group of 20 largest economies (the G20) is the major source of global energy-related CO₂ emissions and global GHG emissions, and thus, is expected to show additional efforts for tackling climate change. Using their economic strength to dominate the transition to a low-carbon economy, the G20 countries put forward great efforts to reduce their impact on the climate. The differences in the countries' responsibility and the desired level of contribution to the global efforts require a fair performance assessment.

ABOUT G20

The G20 was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues. 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 economic issues. India holds the Presidency of the G20 from 1 December 2022 to 30 November 2023. The G20 was upgraded to the level of Heads of State/Government in the wake of the global economic and financial crisis of 2007, and, in 2009, was designated the “premier forum for international economic cooperation”. The G20 Summit is held annually, under the leadership of a rotating Presidency. The G20 initially focused largely on broad macroeconomic issues, but it has since expanded its agenda to inter-alia include trade, sustainable development, health, agriculture, energy, environment, climate change, and anti-corruption.

The Group of Twenty (G20) comprises 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of

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Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom and United States) and the European Union. The G20 members represent around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population.

“India’s G20 Presidency will work to promote this universal sense of oneness. Hence our theme - ‘One Earth, One Family, One Future’” – Prime Minister, Narendra Modi

December 1st, 2023 was a momentous day as India assumed the presidency of the G20 forum, taking over from Indonesia. As the largest democracy in the world, and the fastest growing economy, India’s G20 presidency would play a crucial role in building upon the significant achievements of the previous 17 presidencies. As India takes the G20 Presidency, it is on a mission to bring about a shared global future for all through the Amrit Kaal initiative with a focus on the movement which aims to promote environmentally-conscious practices and a sustainable way of living. With a clear plan and a development-oriented approach, India aims to promote a rules-based order, peace and just growth for all. The 200+ events planned in the run up to the 2023 Summit will strengthen India’s agenda and the six thematic priorities of India’s G20 presidency.

The G20 has two main tracks of engagement: the Finance Track for finance ministers and central bank governors and the Sherpa Track. The G20’s proceedings are led by the Sherpas, who are appointed as personal envoys of the leaders of member nations. These Sherpas are responsible for overseeing the negotiations that occur throughout the year, deliberating on the agenda for the summit and coordinating the substantive work of the G20. Both tracks have working groups to address specific themes with representatives from relevant parties. Working groups this year will focus on global priority areas such as green development, climate finance, inclusive growth, digital economy, public infrastructure, technology transformation, and reforms for women empowerment for socio-economic progress. All these steps are taken to accelerate progress towards the Sustainable Development Goals and secure a better future for the generations to come.

G20 SUMMIT UNDER INDIA’S PRESIDENCY

India is undergoing structural urban and economic transitions and has set ambitious policy targets to meet its rising energy needs for development. Expanding coal and renewables are two important pillars of this undertaking and, since 2008, climate protection is of increasing concern. India’s international engagements reflect these motivations of both energy security and climate change, where India is

increasingly engaging in transfer of clean and efficient energy technologies to developing countries like itself. India will convene the G20 Leaders' Summit for the first time in 2023, as 43 Heads of Delegations- the largest ever in the G20—will participate in the final New Delhi Summit in September later this year. As a nation committed to democracy and multilateralism, India's presidency will be a significant milestone as it seeks to find practical global solutions for the benefit of all and embody the idea of "Vasudhaiva Kutumbakam," or "the world is one family."

The G20 Summit is held annually with a rotating presidency, and in 2023, India hold the presidency. The group does not have a permanent secretariat and is supported by the previous, current, and future holders of the presidency, known as the troika. In this year 2023, the troika consists of Indonesia, Brazil, and India.

This summit will conclude a series of meetings throughout the year, with potential host cities for meetings from December 2022 to February 2023 including Bengaluru, Chandigarh, Chennai, Guwahati, Indore, Jodhpur, Khajuraho, Kolkata, Lucknow, Mumbai, Pune, Rann of Kutch, Surat, Thiruvananthapuram, and Udaipur.

Vasudhaiva Kutumbakam, which translates to "One Earth, One Family, One Future," is the theme of India's G20 presidency. It is inspired from the Maha Upanishad, an old Sanskrit scripture. The theme fundamentally highlights the importance of all life—human, animal, plant, and microorganism—as well as their interdependence on Earth and across the universe. The theme also exemplifies LiFE (Lifestyle for Environment), which highlights the importance of environmentally sustainable and responsible lifestyle choices, both at the individual and national level, in creating a cleaner, greener, and bluer future.

The G20 Presidency also heralds for India the start of "Amritkaal," a 25-year period commencing from the 75th anniversary of its independence on August 15, 2022, leading up to the centenary of its independence

INDIA'S G20 PRIORITIES

1. Green Development, Climate Finance & LiFE

India's focus on climate change, with a particular emphasis on climate finance and technology, as well as ensuring just energy transitions for developing countries. Introduction of the LiFE movement, which promotes environmentally-conscious practices and is based on India's sustainable traditions.

2. Accelerated, Inclusive & Resilient Growth

Focus on areas that have the potential to bring structural transformation, including supporting small and medium-sized enterprises in global trade, promoting

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labour rights and welfare, the global skills gap, and building inclusive agricultural value chains and food systems.

3. Accelerating Progress on SDGs

Recommitment to achieving the targets set out in the 2030 Agenda for Sustainable Development, with a particular focus on addressing the impact of the COVID-19 pandemic.

4. Technological Transformation & Digital Public Infrastructure

Promotion of a human-centric approach to technology and increased knowledge-sharing in areas such as digital public infrastructure, financial inclusion, and tech-enabled development in sectors such as agriculture and education.

5. Multilateral Institutions for the 21st century

Efforts to reform multilateralism and create a more accountable, inclusive, and representative international system that is fit for addressing 21st century challenges.

6. Women-led Development:

Emphasis on inclusive growth and development, with a focus on women empowerment and representation in order to boost socio-economic development and the achievement of SDGs.

CHALLENGES UNDER INDIA'S G20 PRESIDENCY

1) The EV Policy

Electric transportation in India is set to expand significantly in the near future. The country aspires to achieve 30-percent electrification of its entire vehicle fleet by 2030. This is evident from the incentives and the direction of policymaking being pursued by the government in relation to manufacturing of electric vehicles, the uptake of hydrogen as a fuel, and adopting emerging technologies. Some of the important policies launched to support the growth of the EV market include:

Faster Adoption of Manufacturing of Electric Vehicles Scheme – II (FAME – II): The FAME India initiative was launched to promote the use of electric/hybrid vehicles in India and reduce the use of ICE vehicles. The first phase of FAME provided demand incentives worth INR 3,590 million supporting 0.28 million hybrid and electric vehicles. The second phase of the scheme is targeted at electrification of public and shared transportation and creation of charging infrastructure.

Production Linked Incentive Scheme (PLI), Battery Swapping Policy and Special Electric Mobility Zone: The Production Linked Incentive for Advanced Chemistry Cell Battery Storage seeks to encourage investments in India's Giga scale ACC manufacturing facilities. The total pay-out of this scheme is INR 18,100 crore. The government's battery-swapping policy will help lower battery costs, accelerate the sale of electric vehicles, and promote standardisation.

2) The National Green Hydrogen Mission

The National Green Hydrogen Mission envisions India as a global centre for the manufacture, use, and export of green hydrogen. The ultimate target of this mission is to boost India's self-reliance in energy and accelerate decarbonisation of the industrial, transportation and energy sectors of the economy. The mission is focused towards generating several beneficial outcomes: employment generation; reduction of fossil fuel imports; and reduction of overall greenhouse gas emissions.

The Strategic Interventions for Green Hydrogen Transition Programme (SIGHT) will support two financial incentive schemes—one involving the production of electrolysers; and the other relating to the manufacture of green hydrogen. The mission will identify new end-use sectors and alternative production modes to support pilot projects. Regions that have the potential of emerging as green hydrogen hubs will be identified and developed. The mission seeks to create a favourable policy environment to incubate the green hydrogen ecosystem. A robust standards and regulatory regime is also targeted by the mission.

3) The Smart Cities Mission

The Smart Cities Mission endeavours to create cities that rely on smart solutions to provide basic infrastructure, a decent standard of living, and clean and sustainable environment. The mission is a centrally sponsored scheme in which 100 cities have been identified using a two-stage competition and 5,151 projects worth INR 2,050,180 million have been selected in the 'smart city' proposals. Till date, 1,987 projects have been completed, and 4,375 projects are being implemented. It mandates cities to source at least 10 percent of their energy requirements from solar and ensure that at least 80 percent of their buildings are energy-efficient. A Climate Smart Cities Framework has been formulated which defines climatic parameters such as energy, mobility, and air quality, to evaluate and monitor cities on their efforts to mitigate and adapt to climate change. This is a step towards ensuring sustainable lifestyles in the urban spaces.

CONCLUSION

The India's G20 presidency holding on this year is an extremely critical period for global climate action. The country has the opportunity to steer global climate governance in a direction that will adequately address issues that are material for effective climate action but were previously ignored. India can emerge as a champion of climate cooperation between the global north and the global south. Global climate governance in its current form does not adequately incorporate concerns of climate justice and equity. India has the opportunity to change this in its presidency. The findings based on study can assist G20 countries in revisiting their climate policies and improving their contribution to climate change mitigation. The report highlights the existence of significant divergences in the overall climate action performance of the G20 countries. Compared to the advanced economies, most of the emerging economy members within the G20 have performed significantly well in resource use efficiency and targeted emissions reduction for climate mitigation.

At the same time, it is evident that none of the G20 members emerge as absolute winners with respect to their climate action strategies and outcomes. Each country has its strengths that it can play upon to advance its climate goals, and some pressing stress points that it needs to address to improve its climate performance in the long term. The comprehensive assessment undertaken here points out some of these relative strengths and weaknesses of the G20 countries.

The recommendations can act as an input in defining the agenda of the G20 Climate Sustainability Working Group and can be instrumental in developing a voluntary framework that can strengthen global climate action through the establishment of specific institutional arrangements that ensure consistent achievement of targets and commitments. Comprehensive assessments made in this report can be extended to a G20-plus model, capturing experiences and realities of climate performance in the most underdeveloped nations and making recommendations based on these assessments that can broaden the ambit of global climate action.

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Climate change in recent scenario: Impact and Role of G-20

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Climate change in recent years has intensified extreme-weather conditions. Global warming, a result of climate change, has a major impact on environment and thus well-being of creatures on Earth. The present article reviews the impacts of climate change and the contribution of G-20 members towards climate and solutions to its adverse consequences. The data for this study was obtained from published articles. The main database PubMed, search engines like Google and Google scholar and G-20 documents were used to extract the information. The G-20 Ministerial Meetings addressed current global challenges and sought to strengthen multilateralism along with food and energy security. The issues related to climate and environment were discussed and a roadmap was planned for a safer better planet.

INTRODUCTION

Climate change is a long-term change in the average weather patterns that affects Earth's local, regional and global climates. It has been observed that changes in Earth's climate since the mid-20th century are driven by human activities, particularly fossil fuel burning, which increases heat trapping greenhouse gas levels in Earth's atmosphere. Scientific data provide evidence of climate change key indicators, such as global land and ocean temperature increases; rising sea levels; ice loss at Earth's poles and in mountain glaciers; frequency and severity changes in extreme weather such as hurricanes, heatwaves, wildfires, droughts, floods, and precipitation; and cloud and vegetation cover changes (1).

One of the most significant initiatives in efforts to fight climate change has been the Paris Agreement that was adopted in December 2015. It is the first-ever universal, legally binding global climate agreement and has so far ratified by 187 of 197 Parties to the United Nations Framework Convention on Climate Change (UNFCCC) (2). The Parties agreed to strengthen the global response to the threat of climate change by keeping a 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 (1). It is desirable that all countries take their commitments under the Paris Agreement seriously and implement their national policies & make contributions to move us closer to a green and sustainable path towards economic growth and development.

MAJOR IMPACTS OF CLIMATE CHANGE

- Climate change comprises not only global warming but also several other physical changes like precipitation, the intensity and frequency of storms and the occurrence of droughts and floods.
- It also causes widespread melting of the Greenland and West Antarctic ice sheets, which would lead to significant rise in sea level, and changes in the thermohaline circulation (THC) - the global density-driven circulation of the oceans - that amplify climate change, are considered as two of the main irreversible risks associated with climate change.
- Temperatures have already increased by an estimated 0.7°C compared with pre-industrial levels. There is still some controversy on the contribution of anthropogenic greenhouse gases (GHG) emissions to temperature increases. However, the last report of the Intergovernmental Panel on Climate Change (IPCC, 2007), indicates that most of the observed increase in global average temperatures since the mid-20th century to anthropogenic causes with a probability of more than 90%.
- Recent scientific evidence suggests that **a)** an average increase in temperature by 1.5°C (relative to pre-industrial levels) may initiate the melting of the Greenland ice sheet that could result to rise in sea-level up to 7m and also lead to coral bleaching. **b)** A larger increase (2.5°C and above) can lead to the disintegration of the West Antarctic ice sheet and an additional 5m rise in sea level.
- Climate change is likely to have consequences in many areas of human activity, and some of these consequences are already being observed. The consequences are often divided in two broad categories depending on whether they directly affect a) the economy like agriculture production, energy consumption, called “market” impacts and b) whether they affect humans and society (health, environment), then called “non-market” impacts.
- The health, in general is deteriorated due to increase in temperature. Its size may be underestimated as estimates are largely incomplete. The number of

additional deaths coming from an increase in temperatures has been estimated only for specific diseases (Malaria, heat related respiratory mortality and heat related cardiovascular mortality etc). In addition to this, the indirect consequences of climate change on health is via lesser availability of food, reducing air quality, water constraints etc (3).

- Though less studied, climate change also have a negative impact on biodiversity and the ecosystem. Similarly, there are some estimates of impact on agriculture. There are debates whether CO₂ fertilisation occurs, according to which the increase in CO₂ concentration in the atmosphere increases rate of photosynthesis, thus allowing stronger growth of plants and more effective carbon fixation. It has the potential to mitigate or even to offset the negative impact of climate change in the agriculture and forestry sector (4).
- Climate change may enhance or suppress energy consumption and water resources & demand. This impact depends on regions, with warm areas being more negatively affected compared to cooler ones.

ROLE OF G-20 MEETING IN THE YEAR 2023 (5)

The G20 representing around 85% of the global GDP and over 75% of global trade have major role in climate change. In a G-20 meeting held in March 2023, the Foreign Ministers addressed climate action in the context of common but with differentiated responsibilities. They urged developed countries to fulfil their commitments to deliver on the goal of jointly mobilizing \$100 billion per year urgently and through 2025 to tackle climate change (2). Despite the challenges of the divergent positions on the conflict in Ukraine, the Indian Prime Minister urged ‘we did focus more on what unites us than what divides us’. It has been India’s endeavor to ensure that the voice of the Global South is heard on the G20 table and that is the reason why the Voice of the Global South Summit was organised in January 2023 in which 125 countries participated.

Several initiatives have been taken by Indian Government for safer climate and citizen’s health like building on the UJALA Scheme, where, the Government has rolled out Gram Ujala in 2021- a customized programme for rural India, based on carbon finance. The Gram UJALA programme have a significant impact on India’s climate action resulting in energy savings of around 2,025 million KWh/year and CO₂ reduction of 1.65 million T CO₂/year. A pilot project is currently underway. Similarly, with Pradhan Mantri Ujjwala Yojana (PMUY) – launched in May 2016, the Government aimed to maximize the usage of LPG for cooking in rural and low-income households. As per an estimate, more than 95 million households are being

benefitted in the country, the scheme has become an example in ensuring energy access, helping mitigate climate change and improving family health. State governments in India are currently adopting the strategies for cleaner and safer environment. Chief Minister of Sikkim in March 2023 quoted “Sikkim is the core of India that promotes globalization of locals, including indigenous knowledge development practices, gender equality, community partnerships, and zero-carbon climate conservation” supporting the climate conservation.

There is a need for enhancing R&D collaborations between the public and private sector to build resilient agriculture and food systems, find solutions for climate change adaptation and mitigation without adverse effects on food security, protect and enhance biodiversity, and help improve productivity and profitability sustainably in global agri-food value chains. The G-20 recognize the potential of crop and livestock breeding innovations to improve environmental health and productivity outcomes. Effective investments in agricultural research and innovations will enhance the capacity to build resilience to climate change.

The members highlighted the importance of locally adapted crops for the transition towards resilient agriculture and food systems, enhancing agricultural diversity, and improving food security and nutrition. Recognizing the achievements of the wheat initiative, we intend to continue the R&D efforts to provide inclusive solutions for climate-resilient, nutritious, locally adapted, indigenous and underutilized grains. To strengthen the research collaboration and public awareness of these grain crops, we support the launch of the “Millets And OtHer Ancient GRains International ReSearch Initiative (MAHARISHI)” with voluntary membership from G20 member countries, non-member countries, International Organizations and the private sector.

The G20 Finance Ministers’ meeting held in Bengaluru on February 24-25, 2023 and the G20 Foreign Ministers’ meeting held in New Delhi on March 01-02, 2023 concluded with the Chair’s Summary and outcome document. The Ministerial Meetings addressed current global challenges and sought to strengthen multilateralism along with food and energy security. The climate and environmental action, global health, disaster risk reduction, gender equality and women’s empowerment were also discussed. The G20 called for further pledges to the Poverty Reduction and Growth Trust to meet the demands of vulnerable countries. There was unanimous support for implementation of the OECD/G20 two-pillar international tax package, the Common Framework for Debt Treatment beyond the DSSI, calls for adequate climate financing and the post pandemic global health architecture led by WHO.

The 2nd G-20 Framework Working Group (FWG) meeting under India’s G20 Presidency successfully concluded in Chennai with G20 delegates discussing the global economic outlook. Around 87 delegates from G20 member countries,

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invitees, and international organizations attended the meeting and agreed on the way forward for important deliverables for the year. This also included macroeconomic consequences of food and energy insecurity and climate change and transition pathways. The discussions also highlighted the difficult trade-offs countries face as they balance short-term energy security with long-term structural reforms for the transition to cleaner energy. On the side-lines of this meeting, a panel discussion on “Macroeconomic Impacts of Climate Change and Transition pathways” was also organized in collaboration with the UAE. The session aimed to develop a collective understanding of the challenges facing countries during the climate transition and initiate a discussion on the macroeconomics around climate policy action and transition pathways.

The G-20 supported India’s proposal on climate change, sustainable and climate-resilient agricultural practices and actions to make agriculture a part of the solution to the climate crisis. They also recognized the enhanced need of cooperation and research on transboundary diseases, antimicrobial resistance and prevention of zoonotic disease emergence among One Health issues (6). The proposal was also supported to organize an experts meeting on the ‘One Health’ approach for identifying opportunities to undertake research through collaborations, without duplicating the efforts of existing international organizations.

CONCLUSION

Climate change shifts in temperatures and weather patterns. Such shifts are generally harmful to both living creatures including human and environment. The initiatives taken by G-20 Nations for the protection of climate and environment are encouraging. There is a need to adopt environment friendly lifestyle and minimise over exploitation of natural resources. The climate-resilient, nutritious, locally adapted, indigenous and underutilized grains should be encouraged. Oil and gas operations, energy, industry, transport, buildings, agriculture and land use are among the main sectors causing greenhouse gases and should be cautiously utilised.

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Parameters of Environmental Friendly P-V Systems

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India, a country which has a rapidly growing economy with more than 1 billion people is facing a huge energy demand. The electricity production has expanded over the years but not up to demand. The coal reserves won't last beyond the year 2040-50. To meet this increasing demand, solar energy is the best form of energy to fulfill the energy needs of India and bridge the energy demand-supply gap. A solar photovoltaic system shows benefits to the environment by decreasing carbon emission. This paper presents effects on the environment due to the usage of solar PV systems like, at the time of construction, installation and also at the time of destruction, air, water and soil pollution, emission of greenhouse gases, carbon footprints, global warming, ozone layer depletion, climate change and acid rains are some of the positive impacts during transition to green energy, i.e., usage of fuels from fossil fuels to solar energy at regional level, national level and global level.

INTRODUCTION

Electric power generation using solar energy has gone up by a record value of 192 TWh in 2022 achieving 17% growth when compared with 2021. Also electric power generation using solar energy is the least cost for production by using solar PV system and its accounts for third largest 3.9% of electric power generation global. The top five countries having largest installed electrical power generation capacity by PV system are firstly, China claims the World's largest installed electrical power generation capacity by PV system as 240 GW in the year 2022. US, Japan, Germany and India are at second, third, fourth and fifth positions in installed electrical power generation capacity by PV system in World.

FACTORS FOR ECOLOGICAL EFFECTS

Various influences associated with the usage of PV systems are health of human being, their welfare, geo-hydrological resources, requirement of land, flora and fauna and their habitat, weather etc. An index by name life cycle assessment

(LCA), for ecological impacts by the usage of PV systems has been presented in literature by and mostly discusses about energy payback time, greenhouse gas emissions, emission of dangerous materials, effects on wild animals, water, huge requirement of land etc.

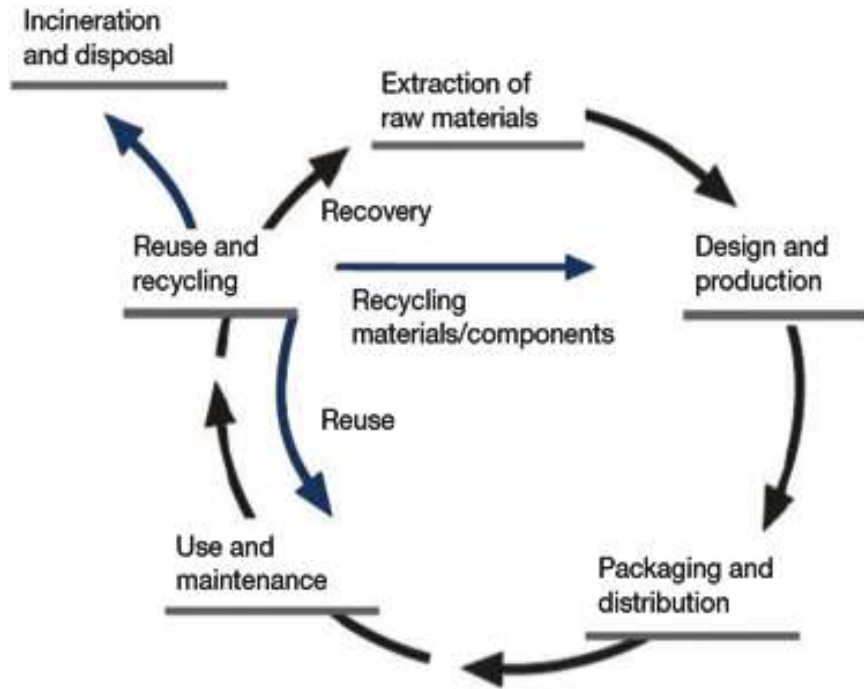


FIGURE-01

Also some other parameters are Bureau of Land Management (BLM) and Department of Energy (DOE) conjointly used in U.S. The BLM and DOE evaluates the weather changes, land requirement due to installation of large PV systems. The life cycle of renewable technologies is explained with help of the figure-01.

The life cycle of renewable technologies explains starting from the acquisition of raw materials, production of materials and equipment's, operation and system assembly and finally finishes with their dumping. The above stated life cycle of renewable technologies require the effort from all the economic sectors namely machine-building, metallurgical, agricultural etc.

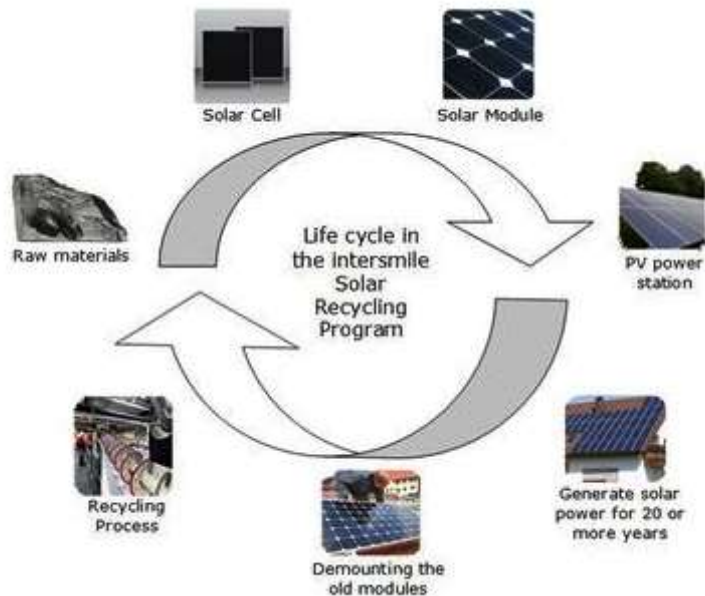


FIGURE-02

Also, the usage of energy from fossil sources, leads to the emission of hazardous substances into the environment. The life cycle assessment of solar PV systems is shown in figure-02.

VARIOUS INDEX FOR PV SYSTEM

The LCA for the PV systems will be evaluated before its installation. The indices for LCA evaluation are fixed depending upon the purpose of work. Now PV systems produce electricity, hence the index will be energy payback time (EPT) is to be estimated. The EPT states the total number of years the PV system has to operate to regain the consumption of its initial energy incurred in the creation during its life period during the energy production of the same system. Thus,

$$\text{EPT (Years)} = \frac{\text{ELPC}}{\text{EPPA}}$$

Where,

ELPC: Electric power used by PV system during the life cycle (kWh)

EPPA: Electric power produced annually (KWh)

Again to know the effect of global warming due to PV systems, its CO₂ emission rate needs to be calculated, this rate is compared with different energy generation technologies. The CO₂ emission rate is given as:

$$\text{CO}_2 \text{ emission rate} = \frac{\text{CO}_2\text{ED}}{\text{EPGA} \times \text{LT}}$$

Where,

CO₂ED: CO₂ emitted during its life (gCO₂)

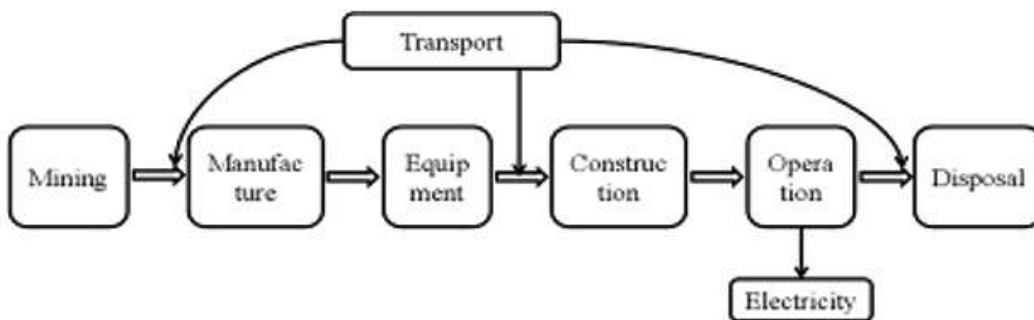
EPGA: electric power generated annually (kWh/Yr),

LT: life time.

As less the carbon emission rate as better would be the environment, lesser temperature.

Finally the energy return on investment (EROI) is defined as the ratio of the working energy returned during operation of the system to all the required energy to make this energy working.

$$\text{EROI} = \frac{\text{LIFE TIME}}{\text{EPT}}$$



Therefore LCA can be concluded to get sensitivity analysis which will be carry out positive environmental effects like not producing sound, noise, chemicals or gases during its functioning. It can be used in city areas creating a picturesque area without having poles or wires hanging all over. The effects of PV systems on various natural parameters are as follows-

- [1] **Ejections of pollutants-** In the course of usual operation of the PV systems, it does not emit any solid, liquid or gaseous pollutants. But, in case of a fire accident of the PV systems, the PV modules generate toxic substances or chemical pollutants that will be released into the atmosphere.
- [2] **Air pollution-** For poly- and mono-crystalline modules, the expected discharges are 5.049–5.524 kg SO₂ /kWp , 2.757–3.845 kg CO₂ /kWp and 4.507–5.273 NO_x /kWp
- [3] **Land use-** The effect of land use on the environment depends upon various features like how much land area PV systems covers, the landscape topography, biodiversity and the distance from sensitive environment. This finally leads to reduction in production of all the cultivated food items.
- [4] **Visual impacts-** With development in different types of PV modules for the porticos, they give a beautiful look in addition to it they perform their applied functions such as heating, current generation, shading, etc.
- [5] **Noise interruption-** During the construction, installation of the PV systems there will be some noise generated. Moreover, there will be generation of employment in the course of the construction stage and operational stage.
- [6] **Exhaustion of natural resources-** Prior to usage of renewable energy sources, fossil fuels were used for all purposes. Due to the natural resources getting depleted, the renewable energy sources are replacing the natural resources. Particularly the mono-crystalline PV modules and the poly crystalline PV modules generate electrical power at high efficiency.
- [7] **Waste administration-** The LCA of the batteries being used are responsible for the various environmental effects due to heavy metal contact and the life span of the batteries being small. Moreover, a large quantity of energy and raw resources are required for the production of the batteries. Also a recycling arrangement can improve this condition.

CONCLUSION

The solar P-V systems offer valuable advantages when compared with traditional sources of energy. The solar energy is never exhausting, the SPVS do not produce any gaseous byproducts during their operation, and it is safe and clean energy. It does not require laying of long transmission lines to the hilly areas, remote places thus facilitating the ecological balance. The solar system can be used for water heating, space heating in addition to electric power generation. Still there are few negative

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effects due SPVS's, like air pollution, land use, visual impacts, noise interruption, generation of waste during production of PV panels, requirement of batteries for storing the energy generated during day time, as electric power can't be produced during the night time due to nonavailability of sun light, no power generation during cloudy days, various ecological factors like partial shading conditions, water droplets, the accumulation of dust, birds droppings, reduce the efficiency of the SPSVs significantly.

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Analyzing the Role of The G20 In Promoting Sustainable Consumption And Production

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INTRODUCTION

You are aware and must have learnt in your Social Science classes how international forum like United Nations Organization (UNO) came into being to bring together and work with nations of the world for peace, development and strengthening relationship and cooperation among the nations and peoples of the world.

IMPORTANCE OF INTERNATIONAL ORGANISATIONS IN CLIMATE CHANGE COMBAT

Global warming, the main result of climate change, has a major impact on our environment, but also on economic growth of countries and well-being of their population. As per the International Monetary Fund (IMF) World Economic Outlook, January 2020 upgrade, growth forecast for global economy for 2020 and 2021 has been downgraded. To quote the report “Climate change, the driver of the increased frequency and intensity of weather-related disasters, already endangers health and economic outcomes, and not only in the directly affected regions. It could pose challenges to other areas that may not yet feel the direct effects, including by contributing to cross-border migration or financial stress (for instance, in the insurance sector).”² More and more frequently we hear about climate extremes never seen before: severe droughts in South Africa, Sahel or Australia, new temperature records set in France and Germany or extreme heat waves in India during summer 2019, rainstorms and floods in Brazil or Bangladesh, unusual cyclone patterns such as Cyclone Idai in Mozambique, Zimbabwe and Malawi, devastating hurricanes like Irma and Maria in Caribbean, or fires in California, Indonesia, Amazon rainforest and Australian bushfires. These are only a few examples from couple of years back that are adding to increasing vulnerabilities and costs of climate crisis.

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Some of these organisations are at the global level, they are international and some of them are at the regional level. Why do countries come together to form an organization? Do they have a common cause or interest? Yes. If you have guessed it, you are absolutely right. They come together for a common cause and mutual benefit and understanding, and to make the world a better place to live in. You must have also learnt about Non-Aligned Movement (NAM), South Asian Association of Regional Cooperation (SAARC), European Union and so on. Do you know about G20? How it came into being? Let us explore and learn about G20.

India has assumed its Presidency on 1st December 2022 and will hold it till 30th November 2023. It is a proud moment for all in India as citizens and for the countries in Asia and Africa and also for all other countries for India has taken over the G20 Presidency at a crucial period of time in history. It is also apt that India heads the G20 as India is the Fountain Head of Democracy as the first Republic of the world originated in the Ancient India. India is imbedded with the spirit of democracy since more than 3000 years and has been always at the forefront of cooperation. G20 forum gives India the unique opportunity to communicate its democratic ethos to the world.

The G20 was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues. As you are aware that the Central Bank in India is known as the Reserve Bank of India. As a premier forum for international economic cooperation, G20 plays a vital role in shaping and strengthening global architecture and governance on all major international economic issues. G20's role as international forum was recognized through its initiatives for economic and mutual cooperation of member countries and the Group of Twenty was strengthened and upgraded to the level of Heads of State and during the global financial crisis of 2007 and got 3 designated as the 'premier forum for international economic cooperation'.

CONCLUSION

G20 LOGO has been designed to convey the essence and indigenous wisdom of India. You can see below as it depicts the overarching vision of human existence Vasudhaiva Kutumbakam, the World is one family. G20 website g20.org was recently launched by Honorable Prime Minister of India, Shri Narendra Modi and India took over the official social media handles, including the twitter handle @g20org, from the previous Presidency, Indonesia.

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Resources for Climate Action in G20 Countries

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Climate change is one of the most significant challenges facing the world today, and the G20 countries have a critical role to play in addressing this challenge. This research paper aims to provide an overview of the resources available to G20 countries for climate action. It examines the financial, technological, and institutional resources available to these countries and their efforts to mobilize these resources to achieve climate goals. The paper also explores the challenges that G20 countries face in mobilizing resources for climate action and identifies potential solutions to address these challenges. more to support technology transfer and capacity-building in developing countries. Additionally, the G20's commitment to phasing out inefficient fossil fuel subsidies has been slow, with some countries continuing to provide significant subsidies to fossil fuels. Finally, there is a need for greater cooperation and coordination between G20 countries to ensure that their efforts are aligned and complementary. Addressing these challenges will be critical to achieving the G20's climate goals and ensuring a sustainable future for all.

INTRODUCTION

The Group of Twenty (G20) is an international forum comprising 19 countries and the European Union, established in 1999 to discuss and coordinate on international economic and financial issues. The G20 represents about two-thirds of the world's population, 80% of global GDP, and 75% of international trade. Its objectives include promoting global economic growth, enhancing international trade and investment, and promoting sustainable development. India holds the Presidency of the G20 from 1 December 2022 to 30 November 2023. India's participation in the G20 is important as it allows the country to engage with other leading economies, showcase its economic progress, raise its concerns and priorities on the global stage, and strengthen economic ties with other countries. The G20 also plays a crucial role in governing climate change, and the leaders have committed to addressing it by phasing out inefficient fossil fuel energy subsidies over the medium term. The G20's flexible institutional setup and cooperation tools could enable its members to

customize policies and engage with developing countries, influencing other key countries to reach an agreement on key climate change-related issues and facilitating the UN process.

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 economic issues. India holds the Presidency of the G20 from 1 December 2022 to 30 November 2023. The G20, or Group of Twenty, is a leading international forum that brings together the world's 20 largest economies, including India. Since its establishment in 1999, the G20 has become a significant platform for discussions on global economic issues, and India has been an active participant in its meetings.

From India's point of view, the G20 is an important forum for several reasons. Firstly, as one of the world's largest economies, India has a significant stake in global economic governance. The G20 provides India with an opportunity to engage with other leading economies and shape global economic policies that are in its best interest. Secondly, the G20 is a platform for India to showcase its economic progress and potential. India's economy has been growing rapidly in recent years, and it has become an increasingly attractive destination for foreign investors. By participating in the G20, India can highlight its economic achievements and potential and seek greater investment and cooperation from other countries. Thirdly, the G20 is an opportunity for India to raise its concerns and priorities on the global stage. India faces several economic challenges, including high levels of poverty, inequality, and unemployment. By participating in the G20, India can push for global policies that address these challenges and promote inclusive and sustainable economic growth. India's participation in the G20 has yielded several positive outcomes.

FINANCIAL RESOURCES FOR CLIMATE ACTION

The G20 countries are at the forefront of the fight against climate change, and financing climate action is a key factor in this fight. Public and private financing, international funding mechanisms, innovative financing mechanisms, and just transition financing can provide the financial resources needed to drive the transition to a low-carbon economy and mitigate the impacts of climate change. The G20 countries have committed to mobilizing trillions of dollars in public and private finance to support the transition to a low-carbon economy, but there is still a significant financing gap. The Green Climate Fund is a critical source of finance for climate projects in developing countries, but more resources are needed to achieve global climate goals. Many G20 countries have also pledged to reach net-zero emissions by 2050, but the financial resources needed to achieve this goal are not yet clear.

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One of the most significant resources required for climate action is finance. G20 countries have committed to mobilizing trillions of dollars in public and private finance to support the transition to a low-carbon economy. In 2015, the G20 countries committed to mobilizing \$100 billion per year in climate finance by 2020 to support developing countries in their efforts to address climate change. While some progress has been made towards this goal, there is still a significant financing gap.

To mobilize finance for climate action, G20 countries have established various financing mechanisms. For instance, the Green Climate Fund (GCF), established by the United Nations Framework Convention on Climate Change (UNFCCC), is a critical source of finance for climate projects in developing countries. As of 2020, the GCF had approved \$19.3 billion in funding for 173 projects in 99 countries.

TECHNOLOGICAL RESOURCES FOR CLIMATE ACTION

Climate change is one of the most significant challenges facing the world today, and the G20 countries have a critical role to play in addressing it. Technology is a key component of the fight against climate change, and the G20 countries have access to a wide range of technological resources to support climate action.

Renewable Energy One of the most significant technological resources for climate action is renewable energy. G20 countries have access to a variety of renewable energy technologies, such as solar, wind, and hydropower, which can help to reduce greenhouse gas emissions. Many G20 countries have set ambitious renewable energy targets, such as Japan's goal of achieving 24% renewable energy by 2030 and India's goal of achieving 175 GW of renewable energy by 2022.

Energy Efficiency Another important technological resource for climate action is energy efficiency. G20 countries can invest in energy-efficient technologies to reduce energy consumption and greenhouse gas emissions. For example, smart grids can help to optimize energy usage and reduce waste, while energy-efficient buildings can reduce energy consumption and associated emissions.

Carbon Capture and Storage Carbon capture and storage (CCS) is another technological resource for climate action. CCS technology captures carbon dioxide emissions from power plants and other industrial sources and stores them underground or repurposes them for other uses. Many G20 countries, such as the United States and Canada, have ongoing CCS projects and are investing in this technology as a way to reduce greenhouse gas emissions.

Electric Vehicles Electric vehicles (EVs) are another technological resource that can help to reduce greenhouse gas emissions. G20 countries can support the

development and adoption of EVs by providing incentives and investing in charging infrastructure. Many G20 countries, such as China and Germany, have set ambitious targets for the adoption of EVs.

Technological innovation is critical to achieving climate goals, and G20 countries have a significant role to play in driving innovation. G20 countries are home to some of the world's leading research institutions and technology companies, making them well-positioned to develop and deploy new technologies to reduce emissions.

To support technological innovation, G20 countries have established various initiatives, such as the Mission Innovation (MI) initiative. MI is a global initiative launched in 2015 to accelerate clean energy innovation and increase investment in research and development. As of 2020, MI had 25 members, including 24 G20 countries.

HUMAN RESOURCES FOR CLIMATE ACTION

Human resources are critical for implementing policies and initiatives to address climate change. G20 countries have a highly skilled workforce and academic institutions that can contribute to developing and implementing climate policies. However, there is a need for increased capacity building and training programs to ensure that the workforce has the necessary skills and knowledge to address the complex challenges of climate change. Additionally, there is a need for greater public awareness and engagement to mobilize support for climate action.

INSTITUTIONAL RESOURCES FOR CLIMATE ACTION

Climate change is one of the most significant challenges facing the world today, and the G20 countries have a critical role to play in addressing it. Institutional resources are one of the key components of the fight against climate change, and the G20 countries have access to a variety of institutional resources to support climate action.

Government Agencies and Programs One of the most important institutional resources for climate action is government agencies and programs. G20 countries can create dedicated agencies and programs to support climate action and implement policies and initiatives to reduce greenhouse gas emissions. For example, the United States has the Environmental Protection Agency (EPA), which is responsible for protecting the environment and reducing greenhouse gas emissions.

International Organizations and Agreements International organizations and agreements are another important institutional resource for climate action. The G20

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countries can participate in international organizations such as the United Nations Framework Convention on Climate Change (UNFCCC) and agreements such as the Paris Agreement to coordinate their efforts to reduce greenhouse gas emissions. Through these international agreements, G20 countries can work together to mitigate the impacts of climate change and ensure a sustainable future for the planet.

Research Institutions and Universities Research institutions and universities are also critical institutional resources for climate action. G20 countries can support research institutions and universities to conduct research and develop new technologies to reduce greenhouse gas emissions. Many universities are leading the way in research and development of renewable energy technologies, energy-efficient buildings, and sustainable transportation systems.

Public-Private Partnerships Public-private partnerships are another institutional resource for climate action. G20 countries can leverage public-private partnerships to develop and implement climate solutions. For example, governments can partner with businesses to invest in renewable energy projects or energy-efficient buildings.

Institutional resources, such as governance structures and regulatory frameworks, are critical to achieving climate goals. G20 countries have established various institutions to support climate action, including national climate change bodies, climate finance institutions, and climate-related laws and regulations.

One example of an institutional resource is the National Adaptation Plan (NAP) process. The NAP process provides a framework for countries to identify and prioritize adaptation actions, taking into account the country's specific climate risks and vulnerabilities. As of 2020, 25 G20 countries had initiated the NAP process.

POLICIES AND INITIATIVES FOR CLIMATE ACTION

G20 countries have adopted various policies and initiatives to address climate change, including carbon pricing, renewable energy targets, and energy efficiency standards. However, many G20 countries continue to subsidize fossil fuels, which undermines their climate goals. Additionally, more needs to be done to address the transportation sector, which is a significant source of greenhouse gas emissions. The G20 countries have an opportunity to lead by example and adopt policies and initiatives that promote sustainable transportation, such as electric vehicles and public transportation.

CHALLENGES

While G20 countries have made progress in mobilizing resources for climate action, there are still significant challenges that need to be addressed. One of the

biggest challenges is the financing gap. Despite commitments to mobilize \$100 billion per year in climate finance by 2020, the actual amount mobilized falls short of this target.

Another challenge is the lack of technology transfer from developed to developing countries. Many developing countries lack the technological resources required to transition to a low-carbon economy. G20 countries must do.

CONCLUSION

Climate change is a global challenge that requires urgent action from all countries, but the G20 countries have a special responsibility to lead the way. This paper has provided an overview of the resources available to G20 countries for climate action, including financial, technological, and human resources. The research findings suggest that while G20 countries have made progress in committing resources for climate action. Climate change is a global challenge that requires urgent action from all countries, but the G20 countries have a special responsibility to lead the way. This paper has provided an overview of the resources available to G20 countries for climate action, including financial, technological, and human resources. The findings suggest that while G20 countries have made progress in committing resources for climate action.

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A Study on the Vedic Perspective of Building Climate Resilient Communities in the Context of G-20 Framework

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Mother Nature has sufficient resources to provide for sustainable life without losing its equilibrium. However, man has a propensity to take more than what Mother Nature can provide. Unbridled desires produced by the mental pollution inside our consciousness is the main culprit for the present dire state of the environment. Not air, water, noise, or soil pollution is the primary form of pollution that contributes to climate change. Instead, it is mental pollution resulting from people's insatiable urges. G-20 is a leading forum for global economic collaboration, which is working on more general macroeconomic issues, but due to the severity of the environmental crises, it has broadened its agenda to include trade, sustainable development, health, agriculture, energy, environment, climate change, and corruption prevention. This paper is an attempt in the context of building climate resilient communities based on the rich Vedic knowledge base which India has since ages highlighting the importance of cultivating inner resilience to live a sustainable life.

Section I of the present study provides background knowledge about G-20 and its various functions and its linkage with ancient text. Section II deals with the literature review to understand the thought process of previous researchers on the topic related to the Vedic literature available. Section III puts forth the research methodology of the study, its objective and scope. Section IV presents data analysis in which the relationship between human beings and Mother Nature is described as given in our Vedic knowledge, primarily, Srimad Bhagavad Gita and Srimad Bhagawatam and also how the resilient community can be created through sustainable practices as mentioned in our Vedic literature, emphasising on 'Simple living and high thinking'. Section V outlines the study's findings and conclusions to motivate present and future generations to adopt such practices which can be a milestone in building climate resilient communities ensuring Sustainability.

SECTION I: INTRODUCTION

The Group of Twenty (G-20) is the most prominent platform for global economic cooperation. Following the 1997–1998 Asian financial crisis, the G-20 came into being in 1999 as an informal forum for the most significant industrialised and developing economies to discuss global economic and financial stability. The G-20 initially focused on broad macroeconomic issues like establishing and enhancing a global governance framework for all significant global financial issues, but in light of the severity of the environmental crisis, it has since broadened its agenda to include trade, equitable development, good health, agriculture, energy, the environment, climate change, and corruption prevention. The OECD supports the work of the G20 Presidency, drawing on its vast expertise in green development, clean and climate-resilient infrastructure, subsidies for fossil fuels, regulation of energy, green financing and investments, environmental taxes, and environmental, social, and governance (ESG).

Sustainability, being a major issue, forces every nation in the world to focus on sustainable development, and the G-20 nations too have adopted this as their motto. It's important to note that the ancient Vedic literature contains a number of references to ecological equilibrium, climate cycles, rainfall events, the water cycle, and related topics. These references clearly demonstrate the high level of consciousness of the sages and people of that time and provide evidence of the Vedic age. Modern society disbelieves in the spiritual value of nature and sees itself as the owner of the cosmos. However, the ancient texts indicate a deep understanding of the negative consequences of environmental deterioration, whether brought upon by natural or human factors. Ancient vedic literature such as Mahabharata, Ramayana, Vedas, Upanishads, Bhagavad Gita and Puranas are all full of teachings about environmental protection and ecological balance. Our ancient Vedic literature is extremely helpful in resolving contemporary issues pertaining to the environment and sustainability. But regrettably, we have lost sight of those timeless truths which might be a game-changer in addressing the urgent issues of sustainability and mental pollution.

SECTION II: REVIEW OF LITERATURE

(Sarkar, 2018) “Environment and Environmental awareness in the Bhagavad Gita” This study focuses on the environment and topics associated with it that are discussed in the Srimad Bhagavad Gita. The verses that discussed nature, human nature associations, appraisal, and human behaviour that was centred around nature were emphasised. This investigation helps the researcher prove that the Hindu civilisation had a close bond with nature, which is represented in the sacred text.

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(Shweta, 2023) This study “**Environment- The Problems, The Laws and An Untraditional Approach to Find a Solution in Spirituality**” emphasize on the importance of the ancient book in helping to solve modern problems like climate change. The study is based on The Bhagavad Gita’s teachings on nature, which have the potential to be the world’s moral compass and outlined the origins and effects of pollution. Finally, the research attempts to present the Bhagavad Gita as a novel strategy for resolving environmental problems.

(Londhe, 2019) through the study “**Can We Revisit Scriptures For Addressing The Challenges Of Climate Change And Sustainability?**” stressed on the necessity to return to these Ancient Bhagavad Gita principles for finding the divine solutions of the present pressing problem of climate change. The study concludes that Bhagavad-Gita’s teachings are important for nature preservation, ecological harmony, and environmental protection. significant.

(AHRENS, 2022) This thesis titled “**Know This To Be The Enemy”: Desire In The Bhagavad Gita And Environmental Destruction** “ investigates the relationship between desire in the Bhagavad Gita and the consumption-related environmental damage in the modern day. The study claims that the Bhagavad Gita’s teaching of desirelessness is timeless and greatly pertinent to environmental challenges. The purpose of this thesis is to explore the insights that the discourses on desirelessness as explained in the Bhagavad Gita regarding the specific connection between want, consumption, and the environment is significant.

(Luiz C. Terra dos Santos, 2023) This study tracks and compares the performance of 19 G20 members from 2000 to 2020 in order to evaluate each nation’s advancement towards the environmental, economic, and social sustainability outlined in the CE principles. The methodology used in the study is goal programming along with the five sectors sustainability model. The findings indicated that Canada, Australia, Italy, the UK, and the US have the best overall sustainability (environmental, economic, and social) in 2020.

SECTION III: RESEARCH METHODOLOGY

Research Objectives

1. To Analyze the relationship between human beings and Mother Nature as described in our Vedic Literature.
2. To identify such sustainable practices that will help in building resilient communities as mentioned in our Vedic Literature.
3. To suggest courses of action which will

The study is descriptive in nature. The Ancient Vedic Literature has been analysed and interpreted using Hermeneutics, a qualitative research methodology in order to investigate its applicability in building resilient communities.

Scope of the Study

The present study primarily focused on the teachings of Bhagavad Gita in creating a resilient community through sustainable practices. The future researchers can further deeply analyse the other scriptures that can help in further creating a resilient community. the underlying guiding principle of sustainability has been “Simple living and high thinking,” which all of us need to make a part of our lifestyle. As the eternal parts and parcels of the Supreme Lord and keeping Him in the centre of all of our actions, we have to take utmost care, respect and perseverance towards Lord’s property.

SECTION IV: DATA ANALYSIS AND INTERPRETATION

Relationship between Human Beings and Mother Nature

The relationship between human beings and mother earth can be understood from an analogy of a mother and a child. **Chapter 14 Text 4** confirms Earth as the mother and Lord Krishna as the seed giving father as follows:-

सर्वयोनिषु कौन्तेय मूर्तयः सम्भवन्ति याः ।
तासां ब्रह्म महद्योनिरहं बीजप्रदः पिता ॥ ४ ॥

(Prabhupada A. B., B.G 14.4, 1968) It should be understood that all species of life, O son of Kuntî, are made possible by birth in this material nature, and that I am the seed-giving father.

Explanation: Lord Krishna confirms in the Bhagavad Gita that all living entities within the earth, within water and within fire are my part and parcel. All of these manifestations are due to the Mother Earth, and K[cGa’s seed-giving process. Humans suffer when they want to engage in sensual pleasure and forget their eternal connection to Lord Krishna and Mother Earth. They get influenced by their sensory pleasures and result in the destruction of their own mother Earth and then face its consequences.

Chapter 3 Text 14 describes the relationship between human behaviour with nature and its impact on the production of food grains.

अन्नाद्भवन्ति भूतानि पर्जन्यादन्नसम्भवः ।

यज्ञाद्भवति पर्जन्यो यज्ञः कर्मसमुद्भवः ॥१४॥

(Prabhupada A. B., B.G 3.14, 1968)

Meaning: All living bodies subsist on food grains, which are produced from rains. Rains are produced by performance of yajña [sacrifice], and yajña is born of prescribed duties.

Explanation: In the aforementioned shloka, Lord Krishna discusses the significance of offerings. The word “Yajna” denotes work carried out with altruistic intent and for the well-being of others. According to the Vedic sacrifices, the demigods must be appeased in order for them to be happy and provide enough air, light, and water for food grains. The field’s ability to produce food is a result of adequate rainfall, which is managed by demi-gods like Indra, the sun, moon, and other celestial bodies who are all devoted to the Lord. Since sacrifices can appease the Lord, it follows that anyone who is unable to offer them, will experience scarcity. This is the law of nature.

Chapter 7 Text 8 explains how the Lord is present in each component of the nature as follows:

रसोऽहमप्सु कौन्तेय प्रभास्मि शशिसूर्ययोः ।

प्रणवः सर्ववेदेषु शब्दः खे पौरुषं नृषु ॥८॥

(Prabhupada A. B., B.G 7.8, 1968) **O son of Kuntī, I am the taste of water, the light of the sun and the moon, the syllable oA in the Vedic mantras; I am the sound in ether and ability in man.**

Explanation: This verse highlights the way the Lord’s various material and spiritual energies make Him all-pervasive. By tasting the water, we can detect the Lord’s presence and praise Him for kindly providing tasty water to quench man’s thirst. The brahma-jyotir, or impersonal effulgence of the Lord, is where the light of the sun and moon also originates. And every Vedic hymn begins with pranava, or the transcendental sound of omkara, which addresses the Supreme Lord. The Lord Krishna explains to us the spiritual significance of each and every element the cosmos provides, whether it is the sun, the sound of Om, or water. Lord created this universe with a perfect equilibrium. Humans need to cultivate the consciousness of the Lord’s presence in every aspect of this cosmic creation, and should work to maintain this balance.

Creating resilient community through Sustainable Practices as mentioned in Srimad Bhagavad Gita

Community resilience is the long-term capacity of a community to adapt to, endure, and recover from unfavourable events using the available resources. Awakening to the wrongdoings of human society came with Covid 19. As our desire for more wealth, influence, or status grew, we became more and more avaricious to the point where we neglected our duties to the earth. Even though we are aware that this life is temporary, we continue to sprint forward in the blind race of possessions. We consume and buy things we don't require, losing ourselves in the process and harming the environment. We are standing at a crossroads, unsure of which way to go to protect our Mother Earth, and wondering what we can do. All these questions have already been addressed in the Ancient Vedic Literature thousands of years ago. In the present section, this study presents such verses given in the Bhagavad Gita that are helpful in instructing the human community to be resilient and sustainable.

Chapter 3 Text 11 teaches the human society to cooperate with nature to bring prosperity as follows:-

देवान्भावयतातेन ते देवा भावयन्तु वः ।

परस्परं भावयन्तः श्रेयः परमवाप्स्यथ ॥११॥

(Prabhupada A. B., B.G 3.11, 1968) The demigods, being pleased by sacrifices, will also please you, and thus, by cooperation between men and demigods, prosperity will reign for all.

Explanation: The demigods are in charge of providing the air, light, water, and other blessings needed to maintain every living thing's body and soul. Their happiness or unhappiness is determined by how well human beings perform yajna. Yajna is a term used to describe acts of selflessness that advance social well-being. Every deed should be undertaken to please Lord Krishna. When these yajnas are flawlessly carried out, the demigods in charge of the various supply departments are naturally pleased, and there is no shortage of the supply of natural goods. Yajnas are performed to liberate people from their material entanglements and to purify their existence.

Chapter 3 Text 12 advises the human society to create a bond by giving back to the nature in the form of Yajnas as follows:-

इष्टान्भोगान्हि वो देवा दास्यन्ते यज्ञभाविताः ।

तैर्दत्तान्प्रदायैभ्यो यो भुङ्क्ते स्तेन एव सः ॥१२॥

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(Prabhupada A. B., B.G 3.12, 1968) In charge of the various necessities of life, the demigods, being satisfied by the performance of yajña [sacrifice], will supply all necessities to you. But he who enjoys such gifts without offering them to the demigods in return is certainly a thief.

Explanation: Humans receive all of their basic needs from the agents of the Lord, such as grains, fruits, vegetables, milk, sugar, sunlight, moonlight, rain, breeze, etc., and if we don't give anything back to nature in exchange, we are undoubtedly thieves and subject to the laws of material nature. By performing yajnas for the well-being, harmony, and peace of human society, this life's goal can be achieved. A thieving society can never be content since they have no purpose in life. Gross materialist thieves have no overarching life purpose. They are not taught how to do yajnas; their only goal is to satisfy their senses. Therefore, the Lord advises that you live in harmony with perfect tuning with the nature.

Chapter 13 Text 29 talks about the presence of the Lord in all the living entity and Non Violence as a measure of resilience as follows:-

समं पश्यन्हि सर्वत्र समवस्थितमीश्वरम् ।

न हिनस्त्यात्मनात्मानं ततो याति परां गतिम् ॥ २६ ॥

(Prabhupada A. B., B.G 13.29, 1968) One who sees the Supersoul equally present everywhere, in every living being, does not degrade himself by his mind. Thus he approaches the transcendental destination.

Explanation: The living creature has changed from his position in his spiritual life as a result of accepting his material existence. However, if one realises that the Supreme is present in His Paramatma manifestation everywhere, or if they are able to recognise the Supreme Personality of Godhead in all living things, they will not degrade themselves by having a destructive mentality and will instead make gradual progress into the spiritual world. They will consider all living beings as an extension of Lord Krishna and will stop killing animals for the sake of satisfying their tongue. The mind tends to be addicted to sense pleasing activities, but when it turns to the Supersoul, one develops deep spiritual insight.

Chapter 16 Text 21 describes **lust, anger and greed** as the three enemies to a sustainable life as follows:-

त्रिविधं नरकस्येदं द्वारं नाशनमात्मनः ।

कामः क्रोधस्तथा लोभस्तस्मादेतत्त्रयं त्यजेत् ॥ २१ ॥

(Prabhupada A. B., B.G 16.21, 1968) There are three gates leading to this hell – lust, anger and greed. Every sane man should give these up, for they lead to the degradation of the soul.

Explanation: This verse explains the genesis of demoniac life. When a person tries to sate his lust but is unable, he becomes enraged and greedy. A rational person who does not want to descend to the species of demoniac life must make an effort to give up these three adversaries because they have the power to destroy oneself to the point where there is no chance of escape from this material entanglement. The same cycle of natural disaster continues. Human society, driven by its insatiable needs, ruthlessly depletes the earth's natural resources, which has a knock-on effect on the health of the natural ecosystem.

SECTION V: FINDINGS AND RECOMMENDATIONS

With reference to our current study, which is based on building a Value-based resilient community through the teachings of the Bhagavad Gita, the following qualities or values were discovered to be urgently needed to be adopted by the G-20 nations in their policy making:

- 1. Self-Control:** The human beings should learn the art of Self (Mind) control to keep their desires regulated so that the mother earth can be protected and sustained for future generations.
- 2. Simplicity:** It means that one should adhere to the exalted principle of “High thinking and simple living,” which calls for gathering only what is truly necessary rather than having excess possessions putting extra pressure on self and the mother earth. Being a minimalist, one can help to restore the equilibrium of the mother earth.
- 3. Satvik lifestyle:** Ecotheology encourages people to deeply appreciate nature and to appreciate the created world, by adopting satvik way of life and concern for animal rights. Krishna's example of expelling the demon Kaliya for contaminating the Yamuna River is an evidence that the Lord preserves the natural world and punishes those who contaminate it.
- 4. Overcoming lust, greed and anger:** Lust, anger, and greed are the three entrances to the hell. These should be abandoned by every rational individual because they degrade the soul. When our senses are out of control, lust, anger, and greed start to infiltrate our minds. Purification of the mind is required in order to regulate the exploitative uses of natural resources.

5. **Temporary nature of the universe:** The Lord himself creates and destroys the universe according to its cosmic manifestation. We human beings mistakenly believe it to be eternal and spend our entire lives working for wealth, notoriety, and prestige in an effort to control or subjugate others. This sense of dominion results from a mistaken sense of “I” and “mine.” A wise individual would acknowledge that this material nature is the Lord’s possession and it should be used for the service of the lord.
6. **Sacrifice:** Work performed for the welfare of others is known as sacrifice. Being an integral part of the Supreme Lord, it is the duty of every human being to care for the mother Earth and all of its inhabitants as if they were their own siblings. No species on this mother planet will suffer by maintaining such an endeavour, and there will be complete harmony and bliss.
7. **Cooperation with nature:** At the beginning of creation, Lord Krishna instructed mankind to do Yajnas in order to please the Demi-gods as a gesture of gratitude for providing all the necessities of life. Being the most intelligent species in the universe, humans have been given the duty to work in harmony and cooperation with nature to promote prosperity.
8. **Development of Ecotheological consciousness:** One needs to cultivate an understanding of the Divine being who is the source of creation and who, as this source, is impossibly deeply ingrained and embodied into each and every ingredient, each particle, and every movement of the movement of Earthly creation. An important aspect of ecotheology is the need to develop a consciousness that values creation and enables people to sense God’s presence among the natural world.
9. **Nature as Guru:** Verse (11.7) of the Srimad Bhagavatam describes how young ascetic Dattatreya chose nature as his guru. The wise man elaborates on the lessons he has learned from the Earth, fire, wind, spiders, kids, and even his own body. The lessons are applicable and have a big impact on the environment. The lesson of Dattatreya’s tale teaches us to seek out nature as our guru and fosters the regards that Vaishnavas(Devotees of the lord) have for it.
10. **Sense of Animal Rights:** According to Bhakti yoga, it is our responsibility to serve all living beings on this earth with an attitude of modesty, amity, compassion, and active service. The knowledge that every living being is a constantly existing, aware, and joyous jiva (living being). All living things, in their physical manifestations, are worthy and deserving of respect, care, and compassion. This is true because every living being is an eternal spiritual being that is inextricably linked to the Supreme Personality of Godhead.

CONCLUSION

The Practise of Bhakti-Yoga requires concern and protection for all other living things, both human and non-human. The ethical pillars of our tradition include sarva-bhuta-hita, which refers to “devotion for the well-being of all creatures,” and loka-hita, which means to “devotion for the well-being of all human beings,” .Therefore, one of the fundamental ethical precepts of our tradition’s practise of Bhakti-Yoga is the protection of all living beings. The Earth can be considered as a holy adobe as Lord Krishna, who personally transcended the planet Earth, engaged in his favourite playful activities, and left the marks of his footprints upon it. Everything the Earth produces is God’s energy; it is His property and ought to be used in his service. We are all related to one another as brothers and sisters as Lord Krishna is the seed giving father and we all have duties to Mother Earth and Father of the universe Lord Krishna. Immense care, respect, and compassion is required to protect the material nature which is an eternal energy of the Lord.

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G.20 : अंतर्राष्ट्रीय सहयोग और जलवायु परिवर्तन

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जी-20 एक समूह है जो यूरोपियन संघ और उन्नीस देशों से मिलकर बना है। जी-20 अंतर्राष्ट्रीय आर्थिक और वित्तीय कार्यसूची के अत्यंत महत्वपूर्ण पहलुओं पर अंतर्राष्ट्रीय सहयोग के लिए एक मुख्य मंच है, जो विश्व की उभरती और उन्नत अर्थव्यवस्थाओं को एक साथ लाने का काम करती है। जी-20 जलवायु परिवर्तन के मुद्दों को सीमित करेगा, तकनीकी ज्ञान में विकास तथा नवीकरणीय ऊर्जा के लिए द्वार खोलेगा। यह जलवायु परिवर्तन के नकारात्मक प्रभाव को कम करके पर्यावरण में सुधार करेगा। जी-20 के चलते 20 देश मिलकर आपसी सहयोग के साथ कार्य करेंगे जिससे उनके आपसी सम्बन्ध भी मजबूत होंगे। जी-20 में देशों पर कर्ज के बोझ को कम करने, बेरोजगारी और वैश्विक अर्थव्यवस्था को महामारी से उबारने पर भी ध्यान दिया जा रहा है।

जी-20 : अंतर्राष्ट्रीय सहयोग और जलवायु परिवर्तन

जलवायु का हमारे जीवन पर गहरा प्रभाव पड़ता है क्योंकि मनुष्य का रहन-सहन, खान-पान, स्वास्थ्य, उसकी वेशभूषा सभी पर जलवायु का प्रभाव पड़ता है। परिवर्तन प्रकृति का नियम है। सभ्यता के उद्भव से अब तक इसमें निरन्तर परिवर्तन होता रहा है। विश्व के सभी शहर व महानगर शहरीकरण से प्रभावित हो रहे हैं। जलवायु परिवर्तन से सागर और नदियों के किनारे पर बसे लोगों पर बाढ़ का खतरा मंडरा रहा है, ऋतु में परिवर्तन के कारण तापमान में वृद्धि हो रही है। पृथ्वी पर रहने वाले जीवों के लिए जलवायु में हो रहे नकारात्मक परिवर्तन बहुत ही घातक सिद्ध हो रहे हैं। जलवायु परिवर्तन से जुड़े खतरों के प्रति संगठन और संस्थाएँ जागरूक हो रही हैं और लोगों को भी जागरूक करने का भरसक प्रयत्न किया जा रहा है। जलवायु परिवर्तन के नकारात्मक प्रभाव को रोकने के लिए जी20 महत्वपूर्ण भूमिका निभा रहा है। जी20 के दौरान पर्यावरण को स्वस्थ व सुरक्षित करने पर ध्यान केंद्रित किया जा रहा है।

जी-20 का पूरा नाम है - GROUP OF TWENTY (ग्रुप ऑफ ट्वेन्टी)। जी-20 की स्थापना 1999 में एशियाई वित्तीय संकट के बाद वित्त मंत्रियों और केंद्रीय बैंक के गवर्नरों के लिए वैश्विक, आर्थिक और वित्तीय मुद्दों पर चर्चा करने के लिए एक मंच के रूप में की गई थी। इसकी पहली बैठक दिसम्बर सन् 1999 में बर्लिन में हुई थी। यह एक समूह है जो यूरोपियन संघ और उन्नीस देशों से मिलकर बना है। जी-20 में शामिल सदस्य देशों के नाम हैं :- भारत, अमेरिका, फ्रांस, रूस, जापान,

चीन, ऑस्ट्रेलिया, जर्मनी, ब्राजील, यूनाइटेड किंगडम, कनाडा, सउदी अरब, दक्षिण अफ्रीका, अर्जेंटीना, मेक्सिको, इंडोनेशिया, इटली, रिपब्लिक ऑफ कोरिया, तुर्की, यूरोपीय संघ। जी-20 अंतर्राष्ट्रीय श्रम संगठन, संयुक्त राष्ट्र, विश्व बैंक, अंतर्राष्ट्रीय मुद्रा कोश, राष्ट्रीय आर्थिक सहयोग एवं विकास संगठन, विश्व व्यापार संगठन और वित्तीय स्थिरता बोर्ड के साथ मिलकर कार्य करता है। इसका प्रमुख कार्य आर्थिक स्थिति पर नियंत्रण बनाए रखना और वैश्विक स्तर पर आर्थिक सहयोग प्रदान करना है।

जी-20 अंतर्राष्ट्रीय आर्थिक और वित्तीय कार्यसूची के अत्यंत महत्वपूर्ण पहलुओं पर अंतर्राष्ट्रीय सहयोग के लिए एक मुख्य मंच है, जो विश्व की उभरती और उन्नत अर्थव्यवस्थाओं को एक साथ लाने का काम करती हैं। इसमें व्यापार, जलवायु परिवर्तन, सतत विकास, स्वास्थ्य, कृषि, ऊर्जा, पर्यावरण और भ्रष्टाचार विरोधी कार्य शामिल हैं। इसका प्रमुख उद्देश्य है : अंतर्राष्ट्रीय स्तर पर नई वित्तीय संरचना तैयार करना, भविष्य में आए वित्तीय संकट को रोकने के लिए और जोखिमों को कम करने के लिए वित्तीय नियमों को प्रोत्साहन देना, वैश्विक आर्थिक स्थिरता और सतत विकास के लिए सदस्य देशों के बीच नीतियों का तालमेल व सामंजस्य बिठाना।

जी-20 ने जीवाश्म ईंधन की खपत में कटौती करके ग्लोबल वार्मिंग से लड़ने, हाइड्रोजन, इथेनॉल जैसे नए ऊर्जा स्रोतों की ओर बढ़ने का फैसला किया है, भारत की जी-20 अध्यक्षता के चलते पर्यावरण को स्वस्थ तथा सुरक्षित करने और भविष्य में जलवायु परिवर्तन से जुड़े मुद्दे पर अधिक ध्यान केंद्रित किया जा रहा है। वैश्विक स्तर पर जी-20 के अध्यक्ष होने के कारण सभी देशों की निगाहें भारत की तरफ हैं।

भारत की जी-20 अध्यक्षता के दौरान पर्यावरण के तीन प्राथमिकता वाले क्षेत्रों की पहचान की गई है जो कि भारत के साथ-साथ वैश्विक स्तर पर सभी देशों के लिए अहम होंगे और सतत विकास 2030 के लक्ष्यों को पूरा करने या सुनिश्चित करने में महत्वपूर्ण भूमिका निभाएंगे। तीन प्राथमिकताओं में खराब या बंजर भूमि और पारिस्थितिकी तन्त्र बहाली, तटीय स्थिरता के साथ ब्लू इकोनॉमी को बढ़ावा देने, जैव विविधता में वृद्धि और सर्कुलर अर्थव्यवस्था को मजबूत करना शामिल है। इसका लक्ष्य सभी का एकीकृत विकास करना है। भारत के केंद्रीय मंत्री ने सतत विकास को बढ़ाने के लिए और जलवायु परिवर्तन से निपटने के लिए कहा कि भारत जी-20 के लिए लाइफ - स्टाइल फॉर एनवायरमेंट और रेजीलिएन्ट डेवलपमेंट पैराडाइम को भी बढ़ावा देगा। LIFE (LIFE STYLE OF ENVIRONMENT) की अवधारणा का उद्देश्य सतत जीवन के लिए प्रकृति के साथ सामंजस्य बनाकर रहना है।

जी-20 का प्रतीक चिन्ह भारत का राष्ट्रीय पुष्प कमल पर शून्य के स्थान पर पृथ्वी के साथ जी-20 बना है और यह भारत के राष्ट्रीय ध्वज के जीवन्त रंगों केसरिया, सफेद और हरा तथा नीले रंग से प्रेरणा लेता है। जी-20 लॉगो के नीचे देवनागरी लिपि में “भारत 2023” और अंग्रेजी भाषा में INDIA लिखा हुआ है। भारत का जी-20 का विषय है - “वसुधैव कुटुम्बकम्” अर्थात् एक पृथ्वी, एक

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कुटुम्ब, एक भविष्य। यह महा उपनिषद के प्राचीन संस्कृत पाठ से लिया गया है। यह विषय सभी प्रकार के जीवन मूल्यों, मानव, पौधे तथा सूक्ष्मजीव, पृथ्वी एवं ब्रह्मांड में उनके परस्पर सम्बन्धों की पुष्टि करता है।

यह विषय राष्ट्रीय विकास और व्यक्तिगत जीवन शैली दोनों स्तर पर पर्यावरण की दृष्टि से धारणीय और जिम्मेदार विकल्पों से सम्बद्ध पर्यावरण के लिए जीवन शैली पर प्रकाश डालता है, जिससे वैश्विक स्तर पर परिवर्तनकारी कार्यों के परिणामस्वरूप एक स्वच्छ, हरे - भरे और उज्ज्वल भविष्य का निर्माण होता है।

अतः जी-20 भारत के लिए महत्वपूर्ण है क्योंकि यह भारत को अपने आर्थिक हितों को बढ़ावा देने, दुनिया की सबसे बड़ी अर्थव्यवस्थाओं के साथ जुड़ने और महत्वपूर्ण वैश्विक मुद्दों को सम्बोधित करने के लिए एक मंच प्रदान करता है।

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Identification of Opportunities and Challenges in Leveraging the G20 Platform to Accelerate Climate Action at a Global Level

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The 2023 G20 Delhi Summit is the upcoming eighteenth meeting of Group of Twenty (G20), a summit scheduled to take place in International Exhibition-Convention Centre. It will be the first ever G20 summit to be held in India as well as in South Asia. The Host Country of this summit is India this year. The G20 New Delhi Summit will be chaired by the Indian Prime Minister, Narendra Modi.

India's presidency began on 1 December 2022, leading up to the summit in the third quarter of 2023. The presidency handover ceremony was held as an intimate event, in which the G20 Presidency gavel was transferred from Indonesian President to Indian Prime Minister.

The India's G20 Presidency would guide the work of the G20 under the theme of "Vasudhaiva Kutumbakam" or "One Earth One Family One Future" – drawn from the Sanskrit phrase of the Maha Upanishad, which means "The World is one Family". Essentially, the theme affirms the value of all life- human, animal, plant and microorganisms- and their interconnections on the planet Earth and in wider universe.

INTRODUCTION

Climate change, biodiversity loss and sustainable growth are long-standing global challenges. Today they are even more crucial, given the crisis brought about by the Covid-19 pandemic, which calls for making the much-needed recovery in the global economy compatible with the planetary boundaries. Post-pandemic recovery provides an opportunity for governments to look ahead and build a low-carbon and climate-resilient future. However, this opportunity comes with challenges, not least because to succeed societies need to embrace profound socio-ecological transformations from the agri-food system to energy, transport, and infrastructure at

large. Representing almost 90% of global GDP around two-thirds of the world population and close to 80% of greenhouse gas emissions, the G20 countries can and should- play a leading role in limiting global warming to 1.5 degree Celsius. Advancing climate action at all levels, as well as well as coordinated efforts among the G20 countries are critical for pursuing this goal, and ensuring sustainable and climate-resilient post-pandemic economic recovery worldwide. The rest of the international community expects the G20 countries, as the world's largest emitters and largest economies, not only to pioneer ambitious action on climate and biodiversity protection, but also to support less developed countries in their respective efforts through finance, technology transfer and capacity building.

To re-launch the global economy while fighting climate change, we recommend that the G20 countries coordinate their efforts to prioritise low-carbon, green growth policies in their post-pandemic recovery packages. This can be achieved through concerted action on several fronts when committing that the major share of recovery funding supports healthy, environmentally friendly solutions and that any funding adheres to the “do no significant harm” principle. We recommend that the G20 countries make a renewed commitment to deploying budgetary instruments, such as carbon pricing, tax incentives and subsidies, to encourage decarbonisation while implementing a rapid phasing-out of direct and indirect fossil-fuel subsidies and any public financial support for fossil fuels, particularly new coal power plants and mining facilities. At the same time, the investments needed to green the global economy exceed by a wide margin the public funds available, making the private sector an important partner in this endeavour. To help redirect private finance towards green investment, we recommend that the G20 countries step up efforts to set a common international taxonomy of sustainability and standards for consistent and comparable reporting frameworks to underpin reliable disclosure of green investments, including green bonds and sustainable assets. Action in this area can be complemented by the establishment of a Low-Carbon Finance Facility to catalyse funds for the recovery, as well as of a Green Rating Agency to support the adoption of internationally recognized sustainability disclosure and reporting standards, and the development of a global green bond market. This is particularly important to finance energy efficiency investment. There is much scope for the G20 to take a leadership role in the global governance architecture and foster cooperation to align the legal and policy regimes on climate goals and international trade, including on carbon border adjustment mechanisms.

ECONOMIC IMPACTS OF CLIMATE CHANGE

Positively, the Indian democracy has resulted in equity moderately greater than the global average and the dependency ratio is also relatively greater. Nonetheless,

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the poor living standards of people involved in agriculture and people born into socially and economically backward castes and regions limit the robustness of the wholesome economy. It is possible and predicted that climate change will rip off the existing economic standards of these people so much so that it will result in severe taxes on the economic and industrial assets of the state and central government.

It has been projected that climate change can deplete India's GDP by circa 2.6% by 2100 even while capping the global temperature rise below 2 °C. In a scenario where global temperature also keeps increasing (4 °C), this depletion is projected at 13.4%. These figures are an outcome of the changes in precipitation and temperature levels, and the impact of climate change on labor productivity. Labor productivity may as well get affected by endemic vector-borne diseases like malaria, dengue, etc. The probability of the outbreak of such diseases increases due to climate change.¹⁷

Nevertheless, gauging the exact financial and economic costs of climate change is a herculean task and also appears complicated due to uncertainties at every step. The absolute cost of flooding, heatwaves, cyclones, water scarcity, sea-level rise, and other climate-related hazards can be determined by the level and direction of economic development, the solutions opted in infrastructure development, spatial planning in the future, and the intermingling of hazards and how they will multiply each other. On top of everything, global warming will have a major role to play in determining the economic costs.

Elsewhere, climate change can entail significant risks to macrofinancial stability. Nonfinancial corporate sectors face risks from climate damages and stranded assets—such as coal reserves that become uneconomic with carbon pricing—and the disruption could affect corporate balance sheet quality.

WHAT ARE 3 ECONOMIC IMPACTS OF CLIMATE CHANGE?

Global warming will primarily influence economic growth through damage to property and infrastructure, lost productivity, mass migration and security threats. The balance between winners and losers turns increasingly negative as temperatures rise.

TRANSITION TOWARDS CLIMATE-NEUTRAL ECONOMIES

The G20 countries should commit to becoming carbon neutral by 2050. They should furthermore define their long-term strategy, including science-based, sector specific targets for 2030 and 2040. This will give industry a reliable framework for investment. Addressing energy poverty is a challenge in many parts of the world. In this regard, we recommend that the G20 countries create a Forum on Energy Poverty

to foster institutional dialogue and disseminate best regulatory and business and model practices. Through this Forum the G20 could also engage the least developed countries in their efforts to tackle energy poverty. We also recommend that the G20 countries endorse the concept of “energy communities” and recognize their role in actively involving citizens and other stakeholders in the renewable energy transition. This could facilitate the task of securing access to energy during the transition by the currently undeserved population, fighting energy poverty through reduced energy poverty through reduced energy consumption and lower energy costs. We also recommend that the G20 countries establish a Commission to accelerate the implementation of capacity building for workers affected adversely by the transformation, as well as quality youth education for climate change and sustainable development across formal and non-formal learning contexts.

EMPHASIS ON NATURE-BASED SOLUTIONS TO FIGHT CLIMATE CHANGE AND BIODIVERSITY LOSS

It recommends that the G20 countries strengthen the REDD+ climate forests and extend it to Blue Carbon from coastal and marine ecosystems. Efforts in this area would allow for covering the Earth’s two largest, most diverse and most productive ecosystems, so that these two approaches can deliver significant economic and climate benefits. It call on the G20 countries to recognize nature-based solutions in addition to budgetary instruments to fight- and adapt to – climate change. It recommends that they support the Restor Platform with targets to restore forest ecosystems; reduce air and lead pollution in cities; support green coasts in small island developing states; raise renewable share of energy; and lower land- use stress. The G20 countries can also act in the areas of food and water security. It recommend that they promote and support international coordination for the smart repurposing of agricultural subsidies. This could be achieved by strengthening support for scientific efforts to assess alternative options aligned with objectives of sustainability and efficiency of food systems, poverty reduction, food security and affordability of healthy diets. Building climate-resilient food systems and reducing GHG emissions from agriculture are urgent priorities. An important first step is a concerted G20 effort to redirect the more than 700 billion per annum in agricultural support measures toward R&D in productivity enhancing and emission reducing technologies, and incentives to producers and consumers to adopt sustainable and healthy practices.

CONCLUSION

In 2015, 196 parties adopted the Paris Agreement setting the goal to limit global warming to well below 2 degree Celsius, preferably to 1.5 degree Celsius,

compared to pre-industrial levels. In order to meet the Paris objectives climate action needs to be much more ambitious. Emissions would need to peak in the next decade and fall to zero by around 2050. In this race towards climate neutrality many countries have announced different strategies to address the climate crisis and environmental degradation while ensuring sustainable growth. National policies are key but international efforts are equally important. Multilateral coordination at the G20 level has a critical role to play by fostering global collaboration and setting the stage for further action in the context of the UNFCCC COP-26. On top of providing short-term proposals to tackle the most urgent challenges, this T20 task force aims to provide medium to long term policy options to ensure that the post-pandemic recovery packages represent an opportunity to build a low-carbon and climate-resilient future. The strategy aimed at striking a balance and maximizing synergies between the much-needed economic recovery and environmental sustainability lies at the centre of this effort.

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G20 and Its Role in Development of Production and Climate Change

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SUSTAINABILITY - CLIMATE SUSTAINABILITY AND ENERGY

The G20 recognises the importance of collective action in tackling environmental challenges and climate change while promoting transitions towards more flexible, transparent and cleaner energy systems. The OECD supports the G20 Presidency's work, building on its extensive expertise in green growth, clean and climate-resilient infrastructure, fossil fuel subsidies, energy regulation, green finance and investment, environmental taxation and Environmental, Social and Governance (ESG).

CLIMATE AND GROWTH

In 2017, the OECD supported the German Presidency's major climate initiative by developing a new pro-climate and pro-growth narrative in its report Investing in Climate, Investing in Growth, which was commissioned by the Presidency and presented to G20 Leaders at the G20 Hamburg Summit. This OECD report provides evidence-based analysis on how fiscal and structural reforms combined with coherent climate policy could generate sustainable growth that significantly reduces climate risks, whilst providing employment and health benefits.

The Argentina G20 Presidency in 2018 has been focusing on a number of issues related to adaptation to climate change and extreme weather events. The OECD has been contributing its analysis on climate-resilient infrastructure to the discussions of the Climate Sustainability Working Group.

During the Saudi G20 Presidency in 2020 the OECD produced a paper on enabling policies for the transition to net-zero, as well as analysis on Strengthening Adaptation-Mitigation Linkages for a Low-Carbon, Climate-resilient Future.

In 2021, the OECD is underpinning the strong impetus that Italy's G20 Presidency is giving to green recovery and climate sustainability, which is

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mainstreamed in all tracks, leveraging Italy's role in the CoP 26, in partnership with the UK.

FOSSIL FUEL SUBSIDIES

In 2009, G20 Leaders in Pittsburgh committed to “rationalise and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption”. Since then, the OECD has been documenting the size and scope of fossil fuel subsidies (FFS). Under the Russian Presidency in 2013, the OECD contributed to developing a flexible, country-led methodology for undertaking voluntary peer reviews of countries' FFS. The OECD supports countries' efforts to undertake such peer-reviews, supporting the fossil fuels subsidies' reviews of China and the United States, chairing the review of Germany and Mexico under the German Presidency in 2017, and the peer reviews of Italy and Indonesia in 2018. Additional work in this workstream is foreseen under Italy's G20 Presidency.

GREEN FINANCE

In 2016, a new Green Finance Study Group (GFSG) was established under the G20 Finance Track to identify institutional and market barriers to green finance. The OECD, drawing on its expertise in green bonds and greening institutional investors, actively contributed to the five sub-group work streams of the GFSG. This included providing substantive inputs to the G20 Green Finance Synthesis Report that presented options to enhance the ability of the financial system to mobilise private capital for green investment. Italy has decided to re-establish this workstream, by launching in 2021 the Sustainable Finance Study Group, which will be supported by OECD work.

Summits of leaders from the twenty largest economies of the world, G-20, began their journey in 2008. Their principal objective then was to tackle the economic recession gripping the world and to have a mechanism to address such challenges for the future. Climate Change had, by then, also been clearly recognized as a major global challenge with huge economic implications and one that even had an existentialist dimension for humankind. Urgent action was the need of the hour, yet all that the first G-20 Summit, held in 2008 in Washington DC, had to say on climate change and a host of critical issues for the globe in its declaration was:

“We remain committed to addressing other critical challenges such as energy security and climate change, food security, the rule of law, and the fight against terrorism, poverty and disease”.

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President George Bush was the US President at that time and for many this very limited reference to climate change was understandable given that the US's main efforts at that time was to rope in the major emerging economies into taking mitigation (reducing GHG emissions) actions, no matter the impact of this on their development imperatives. The US had not joined the Kyoto Protocol under which developed countries took quantified emission reduction targets and all effort were directed to dilute, if not jettison, the guiding UNFCCC (United Nations Framework Convention on Climate Change) principle of common but differentiated responsibilities (CBDR). This would also do away with the scientifically proven responsibility of the developed world for their emissions since industrialisation. In action, rather than words, the direction was to maintain the hegemony of the developed world even in climate action. This has continued to remain.

In the G-20, the developed world also sought to rope in the leading emerging economies to share in the global burden. In brief, with the by then apparent rise of China, a US-China concert, with some help from Europe (read Germany) was set in motion. There were, of course, checks and balances, including the inclusion of the next set of emerging economies like India, Brazil, Russia, South Africa and others in the grouping to make it more 'inclusive'. The US-China concert has also continued to play in the climate change auditorium.

In 2009, President Barack Obama was inaugurated and a Democratic administration with an avowed commitment to multilateralism and tackling climate change came into place. CBDR now found its way into the simple declaration of the 2nd G-20 held in London in early 2009:

“We reaffirm our commitment to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities, and to reach agreement at the UN Climate Change conference in Copenhagen in December 2009”. This was, in reality, lip service.

The next G-20 Summit was held in Pittsburgh USA in late 2009 just prior to the United Nations Convention on Climate Change (UNFCCC) Conference of Parties (CoP) in Copenhagen. Articulating a strong resolve on climate change, the Summit declared the G-20's “resolve to take strong action to address the threat of dangerous climate change. We reaffirm the objective, provisions, and principles of the United Nations Framework Convention on Climate Change (UNFCCC), including common but differentiated responsibilities We will intensify our efforts, in cooperation with other parties, to reach agreement in Copenhagen through the UNFCCC negotiation. An agreement must include mitigation, adaptation, technology, and

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financing”. Finance Ministers were tasked to report back with “a range of possible options for climate change financing to be provided as a resource to be considered in the UNFCCC negotiations at Copenhagen” and climate and green financing underscored as important for the World Bank’s agenda.”

The Pittsburgh the G-20 declaration basically set the tenet for the G-20 position on climate change, which nominally acknowledged the developing countries on differentiation but demanded action by ALL countries. Underplaying the providing of climate finance and collaboration on innovation have also been a hallmark though again in well couched language.

Another push by the developed world at the G-20 which was concretised at a working lunch at the environment friendly facility of Phipps Conservatory at Pittsburgh was “to phase out and rationalize over the medium-term inefficient fossil fuel subsidies while providing targeted support for the poorest. Inefficient fossil fuel subsidies encourage wasteful consumption, reduce our energy security, impede investment in clean energy sources and undermine efforts to deal with the threat of climate change”.

Since then, this has been one of the recurring themes driving the G-20 against fossil fuel subsidies. The narrative pushed is that these subsidies distort markets, widen fiscal deficits across economies and slower the adoption of cleaner fuels thus making fossil fuel subsidies an unfavourable global policy choice. All this, even while the developed world continues to ply its own fuel subsidies in various forms.

Let us see how things moved on climate change at the G-20 from 2009, the pivotal year in so far as global climate negotiations with world leaders attending the CoP at Copenhagen and even participating in the negotiations.

No matter the change in administration in the US, the country, with able support from the rest of the developed world, continued to be strong in dismantling differentiation. Indeed, President Obama himself negotiated with leaders of the BASIC group [India, China, Brazil and South Africa] on the issue of all countries agreeing to have their climate actions “verified” internationally, no matter this not being in consonance with the UNFCCC and its Kyoto Protocol, which was now in force. Despite strong opposition from the Chinese, he finally relented only when Prime Minister Dr Manmohan Singh told him that the Indian Parliament would not countenance such infringement of sovereignty. The leaders settled on the expression “consultation” in so far as developing countries were concerned and at the next CoP, in 2010 at Cancun, a process of International Consultations and Analysis was agreed for them as against an International Assessment and Review for developed countries.

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The story regarding finance is equally interesting where developing countries were presented a figure of US\$ 30 billion as commitment by developed countries for finance for the years 2010-2012 and US\$ 100 billion a year for the coming decade till 2020. However, just as the hammer was to go down, an advisor whispered something in his ear and a visibly embarrassed President Obama had to block the proposal on the ground that specific money matters were a Congressional prerogative and not in his remit. The expression “approaching US\$ 30 billion” then crept into the Copenhagen Accord and ‘approaching’ has been the guiding principle on climate financing to be provided by developed countries ever since. Indeed, the long-term promise of US\$ 100 billion a year is still nowhere on the horizon with the Glasgow Climate Pact (UNFCCC COP in 2021), more than a decade later, noting the “regret” of the developed countries in keeping their commitment!

The next two G20 meetings, both held in 2010, at Toronto and Seoul, did precious little on climate change but heard special briefings from President Felipe Calderón of Mexico and Prime Minister Meles Zenawi of Ethiopia on climate change financing. The next G-20 Summit in Cannes (France) in 2011 saw the grouping return to the issue of fossil fuel subsidies with decisions on bettering data to tackle this issue.

Things changed at the G-20 as the Mexicans took the Presidency in 2012. The Los Cabos Summit moved to provide some substance to the climate finance agenda creating a group on climate finance and for finding ways to mobilize resources. Further, green recovery and sustainable finance mechanisms were also discussed in greater detail. Also, by 2012 the need for restructuring and refinancing the multilateral development bodies to support green growth was very well established and the G-20 action at Los Cabos sought taking measured steps to restructure the global financial architecture to deliver finance for green growth and tackling climate change.

The Los Cabos Summit, as indeed other Summits, clearly showed the interest of the hosts in guiding the declaratory thrust of the grouping. This was best noticed at the next G-20 Summit in 2013 in St. Petersburg where the Russians ensured that the declaration limited itself to a very narrow set of issues pertaining to the climate change and support to developing a legal instrument under UNFCCC to deal with climate challenge. Russia, whose ratification in 2004, had brought the Kyoto Protocol in force had now sown the seed for the jettisoning of the principle of differentiation with the support for a new legal instrument under the UNFCCC.

The directional shift of action by ALL was clearly noticeable in the declaration of the 2014 G-20 Summit in Brisbane (Australia) which noted “We will work together to adopt successfully a protocol, another legal instrument or an agreed outcome with legal force under the UNFCCC that is applicable to all parties at the 21st Conference of the Parties (CoP21) in Paris in 2015. We encourage parties that are ready to

communicate their intended nationally determined contributions to do so well in advance of CoP21 (to be held in Paris in 2015).

This was reinforced at Antalya, Turkey in 2015 though there the CBDR principle was at-least paid lip-service: “We underscore our commitment to reaching an ambitious agreement in Paris that reflects the principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances. We reaffirm that UNFCCC is the primary international intergovernmental body for negotiating climate change. We welcome that over 160 Parties including all G20 countries have submitted their Intended Nationally Determined Contributions (INDCs) to the UNFCCC, and encourage others to do so in advance of the Paris Conference”.

The UNFCCC CoP at Paris in 2015 was a game-changing conference that saw a jettisoning, in real effect, of differentiation and committed ALL countries to nationally determined commitments (NDCs). The US, and the developed world, appeared to have prevailed with the Chinese as willing partners. Indeed, the game appeared set after the US and China announced a climate partnership in 2014. This was again to be witnessed in 2021.

India, under Prime Minister Modi, played a major role at Paris in giving a huge fillip to renewable energy by establishing the International Solar Alliance in collaboration with France. But the ironies of the twists of history continued. Presidential elections in the US brought President Donald Trump to power in 2016 and one of his first acts was to pull the US out of the Paris Agreement. From then onward, for the next four years, the G-20 was basically a divided grouping on climate change with the US, perhaps, elaborating disdain for the Paris Agreement [best captured in the G-20 declaration from Hamburg (2019): “The United States reiterates its decision to withdraw from the Paris Agreement because it disadvantages American workers and taxpayers.” The real reason, it can be surmised, was not only its unwillingness to cap growth but to commit to cut down on fossil fuel usage.

Interestingly, but not unexpectedly, the US response of 2019 elicited a strong counter-response from the others under German leadership: “The Leaders of the other G20 members state that the Paris Agreement is irreversible We reaffirm our strong commitment to the Paris Agreement, moving swiftly towards its full implementation in accordance with the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances and, to this end, we agree to the G20 Hamburg Climate and Energy Action Plan for Growth”

The G-20 Summit after the UNFCCC CoP in Paris was held in 2016 in Hangzhou and, with the US out, provided the Chinese an opportunity to try and take a moral high ground on climate change and push for the Paris Agreement. They also

launched the Green Finance Study Group to identify institutional and market barriers to green finance and options to enhance the mobilisation of private capital for green investment.

The Osaka (2019) G-20 Summit tried to refocus matters on finance “we strive to foster inclusive finance for sustainable development, including public and private financing mobilization and alignment between them, as well as innovation in a wide range of areas for low emissions and resilient development.....We emphasize the importance of providing financial resources to assist developing countries with respect to both mitigation and adaptation in accordance with the Paris Agreement”

Thereafter, Riyadh (2020), a virtual Summit given the COVID-19 pandemic, had a non-negotiated declaration on climate change and an endorsement for a Circular Carbon Economy (CCE).

But the twists of history continued and in 2020, President Joe Biden assumed the Presidency of the US and brought it back into the Paris Agreement. There was, of course, no change in the pursuit of hegemony of power. Once again, no heed was paid to differentiation and accepting responsibility for past emissions, but the call was for ALL countries to achieve Net Zero GHG emissions by 2050. The G-20 Summit in Rome, Italy, was held in this backdrop and preceded the UNFCCC CoP at Glasgow which once again saw global leaders converging at a CoP.

Of all the G-20 Summits, Italy’s G20 presidency of 2021 delivered the most seminal declaration on climate change. The declaration touched upon various important issues including, climate mitigation, circular economy, fossil fuel subsidies and using tax instruments for climate finance. The G20 climate finance study group constituted in 2018, under the Argentinian Presidency, was expanded in terms of its mandate and now tasked to consider additional aspects of sustainable development. The group was, therefore, renamed Sustainable Finance Study Group (SFSG). The Group was also mandated to developing, climate focused G20 sustainable finance roadmap, improving sustainability reporting, identifying sustainable investments, and aligning International Financial Institutions’ efforts with the Paris Agreement.

Italian presidency also witnessed introduction of a new pillar dedicated to protecting the planet in the G20 action plan. Climate change was no longer being viewed as one of global challenges, rather its macro-economic and fiscal impacts were being assessed for safeguarding the global economic architecture.

The relevant text from Rome thus demands full reproduction, even though it is lengthy, to capture its full import: By the end of 2021, it was almost clear that the developed world couldn’t mobilize committed climate finance of \$ 100 bn per year. The climate delivery plan submitted at the Glasgow presidency of Conference of

Parties to the UNFCCC acknowledged that the target agreed at time of the Paris agreement, can only be achieved by 2023[i]. Therefore, the G20 needed to step up its efforts in mobilizing and safeguarding the financial resources for climate action.

The declaration reaffirmed the G-20's "commitment to the full and effective implementation of the UNFCCC and of the Paris Agreement, taking action across mitigation, adaptation and finance during this critical decade, on the basis of the best available scientific knowledge, reflecting the principle of common but differentiated responsibilities and respective capabilities, in light of different national circumstances. We remain committed to the Paris Agreement goal to hold the global average temperature increase well below 2°C and to pursue efforts to limit it to 1.5°C above pre-industrial levels, also as a means to enable the achievement of the 2030 Agenda.

We recognize that the impacts of climate change at 1.5°C are much lower than at 2°C. Keeping 1.5°C within reach will require meaningful and effective actions and commitment by all countries, taking into account different approaches, through the development of clear national pathways that align long-term ambition with short- and medium-term goals, and with international cooperation and support, including finance and technology, sustainable and responsible consumption and production as critical enablers, in the context of sustainable development. We look forward to a successful CoP26.

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Climate Change & Climate Action: The Role of G-20

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INTRODUCTION

Humanity is facing climate change since the beginning of its existence. However, it has only been in the last century that we've started to observe significant negative the impact of our actions on the climate and environment. Healthy climate is an integral part of our existence and should be our main concern. We can say that recognition of this topic has finally reached its peak. It is not long topics are discussed only among experts or visionary. Calls for climate solutions the echo of change is being heard at a high level these days meetings of world leaders and policy makers, but also on the streets. People of all walks of life, all ages, all geographies included area and educational background are take a stand. Wherever you look, wherever you go, you can't escape the movement which was specifically brought to the attention of inspired by the younger generation colleague Greta Thunberg. Understanding that they are our future and to whom it will be left deal with consequences, youth demands strong action. Some say it's already too late and we won't be able to deliver on Paris Agreement to keep global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to step up efforts to limit temperature further increase to 1.5°C1. However, if we take the issue seriously and sure enough, we still have a chance. This leads us to the question: what is G20 as a grouping of twenty major economies done so far and what needs to be done to support it climate change solution? What policies are at the disposal of countries to improve environmental and sustainable living assurance and the climate for generations to come?

IMPORTANCE OF DISCUSSION ABOUT CLIMATE CHANGE

Global warming, the main result of climate change has a major impact on us environment, but also on economic development well-being of countries and their populations. According to the International Monetary Fund (IMF) World Economic Outlook, January 2020 upgrading, growth forecast for the global economy downgraded for 2020 and 2021. To cite the report "Climate Change", the driver

increased frequency and intensity of meteorological disasters, already at risk health and economic consequences, and not only directly in the affected areas. It can pose challenges to other sectors that may not yet be realized direct effect including contribution for cross-border migration or financial stress (for example, in the insurance sector).”More and more often we hear about climate extremes never seen before: severe drought in South Africa, the Sahel or Australia, new temperature records were set in France and during extreme heat waves in Germany or India summer 2019, storms and floods in Brazil or Bangladesh, unusual cyclone patterns like Mozambique, Zimbabwe as Cyclone Idai and Malawi, devastating storms like Irma and Maria in the Caribbean, or fires in California, Indonesia, Amazon rainforest and Australian Shrubs. These are just a few examples who have been adding since a few years ago growing vulnerability and the cost of climate crisis. In addition, the melting of the ice caps continues and rising sea levels increase the risk of flooding which in the future may affect not only coastal regions or small islands, but also major cities close to the water, like New York, Mumbai, Osaka, Shanghai, Bangkok and many more. It is very important to pay attention to climate change because it is often the source of food shortages, instability, conflict and resulting population displacement. Climate change affects everyone without distinction, but the weakest usually those whexposed to its harmful effect. In order to be most effective in efforts it is necessary to use it to fight climate change international cooperation and come together global solutions.

One of the most important initiatives in efforts to fight climate change Paris Agreement that was adopted December 2015. This is the first ever universal, legally binding global climate agreement and so far 187 out of 197 parties have ratified it to the United Nations Framework Convention on Climate Change (UNFCCC). The parties agreed to strengthen the global response to keeping the global threat of climate change temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to step up efforts to limit temperature increase further by 1.5 °C. To reach these goals, appropriate mobilization and the provision of financial resources, technology and advanced capacity building was to be imposed. Financial flows were believed to help reach the lower greenhouse gas (GHG) emissions and climate-resilient way. Another provision confirmed this 2010 Cancun Agreement that evolved into countries committed to the goal of mobilization thus combined USD 100 billion per year by 2020, supporting the needs of development action and weakest country. The agreement also provides a better transparency framework for action and advocacy.

G20 AND CLIMATE CHANGE

Early years

Various issues related to climate change has been included in the G20 agenda over time policy makers started recognize the relationship of climate to holistic economic performance of countries and as a result, the need to act. There was a clear evidence for the approach based on Cooperation and the G20 Acted as a leading platform. Realizing that asymmetry of its members, G20 encouraged country-specific policies, while support coordinated action in battle against climate change.

Since their first summit in 2008 Washington DC, USA, Climate topics played an important role in discussions of G20 leaders. In Washington, the G20 members expressed concern climate change for the first time. Next topic got more exposure during the year 2009 London, UK summit, where leaders reaffirmed its commitment to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities. Leaders committed to creating transition to clean, innovative, low carbon technologies and infrastructure. They also assured to reach agreement on 15th Conference of the Parties (COP15) UNFCCC which took place in December 2009 Copenhagen. Around 115 COP15 leaders participated in the high-level segment and elevated climate change policy to the highest level political level. Participants agreed Copenhagen Accord, which expressed express political intent to compel response to carbon and climate change, both in short and long term. Key element of the long-term goal was to limit settlement maximum global mean temperature raise no more than 2°C above pre-industrial levels, subject to review in 2015. It also included a reference to consider limit the rise in temperature 1.5°C, a key demand made by weak developing countries. However, The parties did not specify how to do this practical terms. Developed in addition countries pledged to fund actions to reduce to provide US\$30 billion for GHG emissions 2010-2012 period, and to mobilize the long - Term finance of another US\$100 billion per year to help more from various sources till 2020 developing countries adapt to the inevitable effects of climate change. Green climate the fund was also established at COP15.

Pittsburgh, US at the 2009 summit G-20 endorses Copenhagen Accord mitigation, adaptation, to include technology, and financing, and is committed to “*supporting developing countries in the deployment of clean energy technologies, reducing forest-related emissions, and adapt to the effects of global warming.*” They calls upon the World Bank to play a leading role responding to globally urgent problems coordinated action, among them climate change, and asked international financial institutions to provide assistance to countries this process. G-20 members

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agreed to step out more inefficient fossil fuel subsidies medium term, providing targeted support for the poorest. Was a special attraction on financing the transition to a green economy through investing in sustainable clean energy, energy efficiency, renewable and climate resilience. To access the result, countries must integrate climate change concern in their domestic policies and to do access to new sources of climate finance.

NATIONAL ACTION PLAN ON CLIMATE CHANGE

There are Eight National Missions which form the core of the National Action Plan, representing multi-pronged, long-term and integrated strategies for achieving key goals in the context of climate change. While several of these programmes are already part of our current actions, they may need a change in direction, enhancement of scope and effectiveness and accelerated implementation of time-bound plans.

- National Solar Mission
- National Mission for Enhanced Energy Efficiency
- National Mission on Sustainable Habitat
- National Water Mission
- National Mission for Sustaining the Himalayan Ecosystem
- National Mission for a Green India
- National Mission for Sustainable Agriculture
- National Mission on Strategic Knowledge for Climate Change

National Solar Mission:

A National Solar Mission will be launched to significantly increase the share of solar energy in the total energy mix while recognizing the need to expand the scope of other renewable and non-fossil options such as nuclear energy, wind energy and biomass. India is a tropical country, where sunshine is available for longer hours per day and in great intensity. Solar energy, therefore, has great potential as future energy source. It also has the advantage of permitting a decentralized distribution of energy, thereby empowering people at the grassroots level. Photovoltaic cells are becoming cheaper with new technology. There are newer, reflector-based technologies that could enable setting up megawatt scale solar power plants across the country. Another aspect of the Solar Mission would be to launch a major R&D programme, which could draw upon international cooperation as well, to enable the creation of

more affordable, more convenient solar power systems, and to promote innovations that enable the storage of solar power for sustained, long-term use.

National Mission for Enhanced Energy Efficiency:

The Energy Conservation Act of 2001 provides a legal mandate for the implementation of the energy efficiency measures through the institutional mechanism of the Bureau of Energy Efficiency (BEE) in the Central Government and designated agencies in each state. A number of schemes and programmes have been initiated and it is anticipated that these would result in a saving of 10,000 MW by the end of 11th Five Year Plan in 2012. To enhance energy efficiency, four new initiatives will be put in place. These are: •A market based mechanism to enhance cost effectiveness of improvements in energy efficiency in energy-intensive large industries and facilities, through certification of energy savings that could be traded. •Accelerating the shift to energy efficient appliances in designated sectors through innovative measures to make the products more affordable. •Creation of mechanisms that would help finance demand side management programmes in all sectors by capturing future energy savings.

National Mission on Sustainable Habitat:

A National Mission on Sustainable Habitat will be launched to make habitat sustainable through improvements in energy efficiency in buildings, management of solid waste and modal shift to public transport. The Mission will promote energy efficiency as an integral component of urban planning and urban renewal through three initiatives. i. The Energy Conservation Building Code. ii. Recycling of material and Urban Waste Management iii. Better urban planning and modal shift to public transport.

National Water Mission:

A National Water Mission will be mounted to ensure integrated water resource management helping to conserve water, minimize wastage and ensure more equitable distribution both across and within states. The Mission will take into account the provisions of the National Water Policy and develop a framework to optimize water use by increasing water use efficiency by 20% through regulatory mechanisms with differential entitlements and pricing. The National Water Policy would be revisited in consultation with states to ensure basin level management strategies to deal with variability in rainfall and river flows due to climate change. This will include enhanced storage both above and below ground, rainwater harvesting, coupled with equitable and efficient management structures. The Mission will seek to develop new regulatory structures, combined with appropriate entitlements and pricing.

National Mission for Sustaining the Himalayan Ecosystem:

A Mission for sustaining the Himalayan Ecosystem will be launched to evolve management measures for sustaining and safeguarding the Himalayan glacier and mountain eco-system. Himalayas, being the source of key perennial rivers, the Mission would, inter-alia, seek to understand, whether and the extent to which, the Himalayan glaciers are in recession and how the problem could be addressed. This will require the joint effort of climatologists, glaciologists and other experts. We will need to exchange information with the South Asian countries and countries sharing the Himalayan ecology.

National Mission for a Green India:

A National Mission will be launched to enhance ecosystem services including carbon sinks to be called Green India. Forests play an indispensable role in the preservation of ecological balance and maintenance of bio-diversity. Forests also constitute one of the most effective carbon-sinks. The Prime Minister has already announced a Green India campaign for the a forestation of 6 million hectares. The national target of area under forest and tree cover is 33% while the current area under forests is 23%. The Mission on Green India will be taken up on degraded forest land through direct action by communities, organized through Joint Forest Management Committees and guided by the Departments of Forest in state governments.

National Mission for Sustainable Agriculture:

The Mission would devise strategies to make Indian agriculture more resilient to climate change. It would identify and develop new varieties of crops and especially thermal resistant crops and alternative cropping patterns, capable of withstanding extremes of weather, long dry spells, flooding, and variable moisture availability. Agriculture will need to be progressively adapted to projected climate change and our agricultural research systems must be oriented to monitor and evaluate climate change and recommend changes in agricultural practices accordingly. Focus would be on improving productivity of rainfed agriculture. India will spearhead efforts at the international level to work towards an ecologically sustainable green revolution.

National Mission on Strategic Knowledge for Climate Change:

To enlist the global community in research and technology development and collaboration through mechanisms including open source platforms, a Strategic Knowledge Mission will be set up to identify the challenges of, and the responses to, climate change. It would ensure funding of high quality and focused research

into various aspects of climate change. The Mission will also have, on its research agenda, socio-economic impacts of climate change including impact on health, demography, migration patterns and livelihoods of coastal communities. It would also support the establishment of dedicated climate change related academic units in Universities and other academic and scientific research institutions in the country which would be networked.

RECOMMENDATION

Protect the poor from climate

The G20 countries should commit to increasing the protection of the poor and vulnerable, in particular women and girls, against climate risks. This should include pro-active adaptation, pro-poor insurance approaches and investing into social protection systems in vulnerable developing countries. In particular developed countries in the G20 need to significantly ramp up adaptation finance to poor countries by 2020 as well as additional finance to address loss and damage, when people experience climate impacts beyond what they can adapt to. The cooperation with other countries, in particular with the V20/Climate Vulnerable Forum and Africa, should advance climate resilience in all actions it takes, including infrastructure investments.

Promote radical emission reductions towards the 1.5°C limit

All G20 governments should provide Nationally Determined Contributions (NDCs) under the Paris Agreement with high and comparable ambition levels that are sufficient to put the world on rapid emission reduction pathways consistent with the 1.5°C limit. They should commit to back up their NDCs with concrete and transparent national low-GHG emission development strategies by 2018. This should be complemented by concrete action initiatives which further reduce emissions before 2020, in particular by accelerating the shift to 100% renewable energy and near-zero emissions, away from fossil fuels. Other ambitious countries, like the 48 countries in the V20/Climate Vulnerable Forum (CVF), should be ambitiously supported in their own transition to 100% renewable energies, with a particular focus on overcoming energy poverty.

Promote gender equality and human rights in climate action

Based on countries' commitments under human rights, the SDGs and the provisions of the Paris Agreement, G20 countries should commit to fully promoting gender equality and human rights in all climate action. G20 countries should promise to regularly exchange experience and report on progress achieved in this regard

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(incl. in relation to the NDCs). They should also promise to support the work on a strong gender action plan under the UNFCCC.

Phase out fossil fuel subsidies and make finance sustainable

The G20 must agree on the equitable, pro-poor phase-out of all fossil fuel subsidies by 2020: The G20 should create a process to initiate redirection of energy-related domestic and international public finance to only support cost-effective, clean, healthy and safe sources of renewable energy and energy efficiency by 2020, to be in line with the 1.5°C limit. The G20 must cooperate to make financial investments sustainable and advance poverty-sensitive carbon pricing, which can also generate additional public resources for climate and SDG action.

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Importance of Gas Sensors for Environmental Monitoring

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Clean air is very important for the life of human beings, animals and trees but presently the air quality is not good, there are many pollutants in the air. The main sources of pollutants that regularly degrade the natural environmental conditions are the fast-growing population, industrial emissions, automobile exhaust, and open burning of garbage material. The continuous monitoring of these pollutants is necessary to prevent environmental deterioration. Various types of instruments are available to monitor the pollutants and harmful gases, which are time-consuming, expensive and rarely used for in real-time areas. The gas sensor is a popular and ideal device for monitoring the environment. There are different types of materials such as carbon nanotubes (CNTs), Graphene (G), metal/metal oxide nanoparticles, two dimensional (2D) nanomaterials and hybrid nanostructures, which have been widely investigated as sensing materials for environmental gas sensors.

INTRODUCTION

With the development of urbanization and industrialization, our lifestyles have been changed dramatically over the past several years. With the rapid economic development the toxic, flammable, and explosive exhaust gases, mostly emitted from fuel combustion from vehicles and industry, have already negatively impacted both human health and the environment.

Unfortunately air pollutions caused by toxic gas emissions from constructions, indoor/outdoor atmosphere have become a global issue because of the serious threat to human health and life. It is due to increased consciousness about potential environmental hazards environmental gas monitoring has become an important research area.

The pollution control authorities that monitor daily pollution levels and feed data through the internet, those agencies usually provide only averaged Air Quality Index for specific regions. According to the World Health Organization (WHO) about

3.8 million people die prematurely every year due to household air pollution out of 7 million death caused by all types of air pollution. Thus, accruing location-and time-specific gas pollution information is indispensable. Also employees working in mining, medicine and other manufacturing sectors are often exposed to different toxic and flammable gases due to emissions from industrial processes and applications. Long-term exposure to those toxic gases could cause respiratory-related diseases and prolonged exposure to those hazardous gases may also cause heart-related problems, cancer or even stroke.

Thus, there is a strong demand for developing a device (gas sensors) with excellent sensing performance for air monitoring and human health protection. Recently gas sensing as a typical application in intelligent systems is receiving increasing attention in both industry and academia. Gas sensing technology has become more significant because of its widespread and common applications in the following areas: (1) industrial production (2) automotive industry (e.g., detection of polluting gases from vehicles) (3) medical applications (e.g., electronic noses simulating the human olfactory system) (4) indoor air quality supervision (e.g., detection of carbon monoxide) and (5) environmental studies (e.g., greenhouse gas monitoring) etc.

The aim of industry and researchers community is to develop modern class of environmental gas sensors using electronic nose based advance technology with low cost and power consumption. Most of the common commercial gas sensors are based on metal oxide semiconductors (MOS), polymer materials and the methods used for sensing are optical methods, calorimetric methods, gas chromatography and acoustic methods. Nano-material-based gas-sensing materials have gained significant momentum due to many promising electrical, optical, and thermal properties combined with high surface to volume (S/V) ratio, short response and recovery times, high sensitivity, selectivity, reversibility and stability etc. Different carbon materials, such as carbon nanotubes (CNT), Charcoal, Graphene, Graphene oxide (GO), bio char, etc. have been shown to be useful as chemical and bio-sensors due to the ease in tailoring their sensitivity by simple chemical treatments.

AIR POLLUTION AND ITS SOURCE

Air pollution is a serious environmental health problem that seriously affecting the life of everybody on the earth. Air pollutant is a substance in air that can be source of damage to living beings and environment. The different source of pollutants are solid particles, stoves at home, tobacco smoke, motor vehicles, industrial facilities, open construction and forest/agricultural fires. There are two type of pollutants i.e. primary and secondary.

The emission of toxic gases such as NO_x and CO from vehicles exhaust and release of SO_x from industrials factories come under the category of primary pollutants

such as CO, NO, SO₂, NO₂, NH₃, VOC etc. However, secondary pollutants are not emitted directly. They produced in the air when primary pollutants react/interact. The prominent reason of ground level ozone is secondary pollutant. SO₃, HNO₃, H₂SO₄, H₂O₂, NH₄⁺, O₃ etc. are the example of secondary pollutants. According to World Health Organization (WHO) pollution is responsible for exacerbation of asthma and increase in respiratory infections especially in children. Increased morbidity and mortality, due to cardiovascular diseases including stroke, chronic respiratory diseases and cancers have also been attributed to air pollution. Presently air pollution is considered as the greatest environmental risk to health. These above mentioned issues indicates that air pollution is now the world’s largest single environmental health risk. Some of the more important atmospheric pollutants, their sources, effect on human health and environment are summarized in Table 1. The indoor air quality is equally important as we spend maximum time at indoor such as houses, hospitals, schools and so on.

Pollutants	Main sources	Effect on environment	Effect on human beings
NO _x (NO, NO ₂ , N ₂ O)	Transport and industry	Nitrogen deposition that Causes over fertilization	Respiratory and cardiovascular sickness
CO	Combustion transport and power generation	-	Headache, functioning of heart and prolong inhalation lead to comma
CO ₂	Fossil fuel, cement construction and vehicles	Global Warming Affect	O ₂ movement in blood
SO ₂	Combustion, power generation Acid deposition,	acid rain that effect rivers, lakes and trees	Problem in breathing of children, visibility impairment and respiratory disorder
Particulate materials (PM ₁₀ , PM _{2.5} , subscript indicate the diameter of particles i.e. μm, and VOCs	Vehicles exhaust, open air construction, improper garbage decompose	Affect visibility and smog formation	Affect heart functioning, lung cancer skin and eyes irritation

Table-1: Some pollutants their resource and their effect on the environment and human beings.

GAS SENSOR

The gas sensor is one of the classifications of chemical sensors. A chemical sensor comprises of a transducer converting the chemical information into another form of electronic signal like frequency change, current change or voltage change resistance change. A gas sensor is a device that measures the concentration of the gas that comes in contact with it. The characteristic of the gas that is detected by the gas sensors is their breakdown voltage which is specific for a particular gas. In this way gas sensor identifies the gas by measuring their breakdown voltage. While current discharge in the device gives the concentration of the gas. These are transducers that detect gas molecules and provide an electrical signal proportional to their concentration.

A sensor is made up of sensitive material that is either in bulk or placed on a suitable support and is used to perform molecular recognition. The analyte recognition process happens on the sensing element's surface or in the bulk of the material, resulting in a concentration-dependent change property that can be converted into an electrical signal by the suitable transducer. This simple transduction mechanism allowed for the creation of devices in a variety of shapes and sizes. Even though these sensors are modest, several applications require further downsizing. Compatibility with integrated circuit (IC) technology, in particular, is increasingly widely pursued. Top-down techniques have been used to fabricate fully integrated devices, however the top-down approach often has higher throughput and is more suited to large-scale integration. Micromachined sensors can be manufactured on a chip substrate using these processes, allowing for easy interface with traditional silicon microelectronics.

Sensors, on the other hand, are becoming increasingly common in our daily lives. Our environment is rapidly changing and sensors are a vital part of that change. Sensors are commonly agreed upon to have the following characteristics:

- Be in direct contact with the examined subject
- Convert non-electric information into electric signals
- Respond rapidly
- Operate continuously or at least in repeated cycles Be small

The most important characteristics of a sensor are

- Sensitivity

- Stability
- Repeatability

In most cases, a sensor is only usable if all three components are precisely determined for a specific range of measured values and operation time. If the output of a highly sensitive device deviates significantly during the measurement time, the data acquired may not be accurate, and the measurement may not be repeatable. Other sensor qualities, such as selectivity and linearity, can often be adjusted by adding more sensors or employing signal conditioning circuits. Sensor classification techniques might be either simple or extremely complicated.

Sensor type	Sensitive material	Detection principle
Acoustic sensors: Quartz crystal microbalance (QMB); surface & bulk acoustic wave (SAW, BAW)	organic or inorganic film layers	mass change (frequency shift)
Calorimetric; catalytic bead (CB)	pellistor	temperature or heat change (from chemical reactions)
Catalytic field-effect sensors (MOSFET)	catalytic metals	electric field change
Conducting polymer sensors	modified conducting polymers	resistance change
Electrochemical sensors	solid or liquid electrolytes	current or voltage change
Infrared sensors	IR-sensitive detector	Infrared-radiation absorption
Metal oxides semi-conducting (MOS, Taguchi)	doped semi-conducting metal oxides (SnO ₂ , GaO)	resistance change

Table -2: Different type of gas sensors their material and principle of sensor
CONCLUSION

The importance of gas sensors for monitoring the environment has been increased exponentially due to the increase of toxic gas emissions and at the same time imposition of several emission norms in the industries and permissible health hazard limits announced by health organizations. Looking at the historical aspects of the sensor development works; the gas sensor starts with the scope of various gas sensors to the make environment risk-free. Defining thin film, ultra-thin film, and

nanomaterials, efforts were made to categorize sensors and structures based on materials although there is always an overlapping research prospect. Various standard methods of preparation for sensing material, however, every sensor research based on nanotechnology is bringing some improvised method to fabricate sensor structures modifying available techniques. Sensing mechanisms were elaborated. Since preparing nanostructure is tricky and expensive, more efforts should be given to achieve sensor fabrication viable, sustainable and useful for mass production with acceptable quality.

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Resources for Climate Action in G20 Countries

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INTRODUCTION

A climate action plan is a framework document for measuring, tracking, and reducing greenhouse gas emissions and adopting climate adaptation measures. These documents are used as a framework to guide administrative bodies in addressing the impact of climate change in their communities. Multilateral forums like the Group of Twenty (G20) play a crucial role in bolstering global collective action

- The G20 gathers the world's most developed economies and emerging ones, which together account for more than 80 percent of global GDP, 75 percent of international trade, and 60 percent of global population.
- The G20 economies are responsible for about 75 to 80 percent of global greenhouse gas emissions.
- All but one of the top 10 carbon-emitting countries are G20 members

FIVE WAYS THE G20 CAN SUPPORT CLIMATE ACTION

1. What Does a Sustainable Food Future Entail?

One of Argentina's identified priorities for this G20 meeting—along with The Future of Work, Infrastructure for Development and Gender Mainstreaming—is A Sustainable Food Future. Items under discussion include soil erosion and food security.

It's unclear what might come from this discussion on the sustainability front, but the potential for action is enormous. "Food loss and waste apparently is on the agenda," said Craig Hanson, director of Food, Forest and Water at WRI. "The G20 has a unique opportunity to affirm member commitment to halving food loss and waste by 2030."

Halving food loss and waste would take a major step toward creating a sustainable food future, generating economic benefits and helping reduce hunger.

2. Will Infrastructure Be Sustainable and Climate-Resilient?

The agenda for the Finance Track, coordinated by the Argentine Ministry of the Treasury and the Central Bank, includes an emphasis on “infrastructure for development” and “sustainable finance.” These are much-needed: \$90 trillion is expected to be spent on infrastructure in the next 15 years, doubling the world’s stock of infrastructure on the ground today.

G20 countries have previously endorsed the idea they should only invest in “quality” infrastructure. But efforts to rigorously include sustainability or climate resiliency in the definition of quality infrastructure have failed so far. “We need a harmonized definition of ‘sustainable infrastructure’ that includes elements of both low-carbon approaches as well as resilience to climate change impacts,” said Leonardo Martinez-Diaz, director of the Sustainable Finance Center at WRI. One place to watch may be the new adaptation work program of the Climate Sustainability Working Group (PDF). Its objective of “sharing country experiences and promoting enhanced efforts for adaptation and resilience-building” could provide auspices for the conversation on infrastructure to grow legs; Germany is leading review of case studies in this line of study that will continue into 2019. Whether this conversation is ultimately mainstreamed into the Finance infrastructure track is something to watch.

This issue also raises a thorny question for next year’s president, Japan, which has continued to export fossil fuel infrastructure (by financing fossil fuel projects abroad or exporting technology used in fossil fuel infrastructure). “We’ve had a notable shift with multilateral development banks [like the World Bank] and private finance away from risky investments in coal. This is a time when G20 countries should step up and show leadership as well,” added Helen Mountford, director of economics at WRI.

3. What’s the Schedule for Eliminating Fossil Fuel Subsidies?

The 2009 Pittsburgh G20 communique included a momentous commitment to “phase out and rationalize over the medium term inefficient fossil fuel subsidies while providing targeted support for the poorest.” These subsidies don’t make sense for the economy or the environment, but measure in the billions of dollars each year—at least \$373 billion from 2010 to 2015, according to an OECD review.

Almost a decade later, there’s been little progress. What’s the problem? “No one ever defined medium term,” said Mountford, “and now, almost ten years later, a number of countries are still delaying phase-out of these distorting subsidies.” Setting the timetable—perhaps in the context of the recent IPCC 1.5°C report, which

quantified some of the urgency around the drawdown of carbon emissions—would be a good step.

It's not that there hasn't been any progress. G20 countries agreed to a voluntary peer review of their individual fossil fuel subsidies, a stepping stone towards phasing out wasteful subsidies. This year, Indonesia and Italy are participating.

Indonesia in particular is interesting: While President Widodo capped the diesel subsidy and “scrapped subsidies for petrol” in 2015, these efforts have stalled ahead of a competitive election. The peer review could provide lessons for other countries working to reform their consumer subsidies.

4. Will More G20 Nations Release Long-Term Strategies?

Another priority identified by Argentina for the Climate Sustainability Working Group: long-term strategies. Also called “mid-century long-term low GHG emissions development strategies,” these are documents outlining how a country will reach net-zero emissions in the second half of the century, a goal laid out by the Paris Agreement on climate change. Releasing these now sets countries up to successfully align their economic planning with the low-carbon transition, and further catalyzes that transition by sending a strong signal to other players, such as neighboring countries, investors and the public.

Earlier this year, we published a blog highlighting that only six of the G20 have released long-term strategies for climate action. Katherine Ross, associate with the WRI Climate Program, said “Any G20 country that hasn't studied for its LTS yet is lagging behind. Releasing these would show the world that the biggest economies realize their development and economic aspirations are tied to climate action.”

In summary, Argentina made developing low-carbon pathways a priority, and we can expect lots of high-level messaging on climate, except must wait to see...

5. Will the Communique Reflect Consensus or Division?

Every G20 meeting results in a public communique that records the group's shared priorities and any new commitments. The recent IPCC Special Report on 1.5°C provided a dire assessment and underscored the need—and opportunities—for urgent action to tackle the climate challenge. At last year's G20 summit, the communique included a section on climate change that noted both U.S. recalcitrance and resolve from the rest of the G20, including around the Paris Agreement.

Argentina will be keen to avoid a repeat of this scenario, and is likely to push for a single, clean communique. Whether it can achieve strong language on climate

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while ensuring it is acceptable to U.S. representatives may serve as a bellwether for international climate cooperation writ large. “It’s aspirational that the United States would endorse the Paris Agreement, but hopefully they will not block endorsement by other parties,” said Distinguished Senior Fellow in the WRI Global Climate Program Andrew Light.

CAN G20 CATALYZE COP—AND BEYOND?

The G20 is an ongoing process. This year’s work will continue next year in Japan, and Shinzo Abe has said climate will figure prominently in the 2019 agenda. They have an opportunity to focus the world’s attention on emerging opportunities to accelerate climate action, including issues like adaptation (Japan is a leader in meteorological data; how can we make it available for developing countries and small-to-medium enterprises?) and best practices and standards for low-carbon technology.

The G20 provides ample opportunity for world leaders to show their peers that they are serious about climate change. Sustainable development and climate action will not be most effective until the world’s biggest economies—and polluters—are fully mobilized for sustainable development and climate action.

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भारतीय अर्थव्यवस्था पर जलवायु परिवर्तन के प्रभाव, कारण एवं निवारण

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गोकुलदास हिंदू गर्ल्स डिग्री कॉलेज, मुरादाबाद

जलवायु- जलवायु एक लंबे समय में या कुछ सालों में किसी स्थान का औसत मौसम है और जलवायु परिवर्तन उन्हीं औसत परिस्थितियों में बदलाव है। मानवीय गतिविधियों और क्रिया-कलापों के कारण दुनिया का तापमान बढ़ रहा है और इससे जलवायु में होता जा रहा परिवर्तन अब मानव जीवन के हर पहलू के लिए खतरा बन चुका है। (परिभाषा गूगल विकिपीडिया से ली गई हैं) जलवायु परिवर्तन होने के कारण हमारे वातावरण जलवायु में विभिन्न परिवर्तन देखने को मिल रहे हैं जैसे वर्तमान में देखा जा सकता है मार्च-अप्रैल में मूसलाधार वर्षा का होना नवंबर दिसंबर तक गर्मी के तापमान का बना रहना वातावरण की जलवायु में परिवर्तन होने का मुख्य कारण प्रकृति के साथ छेड़छाड़ करना है जैसे हाल ही में हमारा भारत देश और विश्व के कई देश कोरोनावायरस महामारी से जूझे है जलवायु परिवर्तन के कारण बीमारियां उत्पन्न हो रहे हैं।

जलवायु परिवर्तन के कारण

जितनी तेजी से जलवायु परिवर्तन हो रहा है उसके लिए मानव-क्रियाएं सर्वोपरि दोषी हैं। घरेलू कामों, कारखानों और परिचालन के लिए मानव तेल, गैस और कोयले का इस्तेमाल करते हैं जिसकी वजह से जलवायु पर प्रतिकूल प्रभाव पड़ा है। जब ये जीवाश्म ईंधन जलते हैं तो उनसे ग्रीनहाउस गैस निकलती हैं जिसमें सबसे अधिक मात्रा कार्बन डाइऑक्साइड की होती है। इन गैसों की सघन मौजूदगी के कारण सूर्य का ताप धरती से बाहर नहीं जा पाता है और ऐसे में ये धरती का तापमान बढ़ने का कारण बनती हैं। 19वीं सदी की तुलना में धरती का तापमान लगभग 1.2 सेल्सियस अधिक बढ़ चुका है और वातावरण में CO₂ की मात्रा में भी 50% तक वृद्धि हुई है।

जलवायु परिवर्तन के प्रभाव

प्राकृतिक घटनाओं में जिस तरह से एकाएक बदलाव आए हैं, वह जलवायु परिवर्तन का ही परिणाम है। तूफानों की संख्या बढ़ गई है, भूकंपों की आवृत्ति बढ़ गई है, नदियों में बाढ़ का विकराल स्वरूप आदि घटनाएं पहले से कहीं अधिक बढ़ गई हैं, जिसका सीधा असर जीवन और जीवित रहने

के माध्यमों पर पड़ रहा है। अगर तापमान यूं ही बढ़ता रहा तो कुछ क्षेत्र निर्जन हो सकते हैं और खेत रेगिस्तान में तब्दील हो सकते हैं। तापमान बढ़ने के कारण कुछ इलाकों में इसके उलट परिणाम भी हो सकते हैं। भारी बारिश के कारण बाढ़ आ सकती है। हाल ही में चीन, जर्मनी, बेल्जियम और नीदरलैंड्स में आई बाढ़ इसी का नतीजा है। तापमान वृद्धि का सबसे बुरा असर गरीब देशों पर होगा क्योंकि उनके पास जलवायु परिवर्तन को अनुकूल बनाने के लिए पैसे नहीं। कई विकासशील देशों में खेती और फसलों को पहले से ही बहुत गर्म जलवायु का सामना करना पड़ रहा है और ठोस कदम के अभाव में इनकी स्थिति बदतर हो जाएगी उदाहरण के लिए ऑस्ट्रेलिया में ग्रेट बैरियर रीफ जलवायु परिवर्तन के कारण बढ़े समुद्री तापमान की वजह से पहले ही अपने आधे कोरल खो चुकी है।

जंगलों में लगने वाली आग की संख्या भी बीते सालों में बढ़ी है। गर्म और शुष्क मौसम के कारण आग तेजी से फैलती है और इनके बार-बार लगने की भी आशंका बढ़ जाती है। तापमान वृद्धि का एक बुरा असर यह भी होगा कि साइबेरियाई क्षेत्रों में जमी बर्फ भी पिघलेगी जिससे सदियों से अवशोषित ग्रीनहाउस गैसों भी मुक्त हो जाएंगी, जिसका बुरा असर होगा। तापमान बढ़ने के कारण जीवों के लिए भोजन और पानी का संकट बढ़ जाएगा। उदाहरण के लिए, तापमान बढ़ने से ध्रुवीय भालू मर सकते हैं क्योंकि जो बर्फ उनके लिए आवास है और जहां से वे अपने लिए भोजन प्राप्त करते हैं वह तेजी से पिघल रही है (संदर्भ बीबीसी न्यूज)

संयुक्त राष्ट्र के इंटरगवर्नमेंटल पैनल ऑन क्लाइमेट चेंज (IPCC) की रिपोर्ट अगर दूसरे देशों को पर्यावरण विनाश के लिए कार्बन उत्सर्जन कम करने को लेकर ध्यान दिला रही है तो भारत को इसे दूसरे नजरिए से भी देखने की जरूरत है।

कार्बन उत्सर्जन के मामले में चीन और अमेरिका के बाद भारत तीसरे स्थान पर है और वह कह चुका है कि वह पेरिस जलवायु समझौते के अपने वादे को पूरा करने की दिशा में अग्रसर है और 2005 के स्तर के अनुसार वह 2030 तक 33-35% कार्बन उत्सर्जन कम करेगा।

भारतीय अर्थव्यवस्था पर जलवायु परिवर्तन के प्रभाव

उपज में कमी:

जलवायु परिवर्तन मौसम पैटर्न को समझना दुरूह बना देंगे। मानसूनी परिवर्तनों के बारे में अनिश्चितता किसानों के निर्णय को प्रभावित करती है कि कब कौन-सी फसल उगाई जाए और इसके परिणामस्वरूप उत्पादकता कम हो जाती है। इसके अलावा, समय पूर्व मौसमी हिम गलन और घटते ग्लेशियर सिंचाई के लिये आवश्यक नदी के प्रवाह को कम कर देंगे।

पशुधन पर प्रभाव:

भारत में दुनिया की सबसे बड़ी पशुधन आबादी मौजूद है, जहाँ पशुओं का उपयोग विशेष रूप से भूमिहीन परिवारों में दूध उत्पादन, खाद एवं बीजारोपण और घरेलू पूंजी के रूप में किया जाता है।

हीट स्ट्रेस (Heat Stress) पशुओं के लिये आहार और चारे को कम करते हैं तथा रोग प्रसार की अनुकूल दशाओं को बढ़ाते हैं।

श्रम कार्यबल में कमी:

चरम ताप/गर्मी के दिनों में श्रमिकों की उत्पादकता कम हो जाती है जिससे औद्योगिक उत्पादन कम हो जाता है। इससे निर्यात में कमी आती है और राष्ट्रीय आय घटती है। इससे अप्रत्यक्ष रूप से विश्व व्यापार प्रभावित होता है। जलवायु परिवर्तन संज्ञानात्मक प्रदर्शन को कम करता है और उन क्षेत्रों में कार्य घंटों में कमी लाता है जहाँ निर्माण जैसी भारी बाह्य गतिविधि की आवश्यकता होती है।

ऊर्जा संकट:

अंतर्राष्ट्रीय ऊर्जा एजेंसी (IEA) के अनुसार, भारत की प्राथमिक ऊर्जा मांग वर्ष 2030 तक दोगुनी हो जाएगी। ऊर्जा और जलवायु के बीच एक विशिष्ट संबंध पाया जाता है जहाँ बढ़ते तापमान के साथ ऊष्मा प्रभावों के शमन की प्रक्रिया में सहयोग के लिये ऊर्जा उपयोग में वृद्धि की मांग बढ़ती जाती है। इसके अलावा, ऊर्जा की बढ़ती मांग प्रायः जलवायु-परिवर्तन नीतियों के साथ टकराव रखती है।

संदर्भ- G20 बैठकों के भाग के रूप में, MIDS और भारतीय रिजर्व बैंक ने भारतीय अर्थव्यवस्था पर जलवायु परिवर्तन के प्रभावों पर चर्चा का आयोजन किया।

भारतीय अर्थव्यवस्था पर जलवायु परिवर्तन के प्रभाव:

फसलों पर कम उपज:

जलवायु परिवर्तन के कारण मौसम के मिजाज का अनुमान लगाना कम हो सकता है। किस फसल को बोना है और कब बोना है, इसके बारे में किसानों के निर्णय मानसूनी परिवर्तनों के बारे में अनिश्चितता से प्रभावित होते हैं, जिससे उत्पादकता कम हो जाती है। इसके अतिरिक्त, घटते ग्लेशियर और पहले के मौसमी हिमपात से सिंचाई से संबंधित नदी का प्रवाह कम हो जाएगा।

पशुओं पर प्रभाव :

पशुओं का घरेलू पूंजी के रूप में उपयोग किया जाता है, विशेष रूप से भूमिहीन परिवारों में, और भारत की सबसे बड़ी पशुधन आबादी में दूध उत्पादक, खाद और बोनो के रूप में। गर्मी के तनाव के तहत चारा और चारा कम उपलब्ध होता है, और बीमारी को बढ़ावा देने वाली स्थितियाँ बिगड़ जाती हैं।

कम श्रमिकों के साथ कार्यबल:

अत्यधिक गर्मी वाले दिनों में, श्रमिकों की उत्पादकता कम हो जाती है, जो औद्योगिक पैदावार कम करती है, निर्यात कम करती है, राष्ट्रीय आय कम करती है और अप्रत्यक्ष रूप से वैश्विक व्यापार को प्रभावित करती है। निर्माण जैसे उद्योगों में जो बाहरी गतिविधि पर बहुत अधिक निर्भर करते हैं, जलवायु परिवर्तन संज्ञानात्मक प्रदर्शन और काम के घंटे कम कर देता है। अंतर्राष्ट्रीय ऊर्जा एजेंसी (IEA) की भविष्यवाणी है कि भारत की प्राथमिक ऊर्जा खपत 2030 तक दोगुनी हो जाएगी।

जलवायु और ऊर्जा का एक अनूठा संबंध है, जिसका अर्थ है कि जैसे-जैसे तापमान बढ़ता है, गर्मी के प्रभाव को कम करने के लिए अधिक ऊर्जा का उपयोग करने की आवश्यकता होती है। इसके अतिरिक्त, जलवायु परिवर्तन नीतियां अक्सर बढ़ती ऊर्जा मांगों से टकराती हैं।

संरचना पर प्रभाव:

एक मजबूत बुनियादी ढांचे से एक देश की अर्थव्यवस्था को बहुत लाभ होता है। चरम प्राकृतिक आपदाओं में जलवायु परिवर्तन की वृद्धि से बुनियादी ढांचा गंभीर रूप से प्रभावित हुआ है। उदाहरण के लिए, पिछले दस वर्षों में भारत को बाढ़ से संबंधित आर्थिक नुकसान कुल \$3 बिलियन, या वैश्विक कुल का 10% था।

2020 में भारत में लगभग 13 मिलियन लोग चक्रवात अम्फान से प्रभावित हुए थे।

जल निकासी व्यवस्था पर प्रभाव:

भारत सिंधु-गंगा के मैदान को अपनी “रोटी की टोकरी” के रूप में उपयोग करता है और प्रत्येक वर्ष उपलब्ध पानी का 34% हिस्सा लेता है। बढ़ते तापमान और बढ़ती मौसमी परिवर्तनशीलता के परिणामस्वरूप हिमालय के ग्लेशियर लगातार बढ़ती दर से पिघल रहे हैं। यदि दर बढ़ती है, तो हिमनदी झीलें अपनी प्राकृतिक सीमाओं को तोड़ देंगी, जिससे इन ग्लेशियरों द्वारा पोषित नदी घाटियों में बाढ़ आ जाएगी और प्रवाह कम हो जाएगा जिससे पानी की कमी हो जाएगी।

बढ़ती असमानता:

भारत में, अनुकूलन क्षमता राज्य, स्थान और सामाजिक आर्थिक स्थिति के अनुसार भिन्न होती है। क्योंकि वे अनाज की बढ़ती कीमतों और घटती कृषि मजदूरी से सीधे प्रभावित होते हैं, कम आय वाले परिवार जलवायु परिवर्तन के कारण होने वाले आर्थिक नुकसान के प्रति अधिक संवेदनशील होते हैं। नतीजतन, जलवायु परिवर्तन को अपनाने से आर्थिक विकास कम हो सकता है और जिनके संसाधन सीमित हैं उनके लिए सख्त बजट हो सकता है।

आगे बढ़ने का रास्ता

शमन :

प्रकृति पर आधारित समाधान: हरित और स्वच्छ ऊर्जा का विकास वायु प्रदूषण को कम कर सकता है और जीवाश्म ईंधन के बोझ को कम कर सकता है। इसके अतिरिक्त, यदि नए ट्रांजिट सिस्टम का निर्माण किया जाता है या मौजूदा लोगों को बढ़ाया जाता है तो रोजगार में वृद्धि हो सकती है। भारत की राष्ट्रीय स्तर पर निर्धारित योगदान (NDC) रिपोर्ट में 2030 तक 40 प्रतिशत स्वच्छ ऊर्जा उत्पादन का लक्ष्य रखा गया है।

पर्यावरण के अनुकूल प्रक्रियाएं: पर्यावरण और अर्थव्यवस्था साथ-साथ चलते हैं। जलवायु परिवर्तन से उत्पन्न चुनौतियों को प्रभावी ढंग से संबोधित करने के लिए, विकास के लिए एक नियोजित दृष्टिकोण की आवश्यकता है जो निर्बाध विकास की संभावनाओं की गारंटी देता है - विशेष रूप से भारत में ग्रामीण अर्थव्यवस्था के लिए। इसके अतिरिक्त, जलवायु परिवर्तन एक सतर्क लेकिन टिकाऊ तरीके से विकसित होने का अवसर प्रस्तुत करता है। आद्रभूमियों और वनों का संरक्षण: वर्षा और तापमान नियमन वनों के प्रसिद्ध कार्य हैं।

वुडलैंड्स और वेटलैंड्स का संरक्षण और उन्नयन बागवानी दक्षता, सीक्वेस्टर CO₂ उत्सर्जन को बनाए रखेगा, और फोरफ्रंट हीरोज के रूप में पारिस्थितिक झटके के लिए बहुमुखी प्रतिभा में सुधार करेगा।

कचरे का उचित निपटान:

वातावरण में विभिन्न प्रकार के प्रदूषकों को जोड़कर, अनुचित अपशिष्ट प्रबंधन जलवायु परिवर्तन में योगदान देता है। इस मुद्दे को अपशिष्ट गैसीकरण जैसे अपशिष्ट-चयनात्मक प्रबंधन संयंत्रों की स्थापना से संबोधित किया जाएगा।

इन संयंत्रों के बुनियादी ढांचे के निर्माण और बाद में रखरखाव के परिणामस्वरूप कुशल और अकुशल श्रमिकों दोनों को रोजगार के नए अवसर प्राप्त होंगे।

अनुकूलन:

अनुकूली क्षमता के विकास में नियोजित अनुकूलन का महत्व माना जाता है।

पैसिव कूलिंग के लिए तकनीकें:

पैसिव कूलिंग तकनीक आवासीय और व्यावसायिक भवनों में शहरी गर्मी के द्वीपों को कम करने के लिए एक व्यवहार्य विकल्प है। इंटरगवर्नमेंटल पैनेल ऑन क्लाइमेट चेंज (आईपीसीसी) रिपोर्ट में उद्धृत प्राचीन भारतीय भवन डिजाइनों में इस तकनीक का उपयोग किया गया है, जिसका उपयोग समकालीन सुविधाओं में किया जा सकता है।

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खेती के बेहतर तरीके:

जलवायु परिवर्तन की चुनौतियों को फसल विविधीकरण, सिंचाई आधारित खेती के माध्यम से संबोधित किया जा सकता है, जो वर्षा और अन्य प्रथाओं पर निर्भरता कम करता है।

आपदाओं के लिए एक लचीला बुनियादी ढाँचा:

आश्रय गृह, तटीय तटबंध, और बाढ़ प्रतिरोधी सड़कों का निर्माण, ये सभी आपदा-प्रतिरोधी बुनियादी ढाँचे के उदाहरण हैं। इसके अतिरिक्त, मौसम के पूर्वानुमान और पूर्व चेतावनी प्रणाली को विकसित करना आवश्यक है जो अधिक सटीक और समय पर हो।

संदर्भ

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भारत में जलवायु परिवर्तन : शिक्षा तथा जागरूकता

प्रो० (डॉ०) सुधारानी सिंह

डी० लिट्०

विभागाध्यक्ष (हिन्दी)

श० मं० पा० राजकीय महिला स्नातकोत्तर महाविद्यालय, मेरठ।

जलवायु परिवर्तन एक गंभीर वैश्विक मुद्दा है जिस पर तत्काल ध्यान देने और उपचारात्मक कार्रवाई करने की आवश्यकता है। यह एक ऐसी घटना है जो जीवाश्म ईंधन का जलना, वनों की कटाई, औद्योगीकरण और ग्रीनहाउस गैसों के उत्सर्जन आदि जैसी मानव गतिविधियों के कारण एक लंबी अवधि में घटित होती है। भारत उन देशों में से एक है जो जलवायु परिवर्तन के प्रभावों के प्रति सबसे अधिक संवेदनशील हैं, जिसमें समुद्र का बढ़ता जलस्तर, बढ़ा हुआ सूखा और चरम मौसम की घटनाएं शामिल हैं। इस चुनौती से निपटने के लिए सरकार और देश के विभिन्न संगठनों ने जलवायु परिवर्तन संबंधी जागरूकता बढ़ाने और कार्रवाई को बढ़ावा देने के लिए अनेक जलवायु परिवर्तन शिक्षा कार्यक्रम शुरू किए हैं। इस पत्र का उद्देश्य इन कार्यक्रमों की प्रभावशीलता का मूल्यांकन करना और भारत में जलवायु परिवर्तन शिक्षा को बढ़ावा देने के लिए रणनीति सुझाना है।

हाल के वर्षों में जलवायु जागरूकता बढ़ाने और कार्रवाई को बढ़ावा देने के लिए भारत में अनेक जलवायु परिवर्तन शिक्षा कार्यक्रम शुरू किए गए हैं। ऐसा ही एक कार्यक्रम जलवायु परिवर्तन पर राष्ट्रीय कार्य योजना (National Action Plan on Climate Change) है, जिसे 2008 में भारत सरकार द्वारा शुरू किया गया था। इस योजना में आठ राष्ट्रीय मिशन शामिल हैं, जिनमें सतत शिक्षा के लिए राष्ट्रीय मिशन, राष्ट्रीय जल मिशन और हरित भारत के लिए राष्ट्रीय मिशन आदि शामिल हैं। इन मिशनों का उद्देश्य सतत विकास को बढ़ावा देना और जलवायु परिवर्तन के प्रभावों को कम करना है। इसी प्रकार जलवायु परिवर्तन पर एक अन्य कार्यक्रम ग्रीन स्कूल प्रोग्राम है, जिसे सेंटर फॉर साइंस एंड एनवायरनमेंट द्वारा शुरू किया गया है। इस कार्यक्रम का उद्देश्य स्कूलों में पर्यावरण जागरूकता और स्थिरता को बढ़ावा देना है। इस कार्यक्रम के तहत, स्कूलों को वर्षा जल संचयन, कंपोस्टिंग और अपशिष्ट पृथक्करण जैसी पर्यावरण-अनुकूल प्रथाओं को अपनाने के लिए प्रोत्साहित किया जाता है। इस कार्यक्रम के अंतर्गत शिक्षकों और छात्रों को जलवायु परिवर्तन और स्थिरता पर प्रशिक्षण भी प्रदान किया जाता है। जलवायु परिवर्तन शिक्षा को बढ़ावा देने की दिशा में अनेक गैर-सरकारी संगठन भी भारत में काम कर रहे हैं। उदाहरण के लिए क्लाइमेट रियलिटी प्रोजेक्ट इंडिया नामक एनजीओ जलवायु परिवर्तन पर कार्रवाई करने के लिए लोगों को जागरूक करने हेतु प्रशिक्षण कार्यक्रम आयोजित करता है। यह संगठन जलवायु परिवर्तन पर छात्रों को शिक्षित करने के लिए विश्वविद्यालयों और स्कूलों के साथ भी भागीदारी करता है।

भारत में जलवायु परिवर्तन शिक्षा को बढ़ावा देने के अनेक सरकारी व गैर सरकारी प्रयासों के बावजूद इन कार्यक्रमों की प्रभावशीलता संदिग्ध बनी हुई है। उचित निगरानी और सटीक मूल्यांकन तंत्र की कमी के कारण लोगों पर इन कार्यक्रमों द्वारा पड़ने वाले प्रभाव को निर्धारित करना चुनौतीपूर्ण हो जाता है। हालांकि, कुछ अध्ययनों से पता चलता है कि जलवायु परिवर्तन शिक्षा कार्यक्रमों का लोगों की जलवायु के प्रति जागरूकता और व्यवहार परिवर्तन पर सकारात्मक प्रभाव पड़ता है। उदाहरणस्वरूप सेंटर फॉर साइंस एंड एनवायरनमेंट द्वारा किए गए एक अध्ययन में पाया गया कि ग्रीन स्कूल कार्यक्रम में भाग लेने वाले स्कूलों ने अपनी ऊर्जा खपत और अपशिष्ट उत्पादन में महत्वपूर्ण कमी दिखाई है। अध्ययन में यह भी पाया गया कि कार्यक्रम में भाग लेने वाले छात्रों ने पर्यावरण संबंधी मुद्दों की बेहतर समझ प्रदर्शित की और उनके दैनिक जीवन में पर्यावरण के अनुकूल प्रथाओं को अपनाने की अधिक संभावना थी।

भारत में जलवायु परिवर्तन शिक्षा को प्रभावी ढंग से बढ़ावा देने के लिए अनेक रणनीतियों को लागू करने की आवश्यकता है। सबसे पहले सरकार तथा गैर सरकारी संगठनों और अन्य हितधारकों के बीच परस्पर सहयोग बढ़ाने की आवश्यकता है जिससे व्यापक और एकीकृत जलवायु परिवर्तन शिक्षा कार्यक्रमों द्वारा लोगों की जागरूकता बढ़ायी जा सकती है। दूसरे, जलवायु परिवर्तन शिक्षा को स्कूलों और विश्वविद्यालयों के पाठ्यक्रम में अनिवार्यतः शामिल करने की आवश्यकता है जिससे छात्रों को इस मुद्दे की बेहतर समझ प्रदान करते हुए उन्हें जलवायु तथा पर्यावरण संरक्षण के प्रति अधिक संवेदनशील बनाया जा सके। तीसरा, व्यापक दर्शकों तक पहुँचने के लिए नवीन संचार और आउटरीच रणनीतियों की आवश्यकता है। उदाहरण के लिए, विभिन्न सोशल मीडिया मंचों का उपयोग जलवायु परिवर्तन पर जागरूकता बढ़ाने और कार्रवाई को बढ़ावा देने के लिए किया जा सकता है। इन्फोग्राफिक्स और वीडियो जैसे विजुअल माध्यमों को इस मुद्दे को लेकर लोगों की समझ बढ़ाने में उपयोग किया जा सकता है। इसके अतिरिक्त जलवायु परिवर्तन शिक्षा कार्यक्रमों के प्रभाव का आकलन करने के लिए उचित निगरानी और मूल्यांकन तंत्र की आवश्यकता है। यह आकलन इन कार्यक्रमों की ताकत और कमजोरियों की पहचान करने में मदद कर सकता है और जागरूकता को बढ़ावा देने के लिए साक्ष्य-आधारित रणनीतियों के क्रियान्वयन को संभव बनाता है। साथ ही, यह पहचानना भी महत्वपूर्ण है कि जलवायु परिवर्तन शिक्षा स्कूलों और विश्वविद्यालयों तक ही सीमित नहीं होनी चाहिए। इसे शिक्षा, ऊर्जा और परिवहन सहित विभिन्न क्षेत्रों की नीतियों और प्रथाओं में भी अंतर्निहित किया जाना चाहिए। यह कदम सतत विकास को बढ़ावा देते हुए जलवायु परिवर्तन के प्रभावों को कम करने में सहायक सिद्ध हो सकता है। अतः, जलवायु परिवर्तन एक ऐसी वैश्विक चुनौती है जिसके लिए अनिवार्य सामूहिक कार्रवाई की आवश्यकता है जो कि जलवायु शिक्षा, जागरूकता, सटीक रणनीतियों तथा इनके उचित क्रियान्वयन के बगैर संभव नहीं है। प्रभावी जलवायु परिवर्तन शिक्षा कार्यक्रम लोगों में जागरूकता को बढ़ावा देने और उन्हें स्थिरता व पर्यावरण संरक्षण की दिशा में कार्रवाई करने के लिए सशक्त करने में महत्वपूर्ण भूमिका निभा सकते हैं।

Sustainable Energy Transition: G20's Role in Promoting Clean Energy, Green Energy

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G-20 is Group of 19 plus European union. The 1990s financial crises in some emerging economies and the rising realisation that some of these nations were underrepresented in discussions and governance of global economics led to the formation of the G20. Together, the G20 nations account for around 90% of the world's GDP, 80% of its commerce, and two thirds of its population. The G20's goals are to coordinate policies among its members to achieve economic stability and sustainable growth on a global scale, to advance financial laws that decrease risks and avert future financial crises, and to establish a new worldwide financial architecture. Governments have developed and executed a variety of public policies to promote the production and use of renewable energy globally in order to secure energy security and address global issues like climate change and environmental degradation. For achieving this goal need more focus on renewable energy resource. The focus of this book chapter will be on prospective strategies for assessing and enhancing the global competitiveness of the G20's renewable energy sector. By creating a revised Diamond Model in relation to Porter's theory of industry competitive advantage, it offers an analytical framework for evaluating the national renewable energy competitiveness of the G20 members, conducts an extensive investigation into the primary driving forces for the renewable energy industry, and presents a reliable competitiveness assessment of the present and future of the G20's renewable energy industries, including solar, wind, hydropower, and biomass. The research also suggests a series of policy suggestions based on the G20's global analysis to assist decision-makers in the assessment and selection of methods for boosting their country's competitiveness in renewable energy. Our findings might better assist international efforts to address the sustainability of global energy usage by providing a valuable reference for both policy makers and industrial end users.

INTRODUCTION

The 1990s financial crises in some emerging economies and the rising realisation that some of these nations were underrepresented in discussions and governance of global economics led to the formation of the G20. For the first time,

in December 1999, in Berlin, Germany, the Finance Ministers and Central Bank Governors of developed and developing nations with systemic importance convened for an informal discussion on crucial concerns for global economic stability. Since then, a yearly meeting of central bank governors and finance ministers has been held. G20 finance ministers and governors of the central banks met in India in 2002. In order to confront the global financial and economic crisis of 2008 in G20 was elevated to the summit level, India in 2008 started their 8 mission plan for fight climate change & Global warming.

There is no permanent secretariat or staff at the G-20. The chair is chosen from a new geographical group of nations each year and rotates among the members. The chair is a member of the Troika, a rotating trio of management officials that includes the past, current, and future chairs. Mexico is the G-20's current chair; Russia will take over as chair after her. The established Sherpa and Finance tracks are used to prepare for and monitor the topics and commitments agreed at the Summits as part of the G20 Summit preparation process. The Sherpas' Track addresses internal concerns like G20 procedure norms while concentrating on non-economic and financial topics including development, anti-corruption, and food security. There is a great deal of conjecture about the G20's goals and thrust areas now that India is serving as the organization's captain. A few crucial topics that the G20 is anticipated to prioritise are highlighted in the most recent statement of G20 Leaders, which was released in Bali in November of last year. The Declaration discusses issues such as the difficulties to global supply chains' stability, climate change and just transition, trade and investment cooperation, and digital.

The world's main economies must accelerate their transition to cleaner and renewable energy in order to address the increasing climate change threat. How India defines the G20's response to this issue is irrelevant since it must safeguard the demands of energy access and security.

The Bali Declaration (2022) states that G20 nations would accelerate efforts to phase out coal while using all available clean energy choices, including renewable energy. This phrase is somewhat reminiscent to the CoP26's decision-making language from Galway last year. However, effective advancement along this route is dependent on a number of variables.

The G20 must first explore certain types of energy policy in order to advance cleaner energy sources. Over the last five years, autonomous global investment in the renewable energy industry has continuously outpaced that in the conventional energy sector. But if the overall objective is to be achieved

this needs to be built up much further. By 2030, India intends to have 50% of its energy capacity come from renewable sources. The International Solar Alliance, whose goal is to expand the use of solar energy across continents, is led by this organisation. To be able to support this approach, G20 would do well to develop explicit renewable energy objectives in terms of capacity or generation. The promotion of international collaboration in the creation and use of alternative fuels comes next. It is essential to invest in the development of biofuels, clean hydrogen, and modern energy storage technologies in order to decarbonize industries with high emission levels, such as steel, cement, and transportation. Sadly, the industry transition leadership group, which was established at the UNSG-hosted Climate Summit in 2019, has not made much headway. India could encourage international partnerships that can expedite the development of alternative clean fuels, generate worldwide demand for such technologies, and assist in the establishment of demonstration plants in the hard-to-reduce industries as the G20's current leader. The challenge of generating money to finance the clean energy developments is equally crucial. International funders and multilateral financial institutions are starting to consider investments in the future of energy through the prism of coal phase down or phase out. This is the foundation of the Just Energy Transition Partnership (JETP), which the G7 announced under Germany's leadership. After South Africa, Egypt, and Indonesia, who are currently partners in the JETP, it is anticipated that India would join them. India will have the task of making sure that the growth of JETP does not depend on a strategy whose main purpose is to make the withdrawal of coal-related investments easier while serving as the G20 President. In the medium term, an energy security and power sector transformation plan based on this strategy will be detrimental to India. This has to take place over time. But, India's long-term low emission development strategy, which was just published in Sharm El Sheikh, does not specify a time limit for the peaking of emissions from either the coal industry or the economy as a whole. The G20's Bali statement acknowledges the need for an energy transition to happen in a fair way that takes into account local conditions. Hence, under the framework of Nationally Determined Contributions, JETP should fulfil ambitions of renewable energy capacity (NDCs). In order to make sure the process is effective, it should include regional economic diversification plans and work to increase incomes and revenues for the states who may lose out in the case of an energy transition. Another area of focus is the conditions under which finance from outside and bilateral aid will be mobilised to help the energy transformation. The developed world is clearly not in the mood to offer public subsidies or concessional monies to achieve climate targets, according to discussions at CoP27 in Egypt. By offering risk-free financing in a way distinct from that of multilateral financial institutions, JETP ought to fill this vacuum. The G20 is in a good position to establish an international equity capital global risk mitigation fund that can handle the risk of investing in emerging nations. The blue economy and nature-based

solutions are two more spheres of collaboration that the G20 might look into. At Sharm El Sheikh, it was first brought to light how crucial seas are as a tool for regulating the climate. The economies of various nations with extensive coastlines stand to gain significantly from cooperation in this area. A viable area for carbon market funding is thought to be nature-based solutions. India should embrace it if it encourages agro-forestry, increasing tree cover outside of forests, and carbon-plus benefits in terms of protecting biodiversity and ecosystems. With a worldwide fund led by the G20, these benefits may be evaluated and compensated. India has the chance to direct the G20's discussion on the energy transition on its own terms. India's Prime Minister's personal commitment to the Lifestyle for Environment (LiFE) philosophy may be a suitable starting point for persuading the other G20 members of the legitimacy of a transition that is fair for both the present and future generations. India main concern A rapidly warming planet requires that major global economies shift their focus toward clean and green energy. It would be interesting to observe how India, as the G20's leader, approaches the problem while fulfilling the dual objectives of energy access and energy security. The first step is to determine the energy regulations that the G20 must adhere to in order for renewable energy to advance. India set a goal of having 50% of its energy capacity come from renewable sources by 2030. The International Solar Alliance (ISA), which seeks to advance the deployment of solar energy across continents, is also presided over by India. The G20 would do well to develop renewable energy targets to satisfy capacity requirements in order to support this project. The second is to promote collaboration in the creation and use of fuel from non-conventional energy sources. To decarbonize challenging industries like cement and steel, it is crucial to develop energy storage technologies like green hydrogen. India should promote international collaborations while holding the G20 chair in order to hasten the development and use of renewable energy technology and to spur demand for them on a global scale. Thirdly, international financing organisations and financial institutions are looking at future energy requirements from the standpoint of the phase-down of coal. In one such alliance, the G7 nations of Germany, Italy, Canada, France, Japan, the United Kingdom, and the United States have partnered with India, Indonesia, Vietnam, and Senegal. This relationship is known as the Just Energy Transition Partnership (JETP). During the Partnership for Global Infrastructure and Investment event at the G20 Summit in November 2022, his partnership was officially established. Such an alliance would assist developing nations in shifting their economies and power sources away from fossil fuels and towards low-carbon technology.

In 2021, the G7 nations agreed to invest \$8.5 billion in South Africa. A \$20 billion joint venture with Indonesia and a \$15.5 billion joint venture with Vietnam were both inked in 2022. JETP decreases coal power output in South Africa while not investing in new coal plants. Indonesia can benefit from the first \$20 billion invested over a period of three to five years through the JETP to promote renewable

energy. JETP is a brand-new initiative for international collaboration amongst nations engaged in national initiatives to address climate change. To promote a fair transition away from fossil fuels, it uses public-private financial arrangements for climate finance among poor nations.

Along with allowing for climate funding, JETP also promotes a green economy and handles the financial and social requirements of emerging communities who are susceptible to the consequences of the energy transition. Along with allowing for climate funding, JETP also promotes a green economy and handles the financial and social requirements of emerging communities who are susceptible to the consequences of the energy transition.

India will have a demanding role during its G20 presidency in making sure that the growth of JETP does not depend exclusively on the slow demise of the coal industry. By guaranteeing the presence of clean, sustainable, just, economic, and inclusive energy transitions and the availability of sustainable funds, the G20 Bali leaders' declaration enables the need to develop and expand the energy systems and advance energy resiliency, security, as well as market stability.

To guarantee that renewable energy objectives are met within the framework of Nationally Determined Contributions, JETP must mobilise resources. Fourth, it is necessary to determine the terms for energy cooperation and the funding allotment for planning energy transition. The establishment of a "loss and damage fund" was discussed during the recently finished 27th Conference of Parties (COP27) to the United Nations Framework Convention on Climate Change in Egypt. This fund would offer assistance when climate-related losses exceed what human society can bear. Nevertheless, no funding or assistance was given to reach the climate-related goals. JETP can fill this gap and provide the funds or assistance needed to reach these goals. The G20 is well-positioned to create a risk mitigation endowment to lessen the risks associated with investments in the developing countries. Finally, the G20 may look at other possibilities for the energy transition, such the blue economy and other environmental fixes. One of the workshops offered at COP27 focused on implementing ocean-based climate solutions to achieve a resilient, Net Zero, egalitarian, and nature-positive future. The World Bank introduced the Blue Economy for Resilient Africa Program at COP27 in order to increase funding and lessen the difficulties in Africa's coastal marine regions. These partnerships may support the economy of emerging nations with substantial. As they show great potential for the carbon markets, environmental solutions are being investigated. India should support initiatives like agroforestry, increasing the amount of green space outside of forests, and the benefits of ecosystem protection for carbon offsets.

Sixth, India's leadership in the field of regional grid integration through the One Sun One World One Grid (OSOWOG) initiative can help to enlist the support

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of G20 nations for putting OSOWOG's vision into action as well as to strengthen cross-border energy trade and regional energy cooperation as a tool or policy option for facilitating the global and regional clean energy transition and building an energy-integrated world.

CONCLUSION

India has the chance to improve energy transitions while serving as the G20's head. On February 5, 2023, Bengaluru hosted the inaugural meeting of the G20 energy transitions working group. According to the Union Minister for Power and New and Renewable Energy, RK Singh, India was among the top five performing nations on the Climate Change Performance Index, and the nation's per capita greenhouse gas emissions in 2020 were lower than the global average of 6.3 tonnes carbon dioxide equivalent. The government's energy-saving initiatives were able to reduce the 267.9 million tonnes of CO₂ produced annually, resulting in savings of \$18.5 billion. Also, the G20 presidency would assist India in realising the OSOWOG mission and achieving the UN-mandated sustainable development target. 7 — Reasonably priced. Hopefully India do the favor for secure their energy demand & fill the gap of money ,technology transfer. fulfill the dreams of right direction approach of inclusive sustainable developing strategy. Green energy technology and allied sectors have experienced astounding and welcome growth. Government regulations, business demands for sustainable energy, and the rising market competitiveness of solar, wind, and offshore wind have all contributed to this. Regrettably, this recent study indicates that both are accurate. Renewable energy is advancing quickly. Yet as countries become wealthier and populations increase, there is a steadily increasing global need for energy. The most difficult task we have is to transition off fossil fuels. Politicians will have to negotiate the solutions. Since we currently possess nearly all of the necessary technology, we can quit burning fossil fuels.

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Effects of Climate Change on Human Health and Well-being: A Comprehensive Analysis

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INTRODUCTION

Climate change is recognised today as the biggest public health challenge of the twenty- first century, threatening to undo decades of gains in public health (Costello et al., 2009). Globally, according to the 2018 Lancet Countdown, if temperatures continue to rise, present- day changes in agricultural production, labour capacity and vector- borne disease are indicative of an early warning of compounded and overwhelming impact.

Climate change is a global phenomenon that has been affecting the environment and the economy of different countries. The effects of climate change have been seen in different forms, such as changes in temperature, precipitation patterns, sea level rise, and extreme weather events. The purpose of this chapter is to analyse the causes and effects of climate change and to examine the measures that can be taken to mitigate its impact.

CAUSES OF CLIMATE CHANGE

The causes of climate change can be attributed to both natural and human activities. The natural factors that contribute to climate change include changes in solar radiation, volcanic activity, and variations in the Earth's orbit. However, the primary cause of climate change in recent times is human activities such as burning fossil fuels, deforestation, and industrial processes. These activities release greenhouse gases such as carbon dioxide, methane, and nitrous oxide into the atmosphere, which trap heat and cause the Earth's temperature to rise.

These greenhouse gases cause our climate to get warmer. Normally when the heat from the sun warms our planet, some of the heat reflects into space with greenhouse gases. acts like a big blanket holding some of it in this extra heat can cause all sorts of problems for our planet and the plants, animals and people who live here. Our ice and snow are melting faster. Our oceans are getting warmer and

higher, and our weather is becoming more extreme with more heat waves, heavy rainfalls. Climate change has numerous effects on the environment and the economy. The most prominent effect is the rise in global temperature, which leads to melting glaciers and ice caps, rising sea levels, and more frequent and severe heatwaves, droughts, and wildfires. Climate change also leads to changes in precipitation patterns, which can result in more frequent and severe floods and droughts. These changes can affect the availability of water resources and the agricultural sector, leading to food insecurity in distinct parts of the world. Climate change also affects the biodiversity of different ecosystems, leading to the extinction of different plant and animal species.

The most affected Countries today are:

1. CHAD

It is considered the most vulnerable country on the planet according to the University of Notre Dame's country vulnerability studies due to flooding, increased military confrontation and famine affecting the whole country.

2. SOMALIA

Due to drought and political problems in the country, IRC (International Rescue Committee) expects that more than eight million Somalis could suffer from famine during the year.

3. SYRIA

After a decade of war, drought and an earthquake in February 2023 have caused the Middle Eastern country to be considered as one of the countries with the greatest problems in dealing with climate-related shocks.

4. DEMOCRATIC REPUBLIC OF CONGO

With more than 100 armed groups vying for control of the country, multiple diseases such as malaria and Ebola have affected large parts of the country. Famine has increased even further with increased flooding in recent months.

5. AFGHANISTAN

Since the return to power of the Taliban regime, international aid has disappeared in a context where the country has been suffering from drought for three years while the rest of Afghanistan has been suffering from flooding.



HOW CLIMATE CHANGE AFFECTS OUR HEALTH?

Most people think of climate change as just an environmental issue. But the World Health Organization has declared it the biggest threat to health in the 21st century. Climate change is an urgent problem that affects our health in many ways, now and in the future. Already, we have seen a rise in extreme events like floods and bushfires. These events affect our health, threaten us and drinking water supplies, and pollute the air we breathe.

Climate change can affect our health, ability to grow food, housing, safety and work. Some of us are already more vulnerable to climate impacts, such as people living in small island nations and other developing countries. Conditions like sea-level rise and saltwater intrusion have advanced to the point where whole communities have had to move, and protracted droughts are putting people at risk of famine. In the future, the number of “climate refugees” is expected to rise.

While climate change is a global process, its impacts may affect communities in different and unequal ways. Some of these effects are relatively direct, as when heat waves or hurricanes cause injury and illness, and even death. Some effects of climate change are less direct and involve shifts in our environment that, in turn, can affect human health. For example, changes in temperatures and rainfall can affect

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the lifecycles of insects that transmit Lyme disease and West Nile virus, leading to new or varied outbreaks. Rising sea levels can worsen the flooding from hurricanes in coastal areas, leading to more people exposed to contaminated water, pollutants, and hazardous wastes. Climate fluctuations often occur with other health stressors, such as poverty, social disadvantage, and impaired language ability, to increase vulnerability. Under-resourced and marginalized populations are most at risk.

WHO IS MOST AT RISK FROM CLIMATE CHANGE?

Low-Income Groups

People with low incomes live with many factors that increase their vulnerability to the health effects of climate. They are more likely to live in risk-prone areas, such as urban heat islands, isolated rural areas, or coastal and other flood-prone areas, or where there is older or poorly maintained infrastructure. Low-income groups often face an added burden of air or water pollution that may be worsened by climate events like severe storms. They experience relatively more chronic medical conditions, such as diabetes and cardiovascular, respiratory, and kidney diseases, all of which may be amplified by climate change. Also, limited transportation and access to health care and education can impede their ability to prepare for, respond to, and cope with climate-related health risks.

Older Adults

The percentage of people aged 65 and older is increasing rapidly in the world. Older adults are a population of concern for climate change impacts from extreme heat and weather events, degraded air quality, vector-borne diseases, and other factors. Older adults may be further challenged by social factors such as isolation or living in older structures that make them vulnerable to heat and extreme events, such as hurricanes and floods; pre-existing health conditions, such as respiratory conditions that may be worsened by extreme climate; and mental health challenges, such as depression, dementia, and other cognitive impairments. Older adults are also more likely to take medications to treat chronic medical conditions, including antidepressant and antipsychotic drugs and diuretics, which make them more vulnerable to complications from heat exposure.

Indigenous Peoples

Several health risks are higher among indigenous populations, such as poor mental health related to historical or personal trauma, environmental exposures from pollutants or toxic substances, and diabetes. Because of existing vulnerabilities, Indigenous people, especially those who are dependent on the environment for

sustenance or who live in geographically isolated or impoverished communities, are likely to experience greater exposure and lower resilience to climate-related health effects. Indigenous communities face threats to their homes, food sources, and cultural traditions from environmental impacts, such as reductions in sea ice, increases in flooding and landslides, damage to wildlife habitats, loss of medicinal plants, and effects on the abundance and nutrition of certain traditional foods.

Occupational Groups

Outdoor workers are often among the first to be exposed to the effects of climate. Severe climate change may affect the health of outdoor workers through increases in ambient temperature, degraded air quality, extreme weather, vector-borne diseases, industrial exposures, and altered built environment. Agricultural and construction workers are particularly vulnerable to rising temperatures. These workers may also experience socioeconomic disadvantages, including limited access to health care and limited control over work environments. Also, laborers exposed to hot indoor work environments that lack air conditioning may be at risk for extreme heat exposure. Military personnel who train and conduct operations in hot field environments may be at risk for heat-related illness, and may also be at increased risk for certain vector-borne diseases

Children and Pregnant Women

Many factors, such as economic status, nutrition and diet, living conditions, geographic location, and stage of development, will affect children's exposure to health threats due to climate change in the U.S and internationally. These factors, combined with climate fluctuations, may increase their exposure to environmental contaminants. Extreme heat threatens student athletes who practice outdoors, as well as children in homes or schools without air conditioning. Children may be vulnerable to injury during extreme weather events, as they depend on adults to escape harm, and can suffer emotional trauma from displacement, loss of home or school, and exposure to the event itself. Climate-related exposures may lead to adverse pregnancy outcomes, including spontaneous abortion, low birth weight, preterm birth, and risks to Newborns and infants, including increased neonatal death, dehydration, malnutrition, diarrhea, and respiratory diseases.

Persons With Disabilities or Chronic Medical Conditions

The term "disability" covers a variety of functional limitations related to hearing, speech, vision, cognition, and mobility. An increase in climate change can be expected to disproportionately affect populations with disabilities. Pre-existing

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medical conditions present risk factors for increased illness and death associated with climate related stressors, especially exposure to extreme heat. Chronic medical conditions, including cardiovascular disease, respiratory disease, diabetes, asthma, and obesity, are likely to increase over the coming decades, resulting in larger populations at risk of medical complications from climate-related exposures. Communities that are both medically underserved and have a high prevalence of chronic medical conditions can be especially at risk.

Social Impact by Climate Change on Human Being

Certain social groups are particularly vulnerable to crises, for example, female-headed households, children, persons with disabilities, Indigenous Peoples and ethnic minorities, landless tenants, migrant workers, displaced persons, sexual and gender minorities, older people, and other socially marginalized groups. The root causes of their vulnerability lie in a combination of their geographical locations; their financial, socio-economic, cultural, and gender status; and their access to resources, services, decision-making power, and justice.

Economic Impact by Climate Change on Human Being

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

The process of climate change is set to have a significant economic impact on many countries, with a large number of lower income countries being particularly at risk. Macroeconomic policies in these countries will need to be calibrated to accommodate more frequent weather shocks, including by building policy space to respond to shocks. Infrastructure will need to be upgraded to enhance economic resilience.

Effects of Climate Change on Animals

Climate change can also have indirect impacts on animals through its effects on human society. For example, as sea levels rise and extreme weather events become more common, human populations may be forced to move to higher ground or to other areas, which can lead to increased pressure on wildlife and ecosystems. Here are some ways in which climate change affects animals

1. Changes in distribution and migration patterns: Climate change can cause changes in the distribution and migration patterns of animals. For example,

some species may shift their ranges towards the poles or to higher elevations to escape the impacts of warming temperatures.

2. Changes in phenology: Climate change can cause changes in the timing of seasonal events, such as breeding, migration, and hibernation. These changes can disrupt the timing of food availability and other ecological interactions.

3. Habitat loss and fragmentation: Climate change can lead to habitat loss and fragmentation, as ecosystems are altered and disrupted. This can affect the availability of suitable habitat for many species, leading to declines in populations and biodiversity.

4. Changes in food webs: Climate change can affect the availability and quality of food sources for animals, which can in turn affect the structure and dynamics of food webs.

5. Adaptation and evolution: Some animals may be able to adapt to changing environmental conditions, while others may not. This can lead to changes in the genetic makeup of populations over time, as well as changes in the behaviour and physiology of individuals.

Another impact of climate change on animals is the spread of diseases and parasites. As temperatures and precipitation patterns change, the distribution and abundance of disease vectors such as mosquitoes and ticks are also changing, which can lead to the spread of diseases such as Lyme disease and West Nile virus. In addition, as animals are forced to move into new areas in search of suitable habitat, they may encounter new diseases and parasites that they are not adapted to, which can lead to population declines or even extinction.



HOW TO PROTECT OURSELVES FROM CLIMATE CHANGES?

We should do things like walking or cycling instead of driving; eating a diet full of fruit, veggies and whole grains; reducing the amount of processed and packaged foods we eat; and choosing tap water over bottled water and sugary drinks, not only help to reduce our impact on the environment, but also improve our mental and physical Wellbeing.

Mitigation Measures:

To mitigate the impact of climate change, several measures can be taken. The most effective measure is to reduce greenhouse gas emissions by transitioning to renewable sources of energy, such as solar, wind, and hydropower. This can be achieved through policies and regulations that incentivize the use of renewable energy sources and penalize the use of fossil fuels. Another measure is to increase energy efficiency by implementing energy-saving technologies in buildings and industries. Carbon capture and storage technologies can also be used to capture carbon dioxide emissions from power plants and other industrial processes.

Greenhouse Gas

A greenhouse gas is called that because it absorbs infrared radiation from the Sun in the form of heat, which is circulated in the atmosphere and eventually lost to space. Greenhouse gases also increase the rate at which the atmosphere can absorb short-wave radiation from the Sun, but this has a much weaker effect on global temperatures.

The CO₂ released from the burning of fossil fuels is accumulating as an insulating blanket around the Earth, trapping more of the Sun's heat in our atmosphere. Actions carried out by humans are called anthropogenic actions; the anthropogenic release of CO₂ contributes to the current enhanced greenhouse effect

Which gases causes the Greenhouse effects?

- carbon dioxide (CO₂)
- methane (CH₄)
- nitrous oxide (N₂O)
- hydrofluorocarbons (HFCs)
- perfluorocarbons (PFCs)
- sulphur hexafluoride (SF₆)

MEASURES TO REDUCE GREENHOUSE GAS

Reducing greenhouse gas emissions and building more resilient and adaptive health systems are critical steps to mitigate the impacts of climate change on human health and well-being. Here are some measures that can be taken:

1. Transition to renewable energy: Transitioning away from fossil fuels to renewable energy sources, such as solar, wind, and hydropower, can significantly reduce greenhouse gas emissions.

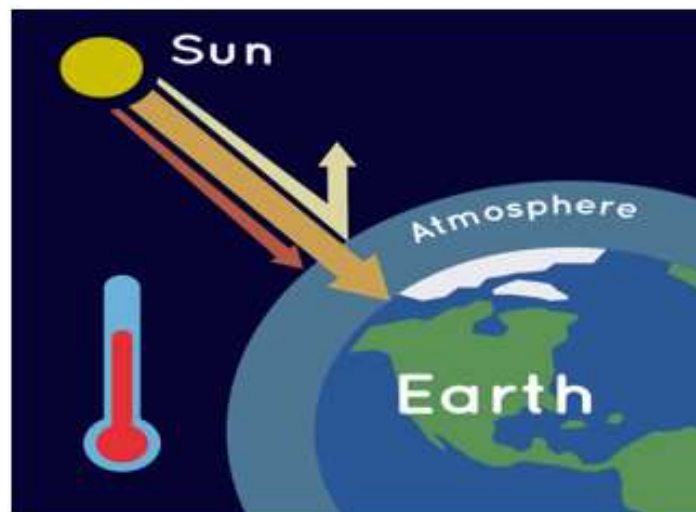
2. Energy efficiency: Improving energy efficiency in buildings, appliances, and transportation can also reduce greenhouse gas emissions while saving money and reducing energy costs.

3. Sustainable agriculture: Promoting sustainable agricultural practices, such as regenerative farming and reducing food waste, can reduce greenhouse gas emissions and increase resilience to climate change impacts.

4. Climate-smart infrastructure: Investing in climate-smart infrastructure, such as green roofs and permeable pavement, can help to reduce the urban heat island effect and improve air and water quality.

5. Health system adaptation: Building more resilient and adaptive health systems can help to mitigate the impacts of climate change on human health. This can include measures such

6. Public awareness and education: Public awareness and education campaigns can help to build support for climate action and encourage individuals and communities to adopt more sustainable and resilient practice



ROLE OF G20 ON CLIMATE CHANGE

Areas with weak health infrastructure – mostly in developing countries – will be the least able to cope without aid to prepare and respond.

Data from the Climate Action Tracker (CAT) shows that of the G20 countries, only the UK has put in place climate action targets and policies that could help the global community achieve the goal of limiting global warming to 1.5 degrees Celsius. Prior to the negotiations at COP27 in Egypt in 2022, participating countries were expected to give revised or updated targets with renewed pledges; but they hardly delivered. While 19 out of the 20 countries have updated their pledges, only 11 given targets that are stronger than their earlier ones. These targets must be strengthened, and suitable policies carefully planned and implemented to meet them.

Here are some ways in which the G20 can address ClimateChange:

Commit to ambitious climate targets: The G20 can play a key role in setting ambitious climate targets and encouraging other countries to do the same. This includes targets for reducing greenhouse gas emissions, increasing the use of renewable energy, and promoting sustainable development.

Encourage investment in renewable energy: The G20 can work to create an enabling environment for investment in renewable energy, such as through policies that promote renewable energy technologies and financial mechanisms that reduce investment risks.

Phase out fossil fuel subsidies: The G20 can work to phase out fossil fuel subsidies, which can help to level the playing field for renewable energy and reduce greenhouse gas emissions.

Promote sustainable transportation: The G20 can work to promote sustainable transportation, such as through policies that encourage the use of public transportation, walking, and cycling, and the development of low-emission vehicles.

Support adaptation and resilience: The G20 can work to support adaptation and resilience to the impacts of climate change, particularly in vulnerable and developing countries. This includes support for climate risk assessment, early warning systems, and disaster preparedness and response.



CONCLUSION

In conclusion, climate change is a global issue that requires immediate attention and action from policymakers, businesses, and individuals. The primary cause of climate change is human activities, and its effects are seen in different forms, such as rising temperatures, sea level rise, and extreme weather events. To mitigate the impact of climate change, measures such as transitioning to renewable energy, increasing energy efficiency, and carbon capture and storage should be implemented. These measures can not only reduce greenhouse gas emissions but also contribute to the development of a sustainable and resilient future.

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Climate Change and G20: An Analysis

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This Paper examines how the G20, a worldwide meeting of advanced economies, has dealt with the problem of climate change over time. The effect of climate change on our environment, the rate of economic growth, and public health has been emphasized by the international community. The G20, which represents the major world powers, may be able to define the course for adaptation and mitigating the effects of climate change. Examining how G20 nations can support the Paris Agreement's climate change measures and encourage sustainable living is equally vital. The G20 must promote international cooperation in addressing the effects of climate change and collective support from other country groups and international organizations in order to build on the cooperation and support among member nations.

The G20 is a powerful, influential international grouping of the top 20 economies with the potential to define the course for the major problems facing the world today. Meetings provide a singular arena and the most important worldwide forum for higher level thought exchange, leading to recommendations of viable answers to the most pressing issues-climate change being one of the most pressing at the moment.

Key Words: Intended Nationally Determined (INDCs), Sustainable Finance Working Group (SFWG), Energy Transition Working Group (ETWG), Think-20 (T20), The Ministry of External Affairs (MEA's), antimicrobial resistance (AMR), United Nations Framework Convention on Climate Change (UNFCCC), Green Climate Fund (GCF), Lifestyle for Environment (LiFE), Violent Extremism Conducive to Terrorism (VECT).

INTRODUCTION AND HISTORICAL BACKGROUND

From the very beginning of our existence, it is seen that humanity has been facing climate change. However, in the past century, we started to observe significant effect of our actions on environment and climate. It is not only discussed among experts or visionaries but also a topic for high level meetings of world leaders, policy maker and also for the people walking on the streets. Wherever we look, wherever we go, we cannot escape the topic of climate change that was brought to a great




attention by our young generations who realizes that our future will be in danger. It is believed that we will not be able to fulfill our promise of Paris Agreement's of keeping global temperature rise should be below 2°C above pre-industrial levels and to limit the temperature increase even further to 1.5°C.

ORIGIN AND EVOLUTION




The G20 was founded in 1999 after the Asian financial crisis as a conference for the Finance ministers and Central Bank Governors to discuss global, economic and financial issues. The G20 mainly focuses on broad macroeconomic policy. It has expanded its scope which includes trade, climate change, sustainable development, energy, environment, climate change, anti-corruption etc.

The Group of Twenty (G20) includes Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom and the United States along with the European Union. Spain is also invited as a permanent guest. G20 members currently account for more than 85% of world GDP, 75% of global trade and Two Third (nearly 75%) of global population. In the wake of the global financial and economic crisis of 2007, the G20 was elevated to the level of Heads of State/ Government and was named the “premier forum for international economic cooperation.

PREVIOUS G20 SUMMITS


G20 Summits	Dates	G20 Host Countries	Host City	Venue	Host Leader	Summary
1st	14–15 November 2008	 United States	Washington, D.C.	National Building Museum	George W. Bush	<ul style="list-style-type: none"> It paved the way for the most significant change to the global financial system in more than 60 years. Following the financial crisis of 2008, the G20 decided to implement more stringent regulations on hedge funds and rating agencies.
2nd	2 April 2009	 United Kingdom	London	ExCeL London	Gordon Brown	<ul style="list-style-type: none"> G20 leaders decided to cut back on state debt. The advanced industrial nations promised to cut back on their budget deficits and borrowing from abroad.
3rd	24–25 September	 United States	Pittsburg	David L. Lawrence	Barack Obama	<ul style="list-style-type: none"> At this conference, it was resolved to impose harsher rules on the banking industry, requiring banks to retain more of




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	2009	States	h	e Conventi on Center	Obama	their revenues to raise capital. These measures assisted in lowering the financial danger that high-risk private sector activity posed to governments and tax-payers.
4th	26-27 June 2010	 Canada	Toronto	Metro Toronto Conventi on Centre	Stephe n Harper	<ul style="list-style-type: none"> G20 leaders decided to cut back on sovereign debt. The advanced industrial states promised to cut back on their budget deficits and borrowing from abroad.
5th	11-12 November 2010	 South Korea	Seoul	COEX Conventi on & Exhibiti on Center	Lee Myung -bak	<ul style="list-style-type: none"> In Seoul, Republic of Korea, the G20 Leaders gathered once more in 2010, adopting stronger banking restrictions (Basel III Norms) and deciding to modify the financial stakes and voting shares in the International Monetary Fund (IMF). The summit's agenda included discussions about development policies, which became known as the "Seoul Consensus."
6th	3-4 November 2011	 France	Cannes	Palais des Festivals	Nicolas Sarkoz y	<ul style="list-style-type: none"> G20 Leaders agreed to establish the Agricultural Market Information System, an inter-agency platform to enhance food market transparency and encourage international policy coordination in times of crisis.
7th	18-19 June 2012	 Mexico	San José del Cabo, Lo s Cabos	Los Cabos Internati onal Conventi on Center	Felipe Calder ón	<ul style="list-style-type: none"> The Summit's main objectives were to reduce youth unemployment and develop high-quality jobs that provide fair pay and social security benefits. The relationship between the development agenda, agriculture, and green growth was also stressed at the summit.
8th	5-6 September 2013	 Russia	Saint Petersbu rg	Constant ine Palace	Vladim ir Putin	<ul style="list-style-type: none"> The fight against tax evasion and avoidance saw the most significant advancement. The Base Erosion and Profit Shifting (BEPS) Action Plan and the automatic exchange of tax information were both approved by the G20.
9th	15-16 November 2014	 Australia	Brisbane	Brisbane Conventi on & Exhibiti on Centre	Tony Abbott	<ul style="list-style-type: none"> The G20 set an ambitious target of boosting its combined GDP by an additional 2%. The approval of the Common Reporting Standard for Automatic Exchange of Tax Information by the Finance Ministers and Central Bank Governors is another significant development in the area of banking regulation.

						<ul style="list-style-type: none"> The 'Brisbane 25 by 25' target, which sought to close the gender gap in the labour force by 25% by 2025, was supported by the Leaders.
10th	15–16 November 2015	 Turkey	Serik, Antalya	Regnum Carya Hotel Convention Centre	Recep Tayyip Erdoğan	<ul style="list-style-type: none"> The G20 examined migration and refugee mobility for the first time. They resolved to support the global climate pact as well as more banking sector reforms. A G20 Statement on the Fight against Terrorism was also released by the leaders.
11th	4–5 September 2016	 China	Hangzhou	Hangzhou International Exhibition Centre	Xi Jinping	<ul style="list-style-type: none"> The goal was to strengthen the global economy's inclusive long-term growth. The Summit also considered the relationship between social welfare and sustainable growth. During China's G20 Presidency in 2016, the digital economy—a vital engine of development and growth—became a topic on the agenda for the first time.
12th	7–8 July 2017	 Germany	Hamburg	Hamburg Messe	Angela Merkel	<ul style="list-style-type: none"> The G20, which was hosted by Germany, gathered under the theme "Shaping an interconnected world" and placed particular emphasis on confronting the threat of terrorism on a worldwide scale. It called on multilateral development banks (MDBs) to support promoting universal access to affordable and clean energy and underlined energy security as the driving concept for the reform of the energy sector.
13th	30 November – 1 December 2018	 Argentina	Buenos Aires	Costa Salguero Center	Mauricio Macri	<ul style="list-style-type: none"> Building Consensus for Fair and Sustainable Development was the theme of the G20 while Argentina held the presidency. Future of work, the Fourth Industrial Revolution, health, youth, infrastructure for development, and sustainable food security were the top priorities for Argentina's presidency.
14th	28–29 June 2019	 Japan	Osaka	Intex Osaka	Shinzo Abe	<ul style="list-style-type: none"> The G20 Summit in 2019 (Japan) concentrated on important issues like trade and investment, excess steel production capacity, digitalization, trust-based data flow, the G20/OECD Framework on Base

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						<p>Erosion and Profit Sharing, quality infrastructure investment, anti-corruption, climate change, energy, the environment, and displacement and migration.</p> <ul style="list-style-type: none"> • A significant statement on 'Preventing Internet Exploitation for Terrorism and Violent Extremism Conducive to Terrorism (VECT)' was released by the G20 leaders.
15th	21–22 November 2020	 Saudi Arabia	Riyadh	(The summit took place with a worldwide video conference due to the COVID-19 pandemic in Saudi Arabia)	King Salman	<ul style="list-style-type: none"> • The theme of the 15th G20 Summit was "Realising Opportunities of the 21st Century for all." In G20 history, it was the first virtual summit that ever took place. • The Saudi Presidency also organised a "Extraordinary Virtual G20 Leaders' Summit" on March 25, 2020, at the request of Prime Minister Modi, to discuss the difficulties faced by the COVID-19 epidemic and to create a coordinated international response.
16th	30–31 October 2021	 Italy	Rome	EUR Convention Center	Mario Draghi	<ul style="list-style-type: none"> • People, Planet, and Prosperity were the three main, interconnected pillars of action at the 2021 G20, which was led by Italy. • The G20 wants to take the lead within these pillars in guaranteeing a quick international response to the COVID-19 pandemic, capable of providing equitable, global access to diagnostics, treatments, and vaccines, while also bolstering resilience to upcoming health-related shocks.
17th	15–16 November 2022	 Indonesia	Nusa Dua, Bali	The Apurva Kempinski Bali	Joko Widodo	<ul style="list-style-type: none"> • 'Recover Together, Recover Stronger' was the theme of the G20 in 2022. • Recognising the COVID-19 pandemic's effects on all facets of society and the inability of many nations to deal with the problem, the Indonesian Presidency will concentrate on three key pillars for its G20 2022 Presidency: Digital transformation, sustainable energy transition, and global health architecture. • With the help of these pillars, Indonesia hopes to maintain its position as a global leader in the areas of ensuring equal access to COVID-19 vaccinations, fostering inclusive and sustainable economic growth through the involvement of micro, small, and medium-sized companies (MSMEs), and the digital economy.

18th	9–10 September 2023	 India	New Delhi	International Exhibition-Convention Centre (IECC)	Narendra Modi	Proposed
19th	TBD 2024	 Brazil	TBD	TBD	Luiz Inácio Lula da Silva	Proposed
20th	TBD 2025	 South Africa	TBD	TBD	TBD	Proposed

G20 AND INDIA

India’s G20 Presidency will work to promote universal sense of one-ness. Hence, our theme – “One Earth, One Family, One Future” or “Vasudhaiva Kutumbakam”. It is inspired from the Maha Upanishad, an old Sanskrit scripture. The theme fundamentally highlights the importance of all life-human, animal, plant, and microorganism—as well as their interdependence on Earth and across the universe. The theme also exemplifies LiFE (Lifestyle for Environment), which highlights the importance of environmentally sustainable and responsible lifestyle choices, both at the individual and national level, in creating a cleaner, greener, and bluer future. India’s G20 presidency began on 1st December, at a time when the world is facing great geopolitical confusion and uncertain situation of the pandemic and Ukraine War.

Prime Minister Modi also suggested that “Data for Development” will be an integral part of India’s presidency. The digital transformation shouldn’t be limited to a small part of society, and its greater benefits will be realized only when digital access becomes truly inclusive. India’s own experience in the past few years is a best example to show that if digital architecture is made widely accessible, it can bring about socioeconomic transformation.

WORKING OF G20

For one year, the G20 Presidency sets the agenda and hosts the Summit. The Finance Track and the Sherpa Track are two concurrent tracks that make up the G20. Sherpas are in charge of the Sherpa Track, while Finance Ministers and Central Bank Governors are in charge of the Finance Track. The Sherpas of the participating nations, who serve as the Leaders’ personal representative, are in charge of the G20 process from the Sherpa perspective. The Working groups within the two tracks, in

which representatives from the member countries' relevant ministries as well as those from invited/guest nations and numerous international organizations participate in this regard.

The Ministry of Finance is primarily in charge of the Finance Track. Throughout the course of each Presidency, these working groups have to come together frequently. The G20's substantive work is coordinated by the Sherpas, who also discusses Summits agenda items and monitor discussions during the course of the year. Additionally, there are Engagement Groups that bring together individuals from the G20 countries civil society organisations, legislatures, think tanks, youth, labour, businesses, and researchers.

There is no permanent secretariat for the Group. The past, present, and incoming presidents—the troika—support the presidency. The troika will consist of Indonesia, India, and Brazil during India's Presidency, accordingly. Working groups this year will focus on global priority areas such as green development, climate finance, inclusive growth, digital economy, public infrastructure, technology transformation, and reforms for women empowerment for socio-economic progress. All these steps are taken to accelerate progress towards the Sustainable Development Goals and secure a better future for the generations.

G20 ACTION PLAN ON CLIMATE CHANGE

In 2022, many nations saw the effects of global warming, including heat waves in India and throughout Europe, as well as floods in Pakistan and Puerto Rico. The effects of climate change are especially severe in developing nations. India should use the G20 platform to increase global climate ambitions and make sure that nations have access to resources like technology and funding to achieve their objectives.

The G20 has made energy and climate change a priority. The Paris Agreement's ratification and the timely submission of nations Intended Nationally Determined (INDCs) were both demands made by the G20 in 2015. The G20 has promoted increased capital mobilization for green energy and strategies for decarbonization without compromising goals for energy access through its work stream, such as the Sustainable Finance Working Group (SFWG) and Energy Transition Working Group (ETWG), and engagement groups, such as the Think-20 (T20).

The Ministry of External Affairs (MEA's) announces that India's presidency will concentrate on climate finance, energy security and green hydrogen in the energy

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sector. These topics were crucial during the 2019-2020-2021 G20 presidencies of Japan, Saudi Arabia, and Italy, respectively, and are currently the subject of intensive discussion under Indonesia's G20 leadership.

Since its formation, the G20 has incorporated a climate change agenda and said that cooperation and support within the G20 are crucial. They shouldn't be restricted to just this particular collection of the world's top economies. Governments may combat climate change through a variety of policies and actions, not just those aimed at reducing CO₂ emissions.

The Climate agenda is not an easy process. Nations can't achieve it alone. Everyone is affected by the effects of climate change, regardless of their money, age, or ethnicity. So, the problem could be solved by the worldwide cooperation. Knowing that limiting global warming to 1.5 degrees Celsius rather than 2 degrees Celsius has clear and significant benefits that are not only economic but also help significantly reduce risks of water scarcity, illness, food insecurity, flood and drought, extreme heat, tropical cyclones, biodiversity loss, and sea level rise, we must work towards the most ambitious targets.

CLIMATE CHANGE DISRUPTS DEVELOPMENT

The unfavorable effects of climate change are felt by those who are least responsible for greenhouse gas emissions: those who live in poverty. CARE is already observing how global gender inequality, social injustice, and economic injustice are being problem by climate changes, which are also degrading and reversing development gains. In addition to producing a variety of learning tools based on its experiences, CARE is already actively involved in advocating and communicating with communities to support their efforts to develop resilience and adapt to the impacts of climate change.

The year 2016 experienced the largest increase in atmospheric CO₂ concentrations. It is the hottest months in the past 137 years on record worldwide. The effects of climate change have caused pain for millions of people all around the world. For example, the drought brought on by El Nino and problem by climate change is increasing food insecurity, which is a clear sign of the terrible lack of disaster alertness and adaptation. The number of people that had to leave their houses due to extreme weather disasters is unparalleled globally. This scenario is recognized as the worst humanitarian crisis during the end of World War II.

G20 COUNTRIES: MAJOR HISTORICAL CONTRIBUTORS TO HARMFUL EMISSIONS

A large and unequal amount of the world's CO₂ emissions are produced by the G20. The unexpected statistic that the G20 accounts for 99% of all historical CO₂ emissions (excluding land use) between 1850 and 2013 shows their global responsibility for mitigating climate change and assisting others in preparing for its necessary effects. This viewpoint is important since CO₂ in the atmosphere contributing to long-term warming. According to this view, the main emitters are the US and the EU. Nearly all of the top ten energy-related CO₂ emitters in 2013 were G20 nations: China, United States, India, Russia, Japan, Germany, Iran, South Korea, Canada, and Saudi Arabia. While the conversion and destruction of forests contributes significantly more emissions in Brazil, Argentina, and Indonesia.

Evidence shows the fact that current per capita emissions in the US and Canada is roughly ten times greater than India. The poorest 50% of the population in nations like the USA nevertheless have higher per capita emissions than the average in many G20 countries, with the richest 10% of the population in each country projected to have almost five times the emissions of the middle 50% of the population.

The G20's consistent rise in CO₂ emissions from 1850 to 2013 and their contribution of 80% of current global emissions hint at the significant influence these nations have on climate change. The G20 nations are lead to the rest of the world in switching to renewable or sustainable energy because they have historically done so.

POLICIES IN SUPPORT OF CLIMATE CHANGE SOLUTIONS

The G20 is a powerful, influential international grouping of the top 20 economies with the potential to define the course for the major problems facing the world today. Meetings provide a singular arena and the most important worldwide forum for higher level thought exchange, leading to recommendations of viable answers to the most pressing issues—climate change being one of the most pressing at the moment.

The Fiscal Monitor of the IMF, which was published in October 2019, offers a more thorough technical analysis of the advantages and disadvantages of several scenarios including these current actions. Out of various mitigating strategies carbon taxes placed on fossil fuel supply in proportion to their carbon content are the most powerful and efficient, because they enable firms and households to find the least-expensive ways of reducing energy use and shifting towards cleaner alternatives.

One of the most effective tools of environmental policy to use in order to quantify negative environmental impacts and maybe influence behaviour in taxation as a price tag on carbon. Carbon prices effectiveness in raising significant revenue and their generally simple Administration may be responsible. The focus is on one particular tool, and is most usually employed as opposed to numerous alternate methods of mitigation, including such as rebates, carbon trading programmes, or regulations.

One strategy is for nations to concentrate on funding and developing support programmes for renewable energy sources, including solar and wind, together with the gradual phase-out of coal and gas supplies. India is a good illustration of this, where the solar energy business has grown to be the most promising in the world. Between 2014 and 2019, the share of coal, which was originally the main energy source, fell from 60.31 to 54.17 percent, and the share of renewable energy rose from 10.4 to 22.85 percent. By the year 2040, it is anticipated that, with the government's help and as a result of its commitments to the Paris Agreement, around 49% of the electricity will be produced from renewable sources, resulting in cost savings of 66% in solar power generations.

Another way to boost decarbonization is to prioritize policies that support innovative technologies and infrastructure including smart grids, energy storage and utilization or technologies for greener and energy-saving buildings and transport that have a potential to attract new types of capital and investment also from the private sector.

Challenges and Opportunities: Since international groups have acted as venues to strike a balance between members' national interests ever since World War II, the issue ultimately comes down to how duties and rights are allocated in terms of global public goods. Because Member States are at different stages of development and problems also varied substantially.

The G20 Summit is distinctive in that it lacks any treaties, a charter, a permanent secretariat, or any sort of legal standing under international law. It is a summit meeting of heads of state when the host nation has the most control over the schedule and surroundings. The fact that not all decisions adopted during the G20 Summit have been completely implemented presents a significant problem for the G20 today. This is partially caused by underrepresentation: only 10% of the world's 200 nations participate in G20 decision-making, undermining the group's power. Since certain important members occasionally fail to uphold their agreements, the G20's power is also diminished. There are major five challenges such as:

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- **Conflict in Russia and Ukraine:** This issue is the elephant in the room, and India needs to act sensibly and constructively to encourage both the West and Russia to defuse the tension.
- **The Extraordinary Rise in Global Prices:** The international prices of food, fuel, and grains, as well as the sharp increase in fertiliser costs, have resulted in a sharp decline in global inflation.
- **Energy:** Due to Western sanctions against Russia and the blockade of supply routes, as well as the Russian embargo on the delivery of oil and gas to European nations. The Russia-Ukraine crisis has produced a number of disruptions in the supply chains of energy supplies. Despite the fact that Russia supplies gas to Europe, the G20 looks to be the right venue for food grains from Ukraine.
- **Job Creation and Environmental Management:** The G20 can serve as a forum to discuss societal benefits, emerging business trends, the growth of startups into unicorns, and gender progress as this cooperative approach would encourage new and creative thinking.
- **Public Health:** This sector is expanding quickly and faces the threat of antimicrobial resistance (AMR), which necessitates the development of new antibiotics and R&D cooperation across biotechnology institutions.

Opportunities: Globalisation, digitization, demographics, and climate change have all recently changed how economies function. Due to the unequal distribution of the benefits of growth, these trends have both increased inequality and created new opportunities for it. The COVID-19 pandemic is causing a sharp fall in economic activity and a rise in unemployment in many nations. It is a global public health crisis.

India is actively participating in the G20 procedures on the finance and sherpa tracks. The G20's ongoing promotion of international collaboration, inclusive development, financial stability, and sustainable growth is consistent with the national objectives and guiding principles of India, which have been endorsed by other G20 leaders. It is crucial for India to not overstress or undervalue the importance of the G20's activities while it holds the presidency in 2023.

The World Bank predicts that from 5.5% in 2021 to 4.1% in 2022 and 3.2% in 2023, the rate of global growth would significantly drop down. It would be an honour for India to preside over the G20 Forum in 2023. The 76th year of its independence, India, a large economy and developing country with a developing

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democracy, has the chance to set “Agenda 2023” with an emphasis on equitable green development and robust economic growth.

The Indian Ministry of External Affairs will increase international support for issues that are crucial for developing nations in a variety of social and economic sectors, including employment, tourism, anti-corruption campaigns, and women’s empowerment, as well as in focus areas that have an impact on the most disadvantaged and vulnerable people. These sectors include energy, agriculture, trade, the digital economy, health, and the environment.

While a one-year presidency does not provide the host the ability to transform the world, India can show the world its domestic success in order to encourage adoption. In order to build multi-layered governance, the G20 partnership must be able to access specialists, civil society, politicians, policymakers, and other non-state players. This requires the partnership to adopt the disparate interests of all the forum’s participants. The platform offers India the chance to collaborate closely on urgent global issues when their methods may not be the same but are fundamentally the same. India must play a critical role in leading the economic growth and development agenda for not only India but the entire global South as it obtains the G20 presidency in 2023.

G20 PRIORITIES FOR INDIA

- 1. LiFE, Climate Finance, and Green Development:** India is putting a lot of effort into combating climate change, with a focus on climate financing and technology as well as ensuring equitable energy transitions for poor nations. The LiFE movement, which supports ecologically responsible behaviour and is founded on India’s sustainable traditions, is introduced.
- 2. Inclusive, resilient and Accelerated Growth:** Focus on initiatives that could result in structural change, such as assisting small and medium-sized businesses in international trade, advancing labour rights and welfare, solving the global skills gap, and constructing inclusive agricultural value chains and food systems.
- 3. Advancing the SDGs’ Progress:** Reaffirmation of commitment in attaining the goals outlined in the 2030 Agenda for Sustainable Development, with an emphasis on resolving the COVID-19 pandemic’s effects.
- 4. Digital Public Infrastructure and Technological Transformation:** Encouragement of a human-centric view of technology and improved information exchange in areas like financial inclusion, digital public

infrastructure, and tech-enabled development in industries like agriculture and education.

5. **21st-Century Multilateral Institutions:** Efforts to improve multilateralism and build a more accountable, inclusive, and representative global order capable of facing the challenges of the twenty-first century.
6. **Development led by Women-** In order to promote socioeconomic development and the fulfillment of the SDGs, emphasis should be placed on inclusive growth and development, with a focus on women's empowerment and representation.

CONCLUSIONS

Climate change agenda has been included in the G20 from the very beginning. Even though the G20 is a select club of the world's greatest economies, cooperation and support should not be restricted to just them. In fact, because of their position, they have a duty to care for those who are most in need because they cannot afford to fight environmental deterioration and frequently suffer the effects of their actions.

We are a long way from achieving this objective, and it is not an easy task. The individual efforts of nations are insufficient. Consequently, international cooperation is essential key. Knowing that limiting global warming to 1.5 degrees Celsius rather than 2 degrees Celsius has obvious and significant benefits that are not only economic but also help significantly reduce risks of water scarcity, illness, food insecurity, drought and flood, extreme heat, tropical cyclones, biodiversity loss, and sea level rise. Countries must work towards the most ambitious targets.

All G20 nations bear the same level of accountability. Under the UNFCCC, only developed nations are subjected to support commitments. Oxfam determined that 95% of the financing for adaptation should come from Japan, Canada, Australia, the European Union, and the United States after taking into account many variables, including GDP and the contribution to climate change. These countries are not only among the most responsible for climate change impacts, but are also among the most economically able countries to invest in adaptation finance. However, other G20 nations have begun to assist less developed nations in taking climate action. For instance, China has pledged to donate USD 3 billion to less developed nations, and Mexico and Indonesia have made contributions to the Green Climate Fund.

It can be said that worldwide efforts are required to reduce both CO₂ and non-CO₂ climate pollutants across all economic sectors. G20 countries need to give special attention to the poorest and most marginalised populations, particularly women

and girls, and build their resilience. This must be an essential component of broader national resilience strategies.

Way Forward: India should make sure that the G20 can at least show some leadership in reducing tensions and resolving multilateral disagreements. Opportunities in a variety of industries, including tourism, hospitality, information technology, and civil aviation, are also made possible by India's holding of the G20 presidency. In order to enable global financial stability, address climate change mitigation, and maintain sustainable development, India's strategy of prioritizing international peace to ensure national security is vital. There is room for leadership and caution as India prepares to hold the G20 presidency for the first time in a few months.

The poorest and most marginalized groups, especially women and girls, require special attention from G20 nations in order to increase their resilience; this must be a key element of more comprehensive national resilience programmes. The G20 should support new public financing initiatives that can bring in tens of billions of dollars more to fund climate action in developing nations, such as carbon pricing, air or sea transportation levies, etc.

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Global Warming and Climate Change: The Role of the G20

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December 1st, 2022 is a momentous day as India assumed the presidency of the G20 forum, taking over from Indonesia. As the largest democracy in the world and the fastest growing economy, G20 presidency will play crucial role in building upon the significant achievements of the previous 17 presidencies.

The 18th Heads of State and Government Summit of the Group of 20 (G20) will take place in September 2023 in New Delhi, India. Under the Indian Presidency, the G20 in 2023 will focus on the theme, ‘**One Earth, One Family, One Future.**’

The G20 gathers the world’s most developed economies and emerging ones, which together accounts for more than 80 percent of global GDP, 75 percent of international trade and 60 percent of global population. The G20 economies are responsible for about 75 to 80 percent of global greenhouse gas emissions.

The G20 initially focused largely broad macro-economic issues, but it has since expanded its agenda to inter-alia include trade, sustainable development, health, agriculture, energy, environments climate change and anti-corruption.

Why is climate change relevant for India?

India is among the countries that are most vulnerable to climate change. It has one of the highest densities of economic activity in the world, and very large numbers of poor people who rely on the natural resources based on their livelihood, with a high dependence on rainfall.

Causes of Climate Change- As greenhouse gas emissions blanket the Earth, they trap the Sun’s heat. This leads to global warming and climate change. The world is now warming faster than at any point in the recorded history. There are so many reasons for climate change but some important causes are:

1. Generating Power - Generating electricity and heat by burning fossil fuels such as coal, oil, and natural gas causes a large chunk of global emissions. Most of the electricity is still produced from fossil fuels, only about a quarter comes from wind, solar and other renewable sources.

2. Manufacturing Goods - Manufacturing and industry produce emissions, mostly from burning fossil fuels to producing energy for making things like cement, iron, steel, electronics, plastics, clothes and other goods. Mining and other industrial processes also release gases.

3. Cutting down forests - Cutting down forests to create farms or pastures, or for other reasons, causes emissions because when trees are cut, they release the carbon which they have been storing. since forests absorb carbon dioxide, destroying them also limits nature's ability to keep emissions out of the atmosphere.

4. Using Transportation- Most cars, trucks, ships and planes run on fossil fuels that makes transportation a major contributor to greenhouse gases, especially carbon dioxide emissions. Road vehicle accounts for the largest part, but emissions from ships and planes continue to grow.

5. Producing Food - Producing food requires energy to run farm equipment or fishing boats, usually with fossil fuels. Growing crops can also cause emissions, like when using fertilisers and manure. Cattle produces methane, a powerful greenhouse gas and emissions also come from packaging and distributing food.

6. Powering Buildings- Globally, residential and commercial buildings consume over half of all electricity. As they continue to draw on coal, oil and natural gas for heating and cooling, they emit significant amount of greenhouse gas emission.

7. Consuming too much- Your house and use of power, how you move around, what you eat and how much you throw away – all contribute to greenhouse gas emissions, so does the consumptions of goods such as clothing, electronics and plastics.

Acts and Policies in Indian Constitution to address the issues of global warming and pollution.

Some of the important Acts and Policies are:

1. The Air (Prevention and Control of Pollution) Act, 1981: This act provides for the prevention, control, and abatement of air pollution in India. It also establishes the Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) to regulate air pollution.
2. The Water (Prevention and Control of Pollution) Act, 1974: This act provides for the prevention and control of water pollution in India. It establishes the CPCB and SPCBs to regulate water pollution.

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3. The National Green Tribunal (NGT) Act, 2010: This act establishes the NGT, which is a specialized court for environmental disputes. The NGT has the power to hear and dispose-off cases related to environmental protection and conservation.
4. The Forest (Conservation) Act, 1980: This act provides for the conservation of forests and regulates the diversion of forest land for non-forest purposes. It also establishes the National Board for Wildlife (NBWL) to protect wildlife and their habitats.
5. The National Action Plan on Climate Change (NAPCC), 2008: This plan outlines India's strategy to mitigate and adapt to climate change. It includes eight national missions that focus on areas such as solar energy, energy efficiency, and sustainable agriculture.
6. The Energy Conservation Act, 2001: This act provides for the efficient use of energy and the conservation of energy resources in India. It establishes the Bureau of Energy Efficiency (BEE) to promote energy efficiency in various sectors.
7. The Solid Waste Management Rules, 2016: These rules provide for the proper management of solid waste in India. They establish guidelines for waste segregation, storage, transportation, and disposal.
8. The Plastic Waste Management Rules, 2016: These rules provide for the proper management of plastic waste in India. They establish guidelines for the collection, segregation, and disposal of plastic waste.

These acts and policies are crucial in addressing the issues of global warming and pollution in India. However, their effective implementation and enforcement are equally important to achieve the desired outcomes.

FUNDAMENTAL DUTIES OF THE CITIZENS OF INDIA WITH RESPECT TO THE ENVIRONMENT

The Constitution of India provides for several fundamental duties that every citizen must abide by. With respect to the environment, the following fundamental duties are applicable:

1. To protect and improve the natural environment, including forests, lakes, rivers, and wildlife, and to have compassion for all living creatures.
2. To promote harmony and the spirit of common brotherhood amongst all the people of India, transcending religious, linguistic, and regional or sectional

diversities, to preserve the rich heritage of the nation's composite culture, and to protect the environment.

3. To develop the scientific temper, humanism, and the spirit of inquiry and reform.
4. To safeguard public property and to abjure violence.
5. To strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement.

These fundamental duties emphasize the importance of protecting and preserving the environment, promoting scientific temper and inquiry, and striving towards excellence in all activities. It is the responsibility of every citizen of India to act in an environmentally responsible manner, and to contribute towards the protection and conservation of the natural environment. This can be done by adopting sustainable practices, reducing wastage, conserving natural resources, promoting renewable energy sources, and being mindful of the impact of one's actions on the environment.

PENALTIES AND PUNISHMENT RULES IN THE INDIAN CONSTITUTION

The following are some of the important provisions:

1. The Air (Prevention and Control of Pollution) Act, 1981: This act provides for penalties and punishment for violating the provisions of the act, including imprisonment for a term that may extend to five years, or with a fine that may extend to one lakh rupees, or both.
2. The Water (Prevention and Control of Pollution) Act, 1974: This act provides for penalties and punishment for violating the provisions of the act, including imprisonment for a term that may extend to three years, or with a fine that may extend to ten thousand rupees, or both.
3. The Environmental Protection Act, 1986: This act provides for penalties and punishment for violating the provisions of the act, including imprisonment for a term that may extend to five years, or with a fine that may extend to one lakh rupees, or both.
4. The Wildlife Protection Act, 1972: This act provides for penalties and punishment for violating the provisions of the act, including imprisonment for a term that may extend to three years, or with a fine that may extend to twenty-five thousand rupees, or both.

5. The Forest (Conservation) Act, 1980: This act provides for penalties and punishment for violating the provisions of the act, including imprisonment for a term that may extend to fifteen years, or with a fine that may extend to ten lakh rupees, or both.

Apart from these acts, there are various other provisions under the Indian Penal Code and other laws that provide for penalties and punishment for environmental offences. It is important to note that the severity of the penalty or punishment may vary depending on the nature and gravity of the offence committed. The government and law enforcement agencies need to enforce these laws strictly to deter individuals and industries from causing harm to the environment.

G20 importance for India- The Group of twenty (G20) is the premier inter-governmental forum for international economic cooperation. The forum plays an important role in shaping and strengthening global architecture and governance on all major international economic and environmental issues.

India's G20 presidency will be aimed for boosting digital transformation which will include digital economy, digital education, digital health, digital government and digital finance. India will work towards bridging the digital divide and ensuring that everyone has access to digital technology.

The G20 summit is a critical event for addressing the challenges facing the global community. The leaders will come together to discuss the issues affecting the world's economy, global warming, climate change, including the on-going COVID-19 pandemic and the need for a sustainable and inclusive economic recovery.

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Impacts of Climate changes: Role of G20

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Climate change refers to long-term shifts in temperatures and weather patterns like global warming, natural disasters etc. Efforts are being made since decades to control and rectify its impacts. These impacts are more pronounced in lesser developed countries. Group of Twenty (G20) selective countries' group and the forum for international economic cooperation is a platform for international economic cooperation. G20 not only deals with different outcomes of climate changes but also help lesser developed countries financially. This article is an effort to highlight the efforts made by G20 groups and future strategies to fight against climate change in brief. Efforts made by G20 can only be successful if countries and governments take the guidelines seriously, implicate accordingly and developed countries give financial help to lesser developed countries. Then only targets and goals can be achieved.

INTRODUCTION

The collective effects of human life on earth over the past few decades, and in particular the industrial revolution, resulted in a constant increase in greenhouse gas production¹. The accumulation of greenhouse gases in the air traps the radiation released from the surface of the Earth following absorption of light and heat. It ultimately causes continuous increase in temperature, termed global warming. Global warming in turn cause extreme changes in our climate, characterized as climate change, which is accompanied by an increase in the occurrence and intensity of natural disastrous like droughts and heat waves, as well as of other abiotic environment calamities such as flooding, salinity, and freezing stresses etc.¹ By definition Climate change is an area of science that has been studied for many years and refers to long-term shifts in temperatures and weather patterns. This is no surprise since climatic change would disrupt or otherwise alter a large range of natural ecological and physical systems that are an integral part of Earth's life support system.

Global warming not only has key impact on our environment but also on exerts impacts on economic growth of countries and health of their residents. As per the International Monetary Fund (IMF) World Economic Outlook, January 2020 upgrade, growth estimated for global economy for 2020 and 2021 has been decreased.

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To quote the report “Climate change, the driver of the increased frequency and intensity of weather-related disasters, already endangers health and economic outcomes, and not only in the directly affected regions. It could pose challenges to other areas that may not yet feel the direct effects, including by contributing to cross-border migration or financial stress.”² Climate change affects all without difference, but the most susceptible are specially those who are utmost exposed to its destructive effects. If we wish to be effective in our efforts, need of international cooperation is foreseen and this is the only way for attaining global solutions.

GROUP OF TWENTY (G20) AND SUMMITS

The Group of Twenty (G20), the forum for international economic cooperation, was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues.³ As the world’s largest emitters, responsible for over 80% of current greenhouse gas emissions and representing 85% of global GDP and 51% of the population, it is the responsibility of the G20 to lead the reduction of emissions through a transition to renewables and adequate climate finance.² Issues concerning climate change were added later to the agenda of the G20 when the policy makers recognized climate’s correlation to the whole economic performance globally. Since then, various issues related to climate change has been added to the list over time by policy makers and has been realized that different countries need different policies according to its circumstances i.e. country specific plans need to be sort out.

First summit of G20 took place in Washington DC, USA in 2008 and topic of climate change got a significant part in discussion and G20 members communicated their concern over climate change⁴. In next year i.e., 2009 London, UK Summit, leaders repeated their pledge to address the danger of irreversible climate change, based on the concept of general but different requirements and issue got more exposure when Leaders were dedicated to make a shift towards clean, pioneering, low carbon technologies and infrastructure⁵.

As the global temperature continues to rise, it is important that the G20 countries commit to the mission of addressing the climate change and play the key role in taking care of the commitments of the Paris Agreement to avoid the global temperature rise. At the 15th Conference of the Parties (COP15) of the UNFCCC, in December 2009 in Copenhagen almost 115 world leaders raised climate change policy to the topmost political level and agreed on the Copenhagen Accord, which intent to constrain carbon and respond to climate change, in both the short- and long-term⁶. The long-term goal of limiting the maximum global average temperature

rise to no more than 2 degrees Celsius was the key element of the Accord. In addition, the developed countries confirmed to fund the program to lower GHG emissions. The *Green Climate Fund* was also established at the COP15⁶. Since then, till now several meetings and summits conducted and a constant concern was about climate change and developed countries agreed to finance and support the lesser developed ones for the fight against.

India assumed G-20 presidency on 1st December 2022 and intended to convey theme 'one earth, one family, one future' for 2023⁷. Its agenda is based on 5 points stated as to reach non-fossil energy capacity of 500GW by 2030, Fulfil 50% energy requirements via Renewable Energy by 2030, Reduce 1 billion carbon emissions by 2030, Reduce carbon intensity below 45% by 2030 and India will achieve the target of Net-Zero by 2070⁷.

ROLE OF G20 AND CLIMATE CHANGE

The G20 countries generate a significant and high percentage share of global CO₂ emissions. The shocking fact that the G20 represent about 75 to 80 percent of global greenhouse gas emissions⁸, it makes their share of responsibility to be greater at global level to moderate climate change and to facilitate others to adjust to its inevitable impacts. This is an important perspective as CO₂ in the air has a long-term warming affect. In 2013 among chief emitters of energy-related CO₂ were China, United States, India, Russia, Japan, Germany, Iran, South Korea, Canada, Saudi Arabia, respectively almost totally consist of G20 countries⁹. While, Brazil, Argentina, and Indonesia had substantial added emissions from forest destruction and transformation⁹.

According to current data per capita, emissions in the US and Canada are approximately 10 times higher than in India, outlining one more level of distinction. The G20's continuous increase in CO₂ emissions from 1850-2013, additionally their current share of 80% of global emissions, refer to the major impact of these countries on climate change. The G20 countries should take the responsibility to lead the world in a switch to renewable, sustainable energy¹⁰.

Utilizing more renewable energy resources is one of the leading approaches to moderate emissions, which may further escalate climate change. G20 countries must now follow-up the Paris Agreement with increased serious action, by transitioning to 100% renewable energy, to avoid average global warming from rising 1.5°C above pre-industrial levels. This transition must be equitable, and thus aid in ensuring energy approach for the poor. The G20 produces 76% of the world's electricity from renewable sources but has not come close to reaching its potential.

In survey studies of two indices, Allianz and EY RECAI, evaluated investment energy attractiveness, particularly pertaining to renewable energy and sustainable finance. Allianz completely examined the investment attractiveness. In the Allianz index, there is a difference between investment needs and attractiveness. For example, India ranks 1 for investment needs, despite ranking 11 for attractiveness; the high level of investment needs are likely due to the large share of India's population, 21%, that still lacks access to electricity.¹⁰ However, when just reflecting renewable energy attractiveness, examined by Allianz, many of the rankings of the G20 change significantly. Among the countries that EY RECAI ranked, Turkey is the only country that matches the attractiveness rankings from Allianz¹¹.

As the process of climate change is going through acceleration, we need to charge up our ambitions to deal with it. One should take into consideration that with time challenges will be tougher and may be impossible in few points. As, according to Paris Agreement temperature rise should not be more than 1.5°C, rapid transformation should be made for zero-carbon economy. For the mission to attain not only coordination but support from the developed countries is need of the hour. According to the Climate Action Tracker, there are no countries within the G20 that have adequate levels of ambition which are levels that are recommended “fully consistent with below 2°C limit”¹². The inadequate or medium levels of drive from the G20 designate that temperatures are likely to rise above 2°C, If nothing is reformed given their considerable share of the world's emissions.

These conclusions match with the results from the CSO equity review, which observed that mitigation ambition is only 30-44% of what's needed to prevent a rise above 1.5°C¹³. Compared to 2020 pledges, the US, EU and Japan are pledging far below their fair share of contributions to emissions. Recent research also suggests that China and India are making good growth towards attaining and potentially over-achieving their Paris Agreement pledges¹³.

G20 countries and the rest of the world observe the display of an abrupt rise in the incidences of natural disasters¹⁴. From 1990 to 2016, the number of natural disasters global occurrence has been more than double the total from the previous years. There can be seen various examples from various countries in past few decades like extreme heat waves in India during summer 2019, new temperature records set in France and Germany, droughts in South Africa, or rainstorms and floods in Brazil, Cyclone Idai in Zimbabwe and so many others¹⁴. Experts have revealed the role of climate change in increasing the likelihood and severity of these extreme weather outcomes. As climate change is continuously accelerating, this pattern will potentially become more and more severe and the effects may be more catastrophic, despite efforts to reduce disaster risks.

Rankings from the German watch Global Climate Risk Index (CRI), which analyses the impacts of extreme weather events, vary substantially among G20 countries, for the period 1996-2015¹⁵. Looking only at the relative impacts in relation to population size and GDP, developing nations are some of the most affected by natural disasters. In addition to being amongst the most exposed regions to climate impacts, developing countries have a low ability to adapt and often lack sufficient economic and political structures. However, given that the G20 represents 51% of the world's population, these financial superpowers are experiencing much fewer natural disasters per capita than their less equipped counterparts, particularly those in Africa and other vulnerable regions: 116 (39%) occurrences of natural disasters took place in G20 countries in comparison to 181 (61%) in the rest of the world in 2016¹⁶. With the exception of India, G20 countries are experiencing fewer and less extreme instances of weather impacts compared to the rest of the world, and in particular the most vulnerable.

The ND GAIN index scrutinised countries' preparations and susceptibility to climate change impacts. The five most susceptible G20 countries were India, Indonesia, Saudi Arabia, South Africa, and Argentina, respectively¹⁷. Comparatively, the five countries least ready for climate change impacts were India, Indonesia, Brazil, Argentina, and Argentina, respectively¹⁷. Thus, most of the countries that are very less prepared for climate impacts are also the most vulnerable are at the highest risk within the G20 group.

G20 AND FINANCIAL ASSISTANCE

The countries most vulnerable to climate change need more of adaptation finance and support, which they are assigned to get according to the UN Climate Change Convention. Developed countries must rise financial support for the poor so they can better adapt to climate change impacts. Existing investment plans allocate only 20% of finances to adaptation finance compared to substantial funds in emission reductions and despite the fact that a commitment is made under the UNFCCC to achieve a balance between mitigation and adaptation¹⁸. At present, about 16% of climate investment goes towards adaptation to achieve the assured balance with mitigation finance. But G20 countries should promote new and innovative public fund resources to generate additional finances to support climate action in developing countries¹⁸.

Only developed countries have these funding responsibilities under the UNFCCC and we should not hold all G20 countries responsible for it. When considering different factors, such as GDP and contribution to climate change, Oxfam

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found that 95% of adaptation finance should come from Japan, Canada, Australia, European Union, and the United States¹⁹. These countries are not only amongst the most accountable for climate change impacts but are also most economically valued to invest in adaptation finance. Nevertheless, now few other G20 countries have also initiated to support lesser developed countries in climate action. For example, Mexico and Indonesia have contributed to the Green Climate Fund, and China has promised bigger funds to poorer countries¹⁹.

All OECD countries have contributed to adaptation finance in developing countries²⁰ but varied trends can be seen. While there has been an overall increase, Australia and Germany show a declining trend in 2015 compared to 2014. From various analyses it has been observed that many funded projects for “adaptation” have questionable climate relevance²⁰.

CONCLUSION

All G20 governments should oblige Nationally Determined Contributions (NDCs) according to the Paris Agreement with elevated ambition levels that are adequate to put the world on instant emission reduction pathways coherent with the 1.5°C limit. They should give to back up their NDCs with actual and obvious national low-GHG emission development approaches. This should be accompanied by certain act and initiatives for further emission reduction, specially by speedy the shift to renewable energy and near-zero emissions. Many G20 countries invest in either constructing new or renewing existent resources. G20 countries need to give specific consideration to the lesser developed populations Developed countries in the G20 should upgrade finance to lesser developed countries.

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G20 and Its Role in International Cooperation and Climate Change

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INTRODUCTION

“India’s G20 Presidency will work to promote this universal sense of oneness. Hence our theme - ‘One Earth, One Family, One Future’” – PM Narendra Modi

Development Working Group (DWG)

The DWG meetings aims to discuss developmental issues in Developing Countries (DC), Least Developed Countries (LD) and Island Countries (Small Island Developing States/SIDS).

The DWG is a platform for G-20 member countries to come together and prioritize multilateralism, share solutions that promote growth, remap development plans and achieve the Sustainable Development Goal’s targets (SDG). The G-20 possesses the knowledge, expertise, financial resources required to reverse trajectories that have gone off track.

The DWG held in the 3rd G-20 at Bali between August 10-12, 2022, concluded with the discussion and finalization of key G-20 agreements.

These include G-20 Roadmap for Stronger Recovery and Resilience in DCs, Least Developed Countries (LDCs) and SIDs, the G- 20 principles to Scale up Blended Finance in DCs, the G-20 Ministerial Vision Statement: Multilateralism for Sustainable Development Goals(SDGs) Decade of Action and the 2022 G-20 Bali Update.

The first DWG Meeting during India’s Presidency will be held in Mumbai from December 13 -16, 2022. In these meetings, sessions on Data For Development, Role of G-20 in Advancing the 2030 Agenda, Infusing New LiFE into Green Development and Accelerating Progress on the SDGs. The delegates will enjoy cultural events that give them a unique India experience, go for a Gateway of India walk and also an excursion to Kanheri Caves on the last day.

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Visit <https://www.g20.org/en/> for more information. Also read <https://pib.gov.in/PressReleasePage.aspx?PRID=188014>

December 1, 2022 is a red-letter day as India assumed the G20 Presidency from Indonesia and will convene the G20 Leaders' Summit for the first time in the country in 2023. A nation deeply committed to democracy and multilateralism, India's G20 Presidency would be a watershed moment in her history as it seeks to play an important role by finding pragmatic global solutions for the wellbeing of all, and in doing so, manifest the true spirit of 'Vasudhaiva Kutumbakam' or the 'World is One Family'.

So, what is the G20?

The Group of Twenty (G20) is an intergovernmental forum comprising 19 countries - Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom and United States and the European Union.

The G20 members represent around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population.

The G20 was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues. It was upgraded to the level of Heads of State/Government in the wake of the global economic and financial crisis of 2007, and, in 2009, was designated the "premier forum for international economic cooperation".

What is the G20 Summit?

The G20 Summit is held annually, under the leadership of a rotating Presidency.

How does the G20 work?

The G20 Presidency steers the G20 agenda for one year and hosts the Summit. The G20 consists of two parallel tracks: the *Finance Track* and the *Sherpa Track*. Finance Ministers and Central Bank Governors lead the Finance Track, while Sherpas lead the Sherpa Track.

The Finance Track is led by Finance Ministers and Central Bank Governors of the member countries. Within the two tracks, there are thematically oriented working groups in which representatives from the relevant ministries of the members as well as from invited/guest countries and various international organisations participate.

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The G20 process from the *Sherpa Track* is coordinated by the Sherpas of member countries, who are personal emissaries of the Leaders. The Sherpa Track oversees inputs from 13 Working Groups, 2 Initiatives – *Research Innovation Initiative Gathering (RIIG)* and *G20 Empower*, and various Engagement Groups, all of whom meet throughout the year and develop their Issue Notes and Outcome Documents in parallel. These substantive discussions then feed consensus-based recommendations to the Sherpa Meetings. The outcome document of the Sherpa-level meetings eventually forms the basis of the Leaders’ Declaration, which will be debated and signed (after and if consensus is reached) at the final New Delhi Summit in September next year by the Leaders of all G20 member countries.

In addition, there are Engagement Groups which bring together civil societies, parliamentarians, think tanks, women, youth, labour, businesses and researchers of the G20 countries. *The Startup20 Engagement Group will be established under India’s G20 Presidency for the first time, recognising the role of startups in driving innovation that responds to a rapidly changing global scenario.* Active consultation with the Engagement Groups forms an integral part of India’s “inclusive ambitious, decisive, and action-oriented”, G20 approach, as outlined by Prime Minister Narendra Modi in the Bali Summit this year.

India’s G -20 Presidency

India holds the Presidency of the G20 from December 1, 2022 to November 30, 2023. The 43 Heads of Delegations- the largest ever in G20-will be participating in the final New Delhi Summit in September next year.

The *G20 Logo* draws inspiration from the vibrant colours of India’s national flag – saffron, white and green, and blue. It juxtaposes planet Earth with the lotus, India’s national flower that reflects growth amid challenges. The Earth reflects India’s pro-planet approach to life, one in perfect harmony with nature. Below the G20 logo is “Bharat”, written in the Devanagari script.

The theme of India’s G20 Presidency - “Vasudhaiva Kutumbakam” or “One Earth · One Family · One Future” - is drawn from the ancient Sanskrit text of the Maha Upanishad. Essentially, the theme affirms the value of all life – human, animal, plant, and microorganisms – and their interconnectedness on the planet Earth and in the wider universe. The theme also spotlights LiFE (Lifestyle for Environment), with its associated, environmentally sustainable and responsible choices, both at the level of individual lifestyles as well as national development, leading to globally transformative actions resulting in a cleaner, greener and bluer future.

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For India, the G20 Presidency also marks the beginning of “Amritkaal”, the 25-year period beginning from the 75th anniversary of its independence on 15 August 2022, leading up to the centenary of its independence, towards a futuristic, prosperous, inclusive and developed society, distinguished by a human-centric approach at its core.

A new working group on Disaster Risk Reduction will be established under India’s Presidency to encourage collective work by the G20, undertake multi-disciplinary research and exchange best practices on disaster risk reduction.

India’s special invitee guest countries are Bangladesh, Egypt, Mauritius, Netherlands, Nigeria, Oman, Singapore, Spain and UAE.

G-20’s invited international organisations are UN, IMF, World Bank, WHO, WTO, ILO, FSB, OECD, AU Chair, NEPAD Chair, ASEAN Chair, ADB, ISA and CDRI.

G20 meetings will not be limited only to New Delhi or other metropolises. Drawing inspiration from its G20 Presidency theme of “Vasudhaiva Kutumbakam”- “One Earth One Family One Future, as well as the Prime Minister’s vision of an ‘all of government’ approach, India will host over 200 meetings in over 50 cities across 32 different workstreams, and would have the opportunity to offer G20 delegates and guests a glimpse of India’s rich cultural heritage and provide them with a unique Indian experience. The Presidency is also a chance for the G20 Secretariat to provide the country’s citizens with the unique opportunity be a part of India’s G20 story.

The Indian G20 presidency has also planned a year-long India Experience’ for G20 member countries, special invitees, and others.

What are India’s G20 Priorities?

· Green Development, Climate Finance & LiFE

The opportunity to lead G20 comes at a time of compounding existential threat, with the COVID-19 pandemic having exposed the fragilities of our systems under the cascading impacts of climate change. In this regard, climate change is a key priority for India’s presidential Presidency, with a particular focus towards not only climate finance and technology, but also ensuring just energy transitions for developing nations across the world.

Understanding that the issue of climate change cuts across industry, society, and sectors, India offers the world LiFE (Lifestyle for Environment) -a behaviour-based movement that draws from our nation’s rich, ancient sustainable traditions to

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nudge consumers, and in-turn markets, to adopt environmentally-conscious practices. This ties closely with India's G20 theme: 'Vasudhaiva Kutumbakam' or 'One Earth. One Family. One Future.

· ***Accelerated, Inclusive & Resilient Growth***

An accelerated, resilient and inclusive growth is a cornerstone for sustainable development. During its G20 Presidency, India aims to focus on areas that have the potential to bring structural transformation. This includes an ambition to accelerate integration of MSMEs in global trade, bring in the spirit of trade for growth, promote labour rights and secure labour welfare, address global skills gap, and build inclusive agricultural value chains and food systems etc.

· ***Accelerating progress on SDGs***

India's G20 Presidency collides with the crucial midpoint of the 2030 Agenda. As such, India acknowledges the detrimental impact of COVID-19, which changed the current decade of action into a decade of recovery. In line with this perspective, India wants to focus on recommitting G20's efforts to achieving the targets laid out in the 2030 Agenda for Sustainable Development

· ***Technological Transformation & Digital Public Infrastructure***

As G20 Presidency, India can foreground its belief in a human-centric approach to technology, and facilitate greater knowledge-sharing in priority areas like digital public infrastructure, financial inclusion, and tech-enabled development in sectors ranging from agriculture to education

· ***Multilateral Institutions for the 21st century***

India's G20 priority will be to continue pressing for reformed multilateralism that creates more accountable, inclusive just, equitable and representative multipolar international system that is fit for addressing the challenges in the 21st century.

· ***Women-led development***

India hopes to use the G20 forum to highlight inclusive growth and development, with women empowerment and representation being at the core of India's G20 deliberations. This includes a focus on bringing women to the fore, and in leading positions, in order to boost socio-economic development and achievement of SDGs.

India kick-started its presidency term agenda with a series of cultural initiatives that included various Jan Bhagidari activities, a special University Connect event

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with 75 educational institutions from across the country, the lighting up of 100 ASI monuments with the G20 logo and colours, and showcasing G20 at the Hombill festival in Nagaland. Sand artist Shri Sudarshan Pattnaik also created sand art of India's G20 logo on Puri beach in Odisha. Various other events, youth activities, cultural performances, and site excursions showcasing the sights and traditions of respective city-venues, are also planned throughout the year-long calendar. Visit <https://www.g20.org/en/> for more information.

Organizational Structure of G20 The G-20 operates without a permanent secretariat or staff. The chair rotates annually among the members and is selected from a different regional grouping of countries. The chair is part of a revolving three-member management group of past, present and future chairs referred to as the Troika. The current chair of the G-20 is Mexico; the next Chair will be Russia. The preparatory process for the G20 Summit is conducted through the established Sherpa and Finance tracks that prepare and follow up on the issues and commitments adopted at the Summits. The Sherpas' Track focuses on non-economic and financial issues, such as development, anti-corruption and food security, while addressing internal aspects such as procedural rules of the G20 process. The Sherpas carry out important planning, negotiation and implementation tasks continuously. The Finance Track focuses on economic and financial issues. The Sherpa and Finance tracks both rely on the technical and substantive work of a series of expert working groups. Additionally, the thematic agenda is developed through the organization of several Ministerial Meetings, such as the Joint Meeting of Finance and Development Ministers, and the Labour, Agriculture and Tourism Ministerial meetings. G20 Leaders Summits. Seven G20 Summits have been held so far. The First Summit was hosted by the US President in Washington in November 2008 to develop a coordinated response to the global financial crisis. At the First Summit, the Leaders discussed the causes of the global economic and financial crisis and agreed to implement an Action Plan around three main objectives, namely, (i) Restoring global growth, (ii) Strengthening the international financial system and (iii) Reforming international financial institutions. The Second Summit in London in April 2009 came up with a stimulus package of US\$ 1.1 trillion to restore credit and growth and strong regulatory provisions, expansion of Financial Stability Forum (renamed as 'Financial Stability Board' or FSB) and Basel Committee on Banking Supervision (BCBS), reiteration of commitment against protectionist trends (including trade, investment and services) and commitment to reform of International Financial Institutions. The Third Summit in Pittsburgh in September 2009 designated the G20 as the 'premier forum' for international economic cooperation. The main outcomes of the Pittsburgh Summit included to foster a 'Framework for Strong, Sustainable and Balanced Growth' in

the 21st century through sound macroeconomic policies that prevent cycles of boom and bust through a Mutual Assessment Process (MAP) or 'peer review' which is co-chaired by India, a decision to reform the IFIs by shifting IMF's quota share to dynamic Emerging Markets and Developing Countries (EMDCs) of at least 5% from over-represented countries to under-represented countries, adoption of a dynamic formula for the World Bank to generate an increase of at least 3% voting power for developing and transition countries that are under-represented; and ensuring that World Bank and Regional Development Banks (RDBs) have sufficient resources to address global challenges. The Fourth Summit in Toronto in June 2010 under the theme 'Recovery and New Beginnings' focused on the 'Framework for Strong, Sustainable and Balanced Growth' and completion of Phase-I work comprising MAP (or 'peer review') by groupings of countries. Advanced economies have committed to fiscal consolidation, i.e. halving of fiscal deficit by 2013 and stabilizing debt by 2016 as part of internal re-balancing. An agreement was also reached on differentiated approach to consolidating growth and recovery versus exit strategies and fiscal consolidation, i.e. 'growth-friendly fiscal consolidation'. 'Development' was introduced for the first time on the G20 agenda to be addressed through a High-Level Development Working Group (DWG). The highlight of the Fifth Summit in Seoul in November 2010 under the theme 'Shared Growth Beyond Crisis' was the launching of the G20 Development Agenda embodied in the Multi-Year Action Plans (MYAP) under the nine development pillars, viz., Infrastructure (including a High-level Panel on infrastructure financing), Human Resources Development, Trade, Private Investment and Job Creation, Food Security, Growth with Resilience, Domestic Resource Mobilization, Knowledge Sharing and Financial Inclusion. The Sixth G20 Summit in Cannes in November 2011 reviewed the global economic situation in the backdrop of the Eurozone/Greek crisis. Its major outcomes included regulation of commodity derivatives markets, including Action Plan on Food Price Volatility and Agriculture and increase in transparency of energy markets and an expression of support for recommendations of High Level Panel and MDBs Action Plan on development. The outcome of the Cannes Summit resulted in the 'Communique' and 'Declaration' titled 'Building our Common Future: Renewed Collective Action for the Benefit of All' along with the 'Cannes Action Plan for Growth and Jobs'. The Seventh G20 Summit was held in Los Cabos, Mexico on 18-19 June 2012 under the Mexican Presidency. Mexico had identified the following as its priorities: i. To promote economic stabilization and structural reforms as foundations for growth and employment; ii. Strengthening the financial system and fostering financial inclusion to promote economic growth; iii. Improving the international financial architecture in an interconnected world; iv. Enhancing food

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security and addressing commodity price volatility; and v. To promote sustainable development, green growth and the fight against climate change. The G20 has, since the Pittsburgh framework and the Seoul Development Consensus, recognized that development and global economic issues cannot be tackled separately. Development is crucial for global economic growth, poverty reduction and employment creation. Development Working Group was set up in 2010 under the Sherpas' Track to complement the G20's economic and financial agenda through multi-sectoral efforts to assist developing countries in areas of importance for the welfare of their societies. Taking forward the development agenda under the G20 DWG, Mexico had chosen Infrastructure, Food Security and Inclusive Green Growth as its development priorities.

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Economic Impact of Climate Change and the role of G20 Economies

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This article examines how the G20, a worldwide meeting of advanced economies, has dealt with the problem of climate change over time. The impact of climate change on our environment, the rate of economic growth, and public health has been addressed by the international community. The G20, which represents the major world powers, may be able to define the course for adaptation and mitigating the effects of climate change. After all, the G20 incorporates 90 per cent of global economic activity and two thirds of the world's population. Examining how G20 nations can support the Paris Agreement's climate change measures and encourage sustainable living is equally vital. This article advances the claim that because of the potential of the G20 as a developing form of global summitry, it can make a contribution to implementing COP21 which deviates from the poor track record of the G20 and its predecessors identified earlier. The G20 is an important and productive site of support for COP21 agenda. It is important to indicate that the COP21 is part of global climate policy which is not simply designed to reduce emissions in the short term but is rather 'about putting in place the structure for a long term technological and economic transformation' which develops low carbon economic systems. This long term structural ambition is going to require the promotion of sustainable economic growth and large scale green financing processes and the G20 has some ongoing work in this area.

INTRODUCTION

G20 is a strong, influential international forum of the world's largest economies with potential to set the direction on main issues that challenge world today. Meetings serve as the unique platform and premier global forum to exchange

ideas on the higher levels, resulting in proposals of potential solutions to the most urgent concerns, with climate change being one of the most critical ones at present. Knowing that G20 members account for around 85 per cent of global gross domestic product (GDP), 75 per cent of world trade, and also for 80 per cent of global carbon dioxide emissions (CO₂) and 70 per cent of global plastic production, as well as two-thirds of the world's population and more than half of the world's poor (UNDP, 2019), the commitments made by them on climate, environment or energy have a huge impact for all, and serve as an inspiration also for non-G20 countries.

G20 members constantly look for most efficient policies and measures that will lead them to successfully reaching the goal of limiting the temperature increase to 1.5 degrees Celsius. One of the main drivers of climate change is the CO₂ emissions. Therefore, limiting or at least reducing the emissions is at present the most significant factor. It is up to the policymakers to find ways and apply policies that promote lowering of emissions or support cleaner and greener economy. Based on the results published in the special report of the Inter-governmental Panel on Climate Change (IPCC), in order to limit warming to 1.5 degrees Celsius, global net CO₂ emissions would have to decline by about 45 per cent from 2010 levels by 2030, reaching net zero around 2050. In case of limiting warming to 2 degrees Celsius only, the decline would be about 25 per cent by 2030, reaching net zero around 2070. The report follows with a cautious warning that “remaining below 1.5 degrees Celsius is possible, but requires deep and rapid emissions reductions from all economic sectors”(IPCC, 2018). In order to do that, countries need to actively decrease energy demand, lower emissions from energy supply and actively remove CO₂ from the atmosphere, while fully decarbonizing the electricity sector and ensuring that renewables are the world's dominant energy source by 2050. Waiting to cut emissions may have severe effects on the planet. The IPCC Special Report also analyzed the NDC (nationally determined contributions) pledges submitted under the Paris Agreement and found out that even if all countries fulfilled their current pledges, there is very high likelihood we will reach 1.5 degrees Celsius warming already by mid-century and remain above this threshold through the year 2100. As of January 2020, 184 Parties submitted their first NDCs and two Parties submitted their second NDCs. Therefore, more ambition is needed and requires intense global reductions in both CO₂ and non-CO₂ climate pollutants from all economic sectors.

ROLE OF G20 TO ADDRESS ECONOMIC IMPACT OF CLIMATE CHANGE

Leaders at the 2009 G20 summit in London reaffirmed a ‘commitment to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities, and to reach agreement at the UN Climate Change

conference in Copenhagen in December 2009' (G20, 2009). However, while environmental discourses and concerns were present, their importance was deferred to other political exigencies. The impact of the global financial crisis was the main impetus for the two G20 summits held in 2009 and indeed the reason that the G20 was hastily convened as a leaders' forum for economic coordination. Concerns about avoiding a sustained and deep economic recession held priority and cut into environmental discourses and commitments to address climate change. Despite the continued use of environmental discourse, the focus was clearly on economic matters. George Monbiot (2009) claims that the 2009 G20 meeting's 'strategy for solving the financial and economic crisis is detailed, innovative, fully costed and of vast scale and ambition. Its plans for solving the environmental crisis are brief, vague and uncosted'. This is despite the economic and social fallout of mounting climate change having the clear potential to dwarf that produced by the global financial crisis.

The G20's relevance to global environmental issues was raised in the aftermath of the failure to develop a binding climate treaty at the 2009 15th conference of the parties (COP15) of the UNFCCC in Copenhagen. With the allegedly inconvenient nature of multilateral efforts to address climate change highlighted at Copenhagen, some observers argued for a form of 'minilateralism' involving a 'magic number' of the 'smallest possible number of countries needed to have the largest possible impact on solving a particular problem' (Naim, 2009; Eckersley, 2012). After all, the G20 incorporates 90 per cent of global economic activity and two thirds of the world's population (Cooper and Thakur, 2013), and thus the vast majority of CO₂ outputs. The G20 could have been a place to initiate an agreement between a smaller group of significant states prior to Copenhagen, which could have led to a broader binding climate treaty. However, despite G20 meetings regularly giving rhetorical support for efforts to address climate change, G20 style minilateralism included some of the 'obstructive' countries that undermined substantive progress in respect to Copenhagen (Eckersley, 2012).

Furthermore, as was the case with previous efforts, the country hosting a G20 summit wields significant influence as to whether the issue of climate change is to be discussed at the summit or in the preparatory meetings. This dynamic was most pronounced at the 2014 G20 summit held in Brisbane when the Australian Prime Minister Tony Abbott resisted including climate change as a distinct agenda item because of his government's conservative agenda which did not consider climate change to be an important priority (Rimmer, 2015). It was only after significant pressure from the US, European countries, and civil society that climate change was added to the agenda. The Brisbane summit therefore declared that member states

will ‘work together to adopt successfully a protocol, another legal instrument or an agreed outcome with legal force under the UNFCCC that is applicable to all parties at the 21st Conference of the Parties (COP21) in Paris in 2015’ (G20, 2014). We see here that the G20 continued support for the UNFCCC process against the background of resistance from some of the G20 member states to the idea that the G20 should be a forum for actively supporting efforts to address climate change.

G20 AND IMPLEMENTATION OF THE COP21

Given this potential, the key question facing the G20 is how it can contribute in future to support the implementation of the COP21 agreement. This is especially pertinent given that the COP21 agreement depends upon voluntary contributions called nationally determined contributions (NDCs) which are internationally reviewed. Furthermore, the current NDCs from states at COP21 are too low to keep a temperature rise below the Paris Agreement temperature limit of ‘well below 2 °C. Therefore the COP21 agreement is going to require significant support and subsequent increases in pledges over time (Falkner, 2016). This article advances the claim that because of the potential of the G20 as a developing form of global summitry, it can make a contribution to implementing COP21 which deviates from the poor track record of the G20 and its predecessors identified earlier. This difference is due to changes in the overall context of the G20’s actions with respect to climate change. . First, because of the formal COP21 agreement in Paris, the G20 can move beyond debates about how to develop a legally binding treaty to questions of implementation which is more suitable to the G20’s policy making strengths with regards to developing and disseminating ideas and coordinating existing forms of global governance. Secondly, the development of G20 working groups and outreach processes, while embryonic and imperfect, offer the prospect that G20 activity is going to be more inclusive and transparent. While the G20 used to have highly opaque and narrow deliberations, G20 working groups and outreach processes have opened up these deliberations and offer further transnational means to insert expert and public views into the collective policy making processes of economically significant states. This capacity to make a contribution to implement COP21 is evident in some strategies that the G20 could develop to act more forcefully in future. One strategy that the G20 can develop to support the implementation of COP21 is in further developing forms of green financing. From the outset it is important to indicate that the COP21 is part of global climate policy which is not simply designed to reduce emissions in the short term but is rather ‘about putting in place the structure for a long term technological and economic transformation’ which develops low carbon economic systems (Falkner, 2016). This long term structural ambition is

going to require the promotion of sustainable economic growth and large scale green financing processes and the G20 has some ongoing work in this area. Indeed at the formation of the G20 as a leaders' forum in 2009 there was the undertaking to 'build an inclusive, green, and sustainable recovery' (G20, 2009). The substance of undertaking 'green growth' was weak in the immediate aftermath of this meeting, however, demonstrating that the G20's 'attention to the issue has waxed and waned over time' (Tienhaara, 2016). The reasons for this inconsistency about promoting green economic growth comes down to the influence of the country hosting the G20 meetings, a general wariness of member states focusing on non-economic issues, and a weak relationship of the G20 with environmental intergovernmental organizations (IGOs) and agencies (Tienhaara, 2016). Yet, the fact that this has been a recurring issue on the G20's agenda at various summits demonstrates the potential for green financing to be a part of the G20 agenda to support COP21 implementation. Consequentially, in recent years the G20 has strengthened its relationships with environmental IGOs and agencies in the form of study groups which seek to develop policy ideas regarding financing climate change efforts. The Climate Finance Study Group was established by G20FM/CBG in April 2012 and has been supported by the Global Environmental Facility (GEP), which itself was established in 1992 and has provided over \$16 billion in grants and mobilized \$90 billion in additional financing for over 4,400 projects (GEP, 2016). To improve the collaboration, dialogue and cooperation between climate funds, the Green Finance Study Group was formed by China when they took over Presidency of the G20 in December 2015 and seeks to develop ways to 'scale up green financing' (G20 Green Finance Study Group, 2016). This study group is co-chaired by China and the UK, with the United Nations Environment Programme (UNEP) supporting this group as a secretariat. As these groups are not G20 working groups, they do not make formal G20 recommendations, but the results of their work are still presented in G20 ministerial meetings. These relationships need to be strengthened by ensuring that they become established as working groups which formally present information about environmental financing into the G20 process. There also may be grounds to condense these two study groups together to centralize the expertise and maximize the input of UNEP and GEP. This is expertise which could fruitfully support the activity of G20 governments to further promote larger scale climate financing needed to support the implementation of COP21.

The G20 is an important and productive site of support for COP21 agenda for three reasons. First, the G20 is a forum of policy coordination which works across the various global governance bodies and has both international and transnational dimensions. The working and study groups as well outreach groups all

demonstrate that the G20 is no longer just a forum of states and offers a broader space for transnational public deliberation which can provide manageable inputs into the G20 process that does not necessarily lead to overloading the G20 agenda. These processes can also enhance the communicative nature of the G20 and can disperse G20 ideas through these transnational networks. Second, the G20 is an important vehicle for implementing COP21 and enhancing global environmental governance simply because it exists. While advocates for environmental concerns have argued for a World Environment Organisation to counterbalance the WTO (Najam et al., 2004), and arguments have been made for a World Climate Council to create a forum to lead debate on climate change (Eckersley, 2012), these mechanisms would need to be created – whereas the G20 is already well-established. Drawing the G20 into implementing COP21 is less utopian than creating new global forums. Third, using the G20 to assist in implementing COP21 opens up the prospects of including environmental ideas and concerns into economic and financial governance rather than in separate forums. This enables the prospect that environmental and economic concerns can be discussed in a holistic and integrated fashion rather than relying on sporadic conferences of states (Barbier, 2012). The value of the G20 is that leaders can take a holistic view of competing political priorities that other specialized forums of global governance cannot (Feinberg, 2013). This also points to the ability of the G20 to assist in coordinating the domestic policies of member states with regards to climate change in conjunction with other pressing global problems.

CONCLUSION

This article has suggested that the G20, a global summitry that promotes actual policy coordination with international networks of policy makers and outreach procedures, has the potential to significantly aid in the implementation of COP21. With reference to the leaders of the different membership of the G20, the G20 can provide transnational support for the COP21 process, which also interacts with the politics of international talks. This can be done by creating policies through which the G20 supports green financing even more, coordinates global efforts to combat climate change, and improves the openness and accountability of G20 member nations with regard to COP21 implementation. The G20 must promote international cooperation in addressing the effects of climate change and gather support from other country groups and international organizations in order to build on the cooperation and support among member nations.

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The Challenges and Climate Change Driven Impacts on Aquaculture and Fisheries

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The fresh water ecosystem are considerably found on each continent except Antarctica and provide major contributions to worldwide food demands. The production of inland fisheries are observed in growing international locations and are in large part placed within the tropics as a basic meals object. some of the poorest, most meals insecure nations inside the international are disproportionately based upon inland fisheries for dietary and meals protection. worldwide, freshwater ecosystems that assist the general public of inland fisheries are subject to a ramification of anthropogenic pressures reflecting worldwide alternate inclusive of over-extraction of water, over-exploitation of fish, introduction of non-native species, pollution, habitat degradation (such as fragmentation) and increases in human populations. The impacts of weather alternate will engage with lots of those factors. climate exchange will lead to adjustments in freshwater habitats and the fish assemblages that they aid: only a few of these consequences are anticipated to be beneficial to inland fisheries particularly those primarily based on native fish populations. Freshwater ecosystems have especially low buffering potential and are consequently exceedingly sensitive to climate-associated shocks and variability. there may be a huge range of physiological and ecological affects on each fish and the freshwater ecosystems assisting inland fisheries associated with water temperature, water availability and flow, and different ecological perturbations. Given the scale of direct and indirect influences of world alternate, the adaptive capacity of all temperate, tropical and subarctic freshwater ecosystems and existing inland fisheries is tremendously low. The direct (and oblique) weather exchange impacts may additionally see great shifts in species compositions, but standard productiveness might be sustained due to the high variety and resilience normally proven by way of tropical structures and plenty of fish species which might be presumptuous.

The illicit activities of human have resulted in surprisingly marked international modifications in the environment, soil, water and the biosphere of the earth. moreover, links them by way of converting the sector's weather, modifying and degrading habitats, over-exploiting and over-extracting sources and permitting the motion of non-native species outside of their natural distributions, we've affected the capability of the natural global to retain to guide human populations, such as inland fisheries. climate exchange has and will keep to have big and regularly unpredictable impacts on inland fisheries, with its impact interacting with different anthropogenic stressors. observed and expected influences on freshwater fish and people who depend on them range over space and time, reflecting the heterogeneity in geography, land use and human activities. The significance of inland fisheries is often centered within nations, with a few subsets of the population more structured than others. Inland fisheries are diagnosed as a fantastic manner to attain meals protection, and to provide employment, earnings, recreation and cultural enrichment to increasing human global populations. it's miles important for stakeholders, such as governments, useful resource managers, fishers and residents, to recognize what weather alternate method in terms of fisheries. there is now clean evidence that anthropogenic climate trade has had a clean and rapid effect on human and natural systems across the globe, with proof of alternate maximum obvious in herbal structures. Air and surface temperatures have modified, even as shifts in precipitation have caused adjustments inside the hydrological cycle and water best (IPCC, 2014a, 2014c). these systems have already been situation to a variety of non-weather stressors driven by means of human sports along with over-exploitation of natural sources, habitat degradation, over-abstraction of water and the introduction of nonnative species.

Projections underneath a selection of various situations reflecting distinct stages of emissions, atmospheric concentrations of greenhouse gases and land use, all imply that the Earth will hold to heat, that warmth waves becomes extra common and ultimate longer, and that precipitation styles will preserve to exchange, with adjustments inside the frequency and magnitude of intense events inclusive of droughts, storms and floods (IPCC, 2014a, 2014b, 2014c). climate trade has been a feature (and herbal) feature of life on this planet over a lot of geological time, and has driven the worldwide distribution and suitability of habitats and in turn, of species, genotypes and phenotypes. The rate of weather alternate because of anthropogenic impacts is acting at a rate that challenges the capacity of species and ecosystems to evolve. because of this recent, fast modifications in climate will keep to impact herbal systems together with freshwater ecosystems, and the services that they provide to human society such as inland fisheries. Interactions between climate change and

non-weather anthropogenic stressors imply that ongoing climate change can extend those influences.

INTRODUCTION

The inland fisheries can be defined as fisheries exploiting fish in waters placed inland of the coastline. those fisheries have a protracted history: proof from Africa suggests as a minimum 90 000 years (Yellen et al., 1995). today, fish are exploited in freshwaters of all types and sizes, from the largest rivers and lakes, right down to reservoirs, small ponds, streams and wetlands, on every continent apart from Antarctica. Freshwater habitats assisting inland fisheries can be transnational and can cross different climatic zones. Inland fisheries hobby tiers in scale, reflecting specific monetary-drivers, from small-scale subsistence (that allow survival) and artisanal (providing income) fisheries, ordinary of less-evolved international locations, through to medium- and even massive-scale industrial fisheries. A further critical region is recreational fishing, not unusual in industrialized nations, but gaining in importance worldwide.

FAO stated a total inland fisheries catch of eleven. five million tonnes in 2015, representing simply over 12 percent of total international capture fishery manufacturing. This production is dominated with the aid of the Asian location. The maximum vital inland fisheries of the sector in phrases of meals manufacturing lie inside the tropical belts of South and South East Asia, sub-Saharan and West Africa and the northern 1/2 of South the us. principal Asia, the Russian Federation, components of Europe and critical and North the us additionally have essential inland fisheries. Seventeen nations produce eighty percent of this inland fishery catch ranging among 151 000 and 2.3 million tonnes in line with united states and the final 20 percentage is spread across a in addition 134 countries (FAO, 2017).

The general biomass and economic price of fish taken from inland fisheries is overshadowed by using marine fisheries at a international scale but freshwater fisheries provide many benefits to society, consisting of guide for cultural structures, meals safety and the economy, and are regularly especially critical in less developed nations. Inland seize fisheries deliver excellent meals to some of the sector's most inclined populations in a manner that is each handy and lower priced. these dietary and meals security blessings are an essential part of the agricultural panorama of these countries and as a result can be impacted and modified as international locations increasingly more develop their water and land resources to produce food for his or her developing populations. Inland fisheries are essential gear for the preservation of human populations on earth: many important and efficient freshwater fisheries

are discovered in areas of the world with low food safety, and ninety percentage of inland seize fishery trap is used for direct human consumption (Welcomme et al., 2010). The freshwater ecosystem are also globally crucial assets of income and employment: 21 million fishers, equivalent to 36 percent of the worldwide seize fishery team of workers, and greater than 36 million people in publish-capture sports are employed inside the region (Lynch et al., 2016). furthermore, regularly constitute vital way of empowerment for disadvantaged agencies, with ninety percent of ladies dominatin submit-seize processing (global financial institution, 2012). This device additionally confirmed a prominent cultural role in the deliver of nutrients and guide for cultural range, via the availability of food and upkeep of way of life and customs in indigenous businesses international, and subsistence fishing gives get entry to to a lot wished proteins, calories and micronutrients. even as inland fisheries are important for many low profits meals deficit international locations, they are regularly markedly understudied, leaving stakeholders inclusive of policymakers, managers and fishers with little steering regarding climate alternate and how it'll affect inland fisheries and destiny livelihoods of people who rely on them for food, earnings and employment.

THE IMPACT OF CLIMATE CHANGE ON AQUACULTURE

The climate alternate has, and maintains to have, a marked worldwide impact on freshwater ecosystems, fish and other aquatic taxa, and the provision of goods and offerings such as fisheries (Myers et al., 2017). Freshwater ecosystems may be touchy signs of weather exchange. Following global mean land and ocean surface temperature increases of zero.eighty five °C (between 1880 and 2012), freshwaters have warmed globally (Bates et al., eds., 2008). those adjustments have been happening for many years, and have doubtlessly motivated our perceptions of what represents baseline ecological situations. A huge and developing literature exists at the affects of climate change on freshwaters and their fisheries, even though records are still lacking for a number of the key areas and international locations supporting efficient inland fisheries, e.g. the tropics. The significance of the problem is pondered in the inclusion of sections specializing in freshwater structures and fisheries in the Intergovernmental Panel on climate alternate evaluation reports. notwithstanding this, the global reviews discussing the affects of climate trade on fisheries are generally, strongly biased toward marine fisheries. although this bias is essentially due to the distinction in fishery yield or monetary well worth of marine fisheries relative to freshwater fisheries, it also reflects marked differences between the 2 sorts of fisheries. it is important to recollect those variations, considering the fact that failure to increase and implement suitable guidelines and techniques for climate

trade specially targeted at inland waters will bring about poor outcomes on those ecosystems and the individuals who depend upon related fisheries for food, employment and earnings. Marine and freshwater fisheries truly have a few functions in not unusual. Overexploitation is, for example, a trouble common to both, and both are structures that include three separate, however interacting additives: aquatic biota, aquatic habitats and the people exploiting these renewable natural assets. moreover, they may be part of complex and unpredictable ecosystems. even though similarities exist, they also have essential variations that are important to apprehend when considering fisheries control underneath weather alternate. At a global stage, inland fisheries are usually heterogeneous, displaying big nearby differences that replicate the extensive global distribution of freshwater habitats, and marked geographical gradients in climate, geology, land use, biodiversity and human population density and financial hobby. the availability of zone-wide steering or predictions is therefore hard, made even extra tough by way of the truth that many globally important fisheries are determined in far flung, low income regions with little scientific infrastructure. the prejudice towards reporting and predicting climate alternate affects in inland fisheries in part reflects the problems in growing a simple combined message from those extremely heterogeneous and diverse structures. The variety of inland fisheries also frequently hinders them from having a strong voice at a national or global stage.

THE IMPACT OF ANTHROPOGENIC PRESSURES ON FRESHWATER ECOSYSTEMS

An essential assessment dividing marine and inland fisheries is the in particular near affiliation among freshwaters and their catchments, meaning that inland fisheries correctly share water with activities taking region of their catchment. The natural and human approaches and sports located upstream or adjoining to a given lake, reservoir, river stretch, or wetland affects their bodily and organic characteristics. this is of precise concern, as many human activities are unfavorable to fisheries, including river law for hydropower, abstraction for agricultural, industrial and municipal makes use of, discharge of cooling waters and infection, and might result in habitat loss. A recent look at anticipated that global, approximately 65 percentage of inland waters had been moderately or rather threatened with the aid of such anthropogenic stressors (Vörösmarty et al., 2010), restricting their application to guide human populations. the various anthropogenic stressors appearing on freshwaters involve the usage of water; and fisheries in freshwater habitats are effectively competing for water with other human activities, a lot of which, together with the production of food and power, can be extraordinarily annoying. Human

activities in a given catchment regularly bring about the quantity and excellent of water to be had to aid inland fisheries to be a good deal reduced under that located underneath herbal conditions. as an example, Postel, each day and Ehrlich (1996) expected that via the overdue Nineteen Nineties, humans worldwide have been appropriating extra than 50 percent of all reachable freshwater, and expected that this will growth to 70 percent through 2025. through the equal year, Arnell (1999) predicted that 60 percent of the world's population might be residing in areas in which greater than 20 percent of to be had water assets were used (i.e. under water stress). climate trade has led, and is anticipated to hold to steer, to changes within the availability and best of water (Vörösmarty et al., 2000), with related affects on aquatic taxa and structures (Dudgeon et al., 2006), although this varies in area and time (IPCC, 2014b). demands for water are anticipated to boom in destiny, pushed via human populace boom and motion, changes in land use and agriculture (e.g. to develop biomass) and commercial needs, suggesting similarly degradation and problems for inland fisheries, along greater current stressors without delay related to weather alternate, freshwater systems have also been issue to sizable anthropogenic strain over the last one hundred fifty years. A latest overview recommended that 90 percentage of world inland seize originates from structures with above common strain levels (McIntyre, Reidy Liermann and Revenga, 2016), imparting an indication that structures are far from sustainable. Such stressors doubtlessly have interaction with climate change, in many cases resulting in a strengthening of the bad effects of weather change on inland fisheries each at once (e.g. adjustments in water temperature, water availability, shifts in go with the flow styles) and not directly (modifications in land use, human behaviour, extended human populations). human beings have additionally purposely and accidentally delivered fish species outside of their herbal distribution, regularly if you want to help inland fisheries. Such species can fundamentally affect environment feature, compete for meals and area or devour local goal species, and those influences may end up enhanced below weather alternate (Rahel and Olden, 2008).

THE IMPACT OF RISEN TEMPERATURE ON FRESHWATER ECOSYSTEM

weather has a strong controlling impact on bodily, chemical and biological procedures in freshwater ecosystems. The hyperlink among air and water temperatures has lengthy been recognized, and water temperature drives most physico-chemical and organic strategies in aquatic systems (desk 18.2). Abiotic and biotic conditions are each touchy to water temperature because of the Arrhenius relation, i.e. chemical reaction charges double with each 10 °C growth in temperature (Regier, Holmes and

Pauly, 1990). almost all biological and chemical approaches in freshwater ecosystems are stimulated by means of temperature, from key chemical changes together with dissolution (e.g. affecting dissolved oxygen concentrations), degradation and evaporation, via to the fee of biochemical procedures within aquatic organisms, ailment risk (Miller et al. 2014), parasite transmissions and the trophic interactions among purchasers and their prey (Dell, Pawar and Savage, 2013). As such, the most apparent environmental shift related to worldwide climate trade is in temperature, so that it will increase globally with predictions varying via situations. given that freshwater fish (and a number of the taxa with which they have interaction) are poikilotherms or thermal conformers, changes in water temperature have next affects on almost each factor of the ecology of freshwater fish which include suborganismal, person, populace, species, community and atmosphere ranges (Brett, 1971; Harrod, 2016), and fish have particular temperature requirements that vary between species and even lifestyles-degrees (Souchon and Tissot, 2012). It isn't always simply warming to be able to have an effect on fish; cold shocks have also impacted stocks in Bolivia (Szekeres et al., 2016).

variant in temperature drives fish distribution both throughout huge geographical scales (biogeography) (Cussac et al., 2009) and between habitats inside a selected freshwater surroundings (Magnuson, Crowder and Medvick, 1979). This fundamental have an effect on led to Brett (1970) describing temperature because the master abiotic issue, and modifications in water temperature associated with human sports or weather trade have and will maintain to have an effect on the potential of freshwater fish to aid inland fisheries. Fish species may be labeled into unique ecological guilds concerning their thermal area of interest or preferred habitat characteristics, i.e. where their ecological performance is optimized. This approach presents a beneficial way by way of which fishery biologists can estimate the probable reaction of species and groups to weather trade. In temperate habitats, fish are regularly categorised as bloodless-, cool- and warm-water following Magnuson, Crowder and Medvick (1979). Classifying fish through the thermal niche concept has much less utility in tropical and subtropical regions, however fishes from tropical lowland habitats can normally be divided into functional guilds based totally on their migratory conduct (Welcomme, 1979): black fish are species which are physiologically and behaviourally adapted to make use of wetlands or different flooded, frequently low-oxygen, habitats; white fish are species which might be sensitive to low water fine and commonly make long migrations between habitats (on occasion of extra than 1 000 km); and gray fish are intermediate and migrate into flooded regions to reproduce or feed, and return to the principle channel for the duration of the dry season.

THE EFFECT OF CLIMATE CHANGE ON HYDROLOGICAL CYCLE

beyond shifts in air and water temperatures, climate change has changed the global hydrological cycle, with prominent changes inside the timing, volume and kind of precipitation (IPCC, 2014a, 2014b), with local differences within the sign and scale of the changes. those changes will preserve, with the depth of changes in precipitation (and evaporation) growing. adjustments in precipitation have comply with-on consequences on different traits of the hydrological cycle, consisting of run-off, groundwater recharge and river discharge, with next affects on the availability, pleasant and beginning of water. In flip, these affect the capacity of freshwater structures to offer surroundings services inclusive of fisheries, dilution of waste and other pollution, and to supply water for abstraction, in an effort to increase the capacity for struggle between different person agencies. The effect of these factors will likely get worse with ongoing weather alternate, with consequent results arising from interactions among discharge and other physiochemical traits along with temperature (van Vliet et al., 2013). inside a multi-user situation with restrained water sources, fisheries will possibly lose out to different sectors, in a few instances ensuing in the total lack of a few freshwater fisheries, e.g. because of diversion of water for agriculture (Miranda, 2016). River law, dam construction and water abstraction are recognized as being some of the maximum critical (non-climate) anthropogenic stressors of inland fisheries causing habitat degradation and fragmentation, marked shifts in network structure, loss of sensitive species and of population connectivity. As a hallmark of the potential significance of weather trade affects on inland fisheries, Döll and Zhang (2010) advised that by mid-twenty-first century, climate exchange may have had a larger impact on ecologically-relevant river go with the flow characteristics than river law and water abstraction have had up to the time of writing. McIntyre, Reidy Liermann and Revenga (2016) stated that international riverine fish catch scaled steeply (and positively) with discharge, and counseled that water abstraction and climate alternate probably have disproportionately massive outcomes on riverine fisheries, specifically in large intensively fished rivers just like the Yangtze, Mekong, Zambezi and Ganges.

Climate exchange has and could retain to have an effect on catchment hydrodynamics thru shifts inside the timing, sorts and intensity of precipitation (de Wit and Stankiewicz, 2006). this will have an effect on discharge styles (i.e. the provision of water for fisheries and different resource users), as well as affecting physico-chemical situations and procedures. in which temperatures increase, and precipitation decreases because of climate alternate, the difficulty of evaporation can cause habitat loss and fishery degradation, an difficulty worsened by way of

over-abstraction of water. In endorheic lakes, evaporation ends in elevated salinization affecting species composition and fish shares. about 10 percent of the Earth's land surface is blanketed via glaciers that keep 75 percent of the Earth's freshwater in a frozen kingdom (Milner, Brown and Hannah, 2009). Following current warming, there is a consensus that most (however not all) glaciers are shrinking, and that the price of recession has multiplied during the last three a long time (Milner, Brown and Hannah, 2009). As weather warming has endured, the snow line (the point above which precipitation falls in solid form) has shifted towards an increasing number of higher altitudes, resulting in elevated rain, and much less snow, decreasing inputs to glacier mass. as the climate warms, and precipitation styles shift, glaciers will decrease, and even be lost. this can in flip modify water deliver to river systems (and associated fisheries). Sustained warming will likely be followed by way of persisted expanded river drift within the close to destiny, observed by using a next breakdown of the properly-described seasonal variation in discharge (that drives the phenology of these systems, in addition to seasonal changes in exploitation), observed by using a marked discount in discharge as glaciers are sooner or later misplaced (Immerzeel, van Beek and Bierkens, 2010). Warming is likewise affecting the distribution of permafrost in excessive range and altitude regions, affecting freshwater habitats and ecosystem feature (Grimm et al., 2013). The late stages of glacial retreat and possible disappearance can be greatest in those basins fed by using waters from the glaciers in the Himalayas and the Tibetan Plateau, but much less so within the big rivers of South the us, wherein the majority of the water budgets is contributed by way of rainwater (Hamilton, 2010).

The climate change impacts the natural fluctuations in lake volume, water tiers and hydraulic retention instances, i.e. the price at which lake waters renew themselves, as well as stratification patterns (George, Hurley and Hewitt, 2007), chemical and nutrient biking (Jeppesen et al., 2010), phenology (Winder and Schindler, 2004), consisting of ice cowl (Magnuson et al., 2000), and ultimately habitat suitability for the fish that aid fisheries (Lappalainen and Lehtonen, 1997). Such elements have marked implications for inland fisheries e.g. because of influences on primary and secondary productiveness (O'Reilly et al., 2003), fish yield (Hickley et al., 2002) or get right of entry to to or quality of key habitats for fish (Fang et al., 2004a, 2004b, 2004c) and at the fishers themselves (MacKay and Seglenieks, 2013).

THE EFFECT OF CLIMATE EXCHANGE ON FRESHWATER SURROUNDINGS AND ASSOCIATED LIVELIHOODS

The inland fisheries sector has contributed little to anthropogenic weather exchange, but it's miles argued to be one of the first sectors to feel its affects. The

vulnerability of fishers to climate change is based upon their ability to trade, sensitivity and potential to evolve. climate change will possibly have an effect on fisher livelihoods via a large number of pathways past the fishery sector by itself. climate change will probable modify fishery production and fishing operations. The drivers which effect inland fisheries and consequently the livelihoods of these established upon inland fisheries, variety across environmental, monetary and social factors. will increase in excessive weather activities, inclusive of droughts and floods, and adjustments within the depth, frequency and period of those will affect the fishery sector and fishdependent livelihoods differently. adjustments in fish composition, relative abundance, biomass and distribution will modify fish yields and the efficiency of different fishing gears. once predictable styles of fish actions or relationships between locations and different species or life degrees might also become weakened or even misplaced, lowering the utility of traditional ecological expertise as a tool in fisheries. Warming of places that currently have long-durations of ice cover will cause reduced ice cover, potentially restricting get right of entry to to fisheries, or the shipping of catches, fishing equipment and employees. extreme climate styles ought to reason lack of fishing days, pose a danger to lifestyles, cause damage or loss of fishing gadget and landing websites. Fish processing and buying and selling will also be affected via demanding situations with processing strategies, which includes solar drying, and via decreased delivery, consisting of from flooded roads. Warming may even see a need for progressed refrigeration and cold storage, particularly in the ones areas present process large increases in temperature e.g. at high latitudes in the northern hemisphere. Fishers additionally enjoy exposure to water borne illnesses, lack of access to fitness care and training, lack of wider economic opportunities and marginalization. climate change will probably expand those stresses, and it will likely be essential to enhance nearby version techniques and hyperlink with wider improvement tasks to lessen poverty and enhance resilience. The degree to which households can adapt to change is but primarily based upon multiple elements along with their livelihood asset base, social class, religion, origin, gender, age, wealth, schooling, location, guidelines and establishments (Williams and Rota, 2011). Fishers have, and will maintain to undertake numerous adaptation techniques to manage and adapt to weather adjustments. Those encompass intensifying or lowering exploitation fees, modifying fishing operations (gears, timing, locations and target species), migration, livelihood diversification and drawing on social capital for food and earnings assistance. A given family's livelihood asset base is critical for growing capability to manage and adapt to change.

Freshwater ecosystems are subsequently driven by water dynamics, in which water stage fluctuation is a natural feature that promotes nutrient cycling, primary

production, get right of entry to to critical habitat and in the end fish yields (Junk, Bayley and Sparks, 1989). The marked seasonal dynamics in the inundation of the floodplain influences the accessibility and availability of fisheries, agricultural crops, wild game and fruits. Many groups are dependent on inland fisheries that regularly range and for this reason they've present adaptive capacity, even though weather alternate might also have an effect on the dimensions and impact of seasonal variation. in the Peruvian Amazon area of Ucayali, Murray (2006) determined that the fitness and nutritional popularity of communities "rhythms" or fluctuates with the annual flooding and next upward thrust and fall of the river. it has been argued that many inland water ecosystems, consisting of in dryland areas which can be unstable environments, are well-tailored to change (Kolding and van Zwieten, 2012). The importance of those fluctuating inland fisheries in drylands are often left out, but while included with other activities they provide possibilities to diversify livelihoods, and with proper maintenance and garage can make a contribution to food and dietary security in extensive methods.

THE CHALLENGES OF PREDICTING CLIMATE CHANGE ON AQUACULTURE

There may be an obvious need to provide predictions of the impacts of climate change on inland fisheries. at the maximum essential stage, stakeholders want to recognize if fisheries will persist or undergo massive alternate (both negative and positive). To counter this, fisheries experts want to describe responses, and identify vulnerability to weather exchange, however also provide predictions on how stocks, communities and fisheries will reply to climate alternate. this is extensively greater complex than climatic modelling because the links between motive and impact are usually provided through a range of interacting environmental variables, which can be additionally at once or not directly inspired by means of climatic variables, e.g. temperature and precipitation, as well as interactions with other stressors appearing at the fishery (including responses to disorder and non-local species) and associated catchment. The further inclusion of biological, ecological and human responses in fashions greatly increases their complexity, which in flip reduces predictive electricity. tries to expect inland fishery responses to climate trade are therefore extremely complicated

Past climatic and non-climatic affects on habitats, fish do not exist in isolation in freshwater ecosystems, but exist inside communities made up of other taxa and purposeful companies, so one can also be impacted with the aid of weather trade, starting from microbes (Marcos-López et al., 2010), parasites (Marcogliese, 2001), primary producers (de Senerpont Domis et al., 2013), fish predators (Moore et al.,

2009) and humans, including fishers (Haines et al., 2006). person lifestyles levels and genotypes of non-fish taxa will display one of a kind proximate responses to weather trade, the ensuing emergent ecological responses (predator-prey relationships, opposition, parasitism, fish yield) will possibly trade as situations and ecological interactions alternate under climate trade and shifts in environmental conditions as humans reply to weather change (discern 18.3). climate trade will probably result in changes to the relative importance of topdown and backside-up processes that impact fish manufacturing. Responses to climatic alternate in freshwater structures may be nonlinear, complex, surprising and probable nonreversible (Isaak and Hubert, 2004). Shifts in water temperature and physical situations will power a whole lot of the response of fish to weather alternate, and the following yield to inland fisheries, but ecological interactions between species may even play a key function (Crozier and Hutchings, 2014). As cited above, inland fisheries are characterized by means of their range and this significantly limits any potential to provide generalized predictions regarding the in all likelihood outcomes of weather trade on freshwater fisheries. however, weather alternate has and could continue to affect freshwater fisheries international and could mainly need to be accounted for in fisheries control coverage and operations. The relative impact of weather alternate will vary in line with geographical region and over the years, meaning that policy will should be evolved at a local- or catchment-stage. In some places, it's far feasible that weather alternate might be the dominant stressor affecting inland fisheries, however given the overwhelming effect of different stressors consisting of land-use trade, over-abstraction of water or habitat fragmentation following river regulation for hydropower, the principle effect of climate change may be the way it interacts with these existing stressors. The affects of climate trade on inland fisheries will in the end depend on which warming and land use eventualities are followed, however in most instances the have an impact on of climate change on inland fisheries will accentuate over the subsequent decades (with marked regional heterogeneity). As such, fishery experts and policymakers will need to contain weather exchange into coverage and management strategies.

CONCLUSION

The influences of climate change on inland fisheries, a tremendously diverse area that occurs on every continent apart from the Antarctic. Inland seize fisheries make crucial contributions to livelihoods and economies around the world, generating recorded catches of over 11 million tonnes in 2015, equivalent to just over 12 percentage of general manufacturing from marine and freshwater seize fisheries. They provide excessive quality, low priced meals to a number of the specifically

poor and prone people globally and are a supply of employment and livelihoods to tens of hundreds of thousands of human beings, in addition to being a basis of cultural structures in lots of places. Freshwater is an important commodity utilized in or tormented by many sectors of human life ranging from human intake to agriculture, undertaking and others. As a end result, the sector's restrained assets of freshwater are subjected to many anthropogenic pressures together with extraction, river law, damming, pollution, habitat degradation, fishing and others. The already excessive call for water is anticipated to increase inside the destiny as a result of human population boom and improvement, which, until pressing remedial action is taken, could have critical bad affects on inland fisheries and the benefits they offer. lamentably, within the opposition for this scarce useful resource the valuable contributions of inland fisheries are regularly not recognized or are beneath-valued and priority is given to different more visible demands for water, with severe results for the sustainability of inland fisheries. As an extra stressor, weather has a strong controlling influence on the bodily, chemical and biological methods in freshwater ecosystems, which ends up in modifications in distribution, abundance and production of inland fishery sources. climate exchange is likewise changing the global hydrological cycle, thru changes in precipitation and Evaporation. ordinary, climate trade is riding adjustments in the composition of species assemblages, the abundance, biomass and distribution of species, fish yields and the efficiency of fishing gears and strategies.

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Impact of Climate Change in Indian Context

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INTRODUCTION

India's Economy is developing. Developing countries are always striving to provide a good life to their citizens by using their available resources. The economy of India is moving from developing nation to develop nation. There are various difficulties, problems and threats to be faced under it. Climate change is one of the main environmental challenges facing the world today. India is facing several problems. The world is witnessing one of the biggest threats ever in the form of climate change, with unprecedented impacts on societies, nations and economies. From unpredictable weather patterns, to extreme climate events including floods, droughts and cyclones, to rise in sea levels, the potential impact of climate change on the planet are unparalleled. The Indian economy is mostly agrarian-based and depends on the onset of the monsoon and its different behaviour. The livelihood of the rural people is directly dependent on climate sensitive natural resources like land, water and forests. The impact of climate change on these natural resources affect the agriculture, forests, water resources and human health. "India is a vast country occupying 2.4% world geographical area sharing 16.2% of the global human population and 15% of the global livestock population. It is endowed with a varied climate supporting rich biodiversity and a highly diverse ecology. More than 60% of its population living in rural areas, where agriculture is the major concern of rural economy, which is the backbone of the Indian economy. . The consistent impact of climate change may threaten livelihood activities, which are mostly based on agriculture providing food security. Climate change is associated with various adverse impacts on agriculture, water resources, forest and biodiversity, health, coastal management and increase in temperature. Climate change would represent additional stress on the ecological and socioeconomic systems that are already facing tremendous pressure due to rapid industrialization, urbanization and economic development. Climate change and global warming pose significant threats to agriculture." The present state of the planet, with the rapid changing of climate, and global warming becoming more apparent around the world, is one of the most worrying concerns the mankind has today. "Being a young and developing country, India, at the crossroads of development and sustainability, will find it much more challenging in times to

come. In order to achieve the ambitious economic goal of five trillion USD, while it takes the reforms that were long promised i.e., relaxation in regulations and controlling, reformation of labour laws, privatisation of state entities, and investment in infrastructure development, it should make sure it is achieved not at the cost of its climate — a highly complex and tough task that needs the cooperation of the private and public sectors. “California, Oregon and certain other parts of the western United States (US) have experienced worst wildfires in the last 18 years, with their frequency and impact catalysed by climate change¹. Recent estimates by NASA-led study has indicated that if greenhouse gas emissions (GHG) continue swiftly, Greenland and Antarctica’s ice sheets could together contribute more than 15 inches (38 centimetres) of global sea level rise, which is beyond the amount that has already been set in motion by Earth’s warming climate”. Thus, it is evident that climate change, exacerbated by emissions from anthropogenic activities, is making the world warmer, disrupting weather patterns and increasing the frequency and intensity of extreme climate events”. The dire effects of climate change will now no longer best have an effect on vital natural capital, infrastructure, human health and productiveness however additionally negatively have an effect on sectors which include agriculture, forestry, fisheries, ecosystem, tourism, to name a few. Hence, climate change has not only direct but also many indirect implications that can have a domino effect on the rise or fall of any economy around the world. Research indicates that insistent rise in average global temperature by 0.04°C per year, barring major policy breakthroughs, is set to reduce world real Gross Domestic Product (GDP) per capita by 7.22% by 2100. The impact of climate change will not be uniform across the world, and developing nations are more vulnerable and are at a higher risk of experiencing the negative effects of global warming. The Intergovernmental Panel on Climate Change (IPCC) defines climate change as a change in the state of the climate that can be identified by changes in the mean or the variability of its properties and that persists for an extended period, typically decades or longer. The current trend of global warming is the heating of global surface temperature due to the emission of greenhouse gases, over a long period of time. “The global average surface temperature has increased by approximately 0.6°C over the past century. Further, the global average surface temperature will increase by 1.4–5.8°C, over the end of 21 century and atmospheric carbon dioxide concentrations by 540–970 ppm over the same period. The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC, 2007) has been analyzed based on observations since 1850 till 2007 under variables of changes in temperature, sea level, and snow cover in the northern hemisphere, as the warming of the earth’s climate system is unequivocal. The global atmospheric concentration of carbon dioxide has increased from a pre-

industrial value of about 280 ppm to 379 ppm in 2005. Multi-Model averages show that the temperature increases during 2090 - 2099 relative to 1980 - 1999 may range from 1.1 to 6.4°C and sea level rise from 18 to 59 cm.” These climatic variabilities were projected to effect on agricultural production, freshwater availability, oceanic acidification, flooding of coastal regions and the outbreak of vector-borne & water-borne diseases. The effect of climate change regarding the vulnerability of agricultural production structures no longer most effective the physiological reaction of the affected plant however additionally but also the vulnerability of socio-economic systems affected by coping of agricultural production by changes in climatic variability. This Article analysis the impact of climate change in various sectors in Indian Context.

Impact of Climate change on various sectors of India:- It is Evident from the various report that the impact of climate change on various sectors of Indian economy, the study focuses on certain sectors including agriculture, health, energy, tourism, insurance, and infrastructure. The various report attempts to quantify the effect of climate change on the health, human productivity and the ecosystem services. All these focus areas have been selected keeping in view their contribution to the GDP, livelihood generation potential, impact of climate change on those sectors and the sectorial impact on climate change. There are presentations of various sectors of Indian context on the secondary data report from the various available resources.

Impact of Climate change on Agriculture:- Indian farming is basically a monsoon-based farming. The variability of climate change in monsoon rainfall and temperature within a season have been adversely affected crop production in various Indian regions. The variability in monsoon rainfall and temperature have been expected greater loss in the rabi crop. Higher temperatures tend to reduce crop yields and favour weed and pest proliferation. Water is the most critical agricultural input but more than 50% of the total cultivated areas do not have proper irrigation facilities in place. The negative effects of climate change impact the irrigated crop yields across agro-ecological regions both due to high temperature and changes in water availability. A continuous shortfall in production will add to India’s import costs which is another major concern for the country.

Impact of Climate change on Tourism:- Tourist sector has played an important role in Economy as service sector. India, being a geographically diverse country, has multiple presenting for tourists. However, the region is highly susceptible to excessive climate events that are caused due to growing weather change, with large effect on infrastructure, requiring emergency preparedness measures, increasing maintenance costs, and disrupted commercial activity. The elements which have

direct effect on tourism are temperature increase, excessive activities, and rise in sea-level. Moreover, in 2005, tourism was responsible for about 5% of worldwide CO₂ emissions, contributed mainly through three tourism subsectors: transportation, accommodation, and tourist activities⁵⁶ and the numbers are increasing ever since. Combined, these account for excessive energy consumption and use of fossil fuels.

Various tourist activities rely upon meteorology and climatology and consequently negative conditions can have an effect the tourist's activities, operations, comforts, and flow of tourist to a massive extent. The effect worsens due to flight delays, cancellations and re-routing, affecting tourist movement. In terms of radiative forcing, tourism contributes to 4.6% of global warming. The transport sector, including air, automobile and rail, generates the most important proportion, with 75% of all emissions. Air travel is responsible for 40% of the overall carbon emissions due to this zone, and 54-75% of radiative forcing. The accommodation sector accounts for 20% of emissions through heating, air-conditioning and the maintenance of accommodation infrastructure. Museums, theme parks, events or shopping also contribute to roughly 3% of emissions.

IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH

Climate Change poses enormous hazard to the health of the overall public. In its Third Assessment Report, the IPCC concluded that 'Climate change is projected to increase threats to human health'. It is predicted that climate change will have an effect on the fitness zone through the frequency, intensity, and quantity of excessive climate activities in addition to deteriorating air quality, extended unfold of weather-touchy illnesses and intensified meals insecurity. Transmission of disease through insects and pests, food, and water have a negative impact on health and well-being of people, which will be further exacerbated owing to the current pandemic. Rising air and water temperatures add to the exposure to waterborne and foodborne diseases. Multiple cases in the past have shown to have an impact on human health across different regions in India. In 1998, the heatwave in Odisha took more than 2,000 lives. 1,421 people died in Andhra Pradesh due to a heatwave in 2003, similar effects of heatwave were also observed in Uttar Pradesh, Haryana, Punjab, Rajasthan, Gujarat, Bihar, and Orissa in 2003. In 2004, a cold wave in Uttarakhand and Uttar Pradesh, a tsunami affecting Tamil Nadu, Andhra, Kerala, and the Andaman-Nicobar Islands, floods in Madhya Pradesh, Maharashtra and Gujarat in 2005 and a cyclone in Andhra Pradesh took many lives and caused immense damage to health infrastructure. In June 2005, Odisha recorded the highest record-breaking temperature in the last 33 years of 46.3°C, which is 10° above the normal.

Impact of Climate change on Infrastructure:- The projected increasing in Indian urban population is 745 million in 2041, which already puts force on the services and infrastructure in almost cities. On top of this, the cities are now exposed to Climate-related hazards. Climate change will not only increase the risks of death, injury, and ill-health and disrupt livelihoods, but also damage property, infrastructure and settlements due to cyclones and coastal and inland flooding, storm surges and sea-level rise. By 2070, there will be an improved danger of storm surges in coastal regions including Chennai, Dhaka, Kolkata, and Mumbai I addition to different low lying, densely populated coastal regions of India. India's densest coastal city agglomerations together with Mumbai, Kolkata, Chennai, and Vishakhapatnam are hubs of critical infrastructure and assets. They make contributions to the nation's economy and growth by providing efficient transport and freight networks, road and rail corridors, industrial zones and parks, maritime and port facilities, petroleum industries, and refineries. More than 60% of India's FDI inflows are received by the coastal states for development purposes, which are at risk due to the impacts of climate change.

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Plasma: Useful For Climate

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This paper attempts to understand the role of the electrode dimensions in the evolution of order-to-chaos-to-order transitions in a co-axial DC electrode discharge system, wherein the ratio of the anode-to-cathode radii is observed to determine the evolution path of the transition. Further the anode dimensions is observed to determine the discharge conductivity after the 1st negative differential resistance (NDR) region and the onset of the order-to-chaos-to-order transition is linked to the cathode dimensions.

1. INTRODUCTION AND MOTIVATION

Plasma sources can be of different types: DC, RF etc [1], and are important components in various industrial plasma applications. The Plasma Physics laboratory at IIT Delhi has been working on the understanding and development of plasma sources for the past two decades. The laboratory now looks forward to further these investigations of plasma sources using nonlinear dynamical analysis tools.

Nonlinearity in plasma sources is not surprising as plasma is a highly nonlinear medium and most plasma observations have inherent nonlinear aspects associated with them. In particular, such nonlinear dynamical behaviour can be quite prominent in the transition regions of plasma discharges. Nonlinear studies in DC discharges have received extensive attention over the last few decades [2-7]. However, recent observations [8, 9] show that there are still aspects which need to be studied. RF discharges, even though, having a wide range of industrial applications have not received much attention from the point of view of nonlinear dynamical characterizations.

Thus the main aim of this research proposal would be to study the nonlinear dynamical aspects of DC and RF coupled plasma discharges using appropriate plasma diagnostics and characterizing the acquired signals using nonlinear dynamical tools. Subsequently, efforts will also be made to correlate these characterizations with appropriate models.

2. LITERATURE SURVEY

Nonlinear dynamics studies started with the intention of investigating the qualitative behaviour of nonlinear problems which were difficult to solve analytically, such as nonlinear oscillators [10] and dynamics of the atmospheric weather [11], fluid turbulence [12], etc. In the late sixties and later, the idea of van der Pol oscillator was applied to explain the growth and saturation of plasma instabilities which could be done using conventional linear theories [13]. Abrams *et al.* first observed nonlinear phenomena like period pulling, frequency entrainment etc. [14] in periodically forced self-oscillatory plasmas [15]. B.E. Keen, *et al.* showed, using a two fluid model that the ion sound instabilities behaved in a manner similar to a van der Pol oscillator when subjected to a driving force [13]. By the mid-eighties, researchers began looking for experimental evidences of deterministic chaos in plasmas. Experimentally, the period doubling bifurcation and chaotic behavior were observed in an electron beam plasma system in 1984, wherein, Boswell showed that the natural oscillations on an electron beam propagating parallel to a magnetic field went through a period doubling bifurcation to a chaotic state with increase in the beam current [16,17]. The period doubling route to chaos was also reported in the driven pulsed filament discharge plasma and an electrical discharge tube [2, 3]. Period addition and subtraction [18], intermittent route to chaos [4, 19], quasiperiodic route to chaos [4-6] and homoclinic chaos [3] have been observed in plasma discharge systems. Other nonlinear phenomena like mode locking, period pulling, frequency entrainments etc., had been observed by Klinger et al [20]. In arc discharge plasmas, chaos has been observed by S. Ghorui, *et al.* [21]. In many other experiments almost similar phenomena had been observed where different types of gases, geometric configurations and parametric regimes were explored [7, 14]. Further, chaos to ordered state transition predicted numerically [22] have also been recently observed experimentally [23-26].

In RF discharges, there have been instances where period doubling associated with the nonlinear behavior of RF sheath capacitance, has been observed in RF plasmas [27, 28]. Further the recent impetus on producing large area, uniform high density RF plasmas has led to studies with larger electrode areas, higher RF frequency discharges and dual-frequency capacitively coupled plasma operation. These investigations have also highlighted the effects of nonlinearity in the RF plasma-sheath [29-32].

3. METHODOLOGY AND OBJECTIVES

The plasma physics laboratory has a dc discharge plasma system wherein experiments have been recently initiated. The initial experiments would be carried out in this discharge system. Simultaneously, nonlinear dynamical codes for data analysis will be developed in-house using MATLAB software. Suitable plasma diagnostics systems, such as Langmuir probes and optical emission diagnostics will

be utilized for these studies design development and fabrication of the necessary diagnostics will be undertaken, as and when necessary.

Subsequently, such similar studies will be carried out in a dedicated capacitatively-coupled RF discharge system. The different control parameters for the characterization of these studies would be the operating pressure, electrode spacing, RF power, etc. The system response will be monitored via fluctuations in density, plasma potential, optical emission, etc. There is also a need to take precaution while acquiring signals in RF environment. For this purpose the diagnostics such as suitable Langmuir probes and energy analyzers would be need.

RESEARCH PLAN

1. In-house development of codes and testing of for data analysis of nonlinear dynamical systems.
2. Design, development and fabrication of electrostatic probes, analyzers and optical emission diagnostics for both DC and RF discharges. Appropriate compensation for the probes and analyzers will be taken into account during the design for use in the RF environment.
3. Conducting experiments to identify and characterize nonlinear dynamical aspects of DC and capacitatively-coupled RF discharges.
4. Modeling of the diagnostics of DC discharges and RF discharges.

4. SCHEMATIC OF DC DISCHARGE SYSTEM

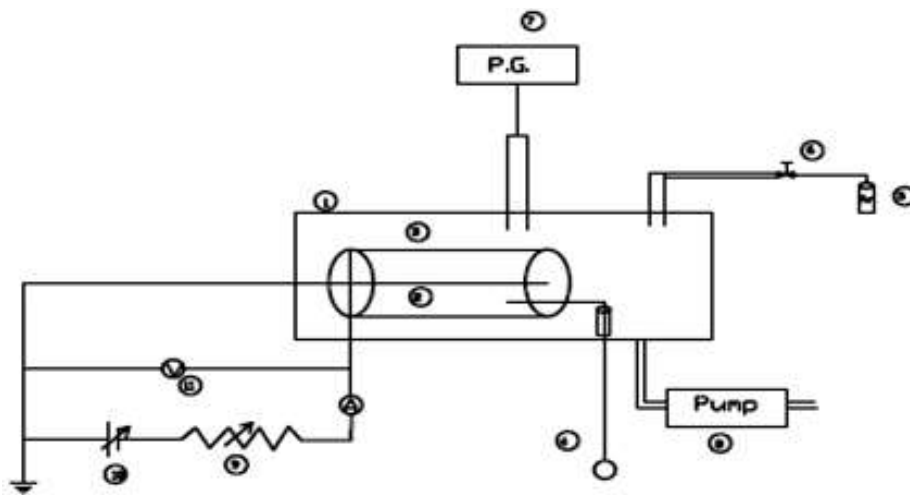


Fig. Schematic diagram of the experiment

Schematic of RF discharge (Capacitively-Coupled discharge)

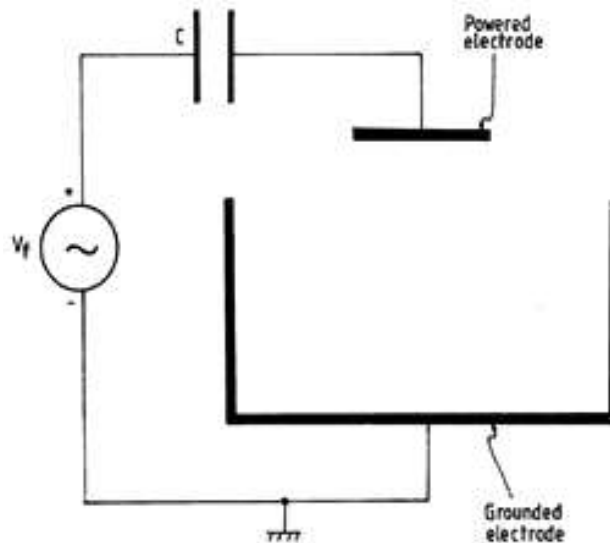


Fig.2 Schematic diagram of capacitively coupled RF discharge system

5. CONCLUSION

The changes in the onset of the 1st NDR when one characterizes configuration; show that the NDR is triggered at significantly higher conductivity as the electrode surface area is increased and the system transits to a significantly higher conducting state after 1st NDR when the anode diameter is changed. However, the onset of the order-to-chaos-to-order transition seems to be governed by the cathode dimensions. Further it needs to be stated that the evolution of the order-to-chaos-to-order zone seems dependent on a critical value of the ratio of anode-to-cathode radii which needs to be investigated further.

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अंतर्राष्ट्रीय सहयोग और जलवायु परिवर्तन : G20 की भूमिका

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प्रस्तावना

सन् 1999 ई० में G20 समूह का गठन हुआ। इसे Groups of Twenty भी कहते हैं। यह 19 सदस्य देश एवं एक यूरोपियन यूनियन का समूह है। प्रारम्भ में यह केंद्रीय बेकों के गर्वनर और वित्त मंत्रियों का संगठन हुआ करता था। दिसम्बर 1999 ई० में इसका पहला सम्मेलन बर्लिन में हुआ। वर्ष 2008 ई० में विश्व को भयानक मंदी का सामना हुआ। जिसके बाद इसके मूलभूत ढांचे में बदलाव करके इसे सदस्य राष्ट्रों के शीर्ष नेताओं के संगठन का रूप दे दिया गया। इसके बाद यह तय पाया कि वर्ष में एक बार G20 राष्ट्रों के शीर्ष नेताओं की बैठक की जाएगी। वर्तमान में G20 का शिखर सम्मेलन भारत में हो रहा है एवं इसकी अध्यक्षता भी भारत कर रहा है। G20 की कार्यसूची में जलवायु परिवर्तन से सम्बन्धित 4 बैठकों का उल्लेख है। जिनका आयोजन क्रमवार 8 से 11 फरवरी 2023 को बेंगलूरु एवं द्वितीय बैठक का आयोजन 27 से 29 मार्च 2023 को गांधी नगर में हुआ। अन्य दो बैठकों का आयोजन क्रमशः 21 से 23 मई एवं 26 से 27 मई को चैन्नई में होगा। विगत बैठकों में खनन से प्रभावित क्षेत्रों एवं जंगल कि आग से प्रभावित क्षेत्रों को फिर से बहाल करने पर चर्चा कि गई। जिससे कि वातावरण में ऑक्सीजन कि मात्रा में वृद्धि हो एवं जलवायु जीवन के अनुकूल बनी रहे।

अन्तर्राष्ट्रीय स्तर पर देखा जाए तो विभिन्न देशों ने मिलकर समय समय पर वातावरण में ग्रीन हाउस गैसों के प्रभाव को रोकने के लिए विभिन्न सम्मेलन किये हैं एवं जलवायु परिवर्तन के गम्भीर परिणामों से निपटने के प्रयास किये हैं। जैसे- पृथ्वी शिखर सम्मेलनए क्योटो प्रोटोकॉलए पेरिस समझौता आदि। वर्तमान में भी अन्तर्राष्ट्रीय स्तर पर G20 समूह के रूप में 19 सदस्य देश व एक यूरोपीयन यूनियन एवं अन्य आमंत्रित देश एकत्र हुए हैं। इस वैश्विक मंच के पटल पर जलवायु परिवर्तन से सम्बन्धित मुद्दे जैसे-जंगल कि आग से प्रभावित वन क्षेत्रों में पुनः वृक्षारोपण करके उन क्षेत्रों को फिर से बहाल करने पर चर्चा कि गई है।

जलवायु

किसी स्थान को दीर्घकालीन मौसमी दशाओं को उस स्थान कि जलवायु कहते हैं। यह स्थाई प्रकृति कि होती है। इसके अन्तर्गत प्रमुख तत्वों - तापमानए वायुदाबए वर्षाए आर्द्रता तथा वायु का अध्ययन किया जाता है। दूसरे शब्दों में कहा जा सकता है कि **मौसम की औसत दशा को जलवायु कहते हैं।**

एवं पृथ्वी पर प्राप्त समस्त भू-भाग में से किसी भू-भाग पर लम्बे समय तक रहने वाले वहाँ के मौसम की सामान्य/असामान्य स्थिति को वहाँ की जलवायु कहते हैं। आमतौर पर किसी भू-भाग की भौगोलिक स्थिति का वहाँ की जलवायु पर भी असर पड़ता है।

यूरोपीय देश जहाँ ग्रीष्म ऋतु का मौसम कम समय का होता है और अधिक समय सर्दी रहती है। भारत में ग्रीष्म ऋतु लम्बे समय तक रहती है। सदियों के कुछ महीने छोड़ कर देखा जाए तो बाकी समय जलवायु गर्म ही रहती है। भारत में सदियों के मौसम का तापमान समुद्र तटीय क्षेत्रों में सामान्य रहता है। इस तरह हम कह सकते हैं कि किसी क्षेत्र की जलवायु उसकी भौगोलिक स्थिति पर निर्भर करती है।

जलवायु परिवर्तन

जलवायु हमारे जीवन से जुड़ा एक अहम मुद्दा है। जिसका प्रभाव हमारे जीवन पर किसी न किसी रूप में अवश्य पड़ता है। अनुकूल हो या प्रतिकूल। वातावरण को अनुकूल बनाने के लिए सरकार समय-समय पर अनेक कार्य करती है। हमें भी व्यक्तिगत तौर पर ऐसे कार्य करते रहना चाहिए जिससे वातावरण जीवन के अनुकूल रहे। जिसमें वृक्ष लगाना सबसे महत्वपूर्ण कार्य है। जिससे कि वातावरण में ऑक्सीजन की वृद्धि हो और जलवायु अनुकूल बनी रहे क्योंकि अनुकूल स्थिति में ही जीवन संभव है अन्यथा नहीं।

विश्व मौसम संगठन के महासचिव पेटेरे टालस का कहना है कि अब तक का सबसे गर्म वर्ष 2016 था। लेकिन जल्द ही इससे गर्म वर्ष देखने का मिल सकते हैं। यह देखते हुए ग्रीनहाउस गैसों के स्तर में वृद्धि जारी है तापमान में भी वृद्धि जारी रहेगी।

अगर हम पिछले वर्षों की समीक्षा करें तो **यूएन रिपोर्ट 2019** इस बात कि पुष्टि करती है कि रिकार्ड में वर्ष 2019 दूसरा सबसे गर्म वर्ष था और 2010-2019 सबसे गर्म दशक। वर्ष 2019 में वातावरण में कार्बन डाई ऑक्साइड तथा अन्य ग्रीन हाउस गैसे (मैथेनएनाइड्रस ऑक्साइडए हाइड्रोक्लोरो कार्बनए हाइड्रो फ्लोरो कार्बनए ओज़ोन) नए रिकार्ड स्तर तक पहुँच गई हैं। इन्हीं कारणों से जलवायु में बदलाव आ रहा है। दूसरे शब्दों में इसे ही जलवायु परिवर्तन कहते हैं।

अगले दशकों के लिए लगाए गए एक हालिया पूर्वानुमान से संकेत मिलता है कि अगले 5 वर्षों या उससे अधिक में एक नया वार्षिक वैश्विक तापमान रिकार्ड मिलने कि आशंका है।

विश्व मौसम संगठन महासचिव के कथनानुसार वर्ष 2016 प्रथम सबसे गर्म वर्ष और यूएन रिपोर्ट अनुसार वर्ष 2019 अब तक का दूसरा सबसे गर्म वर्ष था। परन्तु यह विचार करने योग्य बात है कि हर वर्ष लगातार तापमान में वृद्धि हो रही है।

विश्व मौसम संगठन (WMO), जापान मेटिओरो लॉजिकल एजेंसी (JMA) व अन्य मौसम से सम्बंधित संगठनों द्वारा जारी कि गई रिपोर्ट के अनुसार इस बात कि पुष्टि होती है कि वर्ष

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2016 पहला, 2019 दूसरा, 2020 तीसरा, 2021 चौथा व वर्ष 2022 पांचवां अब तक का सबसे गर्म वर्ष रहा है। वर्ष 2023 का गर्म वर्षों में कौन सा स्थान रहेगा इस बात कि पुष्टि वर्ष 2023 वार्षिक मौसम रिपोर्ट प्रकाशित होने पर होगी।

लगातार गर्म होते वर्षों को देखते हुए अंतर्राष्ट्रीय स्तर पर इस मुद्दे को चर्चा का विषय बनाया गया है। हाल ही में (2023) भारत में G20 शिखर सम्मेलन चल रहा है। जिसकी अध्यक्षता भारत कर रहा है एवं इस शिखर सम्मेलन में जलवायु परिवर्तन के मुद्दे पर भी चर्चा कि जा रही है।

G20

वर्ष 1999 ई0 में G20 का गठन हुआ। इसका दूसरा नाम Group of twenty भी है। यह दुनिया भर के 19 देशों और एक यूरोपियन यूनियन का अनौपचारिक समूह है।

प्रारम्भ में यह केंद्रीय बैंकों के गवर्नरों और वित्त मंत्रियों का संगठन हुआ करता था। दिसम्बर 1999 ई0 में इसका पहला सम्मेलन जर्मनी कि राजधानी बर्लिन में हुआ। वर्ष 2008 ई0 में विश्व को भयानक मंदी का सामना करना पड़ा। जिसके बाद इसके मूलभूत ढांचे में बदलाव करके इसे राष्ट्रों के शीर्ष नेताओं के संगठन के रूप में परिवर्तित कर दिया गया। इसके बाद यह तय पाया कि वर्ष में एक बार G20 राष्ट्रों के शीर्ष नेताओं की बैठक की जाएगी।

G20 की कार्यशैली

G20 कार्यशैली को आसान बनाने के लिए इसे दो ट्रैक में विभाजित किया गया है। शेरपा ट्रैक और वित्त ट्रैक। शेरपा ट्रैक का नेतृत्व शीर्ष नेताओं के निजी प्रतिनिधियों द्वारा किया जाता है एवं वित्त ट्रैक का नेतृत्व सदस्य देशों के वित्तमंत्री और सेन्ट्रल बैंक के गवर्नर करते हैं।

हर देश अपना शेरपा नियुक्त करता है। भारत के G20 शेरपा अमिताभ कांत हैं। शेरपा पूरे साल चर्चाओं की समीक्षा करते हैं और शिखर सम्मेलन की कार्यसूची तैयार करते हैं। अपने देश के हितों के पक्ष में माहोल बनाते हैं। वैसे तो G20 शेरपा का पद काफी प्रभावपूर्ण है। लेकिन उनके पास समझोते का अधिकार नहीं है।

वित्त ट्रैक मुख्य रूप से वित्त मंत्रालय के अधीन आता है। यह कार्यसमूह पूरे साल नियमित बैठकें करते हैं।

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सचिवालय

G20 का कोई स्थाई सचिवालय नहीं है। इसकी अध्यक्षता ट्रोइका के आधार पर होती है। जिसका मतलब तीन शक्तिशाली व्यक्तियों द्वारा शासित या प्रभुत्व वाला एक शासन है। G20 में ट्रोइका का प्रयोग इस आधार पर होता है। पिछला, वर्तमान, और आने वाला। मौजूदा वर्ष में G20 कि अध्यक्षता भारत कर रहा है। भारत के साथ इण्डोनेशिया; पूर्व अध्यक्ष, ब्राजील; वर्ष 2024 अध्यक्ष, अध्यक्षता में शामिल रहेंगे।

G20 थीम और लोगो

भारत में होने वाले G20 शिखर सम्मेलन कि थीम को महा उपनिषद के प्राचीन संस्कृत पाठ से लिया गया है। जो इस तरह है- वासुधैव कुटुम्बकम्। जिसका अर्थ हुआ एक पृथ्वी, एक परिवार, एक भविष्य। G20 लोगो राष्ट्रीय ध्वज के तीन जीवित रंगों केसरिया, सफेद और हरे रंग एवं नीले रंग से प्रेरित होकर बनाया गया है। इसमें भारत के राष्ट्रीय पुष्प कमल को पृथ्वी ग्रह के साथ प्रस्तुत किया गया है जो चुनौतियों के बीच विकास को दर्शाता है। पृथ्वी जीवन के प्रति भारत के पर्यावरण अनुकूल दृष्टिकोण को दर्शाती है। जिसका प्रकृति के साथ पूर्ण सामंजस्य है। G20 लोगो के नीचे देवनागरी लिपि में 'भारत' लिखा है।

पिछले दिनों 8 फरवरी से 11 फरवरी के बीच बैंगलूरु कर्नाटक में पर्यावरण एवं जलवायु समूह कि प्रथम बैठक एवं 27 मार्च से 29 मार्च को गाँधीनगर में इस समूह की द्वितीय बैठक का आयोजन हुआ। इस समूह की तृतीय बैठक का आयोजन 21 से 23 मई एवं चतुर्थ बैठक का आयोजन 26 से 27 मई को चेन्नई में होगा। जिसके अन्तर्गत अंतर्राष्ट्रीय स्तर पर जलवायु के मुद्दे पर चर्चा की जाएगी।

अगर हम अंतर्राष्ट्रीय स्तर पर देखें तो G20 एक ऐसा मंच है जिसके द्वारा दुनिया भर से 19 देश और एक यूरोपियन यूनियन व अन्य आमंत्रित देश इस मंच पर एकत्रित हुए हैं। जिसके द्वारा अंतर्राष्ट्रीय स्तर पर भविष्य व वर्तमान में आने वाली बहुत सारी चुनौतियों से निपटने में आसानी होगी। जिसमें सबसे बड़ी चुनौती जिसका सामना विश्व को करना पड़ रहा है वह जलवायु परिवर्तन है। जिसका हल किसी एक देश से नहीं हो सकता बल्कि सभी सदस्य देशों व अन्य मित्र देशों आपसी सहयोग से निकलेगा। इसी लिए हम G20 के मंच पर एकत्रित हुए हैं।

भारत की G20 अध्यक्षता के दौरान पर्यावरण और जलवायु परिवर्तन पर चर्चा करने के लिए पर्यावरण और जलवायु स्थिरता कार्य समूह (ECSWG) ही चार बैठक आयोजित कि जाएंगी। इस मुद्दे कि प्रथम बैठक का आयोजन 8 से 11 फरवरी 2023 को बैंगलूरु एवं द्वितीय बैठक का आयोजन 27 से 29 मार्च को गाँधीनगर में हुआ। इसके बाद शेष 2 बैठकों का आयोजन क्रमवार 21 से 23 मई व 26 से 27 मई को चेन्नई में होगा। पर्यावरण और जलवायु स्थिरता कार्य समूह की बैठक का आयोजन G20 के शेरपा द्वारा किया जा रहा है।

पर्यावरण और जलवायु स्थिरता कार्य समूह (ECSWG) की प्रथम बैठक में खनन और जंगल कि आग से प्रभावित क्षेत्रों में पुनरू वृक्षारोपड़ के साथ पर्यावरण बहाली के पहलुओं पर वैश्विक दृष्टिकोण से चर्चा की गई। खनन से प्रभावित क्षेत्रों को फिर से बहाल करने को कहा गया तथा जहां-जहां जंगल में आग लगने से वृक्षों कि संख्या में कमी आयी है वहां वृक्षारोपड़ द्वारा उसकी पूर्ति करने पर भी चर्चा कि गई। एवं इस समूह की दूसरी बैठक में पर्यावरण, जैवविविधता, जल संसाधनों के संरक्षण, प्रबन्धन एवं वैश्विक पर्यावरण संरक्षण से सम्बन्धित अन्य मुद्दों पर भी चर्चा कि गई व इसकी दो अन्य बैठकों का आयोजन क्रमशः 21 से 23 मई एवं 26 से 27 मई को चैन्नई में होंगी।

इस तरह हम कह सकते हैं कि G20 अंतर्राष्ट्रीय स्तर पर एक ऐसा मंच है जिस पर एकत्रित होकर सभी सदस्य देश एवं अतिथि देश जलवायु परिवर्तन से सम्बन्धित वर्तमान व भविष्य में आने वाली सभी चुनोटियों के समाधान हेतु अहम भूमिका निभा रहे हैं एवं वातावरण को जीवन के अनुकूल बनाने व प्रतिकूल प्रभावों को रोकने के लिए नितन्तर प्रयासरत हैं। जो कि सभी के सहयोग से संभव है।

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A Brief Review on the Effects of Global Climate Change and Disease Distribution in G20 Countries

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The term “global climate change” refers to noticeable alterations to the features of several aspects of the world’s climate, which are indicative of a change in the geographic seasonal patterns. A rise in the atmospheric concentration of greenhouse gases like methane, carbon dioxide, water vapour, ozone, and others is to blame for these changes. An increase in the concentrations of all of these greenhouse gases is what causes global warming. This develops as a result of human activities such as the use of petroleum and coal, deforestation, intensive farming, and so on. A change in the distribution of diseases, contamination, natural catastrophes, flooding, and other factors have all contributed to the environment’s degradation. These illnesses include those that are vector-borne, airborne, waterborne, and foodborne. Climate change has an impact on a number of diseases, including cholera, bluetongue illness; fever associated with dengue, tick-borne encephalitis (TBE), salmonella, and borreliosis. In 2015, nearly 800 million people were chronically malnourished. An estimated 161 million kids under the age of five are stunted. Simultaneously, 500 million people are obese. Over two billion individuals lack the micronutrients they require to live healthy lives. According to the FAO, food production will need to increase by 60% by 2050 to satisfy rising demand caused by increasing numbers of people and dietary changes. Climate change affects three aspects of disease: disease, transmission, and the host organism. The malaria-causing Plasmodium strain multiplies, spreads, and multiplies during periods of heavy rainfall and warm temperatures. The West Nile virus, which causes dengue fever, takes less time to incubate as temperatures rise. Extreme precipitation and heavy rain spread TBE and bluetongue infections more widely. Excessive rainfall causes flooding, which exacerbates salmonellosis and cholera epidemics due to sewage contamination.

Although it cannot be completely stopped, climate change can be controlled by reducing greenhouse gas emissions. Controlling this problem can be accomplished through the use of renewable energy sources in industry, solar power, electric vehicles, boosting photosynthesis rates, and genetically engineering bacteria to absorb CO₂ from the air and convert it to useful things.

1. CLIMATIC CONDITIONS OF G20

Climate is referred to as a region's averaged environmental variables, such as heat waves, atmospheric pressure, humidity, precipitation, direct sunlight, fogging, and winds (**Houghton, 2001**). It can also be viewed as the typical or typical-for-the-period temperature, precipitation, and wind conditions for a certain region at a given time. The most significant elements that affect climate are latitude, the Earth's axial tilt, the motion of the Earth's wind belts, land-sea temperature variations, terrain, and human activities, notably those connected to the lowering of the ozone layer (**Houghton, 2007; Houghton, 2011; Braide et al., 2020**).

Statistical study of weather patterns throughout time as determined by looking at variations in climatic variables like relative humidity, temperature, and moisture (IPCC, 2013). The most recent findings from the IPCC confirm the main conclusions of previous IPCC reports about the climate's evolution and its basic physical effects, such as the implications for changes in land and ocean temperatures, sea level rise, and ocean acidification. Additionally, it enhances awareness of potential spatial differences in precipitation's intensity, seasonality, and distribution. Furthermore, advances in modeling, as well as data collection and use, allow us to improve medium-term and local-scale projections of climate change impacts. These developments are essential for improving our capacity to comprehend agricultural systems and predict the effects of future changes (**IPCC, 2019; Faurès et al., 2010**).

2. GLOBAL CLIMATE ALTERATION IN THE PATTERNS OF VARIOUS CLIMATE VARIABLES

Climate change is defined as a clear alteration in the patterns of various climate variables, such as changes in temperature, rainfall, wind patterns, and snowfall, which last for a longer time, are dangerous to human health, and have an impact on other species of life. In addition to natural and human factors, there are other factors that contribute to climate change as well (**EPA, 2010**). In many regions, climate change causes a great deal of uncertainty regarding future water availability. It will have an impact on precipitation, runoff, snowmelt, hydrological systems, aquifer recharge, water temperature, and the quality of water. The increased water scarcity brought on by climate change will pose a significant obstacle to climate adaptation in many parts of the world. Surface and groundwater salinity in coastal

areas will be impacted by sea-level rise (FAO, 2015, 2015c; IBRD/WB, 2010). Extreme events are likely to become more frequent and intense as a result of climate change. Farming is already experiencing substantial difficulties as a result of weather extremes. A recent analysis by the FAO of 78 post-disaster needs assessments done in 48 developing countries between 2003 and 2013 found that 25% of the total financial damages and losses caused by short- and massive-scale climate-related emergencies like storms, flooding, and drought in developing countries are caused by agriculture-related activities (Godde et al., 2021).

3. ALTERATION OF CLIMATE CHANGES AROUND THE WORLD

It is possible to claim that climate change is caused by a variety of factors. Global warming is the biggest cause of present-day climate change, according to scientific evidence.

At the global level, climatic shocks affecting regions with a significant impact on food supplies can have indirect effects through (i) changes in how much food is available and how much it costs, which makes the market more volatile; and (ii) effects on mutual contracts and/or import/export behavior, which disrupt trade patterns. Climate change is likely to make the volatility of food prices worse. It is anticipated that trade will be crucial in helping people adapt to changes in the farming industry and food source patterns brought on by climate change. Recent evidence suggests that domestic policies, including export restrictions, have a significant impact on how volatile food prices are affected by climate change. Without sufficient purchasing power, the poorest populations and countries will ultimately be unable to access global markets (FAO, 2015; Faurès et al., 2010).

In countries where a sizable portion of the population spends a disproportionately large portion of its income on food, the impact of environmental hazards may lead to shocks to crop output and accessibility to food, with hazards of market difficulties, implications for supply and storage facilities, and increases in the value of agricultural commodities (food and feed), threatening the availability and stability of food supplies for the entire population. This has macroeconomic consequences for countries where agriculture contributes significantly to GDP and/or provides a significant source of employment. By deterring investments, climatic risks can also impede agricultural development (Rupa et al., 2016; Bongase et al., 2017; ILO, 2018b).

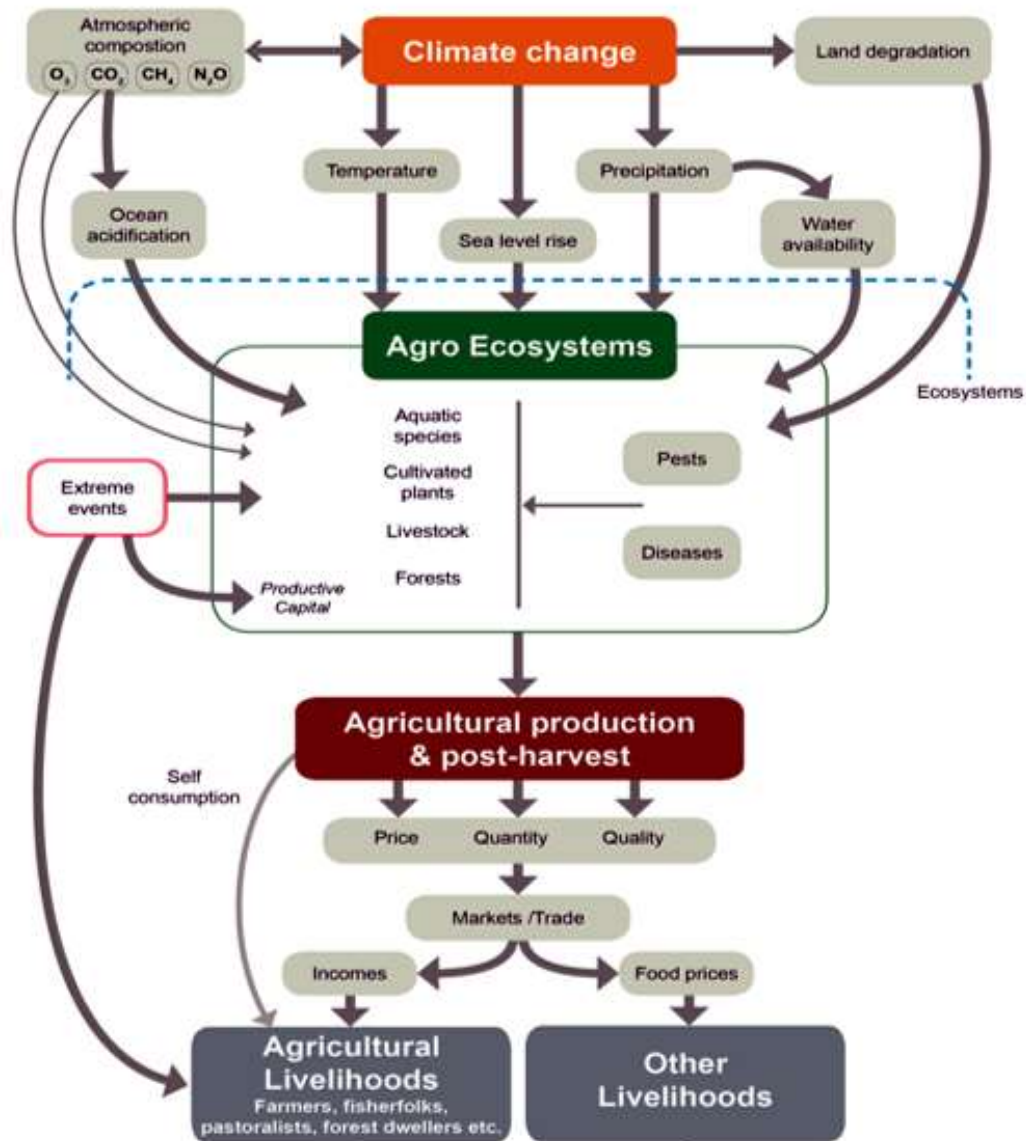


Figure 1: It graphically depicts the domino effect of climate change on global food supplies and health (adapted from FAO, 2015).

3.1. Issues related to global warming

The atmosphere naturally warms up over time due to a process called global warming that is primarily brought on by greenhouse gases. As the earth's temperature

rises, glaciers melt, sea levels rise, cloud forests perish, and wildlife scrambles to maintain their peace, we can also think of global warming as a situation arising from these effects. The earth's climate has changed as a result of global warming, and there have even been long-term changes in weather patterns that vary from place to place. Each day, as the earth spins, new heat swirls with it, picking up moisture over the oceans and obtaining it elsewhere (FAO, 2015; National Geographic, 2018; DEA, 2018). Warming is caused by human-caused greenhouse effect expansion. According to the IPCC (2014), this warming happens when heat emitted by the earth toward space is trapped in the atmosphere.

3.2. Greenhouse effect

Any gaseous molecule that can absorb the energy from the sun (infrared radiation) and emit it back towards the Earth is termed a greenhouse gas. These gases include, for instance, carbon dioxide and methane, hydrogen peroxide, ozone, and nitrous gases; gases that are fluorinated (Micheal, 2018; Mann, 2023).

3.3. Carbon Dioxide effect

The largest amount of greenhouse gas, carbon dioxide, was deposited in the atmosphere between 2005 and 2018, with an average concentration of 2.0 parts per million. It is produced by volcanic off-gassing, aerobic respiration, burning fossil fuels, and the breakdown of organic matter or naturally occurring decay (Micheal, 2018). The process of photosynthesis assimilation by phytoplankton, the soluble pump (the mechanism by which surface seawater containing dissolved CO₂ sinks), and other physical, chemical, and biological processes all contribute to this, and their integration into the earth's crust, which takes up CO₂ from the surroundings by carbon sinking, helps to balance the amount of CO₂ in the atmosphere (Micheal, 2018). Since the rise of industrialization, human activities have tipped the scales in this equilibrium. The burning of fossil fuels like coal, oil, and natural gas is one of these activities. These effects have also been influenced by other anthropogenic activities like land clearing and forest burning (Mann, 2023).

3.4. Water vapour

Some scientists consider water vapor to be climate change or an internal reaction that keeps the climate system active. Air temperatures directly affect the amount of water vapor produced, independent of human activities. The rate at which water evaporates from the surface increases with atmospheric temperature. When there is a higher rate of evaporation, there is a higher concentration of water vapor in the lower atmospheres. This water vapor has the ability to absorb infrared radiation and then emit it back toward the earth. (Micheal, 2018; Mann, 2023).

3.5. Stratospheric ozone depletion

Surface ozone is brought about by air pollution. The presence of carbon monoxide pollution is caused by chemical reactions in the atmosphere. Stratospheric ozone depletion is a contributing factor as well. The atmospheric concentration of surface ozone is 50 ppb, and the net radiative forcing due to human-caused surface ozone emissions amounts to about 0.35 watts per square meter (**Micheal, 2018; Mann, 2023**).

3.6. Biological reactions

These are traces of gases produced by industrial processes. Sulfur hexafluoride, hydrofluorocarbons, and perfluorocarbons are among the fluorinated gases. While fluorinated gases are produced by industrial processes, nitrous oxides are produced by naturally occurring biological reactions in soil and water (**Micheal, 2018; Mann, 2023**).

4. FACTORS THAT CONTRIBUTE TO CLIMATE CHANGE

Anthropogenic Activities: Human has engaged in many activities that have put the earth in danger in an effort to learn new technologies in response to growing demands for better living conditions brought on by globalization and industrialization. The use of fossil fuels, industrialization, deforestation, and the creation of new cities, towns, and roads are some of these activities. According to the **American EPA (2010)**, all of these activities contribute to an increased amount of global warming by releasing greenhouse gases (CO₂) into the atmosphere (**Béné et al., 2014; GIZ, 2015; UNESCO, 2016**).

Innate essentials: The earth's orbit is constantly changing, and this change in orbit affects the climate. Because of human activity, greenhouse gases are increasing, which weakens the ozone layer and raises solar intensity. This causes the ice in the Arctic regions (glaciers) to melt, which causes the oceans to fill up and affect aquatic life. It also raises atmospheric temperatures and increases volcanic activity.

While climate change is frequent on Earth, the present substantial increase in warming cannot be attributed to naturally occurring causes (**EPA, 2010**).

5. CLIMATE VARIABLE AND ITS IMPACT ON INFECTIOUS DISEASES

Climate change includes changes in climate variables such as temperature, precipitation, sunshine, wind, and rainfall. According to **Xiaoxu et al. (2016)**, **pathogens** and diseases that infect hosts may be negatively affected by shifts in these factors, which can influence their ability to live, reproduce, and spread. Global warming, higher temperatures, rising sea levels, pH imbalances, and severe weather

events like flooding, fires, and severe thunderstorms are all outcomes of human activity, specifically the release of greenhouse emissions from fossil fuels (**Braide et al., 2020**).

There are two types of infectious diseases: communicable and non-communicable. Infectious diseases spread via vectors, ingested food, exhaled air, or ingested water. Pathogens include viruses, bacteria, protozoa, and fungi, among many other disease-causing agents. Climate change can have a direct impact on pathogens by influencing their survival, reproduction, and life cycle, or it can have an indirect impact by influencing their habitat, atmosphere, or rivals (**Xiaoxu et al., 2016**).

Water-borne diseases could be affected by changes in precipitation brought on by climate change. The growth of pathogens that cause water-borne diseases is significantly influenced by rainfall. According to **Jofre et al. (2010)**, the presence of fecal pathogens is increased during the rainy season as a result of heavy rain's potential to stir up water sediments and cause an accumulation of fecal microorganisms. On the other hand, unusual precipitation following a protracted drought may lead to an increase in pathogens and an epidemic of diseases (**Wilby et al., 2005**). During times of drought and low rainfall, the Lower River flows more than usual, raising the concentration of waterborne pathogens in the effluent. Infectious disease pathogens are also affected by changes in humidity. Infectious diseases that are spread through the air, like the flu, often have pathogens that are sensitive to humidity levels. According to **Shaman and Kuhn (2005)**, temperature and absolute humidity, for instance, have an impact on the spread and survival of the influenza virus. According to the research of **Lowen et al. (2007)**, flu viruses propagate more easily in environments with low temperatures and low relative humidity. The viruses that cause waterborne diseases are also impacted by changes in humidity. The drying effect of surface water, for example, limits the survival of waterborne viruses near the water's surface (**Braide et al., 2020**). Finally, changes in humidity may affect the virus that causes vector-borne diseases. Humidity has been shown to influence the development of malaria parasites in *Anopheles* mosquitoes (**Patz et al., 2003**). **Thu et al. (1998)** state that mosquitoes are more likely to spread the dengue virus in Yangon and Singapore during the rainy season due to the warmer temperatures and higher humidity, which contribute to dengue hemorrhagic fever outbreaks in these areas. Another significant climate factor that might have an impact on infectious disease pathogens is sunshine.

The prevalence of disease in a given place is in some way related to the local climate. Most infectious diseases are due to microorganisms, which are spread by vectors whose geographic ranges are influenced by the prevailing weather patterns of the time. Climate change has the potential to impact the disease's ability to persist, reproduce, and spread, its mode of transmission, and host susceptibility to the disease

(Xiaoxu et al., 2016; Braide et al., 2020). Climate change effects on disease distribution are defined by alterations in the regional and seasonal patterns of human infectious illnesses, changes in outbreak frequency, and disease severity (Xiaoxu et al., 2016). For example, in the summer, ancient Romans retired to cooler hillside villas to prevent malaria since hotter circumstances encouraged mosquito breeding (WHO, 2010, 2019; UNEP/GPA, 2006).

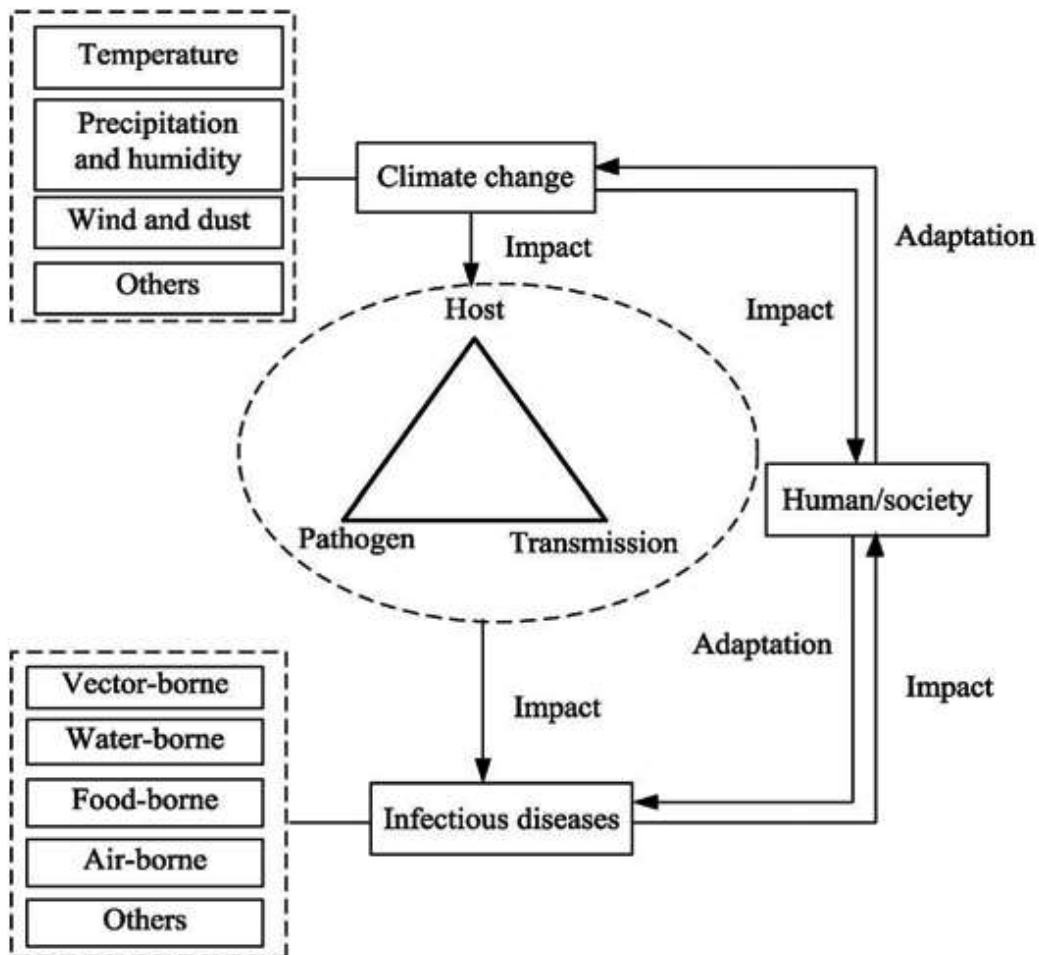


Figure 2: The interplay between global warming, sickness, and the weather (Xiaoxu et al., 2016).

5.1.1. Vector borne diseases

Diseases that are transmitted mostly by animals or people are called vector-borne diseases. The infected animal or human merely acts as a vector for the parasite

or cyst that is responsible for the disease. Malaria, typhus, rickettsiosis, scrub typhus, bird flu, and rabies are all examples of such infectious diseases. When temperatures are higher, insect vectors that spread disease are more active (**Xiaoxu et al., 2016**).

5.1.2. Malaria

Climate change may increase malaria in some areas, while it may not affect mosquitoes in others. Temperature and rainfall affect malaria transmission. The life cycle, transmission rates, and prevalence of the *Plasmodium* parasite in mosquitoes are all influenced by these climatic factors. Tropical mosquitoes like *Anopheles* need temperatures above 16°C to complete their life cycles, while malaria parasites develop faster at temperatures above 20°C. If temperatures are right, one mosquito can spread *Plasmodium falciparum* malaria to 200 people (**Franklin et al., 2017**). Since mosquitoes lay their eggs in water-filled receptacles in aquatic habitats, vector-borne diseases like malaria are considered water-borne (**Lafferty, 2009; Shuman, 2011; Godde et al., 2021**). In JEV ecology, the maximum temperature of 22–23°C for mosquito development and the minimum temperature of 25–26°C for transmission are crucial (**Xiaoxu et al., 2016**).

5.1.3. Dengue fever

Dengue fever is a significant viral infectious disease that is spread by vectors. The number of dengue fever patients rises in direct proportion to the number of mosquitoes available to spread the disease (**Ichiro, 2010**). This is because the abundance of vectors is determined by the prevailing weather patterns at any given moment. Malaria and dengue fever epidemics are more common during the tropics' periodic rainy seasons and following extreme weather events. However, West Nile virus epidemics, which are spread by mosquitoes, are more likely to happen during dry periods. This is because, near restricted water sources, mosquitoes and birds, the virus' principal hosts, are brought into close proximity, facilitating transmission between mosquitoes and birds (and eventually to humans). When wetlands dry up, natural predators of mosquitoes drastically decrease (**Fu et al., 2023; Braide et al., 2020; Godde et al., 2021**).

5.1.4. Water- Borne Diseases

Climate change has a significant impact on the hydrologic cycle, which in turn has a significant impact on water-borne diseases similar to those caused by vectors. When there is a shortage of water, sanitation suffers, and more people are exposed to potentially tainted water. After a severe drought in late 2009, for instance, approximately 4700 cases of cholera were reported in one month in northern Kenya,

with 119 fatalities (**Holzer et al., 2009**). Like drought, floods and heavy precipitation can contaminate water supplies and spread disease, especially if sanitation is inadequate because of overflowing sewage systems or animal waste. Heavy spring rains in Milwaukee, Wisconsin, in 1993 led to an outbreak of cryptosporidium-caused diarrhea. There were approximately 403,000 cases reported, showing how quickly and far-reaching water contamination in a community can spread diarrheal disease (**Braide et al., 2020**).

5.1.5. Cholera

Cholera is a contagious illness caused by the bacteria *Vibrio cholerae* and spread by consuming or drinking tainted water or food. Conditions favorable to bacterial growth include high air temperatures and times of significant rainfall. River levels drop and bacteria concentrations become unhealthy when precipitation is scarce. Extreme rainfall can cause floods, which can transmit bacteria to new areas and quickly create an epidemic (**Laura, 2014**). Flooding and landslides become more common as the frequency of storms and rainfall increases. The result may be a cholera epidemic. Environment-wide infrastructure instability is common after landslides (**Franklin, 2017**).

Due to climate change, the number and distribution of insects that serve as vectors for disease are shifting and growing (**Xiaoxu et al., 2016; Braide et al., 2020**). As a result of the effects of climate change on disease vectors, the distribution, frequency, and severity of infectious diseases may shift. The regional and temporal distribution of disease vectors is influenced by temperature. Insects' native to low-latitude locations may move to mid- or high-latitude areas, as well as areas of high altitude, if global temperatures continue to rise. This could result in the spread of illnesses to new regions. Recent research has shown that the distribution of certain vector-borne human infectious illnesses has expanded. These include yellow fever, the plague, dengue, lyme disease, African trypanosomiasis, tick-borne encephalitis. Mosquitoes, ticks, and midges, which spread these diseases, have expanded their habitat into northern latitudes. The intermediate host of *Schistosoma japonicum*, *Oncomelania hupensis*, has expanded its range in China to include northern China as winter temperatures continue to rise (**Zhou et al., 2010**). In general, low humidity, particularly when combined with high temperatures, creates conditions that are unfavorable for ticks and fleas (e.g., grasslands or forestlands), which in turn limits the development of infectious diseases that are associated with these pests (**Gage et al., 2008; Braide et al., 2020**).

6. CONCLUSIONS

Temperatures on Earth are expected to climb by 3–7 °F by the year 2100 if the current trend continues. More shifts are likely as the climate continues to warm, and many consequences will intensify with time. Heat waves, for instance, are predicted to increase in frequency, intensity, and duration. The likelihood of flooding and destruction in coastal towns is expected to rise as some storms get bigger and more frequent. Adaptation to risks and shifting conditions will determine the specific ways in which climate change will impact various geographic areas, ecological communities, and economic sectors. The ability of societies and ecosystems to respond to threats and adjust to shifting climates and environments has been consistently impressive throughout history. Changes in the climate have already been detected, and the rate of warming has accelerated in recent decades. Due to the G20 countries, human activity is contributing to climate change, which constitutes a significant problem that may call for novel techniques and ways of thinking in order to secure the continued health, welfare, and productivity of society as well as the natural environment.

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India and the G20: Navigating the Climate Change Agenda

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The G20 is a forum of the world's largest economies, including India, that meets annually to discuss global economic governance issues. In recent years, climate change has emerged as a key agenda item at these meetings. India, as one of the world's largest emitters of greenhouse gases, has been a crucial player in these discussions. This paper examines India's position on climate change within the G20, analyzing the country's domestic policies and international commitments on this issue. The paper also explores the challenges that India faces in balancing its economic growth ambitions with its climate change commitments.

Introduction: The G20 has been instrumental in shaping global economic governance, particularly in the aftermath of the 2008 financial crisis. However, in recent years, the group has also emerged as a key forum for discussions on climate change. As one of the world's largest economies and a major emitter of greenhouse gases, India's role in these discussions is crucial. This paper examines India's position on climate change within the G20, exploring the country's domestic policies and international commitments on this issue.

India, an emerging economy, ranks first among all G20 members in terms of overall climate performance, owing to its significantly low per capita contributions to carbon and GHG emissions; very limited share in legacy emissions relative to its population needs; least rate of per capita energy use; and significant efforts towards, not only preserving, but also expanding its climate-regulating land cover by 6% compared with its 1992 levels.

Long-term changes in temperature and weather patterns are referred to as climate change. Such fluctuations may be brought on by significant volcanic eruptions or variations in the sun's activity. But since the 1800s, human activities—primarily the combustion of fossil fuels like coal, oil, and gas—have been the primary cause of climate change.

Fossil fuel combustion produces greenhouse gas emissions that blanket the planet, trapping heat from the sun and increasing temperatures.

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Carbon dioxide and methane are the primary greenhouse gases responsible for climate change. These are produced, for instance, while burning coal or petrol to heat a building. Carbon dioxide can also be released when woods and land are cleared. Oil and gas operations, agriculture, and

Climate scientists have demonstrated that over the past 200 years, almost all of the global warming has been caused by people. The earth is warming faster than it has in at least the last two thousand years due to greenhouse gases caused by human activities like the ones outlined above.

The Earth's surface is currently around 1.1°C warmer on average than in the late 1800s (before the industrial revolution) and warmer than it has ever been in the previous 100,000 years. The last four decades have been warmer than any decade since 1850, with the most recent decade (2011–2020) being the warmest on record.

Climate change may have an impact on our work, housing, safety, and ability to grow food. Some of us, such as residents of small island states and other developing nations, are already more susceptible to the effects of the climate. Long-lasting droughts are putting people at risk of starvation, while conditions like sea level rise and saltwater intrusion have progressed to the point that entire communities have been forced to evacuate. The quantity of “climate refugees” is anticipated to increase in the future.

India's Domestic Policies on Climate Change: India has taken a number of steps to address climate change domestically. The country has committed to reducing the intensity of its greenhouse gas emissions by 33-35% by 2030, compared to 2005 levels. The government has also set a target of generating 40% of its electricity from renewable sources by 2030. Additionally, India has launched a number of initiatives to promote sustainable development, including the Smart Cities Mission, the Atal Mission for Rejuvenation and Urban Transformation, and the National Action Plan on Climate Change.

India's International Commitments on Climate Change: India has also been an active participant in international discussions on climate change. The country was a key player in the negotiations leading up to the Paris Agreement, which was adopted in 2015. Under the agreement, India committed to reducing the intensity of its greenhouse gas emissions by 33-35% by 2030, compared to 2005 levels. The country also pledged to increase its share of non-fossil fuel-based power generation capacity to 40% by 2030. India has also been involved in discussions on climate finance, calling for developed countries to provide more financial support to developing countries to help them address the impacts of climate change.

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Challenges for India: Despite these commitments, India faces a number of challenges in addressing climate change. The country's rapid economic growth has led to a significant increase in energy consumption, which in turn has led to an increase in greenhouse gas emissions. Additionally, India's energy mix is heavily dependent on coal, which is a major source of greenhouse gas emissions. Balancing its economic growth ambitions with its climate change commitments is therefore a major challenge for India.

Conclusion: India's role in the G20 discussions on climate change is crucial, given the country's status as one of the world's largest emitters of greenhouse gases. While India has taken significant steps to address climate change, balancing its economic growth ambitions with its climate change commitments remains a major challenge. The G20 presents an opportunity for India to engage with other countries and develop a coordinated global response to climate change.

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पर्यावरण संरक्षण के संबंध में संवैधानिक एवं कानूनी प्रावधान

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पर्यावरण का अर्थ जीवधारियों और वनस्पतियों के चारों ओर के आवरण से लगाया जाता है। मानव पर्यावरण संबंध विभिन्न कालों में परिस्थितियों के अनुसार बदलते रहे हैं। आदि मानव का प्रकृति से प्रेम पूर्ण संबंध था और पशुपालन युग में भी इस प्रेम में कोई कमी नहीं आई किंतु कृषि के आविष्कार के बाद परिस्थितियां बदलने लगी। जंगलों को साफ करके कृषि भूमि में परिवर्तित किया गया। कृषि क्रांति एवं औद्योगिक क्रांति के बाद मानव पर्यावरण का शत्रु बन गया। जनसंख्या में वृद्धि एवं बढ़ते नगरीकरण ने प्रकृति को व्यापक रूप से नुकसान पहुंचाना शुरू किया। प्राकृतिक संसाधनों पर लगातार बढ़ते बोझ से प्राकृतिक आपदाओं की संख्या में वृद्धि होने लगी।

ग्लोबल वार्मिंग के कारण सूखा, बाढ़, तूफान, समुद्र के जल स्तर में वृद्धि, खाद्यान्न संकट, स्वास्थ्य संकट, विभिन्न प्रजातियों का विनाश, गरीबी और भुखमरी, बड़े पैमाने पर विस्थापन आदि अनेक संकटों का सामना आज संपूर्ण विश्व को करना पड़ रहा है। प्रकृति के इस कहर को कम करने और सतत विकास की अवधारणा को बढ़ावा देने हेतु राष्ट्रीय एवं अंतरराष्ट्रीय स्तर पर अनेक नियमों, कानूनों, संधियों, समझौतों, प्राधिकरणों आदि की स्थापना की गई। संयुक्त राष्ट्र संघ द्वारा पर्यावरण संरक्षण हेतु अनेक सम्मेलनों का आयोजन किया गया जिसमें अंतरराष्ट्रीय स्तर के अनेक समझौते हुए। भारत ने अपनी प्राचीन संस्कृति के अनुरूप पर्यावरण संरक्षण के संबंध में प्रारंभ से ही काफी सकारात्मक दृष्टिकोण अपनाया। भारतीय संविधान के निर्माताओं ने संविधान में प्रकृति के संरक्षण हेतु अनेक प्रावधान किए और इसके लिए अनेक कानूनों का निर्माण एवं प्राधिकरण का गठन किया गया।

भारतीय दंड संहिता (IPC) 1960 एवं आपराधिक प्रक्रिया संहिता (CRPC) 1971 में भी पर्यावरण संरक्षण हेतु विभिन्न व्यवस्थाएं की गई किंतु जन जागरूकता के अभाव, क्रियान्वयन संबंधी समस्याओं और बढ़ती भौतिकवादी प्रवृत्ति के कारण पर्यावरण संरक्षण के संबंध में अपेक्षित सफलता नहीं मिल पाई। इस संबंध में राष्ट्रीय एवं अंतरराष्ट्रीय स्तर पर विभिन्न स्तरों से निरंतर प्रयास किए जा रहे हैं। G7 और G20 जैसे अंतरराष्ट्रीय संगठन पर्यावरण संरक्षण के संबंध में विभिन्न प्रकार के प्रषंसनीय कार्य कर रहे हैं।

प्रस्तावना

पर्यावरण शब्द का साधारण अर्थ जीवधारियों एवं वनस्पतियों के चारों ओर के आवरण से लगाया जाता है। पर्यावरण संरक्षण अधिनियम 1986 के अनुसार “पर्यावरण किसी जीव के चारों तरफ

घिरे भौतिक एवं जैविक दृष्टांत एवं उनके साथ अंतःक्रिया को सम्मिलित करता है।” मानव पर्यावरण संबंधी विभिन्न कार्यों में बदलते रहे हैं। आदि मानव प्राकृतिक पर्यावरण पर पूर्णता निर्भर था और प्रकृति के सानिध्य में रहता था। पशुपालन युग में प्राकृतिक संसाधनों का उपयोग कुछ बढ़ा किंतु इसका प्राकृतिक पर्यावरण पर कोई विपरीत प्रभाव नहीं पड़ा। कृषि के आविष्कार एवं मानव के स्थाई रूप से बसने के बाद विभिन्न नदी घाटी सभ्यताओं का जन्म हुआ। धीरे-धीरे मानव की जनसंख्या में वृद्धि होती गई और अधिक क्षेत्र में कृषि कार्य करने हेतु वनों की सफाई की आवश्यकता पड़ी, इससे धीरे-धीरे प्राकृतिक संसाधनों पर बोझ बढ़ना प्रारंभ हुआ लेकिन यह इतना अधिक नहीं था कि प्रकृति स्वयं इसका समायोजन ना कर सके। कृषि में नई तकनीकों एवं प्रौद्योगिकियों के प्रयोग के साथ ही व्यापक रूप से उत्पादन हेतु वनों को साफ करके कृषि भूमि में परिवर्तित किया गया। कृषि क्रांति के बाद औद्योगिक क्रांति हुई एवं नगरीकरण में वृद्धि हुई। वैज्ञानिक क्रांति के बाद मानव की जनसंख्या में तेजी से वृद्धि हुई, भौतिकवादी प्रवृत्तियों के बढ़ने से अब व्यापक रूप से पर्यावरण का विनाश होने लगा।

जलवायु परिवर्तन के कारण

प्राकृतिक संसाधनों के अविवेकपूर्ण विदोहन, स्थानांतरित कृषि, पशुपालन में वृद्धि, रसायनिक खादों एवं कीटनाशकों का बढ़ता प्रयोग, पशुपालन में वृद्धि, यातायात के साधनों में वृद्धि, ऊर्जा की बढ़ती मांग, कोयले, तेल एवं गैस के प्रयोग में वृद्धि, नगरीकरण, आधारभूत संरचना का विकास, सड़कों, पुलों और फ्लाईओवेरो का फैलता जाल, पर्यटन में वृद्धि आदि से कार्बन उत्सर्जन और ग्लोबल वार्मिंग में तेजी से वृद्धि हुई जिसके कारण मानव और प्रकृति के संबंध शत्रु जैसे हो गए।

प्रकृति के साथ निरंतर छेड़छाड़ एवं प्राकृतिक संसाधनों के अत्यधिक दोहन से पर्यावरण पर काफी दुष्प्रभाव पड़ा जिसके कारण प्रकृति ने भी अपना विकराल रूप दिखाना प्रारंभ किया। सूखा, बाढ़, गर्म हवाएं, तूफान, समुद्र के तापमान में वृद्धि, आर्थिक एवं तटीय क्षेत्रों में बर्फ का पिघलना, समुद्र के जल स्तर में वृद्धि, प्रजातियों का विनाश, तटीय क्षेत्रों से विस्थापन, खाद्य संकट, गरीबी एवं भुखमरी एवं मानव स्वास्थ्य पर संकट आदि समस्याओं का सामना आज भारत सहित संपूर्ण विश्व कर रहा है।

जलवायु संरक्षण हेतु अंतरराष्ट्रीय प्रयास

प्रकृति के कहर को कम करने एवं मानव और प्रकृति के संबंधों में संतुलन बनाने हेतु राष्ट्रीय एवं अंतरराष्ट्रीय स्तर पर विभिन्न संगठनों एवं कानूनों का निर्माण आवश्यक हो गया। सन 1900 में अफ्रीकी वन्यजीवों के संरक्षण हेतु लंदन कन्वेंशन हुई।

1962 में रसेल कार्लसन की पुस्तक Silent Spring के प्रकाशन के बाद पर्यावरण के संबंध में वैश्विक स्तर पर जागरूकता फैली। पहली बार व्यापक रूप से जलवायु परिवर्तन संबंधी समस्याओं पर विचार करने हेतु संयुक्त राष्ट्र संघ द्वारा 1972 में स्वीडन की राजधानी स्टॉकहोम में एक अंतरराष्ट्रीय सम्मेलन का आयोजन किया गया और पर्यावरण संरक्षण हेतु 26 सिद्धांतों को मान्यता दी गई। 1985

में ओजोन परत के संरक्षण हेतु ऑस्ट्रिया की राजधानी वियना में सम्मेलन हुआ और 1987 में मॉन्ट्रियल प्रोटोकॉल हुआ जिसमें 16 सितंबर को ओजोन दिवस मनाने का निर्णय लिया गया। पृथ्वी ग्रह के संरक्षण हेतु प्रथम पृथ्वी सम्मेलन 1992 में ब्राजील की राजधानी रियो डी जेनेरो में हुआ जिसमें टिकाऊ विकास हेतु 'एजेंडा -21' स्वीकृत हुआ। संयुक्त राष्ट्र संघ की पहल पर ग्लोबल वार्मिंग की चुनौती से निपटने हेतु 1992 में यूनाइटेड नेशंस फ्रेमवर्क कन्वेंशन ऑन क्लाइमेट चेंज (UNFCCC) की स्थापना की गई।

1997 में UNFCCC के तीसरे सम्मेलन COP-3 में क्योटो प्रोटोकॉल को स्वीकार किया गया जिसका उद्देश्य पर्यावरण के लिए खतरा उत्पन्न करने वाली हर गतिविधि पर रोक लगाना है।

2002 में जोहानेसबर्ग में द्वितीय पृथ्वी सम्मेलन हुआ जिसमें सतत विकास एवं गरीबी उन्मूलन पर बल दिया गया। उसके बाद भी कानकून, पेरिस और मैड्रिड जैसे महत्वपूर्ण सम्मेलन आयोजित हो चुके हैं एवं अनेक अंतरराष्ट्रीय संगठनों एवं प्राधिकरणों का गठन किया जा चुका है। भारत सरकार ने अपने स्तर पर 2070 तक नेट जीरो का लक्ष्य रखा है एवं जी-20 के अध्यक्ष के नाते भारत इस संगठन के माध्यम से पर्यावरण संरक्षण हेतु महत्वपूर्ण प्रयास कर रहा है।

जलवायु के संरक्षण हेतु संवैधानिक प्रावधान

प्राचीन भारतीय संस्कृति में उच्चतम आदर्शों एवं नैतिक मूल्यों को अत्यधिक महत्व दिया गया है। प्रकृति के विभिन्न रूपों की पूजा प्राचीन काल से ही भारत में होती रही है। हमारे महापुरुषों एवं ऋषि-मुनियों ने सदैव सादा जीवन एवं उच्च विचार और वसुधैव कुटुंबकम जैसे आदर्शों पर बल दिया है। सादा जीवन अपने आप में ही पर्यावरण संरक्षण का पर्याय है। भारत में आज भी बहुत सारे लोग प्राचीन संस्कृति के अनुरूप सादा जीवन एवं उच्च विचार वाले आदर्श का पालन कर रहे हैं इसीलिए भारत में प्रति व्यक्ति कार्बन उत्सर्जन विश्व में लगभग सबसे कम है। प्राचीन भारतीय संस्कृति के आदर्शों को संविधान निर्माताओं ने भी भारतीय संविधान में आत्मसात करने का प्रयत्न किया है। संविधान में पर्यावरण संरक्षण हेतु अनेक प्रावधान किए गए हैं जो के निम्नलिखित हैं-

- संविधान के अनुच्छेद 14 में भारत के सभी व्यक्तियों को विधि के समक्ष समता और विधियों का समान संरक्षण प्रदान किया गया है। यह अनुच्छेद सरकार को ऐसे किसी भी कानून का निर्माण करने से रोकता है जो प्रा तिक संसाधनों के उपभोग एवं प्रयोग में नागरिकों के मध्य भेदभाव करता है। संविधान का यह अनुच्छेद प्राकृतिक न्याय की बात करता है।
- संविधान का अनुच्छेद 19 (1)(D) भारतीय नागरिकों को भारत में अवाध संचरण की स्वतंत्रता प्रदान करता है किंतु 19 (5) के अंतर्गत राज्य अनुसूचित जनजातियों के हितों एवं पर्यावरण संरक्षण हेतु इस अधिकार पर निरबंधन लगा सकता है।
- अनुच्छेद 19 (1) (E) द्वारा नागरिकों के भारतीय क्षेत्र में कहीं भी निवास करने तथा बस जाने की स्वतंत्रता दी गई है किंतु अनुच्छेद 19(5) द्वारा अनुसूचित जनजाति के संरक्षण या पर्यावरण संरक्षण हेतु इस अधिकार पर निरबंधन लगाया जा सकता है।

- अनुच्छेद 19 (1) (F) में भारत के नागरिकों को कोई भी व्यापार या कारोबार करने की स्वतंत्रता प्राप्त है किंतु राज्य द्वारा जनता के स्वास्थ्य की दृष्टि से अथवा पर्यावरण संरक्षण हेतु इस अधिकार पर भी प्रतिबंध का प्रावधान किया गया है।
- संविधान के अनुच्छेद 21 में जीवन और दैहिक स्वतंत्रता के अधिकार का वर्णन किया गया है। जीवन के अधिकार में स्वस्थ वातावरण में रहने का अधिकार भी सम्मिलित है। मेनका गांधी बनाम भारत संघ (1978) के वाद में सर्वोच्च न्यायालय ने मानव गरिमा को बनाए रखते हुए जीवन के अधिकार की बात कही थी।

सुभाष कुमार बनाम बिहार राज्य 1991 के मामले में सर्वोच्च न्यायालय ने निर्णय दिया कि प्रदूषण मुक्त जल एवं स्वच्छ वायु के उपयोग का अधिकार अनुच्छेद 21 के अंतर्गत जीवन के अधिकार में सम्मिलित है।

एम सी मेहता बनाम भारत संघ (1987) के मामले में भी सर्वोच्च न्यायालय का मत था कि प्रदूषण मुक्त वातावरण में रहना अनुच्छेद 21 के अंतर्गत जीवन के अधिकार में निहित मौलिक अधिकार है।

- भारतीय संविधान में वर्णित राज्य के नीति निर्देशक तत्वों के अनुच्छेद 48। में कहा गया है कि राज्य देश के पर्यावरण संरक्षण और संवर्धन का तथा वन और वन्य जीवन की सुरक्षा का प्रयास करेगा। भारत में पर्यावरण संरक्षण एवं वन्यजीवों की सुरक्षा हेतु इस अनुच्छेद को 1946 में संविधान के 42वें संशोधन द्वारा जोड़ा गया।
- संविधान के अनुच्छेद 51 में कहा गया है कि राज्य अंतर्राष्ट्रीय शांति एवं सुरक्षा में वृद्धि राष्ट्रों के मध्य न्याय और सम्मान पूर्व संबंध बनाए रखने तथा राष्ट्रों के आपसी व्यवहार में अंतरराष्ट्रीय कानून और संधियों के प्रति आदर का भाव रखेगा। किस अनुच्छेद के अंतर्गत राज्य पर्यावरण संबंधी अंतर्राष्ट्रीय संधियों एवं कानूनों का पालन करता है एवं फोन को प्रोत्साहन देता है।
- संविधान के भाग 4क (अनुच्छेद 51क) में भारतीय नागरिकों के मौलिक कर्तव्यों का वर्णन किया गया है। इन्हीं में से नागरिकों का एक मौलिक कर्तव्य है कि प्राकृतिक पर्यावरण का जिनके अंतर्गत वन, झील, नदी और वन्य जीव हैं, रक्षा करें और उसका संवर्धन करें तथा प्राणी मात्र के प्रति दया भाव रखें।

संविधान के अनुच्छेद 253 में कहा गया है कि केंद्र सरकार अंतरराष्ट्रीय करारों को प्रभावी करने के लिए राज्य सूची के विषयों पर भी कानून बना सकती है। इसी अनुच्छेद के अंतर्गत भारत की संसद द्वारा 1986 में पर्यावरण संरक्षण कानून पारित किया गया। संसद द्वारा उसके बाद भी पर्यावरण की रक्षा हेतु समय-समय पर अनेक नियमों, अधिनियमों और कानूनों का निर्माण किया गया है जो कि निम्नलिखित हैं-

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- 3- जल (प्रदूषण की रोकथाम एवं नियंत्रण) अधिनियम 1974
- 4- वन संरक्षण अधिनियम 1980
- 5- वायु (प्रदूषण की रोकथाम एवं नियंत्रण) अधिनियम 1981
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संविधान के अतिरिक्त भारतीय दंड संहिता (IPC) 1860 और आपराधिक प्रक्रिया संहिता (CRPC) 1973 में भी पर्यावरण को प्रदूषित करने हेतु विभिन्न अपराधों, दण्ड एवं प्रक्रियाओं का वर्णन है।

- आईपीसी के अध्याय 14 की धारा 268 एवं 294। उन अपराधों से संबंधित है जो सुरक्षा, सार्वजनिक स्वास्थ्य आदि पर विपरीत प्रभाव डालते हैं। यह प्रावधान सार्वजनिक स्वास्थ्य को प्राथमिकता देते हैं और ऐसे किसी भी कार्यों को दंडित बनाते हैं जो पर्यावरण को प्रदूषित करता है एवं जीवन को खतरनाक बनाता है।
- आईपीसी की धारा 277 में कहा गया है कि यदि कोई मनुष्य सार्वजनिक जलाशय के पानी को दूषित करता है तो उसे 3 महीने के कारावास अथवा ₹0 1000 का जुर्माना अथवा दोनों की सजा हो सकती है।
- आईपीसी की धारा 278 में उस व्यक्ति के लिए दंड का प्रावधान किया गया है जो किसी स्थान के वातावरण को अस्वच्छ करता है।
- धारा 290 सार्वजनिक उद्योग एवं पर्यावरण को प्रदूषित करने वाले व्यक्तियों से निपटने के संबंध में है यह धारा ध्वनि प्रदूषण को भी अपराध किस श्रेणी में रहती है।
- धारा 426 में कहा गया है कि कोई भी व्यक्ति जो रिष्टि (किसी सार्वजनिक संपत्ति को नुकसान पहुंचाने अथवा पर्यावरणीय क्षति की शरारत) करेगा तो वह 3 माह के कारावास का हकदार होगा।

- धारा 430 कहती है कि जो व्यक्ति कृषि प्रयोजन हेतु जल अथवा जानवरों के पानी की आपूर्ति में बाधा उत्पन्न करेगा तो वह 5 वर्ष के दंड एवं जुर्माने का भागीदार बनेगा।
- आईपीसी की धारा 431 में कहा गया है कि यदि किसी व्यक्ति द्वारा सार्वजनिक सड़क, पुल, नदी आदि के प्रवाह को बाधित या कम करेगा तो उसे 5 वर्ष तक के कारावास की सजा एवं जुर्माना भरना होगा।
- आईपीसी की धारा 432 लोक जल निकास में बाधा उत्पन्न करने पर 5 वर्ष तक की सजा एवं जुर्माने का प्रावधान करती है।
- दंड प्रक्रिया संहिता (CRPC) की धारा 91 एवं 133 में भी उन प्रक्रियाओं का वर्णन है जो वातावरण को प्रदूषित करने वाली गतिविधियों के लिए दंड का प्रावधान करती हैं।

पर्यावरण के संरक्षण हेतु राष्ट्रीय एवं अंतर्राष्ट्रीय स्तर पर इतने सारे नियम, उपनियम, अधिनियम, कानून, संगठन, प्राधिकरण होने के बाद भी जलवायु परिवर्तन एवं पर्यावरण के विनाश की समस्या दिन-ब-दिन बढ़ती जा रही है।

विश्व मौसम विज्ञान संगठन (WMO) की अभी हाल की रिपोर्ट में कहा गया है कि वर्ष 2022 में पृथ्वी ग्रह का औसत तापमान 1850-1900 के मध्य की अवधि (पूर्व औद्योगिक काल) की तुलना में 1.15 डिग्री सेल्सियस अधिक था।

जलवायु परिवर्तन के दुष्प्रभावों को दूर करने हेतु हमें ना केवल तमाम नियमों, कानूनों, संधियों और समझौतों के क्रियान्वयन में आ रही समस्याओं को दूर करना होगा बल्कि लोगों को व्यापक स्तर पर जागरूक कर यह समझना होगा कि पर्यावरण को प्रदूषित कर हम अपनी कब्र स्वयं खोद रहे हैं और यदि हमने अपने लालच एवं भौतिकवादी मानसिकता को नहीं बदला तो हमें भयानक स्थिति का सामना करने के लिए तैयार रहना होगा।

महात्मा गांधी ने प्रकृति के संरक्षण के संबंध में कहा था कि प्रकृति के पास सभी व्यक्तियों की आवश्यकताओं की पूर्ति के लिए पर्याप्त संसाधन है किंतु किसी भी एक व्यक्ति के लालच की पूर्ति के लिए संसाधन नहीं हैं।

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Analyzing the Potential Impacts of Climate Change on Sectors Such as Agriculture, Energy, and Finance in G20 Countries

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Climate change is a change in a region's typical weather over a period of time, that includes changes in temperature and precipitation. For instance, the United States was largely covered by glaciers 20,000 years ago. There are fewer glaciers and a warmer climate in the United States today. Climate changes may occur by the natural causes, like the changes in the activity of Sun or greater volcanic eruptions. Since 1800s, human activities are the major cause of climate change, including burning of fossil fuels like coal, petroleum and natural gas etc. Climate change can affect availability of food, reduce approach to food, and affect the quality of food. For example, rise in temperature, changes in rain patterns, changes in severe weather conditions, and decrease in availability of water all leads to a decrease in agricultural productivity. Our energy system is at risk to a number of climate change effects.. These include increasing temperatures and severe heat, cold and snow, extreme drought, extreme rain, rise in sea levels etc. Climate change can make banks, insurers and reinsurers less diversified. The economy can experience a decline in output, and investors can experience losses. This paper attempts to analyze the potential impacts of climate change on sectors such as agriculture, energy, and finance in G20 countries.

INTRODUCTION

Climate change has an impact on the social and environmental factors that determine health, which comprises of safe air, safe drinking water, adequate food and enough shelter. Between 2030 and 2050, it is expected that climate change will leads to an additional 2,50,000 deaths per year, mostly from malnutrition, malaria, diarrhoea and heat stress. The places with weak health infrastructure, which are mainly in poor countries, will be the hardest to manage without assistance to prepare and react. Better energy, transportation, and nutritional choices can help lowering of greenhouse gas emissions, which benefits human health by decreasing air pollution. Due to the unlimited growth of greenhouse gas emissions, the earth's temperature is rising. Glaciers are melting, there is more rainfall, there are more extreme weather

conditions, and the seasons are changing as a result. Global climate change is a measurable change in the planet's climate that lasts for a very long time. The term "global climate variability" is typically used when something is brought on by natural causes.

The G20 gathers the world's most developed economies and emerging ones, which together constitutes for greater than 80 percent of global GDP, 75 percent of international trade, and 60 percent of global population. The G20 economies are responsible for about 75 to 80 percent of global greenhouse gas emissions.

Fossil fuels, like coal, oil, and gas, are the major cause of changes in climate, contributing more than 75% of all greenhouse gas emissions and almost 90% of all carbon dioxide emissions.

The sun's heat gets trapped on Earth due to the consequence of greenhouse gas production. Global warming and climate change result from this. The rate of global warming is presently higher than it has ever been. Patterns of weather are changing due to increasing temperatures, which is also damaging the natural order. This lead to great loss to human beings and all types of life on the planet Earth.

A long-term change in the typical weather patterns that have come to characterize local, regional, and global climates on Earth is referred to as climate change.

Global warming, or the continuous increase in the average global temperature, and its affects on the planet's climate system are referred to as climate change.

IMPACT OF CLIMATE CHANGE ON AGRICULTURE SECTOR

Food security is threatened by the accelerating rate of climate change, global population growth, and economic expansion. Agriculture is in big trouble from climate change. In the long run, higher temperatures decreases agricultural yields of targeted crops while fostering the expansion of weeds and pests. With changes in rainfall patterns, the likelihood of both short-term crop failures and long-term production declines, increases. Although some crops will experience advantages in specific parts of the nation, the total effects of climate change on agriculture are anticipated to be negative, endangering the safety of the nation's food supply.

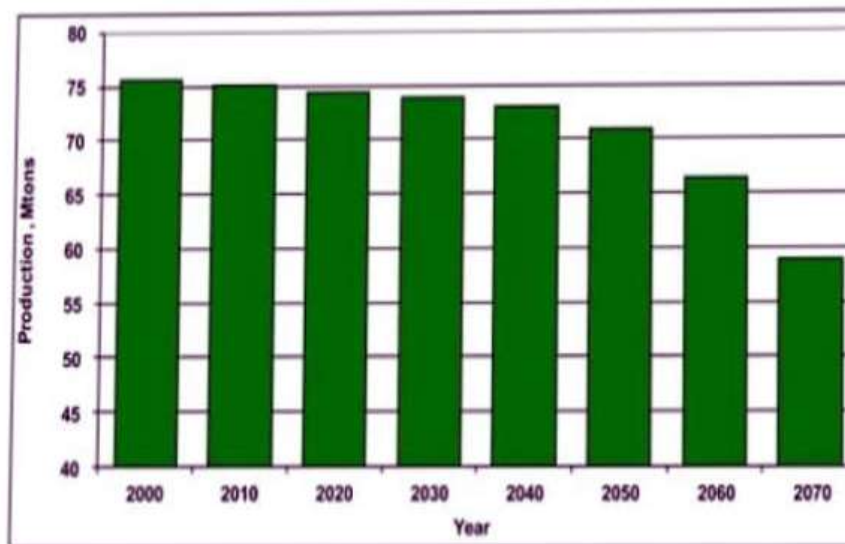
People in underdeveloped countries, who are already at risk and facing food insecurity, are likely to be the most severely impacted. 2.5 billion individuals in developing nations who were economically active in 2005 relied on agriculture as their ultimate means of livelihood Today, rural areas are home to 75% of the nation's poor people.

In United States, there are over two million farms, and more than half of the country's land is dedicated to agriculture. Although the average farm size has stayed relatively constant since the early 1970s, the farms strength is steadily falling since the 1930s. Agriculture encompasses more than just farms. It comprises sectors like food manufacturing and food service.

Problems in agriculture include

- A large number of population faces food insecurity despite short-term overproduction.
- Yields are decreasing.
- Diversification.
- Water resource's quality as well as quantity.

Potential Impact of Climate Change on Wheat Production in India



By 2050, we'll need between 60 and 70 percent extra food to meet the demand on a worldwide scale Rabi crop loss is anticipated to be higher. A temperature increase of 1°C results in a 4–5 million tonnes decrease in wheat production.

For the same production goals, an increase in temperature would mean using more fertiliser, which would increase emissions.

Fish spawning, migration, and harvests may be impacted by rising sea and river temperatures.

IMPACT OF CLIMATE CHANGE ON ENERGY SECTOR

A wide variety of the changes in Climate effects could have an impact on our energy system. These comprises of increased temperatures and hot weather, extreme iceband snowfall, prolonged dry spells, heavy downpours, increasing sea levels, hurricanes, and wildfires. Even while these effects vary from one place to another, they will nevertheless have an impact everywhere in the nation. Additionally, changes in one area or component of the energy system might have an impact on other regions or parts of the system.

Businesses, governments, and other organisations are implementing a variety of steps to strengthen the system of energy , resilience to climate change. For instance, numerous states are modernising as well as securing their electricity network against severe weather. Information is exchanged between corporations and governments through private-public partnerships. Innovative and renewable technologies (like wind and solar) are being developed and installed by businesses and researchers for the decline in the pollution of air and emissions of green house gases. These steps assist in addressing energy system vulnerabilities, and help cut back on emissions that worsen climate change.

Global energy demand is rising, which causes the energy sector's emissions of greenhouse gases (GHG) to rise as well. Population increase and economic expansion are both contributing to rising energy demand.

Progressive temperature rise, escalating and more severe extreme weather conditions, and altering rainfall patterns will have an impact on energy production and distribution.

Energy efficiency has several advantages since it controls greenhouse gas emissions , including direct emissions from the use and burning of fossil fuels. Additionally , it lessens all of the indirect emissions related to the production of power.

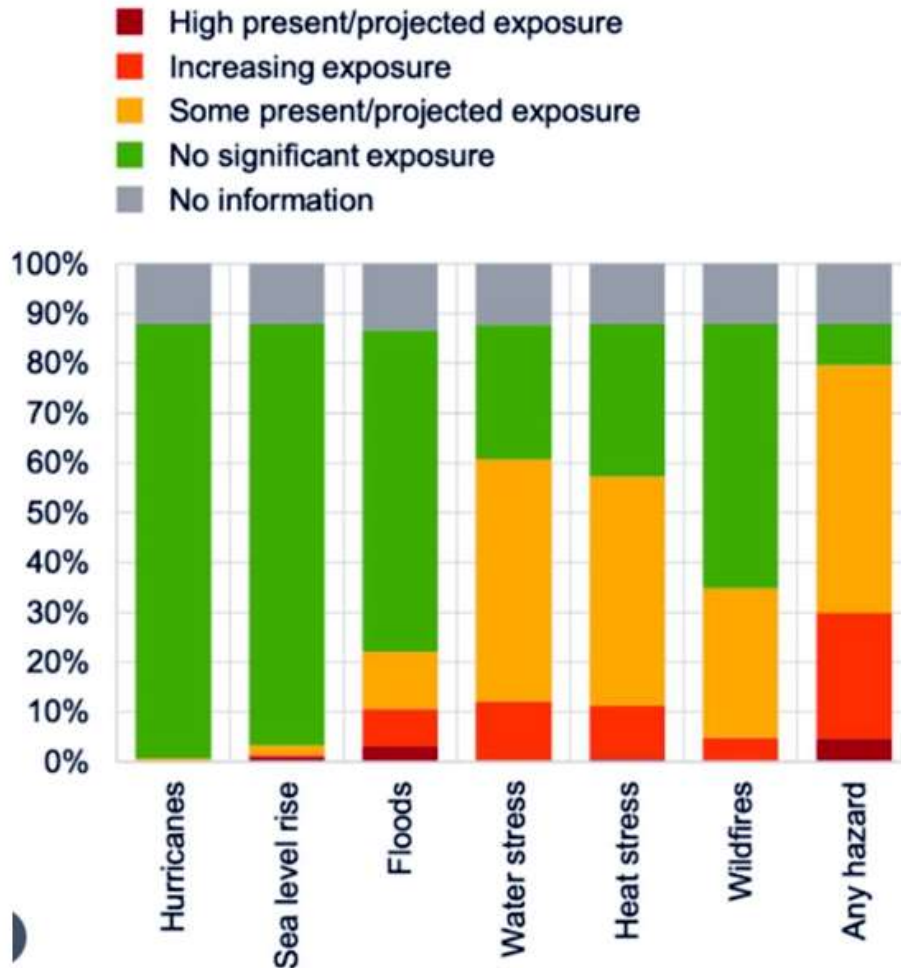
IMPACT OF CLIMATE CHANGE ON FINANCE SECTOR

Depending on how the carbon emission scenario ultimately plays out, climate change poses both challenges and opportunities that will have a substantial affect on the wealth, the monetary industry. Ignoring effects of the climate change can result in serious consequences for the financial industry.

In 2018, weather-related insurance losses amounted to 0.1% of GDP, with overall decline in wealth. Natural disasters were cause of 249 disaster in 1980, 820 in 2019, and a peak of 848 in 2018. Total wealth dropping rose from USD 60 billion in 1980 to USD 150 billion in 2019, with a USD 350 billion peak in 2018, after

accounting for inflation. If climate change decreases future cash flows and increases their volatility, it may have a large impact on asset prices.

Physical and transitional risks associated with climate-related financial hazards have the potential to have an impact on banks' safety and soundness. These risks can have an impact on many different economic sectors, limit access to financial services, and result in unfair consumer treatment.



CLIMATE CHANGE WILL UNEVENLY IMPACT THE EUROPEAN FINANCIAL SYSTEM

By the year 2100, about 2 percent of the world's financial assets would be at risk due to climate change. In the worst-case scenario, by 2100, up to 10% of the world's financial assets could be in danger.

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A significant risk that is already having an effect on many people's lives and money is climate change. Its crucial importance was further reinforced by the World Economic Forum's most recent Global Risks Report, which was published in January 2020.

The effects of climate change are widespread and have far-reaching effects. The fact that there is a direct financial impact is demonstrated by events like the bankruptcy of the Pacific Gas and Electric Company (PG&E) in January 2019, the unprecedented water shortages in South Africa, and the recent announcement by the Indonesian government to relocate its capital from Jakarta.

One of, if not the most urgent challenge of our day is climate change. Australia, California, and the Amazon are all experiencing wildfires. There have been thousands of displaced persons. Homes were destroyed. species that are on the verge of going extinct. Businesses went bankrupt. extensive areas of vegetation were devastated. Alarming sea level rise is still occurring. And these are only a handful of the effects that have already been felt. Additional wildfires, student demonstrations, and the emergence of movements like "extinction rebellion" are all impending risks that could result from climate change's immediate effects.

In recent years, a lot of financial sector companies have revised their risk taxonomies to reflect the increased attention being paid to non-financial risks including conduct and culture, cyber, and reputation. They have attempted to guarantee that the proper focus and attention is given to these important areas by singling them out expressly. These areas were so important in the years leading up to and following the Global Financial Crisis.

CONCLUSION

Sustainable development is increasingly threatened by climate change. The anticipated effects of climate change could substantially threaten agriculture's ability to feed the globe and seriously impede efforts to end hunger, malnutrition, and poverty.

Due to the heat, unpredictability of the weather, and decreasing irrigation availability, Indian agriculture is likely to experience losses.

Strategies for adaptation can reduce adverse effects. These require resources and policy backing.

The amount of water needed to generate energy or extract fuel could fluctuate due to climate change. Competition for water between energy production and other purposes may worsen in locations where there is already a shortage.

If climate change decreases future cash flows and increases their volatility, it may have a significant impact on asset prices. Climate hazards have an impact on

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the value of the guarantee used to secure loans, as well as the potential losses that lenders may experience if borrowers are unable to make their repayments. Through the financing of renewable energy sources like wind and solar, climate finance aids nations in lowering their greenhouse gas emissions. Additionally, it aids in community adaptation to climate change effects.

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Exploring Strategies For G20 Economies To Transition To Low-Carbon, Climate-Resilient Economies

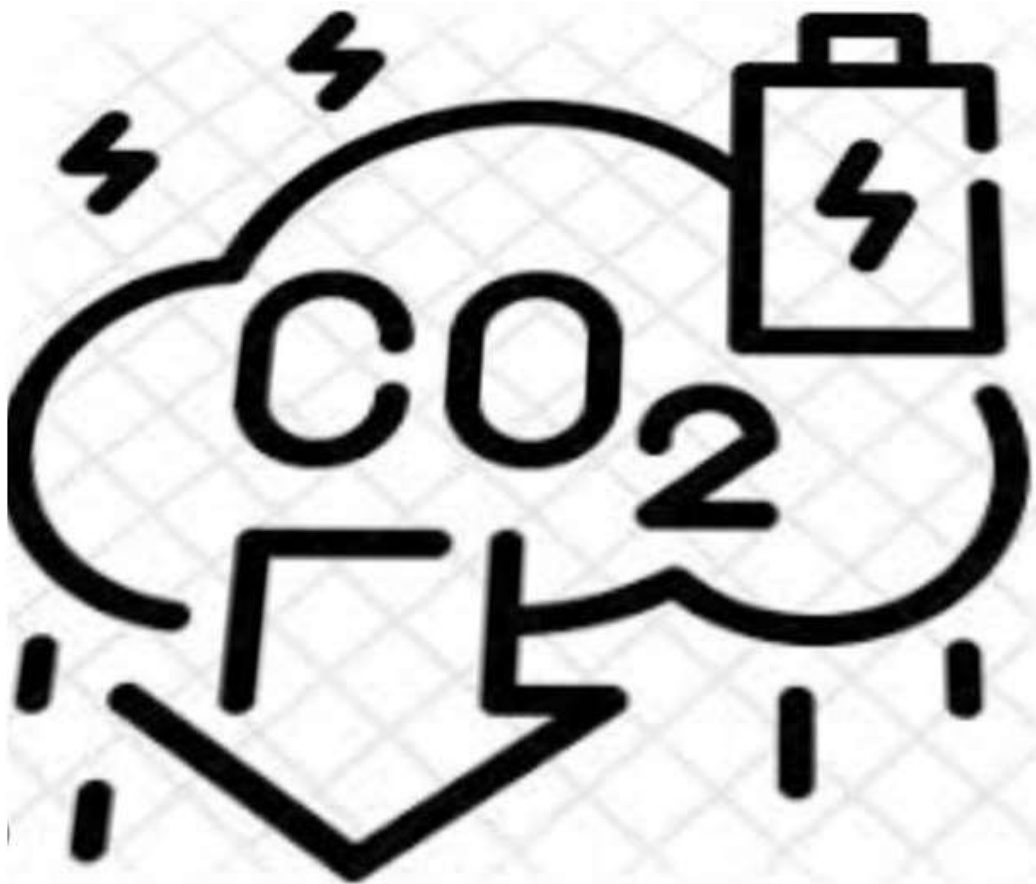
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An international meeting of the world's leading industrialized and emerging economies is known as the G20 or Group of 20. The G20 helps in transition to more open, adaptable, clean energy systems while acknowledging the value of collective action in addressing environmental issues and climate change. G20 meeting in 2023 will centre on the theme "One Earth, One Family, One Future" under the Indian Presidency. In the range of 75 to 80 percent of the world's green house gas emissions are attributed to the G20 economies. Building on its significant experience in clean green growth, and climate-resilient infrastructure, regulation of energy, green financing, and green investment, the OECD (Organisation for Economic Co-operation and Development) supports the G20 Presidency's efforts. This research paper highlights the strategies for G20 economies to transition to low-carbon, climate resilient economies.

INTRODUCTION

Economic systems are built around their infrastructure. The essential services that homes and companies need are provided by buildings, water, and waste systems, and marketplaces are made possible by the transportation and communication infrastructure that connects customers with suppliers and producers. A good quality of life is supported by clean, effective, well-maintained infrastructure in established nations, and the supply of those infrastructure in emerging nations is essential for improving living conditions in light of potential development. Low-carbon economies bring various benefits to ecosystem resilience, commerce, employment, health, energy security, and industrial competitiveness. Material of low carbon is soft, weak and it has good toughness and ductility.



A transition from a largely reliant economy on fossil fuels to a sustainable, low-carbon economy is referred to as a “low carbon transition. A sustainable energy system is likely other uses like less reliance on natural resources, technology advances related to the development of alternative energy sources, increased accessibility to energy services globally, and secure and dependable low-carbon energy sources. An economy that has reduced levels of greenhouse gas (GHG) emissions is said to be decarbonized. Or low carbon economy. Green house gas emissions due as a result of human activities are the main reason of climate change. If emission of greenhouse gases will continue it will result in global changes that will persist a long time, raising the possibility of permanent and widespread consequences on both ecosystems and people. Switching to low-carbon economy on a global level would bring considerable uses both for developed or developing countries. Most countries all over the world are implementing and designing strategies of low emissions. These

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plans aim to advance social, economic, and environmental objectives while lowering long-term greenhouse gas emissions and boosting resistance to climate change's effects. Everyone is affected by climate disaster, but the most vulnerable communities' girls and boys are suffering the most because they are the least to blame for it. Today, about 1 billion children live in nations that are very vulnerable to environmental dangers and climate change. Every kid has the right to a healthy and safe environment now and a sustainable future, according to World Vision.

However, more work needs to be done, notably in the transportation sector, to fully decouple GHG emissions from infrastructure investment in residential structures and, to a lesser extent, from power and industry.

The way infrastructure is built is also crucial to achieving a low carbon, climate resilient (LCR) economy. It necessarily entails constructing, or renovating, infrastructure systems (power, road, rail, water, buildings, etc.) to substantially reduce global greenhouse gas (GHG) emissions, while simultaneously making these systems, and the societies they serve, more adaptable to extreme weather conditions and rising sea levels. Construction or renovation of infrastructure systems (such as those for power, roads, rails, water, buildings, etc.) is unavoidably required in order to significantly reduce global greenhouse gas emissions and increase the adaptability of these systems and the societies they support to extreme weather and sea level rise. In the year 2009 , transportation system, power generation, waste management infrastructure resulted in net GHG emissions of about 74% for developed countries.

In the coming decades, new infrastructure must be planned to resist more severe weather events and changes in mean climate conditions (like precipitation and temperature). Some infrastructure may need to be modified while other infrastructure may need to be specifically constructed to defend against coastal or river flooding. The demand for infrastructure for adaptation to climate change will be especially significant in developing countries where the lack of basic infrastructure offers a barrier to resilient development.

In an expanding green economy, trade in eco-friendly, light-weight products with minimal carbon emissions will outpace the use and transportation of bulky fossil fuels. These goods involve LCR construction parts, transportation equipment, and energy and water delivery systems, all of which are already a new green infrastructure component.

Governments should be encouraged for creating strategic plans in order to speed up the emergence of this green economy.

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New infrastructure will need to be designed to withstand both more extreme weather occurrences and shifts in the mean climate (such as variations in temperature and precipitation). To protect against coastal or river floods, certain infrastructure needs to be changed. Infrastructure for climate change adaptation would especially important in impoverished countries where resilient development is hampered by lack of fundamental infrastructure.

The National Action Plan on Climate Change (NAPCC) contains missions in the areas of strategic knowledge for climate change, solar energy, energy efficiency, water, sustainable agriculture, the Himalayan ecology, and sustainable habitat, demonstrates the Government of India's commitment to this cause. The NAPCC offers a comprehensive framework for all climate-related activities.

LOW CARBON TECHNOLOGIES

Exploring a considerably larger role for nuclear power in low-carbon technologies:

As of right now (2020–2021), nuclear power prevents 41 million tonnes of CO₂ emissions from being produced annually, as opposed to the emissions that would be produced by producing the same amount of electricity from coal-based thermal power plants. 3% of electricity is now produced using nuclear energy.

Supporting domestic production of renewable energy technologies

India is supporting the mass production of technologies for clean energy. The current Production-Linked Incentive programmes favor electric vehicle, energy storage, and solar technology. Support for offshore wind, green hydrogen, intelligent demand-response systems, and other future-oriented technologies may be taken into account in the medium term. The objective is to support local economic development and job creation while making the transition to a greener economy.

Developing an Efficient, Inclusive, Low-Carbon Transport System:

About 10% of India's GDP comes from the transport sector. It is a crucial industry that supports the entire growth of businesses and commercial endeavours in any economy. Therefore, the government of India places a high focus on the growth of the transportation industry. Despite India's low car ownership compared to the rest of the globe and other developed and rising nations, the road sector accounts for the majority of emissions from transportation sector.

Utilising Cleaner Fuels:

1. Alternative fuels include green diesel, biodiesel, compressed natural gas and liquefied natural gas.
2. Short-term fuel alternatives that use natural gas: By 2030, the country's energy mix should include 15% more natural gas.
3. According to the 2018 National Policy on Biofuels, 20% ethanol blending in petrol by 2025 is an objective that could save INR 300 billion in foreign cash annually.
4. Five million tonnes of green hydrogen are anticipated to be produced annually through the National Green Hydrogen Mission.

Improving efficiency of fuel : Regulation of fuel economy, along with electrification and increasing the use of clean fuels, can be extremely effective in reducing the nation's rising oil demand. Additionally, it is crucial for lowering the price of oil imports and boosting energy security. Enhancing fuel efficiency can help to lower GHG emissions by slowing the growth of the overall fuel consumption. Supporting the development of alternative fuels can help to address the significant gap between domestic supply and demand for fuels. Alternative fuels are thought to be a promising replacement for traditional fossil fuels and can help India satisfy its demands for energy security while lowering reliance on fuels with high GHG emissions. The expanded use of cleaner fuels comprises of broad phases: Usage of ethanol, compressed natural gas (CBG), biodiesel and liquefied natural gas (LNG) as short-term fuel alternatives. Biodiesel and methanol/dimethyl ether (DME) supplemented by pipeline biogas (Bio-PNG) as medium-term fuel alternatives. Hydrogen as a long-term alternative: green hydrogen is expected to become a significant fuel in India's transport sector in the medium term,

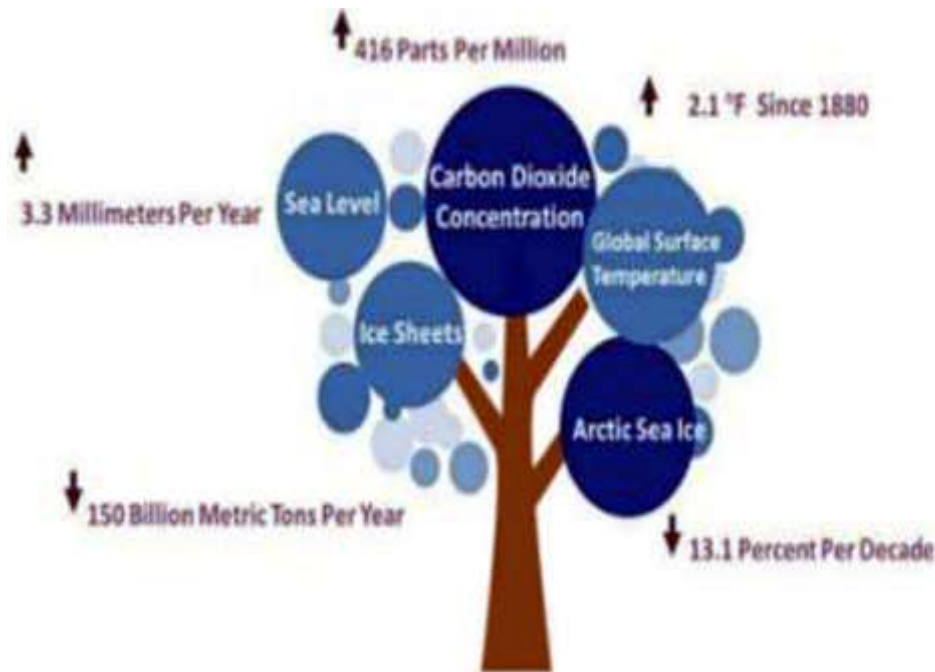
A low-carbon economy is one in which the majority of the energy required comes from 'cleaner' or less carbon-intensive energy sources such as solar, wind, hydroelectric power rather than from carbon-intensive sources like fossil fuels.

CLIMATE CHANGE IMPACTS IN INDIA

India's topography is diversified, with deserts, plains, hills, plateaus, coastal regions, and islands in addition to mountain ranges with snow-capped peaks. Due to its diversified terrain, India has a wide range of climates, from continental to coastal, from extremes of heat to cold, from extreme aridity and little precipitation to high humidity and torrential downpour. The Himalayan Mountains and the Thar Desert

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have a big impact on India's climate. In the months of June through September, the southwest monsoon season, India receives about 80% of its yearly rainfall. Along with having an impact on other elements of many ecosystems, the distribution and intensity of rainfall have a substantial impact on numerous socio-economic sectors, including agriculture and hydrology. India saw its sixth warmest year since records began in 1901 in 2019, and eleven of the fifteen warmest years were seen between 2005 and 2019.



Key climate change signs

CONCLUSION

The biggest issue the world is currently facing is climate change. The rate of global warming is rising daily. If we don't stop it as quickly as we can, our world will suffer negative effects. A variety of development goals, including job creation, better public health, social inclusion, and increased accessibility, can be achieved with the aid of low-carbon initiatives.

Sustainable development is increasingly threatened by climate change. The anticipated effects of climate change could substantially threaten agriculture's ability to feed the globe and seriously impede efforts to end hunger, malnutrition, and poverty.

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At the economic level, low-carbon development promotes clean energy research and development while boosting energy security.

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Analyzing the Role of G20 in Promoting Sustainable Consumption and Production Pattern

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"Unsustainable patterns of consumption and production are root causes of the triple planetary crises of climate change, biodiversity loss and pollution. These crises, and related environmental degradation, threaten human well-being and achievement of the Sustainable Development Goals. Governments and all citizens should work together to improve resource efficiency, reduce waste and pollution, and shape a new circular economy."

The G20 recognises the importance of collective action in tackling environmental challenges and climate change while promoting transitions towards more flexible, transparent and cleaner energy systems. The OECD supports the G20 Presidency's work, building on its extensive expertise in green growth, clean and climate-resilient infrastructure, fossil fuel subsidies, energy regulation, green finance and investment, environmental taxation and Environmental, Social and Governance (ESG)

India's focus on climate change, with a particular emphasis on climate finance and technology, as well as ensuring just energy transitions for developing countries.

Introduction of the LiFE movement, which promotes environmentally-conscious practices and is based on India's sustainable traditions.

Focus on areas that have the potential to bring structural transformation, including supporting small and medium-sized enterprises in global trade, promoting labour rights and welfare, addressing the global skills gap, and building inclusive agricultural value chains and food systems.

Promotion of a human-centric approach to technology and increased knowledge-sharing in areas such as digital public infrastructure, financial inclusion, and tech-enabled development in sectors such as agriculture and education.

Efforts to reform multilateralism and create a more accountable, inclusive, and representative international system that is fit for addressing 21st century

challenges. Our planet has provided us with an abundance of natural resources. But we have not utilized them responsibly and currently consume far beyond what our planet can provide. We must learn how to use and produce in sustainable ways that will reverse the harm that we have inflicted on the planet.

Everyone can help to make sure that we meet the Global Goals. Use these eleven targets to create action for responsible consumption and production.

IMPLEMENT

THE 10-YEAR SUSTAINABLE CONSUMPTION AND PRODUCTION FRAMEWORK

Implement the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries.

SUSTAINABLE MANAGEMENT AND USE OF NATURAL RESOURCES

By 2030, achieve the sustainable management and efficient use of natural resources.

Sustainable management of natural resources means conserving the resources to use them efficiently and avoid their misuse for individual purposes.

The aim of natural resource management is to achieve sustainability by achieving a healthy balance between the three factors mentioned below.

- People, communities, and other social factors.
- Factors affecting the economy include employment, jobs, capital, and so on.
- Animals, plants, biodiversity, and other environmental factors.

All three variables are interconnected, and the only way to achieve a reasonable balance between them is to properly manage natural resources.

HALVE GLOBAL PER CAPITA FOOD WASTE

By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses.

The Food Loss Index (FLI) measures losses along the food supply chain starting from post-harvest losses on the farm up to but not including retail stage.

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Reducing food loss and waste is critical to reduce production costs and increase the efficiency of the food system, improve food security and nutrition, and contribute towards environmental sustainability.

RESPONSIBLE MANAGEMENT OF CHEMICALS AND WASTE

By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.

There is another facet of chemical safety which must be managed, however, and that is protecting the environment from chemical contamination. Improper or careless disposal practices have significant effects on our environment, including polluting water sources, poisoning wildlife, and creating toxic sites which aren't suitable for animal or human habitation. For employees who work with chemicals (and therefore generate chemical wastes) the single most important 'green' activity is conscientious, careful management of chemical wastes.

SUBSTANTIALLY REDUCE WASTE GENERATION

By 2030, substantially reduce waste generation through prevention, reduction, recycling and reuse. To finalize the discussion, the participants expressed their viewpoints on the further development of the waste-management area. It was concluded that waste management policies in target countries are oriented toward resources efficiently, reduces waste, disposes safely toxic waste and pollutants. Implemented waste policy and strategy are in line with SDG.

ENCOURAGE COMPANIES TO ADOPT SUSTAINABLE PRACTICES AND SUSTAINABILITY REPORTING

Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle.

Clear visions, strategies and plans in place for all aspects of sustainability environmental, social and economic (people, planet, prosperity)- across all areas of activity.

Visions, strategies and plans relating to sustainability to be publicly available and incorporated into planning documents.

Commitments to be in line with local, regional, national and/or international targets and ambitions.

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Incorporation of sustainability into reporting for funders and other stakeholders, including the public. Reporting to include commitments and progress towards targets.

PROMOTE SUSTAINABLE PUBLIC PROCUREMENT PRACTICES

Promote public procurement practices that are sustainable, in accordance with national policies and priorities.

The 2030 Agenda for Sustainable Development, adopted by all the United Nations Member States in 2015, seeks to build on the Millennium Development Goals, recognizing the determination of Member states to “take the bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path”.

PROMOTE UNIVERSAL UNDERSTANDING OF SUSTAINABLE LIFESTYLES

By 2030, ensure that people everywhere have the relevant information and awareness for sustainable development and lifestyles in harmony with nature.

Discover the World’s Largest Lesson and wide-ranging activities and materials. All designed to motivate young people and inspire them to become informed and active citizens.

Whether you’re a business or employee, at the start of your sustainability journey or developing your next set of commitments, we’ve got useful resources to support your contribution to the Global Goals.

SUPPORT DEVELOPING COUNTRIES’ SCIENTIFIC AND TECHNOLOGICAL CAPACITY FOR SUSTAINABLE CONSUMPTION AND PRODUCTION

Support developing countries to strengthen their scientific and technological capacity to move towards more sustainable patterns of consumption and production.

While there are no comparable data available on research and development support given to developing countries, a measure of activity can be derived from the number of patents and intellectual property held by these countries. This, of course, is not the same thing, but in the absence of specific data it at least provides some information on trends for developing countries.

The most commonly used indicators to monitor resources devoted to research and development worldwide are total gross domestic expenditure on research and development (GERD) research and development intensity and global share.

DEVELOP AND IMPLEMENT TOOLS TO MONITOR SUSTAINABLE TOURISM

Develop and implement tools to monitor sustainable development impacts for sustainable tourism that creates jobs and promotes local culture and products.

Sustainable tourism is “tourism that takes full account of its current and future economic, social and environmental impacts whilst addressing the needs of visitors, the industry, the environment and host communities. It is a continuous process and requires constant monitoring of impacts”.

REMOVE MARKET DISTORTIONS THAT ENCOURAGE WASTEFUL CONSUMPTION

Rationalize inefficient fossil-fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities

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Emissions and Renewable Energy Use in G20 Nations: A Study

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Today, the whole world is unanimous that the problem related to the environment has reached a huge proportion and to save the environment from degradation, immediate and effective steps should be taken by the nations and the world community. This unanimity is further reflected in the urgency with which most countries have set up environmental law-related legislation and law enforcement agencies. There is no such aspect related to the environment which is not covered under one or the other law. Many controlling and regulatory bodies have come into existence whose function is to allow or disallow certain activities or to frame corrective measures. This unanimity is further visible in the multi-national or global treaties and communiqués held every year to consider various trans-boundary problems and take appropriate steps. In the present-day context of international policy for climate change, it is highly relevant to assess the CO₂ emissions and renewable energy consumption in G20 countries as India has a leading role in both G20 policy and international policy of climate change. In this light present paper of immense use to focus upon the status of CO₂ emissions in G20 countries (except European Union) with respect to renewable energy consumption during different points of time.

INTRODUCTION

In the 1970s, it became a topic of discussion all over the world in view of the increasing environmental problems. In view of these problems some programs were started. Since environmental pollution is a global problem, it cannot be controlled by any NGO or organization alone. Along with this, cooperation from other countries is also expected for environmental protection, so the need for a ministry was felt for high-level talks. The second important thing was that the increasing uses of science and technology had an impact on the animal world, the plant world and the human being equally. It is a necessity to tackle the increasing incidents of climate-induced

phenomena; otherwise, the world will face severe outcomes. The world has seen a lot of difficulties with respect to rising global temperature, pollution caused by glacier melting, air pollution and a resource crunch.

According to the US Geological Survey, global warming is just one aspect of climate change. NASA's definition of climate change says it is "a broad range of global phenomena created predominantly by burning fossil fuels, which add heat-trapping gases to Earth's atmosphere. These phenomena include the increased temperature trends described by global warming, but also encompass changes such as sea-level rise; ice mass loss in Greenland, Antarctica, the Arctic and mountain glaciers worldwide; shifts in flower/plant blooming; and extreme weather events." Hence, Global warming refers to the rise in global temperatures due mainly to the increasing concentrations of greenhouse gases in the atmosphere. On the other hand, climate change refers to the increasing changes in the measures of climate over a long period of time.

Initially, Group of Twenty (G20), established in 1999 for the purpose of international Economic Forum which has converted into multilateral forum, is comprised of 19 countries and European Union. As G20 Groups covering the around 2/3rd of the world population, representing 85% of global GDP, 75% of international trade & responsible for over 80% of GHGs Emissions, so it is the responsibility of G20 Groups to convey, coordinate and manage the long-term structural challenges. Because of its size and strategic importance, G20 has a crucial role to lead in the reduction of emissions and setting a path to sustainable, renewable and green energy for the future of global economic growth. The G20 concedes the importance of collective action in tackling environmental challenges and climate change while promoting transitions towards more flexible, transparent and cleaner energy systems.

In the present-day context of international policy for climate change, it is highly relevant to assess the CO₂ emissions and renewable energy consumption in G20 countries as India has a leading role in both G20 policy and international policy of climate change. In this light present paper of immense use to focus upon the status of CO₂ emissions in G20 countries (except European Union) with respect to renewable energy consumption during different points of time which are 1990, 2000, 2010 and 2019.

METHODOLOGY

This study is mainly descriptive research in nature. The study is based upon the secondary data. The data has been collected from various sources: World Development Indicators (WDI) which is published by the World Bank Group. In

this study, G20 group's 20 members are: Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Korea Republic, Japan, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, United States & the European Union have been taken for analysis which has categorised into Developed and Developing nations as per US categorisation (excluded European Union). The points of time for the study are 1990, 2000, 2010 & 2019. Some statistical tools have been used such as mean (average) etc. The study has been analysed in the following three sections: Developed nations, Developing nations and India's leading role.

CO₂ EMISSIONS AND DEVELOPED NATIONS OF G20

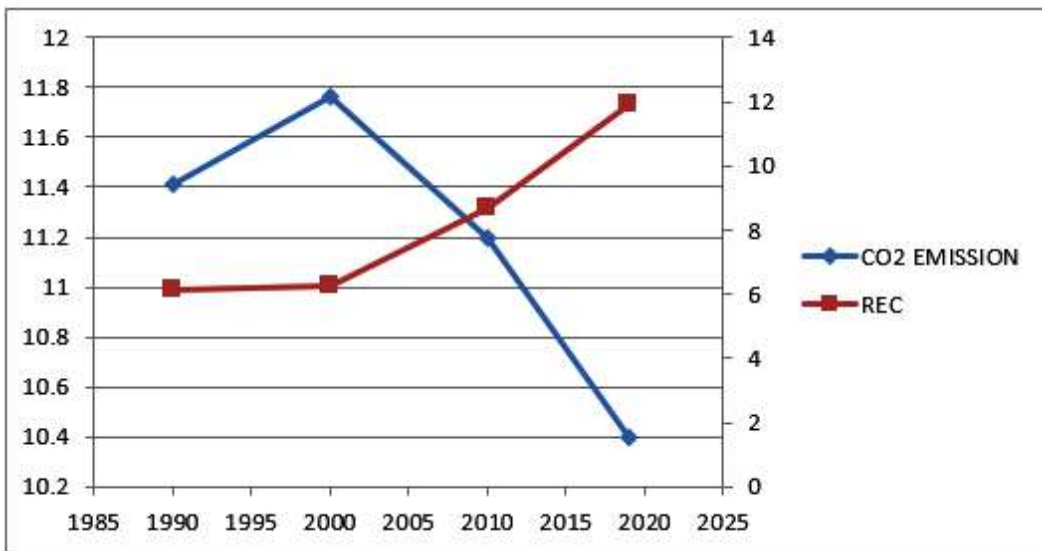
The G20 group is comprised of 19 countries and the EU, out of which, there is 10 developed nations. These are Australia, Canada, France, Germany, Italy, Japan, Korea Republic, Russian Federation, United Kingdom and United States. This study is trying to find the status of CO₂ emissions in developed nations of G20 countries (except European Union) with respect to renewable energy consumption. For this, the following table and related graph is shown for the different points of time which is as follows:

Table 1: Status of CO₂ emissions and renewable energy consumption in developed nations of G20.

S.No.	Country	CO ₂ emissions (metric tons per capita)				Renewable energy consumption (% of total Final energy consumption)			
		2019	2010	2000	1990	2019	2010	2000	1990
1	AUSTRALIA	15.3	17.6	17.8	15.4	10.1	8.2	8.4	8
2	CANADA	15.4	15.8	16.8	15.1	22.1	21.9	22	22
3	FRANCE	4.5	5.3	6.1	6.1	15.5	12	9.3	10.4
4	GERMANY	7.9	9.5	10	12	17.2	11.6	3.7	2.1
5	ITALY	5.3	6.8	7.7	7.1	17.3	12.8	5.1	3.8
6	JAPAN	8.5	9	9.3	8.8	7.7	4.7	3.7	4.6
7	KOREA REPUBLIC	11.8	11.6	9.7	5.8	3.4	1.3	0.6	1.6
8	RUSSIAN FEDERATION	11.8	11.3	10.7	14.6	3.2	3.3	3.5	3.8
9	UNITED STATES	14.7	17.4	20.5	19.4	10.4	7.4	5.4	4.4
10	UNITED KINGDOM	5.2	7.7	9	9.8	12.2	3.7	1	0.7
	Average	10	11.2	11.8	11.4	11.9	8.7	6.3	6.1

Source: World Development Indicators (WDI).

The above table revealed that reduced CO₂ emissions for increasing renewable energy consumption of developed nations of G20. Except Korea Republic, the developed nations of G20 have slowdown the CO₂ emissions (metric tons per capita) during the study period while on the other hand, in case of Renewable energy consumption (% of total Final energy consumption), the following developed nations has increasing trends during the study period. With the help of graphical representation, the above analysis which is based on average of CO₂ emissions and Renewable energy consumptions of mentioned nations is represented in the following manners:



Source: compiled by author's own (Based on table 1)

CO₂ EMISSIONS AND DEVELOPING NATIONS OF G20

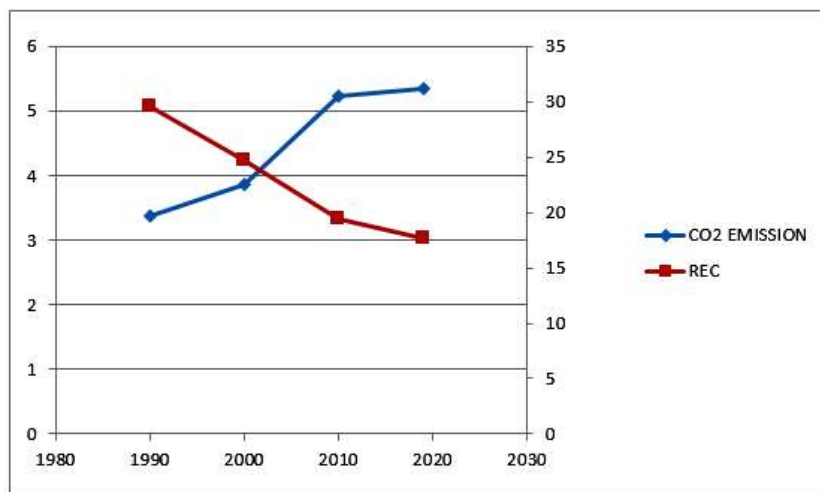
The G20 group is comprised of 19 countries and the EU, out of which, there is 9 developing nations. These are Argentina, Brazil, China, India, Indonesia, Mexico, Saudi Arabia, South Africa and Turkey. This study is trying to find the status of CO₂ emissions in developing nations of G20 countries (except European Union) with respect to renewable energy consumption. For this, the following table and related graph is shown for the different points of time which is as follows:

Table 2: Status of CO₂ emissions and renewable energy consumption in developing nations of G20

S.No	Country	CO ₂ emissions (metric tons per capita)				Renewable energy consumption (% of total Final energy consumption)			
		2019	2010	2000	1990	2019	2010	2000	1990
1	ARGENTINA	3.7	4.1	3.6	3.1	10.7	8.8	9.9	8.9
2	BRAZIL	2.1	2	1.8	1.3	47.1	46.8	42.7	49.9
3	CHINA	7.6	6.3	2.1	1.9	14.5	12.3	29.6	34.1
4	INDIA	1.8	1.3	0.9	0.6	32.9	36.2	46.9	58.7
5	INDONESIA	2.3	1.7	1.3	0.8	19.1	34.8	46.6	58.6
6	MEXICO	3.6	4.1	3.9	3.3	10.3	9.4	12.2	14.4
7	SOUTH AFRICA	7.6	8.2	6.1	6.2	10.5	11.8	16.3	16.6
8	SAUDI ARABIA	14.6	15.2	11.6	10.7	0	0	0	0
9	TURKIYE	4.8	4.1	3.4	2.6	14.1	14.2	17.3	24.5
	Average	5.3	5.2	3.9	3.4	17.9	19.4	24.6	29.5

Source: World Development Indicators (WDI).

The above table 2 revealed that increased CO₂ emissions for decreasing renewable energy consumption of developed nations of G20. Developing nations of G20 like Argentina, Mexico, Saudi Arabia has slowdown the CO₂ emissions (metric tons per capita while rest of the developing nations like mainly India, Indonesia and China has increased the CO₂ emissions but increasing at the decreasing rate of CO₂ emission. While on the other hand, most of the developing nations like mainly India, Indonesia and China have decreased the renewable energy consumption (% of total Final energy consumption). With the help of graphical representation, the above analysis which is based on average of CO₂ emissions and Renewable energy consumptions of mentioned nations is represented in the following manners:



Source: compiled by author's own (Based on table 2)

The concept of Environmental Kuznets Curve (EKC) argues that primarily, the environmental degradation accelerates in the early stages of economic growth, because societies prioritize mainly physical production and income growth over the demands for clean air and water. Since, the awareness of environmental problems is low in this stage. Environment-friendly production technologies are either not used or not available. Income growth through agricultural expansion, typically in the early stages, and other intensive resource extraction activities during industrialization put enormous pressure on the environment and increase pollution. A level of development followed by a higher and rising income level motivates people to value environmental quality. In case of developed nations of G20, renewable energy consumption has increasing trends because of availability of resources, better and advanced technologies and environmental goods are acts as a luxury good for developed nations. While on the other hand, in case of developing nations, renewable energy consumption has decreasing trends because of underutilisation of resources or non-availability of resources. In most of the developing nations, there have been much more severe problems facing like poverty, hunger, etc so developing nations are not understanding and concerning with environmental quality.

INDIA'S LEADING ROLE

In recent estimation, India is the largest populous country of the world and it has problematic aspects of poverty, hunger & inequality, inspite of these situation India not only taken initiative to slowdown the CO₂ emissions at international level but also has lowest CO₂ emissions (metric ton per capita) in G20 countries (see table 1 and 2). India has been instrumental in controlling and managing climate change, affecting the entire world. Many initiatives have been taken, under the leadership of Government of India are as follows:

1. International Solar Alliance (ISA), launched in 2015, it's an alliance of the "sunshine countries" with an objective of efficient utilization of solar energy.
2. National Action Plan on Climate Change or NAPCC, launched on 30th June, 2008.
3. One sun, one world, one grid project along with the United Kingdom OSOWOG.
4. Swachh Bharat mission.
5. To promote the use of eco-friendly products like jute bags instead of plastic bags, kullad tea cups (terracota- local India's initiatives which is environment friendly), electric motor vehicles instead of fuel, etc.

6. COP26 Glasgow summit: In COP26 Summit which is organised in Glasgow in which far-reaching steps taken by Indian Prime Minister, Narendra Modi, on behalf of India committed: -
- To take India's non-fossil fuel energy capacity to 500 GW by 2030.
 - To bring down the carbon intensity of India by more than 45% by 2030.
 - India will achieve the target of net zero carbon emissions by 2070.

Therefore, from above mentioned critical initiatives taken at international, national as well as local level by the Indian Government and also as India has current presidency in G20 summit, 2023.

CONCLUSION

Environmental quality is a luxury goods and needs funds for developing nations to change emission technology from conventional to non-conventional. Although CO₂ emission has risen in India but as a most populous country the world, India us continuously engaged in its commitment to shift to non-conventional sources of energy. Over the last many years since Paris Conference of climate change, policies/ programmes in India related to these efforts are testimony to the fact of India's seriousness. With G20 leadership and active role of India at Conference of Parties for non-conventional sources of energy, it seems of a promising future and convincing results of such efforts in future. India leading from the front is an excellent example in this regard.

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Climate Change Effects on Biodiversity and the Role of G20

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According to the nature of the law, whenever any system component has been modified by any means, modifications are bound to occur in the system. The long-term weather conditions that are characteristic of the area worldwide are changing due to global climate change. This tendency cannot be explained by natural climatic variability alone. By drastically raising the quantities of Gases that trap heat like nitrous oxide (NO), carbon dioxide, methane, and water vapor in the atmosphere, human activities, particularly burning fossil fuels like oil and coal, have caused the globe to warm. The overall decline of biodiversity is a severe challenge to the ecological system. The basis of an appropriate standard of living for humans is a healthy natural system and an accepting atmosphere. Several international programs aim to protect biodiversity, minimize hazardous climate change, and provide everyone with an acceptable and equitable standard of living. The G20 brings together the world's biggest established and rising nations, which represent more than 80% of global GDP, 75% of international commerce, and 60% of the worldwide population. Our generation's most pressing environmental issue is a climate shift. Reducing the production of carbon dioxide and atmospheric greenhouse gases from the industrial, energy, and transportation sectors is important by using less fossil fuel and more environmentally friendly or green energy. The G20's collective restoration aim will increase the worldwide effort to preserve trees and forests as existence-based climate change solutions. The research suggests that deforestation, which leads to global warming, is an important global problem that puts the drive for sustainable development at risk.

INTRODUCTION

The term "climate change" refers to a change in climatic patterns mostly brought on by greenhouse gas emissions. The major driver of global warming has been the release of greenhouse gases, which trap heat in the earth's atmosphere.

Natural processes and human activity are the primary origins of these emissions. In contrast, most human activities focus on producing energy, industry, forestry, and agricultural land and modification (Yue and Gao, 2018; Fawzy et al., 2020). The impact of climate change on biodiversity is going to expand in scope and frequency as CO₂ levels and temperatures rise and as extreme weather events like heat waves and storms become more frequent and intense (Soni et al., 2017). The function of biodiversity in reducing and adjusting to the effects of climate change is crucial. In order to promote global climate regulation, whole ecosystems, including forests, absorb carbon (Amend and Eising, 2010; Carlson et al., 2010). Around the world, it has been noted that greenhouse gas emissions are endangering biodiversity. The global surface temperature could rise by 1.8 to 4.0 C by the end of the 21st century, and an increase of 1.5 to 2.50 C would endanger 20 to 30% of plant and animal species worldwide. Climate change may have a negative influence on over 5,000 plant species owing to a lack of adequate habitat (Bates et al. 2008).

The government of climate change state the, Environment, and Forests, India, a megadiverse country, contribute 7 to 8% of all collected varieties in worldwide biodiversity, comprising 45000 plant species and 9000 species of mammals while having just 2.4% of the world's surface area. It is located at the crossroads of the Afrotropical, Indo-Malayan, and Palearctic kingdoms, all of which sustain a diverse range of wildlife (Soni et al., 2017). Having one of the 17 determined megadiverse states, the country has 10 biogeographic areas and is home to 8.58% of all identified mammal species worldwide. The corresponding percentages for species of birds are 13.66%, for fish 11.72%, and for amphibians 4.66%. In addition, four of the 34 globally recognized biological hotspots indicate India: Burma, the Western Ghats (Sri Lanka), and Sunderland (Mo EFCC, 2014). The nation's biological diversity-rich regions have been mapped using biogeographic categorization for the development and preservation of plants (11.8%) and reptiles (7.91%) (Asiatic Himalaya: ISSN 0974-9411). Biological threats: The difficulties and consequences for biodiversity are both direct and indirect. The impact of climate change's consequences and difficulties is great, and up to one-third of all native species are in danger of going extinct. Through the destruction and fragmentation of marshes, woodlands, grassland areas, and other types of vegetation, ecological change, particularly in some areas of the country's surroundings are being put under pressure by the development of agriculture. Both species and the environments in which they live are also threatened by the expansion of agriculture, which results in the loss of habitat diversity, the impact of agricultural products on wild animals, and pollution from agricultural effluent (Fawzy et al. 2020).

FACTORS CAUSING CLIMATE CHANGE

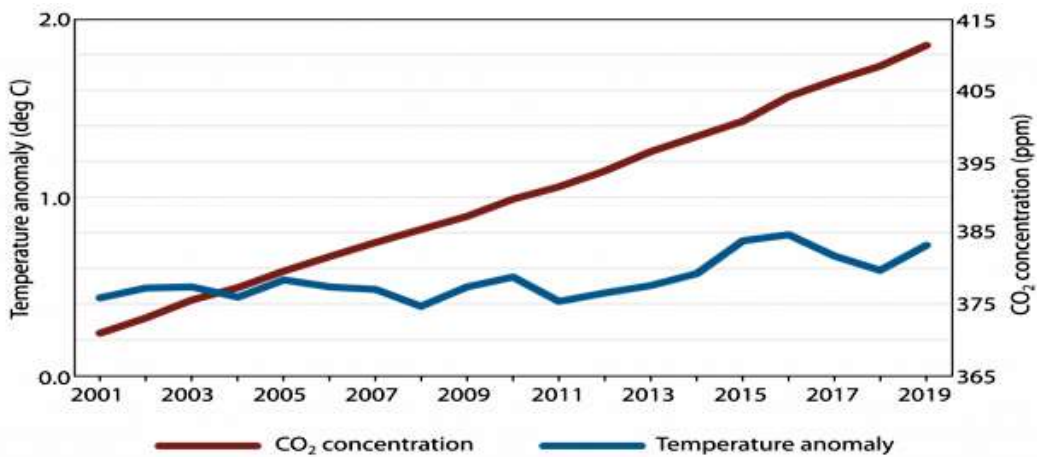
The combustion of fossil fuels, the degradation of trees, and the domestication of animals all have an increasing influence on the planet's climate and temperature. Substantially raising the level of natural carbon dioxide that has been detected already in the environment, enhancing the impact of climate change and promoting warming globally. Global warming mainly caused by human activities is currently rising by 0.2° C per ten years. A 2° C temperature increase above pre-industrial levels is linked to significant adverse impacts on the environment and human health and welfare, including a much-increased chance of hazardous and possibly life-threatening shifts in the global environment. The period between 2011 and 2020 was the hottest on record, with the global average temperature rising by 1.1° C from pre-industrial values in 2019.

Greenhouse gas (GHG) emissions are constantly increasing and are believed to cause climate change that has been brought on by human activities. Carbon dioxide (76%), and methane (16%) are the most prevalent greenhouse gases. The main source of CO₂ is created by human activity. By 2020, its atmosphere concentration had increased to a level that was 48% greater than earlier times (around 1750) levels. Up to 2019, 61% of the world's emissions came from the US, UK, European Union, Canada, Australia, Japan, and Russia, being the biggest CO₂ producers. Currently, China produces the most CO₂ (27%) followed by the USA (11%) and India (6.6%); on per capita consumption, India ranks ninth. Due to the period of industrialization, there were only about 280 ppm of CO₂ in the atmosphere; as of 2019, that number has risen to 412 ppm. Currently, the atmosphere's CO₂ concentration is the highest it has been in at least 2 million years.

Deforestation or destruction of forests increases the danger of storms, fast melting of glacier ice, etc. Flooding is one of the most common natural disasters that impact South Asian countries. The area has experienced some of the biggest flood events in the history of humanity during the last 20 years (Schweikert et al., 2014). Forests comprise around 30% of the Earth's area and Asia accounts for around 15% of the world's forest land area (Percy et al. 2003). Forests impact global climatic patterns by regulating the water cycle, thermal equilibrium, and air composition through physical, chemical, and biological processes. The destruction of forest cover is caused for various purposes such as farming, industrialization, etc.

Temperature rising is also considered an important factor for climate change. An overall decrease in forest cover would result in a marked rise in temperatures.



Forest loss and a decreased rate of cooling by evaporation are expected to cause a rise of roughly 1° C for the area. The warming of the planet is the result of the mixture of methane, carbon dioxide, and nitrous oxide, which mix with water vapor to create a transparent layer in the Earth’s atmosphere that traps infrared radiation, emitted from the planet’s interior, and emits it return to the lithosphere. Methane and nitrous oxide are 25 and 300 times more effective than CO₂, respectively. A rise in air temperature also causes the ocean’s temperature to rise. Some CO₂ after dissolving in the seawater and raising the acidity level. Increased pH levels in the ocean and warming.



Source: United Nations Report

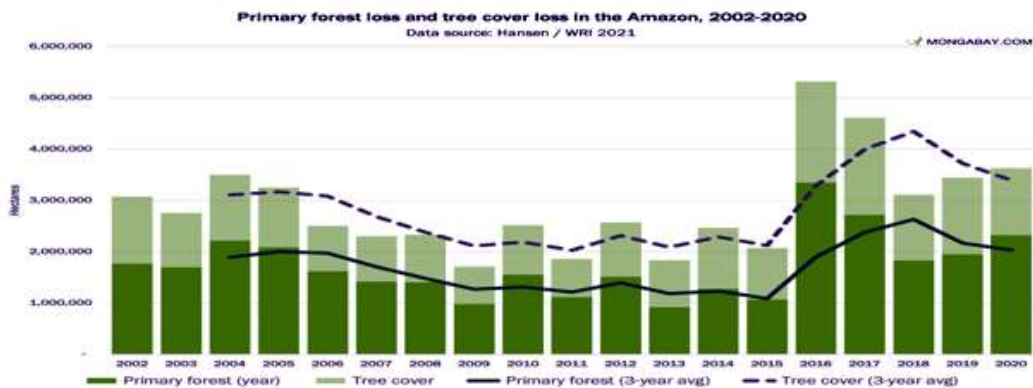
Fig. 1: The graph below shows global temperature anomalies from 1998 to 2019 published by GWPF January 2020.

THE FIVE THREATS TO BIODIVERSITY

				
Land and Sea use Change (Including habitat loss and degradation) Example: Agricultural land use which is responsible for 80% of the global deforestation	Pollution Make the environment unsuitable for survival directly and indirectly	Species overexploitation Example: Overfishing which may decimate global fish populations by 2050	Climate Change Forcing the animal to shift range or confounding the signals that trigger seasonal events and more	Invasive species and disease Compete with native species for space, food and other resources; sometimes spread disease that native species have no immunity of

BIODIVERSITY DEPRIVATION

The extinction of species is caused by a decrease in variety. (animal and plant) from a particular geographic region of the world. The Five Threats to Biodiversity loss are: (1) The steady rise in the number of humans has been having a detrimental influence on the ecology. by excessive cultivation and development of woodlands through deterioration. Additionally, a lot of rivers and lakes are buried in dirt for development purposes. and destroy aquatic habitats. The disappearing of wildlife is a consequence of environmental loss. (2) Nitrogen and phosphate releases influence the environment, which causes a loss of species. In the environment of water, nutrient overloads can promote the growth of algal blooms, which can reduce oxygen levels and result in the extinction of aquatic organisms. (3) Overusing/ Exploitation of the reduction of heterogeneity is caused by the resources that are present in the environment. Uncontrolled fishing, wild animal hunting, mining, and cutting down trees, for instance, can all have a negative effect on the ecology. (4) Climate change like the impact of increased temperature, deforestation, and global warming also responsible for habitat and biodiversity loss directly or indirectly. (5) Invasion of Alien Species: animals, plants, and other organisms that establish themselves away from their native environment. These individuals' multiplication is so quick that it outcompetes native species, leading to their extinction.



Source: Butler 2020

Fig 2: According to Hansen et al 2021's satellite information study, there is a reduction in the canopy of trees and primary woodland in Amazon nations.

Table 1: The loss of biodiversity over the last few centuries

Year	Population	Transformed territory utilization by humans	Extinction of species in an environment
1800	0.9 billion	7.6%	-1.8%
1900	1.7 billion	16.9%	-4.9%
2000	6.1 billion	39.3%	-13.6%
2100 (Green model)	8.7 billion	33.4%	-11.6%
2100 (Current model)	12 billion	49.1%	-17%

EFFECTS OF BIODIVERSITY LOSS

The loss of wildlife results in changes in habitat and damage, placing the extinction of thousands of creatures at risk, Degradation of environmental species affects the environment and soil, which are essential for growing food, presenting a threat to human health and well-being. Crop-damaging pests may originate as a result of the spread of pests that cause environmental imbalances. If their ecological systems are harmed, wood and seas’ capacity to consume CO2 is reduced. Numerous species are at risk of going extinct as a result of habitat modification and damage. Human development is at risk due to biodiversity loss since these elements are essential to growing food, soil and water.

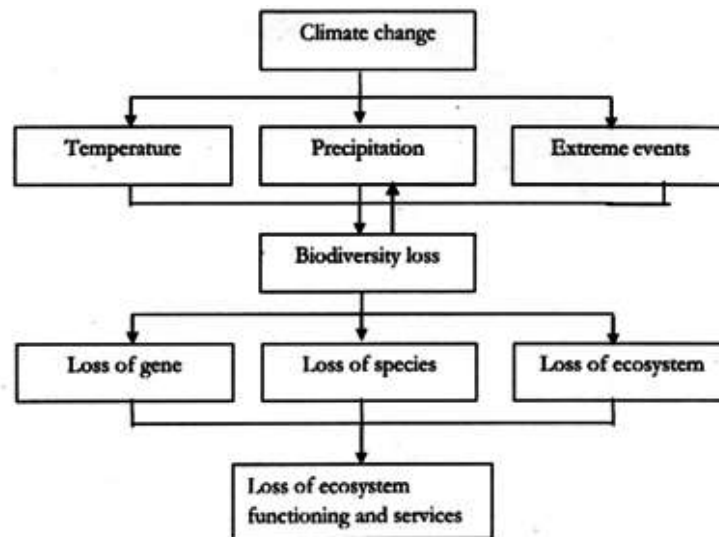


Figure 3: Link between climate change and its impacts on loss of biodiversity and ecosystem.

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David Cooper, the Deputy Minister and Executive Secretary of the UN Convention on the Protection of Biological Diversity utilized the event of the IPBES report appearance to send out an advisory in the course of the COVID-19 crisis. The depletion of ecosystems has many adverse impacts on not only the surroundings but on the individual's finances and health." As ecosystems deteriorate, the risk of pandemics in the future rises."

THE ROLE OF G20 ON CLIMATE CHANGE

The Group of 20 (G20) is a global conference made up of 19 nations (Argentina, Australia, Brazil, Canada, China, France, Germany, Italy, Japan, the Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, United Kingdom, and the United States) plus the European Union (EU). The G20 was established in 1999 as a platform to talk about international economic, climate change mitigation, sustainable development, and financial concerns. Regarding all significant international economic issues, G20 is crucial in forming and enhancing global governance. For one year, the G20 Presidency guides the G20 agenda and holds the Summit. The G20 leaders gathered twice a year beginning in 2008 in Washington, DC, first in London and Pittsburgh in 2009, and then in Toronto and Seoul in 2010. The G20 summits have only been held once a year since France presided over and hosted the organization in 2011. The 2016 summit took place in Hangzhou, China; 2017 in Hamburg, Germany; 2018 in Buenos Aires, Argentina; 2019 in Osaka, Japan; 2020 summit was scheduled in Riyadh, Saudi Arabia, but it was held virtually due to Covid-19; 2021 in Rome, Italy; 2022 in Bali, Indonesia.

Forest conservation is essential to the G20. Based on data from the Food and Agriculture Organization of the United Nations, eight of the G20 nations have the top 10 greatest forest areas. The G20 made a commitment in 2021 to stop and prevent the degradation of biodiversity by 2030. 17 nations of the G20 committed to stop and prevent the loss of woodlands and advance food security while preserving forests in the 2021 Glasgow Presidents' statement on Forests and the Environment. The concept of "forest" was not particularly used in the most recent G20 announcements, which were issued in Rome (2021) and Riyadh (2020). In October 2022, the G20 Summit in Indonesia presented a chance to strengthen the group's commitment to maximizing the benefits of forests, climate mitigation, and reducing global warming.

To stop forest destruction, the G20 strangled stricter against legal restrictions and promoted the simplification of laws and practices for using, conserving, and conserving forests. As an example, Argentina will raise the number of cattle production to 700,000 in the following ten years despite losing the number of cattle

production to 700,000 in the following ten years despite having lost 10% of its Gran Chaco forest area during the previous twenty years. Indonesia has committed to restoring 600,000 hectares of mangrove forests, South Africa has set a goal of planting 3.6 million hectares of forests and land, and China has plans to cover 30% of its land with forests by the year 2050. The G20's collective restoration goal will encourage people all around the world to use trees and forests as natural climate change solutions. It will ensure that Native American and local communities help in reducing the scope of climate change and biodiversity loss. The UN Declaration on the Rights of Indigenous Peoples, and the International Union for Conservation of Nature's nature-based solutions principle all understand their significant role in the management of biodiversity, such as forests. According to research conducted in Indonesia, NTFPs (non-timber forest products) may make up as much as 53% of a community's income in the area of a forest by raising the market demand for and prices of NTFPs. The G20 might therefore encourage coordinated actions to raise market demand for NTFPs and their value chain, while simultaneously establishing systems for sustainable product extraction to prevent excessive use. This would provide vital help not only for the protection of natural resources but also for fostering equitable economic development by lowering differences between urban and rural regions, as well as abundant growing states.

GLOBAL CLIMATE CHANGE PROTOCOLS

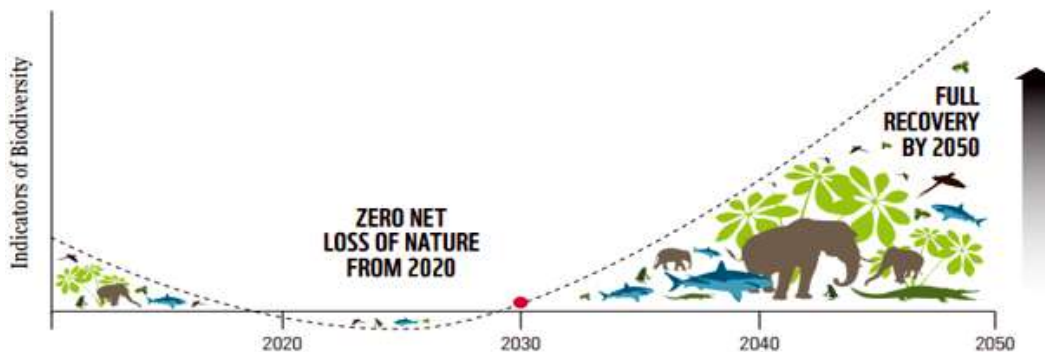
The G20 is a powerful, significant international conference of the world's greatest countries, having the capacity to determine the course on major issues impacting worldwide today. Meetings provide a unique platform and the primary worldwide stage for exchanging ideas at the highest levels, resulting in suggestions for potential solutions to the most serious problems, with climate change being one of the most important at the moment. CO₂ emissions are a major contributor to climate change. As a result, controlling or at least lowering emissions is now the most important element. It is up to policymakers to devise and implement policies that encourage reduced emissions or a cleaner, greener economy. According to the conclusions reported in the Intergovernmental Panel on Climate Change (IPCC) special report, in order to minimize global warming, net CO₂ emissions would have to fall by around 45 percent from 2010 levels by 2030, reaching net zero around 2050. In the event of reducing global warming Although it would require significant and quick reductions in emissions from all economic sectors, 1.5 degrees Celsius is acceptable. To do this, nations must actively reduce energy demand, lower energy supply emissions, and aggressively remove CO₂ from the environment, all while completely reducing the carbon content of the electrical sector and making renewable

energy the primary source of energy on Earth by 2050. Delays in reducing emissions might have negative impacts on the environment.

THE CLIMATE AT THE G20 MEETINGS AND THE ROLE OF INDIA

From December 1, 2022, through November 30, 2023, India will be the G20's president. According to current thinking within the Indian government, prime minister Modi may highlight at the September G20 summit the LIFE (lifestyle for the surroundings) concept that he has been promoting at international forums, along with the work India has done on renewable energy both domestically and abroad through the International Solar Alliance and through the Coalition for Disaster Resilient Infrastructure. The annual UNFCCC summit, or COP (Conference of the Parties), which will be held in the United Arab Emirates at the end of this year for COP28, will examine how nations have performed in relation to the climate commitments they made under the 2015 Paris Agreement and the extent to which they can improve. The Indian government has begun drafting the report it intends to submit to the UN as part of this procedure known as the worldwide inventory. (GST) [Fawzy., et al 2020].

Figure 23: Nature Positive by 2030
A measurable global goal for nature. Source: Locke et al. (2021)¹⁰⁰.



In contrast to other newly industrialized nations, where forest cover has either decreased or remained stagnant, India's forests cover around 692,027 km or 21.05% of its topographical area. Over the past ten years, India has increased its forest and tree cover by about three million hectares. According to the Mo EFCC, 9.08 million hectares, or around 3% of the country's total topographical area, are thought to be covered with trees in India. About 54 National Parks spanning 21,003 km and 373 Sanctuaries covering 22,886,49 km make up a network that covers 1,09,652 km, or

3.34% of the country's geographic area in 198 km. The network has been growing progressively, and as of 2014, there were 690 Protected Areas in total, including 102 National Parks, 527 Wildlife Sanctuaries, 572 Conservation Reserves, and 4 Community Reserves. These protected areas accounted for 5.07% of the country's land area. Despite facing a number of threats, such as changes in land use that affect natural habitats, excessive use of resources from nature, and climate change, the country has 106 islands and 23 marine protected areas.

GOALS FOR THE FUTURE

- An objective should be made to restrict global temperature rise to less than 2 degrees Celsius below pre-industrial levels, with the option of reducing this aim to 1.5 degrees Celsius.
- All signing parties must submit national climate contributions (in the form of country-wide funds), which must be modified frequently to fulfill the established long-term goal.
- Developed nations should be required to continue taking the lead in supplying funding, but for the first time, "other parties" have been encouraged to provide actively supportive funds.
- It will state that the UN will publish a report (known as a "global stocktaking") every five years on the progress made in terms of putting the agreement into practice, including the impact of climate contributions, global temperature estimations, etc.
- Set up a brief timetable for the transition of fossil fuel supports along with powerful climate change commitments (1.5-aligned NDCs and long-term policies) and support across the G20.
- Take specific actions to address nature and climate across all sectors of the economy, including eliminating deforestation, preventing extinction, protecting and restoring oceans, etc.

CONCLUSION

The G20 has always included a climate change focus in its discussions. With time, it has become an ongoing motif, and people are more conscious of the terrible effects that inaction might have on all of us. While G20 support and cooperation are crucial, they shouldn't be restricted to just the chosen selection of the world's greatest economies. They give it to those who are least protected, thus sometimes bearing the effects of their actions even if they did not cause them, and who cannot afford to

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combat the destruction of the environment. Governments may utilize a variety of policies and strategies to combat climate change, not only some focused on decreasing the release of carbon dioxide (CO₂). This is not a simple commitment, and we are still a long way from achieving our objective. Countries cannot accomplish it on their own. Climate change has far-reaching consequences that touch everyone, regardless of money, age, or color. As a result, international collaboration is critical. We must strive for the most ambitious goals, identifying that limiting the increase in temperature to 1.5 degrees Celsius rather than 2 degrees Celsius has clear and major advantages that are not only financially but also change-related, ultimately lowering the risks of storms and droughts, extreme heat, biodiversity loss, and sea level rise.

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Importance of Conservation of Nature in Ancient Bharat

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INTRODUCTION

In the majestic tapestry of antiquity, where time's ethereal fabric interweaves with the echoes of forgotten epochs, Ancient Bharat emerges as a luminous beacon, casting its iridescent glow upon the annals of history. Within this enchanting realm, a profound understanding of the intrinsic interdependence between humanity and the resplendent expanse of nature flourished, birthing a legacy steeped in reverence for the sanctity of the environment. Through the hallowed corridors of time, the Bharatiyas, guardians of ancient wisdom, perceived the ethereal beauty and intricate interconnectedness that pulsed within the realm of nature, embodying the sublime expression of the divine tapestry. This vision, etched in the depths of their consciousness, engendered an unwavering commitment to the preservation and conservation of the natural world—a legacy that reverberates through the corridors of the present, resounding with the echoes of a bygone era.

In Ancient Bharat, nature was not merely perceived as an ephemeral backdrop to the human drama, but as a divine manifestation, an embodiment of celestial grace. The forests, like emerald guardians, stood sentinel, their empyreal canopies breathing life into the primordial landscape, nurturing countless species that danced in a symphony of biodiversity. Rivers, veins of liquid vitality, cascaded through the verdant embrace, bestowing their nourishing elixir upon the land, animating the flora and fauna that thrived in the terrestrial embrace. Mountains, towering monuments of stoic grandeur, kissed the heavens with their snowy peaks, bearing witness to the ebb and flow of civilizations, stoically cradling the fragile ecosystems that flourished upon their lofty slopes. It was within this cherished milieu that the Bharatiyas recognized the profound interconnectedness between themselves and the natural world, forging an indissoluble bond that transcended the boundaries of the tangible realm.

With their innate wisdom and profound comprehension of the delicate balance that governed the cosmos, the ancients of Bharat embraced the sacred duty of

custodianship, embracing the mantle of guardians bestowed upon them by the cosmic design. In the timeless verses of their sacred texts, the Vedas and Upanishads, they hymned the praises of nature, extolling the virtues of conservation, and offering guidance on how to navigate the intricacies of human existence while harmonizing with the rhythms of the natural world. Rituals and customs, intricately woven into the fabric of everyday life, served as a poignant reminder of the sanctity of nature, bridging the divide between the earthly and the celestial realms.

Ancient Bharat stood as a testament to the profound wisdom that can be gleaned from harmonizing with the rhythms of the natural world. It serves as a reminder that conservation, far from being a recent concept, has been an intrinsic part of the human experience since time immemorial. As we venture forth into an uncertain future, beset by the challenges of environmental degradation and ecological imbalance, the echoes of ancient Bharat beckon us, inviting us to embrace the legacy of reverence for nature, and to kindle the flame of conservation that has burned brightly through the annals of time.

ANCIENT REFERENCES IN VEDIC CULTURE

The antiquated Bharatiya manuscripts, encompassing the Vedas, Upanishads, Aranyakas, Vedangas, Ramayana, and Mahabharata, unveil a plethora of references pertaining to environmental preservation and safeguarding. These literary gems manifest the profound veneration and deference the ancient Bharatiyas held for the natural realm, coupled with their astute comprehension of the intricate interdependence between humanity and the environment. Let us embark upon an exploration of these erudite allusions.

Vedas: The Vedas, the primordial sanctified scriptures of ancient Bharat, resound with hymns and verses that exalt the paramountcy of environmental conservation. The Atharva Veda, for instance, extols the significance of safeguarding verdant forests and meandering rivers, duly acknowledging their role as founts of vital sustenance. The Rig Veda, in turn, expounds upon the symbiotic relationship between mortals and the environment, admonishing humans to reside in harmonious consonance with nature's symphony.

Upanishads: The Upanishads, philosophical treatises nestled within the Vedic corpus, delve into the profundities of existence and spiritual contemplation. They fervently advocate the cosmic interconnectedness and the inextricable interdependence of all sentient beings. The Brihadaranyaka Upanishad, imbued with profundity, venerates the Earth as the bestower of life's sustenance, imploring individuals to ardently shield and preserve it for the collective well-being.

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Aranyakas: The Aranyakas, compendia of sacred texts attributed to reclusive hermits and ascetics dwelling amidst sylvan realms, evince an awe-inspiring appreciation for nature and its hallowed conservation. These venerable texts espouse the vital necessity of ecological equilibrium and harmonious coexistence with all sentient entities. The Aranyakas, acknowledging the forests as hallowed sanctuaries, eloquently advocate for their safeguarding.

Vedangas: The Vedangas, auxiliary texts conferring guidance for the immaculate recitation and profound comprehension of the Vedas, encompass tenets that enshrine the principles of environmental conservation. Within the Vedangas, the Kalpa Sutras, renowned for their adherence to meticulous regulations and rituals encompassing various facets of life, including the preservation of the natural order. These sacred teachings underscore sustainable practices such as judicious resource utilization and responsible waste management.

Ramayana: The Ramayana, an epic poetic opus attributed to the sage Valmiki, reverberates with an ineffable reverence for the natural realm. It meticulously delineates the resplendence of sylvan domains, meandering rivers, and majestic peaks, emphasizing the inherent value in their safeguarding and preservation. Lord Rama, the central figure of the Ramayana, serves as an epitome of profound adoration for the environment, tenderly cherishing and cherishing it with utmost solicitude.

Mahabharata: The Mahabharata, another ancient epic replete with sagacity, echoes passages that underscore the indispensability of environmental conservation. It lucidly elucidates the deleterious repercussions of ecological disharmony, unambiguously underscoring the exigency of preserving natural resources. The Bhagavad Gita, a philosophical discourse encapsulated within the Mahabharata's hallowed precincts, accentuates the interconnectedness of all living entities and heralds the clarion call for judicious stewardship of the environment.

Across these resplendent texts, an unwavering motif emerges—nature's sanctity and the imperative of responsible environmental stewardship. The ancient Bharatiyas possessed an innate cognizance that the welfare of humanity is

NATURISM AND PHYSIOLATRY IN VEDIC CULTURE

Naturism and physiolatry epitomize indispensable tenets entrenched in Vedic culture, embodying profound veneration and adoration for the natural world. These principles illuminate the perception of divine essence permeating every facet of the environment. Let us embark on an exploration of these concepts, accompanied by distinctive exemplifications of naturism and physiolatry in the rich tapestry of Vedic culture.

Within the fabric of Vedic culture, naturism reverberates as the veritable worship of nature. Ancient Bharatiyas beheld the natural realm as an embodiment of the divine, recognizing the intricate interdependence between humanity and the environment. Elements, celestial spheres, flora, fauna, and natural forces commanded devout reverence as sanctified entities deserving of utmost deference and veneration. Herein lie glimpses of naturism's manifestations in Vedic culture:

Solar Adoration (Surya): The venerable Vedic texts teem with reverential hymns extolling the Sun, effusive in their praise of its life-bestowing vigour and indispensable role in sustaining earthly existence. The Rig Veda, for instance, harbors the resplendent Gayatri Mantra, a potent invocation to the solar deity, beseeching enlightenment and spiritual awakening. The practice of Surya Namaskar (Sun Salutation) in contemporary yogic traditions attests to the unwavering veneration bestowed upon the Sun in the annals of Vedic culture.

River Reverence: Vedic scriptures beseech homage to rivers as hallowed conduits of purity and fecundity. The River Saraswati, holding profound eminence within Vedic literature, receives copious accolades for its life-sustaining attributes. The River Ganga, hailed as the celestial river, beckons pilgrims by the millions to its banks, seeking purification and spiritual ascension.

Arboreal Worship: Trees, emblematic of longevity, wisdom, and spiritual growth, occupy an indispensable role in Vedic ethos. The Peepal tree (*Ficus religiosa*) and the Banyan tree (*Ficus benghalensis*) stand forth as paragons of sacred import, considered divine abodes and objects of veneration during specific festivities. The preservation of trees and environmental conservation continue to form an indelible part of Vedic customs and ecological endeavors.

Mountain Adulation: Mountains, perceived as celestial abodes of gods and goddesses, inspire reverence in Vedic culture. Mount Kailash, the hallowed peak nestled in the Himalayas, assumes an exalted stature as the divine dwelling of Lord Shiva. The Vedic texts luxuriate in the grandeur and spiritual profundity inherent in mountains, elucidating their sanctified communion with the divine.

Conversely, physiolatry encapsulates the worship of divine forces and cosmic energies within the recesses of one's being. It signifies the cognizance that the divine essence permeates every individual and that the path to spiritual enlightenment lies in self-realization. Herein lie glimpses of physiolatry's manifestations in Vedic culture:

The Atman Concept: Vedic scriptures expound upon the existence of Atman, the eternal and divine essence dwelling within each individual. The Brihadaranyaka

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Upanishad, for instance, delves into the profound nature of Atman, illuminating the paradigm of self-realization and the pursuit of inner divinity.

Meditation and Yoga: Vedic culture accords paramount significance to meditation and yoga as conduits for self-discovery and realization. Through these practices, individuals aspire to forge a connection with their higher selves, experiencing the unity that transpires in communion with the divine.

Mantra Recitation: Mantras, sacred sounds or vibrations imbued with spiritual

IDEAS OF CONSERVATION OF NATURE IN SANSKRIT TEXTS

Certainly! Herein lie the Sanskrit scriptures, verses, and aphorisms, intricately intertwined with the tapestry of environmental preservation and the profound significance of nature's essence. Pray, allow me to present them, replete with their profound import and references in Devanagari script:

Sanskrit Verse: “यत्र नारियस्तु पूज्यन्ते, रमन्ते तत्र देवताः यत्रैतास्तु न पूज्यन्ते, सर्वास्तत्र फलः क्रियाः ।” (Reference: Manusmriti 3.56)

Meaning: “Where feminine divinity is venerated, celestial entities rejoice; in lands where such homage is amiss, all endeavors come to naught.”

Sanskrit Verse: “वृक्षो रक्षति रक्षितः ।” (Reference: Atharva Veda 12.1.33)

Meaning: “One who safeguards the arboreal realm is, in turn, enfolded under their benevolent shelter.”

Sanskrit Quote: “सर्वे भवन्तु सुखिनः, सर्वे सन्तु निरामयाः सर्वे भद्वाणि पश्यन्तु, मा कश्चित् दुःखभाग् भवेत् ।” (Reference: Brihadaranyaka Upanishad 1.4.14)

Meaning: “May unbounded bliss pervade all; may afflictions find no abode; may the splendid unfold before all eyes, with sorrow's burden befalling none.”

Sanskrit Quote: “यथा पिण्डे तथा ब्रह्माण्डे” (Reference: Shatapatha Brahmana 6.1.3.9)

Meaning: “As within, so without—the microcosm mirrors the macrocosm.”

Sanskrit Verse: “वसुधैव कुटुम्बकम् ।” (Reference: Maha Upanishad 6.71)

Meaning: “The terrestrial abode, in its entirety, manifests as one indivisible kinship.”

Sanskrit Quote: “प्रकृतिपुरुषविवेकः ।” (Reference: Mahabharata, Udyoga Parva 42.11)

Meaning: “Discerning the demarcation between nature’s realm and that of humanity.

“यन्नदीषु यदोषधीभ्यः परि जायते विषम् । विश्वेदेवा निरितस्तत्सुवन्तु ।।”

Translation:

“May there be no poison in plants and herbs.

May the cosmic forces protect us.”

“सत्यं बृहद्रतं उग्रं दीक्षा तपो ब्रह्म यज्ञाः पृथिवीं धारयन्ति । सा नो भूतस्य भवयस्य पत्नी-उरुं लोकं पृथिवी नः कृणोतु ।।” (12.1.1) It says that the Earth is upheld, is sustained by Truth (Satya), Eternal law or Order or Righteousness (Ritam), Consecration or Initiation (Deeksha), Devotion (Brahma) and Sacrifice (Yajna). Earth is not a “jada” or non-living entity. She is a living mother, a force that is sustained by Truth, Order, Austerity, Devotion and Sacrifice. Hence, it is these attitudes that a human is expected to implement in his life.

“पदपाणं विधि सूत! यथावद् विस्ताराद् वद । विधिना केन कार्तव्यं पदपोद्यापनं वृद्धैः ।।” (MsP, 59.1) The Padmapurana warns: “A person who is engaged in killing creatures, polluting wells, and ponds and tanks, and destroying gardens, certainly goes to hell.”(Padmapurana, Bhoomikhanda 96.7-8).

These sacred verses and timeless dictums, sourced from the wellspring of ancient Bharatiya wisdom, encapsulate the utmost significance of environmental stewardship, the intricate interdependence of all sentient beings, and the exaltation of nature’s sanctity. They beseech us to cultivate an abiding reverence and unswerving regard for our natural surroundings, fostering a harmonious communion with the environment, a legacy to be cherished by generations both present and yet to come.

Nature has always held a sacred place in ancient Indian philosophy, where reverence for the environment and its preservation were deeply ingrained. These 50 Sanskrit verses, with their profound meanings and contexts, highlight the significance of nature conservation and sustainable living in ancient India.

The Divine Essence of Nature:

- पृथिव्यै नमः ।

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Om Prithiviyai Namah. (Salutations to the Earth.)

Context: The verse acknowledges the Earth as a divine entity deserving respect and reverence.

The Harmony of Elements:

- वायुः प्राणो द्यौः शरीरं ।

Vayuh prano dyauh shariram. (The wind is the life force; the heavens, the body.)

Context: This verse from the Brihadaranyaka Upanishad signifies the interconnectedness of the elements and their vital role in sustaining life.

Nature as a Nurturing Mother:

मातरः सर्वभूतानां दया दान्ती च सर्वदा ।

Matarah sarvabhutanaam dayaa daantee cha sarvadaa. (Mothers are compassionate and benevolent to all beings.)

Context: This verse highlights the nurturing qualities of mothers and emphasizes extending the same compassion to all living beings.

The Sacredness of Water:

जलम् शुद्धं विष्णुपथेयं ।

Jalam shuddham Vishnupatheyaam. (Water is pure and sacred.)

Context: Water is considered sacred and holds immense importance in religious ceremonies and daily life.

अपां नपात्सुतो राजा विज्ञानं ब्रह्मचक्षुषा ।

Apam napatsuto raja vijnaanam brahmachakshushaa. (The king, born of waters, perceives through divine knowledge.)

Context: This verse from the Rig Veda emphasizes the connection between water, knowledge, and spiritual enlightenment.

The Earth as a Divine Entity:

यथा पृथिवी शय्या सन्ति, नक्तं च दिवि चान्तरिक्षे ।

Yathaa prithivee shayyaa santi, naktaA cha divi chaantarikshe. (Just as the Earth serves as a bed, so does the night, the heavens, and the space.)

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Context: This verse portrays the Earth as a divine resting place, highlighting its importance in the cosmic order.

पृथिवी रक्षित्री धर्मस्य ।

Prithivee rakshitree dharmasya. (The Earth is the protector of righteousness.)

Context: This verse underscores the Earth's role in upholding righteousness and maintaining moral balance in the world.

The Role of Humans in Nature Conservation:

पृथिव्यां समुद्रां सरितः स्तनयित्नुः ।

Prithivyam samudraam saritah stanayitnuh. (May the rivers nourish the Earth like mothers.)

Context: This verse from the Atharva Veda emphasizes the vital role of rivers in nurturing and sustaining the Earth.

यत्रनारियस्तु पूज्यन्ते, रमन्ते तत्र देवताः यत्रैतास्तु न पूज्यन्ते, सर्वास्तत्रफलः क्रियाः ।

Yatranariyastu pujiyante, ramante tatra devatah; Yatraitastu na pujiyante, sarvastatraphalah kriyah. (Where women are honored, divinity blossoms; where they are dishonored, all actions bear no fruit.)

Context: This verse from Manusmriti highlights the importance of honoring and respecting women, who are seen as embodiments of divine energy.

अभि त्वा शर्मण्यवती सुवाणी युवंस्तर्हि नो वः पयः सुपत्नीषु ।

Abhi tva sharmanyavatee suvaanee yuvamstarhi no vah payah supatnisu. (May you, O Rivers, be gentle and benevolent towards us like loving wives.)

Context: This verse from the Rig Veda invokes the rivers to exhibit qualities of kindness and nourishment, akin to loving and caring wives.

तत् त्वं विश्वस्य भुवनस्य गोप्त्रे विश्वस्य भुवनस्य सूक्तीकम् ।

Tat tvam vishvasya bhuvanasya goptre vishvasya bhuvanasya soopratiikam. (You, O Earth, are the protector and sustainer of the universe, the support of all that exists.)

Context: This verse from the Rig Veda recognizes the Earth as the guardian and sustainer of the entire universe.

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सर्वभूतानि सम्भवन्ति योऽसौ नैव द्वेषति किं चन ।

Sarvabhutaani sambhavanti yo'sau naiva dveshti kim chana. (One who does not despise any living being.)

Context: This verse from the Bhagavad Gita encourages compassion and non-hatred towards all living beings, emphasizing the value of harmonious coexistence.

परित्राणाय साधूनां विनाशाय च दुष्कृताम् ।

Paritraanaaya saadhunaam vinaashaaya cha dushkritam. (For Apologies for the confusion. Here's the continuation of the response:

The Role of Humans in Nature Conservation:

परित्राणाय साधूनां विनाशाय च दुष्कृताम् ।

Paritraanaaya saadhunaam vinaashaaya cha dushkritam. (For the protection of the righteous and the destruction of the wicked.)

Context: This verse from the Bhagavad Gita emphasizes the need to protect and preserve the virtuous while deterring and eliminating harmful elements.

आपो वै श्वत्सरं योनिम् ।

Aapo vai shvatsaram yonim. (Waters are the eternal source of life.)

Context: This verse from the Atharva Veda acknowledges the vital role of water as the source of life and sustenance.

पृथिवीं त्वया धार्त्री सर्वभूतानि धारिताः ।

Prithiveem tvayaa dhartree sarvabhutaani dhaaritah. (You, O Earth, are the sustainer of all beings.)

Context: This verse from the Atharva Veda recognizes the Earth as the nurturing force that sustains all living beings.

These ancient Sanskrit verses provide profound insights into the reverence for nature and the significance of conservation in ancient Indian culture. They reflect a deep understanding of the interconnectedness between humans and the natural world, emphasizing the responsibility to protect and preserve the environment for the well-being of all. By incorporating these timeless teachings into our modern lives, we can cultivate a deeper sense of environmental consciousness and contribute to the sustainable future of our planet.

UTILITY OF ANCIENT BHARATIYA PRACTICES IN MODERN WORLD

Ancient Vedic culture offers profound insights into how rituals, customs, values, and practices can be leveraged to teach and practice nature conservation in the modern world. By delving into the depths of these timeless traditions, we can unearth a treasure trove of wisdom that can guide our approach to environmental stewardship. Here are some precise and detailed ways in which the ancient Vedic heritage can be utilized:

1. Rites and Ceremonies: The elaborate tapestry of Vedic rituals and ceremonies, intricately woven with the fabric of nature, presents an exquisite opportunity to rekindle our reverence for the natural world. By reintegrating these sacred rites into our contemporary practices, we can evoke a sense of profound gratitude and veneration towards nature's bounties. Engaging in rituals that honor and safeguard the sanctity of trees, rivers, and other natural elements enables us to forge a deeper connection with the environment, thus instilling a profound appreciation for its preservation.

2. Environmental Ethics: Vedic culture, deeply rooted in a moral compass, imparts ethical guidelines that resonate with the core principles of nature conservation. The ethos of non-violence (ahimsa) and compassion (karuna), originally espoused to safeguard sentient beings, can be expanded to encompass our entire ecological tapestry. By promoting these values, we can foster responsible and sustainable practices in our daily lives, embracing a plant-based diet, advocating waste reduction, and adopting a mindful approach to consumption.

3. Traditional Knowledge: Within the annals of Vedic literature lie invaluable pearls of ecological wisdom and sagacious insights into the art of sustainable living. Delving into these ancient texts enables us to unearth practical solutions to modern environmental challenges. The time-honored techniques of organic farming, astute water management, and the efficacious realm of herbal medicine, as elucidated in these timeless texts, can be adroitly adapted and implemented to propagate sustainable agricultural practices and holistic healthcare systems.

4. Nature-inspired Lifestyle: Vedic culture extols a lifestyle intricately intertwined with the natural world, harmonizing our existence with the ebb and flow of nature's rhythms. Embracing the concept of simple living and high thinking, we liberate ourselves from the shackles of materialistic pursuits, seeking fulfillment in the realms of spirituality and intellectual exploration. By embracing a minimalist and eco-centric lifestyle, we effectively reduce our ecological footprint and forge an intimate bond with nature, honoring its intrinsic value.

5. Education and Awareness: Infusing the tenets of Vedic teachings and principles into the tapestry of educational curricula plays a pivotal role in cultivating environmental awareness. By instilling in young minds a profound understanding of the interdependence of all life forms, the imperativeness of biodiversity, and the dire repercussions of environmental degradation, we sow the seeds of responsibility and stewardship towards the natural world. Nurturing an eco-conscious generation ensures the perpetuation of sustainable practices and paves the way for a brighter future.

6. Community Participation: The foundations of Vedic traditions were steeped in a profound sense of community and collective responsibility. Resurrecting the essence of these traditions through community-based conservation initiatives strengthens social bonds and engenders a shared commitment to safeguarding natural resources. Galvanizing communities to engage in collective tree-planting endeavors, mobilizing clean-up campaigns, and embarking on nature conservation projects fosters a tangible sense of environmental consciousness, nurturing a sense of belonging and unified action.

7. Modern Technology Integration: While honoring the sanctity of ancient traditions, it is incumbent upon us to embrace the realm of modern technologies and scientific advancements. By synergistically blending traditional wisdom with cutting-edge tools such as renewable energy systems, innovative waste management techniques, and sustainable infrastructure, we unlock unprecedented potential in our conservation endeavors. This harmonious amalgamation empowers us to maximize our impact and propel nature conservation into the realm of the 21st century.

In conclusion, the ancient rituals, customs, values, and practices of Vedic culture provide a rich tapestry from which we can draw inspiration and guidance for nature conservation in today's world. By incorporating these time-honored traditions into our lives, we can foster a deep connection with the environment, embrace ethical principles, tap into traditional knowledge, adopt nature-inspired lifestyles, promote education and awareness, encourage community participation, and integrate modern technologies. The amalgamation of ancient wisdom and contemporary approaches creates a powerful synergy that can catalyze a global movement towards sustainable living and the preservation of our precious natural heritage. As we tread the path laid by our Vedic ancestors, we honor their legacy while paving the way for a harmonious coexistence between humanity and nature in the present and for generations to come.

VIEWS OF INTELLECTUALS

In the vast tapestry of human wisdom, guided by the brilliance of great minds, the luminaries of intellect have found solace and inspiration. Albert Einstein, the

renowned physicist, once affirmed that the ideals illuminating his path were kindness, beauty, and truth. These sacred beacons, akin to the trinity of nature, art, and knowledge, served as the very muse that ignited the ancient philosophies of Bharat. Within the embrace of lush woodlands, Henry David Thoreau, the sagacious American philosopher and naturalist, recognized the profound bond between humanity and the natural world, instilling a profound reverence and appreciation for the environment within the heart of ancient Bharat's culture. Carrying forth this profound understanding, Carl Sagan, the astrophysicist and science communicator, lauded the philosophy of interconnectedness embedded in ancient Bharat, illuminating our place in the cosmos and emphasizing the delicate equilibrium we must preserve with our planet. Echoing this sentiment, Ralph Waldo Emerson, the eloquent American essayist and philosopher, extolled the ancient sages of Bharat for their wisdom, which transcended the confines of mere books. Their profound comprehension of nature's laws and their recognition of the imperative to harmonize oneself with the rhythms and forces of the natural world epitomized true enlightenment. Nikola Tesla, the visionary inventor and electrical engineer, marveled at the scientific culture of ancient Bharat, a culture that reverberated with a profound understanding of the energetic principles governing the universe. Their awe-inspiring knowledge of natural forces and their seamless integration with these forces served as a testament to the magnificence of India's physiocracy and naturalist heritage.

CONCLUSION

Notwithstanding the profound reverence for nature that permeated ancient Bharat, it is regrettable to acknowledge that the environment did not always receive the adoration and safeguarding it so justly merited. As the wheels of civilization turned, the Bharatiyas succumbed to the insidious allure of rapacious exploitation, pillaging the bountiful resources bestowed upon them by Mother Earth. Verdant forests, brimming with arboreal majesty, were remorselessly felled to satiate the insatiable appetite for timber and to yield fertile tracts of land for agricultural pursuits. The once-pure rivers, like arteries pulsating with life-sustaining essence, became cesspools of contamination, their crystalline purity muddied by the callousness of human indulgence. And alas, the creatures that roamed the wild, manifestations of nature's own handiwork, found themselves ensnared in the merciless jaws of extinction, hunted relentlessly for naught but transient gain. The consequences of this ecological indifference reverberated through the annals of time, etching their scars upon the land: soil erosion gnawing away at the very fabric of fertility, arid desertification engulfing once-lush landscapes, and the anguished cry of parched throats, bereft of the life-giving elixir, echoing through the ravaged realms of water scarcity.

In summation, the magnitude of the environment's significance in ancient Bharat is an indelible truth that cannot be overstated. It served as the linchpin, intricately weaving its essence through the tapestry of existence, permeating every facet of religion, philosophy, art, and literature. The Bharatiyas, with their innate wisdom, espoused an awe-inspired perception of the environment as an embodiment of the divine, an ethereal symphony resonating with celestial harmonies. In their pursuit of harmonious coexistence, they harnessed the quintessence of ingenuity to craft sophisticated systems of water management and irrigation, deftly orchestrating the symphony of life-giving sustenance. The resources bestowed upon them by the majestic forests were judiciously employed, a testament to their sagacity and foresight. However, the veil of environmental disregard shrouded this celestial vision, casting a pall of desolation upon the land. The repercussions of this ecological myopia manifested as scars etched upon the land, eroding the very foundations of fertility, engendering the encroachment of arid desolation, and sowing the seeds of dire water scarcity. These poignant lessons from the annals of ancient Bharat, like sacred sutras inscribed upon the scroll of time, serve as an indelible reminder of the imperativeness of reverence and preservation, lest the heritage of generations yet unborn be consigned to the abyss of oblivion.

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हिंदी भाषा के प्रचार प्रसार में G- 20 की भूमिका

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अंतरराष्ट्रीय आर्थिक सहयोग का एक प्रभावशाली मंच है G20 जोर सभी प्रमुख अंतरराष्ट्रीय आर्थिक मुद्दों पर वैश्विक संरचना और अधिशासन निर्धारित करने तथा उसे मजबूत करने में महत्वपूर्ण भूमिका निभाता है। इन देशों में वैश्विक सकल घरेलू उत्पाद का लगभग 85%, वैश्विक व्यापार का 75% से अधिक और विश्व की लगभग दो-तिहाई आबादी है। एक दिसंबर 2022 से 30 नवंबर 2023 तक भारत G20 की अध्यक्षता करेगा। भारत के लिए यह स्वर्णिम अवसर है कि इन देशों से आर्थिक, राजनीतिक और सांस्कृतिक सम्बन्धों को अधिक प्रगाढ़ किया जाय साथ ही हिंदी के वैश्विक फलक को और अधिक विस्तारित किया जाय।

इस शोध पत्र का मुख्य उद्देश्य उन सम्भावनाओं पर विचार करना है जिनसे जी-20 देशों की अधिक से अधिक जनसंख्या तक हिंदी की पहुंच बन सके और भारतीय संस्कृति और सभ्यता से ये देश भली भांति परिचित हो सकें

प्रस्तावना

G20 में अर्जेंटीना, ऑस्ट्रेलिया, ब्राजील, कनाडा, चीन, फ्रांस, जर्मनी, भारत, इंडोनेशिया, इटली, जापान, कोरिया गणराज्य, मैक्सिको, रूस, सऊदी अरब, दक्षिण अफ्रीका, तुर्किये, यूनाइटेड किंगडम और संयुक्त राज्य अमेरिका आदि 19 राष्ट्र और यूरोपीय संघ शामिल हैं। इन देशों में वैश्विक सकल घरेलू उत्पाद का लगभग 85%, वैश्विक व्यापार का 75% से अधिक और विश्व की लगभग दो-तिहाई आबादी है। इन सदस्यों के अतिरिक्त अन्य कई संगठन भी विशेष रूप से आमंत्रित हैं यह संगठन है- UN, IMF, विश्व बैंक, WHO, WTO, ILO, FSB, OECD, AU चेयर, NEPAD चेयर, ASEAN चेयर, ADB, ISA और CDRI आदि।

भारत जी20 की 50 से अधिक शहरों में लगभग 200 बैठकों का आयोजन करेगा। शिखर सम्मेलन आयोजित करने वाले शहर हैं- अमृतसर, बंगलुरु, भुवनेश्वर, चंडीगढ़, चेन्नई, गांधीनगर, गोवा, गुरुग्राम, गुवाहाटी, हंपी, हैदराबाद, इंदौर, जयपुर, जोधपुर, केवड़िया, खजुराहो, कोच्चि, कोलकाता, कुमारकोम, लखनऊ, महाबलीपुरम, मुंबई, नई दिल्ली, पुणे, कच्छ का रण, ऋषिकेश, सिलीगुड़ी, श्रीनगर, तिरुअनंतपुरम, उदयपुर, वाराणसी, विशाखापट्टनम।

वर्कस्ट्रीम, और G20 प्रतिनिधियों और मेहमानों को भारत की समृद्ध सांस्कृतिक विरासत की एक झलक पेश करने और उन्हें एक अद्वितीय भारतीय अनुभव प्रदान कराने का अवसर होगा। इस अवसर पर भारतीय भाषाओं विशेष रूप से हिंदी को प्रोत्साहित करने की भी असीम संभावनाएं हैं। स्क्रिलिंग, अपस्क्रिलिंग और रीस्क्रिलिंग के संबंध में शिक्षार्थियों की बेहतरी सुनिश्चित करने की

प्रतिबद्धता के साथ ळ20 इंडिया की तीसरी एजुकेशन वर्किंग ग्रुप मीटिंग भुवनेश्वर में हो रही है इसमें हिंदी भाषा के प्रोत्साहन के लिए भी समुचित कार्य योजना बनाई जानी चाहिए और भाग लेने वाले सभी प्रतिनिधियों को संपूर्ण कार्यवृत्त हिंदी में उपलब्ध कराया जाना चाहिए।

सुझाव/संस्तुतियां

वैश्विक फलक पर हिंदी के प्रचार प्रसार के लिए कुछ सुझाव हैं-

1. सभी आयोजन द्विभाषी होने चाहिए जिसमें एक हिन्दी अवश्य हो।
2. सभी आयोजनों के कार्यवृत्त अन्य भाषाओं के साथ साथ सरलतम हिंदी में भी होने चाहिए।
3. सभी आयोजनों में हिंदी ट्रांसलेटर/अनुवादकों को अधिक से अधिक संख्या में प्रतिभाग कराया जाना चाहिए।
4. आयोजन स्थलों पर सांस्कृतिक कार्यक्रम अनिवार्य रूप से हिंदी में होने चाहिए।
5. भुवनेश्वर शिखर सम्मेलन का कार्यवृत्त विश्वविद्यालय अनुदान आयोग के माध्यम से देश के सभी उच्च शिक्षण संस्थानों में उपलब्ध कराया जाना चाहिए और उस पर विद्वानों की राय भी लेनी चाहिए।
6. आयोजित सांस्कृतिक कार्यक्रमों के हिंदी रूपांतरण की सॉफ्ट तथा हार्ड कॉपी सभी अतिथियों को दी जानी चाहिए ताकि वे अपने देश में इसका प्रचार प्रसार कर सकें।
7. शिखर सम्मेलन में भाग लेने वाले सभी देशों में अनुवाद केंद्र स्थापित के लिए उनके प्रतिभागियों को प्रोत्साहित किया जाना पसंदचाहिए जहां हिंदी से उस देश की भाषा में अनुवाद किया जा सके और इसके विपरीत भी।
8. प्रतिभागी देशों को अपने यहां आकाशवाणी और दूरदर्शन केन्द्रों से नियमित हिंदी भाषा के कार्यक्रम का प्रसारण किया जाना चाहिए।
9. साहित्यिक कार्यक्रमों की भांति अकादमिक कार्यक्रम में प्रारंभ किए जाने चाहिए जिनमें हिंदी का सीखना भी शामिल हो।
10. भारत सरकार द्वारा इन देशों में हिंदी अध्ययन केंद्र स्थापित किए जाने चाहिए जहां हिंदी में भारतीय साहित्य उपलब्ध हो।

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G20 and the Ongoing Fight to Contain Climate Change

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Humanity has been facing climate change since the beginning of its very existence. However, it has been only in the past century that we started to observe significant negative effect of our actions on the climate and environment. Healthy climate is an integral part of our survival and should be our main concern. Climate change agenda has been included in the G20 from the very beginning. It has become an overarching theme over time, as the calls for action are stronger and the general public is more aware of the dire consequences of non-action could have on all of us. Cooperation and support among the G20 is important, but should not be limited only to this selected group of the world's largest economies. In fact, because of their status, they have a responsibility towards the most vulnerable ones who cannot afford to fight the degradation of environment and often face the consequences they did not cause.

In Washington 2008, the G20 members expressed their concern over climate change for the first time. Following year, the topic got more exposure during the 2009 London, UK Summit, where leaders reaffirmed their commitment to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities. Leaders committed to make a transition towards clean, innovative, low carbon technologies and infrastructure. G20 Summit in Toronto, Canada in 2010 reconfirmed the commitment to green recovery and sustainable global growth. Main focus of the 2011 Summit in Cannes, France was on promoting low-carbon development strategies in order to optimize the potential for inclusive green growth and to ensure sustainable development. G20 members agreed to phase out inefficient fossil fuel subsidies over the medium-term, while providing targeted support for the poorest. The effects of climate change do not stop at the borders, but affect everyone regardless of wealth, age or race. Therefore, international cooperation is the key. One of the most significant initiatives in efforts to fight climate change has been the Paris Agreement that was adopted in December 2015. We have to strive for the most ambitious targets, knowing that limiting global warming to 1.5 degrees Celsius compared to 2 degrees Celsius has clear and considerable benefits which are not only economic, but also help significantly reduce risks of water scarcity, ill-

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health, food insecurity, flood and drought, extreme heat, tropical cyclones, biodiversity loss, and sea level rise.

China hosted the 2016 Summit in Hangzhou, China with high expectations and strong backing of the climate change topic by President Xi Jinping. Unfortunately, the expectations did not materialize, and the final communique gave mostly assurances of ongoing activities. G20 members reaffirmed their ongoing commitment from Petersburg to phase out over the medium-term inefficient fossil fuel subsidies that encourage wasteful consumption. Summit in Hamburg, Germany (2017) served as the high-level platform for calls supporting a fast, full implementation of the Paris Agreement, and securing signatures and ratification in countries that have not yet done so. The Agreement became an effective international law shortly after, in November 2016. Overall, however, the Summit did not bring expected results and pointed to the new geopolitical reality – the “clash” of ideas. G20 Summit in Buenos Aires, Argentina, 2018 and 2019 in Osaka, Japan, all members also agreed to create the *G20 Implementation Framework for Actions on Marine Plastic Litter* - an international framework created to help reduce plastic pollution in the ocean. G20 members would voluntarily report data, share solutions, adopt a life-cycle approach and start implementation in accordance with their national policies, approaches, and circumstances. Overarching theme of the Saudi Arabia G20 Presidency (2020) is to look for solutions that address present pressing challenges of climate and natural disaster threats that are facing everyone. Due to their global reach, there is an inherent need to cooperate in the name of global public interest. Work in the area of climate will be focused towards “safeguarding the planet by fostering collective efforts to protect our global commons. The 2021 G20 Rome summit was the sixteenth meeting of the Group of Twenty (G20), which was held in Rome, the capital city of Italy, on 30–31 October 2021. It was focused on three broad, interconnected pillars of action: People, Planet, Prosperity. At the summit, the G20 leaders agreed to keep the goal of limiting global warming to 1.5 degrees compared to pre-industrial levels within reach and accelerate their actions towards achieving global net zero greenhouse gas emissions or carbon neutrality by or around mid-century. Role of innovation and technologies in helping to control climate change was also highlighted and put to the forefront.

December 1st, 2022 was a momentous day as India assumed the presidency (from 1 December 2022 to 30 November 2023) of the 18th G20 forum, taking over from Indonesia with the theme of *Vasudhaiva Kutumbakam* (One Earth, One Family, One Future). A significant moral compass, as the very idea of a planetary family, invokes values of seeing humans as natural custodians of ecological resources and

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biodiversity, encouraging a critical engagement with indigenous knowledge and wisdom and investing Nature with rights, which are held by the communities who have done least damage to Mother Earth. Speaking on December 10, 2022, on the occasion of Human Rights Day, Smt. Droupadi Murmu, President of India, noted that *“Just as the concept of Human Rights exhorts the society to consider every human being as no different from us, we should treat the whole living world and its habitat with respect. We must learn to treat Nature with dignity”*. Going further, the Indian President spoke of the right of rivers, invoking the rights of *“mother nature indirectly”*. This Presidency is the first opportunity for India to showcase its leadership potential as it will be the most high-profile international event ever hosted by India. On that occasion, Prime Minister Narendra Modi authored an article in which he outlined India’s vision for the G20 presidency and pitched for hope, healing, harmony to deal with pressing global challenges. India’s G20 priorities include a “Green Development Pact” with a roadmap of actions over the next decade to tackle climate change and international cooperation on data for development, external affairs minister S. Jaishankar said on 14 January, 2023. “The actions will include investments in sustainable lifestyles, leveraging green hydrogen for climate action, and accelerating progress on the Sustainable Development Goals (SDGs)”, he said.

The G20 nations represent 99% of historical CO₂ emissions from 1850-2013. The German watch Global Climate Risk Index lists two G20 members (Japan and India) as among the worst affected nations by the onslaught of climate change. Thus, India is standing at a critical juncture to harness its potential in leadership to advocate not only the voice of the global south but also to provide a platform for vulnerable economies on transnational issues like climate change. There are many policies and measures for governments to use in fighting the climate change and they are not limited only to efforts to decrease CO₂ emissions. By sharing its experiences with other G20 countries, India can help other economies adopt similar policies that can spur growth and development. Another way India can contribute to global economic growth is through its engagement with other G20 countries on issues related to international trade.

Analyzing The Potential Impacts Of Climate Change On Sectors Such As Agriculture, Energy, And Finance In G20 Countries

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The possible implications of climate change on energy and agricultural systems around the world are a major issue, although the topic is only briefly addressed in global assessments such as those released by the Intergovernmental Panel on Climate Change. In this chapter, we examine the potential effects of climate change along the terrestrial farming, energy, and financial value chains. Although assessing the overall impact of climate change on the agriculture industry and human beings is beyond our current understanding, there is a strong indication that impacts will occur throughout the entire supply chain, from farm output to manufacturing activities, transportation, storage, retailing, and consumption by people. The energy industry also significantly contributes to climate change by releasing the majority of greenhouse gases into the environment. These gases accumulate in the atmosphere and warm the climate, causing numerous additional changes all throughout the world—in the earth's atmosphere, on land, and in the water bodies. Risks associated with climate change are highly specific to the situation but are expected to be higher in already hot environments with limited socioeconomic and institutional assets for adaptation mechanisms. There are still many unknowns about the future of climate change in the G20 countries, as well as the vulnerability and retaliation of interconnected humans and ecosystems to modifications to the climate over time. As an outcome, choices regarding adaptation will have to take into account an extensive variety of potential futures contracts, including those with low probability but broad implications.

INTRODUCTION

Climate change has been a problem for humanity since the dawn of time. However, we have only recently started to recognize the huge influence that our habits are having on both the environment and the climate. Our primary focus should be on sustaining a pleasant environment because it is critical to our survival. To

effectively combat global warming, it is crucial to promote international collaboration and develop worldwide solutions. The G20 is a powerful and dominant international council composed of the the most powerful economies in the world and has the potential to shape the direction of major global issues. Through its meetings, the G20 provides a unique platform for high-level exchanges of ideas that result in proposals for probable solutions to pressing concerns, including global warming, which is currently one of the most critical issues. With G20 nations accounting for approximately 85 percent of world's GDP, 75 percent of global trade, 80 percent of worldwide carbon dioxide emissions, and 70 percent of manufacturing of plastic, plus two-thirds of the global population more than fifty percent of the world's poor, agreements made by these members on climate, environment, or power have an immense effect on everyone and can inspire non-G20 countries.

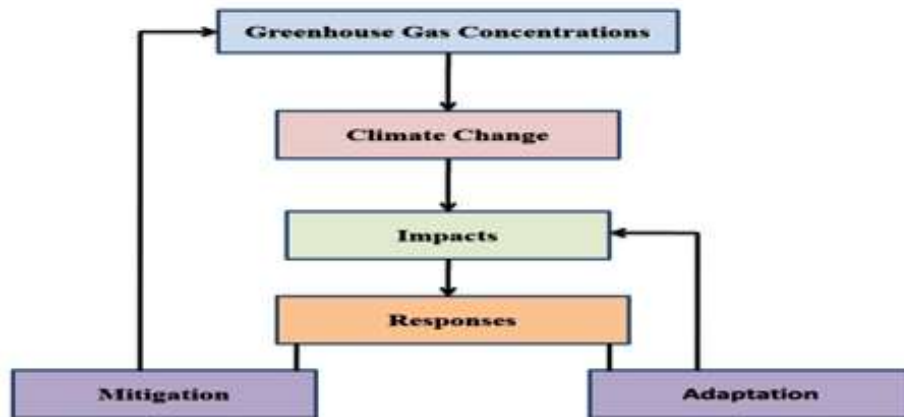


Fig.1. Schematic representation of climate change and its primary contents

Climate change describes alterations to the environment that go beyond the norm and are brought on by both natural and man-made variables, such as the concentration of greenhouse gases and aerosols in the atmosphere and variations in the earth's orbit, volcanic activity, and crustal movements. A megatrend that will bring about large worldwide changes in the future is climate change, often known as global warming, which is the term used to describe the average rise in global temperature. In its fourth assessment of climate change, the UN Intergovernmental Panel on Climate Change (IPCC) provided substantial scientific data about its impacts, and that evidence has since gained widespread acceptance. Additionally, as a result of the ongoing rise in emissions of greenhouse gases and the modifications to the climate system as well, people are becoming more conscious of the fact that global warming cannot be stopped. Crop output is impacted by changes in the climate.

There are numerous studies that take into account the type and volume of production changes for specific crops, locations, and scenarios (IPCC, 2007).

Climate change has an impact on all individuals, regardless of their background, but those who are the most vulnerable tend to face the most severe consequences. It has significant impacts on agriculture, energy, and finance. Agriculture relies heavily on predictable weather patterns, which can lead to food insecurity, price volatility, and reduced incomes for farmers. Energy systems can also be affected, resulting in energy shortages, higher prices, and reduced reliability. Climate change can also pose significant risks to the financial sector, such as physical damage to infrastructure, reduced value of assets, and increased insurance costs. It may also lead to a decline in economic activity, especially in the agriculture and energy sectors, which could negatively impact financial stability. The concept of impact is primarily used to describe the adverse effects of extreme weather, climate events, and changes in climate on systems that are both natural and human-made.

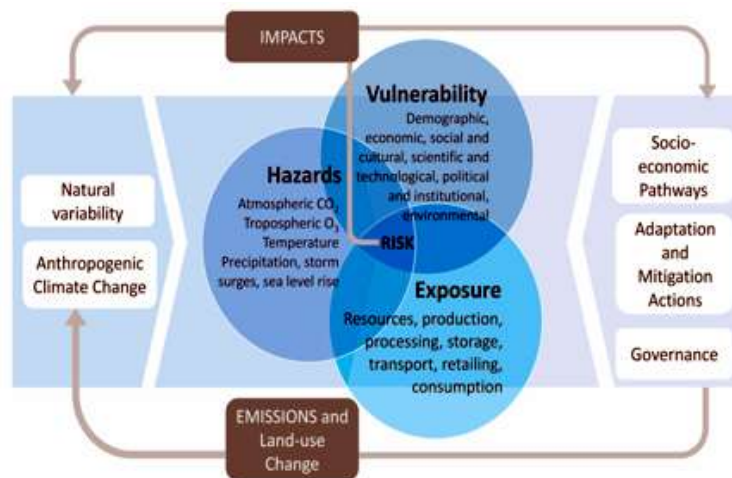


Figure 2:- The interaction of the physical climate system exposure (source – IPCC, 2014)

1. Climate Change and Agriculture: Impacts and Challenges

Modern agriculture around the world is seriously concerned about climate change. Water and feed resources, as well as animal health and production, are impacted by global warming and related alterations in mean temperature variables and climate variability. The processing, storing, moving, selling, and consuming of agricultural goods are all impacted by climate change.

The agricultural industry is a major contributor to greenhouse gas emissions, which are the root cause of the greenhouse effect and subsequent climate change. Despite this, the effects of climate change on agricultural production are increasingly widespread, posing a significant threat to food security in the future. The impacts of climate change on crop production are categorized as primary and secondary. The primary effects result from alterations in the atmosphere's composition due to the increase in greenhouse gases, which lead to changes in crop growth response, energy, and moisture balance in farming. The secondary effects are a result of changes in agricultural climate resources impacted by the primary effects, including changes in suitable cultivation areas and physical and chemical changes in agricultural soil. (Na, Young-Eun, et al., 2007).

1A- Changes in Agricultural Productivity

Various regions may experience better or worse crop-growing conditions due to climate change. For instance, growing seasons are getting longer in practically every state as a result of changes in temperature, precipitation, and frost-free days (Gowda, P., et al., 2018). Both positive and negative effects on food production might result from a prolonged growing season. Wildfire danger may rise as a result of climate change. Farmlands, meadows, and rangelands are seriously at risk from wildfires. Changes in temperature and precipitation will also probably increase the frequency and variety of insects, weeds, and illnesses. This might make weed and pest control more important (Ziska, L., et al., 2016). Most crops require pollination to survive.

When plants blossom and pollinators like bees and butterflies emerge, it can vary depending on the temperature and precipitation patterns. Pollination may decline if there are timing discrepancies between plant flowering and pollinator emergence (Walsh, M.K., et al., 2020).

1B- Impacts on Water and Soil Resources

Heavy precipitation is predicted to occur more frequently as a result of changes in the climate, which could be detrimental to crops due to soil erosion and nutrient depletion (Anaya-Morga, L. 2021). Increased agricultural waste water entering lakes, streams, and oceans is another effect of heavy rainfall (Zamuda, C. et al., 2018). Water quality may be harmed by this runoff.

Extreme weather phenomena, such as floods and severe rain, are occurring more frequently and with greater intensity, which can cause soil erosion, which can lead to the loss of fertile topsoil and reduce the productivity of agricultural lands.

Soil erosion can also have a significant impact on water quality by causing sedimentation, which can affect the availability of water resources and cause environmental damage. Overall, climate change poses significant challenges for soil conservation and sustainable land management, and effective adaptation measures will be necessary to maintain soil resources and food security in the future.

2. Adaptation and Mitigation Strategies for Climate Change in Agriculture

A global climate system's energy balance being thrown off balance as a result of an increase in greenhouse gases and aerosols in the environment, changes in the landscape, and solar radiation is responsible for climate change. Scientific analyses suggest that human activities have likely caused global warming. To address the challenges and risks of climate change, especially global warming, the agricultural sector can consider mitigation methods that reduce greenhouse gas emissions and absorption or adaptation methods that accept the inevitability of global warming, recognize its impacts, and minimize potential damages.

There are various methods we may use to mitigate the effects of climate change on agriculture, including the following:

2A- To adapt climate-smart farming practices to address production challenges caused by the climate, farmers can grow cover crops and use climate forecasting technologies.

2B- Reducing runoff is a crucial strategy to overcome the challenges posed by climate change, as it helps to mitigate the risks of soil erosion, water pollution, and water scarcity by increasing the infiltration of water into the soil, promoting healthy vegetation cover, and conserving water resources for future use.

2C- Boosting crop resistance in response to climate change is a critical approach to ensuring food security by developing crops that can adapt to extreme weather events, pests, and diseases, as well as by promoting sustainable agricultural practices that enhance soil health, water management, and biodiversity.

2D- Livestock producers can mitigate the impact of climate change by recovering methane, a potent greenhouse gas, from biogas created when manure decomposes, which can be used as a renewable energy source, reducing the dependence on fossil fuels, and reducing emissions of methane, which is a much more potent greenhouse gas than carbon dioxide.

3. Climate change and energy : Impacts and Challenges

A wide variety of climate change effects could have an impact on our energy system. These include increased temperatures and heat waves, extreme cold and

snowfall, prolonged dry spells, heaving downpours, rising sea levels, hurricanes, and wildfires. Even though these effects vary from one region to another, they will still have an impact everywhere in the nation (Zamuda, C. et al., 2018). Additionally, changes in one area or part of the energy system can have an impact on other areas or parts of the system.

The energy sector is closely linked to and reliant on other sectors of the economy, including transportation and water resources, and therefore climate-related impacts on these sectors can have repercussions on the energy system. To address these challenges, various stakeholders, such as businesses and governments, are taking several steps to increase the energy system's resilience to climate change. For instance, many states are investing in safeguarding and upgrading their energy infrastructure against extreme weather. Private-public partnerships are being established to share information and expertise, while companies and researchers are working on developing and deploying renewable and innovative technologies such as wind and solar power to reduce greenhouse gas emissions and air pollution. These actions not only help to address the vulnerabilities of the energy system but also contribute to mitigating the impacts of climate change.

3A- Disruptions to Energy Supply

In all parts of the world, the energy supply is seriously threatened by extreme weather and natural calamities. Hurricanes and sea level rise increase the risk of flooding, harming energy installations. The risk of flooding infrastructure is anticipated to increase with more frequent and heavy precipitation events. Thawing permafrost can cause the ground to sink in some areas, jeopardizing fuel pipelines and other energy infrastructure (Zamuda, C. et al., 2018).

In general, the temperature of the climate is rising and the atmosphere's ability to retain moisture is increasing, which can result in prolonged periods of low rainfall. This warming and variable precipitation patterns can also cause a reduction in snow accumulation, alterations in the timing of snowmelt, and prolonged dry spells , all of which have an impact on the availability of water resources required for energy systems.

3B- Disruptions in the Transmission of Electricity

The changing climate poses a threat to the infrastructure that supplies power to our homes and businesses. Extreme weather events such as snow, ice, wind, and wildfires can damage transmission lines and towers, while flooding can impact underground powerlines, pipelines, and storage facilities. In coastal areas, storm

surges can destroy petroleum storage tanks and disrupt transportation networks. Hot temperatures, particularly during the summer months, can also affect power transmission by decreasing the carrying capacity of transmission lines. Wildfires, which are more likely to occur in the Southwest during the summer, can cause transmission towers and powerlines to be damaged, which can interrupt energy networks. Additionally, wildfires can be sparked by defective or downed powerlines striking trees, leading some utilities to shut down powerlines during high wind forecasts to minimize the risk.

3C- Pressure on the Energy System

All G20 nations are experiencing rising temperatures. People are anticipated to require more energy, primarily electricity, for cooling as the environment heats. Additionally, there will be a greater likelihood of blackouts and other power outages due to the higher demand.

People should use less energy to heat their homes during the winter as a result of the changing climate. However, it is anticipated that the potential decrease in energy use brought on by fewer heating requirements will be outweighed by increased summer cooling demands (Zamuda, C. et al., 2018).

4. Increased Air Pollution and Climate Change

The energy sector is a significant contributor to both increased air pollution and climate change. The combustion of coal and other fossil fuels and oil releases pollutants into the atmosphere, contributing to poor air quality and negative health outcomes. Additionally, the greenhouse gases released from the combustion of these fuels, particularly carbon dioxide, cause climate change worldwide by trapping heat in the atmosphere and leading to rising temperatures, sea level rise, and other climate-related impacts.

The energy sector is also vulnerable to the effects of climate change, as changing weather trends and extreme events can disrupt energy infrastructure and supply chains. For instance, heatwaves can cause electricity demand to surge, leading to power outages and blackouts. Extreme weather events, such as hurricanes and flooding, can damage energy infrastructure and cause supply disruptions. The impact of these events can be particularly severe in low-income communities and those with inadequate infrastructure.

To address these challenges, there is a growing recognition of the need to transition to cleaner and more sustainable energy sources, such as wind, solar, and hydropower. By investing in these technologies, we can reduce air pollution and

greenhouse gas emissions, mitigate the impacts of climate change, and create a more resilient energy system.

5. Transition to Low-Carbon Energy: Challenges and Opportunities

The transition to low-carbon energy refers to the shift away from traditional energy sources that extensively pollute the atmosphere with greenhouse gases like carbon dioxide and towards alternative energy sources that produce fewer emissions. This transition is being driven by the urgent need to address climate change and reduce the impact of human activities on the environment. The primary objective of this transition is to reduce greenhouse gas emissions and mitigate the negative impacts of climate change. This can be achieved through the deployment of a variety of low-carbon energy technologies, such as renewable energy sources (e.g., solar, wind, hydropower, and geothermal), energy storage systems, and energy efficiency measures. Here are some points to consider regarding the transition to low-carbon energy:

CHALLENGES

- High initial investment costs for low-carbon technologies
- Resistance from industries and consumers who are comfortable with current energy sources
- Limited availability of low-carbon energy sources in some regions
- Lack of adequate infrastructure and storage capabilities for some low-carbon energy sources
- Some renewable energy sources, including the sun and wind, are inconsistent, which can create stability issues for the energy grid.
- Dependence on fossil fuels in certain sectors, such as transportation and aviation, which are difficult to replace with low-carbon alternatives.
- The need for international cooperation and coordination to address the global nature of climate change and the transition to low-carbon energy.

OPPORTUNITIES

- The potential for economic growth and job creation in the development and deployment of low-carbon technologies
- The opportunity to lower emissions of greenhouse gases and minimize the effects of climate change, improved air and water quality resulting from reduced reliance on fossil fuels.

- Diversifying energy sources has the potential to enhance energy security and independence, while the deployment of low-carbon technologies could increase energy access in developing countries. Furthermore, the energy sector's pursuit of innovation and technological advancement offers promising possibilities for creating a more sustainable future.
- The opportunity to create a more sustainable and resilient energy system for the future.
- Overall, the transition to low-carbon energy is a critical step in addressing the global challenge of climate change and presents a unique opportunity to create a more sustainable and resilient energy system for the future.

6. Climate Change and Finance: Impacts and Risks

Climate change and finance are closely interconnected, as the impacts of climate change can have significant effects on financial systems and institutions. In turn, the financial sector plays a critical role in supporting the transition to a low-carbon economy and mitigating the risks associated with climate change.

Climate change can pose a range of financial risks, including physical risks (e.g., damage to property, infrastructure, and supply chains due to extreme weather events), transition risks (e.g., changes in policy, regulation, or technology that could impact the value of assets), and liability risks (e.g., potential legal action or reputational damage resulting from failure to adequately address climate risks).

Financial institutions, such as banks, insurers, and asset managers, are increasingly recognizing the need to assess and manage climate risks. This includes incorporating climate risk considerations into their investment decisions and risk management processes, as well as disclosing climate-related financial information to stakeholders.

At the same time, the finance industry is crucial to the development of a low-carbon economy. This includes investing in and financing low-carbon infrastructure and technologies, as well as encouraging companies to adopt sustainable business practices.

The impacts of climate change and the associated financial risks are becoming increasingly evident, and there is growing recognition of the need to address these risks in a systematic and coordinated manner. In this context, the financial industry has a crucial role to play because it can accelerate the shift to a low-carbon economy and reduce the risks connected with climate change.

7. Financial Adaptation and Mitigation Strategies for Climate Change

Climate change poses a significant threat to the global economy, and businesses need to adapt and mitigate their financial strategies to withstand its impact. Companies must adopt a proactive approach to manage climate risk and identify potential opportunities that arise from switching to an economy with a low carbon footprint. One way of doing this is through climate risk assessments that identify potential financial risks and opportunities arising from climate change, which can inform adaptation strategies.

Companies can also invest in low-carbon technologies and renewable energy sources to reduce their carbon footprint and lower their exposure to volatile fossil fuel prices. By doing so, companies can also benefit from incentives and tax breaks for investing in sustainable technologies, which can ultimately reduce their long-term operating costs. Additionally, investing in energy-efficient buildings and transportation can improve operational efficiency and reduce energy costs. Another key strategy for financial adaptation and mitigation is the integration of climate change into a company's risk management framework. This involves evaluating climate risk across different areas of the business, such as supply chains, infrastructure, and operations, and implementing appropriate measures to manage these risks. Companies can also leverage climate-related financial disclosures and reporting frameworks to improve transparency and accountability and provide stakeholders with information on how climate risk is being managed.

To effectively tackle the financial impact of climate change, it is important to adopt a forward-thinking and cohesive approach that takes into account the possible risks and opportunities that may arise. Companies must invest in sustainable technologies, integrate climate change into their risk management framework, and improve transparency and accountability through climate-related financial disclosures. By doing so, businesses can not only mitigate the financial risks associated with climate change but also identify new opportunities and enhance their long-term resilience.

CONCLUSION

The world's largest economies, the G20 countries, have a significant impact on global greenhouse gas emissions and must take a lead role in moving toward an economy with fewer greenhouse gases. In agriculture, G20 countries must promote sustainable farming practices and invest in climate-resilient agriculture to reduce emissions and ensure food security. This may involve increasing research and development funding for sustainable agriculture technologies, supporting farmers'

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access to finance, and promoting sustainable land use practices. In the energy sector, G20 countries must accelerate the transition to renewable energy sources by investing in clean energy infrastructure, promoting energy efficiency, and phasing out fossil fuel subsidies. In addition to minimizing greenhouse gas emissions, this will also boost employment and the economy. Finally, G20 countries must encourage responsible finance that supports sustainable agriculture and renewable energy projects while reducing exposure to climate risk. This may involve promoting climate-related financial disclosures, developing green financial instruments, and improving transparency and accountability in the financial sector.

Ultimately, the interconnections between agriculture, energy, and finance in addressing climate change require coordinated action from G20 countries. By promoting sustainable agriculture, transitioning to clean energy, and encouraging responsible finance, G20 nations can support stable economic growth while reducing the effects of climate change.

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Examining the Impacts of Climate Change on Vulnerable Communities' Health Governance and the Need for Climate Resilience and Adaptation Measures

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Climate change is one of the most critical concerns of the present time, and it has already started to impact human health in various ways. Climate change is anticipated to have an influence on the entire world, demanding international cooperation. Changes in wind patterns, regular temperatures, typical precipitation amounts, and the frequency of severe weather conditions threaten human health, food, and water supplies. These dangers are directly related to the loss of biodiversity and the decline of species that affect the vast majority of the world. Climate change causes economic and political instability, altering the living conditions of populations. Vulnerable communities are often the most affected by these impacts due to their limited resources and poor governance structures. These vulnerable groups may be highly susceptible because they live in locations with inadequately maintained or old infrastructure that is incapable of dealing with climate-related catastrophes. Also, these groups reside in areas prone to climate-related health hazards such as flooding, excessive heat, and airborne pollution. In this paper, we examine the impacts of climate change on vulnerable communities' health governance and the need for climate resilience and adaptation measures. We also explore some of the existing measures that can be taken to mitigate the consequences of climate change on health governance in vulnerable communities.

INTRODUCTION

Climate change has been identified as one of the most significant threats to global public health. It is causing changes in weather patterns, leading to more frequent and severe natural disasters. It also alters the distribution and transmission of infectious diseases, amplifying the risk of epidemics and pandemics. These changes are already affecting vulnerable communities' health, who often lack the necessary resources and governance structures to respond effectively.

Climate change refers to long-term alterations in weather conditions and temperatures. These alterations can occur naturally, brought about by changes in solar activity or significant volcanic eruptions. However, since the 1800s, anthropogenic activities have become the primary instigator of climate change, primarily due to the combustion of non-renewable resources (fossil fuels) such as oil, gas, and coal. The combustion of fossil fuels emits greenhouse gases, which act like a wrap around the Earth, capturing heat from the sun and causing temperatures to rise. The chief greenhouse gases that trigger climate change are CO₂ and CH₄. These gases are produced when using gasoline for transportation or coal for heating purposes, among other activities. The destruction of forests and the clearing of land can also emit carbon dioxide. Methane emissions primarily originate from agriculture, oil, and gas operations.

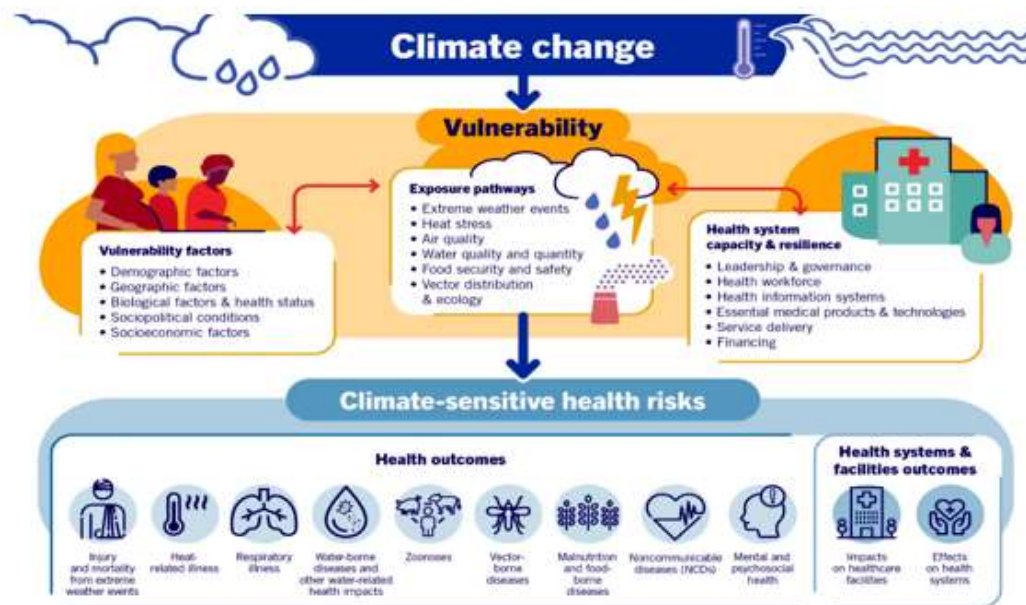


Figure 1: An outline of climate-related health hazards, exposure pathways, and risk factors. Climate change has a direct and indirect impact on health, and it is heavily mediated by socioeconomic and public health variables.

(A) Impacts of climate change on vulnerable communities’ health governance:

Climate change is disproportionately affecting vulnerable communities worldwide, and it has a profound impact on health governance. The lack of infrastructure, resources, and governance structures to respond efficiently to the effects of climate change is leaving these communities vulnerable to negative health

outcomes. In particular, the impacts of climate change on vulnerable communities' health governance can manifest in the following ways:

I. Increased vulnerability to climate-related diseases: Climate change is altering the distribution of contagious diseases, making vulnerable communities more susceptible to diseases such as dengue fever, malaria, and cholera. Due to its status as a developing nation with a significant population density, India could potentially encounter an array of human health consequences caused by climate change, including mosquito-borne diseases like chikungunya and dengue, parasitic infections like kala-azar, elephantiasis, and river blindness, as well as human plague and murine typhus (V. Ramana Dhara et al., 2013). The incidence of these diseases is sensitive to changes in temperature, rainfall, and humidity, which can affect vector populations and disease transmission. Establishing alert systems that detect the spread of communicable diseases would be vital, as this has advantages for both public health and the economy. Additionally, severe weather events can result in various health issues. Dislodgment caused by homelessness, malnourishment, and physical injuries are among the unfavorable impacts that could befall the population.

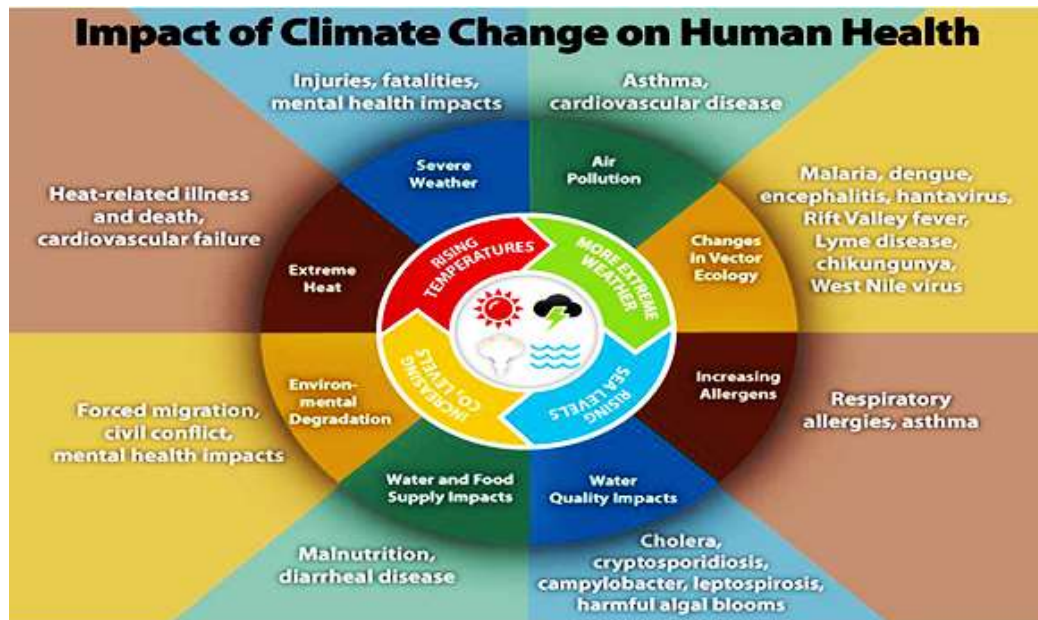


Figure 2: Climate change's impact on human health

II. Reduced access to basic needs: Climate change is making it harder for vulnerable communities to access basic needs such as water and food, increasing their vulnerability to malnutrition and illness. Climate change pushes vulnerable

groups into poverty and hunger, depriving them of access to basic amenities like health and education, increasing inequalities, limiting economic growth, and even provoking conflicts. Climate-induced impacts such as drought, flooding, and extreme weather events can have long-term consequences on agriculture, livelihoods, and economic growth. Climate change is a significant contributing factor to these cycles of destitution and starvation, particularly in regions that are already grappling with social and economic vulnerabilities.

III. Social instability and conflict: Climate change can lead to social instability and conflict, making it harder for vulnerable communities to access healthcare services. Conflict is harmful to health in numerous ways, affecting individuals, communities, and populations as a whole (**Devin C Bowles et al., 2015**). These detriments arise from the direct consequences of violence, which include the targeting of non-combatants and the overburdening of healthcare system. Conflict also generates circumstances favorable to transmissible ailments, which are worsened by poor nutrition, widespread migration, overpopulation, and a lack of accessibility to potable water, sanitation, and housing. These circumstances may potentially hinder the control and prevention of infectious diseases, resulting in challenges to eradicate such illnesses. The destruction of infrastructure, loss of health personnel, and harm to different social factors affecting health may be challenging to address, with long-term mitigation efforts required.

IV. Increased migration and displacement: Climate change can force vulnerable communities to migrate or be displaced, disrupting their access to healthcare and exposing them to new health risks. The movement of people due to the effects of climate change can vary from voluntary relocation as a presumptive measure to compelled displacement as a result of severe danger. Climate-induced migration may encompass a broad spectrum of actions, from temporary and short-term migrations to permanent and long-term resettlement. In certain cases, individuals or entire communities may choose to migrate to avoid environmental pressures, while in other cases, they may have no choice but to leave their homes because of the unbearable effects of a changing climate (**Juan Milan- Gracia et al., 2021**). It may either be compelled by the intensifying environmental conditions or pursued as a proactive approach to sustain one's means of living and overall welfare. Climate-induced migration can range from short-term and seasonal movements to permanent resettlement. In certain instances, people may be impelled to relocate due to the worsening climate circumstances, while in other instances, they may opt to migrate to safeguard their livelihoods and well-being in anticipation of the adverse effects of climate change and can create new health risks, such as the spread of communicable

diseases or exposure to extreme heat, which can further exacerbate health inequalities in vulnerable populations.



(B) Need for climate resilience and adaptation measures:

To mitigate the outcomes of climate change on vulnerable communities' health governance, there is a need for climate resilience and adaptation measures. These measures should be designed to strengthen the resilience of health systems and communities to climate change impacts. Some of the measures that can be taken include:

I. Strengthening health systems: Governments and non-governmental organizations can support the development of health systems in vulnerable communities to ensure that they are resilient to the consequences of climate change. The ability of individuals and communities to withstand challenges is built on the strength of health systems. The services provided by health systems are frequently considered a first line of defense in preventing adverse health outcomes and protecting all global citizens by serving as an essential framework that provides approachable, reasonable, accountable, and trustworthy healthcare as well as public health services (Elizabeth Lugten et al., 2022). Such adaptations will ensure that the context in

which these services are provided is able to meet the needs of individuals and communities effectively. To ensure that health systems remain strong and capable of providing adequate services to their populations while minimizing health security risks, it is essential to incorporate climate-related data more effectively into healthcare system planning. This will improve the adaptability and preparedness of healthcare services to address the impacts of climate change on public health. By implementing these measures, health systems can better safeguard the health and well-being of vulnerable communities.

II. Investing in climate-smart agriculture: Governments can invest in climate-smart agriculture to ensure that vulnerable communities have access to nutritious food and can build resilience to climate change. Climate-smart agriculture (CSA) is an integrated strategy to manage landscapes—cropland, livestock, forests, and fisheries—that tackles the interconnected concerns of food security and climate change (Marcus Taylor, 2017). The CSA seeks to achieve three goals simultaneously.

- a. *Better productivity:* Manufacture additional and superior food to enhance diet reliability and incomes, particularly for the 75 percent of the world's poverty-stricken people who inhabit rural regions and depend mostly on agriculture and farming for their sustenance.
- b. *Increased resilience:* minimize susceptibility to drought, illness, insects, as well as distinctive risks associated with climate change and disturbance, while also increasing the capability to adjust and flourish in the face of prolonged stresses like shorter seasons and variable weather conditions.
- c. *Reduced emissions:* Strive for lower emissions per calorie or kilo of food generated, prevent agricultural deforestation, and seek out ways to eliminate carbon from the surrounding environment.

III. Supporting water management: Governments can invest in water management strategies such as rainwater harvesting, water recycling, and water-efficient irrigation systems to ensure that vulnerable communities have access to clean water. Water recycling has been shown to be an effective approach for increasing accessibility to water in many parts of the world, particularly in areas where water is scarce. Water reuse is also regarded as a climate change adaptation strategy, which is consistent with the circular economy concept that is widely promoted in industrialized countries. Rainwater harvesting is an alternate source of water that can make a substantial contribution towards dealing with future water demands and maintaining or improving water resource quality. It has been demonstrated that it is an economically feasible option for vulnerable communities (Tzanakakis V.A. et al., 2020).

Water management must be evaluated urgently in order to provide a sustainable and safe water supply, particularly in places with shifting populations and vulnerability to climatic alterations. The consequences of climate change should be thoroughly reviewed, taking into account a broad spectrum of human activity and the environment. Water management should handle developing disputes between consumers of water by giving primary choices and alternatives in water dispensation and usage while ensuring water resource sustainability. Adoption of proficient technical approaches and procedures that enhance water use efficiency by users should be the main objective for the management of water in order to reduce the loss of water, support water resource sustainability, and increase water economic profitability.

IV. Building climate-resilient infrastructure: Governments can invest in climate-resilient infrastructure such as flood defenses, early warning systems, and climate-resistant housing to protect vulnerable communities from the impacts of climate change. Infrastructure that is capable of withstanding the impacts of climate change can improve the precision of services, prolong the lifespan of assets, and safeguard the returns on investments. To establish climate resilience, it may encompass a combination of executive measures (like adjusting maintenance schedules and incorporating flexible planning to accommodate future unpredictability) and physical alterations (such as elevating the height of bridges to prepare for rising sea levels or utilizing environmentally sustainable infrastructure, like promoting natural drainage systems) (Lacambra Ayuso et al., 2017).

To mitigate the risks associated with the uncertainty of future climate projections, a flexible and adaptive approach to infrastructure is essential. Although climate models provide valuable information, there is still considerable uncertainty, particularly at the local or regional level. It is also essential to consider other factors such as socioeconomic changes that could impact the future climate. In order to achieve climate resilience, it is important to take into account all relevant uncertainties when making decisions about infrastructure. By doing so, infrastructure can be built to withstand a range of potential future scenarios, thus reducing the costs associated with climate change adaptation. This approach also enables communities to continue functioning, even in the face of extreme weather events, such as floods or droughts. Therefore, the benefits of flexible and adaptive infrastructure go beyond reducing costs and can help ensure the sustainability and wellbeing of our communities.

CONCLUSION

Climate change is already affecting vulnerable communities' health governance, and without adequate measures, the situation is likely to worsen. The

urgency of climate change as a global challenge cannot be overstated, and it is imperative that the scientific community continues to recognize its significance. However, it is equally important to acknowledge the long-term environmental, social, and economic consequences of climate change that every country is currently facing. As such, it is crucial to align future scientific research with these consequences to ensure that they are adequately addressed. This requires a comprehensive and interdisciplinary approach that takes into account the full range of impacts of climate change on both human and natural systems. Additionally, it is necessary to involve all countries in these efforts to address the issue of climate change, as it is a global problem that requires global solutions. By recognizing the severity of the issue and working collaboratively, we can take steps to mitigate the effects of climate change and ensure a sustainable future for all.

Hence, to mitigate the impacts of climate change on health governance in vulnerable communities, there is a need for climate resilience and adaptation measures. These measures should be designed to strengthen health systems and communities' resilience to climate change impacts. Governments, non-governmental organizations, and other stakeholders must work together to develop and implement these measures to ensure that vulnerable communities can access the healthcare they need to stay healthy and thrive.

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Economic Impacts of Climate Change: Risks and Opportunities for G20 Economies: A Review

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Climate change is one of the most major issues confronting nations worldwide today, and its consequences are being felt throughout the world. The G20 is a collection of the world's major economies, accounting for nearly 80% of global GDP (gross domestic product), and it plays an important role in setting global climate change policies. This study looks at the consequences and possibilities of climate change for the G20, as well as the implications for global efforts to reduce the impact of global warming. The report examines the effects of climate change on the economy, agriculture, and human health, as well as the G20's policies and actions to address climate change. The report finds that the G20 plays an important role in tackling climate change and that a coordinated and integrated approach is required to limit its effects.

INTRODUCTION

Climate change is a pressing issue facing the world today, and its impact is being felt across the globe. Climate change is caused by the emission of greenhouse gases (GHGs), which retain radiation in the upper atmosphere and lead to global warming. Excessive agricultural operations, high fuel use, burning of agricultural leftovers, burning fossil fuels, deforestation, national and domestic transportation sectors, and so on are examples of anthropogenic activities. These anthropogenic activities cause climatic disasters, wreaking havoc on local and global infrastructure, human health, and overall production. The most deadly diseases or we can say pandemics, such as COVID-19, have had an impact on global environmental change and the economy (Abbass et al., 2022). Climate change is rising as a global security hazard in the twenty-first century. As a result, we must move fast to reduce future threats to the planet we share and the peace we seek.

The Group of Twenty (G20) accounts for over 80% of global GDP (gross domestic product) and plays a significant role in shaping global policies on climate change. Green development, climate finance, and sustainable development are among India's G20 priorities: accelerating inclusive and resilient growth, progressing to the

objectives of the Sustainable Development Goals (SDGs), advances in technology, digitizing infrastructure for public use, and so on. Climate change poses significant challenges for the G20 members, including the economy, agriculture, and human health.

This article examines the effects and prospects of climate change on the G20 and its implications for global efforts to mitigate the impact of climate change, providing a thorough investigation of climate change and its acutely affected areas, which pose serious risks to the world’s agricultural biological diversity, health, the economy, forestry, and tourism, with the goal of proposing some practical preventative measures and mitigation strategies that can be modified as sound alternatives for enduring the effects of climate change (CC).

IMPACT OF CLIMATE CHANGE ON THE ECONOMY

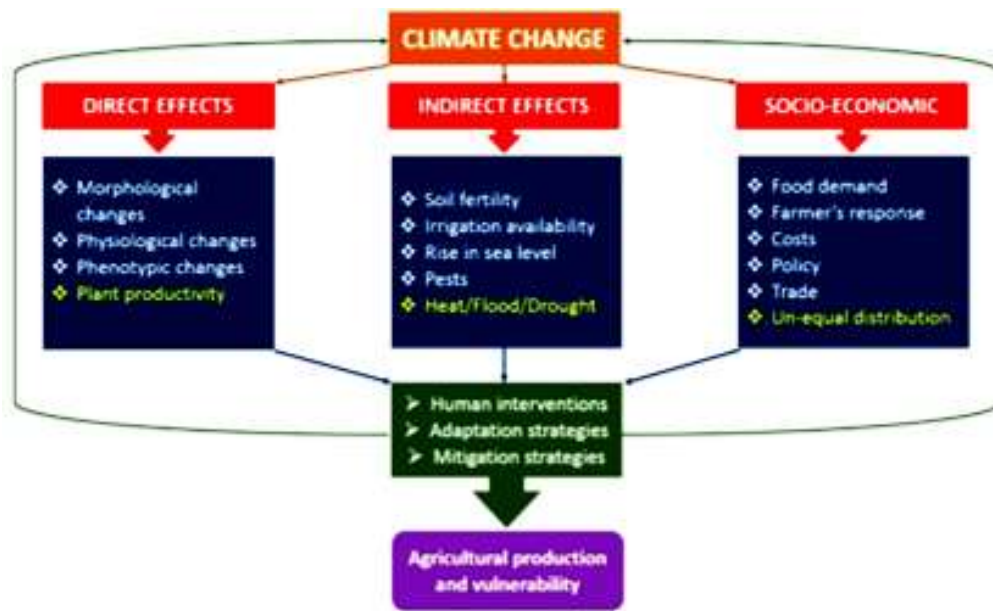
Climate change directly affects the economies of the G20 countries. Extreme weather events such as hurricanes, floods, droughts, and rising temperatures can cause significant damage to infrastructure, leading to economic losses. Environmental change can also reduce agricultural production, resulting in food scarcity and higher food prices. Climate change can also impact tourism, particularly in countries that rely on tourism as a major source of revenue. The impact of climate change on the economy is not limited to G20 countries. Climate change can lead to increased migration from countries affected by climate change to countries with more stable economies. The influx of migrants can place a strain on the resources of the receiving country, leading to social and economic challenges. Climate change events (drought, flooding, extreme temperatures, storms, etc.) are occurring more often, according to the Food and Agriculture Organization (FAO).

	Temperature rise scenario, by mid-century			
	Well-below 2°C increase	2.0°C increase	2.6°C increase	3.2°C increase
	Paris target	The likely range of global temperature gains		Severe case
Simulating for economic loss impacts from rising temperatures in % GDP, relative to a world without climate change (0°C)				
World	-4.2%	-11.0%	-13.9%	-18.1%
OECD	-3.1%	-7.6%	-8.1%	-10.6%
North America	-3.1%	-6.9%	-7.4%	-9.5%
South America	-4.1%	-10.8%	-13.0%	-17.0%
Europe	-2.8%	-7.7%	-8.0%	-10.5%
Middle East & Africa	-4.7%	-14.0%	-21.5%	-27.6%
Asia	-5.5%	-14.9%	-20.4%	-26.5%
Advanced Asia	-3.3%	-9.5%	-11.7%	-15.4%
ASEAN	-4.2%	-17.0%	-29.0%	-37.4%
Oceania	-4.3%	-11.2%	-12.3%	-16.3%

Table 1: Global temperature rises will negatively impact GDP in all regions by mid-century. Image: Swiss Re Institute: The economics of climate change. Source: Swiss Re Institute Report: The economics of climate change: no action, not an option

IMPACT OF CLIMATE CHANGE ON AGRICULTURE

Climate change can have a significant impact on agriculture, particularly in developing countries. The increase in global temperatures can lead to a decline in agricultural productivity, leading to food shortages and increased food prices. Climate change can also lead to changes in rainfall patterns, making it challenging to plan and manage crop cultivation. In addition, climate change can also lead to soil erosion, which can reduce the quality of the soil and make it more difficult to grow crops. Plant physiology has been greatly influenced by climate variability through several means. Environment severe weather and climate unpredictability increased the likelihood of a variety of pressures on plants. Devastating environmental changes have had a significant impact on agricultural production. The availability of water, contaminants in the air and the fertility of the soil all have a significant impact on agricultural output. Due to both the direct and indirect effects of abiotic stressors, the adverse impacts on plant productivity are increasing with sudden changes in environmental circumstances. Because of the continuous deforestation and excessive utilization of fossil fuels, the concentration of CO₂ has escalated from 280 mol/l to 400 mol/l in the atmosphere, which is the main factor in increasing average global temperatures. Climate change has an impact on agricultural output in a variety of ways and has socioeconomic effects, as outlined in.



Source: Raza et.al.2019

IMPACT OF CLIMATE CHANGE ON HUMAN HEALTH

Climate change can also have a significant impact on human health, particularly in developing countries. The increase in global temperatures can lead to an increase in the incidence of heat-related illnesses such as heatstroke and dehydration. Climate change can also lead to an increase in the incidence of water-borne diseases, such as cholera and typhoid fever, due to changes in rainfall patterns and increased flooding. Climate change can also lead to an increase in the incidence of vector-borne diseases, such as malaria and dengue fever, due to changes in the distribution of mosquitoes and other vectors. The impact of climate change on human health is not limited to developing countries. Climate change can also lead to an increase in the incidence of respiratory illnesses, such as asthma, due to increased air pollution. The effects of climate change have a combination of direct and indirect impacts on human health. Extreme heat, increasing levels of seawater, fluctuations in precipitate that lead to droughts and flooding, and enormous hurricanes can all inflict injuries, sickness, and even mortality.

Changing the climate can also have an indirect impact on health due to disruptions to the environment. For example, rising levels of air pollution can have a disastrously detrimental effect on cardiovascular and breathing disorders.

Temperature and rainfall fluctuations may affect the viability, distribution, and activities of insects and other animals, giving rise to mutations of diseases that are transmissible. Environmental factors can also have an impact on food safety by exposing individuals to tainted foods, which can lead to illnesses caused by food borne pathogens. Furthermore, climate change can have an impact on mental wellness and health.

POLICIES AND MEASURES ADOPTED BY THE G20 FOR CLIMATE CHANGE

The G20 is a forum that brings together the world's largest economies to address global challenges, including climate change. Here are some of the key policies and measures adopted by the G20 to address climate change:

Paris Agreement: The Paris Agreement is a legally enforceable international climate change accord. It was accepted on December 12, 2015, by 196 parties at the United Nations Climate Change Conference (COP21) in Paris, France.

In 2015, the G20 countries signed the Paris Agreement, which aims to keep the world's temperatures well below two degrees Celsius above the level of pre-industrial times while also pursuing efforts to keep temperature increases to 1.5 degrees Celsius. The global surface temperature could rise up to 1.5 to 2.50°C. Global

warming, mainly caused by human activities, is currently rising by 0.2° C per ten years. A 2°C temperature increase above pre-industrial levels is linked to significant adverse impacts on the environment and human health, including a much increased chance of hazardous and possibly life-threatening shifts in the global environment. Hence, it would require significant and quick reductions in emissions from all economic sectors; 1.5 degrees Celsius is acceptable.

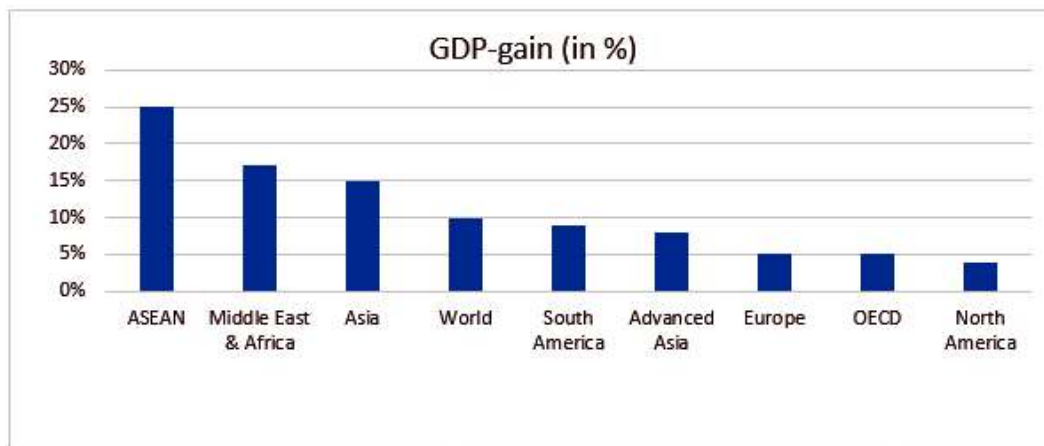


Table 2: The stimulation of severe economic repercussions and uncertainty from climate change depicted in the image indicates the difference in GDP between the 2.6°C scenario and the Paris scenario in the absence of climate change.

Source: Swiss Re Institute Report: The economics of climate change: no action, not an option

Carbon Pricing: Several G20 countries have implemented carbon pricing policies to incentivize the reduction of greenhouse gas emissions. These policies include carbon taxes and cap-and-trade systems. CO₂ emissions are a major contributor to climate change. As a result, controlling or at least lowering emissions is now the most important element. It is up to policymakers to devise and implement policies that encourage reduced emissions or a cleaner, greener economy. According to the conclusions reported in the Intergovernmental Panel on Climate Change (IPCC) special report, in order to minimize global warming, net CO₂ emissions would have to fall by around 45 percent from 2010 levels by 2030, reaching net zero around 2050.

Renewable Energy: The G20 countries have committed to increasing the share of renewable energy in their energy mix. They have also pledged to phase out inefficient fossil fuel subsidies. The G20 takes tangible autonomous initiatives,

comprising a variety of legislative, economic, and modern technology alternatives, to expand access to energy in Asia-Pacific and other regions. In 2015 and 2016, the G20 Voluntary Action Plan on Renewable Energy intends to significantly increase the share of energy from renewable sources in the global mix of energy sources by adopting energy plans that include deploying renewable energy sources and encouraging investment in renewable energy production and consumption.

The G20 supports the ambition of a globe powered by renewable energy for everyone and is going to work to ensure that all individuals have the opportunity to utilize cost-effective, reliable, sustainable, and contemporary energy-related services. It will keep on enacting the Energy Collaboration Principles, encourage current energy systems and resiliency and clear markets for electricity, reinforce collaboration on energy access, clean energy, and energy efficiency, and encourage the funding of novel energy technologies, which include renewable energy sources.

Energy Efficiency: In accordance with the G20 Energy Efficiency Action Plan of 2014, the G20 developed the G20 Energy Efficiency Leading Program in 2016, with the goal of considerably enhancing the efficiency of energy in the G20 via more effective energy collaboration and by promoting members of the G20 to set up active energy efficacy services, policies, and measures depending on each member's particular requirements and circumstances at the national level. The G20 countries have committed to improving energy efficiency in buildings, industry, and transport to reduce greenhouse gas emissions, recognize the need to give targeted assistance to the poorest, and are committed to rationalizing and phasing off ineffective subsidies for fossil fuels that promote unsustainable usage.

Green Finance: Climate change is one of the most pressing issues of our day, and its negative consequences undermine all countries' ability to achieve equal development.. The goal of taking immediate action to prevent global warming and its consequences is a priority for G20 countries, as evidenced by their contributions to the Paris Agreement. The G20 has established the Green Finance Study Group to explore ways to mobilize private capital for investments in climate-friendly projects. The Green Finance Study Group (GFSG) was established in 2016 to strengthen the financial system's capacity to encourage private green investment. Green finance has the potential to play an important role in promoting sustainable development by mobilizing private investment to address today's climate and development challenges. The GFSG has already recognized issues and possibilities in environmental finance across the G20, as well as optional choices for nations to pursue.

The G20 continues to collaborate closely to combat climate change and its repercussions, in addition to working to help ensure the quick entry into ordered and effective implementation of the Paris Agreement, encourage more resources to be

contributed, and prepare to counteract the effects of climate change and encourage financial flows to be consistent with a path toward low greenhouse gas emissions and climate-resilient development. It works to discover alternatives to improve the financial system's ability to raise private financing for green investment.

Climate Adaptation: The G20 countries have recognized the need to adapt to the impacts of climate change, particularly in vulnerable regions, and have committed to providing financial and technical support for adaptation efforts. The commitments represent the intent of climate action expressed by G20 members, while the compliance indicator is a proxy for the actual climate action undertaken by the G20 members. The commitments adopted by the G20 members in the domain of climate change revolve around the following issues: energy access, security, and markets; energy efficiency and renewable; rationalizing and phasing out of fossil fuel subsidies; adoption of advanced and clean technologies; resilient infrastructure; comprehensive adaptation strategies based on traditional and indigenous knowledge, ecosystem and communities based approaches and nature-based solutions; tackling environmental challenges like biodiversity loss; addressing climate-related risks; adoption of the Circular Carbon Economy; accounting and reporting of HFC emissions; sustainable and inclusive green growth; commitment to the Paris Agreement, NDCs, and climate finance assistance.

Sustainable Agriculture: The G20 has recognized the critical importance of sustainable agriculture in combating climate change and pledged to promote sustainable agricultural practices. The G20 has vowed to assist sustainable agriculture in order to improve global food security and nutrition for all by supporting the G20 Technical Platform on Food Loss and Waste, but especially the poor and vulnerable groups, reducing food price volatility, and reducing food waste and loss all over the food value chain. The G20 has agreed to promote environmentally conscious agriculture in order to mitigate climate change. The G20 committed to supporting ecologically friendly farming in order to enhance broad nutritional well-being and food safety for all, but especially the poor and vulnerable groups, to mitigate food price volatility, and to decrease the loss and waste of food all through the food value chain by bolstering the G20's Technique Platform on the measurement and lowering of Food Loss and Waste. The G20 will help to end hunger, poverty, and all forms of malnutrition with the implementation strategies and initiatives relating to agriculture-related SDGs while paying particular attention to the links to other SDGs, expanding the world's ecology for responsible farming investment, helping to facilitate creativity and ICT utilization in agriculture, preventing food loss and garbage, and supporting productive agricultural methods that increase productivity.

These are just a few examples of the policies and measures adopted by the G20 to address climate change. Even though progress has been made, a lot more must be accomplished to reach the Paris Agreement's targets and avert the worst effects of climate change.

CONCLUSION

Climate change has an impact on the global economy. Attempting to appreciate, let alone quantify, these repercussions is a particularly difficult and error-prone undertaking. Despite this, we can draw judgments about how global warming will affect many economic concerns based on what we know now. More severe weather has the potential to slow economic growth by inflicting asset damage, reducing worker supply, and lowering labor productivity.

Climate change is causing concern around the world by impeding agriculture and its goods. Global warming is caused by industrialization and toxic gases, which ultimately disrupt the world's ecosystem. Plant productivity is being harmed by climate change. A biotic stressors are the most common type of stress experienced by plants. Variations in temperature and rainfall are major indications of environmental stress. Weather fluctuations have both positive and negative consequences, although the negative consequences are more thought-provoking. It is still unclear how to approach this topic and what solutions should be used. As a result, researchers must concentrate on improving plant growth and development under a biotic challenge such as drought and heat.

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India Leading G-20 Towards A Sustainable World: Finding Solution Of Climate Change With G-20 And Challenges

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The G-20, as a forum for international economic cooperation, has the potential to play a critical role in promoting sustainable and inclusive growth in India. Sustainable and inclusive growth is characterized by economic growth that benefits all segments of society, while taking into consideration the long-term environmental and social implications of development. India's economic growth has been remarkable in recent years, with various sectors contributing to its success. However, the country faces numerous challenges in achieving inclusive and sustained economic growth, including environmental degradation and climate change. This article explores how India can achieve economic growth that is inclusive and sustainable, while protecting the environment, and how the G-20 can assist in this endeavour. This article also explores the role of the G-20 in promoting sustainable and inclusive growth in India, and the opportunities and challenges presented by this task.

The article reviews the existing literature to identify key areas where India can make progress, and suggests policies that prioritize investments in clean energy, sustainable infrastructure, and environmentally-friendly agriculture. The article concludes by highlighting the potential of the G-20 in supporting India's efforts towards inclusive and sustained economic growth.

INTRODUCTION

India, with a population of over 1.3 billion, is one of the fastest growing economies in the world. India has experienced significant economic growth over the past few decades, with various sectors such as industries, agriculture, and services contributing to its success. However, this growth has not been inclusive, and income inequality remains a major challenge. Furthermore, the country's economic activities have also contributed to environmental degradation and climate change. In response to these challenges, India has adopted a series of policies and initiatives to promote sustainable and inclusive growth. However, the country faces numerous challenges,

including the lack of financial and technological resources, inadequate infrastructure, and limited access to education and healthcare. Economic degradation, climate change and income inequality are just a few of the challenges that India must address to achieve sustained and inclusive growth.

As a member of the G-20, India has an opportunity to leverage the collective efforts of the group to promote sustainable and inclusive growth. The G-20, as a forum for the world's largest economies and a forum for international economic cooperation, has the potential to promote policies that promote sustainable and inclusive growth. The G-20 has identified sustainable and inclusive growth as a key priority. It has taken various steps to promote sustainable development, including endorsing the United Nations Sustainable Development Goals (SDGs) and launching the Green Finance Study Group (GFSG) to promote sustainable finance. The G-20 has also recognized the importance of inclusive growth and has launched several initiatives to promote gender equality and social inclusion. However, more needs to be done to address the challenges faced by India in achieving sustainable and inclusive growth.

One of the major challenges that India is facing is economic degradation. India's economic growth has come at a significant cost to the environment, with high levels of pollution, deforestation and water scarcity. The G-20 could play a significant role in promoting sustainable economic growth in India by supporting clean energy initiatives and promoting sustainable economic growth in India.

The G-20 could promote inclusive growth in India by supporting initiatives that promote equitable access to education, healthcare and other essential services.

OBJECTIVES

- 1) To examine the role of the G-20 in promoting sustainable and inclusive growth in India.
- 2) To identify the key areas where the G-20 could make a significant impact in promoting sustainable and inclusive growth in India.
- 3) To highlight the challenges that India faces in achieving sustainable and inclusive growth, particularly in the face of economic degradation.
- 4) To emphasize the need for greater international cooperation to address the challenges faced by India in achieving sustainable and inclusive growth.
- 5) To contribute to the understanding of the potential of the G-20 in promoting sustainable and inclusive growth in India and the importance of international cooperation in achieving this goal.

THE THREE PILLARS OF INDIAN ECONOMY

1. Agriculture sector:

- Contribution to GDP: around 18%
- Employment: around 50% of the workforce

ENVIRONMENTAL IMPACT & THE SUSTAINABLE PRACTICES

- The use of chemical fertilizers and pesticides contaminates soil and water resources, leading to soil degradation and water pollution. Organic farming, integrated pest management, and crop rotation can help reduce the use of chemicals in agriculture.
- The burning of crop residues contributes to air pollution and can be reduced by promoting alternatives such as converting the residue into biofuels or using it for animal feed or fertilizer.
- Excessive groundwater extraction and water pollution threaten the sustainability of the sector. Water-efficient irrigation techniques and better water management practices can reduce the impact of agriculture on water resources.

THE G-20

- The G-20 can support India's efforts to adopt sustainable agricultural practices on wide scale and to support India with technical and financial assistance.
- At G20 can play an effective role in supporting the multilateral goals of increasing research and development to develop affordable renewable energy. We should also ensure that finance and technology is available to meet the universal global aspiration for clean energy.

2. Industry sector:

- Contribution to GDP: around 30%
- Employment: around 25% of the workforce

ENVIRONMENTAL IMPACT & THE SUSTAINABLE PRACTICES

- The industry sector is a significant source of air and water pollution, hazardous waste, and greenhouse gas emissions. Industries such as thermal power plants and cement factories are significant contributors to air pollution. The lack of proper waste disposal facilities leads to hazardous waste and greenhouse gas emissions and pollution of water resources.
- This pollution can be reduced by promoting sustainable industrial practices such as energy-efficient processes, renewable energy sources, and waste reduction and recycling.

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- Improving waste management practices such as proper disposal of hazardous waste can help reduce water pollution.
- The adoption of green building design and energy-efficient lighting and appliances can reduce the environmental impact of the construction sector.

THE G-20

The G-20 can support India's efforts to adopt cleaner technologies and promote sustainable manufacturing practices, such as energy-efficient processes, renewable energy sources, and waste reduction and recycling and also provide India with technical and financial assistance with emphasis on research & development

3. Service sector:

The service sector, which includes areas such as tourism, healthcare, and education, is the fastest-growing sector in the Indian economy.

- Contribution to GDP: around 52%
- Employment: around 25% of the workforce.

ENVIRONMENTAL IMPACT & THE SUSTAINABLE PRACTICES

- The service sector has a relatively lower environmental impact compared to agriculture and industry. However, it still contributes to pollution and climate change through activities such as transportation, energy consumption, and waste generation.
- Promoting sustainable practices such as the use of public transportation and renewable energy sources can help reduce the impact of the service sector on the environment.
- Eco-tourism and responsible tourism practices can promote sustainable tourism and reduce the environmental impact of the tourism industry.
- The healthcare and education sectors can reduce their environmental impact by adopting energy-efficient and green building designs and reducing waste generation through better resource management practices.

THE G-20

- The G-20 can support India's efforts to promote sustainable tourism practices, such as eco-tourism and responsible tourism, and adopt energy-efficient and green building designs in the healthcare and education sectors.

ROAD AHEAD FROM THE PAPER

Overall, the G-20 can help India reduce pollution and mitigate the impacts of climate change in these sectors by promoting global cooperation and knowledge-sharing. The G-20 can facilitate the transfer of clean technologies and provide

financial and technical assistance to support sustainable development initiatives in India. Additionally, the G-20 can advocate for policies and regulations that incentivize sustainable practices and promote environmental protection, both in India and globally.

1. **Supporting renewable energy:** The G-20 can support India's efforts to transition to renewable energy sources, such as solar, wind, and hydropower. This can be done by providing financial and technical assistance, promoting technology transfer, and facilitating public-private partnerships. India has set a target of generating 450 GW of renewable energy by 2030, and the G-20 can help achieve this goal.
2. **Encouraging sustainable transportation:** The G-20 can support India's efforts to promote sustainable transportation, such as electric vehicles, public transportation, and non-motorized transport. This can be done by sharing best practices and knowledge, providing financial incentives for the adoption of sustainable transportation modes, and promoting the development of infrastructure such as charging stations and bike lanes.
3. **Promoting waste reduction and recycling:** The G-20 can support India's efforts to reduce waste and promote recycling by sharing best practices and knowledge, providing technical assistance, and promoting public-private partnerships. India generates a large amount of solid waste, and proper waste management can help reduce pollution and promote a circular economy.

IN ADDITION TO THE G-20'S SUPPORT, INDIA CAN TAKE SEVERAL STEPS TO REDUCE POLLUTION

1. **Implementing stricter regulations:** India can implement stricter regulations on industries and transportation to reduce emissions and pollution. This can include setting emissions standards, enforcing environmental laws, and promoting compliance with pollution control measures.
2. **Investing in green infrastructure:** India can invest in green infrastructure, such as green buildings, green roofs, and green spaces, to reduce pollution and mitigate the impacts of climate change. This can be done by providing financial incentives for the adoption of green technologies and promoting the development of infrastructure that is sustainable and energy-efficient.
3. **Promoting awareness and education:** India can promote awareness and education on pollution and its impacts through public campaigns, school programs, and community outreach. This can help change behaviour and encourage individuals and businesses to adopt sustainable practices.

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4. Overall, reducing pollution in India requires a collaborative effort between the government, private sector, and civil society. The G-20 can play an important role in supporting India's efforts, but it will require sustained action and commitment from all stakeholders to achieve meaningful progress.

CONCLUSION

Overall, reducing pollution in each sector requires a comprehensive approach that addresses both environmental impact and economic development. Sustainable practices that promote biodiversity, energy efficiency, and waste reduction can help reduce the environmental impact of these sectors while promoting economic growth. India has a crucial role to play in promoting sustainable growth and reducing environmental pollution, but it also needs the support of global organizations like G-20 to achieve this goal. While India has taken significant steps towards sustainable development, such as promoting renewable energy sources, achieving its targets requires significant investment and technical support. By providing financial incentives, promoting sustainable technologies and sharing best practices, G-20 can help Indian achieve its sustainable development goals. Working together, India and G-20 can create a more sustainable future for the planet, where economic growth and environmental protection go hand in hand.

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Potential Impacts of Climate Change on Agricultural Sustainability of G20 Countries

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G20 group is comprised of world's some largest economies, accounting for largest global wealth. It is home to many of the world's most significant carbon sinks also. This year G20 summit is presided over by India and concurrent issues like climate change and agriculture sustainability are likely to be addressed here. Climate change is potentially impacting the agriculture globally. G20 is going to be a productive stand to have deliberations on these issues. A broad four-point agenda has been identified for global challenges in the agriculture sector including digitalization of agriculture value chain.

Climate-smart agriculture includes composite farming, soil health management and technological implementations like drip/ sprinkler irrigation. Further, mapping the vulnerable areas conducting research and increased climate finance would also help farmers to take up adaptation measures in order to mitigate the climate change impacts.

INTRODUCTION

Globally, weather and climate-related risks, which potentially cause loss and damage, have increased dramatically over the past few decades. The most recent climate projections indicate a significant increase in the frequency, duration, and intensity of extreme weather events as well as severe slow-onset climate related changes. These pose a growing risk to sustainable development of communities and countries. G20 composed of most of the world's largest economies, including both developed and developing nations works to address major issues related to the global economy like international financial stability, climate change mitigation and sustainable development. The group was formed in 1999 in response to the severe economic crisis that shocked the economies across the globe. Since 2008, the group has been meeting at least once a year. The annual summit witnesses the participation of heads of government of member countries. Now, India being at the helm of the

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bloc has got a unique opportunity to contribute to the global agenda on pressing issues of international importance.

India this year took over the presidency of the powerful G20 countries, working towards a host of issues having global ramifications. It is also here worthwhile to mention that G20 accounts for around two-thirds of the world population, 75% of the international trade, 80% of Gross World Product (GWP) and 60% of the world's land area; G20 is presently one of the largest and biggest intergovernmental forum comprising of 19 countries and the European Union (EU). For India the G-20 in 2023 will not only be about diplomatic meetings, but it will provide the opportunity to showcase its developmental strides aimed at furthering global good particularly in the agricultural sector towards ensuring food and nutritional security for all. Recently, the Agriculture Deputies of the G20 met for three days and agreed on a broad four-point agenda has been identified for global challenges in the agriculture sector that need immediate attention. This four-point common agenda focuses on issues of Food Security and Nutrition, Sustainable agriculture and Climate Change's Impact, Inclusive Agricultural Value Chain and Digitalization for Agricultural Transformation. (Kumar, 2023)

G20 under India's presidency will focus on climate change and its impact on the livelihood of farmers. "It is a global challenge and G20 is going to be a fruitful platform to have deliberations on the issue. Under the chairmanship of India, the grouping of the world's largest economies will explore how multilateral development banks, the principal agents of development, can be better equipped to meet the global challenges of the 21st century. The challenges being faced are global in nature and require global solutions. Therefore, the world community today needs to lay greater emphasis on globally coordinated policies and actions. There is a need for renewed faith in multilateralism. The G20 summit aims to strengthen weaker sections of societies of the member countries. In today's world, different countries have common problems and there are some issues in which member countries can complement each other. The G20 is the ideal forum to find solutions to all common issues. (Vasudev, 2023)

CLIMATE CHANGE AND G20

Climate change impacting agriculture globally, Multilateral forums like the Group of Twenty (G20) play a crucial role in bolstering global collective action

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against climate change. The G20 gathers the world's most developed economies and emerging ones, which together account for more than 80 percent of global GDP, 75 percent of international trade, and 60 percent of global population. The G20 economies are responsible for about 75 to 80 percent of global greenhouse gas emissions. (Warren,2021) All but one of the top 10 carbon-emitting countries are G20 members (Friedrich et al., 2020). At the same time, the G20 economies account for the largest share of global wealth and therefore possess the financial wherewithal to spearhead the green transition required to limit the rise in global temperature. Moreover, the G20 countries are home to many of the world's most significant carbon sinks, such as the Brazilian Amazon Rainforest, the Searles Marshes in the United Kingdom (UK), and the Sundarbans in India (Warren. 2021). At the G20 Joint Environment and Climate Ministerial Meeting held in August 2022, the member countries acknowledged the severity of the climate crisis and declared that three crucial issues will be prioritised towards fulfilling the goals set by the Paris Agreement: a sustainable global economic recovery; land-based and ocean-based climate action; and resource mobilisation for environmental protection. (GIC, 2021)

Evaluation of climate action is based on two most popular indices- "Climate Change Performance Index (CCPI)" developed by German Watch, and "Climate Action Tracker (CAT)" of the Climate Analytics and New Climate Institute (Green watch, 2022 and CAT, 2022). The CAT undertakes quantification exercises to capture the impacts of a country's climate policies and action. It covers the financing pledges, targets, and nationally determined contributions (NDCs) on national emissions from 1990 onwards to arrive at 2030 projections. Where possible, the tracker explores the future trajectory of national emissions in relation to emission levels compatible with a below-2 degrees Celsius pathway, the NDCs, pledges, and current policies. The CCPI, meanwhile, is based on four fundamental variables: per capita GHG emissions; share of renewable energy per total primary energy supply; per capita total primary energy supply; and climate policy. Data from the Climate Action Tracker shows that among the G20 countries, only the UK has put in place climate action targets and policies that could help the global community to achieve the goal of limiting global warming (Ritchie et al., 2020, Andrew and Peter, 2022). Some important indicators, their timeline, weight to index has been shown in Table-1. Table-2 shows CPI score of G20 countries and categorize them accordingly, depicting that miles to go to achieve global sustainable climate.

Table 1: Indicators of the Climate Performance Index in G20 Countries

Indicator (units)	Weight to CPI	Timeline	Data Source
Per Capita CO ₂ emissions from fossil fuels (metric tons per capita)	14%	2019	World Development Indicator
Per Capita non-CO ₂ GHG emissions (metric tons per capita)	8%	2019	Climate Watch Tracker
Share of Global Cumulative Carbon Emissions relative to Share of Global Cumulative Population	9%	1800-2019	Our World in Data
Carbon Cost of Growth	7%	2019	Global Carbon Atlas, World Development Indicator
Theil Index of Carbon Inequality	9%	2019	World Inequality Database
Rate of Per Capita Energy Use Relative to 2,000 Watts	13%	2019	Our World in Data
Energy efficiency of production (GDP per unit of primary energy consumption) (in billions/Twh)	13%	2019	Our World in Data, World Development Indicator
Renewable energy consumption (as a share of total final energy consumption) (in %)	5%	2019	World Development Indicator
Percentage Change in Climate Altering Land Cover (in %)	12%	1992-2019	IMF Land Cover Accounts
Percentage Change in Climate Regulating Land Cover (in %)	8%	1992-2019	IMF Land Cover Accounts
Climate Policy Coverage	2%	2022	Climate Policy Database

Table 2: Climate Performance Index Scores for the G20 Countries

G20 Member	Climate Action Performance Index Scores	Climate Performance Classification
India	0.76	Leaders
Italy	0.75	
Indonesia	0.72	Runners-up
United Kingdom	0.71	
Turkey	0.71	
France	0.70	
Germany	0.67	
European Union	0.66	
Mexico	0.64	Contenders
Japan	0.63	
Argentina	0.62	
Brazil	0.60	
China	0.59	
Australia	0.46	Aspirants
South Africa	0.44	
South Korea	0.44	
Russia	0.42	Incipient
United States	0.37	
Canada	0.34	
Saudi Arabia	0.29	

SUSTAINABLE AGRICULTURE AND IMPACT OF CLIMATE CHANGE

Climate change is a reality and a universal phenomenon not confined to a specific part of the globe. Almost all the regions are now witnessing the adverse impacts of the rising temperatures. The impact is in the form of decreasing yields,

increased frequency of droughts and floods, loss of biodiversity, changing pattern of precipitation and much more. Agriculture is one such sector which contributes to climate change as well as provides various mitigation as well as adaptation strategies for minimizing the impact of climate change. India has already taken steps to make agriculture climate resilient as well as to ensure sustainability. In this regard, India also shared the steps taken towards 'climate-smart agriculture' like mapping the vulnerable areas and conducting research, increase climate finance to help farmers take up adaptation measures in order to mitigate the climate change impact.

Climate smart agriculture is high priority global agenda that endorses location specific integrated /composite farming systems; soil and moisture conservation measures; comprehensive soil health management; efficient water management practices and mainstreaming rain-fed technologies. Main objective of climate smart agriculture is enhancing water use efficiency by promoting technological interventions like drip & sprinkler technologies, efficient water application & distribution system, secondary storage etc. Soil health management aims to encourage Integrated Nutrient Management (INM) through judicious use of chemical fertilizers including secondary and micro nutrients in conjunction with organic manures and bio-fertilizers for improving soil health and its productivity, strengthening of soil and fertilizer testing facilities to improve soil test-based recommendations to farmers for improving soil fertility.

Sustainability of agriculture requires a multi-pronged strategy encompassing strategic research on adaptation, mitigation, and demonstration of technologies on farmers' fields to create awareness, aiming mainly to evolve crop varieties tolerant to climatic stresses like floods, droughts, frost, inundation due to cyclones and heat waves. India also prompted the steps towards climate smart agriculture, mapping the vulnerable areas and conducting research in the field. The G-20 members stressed on the need to increase climate finance to help farmers take up adaptation measures in order to mitigate the climate change impact on the farm sector. The member countries also suggested that farmers can be incentivised if they are adopting climate friendly farming or green agriculture and reducing carbon credit.

FOOD AND NUTRITIONAL SECURITY

The challenges like food and nutritional security are still present. While a lot of progress has been made on food security, nutritional security is something we need to worry about. While one of the Sustainable Development Goals also focuses on Achieving Zero Hunger by 2030, countries need to work on it cohesively. It has been seen that food insecurity has increased after 2018. This is a cause of concern,

third priority area of strengthening the value chain in agriculture improving it farm to folk. India has already shifted its focus on production-centric approach to value-chain approach. This is how to save agriculture and make it sustainable on achieving one of the Sustainable Development Goals (SDG) of “zero hunger”.

The nutritional insecurity is manifested through the prevalence of stunting and wasting in children, increased Infant Mortality Rate (IMR) and Maternal Mortality Rate (MMR), anaemic mothers and adolescent girls. Indian government is already working on this aspect. A host of various initiatives have been started to address the issue of nutritional security. POSHAN is now the largest nutritional security programme in the country. At the behest of India, the year 2023 is being celebrated as International Year of Millets across the globe.

Millets are nutri-cereals contain about 7-12% protein, 2-5% fat, 65-75% carbohydrates and 15-20% dietary fibre. The essential amino acid profile of the millet protein is better than various cereals such as maize. Millets contain fewer cross-linked prolamins, which may be an additional factor contributing to higher digestibility of the millet proteins. Small millets are good source of phosphorous and iron. Millets also contribute to anti-oxidant activity with phytates, polyphenols, tannins, anthocyanins, phytosterols and pinacolatol and high antioxidant activities. These are good for consumers, for cultivators and for climate.

INCLUSIVE AGRICULTURE VALUE CHAIN

A value chain is a set of linked activities that work to add value to a product. It consists of actors and actions that improve a product while linking a commodity producer to processors and markets. Although there has been no universally accepted definition of the term, it normally refers to the whole range of goods and services necessary for an agriculture product to move from the farm to the final customer or consumer. The term value chain was first popularized in a book published in 1985 by Michael Porter who used it to illustrate how companies could achieve what he called competitive advantage by adding value within their organization. At the heart of agriculture value chain is the idea of actors connected along a chain producing and delivering goods to consumers through a sequence of activities. However, this vertical chain cannot work in isolation and an important aspect of value chain approach is that it also considers horizontal impacts on the chain such as input and finance provision.

Development of Agri Value Chains is another area which needs attention as any disruption in the agriculture value chain can have an impact on the small farmers' income. In this regard, countries are already shifting their focus from a production-

centric approach to a value-chain approach. Presently agri-food systems all over are facing increased population pressure, high level of food loss and waste, increasingly degraded natural resources and vulnerability to climate change, dependency on imports and conflicts of various types. As a result of the COVID-19 pandemic, there has been an increase in food prices. This coupled with the economic slowdown and supply chain disruption as a result of the pandemic has all exacerbated the vulnerability of value chains all over.

Agri-food value chain development also faces many challenges like lack of an enabling environment, governance, infrastructure, and policies conducive to sustainability and growth of agriculture value chains. These agriculture value chains must be made more inclusive, resilient, and sustainable. Through a systematic strategy that should include undertaking holistic analyses of value chains to identify root causes of unsustainable practices; prioritization of leverage points and addressing critical constraints; development of integrated interventions and solutions through collaboration across disciplines and sectors, and within and between countries, inclusive agricultural value chains should be developed and strengthened.

DIGITALIZATION FOR AGRICULTURAL TRANSFORMATION

Digitalization has emerged as the most potent tool in the present times particularly after the COVID pandemic addressing the major issues in the Indian agriculture relating to timely availability of relevant information. Various ICT tools are now supplementing human efforts and make up for the shortage of human resources. A notable digital intervention in the agriculture sector where the country is working is 'Agri-Stacking.' Being described as a digital revolution, an 'Agri-Stack' refers to a collection of technology-based interventions in agriculture on which everything else will be built. Agri-Stack may have a Farmers' Stack. A Farm Stack and a Crop Stack integrated on a technology platform linking existing digital land records, cadastral maps of farm and information. Farm stack would have geospatial information on each farm, owned by a farmer and Crop Stack can contain crop data linked to farms. The government will provide 'required data sets' of farmers' personal information to Microsoft to develop a farmer interface Unified Farmers Service Platform (UFSP) for 'smart and well-organized agriculture.'

This agriculture database is envisaged to facilitate online single sign on facilities for universal access and usher in personalized services to farmers such as direct benefit transfer, soil and plant health advisories, weather advisories, irrigation facilities, and seamless credit and insurance facilities. It will also provide information pertaining to seeds, fertilizers and pesticides, nearby logistic facilities, market access

information and peer to peer lending of farm equipment. There is also a provision of unique farmer ID (FID) to uniquely identify a farmer and to know benefits availed by a farmer under various schemes.

This Centralized Farmers Database shall be useful for various activities like issuing soil health cards, dissemination of crop advisories to the farmers, precision farming, smart cards for farmers to facilitate e-governance, crop insurance, settlement of compensation- claims, grant of agricultural subsidies, community/village resource centres etc. The data of 4.3 crore farmers linked with land records have already been verified and the database would be unveiled shortly. It would enable use of artificial intelligence on large data sets which will help in managing farms more effectively. Applications built over the stack will provide farmers with recommendations on which seeds to buy, and best practices to maximise their yield, along with updates on weather, agricultural credit, insurance, and all other schemes. This will also help increase farmers' income and improve the efficiency of the agricultural sector. Diverse problems such as inadequate access to credit and information, pest infestation, crop wastage, poor price discovery, and yield forecasting can be sufficiently addressed by use of digital technology. This is the fourth priority agenda in agricultural sustainability for moving towards precision farming.

INDIAN FRAMEWORK POLICIES FOR CLIMATE ACTION AND AGRICULTURE SUSTAINABILITY

The Government of India launched eight National Action Plan on Climate Change (NAPCC) on 30th June, 2008. It outlines a national strategy that aims to enable the country to adapt to climate change and enhance the ecological sustainability in its development path (Byravan and Rajan, 2012). These missions are-

1. National Solar Mission, launched in January 2010, with the objective of establishing India as a global leader in solar energy, by creating the policy conditions for solar technology diffusion across the country as quickly as possible.

2. National Mission for Enhanced Energy Efficiency, implemented in 2011, aims to strengthen the market for energy efficiency by creating conducive regulatory and policy regime. The National EV Policy is promoting Electric transportation, which is set to expand significantly soon. India aspires to achieve 30-percent electrification of its entire vehicle fleet by 2030 (Singh, 2023). The National Green Hydrogen Mission that envisions India as a global centre for the manufacture, use, and export of green hydrogen. The ultimate target of this mission is to boost India's self-reliance in energy and accelerate decarbonisation of the industrial, transportation and energy sectors of the economy.

3. National Mission on Sustainable Habitat deliberated for Development of sustainable habitat standards that lead to robust development strategies while simultaneously addressing climate change related concerns. The Smart Cities Mission endeavours to create cities that rely on smart solutions to provide basic infrastructure, a decent standard of living, and clean and sustainable environment with preparation of comprehensive mobility plans that enable cities to undertake long-term, energy efficient and cost-effective transport planning.

4. National Water Mission ensures integrated water resource management to conserve water, minimize wastage, and ensure more equitable distribution both across and within states. The Mission also consider the provisions of the National Water Policy and develop a framework to optimize water use by increasing its efficiency by 20 per cent through regulatory mechanisms.

5. National Mission for Sustaining the Himalayan Eco-system. The Himalayan ecosystem are vulnerable to the impacts of changes due to natural causes, anthropogenic emission related causes and due to developmental paradigms of the modern society. This Mission has been launched with the goal of addressing all such issues holistically and in coordinated manner by involving all possible stakeholders. (NMSHE, 2010)

6. National Mission for a Green India puts greening in the context of climate change adaptation and mitigation. Greening is meant to enhance ecosystem services such as carbon sequestration and storage (in forests and other ecosystems), hydrological services and biodiversity; as well as other provisioning services such as fuel, fodder, small timber, and non- timber forest products (NTFPs).

7. National Mission for Sustainable Agriculture has been made operational from the year 2014-15, it aims at making agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated / composite farming systems; soil and moisture conservation measures; comprehensive soil health management; efficient water management practices and mainstreaming rain-fed technologies. This mission relies on schemes like “Pradhanmantri Krishi Sinchayee Yojana” and “Soil Health card”

8. National Mission on Strategic Knowledge for Climate Change. Since, India is too large a country to adopt strategies based on global averages of climate change. The current levels of uncertainties associated with likely consequences of climate change in various regions of the country are significant and do not enable the development of strategic action plans for different regions within the country. This mission Development of national capacity for modelling the regional impact of

climate change on different ecological zones within the country for different seasons and living standards.

RECOMMENDATIONS FOR CLIMATE CONSERVATION AND AGRICULTURE ENHANCEMENT

- Mainstreaming carbon budgeting into global climate action.
- Sustainable consumption for climate change mitigation.
- Adoption of climate action that is sensitive to carbon inequality.
- Protecting the climate-regulating land cover of the world. Between 1992 and 2019, the loss of climate-regulating land cover experienced by India has been the least among G20 nations.
- Enabling a transition to green growth to reduce their carbon cost of growth. Adopting a green growth pathway demands the appetite for reduced rate of growth.
- Prioritising expansion of renewable energy capacities. The performance of most G20 nations in terms of share of renewable consumption in total final energy consumption is not satisfactory.
- Coordination between national and sub-national governments in climate action: Successful climate action will require considering local realities into climate mitigation strategies.
- Sustainable Agriculture could be obtained by promoting organic farming, increasing the production of Bio-fertilizers, Precise Irrigation, Direct Seed Transplantation, Crop diversification, promoting plantation in Arable land, identification and release of Climate Resilient Varieties (CRV), Identification of genotypes of crops with enhanced CO₂ fixation potential and less water consumption & Nutrients, identification of Climate Resilient genotypes with greater adaptation to drought, flood, salinity and high temperature.

CONCLUSION

While several approaches already exist in the field of short-term risk assessment and management, mainly in the field of extreme events, existing approaches do often not sufficiently address long-term, slow-onset changes due to climate change. Also, risk and vulnerability assessments often do not meet the information needs of policy-makers and local governments in order to manage the risks of climate change and associated agricultural losses and damages effectively.

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The recommendations given here can act as an input in defining the agenda of the G20 climate sustainability working group and can be instrumental in developing a voluntary framework that can strengthen global climate action through the establishment of specific institutional arrangements that ensure consistent achievement of targets and commitments. These comprehensive assessments capture the realities of climate performance in the most underdeveloped nations and can broaden the ambit of global climate action.

Global climate governance in its current form does not adequately incorporate concerns of climate justice and equity. India is presiding over the G20 meet at such a time that is extremely critical for global climate action. The country has the opportunity to steer global climate governance in a direction that will adequately address issues that are material for effective climate action but were previously ignored. India can emerge as a champion of climate cooperation not only in G20 countries but across the globe.

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Ambient Air Pollution and Cancer: An Overview of the Current Evidence and Mechanism of Air Pollution-Derived Carcinogenesis

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Ambient air pollution is a significant factor in the global disease load. The majority of the world's population lives in areas where air pollution levels exceed World Health Organization health-based air-quality criteria because to emissions from industry, electricity generation, transportation, and domestic burning. Because it is omnipresent and has multiple hazardous effects on human health effects, including cancer, outdoor air pollution constitutes an important global public health concern. There is currently extensive evidence from human and experimental animal research, as well as mechanistic data, to indicate a causal association between ambient air pollution, particularly particulate matter (PM), and lung cancer incidence and mortality. PM air pollution is thought to be responsible for hundreds of thousands of lung cancer deaths worldwide each year. The epidemiological evidence on ambient air pollution and the risk of other types of cancer, such as bladder cancer or breast cancer is relatively limited. Ambient air pollution may also be linked to poorer cancer survival, though further research is needed. In addition to providing a summary of ambient air pollutants, their sources, and current worldwide levels, this chapter also describes the epidemiological data connecting ambient air pollution with cancer incidence and mortality. We also highlighted the biological mechanisms through which air pollution causes cancer.

INTRODUCTION

Ambient air pollution is a major public health concern around the world since it is pervasive, affects everyone, and has multiple serious hazardous effect human health, including chronic obstructive pulmonary disease (COPD) linked to elevated ozone (O₃) and acute lower respiratory illness (ALRI), cerebrovascular disease (CEV), ischemic heart disease (IHD), COPD, and lung cancer (LC) linked to PM 2.5 (Lelieveld et al., 2015). In 2019, ambient air pollution was estimated to cause 4.2 million premature deaths globally owing to exposure to fine particulate

matter, which causes cardiovascular and respiratory disorders, as well as cancer. According to WHO, 37% of outdoor air pollution-related premature deaths in 2019 were due to IHD and stroke, 18% and 23% of deaths were due to COPD and ALRI, respectively, and 11% of deaths were due to cancer within the respiratory tract (WHO, 2022). The majority of the world's population lives in places where air pollution levels exceed WHO health-based air-quality standards, owing to emissions from industry, energy generation, transportation, and domestic burning. Outdoor air pollution is a major global public health concern since it is ubiquitous and has numerous negative consequences on human health, including cancer (Turner et al., 2020).

SOURCES AND LEVELS OF AMBIENT AIR POLLUTION

Gaseous pollutants such as sulphur dioxide [SO₂], nitrogen oxides (NO_x), carbon monoxide [CO], and volatile organic compounds [VOCs]) and particulate matter (PM) (including carbonaceous aerosol particles, such as black soot) are among the major primary air pollutants emitted directly into the environment as a result of the combustion of fossil and biomass fuels. Although CO levels are frequently low outside in the industrialized world nowadays (due to pollution regulations such as catalytic converters on automobiles), significant amounts can be found near biomass-burning sources, such as wildfires (Santos et al., 2018) . Secondary air pollutants, which include O₃, a significant component of photochemical smog, are generated in the atmosphere when NO_x and hydrocarbons such as VOCs react in the presence of sunlight. Similarly, particle, sulphates, nitrates and aerosols are regularly formed in the atmosphere from SO₂ and NO_x, respectively. Combustion particles are microscopic in diameter and are frequently referred to as fine particulate matter, or PM_{2.5} Submicron combustion-related PM_{2.5} is of particular concern for human health because it includes various hazardous substances (e.g., heavy metals and acids) and can penetrate deeper into the lung than bigger PM created by natural processes, such as mainly windblown soil particle mass (Thurston, 2017). Air pollutants are released or generated both outdoors and indoors, resulting in individual pollutant exposure levels that can vary from levels measured by regular ambient air pollution measurements at centrally placed air monitoring stations. The most frequent health-related air pollutants of the greatest risk have been compiled in Table and classified into three categories: a) pollutants mostly emitted into the outside environment, b) pollutants primarily discharged into the inside environment, and c) pollutants discharged into both the outdoor and indoor natural environments.

Table 1. General Health-Impacting Air Pollutants, Grouped by source or origin (WHO; Global Environment Monitoring System, 1982; WHO, 2022)

Air Pollutant		Sources		Air Pollutant		Sources	
Strictly outdoor Pollutants							
SO ₂		Combustion, smelters		As, Cr		Coal combustion PM2.5	
O ₃		Photochemical reactions of NO _x and VOCs in atmosphere		Ni, V		Residual oil combustion PM2.5	
Strictly indoor air pollutants							
Radon		Building materials		Synthetic fibers, asbestos, and minerals		Electrical and thermal insulation	
Biological		Infections, dust mites, allergens					
Both outdoor and indoor air pollutants							
PM _{2.5}	Outdoor	Burning of fossil fuel and biomass		PM _{2.5-10.0}	Outdoor	windblown soil and Dust storms, pollens	
	Indoor	Burning of biomass and tobacco smoking			Indoor	Spores and suspended dust	
NO ₂	Outdoor	Fossil fuel combustion		VOCs	Outdoor	Solvents and fuels	
	Indoor	Gas cooking and Tobacco smoking			Indoor	Fuel, cosmetics, and paint vapors,	
CO	Outdoor	Wildfires, Fossil fuel and biomass burning		Pb	Outdoor	Industry, leaded fuel and lead metallurgy	
	Indoor	Tobacco smoking			Indoor	Leaded paint	
Hg	Outdoor	Combustion of coal and metallurgical process		Pesticides	Outdoor	Agricultural	
	Indoor	Fungicides and thermometer			Indoor	Insecticides, herbicides and fungicides	
NH ₃	Outdoor	Livestock yards		NH ₃	Indoor	Metabolic activity and cleaning products	

PM_{2.5}, SO₂, NO₂, O₃, and CO belongs to the pollutants listed, along with their typical sources. The following discussions will concentrate on outdoor air contaminants linked to cancer, particularly PM and its constituents (WHO; Global Environment Monitoring System, 1982; Loomis et al., 2014).

PARTICULATE MATTERS (PM)

SPM is a vast class of chemically and physically varied aerosols made up of solid particles or droplets of liquid that are suspended in the air. These aerosols can be distinguished by their size (described below), generation mechanism, origin,

chemical composition, atmospheric behavior, and measurement method. PM is commonly characterized according to the following size fractions:

- PM_{10} includes the biggest particles that can be inhaled. Particles larger than $10\ \mu\text{m}$ are not often inhaled past the trachea, are trapped in the nose and throat, and are not deposited in the lung. PM_{10} also includes all of the following fractions:
- $PM_{2.5}$, also known as fine particulate matter, can be inhaled into the alveoli sacs of lungs, where oxygen exchange to the bloodstream takes place. As such, Over the past few decades, research on the hazardous effects of outdoor air pollution exposure on human health has increasingly focused on $PM_{2.5}$.

$PM_{2.5}$ is produced directly from combustion sources, but it is also generated from gaseous precursors such as SO_2 and NO_x , as well as organic molecules. Secondary particles account for a significant component of the $PM_{2.5}$ mass in some places. Sulphates, nitrates, chlorides, ammonium salts, organic carbon, and condensed metals are frequent constituents of secondary fine particles. Combustion coal, produces $PM_{2.5}$ that is significantly concentrated in a variety of moderately volatile and potentially hazardous Chalcophile elements such as Zn, As, Se, Mo, and Cd (National Research Council (NRC)., 1980). $PM_{2.5}$ may persist in the atmosphere for up to several weeks and traverse hundreds to thousands of kilometers⁷; however, most coarse particles normally deposit to the earth within minutes to hours and move only tens of kilometers from the source (Turner et al., 2020). In 2017, the global population-weighted average yearly $PM_{2.5}$ concentration was $46\ \mu\text{g}/\text{m}^3$, which is four times higher than the WHO's health-based global air-quality recommendation of $10\ \mu\text{g}/\text{m}^3$. 92% of the world's population lives in areas where ambient $PM_{2.5}$ concentrations exceed the WHO guideline, and large populations in China, Bangladesh, India, Pakistan, and Nigeria have exposures above the WHO's highest interim target guideline of $35\ \mu\text{g}/\text{m}^3$ (Health Effects Institute, 2019). In 2017, population-weighted outdoor $PM_{2.5}$ levels ranged from $7\ \mu\text{g}/\text{m}^3$ in the United States to $91\ \mu\text{g}/\text{m}^3$ in India. NO_2 global population-weighted mean concentrations were projected to be 1.6 ppb from 1996 to 2012, with annual increases of 0.9% (95% CI, 0.6%-1.1%) (Geddes et al., 2016) .

MECHANISMS OF AIR POLLUTION-DERIVED CARCINOGENESIS

The molecular processes underlying air pollution-related cancer are still unknown. Nonetheless, a significant amount of evidence from indirect models demonstrates that outdoor air pollution contributes to aberrant cell growth and cancer (Pitot, 1993). Air contaminants can have consequences in the respiratory tract after

inhalation, including the extrathoracic, tracheobronchial, and alveolar airways. Retained particles and gas can have a major impact on both the local and systemic levels, causing low-grade and long-term inflammation as well as oxidative stress (Brauer et al., 2001). Air pollution contains various mutagens and carcinogens, such as polycyclic aromatic hydrocarbons (PAHs) (Castano-Vinyals, 2004), dioxins (Manisalidis et al., 2020), sulfur-containing chemicals, and 3-nitrobenzanthrone (Arlt, 2005). Because of their ability to produce DNA adducts, PAHs are linked to high risk of carcinogens to human. One meta-analysis verified the nonlinear dose-response connection between PAH and DNA adducts in air pollution, and various investigations have found that carcinogen-DNA adducts are closely linked to cancer risk (Dunn, 1991; Peluso et al., 1998; Peluso, 2001; Moorthy et al., 2015). However, an individual's repair capacity may influence whether DNA adducts are removed by the repair mechanism, possibly leading to DNA alterations or mutations (Demetriou and Vineis, 2015). Gene mutations and gene silencing are particularly important in carcinogenic mechanisms because they can influence tumor suppressor genes (TSGs) (Wang et al., 2018). Several studies have demonstrated that there are mutagenic particulate and volatile matter components in outdoor environment (Claxton et al., 2004). Changes in posttranslational modifications of histones, 5-hydroxymethylation, and, most notably, DNA methylation, which is a biochemical change that occurs in cytosines, particularly in the CpG context, and modifies gene expression as well as several other functions, have all been linked to outdoor air pollution (Sanchez-Guerra et al., 2015). Another research has discovered that after PM exposure, the A549 cell line has dysregulated actin cytoskeleton and down-regulated miR-802 expression (Li et al., 2016). Human bronchial epithelial cells exposed to varying concentrations of PM_{2.5} exhibit transcription alterations in numerous genes, impacting some implicated in inflammatory and immunological response, oxidative stress, and DNA damage, as well as lower cell viability in a dose-dependent way (Ding et al., 2014). Several other studies have demonstrated that air pollutants cause the release of proinflammatory cytokines such as IL-6, TNF-, and granulocyte-macrophage colony-stimulating factor, leading to low-grade, chronic inflammation in the airway and across the body (Baulig, 2007; Gualtieri et al., 2008; Zhou et al., 2015).

Carcinogenesis caused by air pollution is predicted to be a multistep process that comprises initiation, promotion, and advancement. Individual and time-dependent dosages, while not fully understood, influence the mechanisms by which ambient air contaminants cause cancer cell transformation. Further research will determine which processes are most important and can be employed as early biomarkers of cancer caused by air pollution.

CONCLUSIONS

In conclusion, there is clear and substantial proof of a relationship between ambient air pollution, specifically PM in outdoor air, and lung cancer incidence and mortality, resulting in hundreds of thousands of lung cancer deaths worldwide each year. This burden is an urgent global public health concern that necessitates many multilevel public health and policy measures for cancer prevention. More study on cancer incidence and survival at various cancer sites, as well as research on the effectiveness of specific cancer preventive measures, is required, particularly in low- and middle-income countries.

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Role of Mutual Cooperation between India and Other G-20 Nations for Ecotourism Development in India to Attain Sustainable Development Goals

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Ecotourism is an emerging trend in the tourism industry, which involves responsible travel to natural areas that conserves the environment and improves the well-being of local people. It is an essential tool for promoting sustainable development and achieving the Sustainable Development Goals (SDGs). India is a country with a diverse range of wildlife sanctuaries, national parks, and other protected areas that offer immense potential for ecotourism development. The G-20 nations, being the world's leading economies, have a significant role to play in promoting ecotourism development in India as a measure of achieving the SDGs. This research paper aims to examine the role of G-20 nations in ecotourism development in India as a measure of achieving SDGs.

METHODOLOGY

This research paper is based on secondary data obtained from various national and international sources along with the review of relevant literature on ecotourism in India and the role of G-20 nations in promoting sustainable tourism practices. The literature review includes academic articles, government reports, and industry publications. Research articles by (Holden, 2010), (Ziffer, 1989), (Bansal & Kumar, 2011), (Isaacs, 2000), (Lee & Jan, 2019), (Juvan & Dolnicar, 2014), (Tao & Wall, 2009) have identified various positive aspects of Ecotourism and Protected Area Eco-dynamics. The research also draws on case studies of successful ecotourism initiatives in India and other countries. The research work is primarily descriptive and exploratory in its approach.

INTER-CONNECTIONS BETWEEN G-20, SUSTAINABLE DEVELOPMENT GOALS AND ECOTOURISM

The G-20, or Group of Twenty, is a forum for international cooperation and decision-making among the world's major economies. It includes 19 individual countries and the European Union, which together account for around 80% of global

GDP, 75% of global trade, and two-thirds of the world's population. The G-20 was created in 1999 to promote international financial stability and address global economic challenges. The G-20 has recognized the importance of sustainable development and has committed to supporting the SDGs. The Sustainable Development Goals (SDGs) are a set of 17 goals adopted by the United Nations in 2015 to promote sustainable development in various areas, including poverty reduction, climate action, and sustainable tourism. G-20 nations can support the development of ecotourism infrastructure, such as eco-lodges, nature camps, and interpretation centres, to promote sustainable tourism practices (UNWTO, 2017). Considering its importance, the G-20 has made sustainable development a key priority in its agenda, recognizing that economic growth and environmental sustainability are closely intertwined. The G-20 has also acknowledged the role of tourism, in promoting sustainable development, including ecotourism, as it can contribute to economic growth while protecting the environment and benefiting local communities.

In terms of ecotourism, the SDGs can provide a useful framework for promoting sustainable tourism practices. For example, SDG-8 can provide an ecotourism framework for Economic growth and decent work opportunities and provide economic benefits to local communities, SDG-12 on sustainable consumption and production can guide the development of ecotourism activities that minimize waste and reduce the carbon footprint of tourism. SDG-14 on life below water can inform ecotourism activities that promote marine conservation and protect marine wildlife. Similarly, SDG 15 on life on land can guide ecotourism activities that protect biodiversity and natural habitats. As noted by Fennell and Dowling (2013), ecotourism is a sustainable tourism practice that promotes environmental conservation, community development, and cultural exchange.

ECOTOURISM AS A SOURCE OF SUSTAINABLE DEVELOPMENT IN G-20 NATIONS

Ecotourism in wildlife sanctuaries can support several of the Sustainable Development Goals of the G-20. For example, it can contribute to fulfilling the following Sustainable Development Goals (SDGs):

Goal 4: Quality Education - Ecotourism can provide educational opportunities for visitors to learn about local cultures and traditions, as well as to appreciate the value of biodiversity and ecosystem services.

Goal 8: Decent Work and Economic Growth - Ecotourism can provide employment opportunities for local communities and support the growth of sustainable businesses.

Goal 10: Reduced Inequalities- Ecotourism can promote social inclusion by providing economic opportunities to marginalized communities and promoting cultural exchange.

Goal 12: Sustainable Consumption and Production - Ecotourism can promote sustainable consumption and production practices by encouraging visitors to minimize their environmental impact and support local, sustainable businesses.

Goal 14: Life Below Water - Ecotourism can support the conservation of marine and coastal ecosystems by providing economic benefits to local communities that depend on these ecosystems.

Goal 15: Life on Land - Ecotourism can support the conservation of terrestrial ecosystems and biodiversity by providing economic incentives for conservation and promoting sustainable land use practices.

Goal 13: Climate Action - Ecotourism can support climate action by promoting sustainable travel practices, such as carbon-neutral transportation and eco-friendly accommodations.

Ecotourism has significant potential for economic development and sustainable conservation in G-20 nations. In particular, India has an abundance of natural and cultural resources that can be developed for ecotourism, including wildlife sanctuaries, national parks, and historical sites.

In addition to supporting the SDGs, ecotourism in wildlife sanctuaries can also contribute to community development, education, and awareness-building around conservation issues. It can provide opportunities for visitors to learn about local cultures and traditions, as well as to appreciate the value of biodiversity and ecosystem services. To achieve these SDGs through ecotourism, it is important to ensure that tourism activities are managed responsibly and sustainably, taking into account the social, economic, and environmental impacts of tourism. This includes limiting the number of visitors, promoting responsible behaviour among tourists, and ensuring that economic benefits are shared fairly among local communities. By doing so, ecotourism can contribute to the achievement of sustainable development goals while also promoting conservation efforts and cultural exchange.

Overall, the G-20 has recognized the importance of sustainable development and has made commitments to support the SDGs. The G-20 has identified sustainable tourism as a key sector for achieving the SDGs, and the SDGs provide a useful platform for promoting sustainable tourism practices, including ecotourism.

RICH NATURAL BIODIVERSITY AND PROTECTED AREAS INVENTORY FOR ECOTOURISM DEVELOPMENT IN INDIA

India is home to a rich variety of wildlife and natural habitats, including over 500 wildlife sanctuaries and national parks that attract tourists from all over the world. These protected areas have the potential for ecotourism development, which can contribute to sustainable development while promoting conservation and creating economic opportunities for local communities.

PROTECTED AREAS AND NATIONAL PARKS

Protected Areas in India have been divided into several categories which are as follows:

- National Parks
- Wild Life Sanctuaries
- Community Reserves
- Conservation Reserves
- Marine Protected Area

Table 1.1 Category-wise Protected Areas of India (As of December 2021)

Type of Protected Area	Numbers	Covered Area (in KM ²)	Share in Geographical Area of India
National Parks	106	44,372.42	1.35
Wildlife Sanctuaries	564	1,22,509.33	3.73
Conservation Reserves	99	4,726.24	0.14
Community Reserves	218	1,445.71	0.04
Protected Areas (PAs)	987	1,73,053.69	5.26

Source: National Wildlife Database, Wildlife Institute of India (Protected Areas of India, n.d.)

Geographical Area of India (<http://knowindia.gov.in/>) = **32,87,263** km²

The forest cover of India (FSI, 2021)

Forest + Tree Cover Area 7,13,789 + 95,748 = **8,09,537** km²

Forest + Tree Cover Percentage 21.71% + 2.91% = **24.62%** of the geographical area of India

Chart-1: Category-wise Protected Areas of India

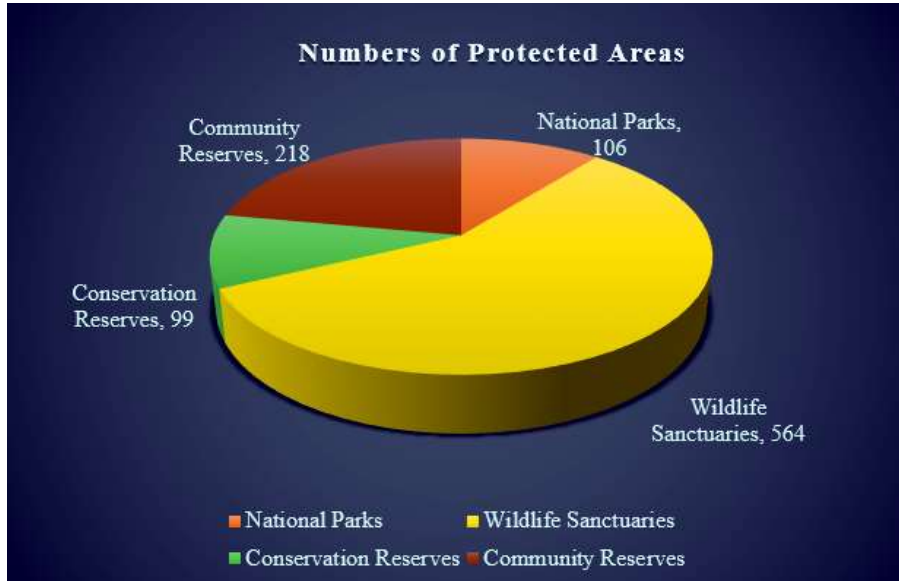


Chart developed by Researcher using National Wildlife Database

Chart-2: Growth of National Parks in India from 2000 to 2020 (Numbers and Area Covered)

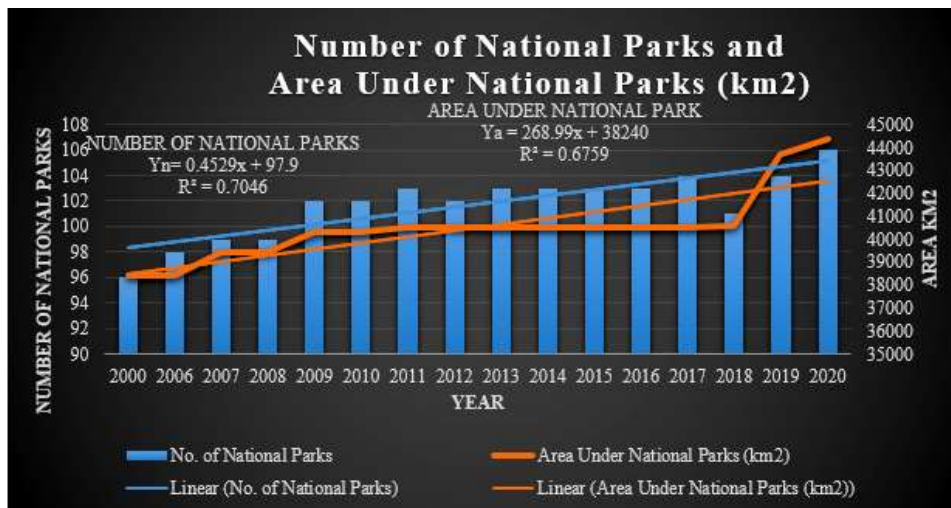


Chart developed by Researcher using National Wildlife Database

Sharma and Thakur (2019) note that “wildlife tourism is one of the most promising areas for Ecotourism development in India,” citing successful initiatives such as the Periyar Tiger Reserve and the Gir National Park.

Map-1: Geographical Distribution of National Parks in India



The National Parks & wildlife sanctuaries in India may provide an enormous potential for ecotourism development, which can contribute to conservation efforts while also providing economic benefits to local communities. Ecotourism activities in these areas can provide a source of revenue for local communities, which can help to reduce poverty and promote economic growth. Ecotourism can also create awareness about the importance of conservation and sustainable development, and encourage visitors to respect the natural environment and local cultures. According to the World Tourism Organization (2019), sustainable tourism practices can

contribute to the achievement of Sustainable Development Goals, particularly in developing countries like India.

However, it is important to ensure that ecotourism is developed responsibly and sustainably, with a focus on minimizing negative impacts on the environment and local communities. This can be achieved through the use of sustainable tourism practices, such as reducing waste and carbon emissions, supporting local businesses, and promoting cultural sensitivity and respect. In conclusion, the potential for ecotourism development in wildlife sanctuaries in India is significant and can contribute to sustainable development and the achievement of the SDGs. The G-20 recognizes the importance of sustainable tourism and has made commitments to support the SDGs through sustainable tourism practices, including in the context of ecotourism in wildlife sanctuaries. However, it is important to ensure that ecotourism is developed responsibly and sustainably, with a focus on minimizing negative impacts and promoting conservation and sustainable development.

ECOTOURISM DEVELOPMENT IN INDIA

India is home to a vast array of wildlife sanctuaries, national parks, and other protected areas that are rich in biodiversity and offer excellent opportunities for ecotourism development. According to the Ministry of Tourism, the total number of foreign tourist visits to wildlife sanctuaries and national parks in India has been steadily increasing over the years, with a total of 3.58 million visits in 2019. However, the potential for ecotourism in India is still largely untapped, and there is much scope for further development.

Ecotourism development in India can provide significant benefits in terms of biodiversity conservation, sustainable economic development, and community empowerment. Ecotourism can generate revenue for local communities and contribute to the conservation of natural resources. It can also help to create employment opportunities and promote the well-being of local people. However, ecotourism development must be carried out in a responsible and sustainable manner to avoid negative impacts on the environment and local communities.

Current State of Ecotourism in India:

India has significant potential for ecotourism development, with diverse ecosystems and wildlife species, a rich cultural heritage, and numerous protected areas. However, the development of ecotourism in India has been slow, with tourism focused primarily on cultural and historical attractions rather than nature-based tourism. According to the Government of India's Ministry of Tourism (2021),

ecotourism in India faces several challenges, including inadequate infrastructure, limited government support, and insufficient community involvement. Ecotourism in India faces several challenges, including inadequate infrastructure, limited government support, and insufficient community involvement.

Potential for Ecotourism Development:

Despite these challenges, India has significant potential for ecotourism development, with numerous wildlife sanctuaries and protected areas that offer unique tourism opportunities. Wildlife tourism is one of the most promising areas for ecotourism development in India, with several successful initiatives such as the Periyar Tiger Reserve and the Gir National Park. Other potential areas for ecotourism development in India include nature-based tourism, adventure tourism, and cultural tourism.

Significant Steps to Explore and Boost the Ecotourism Sector in India and G-20 Nations

India has tremendous potential to lead ecotourism development in G-20 nations through wildlife tourism, given its rich biodiversity and varied wildlife sanctuaries. India can lead ecotourism development in G-20 nations through wildlife tourism. By leading ecotourism development in G-20 nations through wildlife tourism, India can not only promote sustainable tourism practices and conservation efforts but also provide economic benefits to local communities and enhance cultural exchange with international visitors. This can also help to position India as a leader in ecotourism development, enhancing its reputation as a preferred destination for wildlife tourism.

To explore and boost the ecotourism sector in India, the following steps could be taken:

1. Develop ecotourism policies and guidelines: India can develop ecotourism policies and guidelines that prioritize sustainable practices and the conservation of natural and cultural resources. This will provide a framework for ecotourism development in the country.

2. Promote ecotourism destinations: India can promote its ecotourism destinations through targeted marketing and branding efforts. This can include partnering with travel agencies, tour operators, and online travel platforms to reach international audiences.

3. Encourage public-private partnerships: India can encourage public-private partnerships to develop ecotourism infrastructure and services. This can include developing eco-friendly accommodations, transportation, and tour services.

4. Enhance community involvement: India can enhance community involvement in ecotourism development to ensure that local communities benefit from tourism activities. This can include promoting community-based ecotourism initiatives and providing training and capacity-building opportunities for local communities. India can encourage community participation in wildlife tourism by promoting community-based ecotourism initiatives. This can provide economic benefits to local communities and help to build their capacity to participate in tourism activities.

5. Strengthen International cooperation: India can strengthen international cooperation in ecotourism development by partnering with other G-20 nations and international organizations. This can include sharing best practices, promoting joint marketing efforts, and developing sustainable tourism standards. Collaboration with other G-20 nations and international organizations can boost ecotourism development opportunities in a significant manner. This can help to promote wildlife tourism as a means of promoting sustainable development and conservation.

6. Establishing best practices for wildlife conservation and ecotourism: India can share its experience and expertise in wildlife conservation and ecotourism with other G-20 nations, especially those with rich biodiversity. India's conservation success stories, such as Project Tiger, can serve as models for other nations to emulate.

7. Developing world-class infrastructure for wildlife tourism: India can develop world-class infrastructure for wildlife tourism, such as wildlife resorts, nature camps, and interpretation centres. This will attract both domestic and international tourists and enhance the quality of wildlife tourism experiences. International cooperation and Investment among the G-20 nations can be extremely helpful for developing world-class infrastructure for wildlife tourism.

8. Promoting responsible wildlife tourism: India can promote responsible wildlife tourism by creating awareness among tourists about the importance of conservation and wildlife protection. This can be done through signage, interpretation boards, and trained guides who can educate tourists about the dos and don'ts of wildlife tourism.

By taking these steps, India can explore and boost the ecotourism sector, while promoting sustainable tourism practices and conservation efforts. This can

also provide economic benefits to local communities and enhance cultural exchange with international visitors. Additionally, by strengthening international cooperation, India can benefit from the experiences and expertise of other G-20 nations and international organizations, which can further support the growth and development of the ecotourism sector in the country.

Role of G-20 Nations to Promote Ecotourism and Attain Sustainable Development Goals through Mutual Cooperation.

The G-20 nations can play a significant role in achieving sustainable development goals through ecotourism by promoting and supporting sustainable tourism practices, particularly in the context of wildlife sanctuaries and protected areas. Here are some ways G-20 nations can cooperate to achieve sustainable development goals through ecotourism:

1. Promote Internationally Recognized Sustainable Tourism Practices:

The G-20 nations can work together to promote sustainable tourism practices that prioritize conservation, community involvement, and responsible tourism behaviours. This can be achieved through joint initiatives, awareness campaigns, and capacity-building programs.

2. Support the Development of Ecotourism Infrastructure: G-20 nations can cooperate in supporting the development of ecotourism infrastructure, such as eco-lodges, nature camps, and interpretation centres. This can help to improve the quality of tourism experiences, enhance visitor satisfaction, and generate revenue for local communities.

3. Encourage Research and Monitoring: G-20 nations can collaborate in conducting research and monitoring of wildlife populations, ecosystems, and tourism activities to identify potential risks and develop effective management strategies. This can help to promote sustainable tourism practices and improve the conservation of wildlife and their habitats.

4. Promote Cultural Exchange: G-20 nations can cooperate in promoting cultural exchange through ecotourism, highlighting the cultural heritage and traditions of local communities living near wildlife sanctuaries. This can help to promote cultural understanding, diversity, and appreciation.

5. Support Conservation Efforts: G-20 nations can collaborate in supporting conservation efforts through tourism revenue sharing, promoting community-based ecotourism initiatives, and establishing partnerships with conservation organizations. This can help to ensure the long-term conservation of wildlife and their habitats. The

G-20 nations can support conservation efforts in India's wildlife sanctuaries and national parks. This can include providing financial and technical support for conservation programs, promoting community-based ecotourism initiatives, and establishing partnerships with conservation organizations.

6. Develop Ecotourism Certification Programs: G-20 nations can cooperate in developing ecotourism certification programs that promote sustainable tourism practices and provide recognition for businesses that adhere to these standards. This can help to improve the quality of tourism offerings and promote responsible tourism practices.

7. Capacity Building and Training: The G-20 nations can support capacity building and training programs for local communities and tourism operators. This can help to enhance their skills and knowledge in ecotourism management and promote sustainable tourism practices. According to a study by Hossain and Islam (2020), "Capacity building and training programs can be instrumental in promoting sustainable tourism practices in India and supporting the development of ecotourism."

8. Marketing and Branding: The G-20 nations can support the marketing and branding of India's wildlife sanctuaries and national parks as ecotourism destinations. This can help to attract more tourists and generate revenue and achieve SDGs.

By cooperating in these ways, G-20 nations can help to achieve sustainable development goals through ecotourism, supporting the conservation of wildlife and their habitats, promoting sustainable economic development, and fostering cultural exchange and understanding.

RECOMMENDATIONS

Recommendations to promote ecotourism in wildlife sanctuaries in G-20 countries are as follows:

1. Develop and enforce sustainable tourism policies that prioritize conservation and responsible tourism practices.
2. Promote and market wildlife sanctuaries as ecotourism destinations through targeted marketing and branding efforts.
3. Develop and promote eco-friendly accommodations, such as lodges and camps, to minimize the impact of tourism on the environment.

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4. Provide training and capacity-building opportunities for local communities to participate in tourism activities and benefit from tourism revenue.
5. Promote community-based ecotourism initiatives that involve local communities in tourism planning and implementation.
6. Develop interpretive facilities and programs to educate visitors about the importance of wildlife conservation and sustainable tourism practices.
7. Establish guidelines for responsible wildlife viewing and behaviour around wildlife to ensure the safety of both visitors and animals.
8. Develop ecotourism certification programs to recognize and promote businesses that adhere to sustainable tourism practices.
9. Encourage partnerships between tourism businesses and conservation organizations to support conservation efforts and promote sustainable tourism practices.
10. Establish monitoring programs to track the impact of tourism on wildlife and their habitats, and use this data to inform tourism management decisions.
11. Develop and promote nature-based tourism activities, such as hiking, birdwatching, and wildlife photography, to diversify tourism offerings.
12. Develop and promote sustainable transportation options, such as bicycles and electric vehicles, to reduce the carbon footprint of tourism.
13. Encourage visitors to purchase locally produced and sustainable products, supporting local economies and reducing the carbon footprint of tourism.
14. Implement waste management and recycling programs to minimize the impact of tourism on the environment.
15. Establish visitor centres that provide information about the wildlife sanctuary and the local ecosystem, as well as promote sustainable tourism practices.
16. Provide opportunities for visitors to participate in conservation efforts, such as tree planting or habitat restoration.
17. Encourage research and monitoring of wildlife populations and their habitats to support effective conservation management.
18. Promote responsible wildlife photography and discourage practices that disturb or harm wildlife.

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19. Collaborate with other wildlife sanctuaries and tourism destinations to promote sustainable tourism practices and share best practices.
20. Develop and promote cultural tourism activities that showcase the cultural heritage and traditions of local communities living near wildlife sanctuaries, encouraging cultural exchange and supporting local economies.

By implementing these recommendations, G-20 countries can promote sustainable ecotourism practices in wildlife sanctuaries, supporting conservation efforts, local communities, and sustainable economic development.

CONCLUSION

G-20 nations can play a significant role in promoting sustainable tourism practices in India and supporting the development of ecotourism. G-20 nations can collaborate with the Indian government and local communities to promote sustainable tourism policies and practices, provide financial and technical assistance, and support capacity-building and training programs. G-20 nations can also promote the development of ecotourism infrastructure, such as eco-lodges, nature camps, and interpretation centres, and encourage responsible tourism behaviour through awareness campaigns and certification programs. Additionally, G-20 nations can support conservation efforts and cultural exchange through tourism revenue sharing and partnership initiatives. Ecotourism is a promising tool for achieving Sustainable Development Goals, particularly in developing countries like India. The development of ecotourism in India faces several challenges, but G-20 nations can play a significant role in promoting sustainable tourism practices and supporting ecotourism development. By collaborating with the Indian government and local communities, providing financial and technical assistance, and promoting responsible tourism behaviour, G-20 nations can help to achieve sustainable development goals in India while promoting environmental conservation, community development, and cultural exchange. By working together, G-20 nations, governments, businesses, and civil society organizations can promote sustainable tourism practices that not only benefit the environment but also support economic growth and the well-being of local communities.

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Practices under G20 for Controlling Change in Climate with Its Opportunities and Challenges

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When the UN Summit in September 2015 agrees on Sustainable Development Goals (SDGs) that everyone can use, the world will be in new territory. By 2015, all countries, rich and poor, will have to change their growth paths in a fundamental way. The new agenda is nothing less than a Copernican turn in how people think about and work on growth and cooperation. The shift to sustainable development and the idea that came out of it, the Global Partnership for Sustainable Development, have not yet reached all policymakers, companies, and people everywhere. So far, attention has only been paid to how low-income countries accomplish their plans at home and how high-income countries work together internationally. The reason for this uneven pattern of attention should be a cause for concern since the growth paths of the high-income countries and some of the larger middle-income countries are key to the success of the new agenda. Given what they have promised and what they have done in the past, the question for the G20 is not whether to help with the SDGs, but how. G20 leaders should strongly support the new plan and promise to put the SDGs into action in their own countries, in their global policies, and in their work with others. The G20 should create a G20 SDG Framework and adopt the new architecture for implementing the SDGs. On a practical level, the G20 should focus its work on the areas where their actions would have the most global impact and/or give them the most benefit.

INTRODUCTION

The world's biggest economies, which are part of the G20 group, are responsible for about 80% of all greenhouse gas (GHG) emissions. For the world to reach its climate goals, it is important for these countries to encourage the use of clean energy. Clean energy is a science that will change the way we live in the future and help us get there. Just switching to clean energy sources could give us a chance to create more jobs. This change could be made by putting more money into research and development of clean energy technologies, making it easier for businesses to get

the money they need to invest in clean energy production, and teaching people more about the benefits of moving away from traditional ways of making energy. This study paper talks about the best ways to promote clean energy within the G20 framework and makes policy suggestions.

THE OBJECTIVES OF THE G20 ARE:

- A. Policy coordination between its members in order to achieve global economic stability, sustainable growth;
- B. To promote financial regulations that reduce risks and prevent future financial crises; and
- C. To create a new international financial architecture

ORIGIN AND EVOLUTION OF G20:

The G20 was formed in reaction to the financial crises that happened in a number of emerging economies in the 1990s and to the fact that some of these countries weren't getting enough attention in global economic discussions and decisions. In December 1999, the Finance Ministers and Central Bank Governors of important developed and developing countries met for the first time in Berlin, Germany, to talk informally about important problems for the stability of the world economy. Since then, the finance ministers and the heads of the central banks have met every year. In 2002, the finance ministers and central bank directors of the G20 met in India. In 2008, the G20 became a summit to deal with the 2008 world financial and economic crisis.

Renewable energy target: A key way to encourage the use of clean energy is to set a renewable energy goal as a percentage of overall energy use. This goal can be set on a national level, and it should be hard but not impossible to reach. A fair transition must make sure that people who depend on traditional ways of making power are not left behind or affected more than they should be by these changes. We need to find fair solutions that let everyone take advantage of the improvements in clean energy technologies while minimizing any negative effects of this change in our energy infrastructure. Feed-in tariffs are a key strategy that is meant to encourage people to invest in renewable energy sources.

Feed-in tariffs encourage the use of green energy by guaranteeing a price for electricity made from sources like the sun or the wind. Several countries, like Japan, Germany, and the U.S., have been able to use more solar and wind energy because of this strategy. It can be helpful for the G20 countries.

ENERGY EFFICIENCY STANDARDS:

The energy economy is important tools that can help all countries meet their energy needs in the future. It could have a wide range of benefits, such as offsetting increases in energy demand, lowering energy bills, and letting CO₂ emissions go down. Modern economies are built on energy, and economic growth and wealth depend on energy. Setting guidelines for how buildings, appliances, and vehicles use energy can cut down on energy use and encourage the use of clean energy. These standards should be looked at and changed every so often to keep up with changes in technology.

Carbon pricing

Carbon pricing mechanisms, such as a carbon tax or a cap-and-trade system, can promote the use of clean energy by making polluting energy sources more expensive. By putting a price on carbon, one can help shift responsibility for the harm that GHG emissions cause back to those who are in charge of them and have the power to stop them. Several countries have adopted this strategy, which can be a good way to cut down on greenhouse gas (GHG) emissions.

Policy recommendations

International collaboration on sustainable energy should be promoted by the G20 nations working together. This may involve working together on research and development, sharing best practices, or aiding developing nations financially.

Investment in clean energy

The nations that make up the G20 should expand their investments in research and development related to clean energy, as well as investments in the implementation of technology related to clean energy. This can include funding for renewable energy infrastructure, carbon capture and storage technology, and energy storage technologies.

Phasing out of fossil fuel subsidies:

It is time for the G20 nations to stop providing financial support to the fossil fuel industry. These subsidies constitute a barrier that prevents the adoption of technology that produce clean energy and are detrimental to the goals regarding the climate. The survey found that a record 157 GW of renewable energy (including wind, solar, biomass, waste-to-energy, geothermal, marine, and small hydro) was installed worldwide in 2017.

Promotion of energy access:

The countries that make up the G20 should encourage the use of sustainable energy while also working to provide access to electricity for underdeveloped countries. This may include providing financial support for the construction of infrastructure for renewable energy sources in developing nations as well as encouraging the use of clean energy technologies in these nations.

G20 LEADERS SUMMITS

Seven G20 Summits have been held so far:

- To provide a unified response to the worldwide financial crisis, the United States president hosted the First Summit in November of 2008. The world's leaders met for the first time to discuss the causes of the economic and financial crisis and to agree on a plan of action centered on three goals: (i) reviving the global economy; (ii) shoring up the international financial system; and (iii) revamping the world's major financial institutions.
- The Second Summit in London in April 2009: came up with a stimulus package of US\$1.1 trillion to restore credit and growth and strong regulatory provisions, expansion of Financial Stability Forum (renamed as 'Financial Stability Board' or FSB) and Basel Committee on Banking Supervision (BCBS), reiteration of commitment against protectionist trends (including trade, investment, and services), and commitment to reform of International Financial Institutions.
- The Third Summit in Pittsburgh in September 2009 designated the G20 as the 'premier forum' for international economic cooperation. The main outcomes of the Pittsburgh Summit included to foster a 'Framework for Strong, Sustainable and Balanced Growth' in the 21st century through sound macroeconomic policies that prevent cycles of boom and bust through a Mutual Assessment Process (MAP) or 'peer review' which is co-chaired by India, a decision to reform the IFIs by shifting IMF's quota share to dynamic Emerging Markets and Developing Countries (EMDCs) of at least 5% from over-represented countries to under-represented countries, adoption of a dynamic formula for the World Bank to generate an increase of at least 3% voting power for developing and transition countries that are under-represented; and ensuring that World Bank and Regional Development Banks (RDBs) have sufficient resources to address global challenges
- The 'Framework for Strong, Sustainable, and Balanced Growth' and the conclusion of Phase-I work encompassing MAP (or 'peer review' by

groupings of countries were the primary topics of discussion at the Fourth Summit, held in Toronto in June 2010 under the theme of ‘Recovery and New Beginnings. budget consolidation, or the halving of the budget deficit by 2013 and the stabilization of debt by 2016, is a key aspect of domestic rebalancing in advanced countries. A ‘growth-friendly fiscal consolidation’ strategy that prioritizes economic growth and recovery over exit alternatives and budget cuts was also agreed upon. A High-Level Development Working Group (DWG) was established to discuss the newly added topic of “Development” to the G20 agenda.

- The G20 Development Agenda, embodied in the Multi-Year Action Plans (MYAP) under the nine development pillars, namely, infrastructure (including a high-level panel on infrastructure financing), human resources development, trade, private investment, job creation, food security, growth with resilience, domestic resource mobilization, and knowledge sharing, was the highlight of the Fifth Summit in Seoul in November 2010 under the theme “Shared Growth Beyond Crisis.”
- The global economic situation was discussed at length at the Sixth G20 Summit, held in Cannes, France, in the midst of the Eurozone/Greek crisis in November 2011. Its primary results included an Action Plan on Food Price Volatility and Agriculture, greater transparency in the energy markets, and an endorsement of the suggestions made by the High Level Panel and the Multilateral Development Banks’ Action Plan on Development. The Cannes Summit produced the “Cannes Action Plan for Growth and Jobs,” as well as the “Communiqués” and “Declaration” titled “Building our Common Future: Renewed Collective Action for the Benefit of all.”
- In the midst of the Eurozone/Greek crisis, the Sixth G20 Summit was convened in Cannes, France in November 2011 to debate the global economic situation at length. The key outcomes of this effort were the production of an Action Plan on Food Price Volatility and Agriculture, increased transparency in the energy markets, and an affirmation of the recommendations made by the High Level Panel and the Action Plan on Development formulated by the Multilateral Development Banks. The Cannes Summit resulted in the production of the “Cannes Action Plan for Growth and Jobs,” as well as a “Communiqués” and “Declaration” with the title “Building our Common Future: Renewed Collective Action for the Benefit of all.”

CONCLUSION

The development of renewable sources of power is absolutely necessary if we are going to meet our climate change targets. As the greatest economies in the world, the G20 nations play a pivotal role in advancing the use of renewable energy sources. Energy efficiency regulations, carbon pricing, feed-in tariffs for renewables, and other best practices can all be powerful instruments in the fight for clean energy. The transition to a clean energy economy can be sped up with the help of policy recommendations such international cooperation, investment in clean energy, the phasing out of subsidies for fossil fuels, and the promotion of energy access. The G20 countries have the opportunity to set an example for the rest of the world by adopting these rules and procedures.

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जलवायु परिवर्तन का भारतीय जैवविविधता पर प्रभाव एवं G-20

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प्रस्तावना

प्रस्तुत आर्टिकल, जलवायु परिवर्तन एवं उसके प्रभाव का भारतीय जैव विविधता पर प्रभाव पर आधारित है तथा यह जी 20 से किस प्रकार संबंधित है इस विषय में प्रकाश डाला गया है भारत में नाना प्रकार के जीव समुदाय अस्तित्व में है जो की भारतीय इकोसिस्टम हेतु अत्यन्त आवश्यक है। जलवायु परिवर्तन होने से न केवल जीव समुदाय को अपितु मानव जाती भी परेशानियों का सामना करना पड रहा है। जी 20 की हुई समिट ने अनेको अन्य मुद्दों के साथ साथ जलवायु परिवर्तन से निपटने के लिए कदम बढ़ाया है तथा बढ़ते तापमान को 1.5°C तक स्थिर रखने का संकल्प लिया है जो की सम्पूर्ण जीव जगत के लिए वरदान सवित हो सकता है। इसके अतिरिक्त आर्टिकल में जलवायु परिवर्तन होने के कारन तथा उससे निपटने के उपायों के विषय में भी प्रकाश डाला है जैव विविधता क्या है, इस पर भी चर्चा की गयी है।

प्रस्तुत कार्य डॉ बेबी तबस्सुम जी के निर्देशन में किया गया है, में उनका सदैव आभारी रहूँगा तथा श्री गाजी खान जी ने मेरी सराहनीय मदद की है में उनका धन्यवाद करता हूँ। इसके साथ ही में श्री सुमीत जी का भी आभारी हूँ, जिन्होंने मेरी टंकण कार्य में मदद की है।

जैव विविधता क्या है?

जैव विविधता का सामान्य अर्थ है समस्त जीवों (पौधों एवं प्राणियों) की प्रजातियों में पाई जाने वाली विविधता। इस शब्द का प्रयोग सबसे पहले आर. फ. डेस्मैन ने 1968 में किया था जैव विविधता 3 प्रकार की होती है : आनुवंशिक, प्रजातीय एवं पारितंत्रिय। जबकि जैव-विविधता के “हॉट-स्पॉट” (HotSpot) की संकल्पना को ब्रिटेन के जीव-विज्ञानी नारमैन मेयरस (Norman Meyers) ने 1988 में प्रस्तुत किया था।

नारमैन मेयरस ने हॉट-स्पॉट के सीमांकन का आधार निम्नलिखित हैं:

1. किसी प्रदेश में 1500 स्थानीय प्रजातियाँ पाई जाती हों जो विश्व की 300,000 जीव-जातियों का 0.5 % है,
2. किसी प्रदेश में कम से कम 70 % से अधिक मूल जैव-जातियाँ नष्ट हो चुकी हों, और

3. सागरीय हॉट-स्पॉट के संबंध में मूँगे की चट्टानों (Coral Reefs), मछलियों घोंघे (Snail) आदि को भी सम्मिलित किया गया है। अतः साधारण शब्दों में, जैव विविधता के हॉट-स्पॉट ऐसे स्थल हैं जो जैव विविधता की दृष्टि अत्यंत महत्वपूर्ण हैं और साथ ही साथ अत्यंत संवेदनशील भी हैं। विश्व के अधिकतर हॉट-स्पॉट ऊष्ण कटिबंध अथवा अर्ध-ऊष्ण कटिबंध में पाये जाते हैं।

भारत की जैव विविधता

दुनिया के जैव-समृद्ध राष्ट्रों में भारत का महत्वपूर्ण स्थान है और यहाँ पौधों व प्राणियों की व्यापक विविधता है जिनमें से अनेक प्रजातियाँ ऐसी हैं जो विश्व में कहीं और नहीं पाई जातीं। ऐसी प्रजातियों को स्थानिक (endemic) कहते हैं व भारत में स्तनपायीयों की 350 प्रजातियाँ हैं जो कि दुनिया भर के देशों में 8वीं सबसे बड़ी संख्या है व पक्षियों की 1200 प्रजातियाँ हैं (संसार में 8वाँ स्थान), सरीसृपों की 453 प्रजातियाँ हैं (संसार में 5वाँ स्थान) और पौधों की 45,000 प्रजातियाँ हैं (संसार में 15वाँ स्थान)- जिनमें से अधिकांश तो आवृत्तबीजी (angiosperms) हैं। इनमें 1022 प्रजातियों वाले फर्न और 1082 प्रजातियों वाले आर्किड की विशेष रूप से भारी विविधता भी शामिल है। 13000 तितलियों और बीटल्स समेत यहाँ कीड़े-मकोड़ों की 50,000 ज्ञात प्रजातियाँ हैं। अनुमान लगाया गया है कि अज्ञात प्रजातियों की संख्या इससे कहीं बहुत अधिक हो सकती है और इस सन्दर्भ में शोध जारी हैं। भारत के 18% पौधे स्थानिक हैं और दुनिया में कहीं और पाए नहीं जाते। पौधों की प्रजातियों में फूल देनेवाले काफी हद तक स्थानीय पौधे हैं, इनमें से लगभग 33% दुनिया में कहीं और पाए ही नहीं जाते। भारत के जल-थलचारी प्राणियों में 62% इसी देश में पाए जाते हैं। छिपकलियों की 153 ज्ञात प्रजातियों में 50% स्थानिक हैं। इसी प्रकार कीड़े-मकोड़ों, केचुओं और कई जलीय जीवों के विभिन्न समूहों में भी भारी स्थानीयता पाई जाती है।

जलवायु परिवर्तन क्या है?

जलवायु परिवर्तन का तात्पर्य दशकों, सदियों या उससे अधिक समय में होने वाली जलवायु में दीर्घकालिक परिवर्तनों से है। यह मुख्य रूप से जीवाश्म ईंधन (जैसे, कोयला, तेल और प्राकृतिक गैस) को जलाने के कारण पृथ्वी के वातावरण में तेजी से बढ़ती ग्रीनहाउस गैसों के कारण होता है।

ये गर्मी-फंसाने वाली गैसों पृथ्वी और महासागरों को गर्म कर रही हैं, जिसके परिणामस्वरूप समुद्र का स्तर बढ़ रहा है, तूफान के पैटर्न में बदलाव, समुद्र की धाराओं में बदलाव, बारिश में बदलाव, बर्फ और बर्फ पिघलना, अधिक चरम गर्मी की घटनाएं, आग और सूखा। इन प्रभावों को जारी रखने और कुछ मामलों में, मानव स्वास्थ्य, बुनियादी ढांचे, जंगलों, कृषि, मीठे पानी की आपूर्ति, समुद्र तटों और समुद्री प्रणालियों को प्रभावित करने, तेज करने का अनुमान है।

अनुमान

- वायुमंडलीय तापमान: 2-4 ° C 2100 द्वारा वृद्धि, ज्यादातर मानव गतिविधि के कारण
- समुद्र के स्तर में वृद्धि: ~ 1 मीटर 2100 द्वारा थर्मल विस्तार और हिमनदों के पिघलने के कारण। नोट: ग्रीनलैंड और पश्चिम अंटार्कटिक बर्फ की चादर के योगदान से समुद्र के स्तर में वृद्धि हो सकती है
- तूफान के पैटर्न में बदलाव: वार्मिंग के कारण विश्व स्तर पर उष्णकटिबंधीय तूफान औसतन अधिक तीव्र हो सकते हैं (11-2100: की तीव्रता में वृद्धि के साथ)

मौसम और जलवायु के बीच अंतर

- मौसम थोड़े समय (कुछ घंटों या कुछ दिनों) में तापमान और वर्षा जैसी वायुमंडलीय स्थितियों को संदर्भित करता है। मौसम वह है जो आप दिन-प्रतिदिन अनुभव करते हैं।
- जलवायु किसी विशेष स्थान के लिए आमतौर पर कम से कम 30 वर्षों में मौसम का औसत पैटर्न होता है।

जलवायु परिवर्तन के कारण क्या हैं?

जैसा कि पहले ही ऊपर उल्लेख किया गया है, जलवायु परिवर्तन के कारणों को आसानी से प्राकृतिक या मानवजनित (मानव-प्रेरित) के रूप में वर्गीकृत किया जा सकता है।

जलवायु परिवर्तन के प्राकृतिक कारण

पृथ्वी की जलवायु को प्रभावित करने वाले प्रमुख प्राकृतिक कारक इस प्रकार हैं:

1. पृथ्वी की कक्षा में परिवर्तन: पृथ्वी की सतह पर पड़ने वाले सूर्य के प्रकाश की पहुंच सीधे पृथ्वी की अपनी कक्षा में स्थिति से संबंधित है। पृथ्वी की कक्षा में कोई भी बदलाव पृथ्वी के संपूर्ण ऊर्जा बजट पैटर्न को प्रभावित करता है जिससे जलवायु परिवर्तन होता है।

2. ज्वालामुखी क्रियाएँ: ज्वालामुखी विस्फोट के दौरान निकलने वाली गैसों और धूल के कण आने वाली सौर किरणों को आंशिक रूप से अवरुद्ध कर देते हैं जिससे मौसम ठंडा हो जाता है। जबकि ज्वालामुखी गतिविधियां बहुत कम समय के लिए होती हैं, बड़ी मात्रा में निकलने वाली गैसों और धूल जलवायु पैटर्न को लंबे समय तक प्रभावित करती हैं।

3. महाद्वीपीय बहाव: महाद्वीपीय बहाव जल निकायों, दिशा, और हवाओं की ताकत, हवाओं के प्रवाह, महासागरीय धाराओं आदि के साथ इसकी निकटता सहित एक भूभाग की भौतिक विशेषताओं को बदल देता है। समग्र भौतिक विशेषता में परिवर्तन दुनिया के जलवायु पैटर्न को प्रभावित करता है।

4. **प्लेट टेक्टोनिक्स:** प्लेट टेक्टोनिक्स से जुड़े क्षेत्रीय और ऊर्ध्वाधर विस्थापन लंबे समय तक जलवायु परिवर्तन को बहुत प्रभावित करते हैं। पृथ्वी की सतह की निरंतर विकसित प्रकृति और भूभाग का पुनर्वितरण आने वाले और बाहर जाने वाले विकिरण के संतुलन को प्रभावित करता है।

जलवायु परिवर्तन के मानवजनित कारण

जलवायु अध्ययनों से पता चला है कि वर्तमान समय में तेजी से हो रहे जलवायु परिवर्तन के लिए काफी हद तक मानवीय गतिविधियों को जिम्मेदार ठहराया जा सकता है। जलवायु परिवर्तन के कुछ मुख्य मानवजनित कारण इस प्रकार हैं:

1. **कार्बन उत्सर्जन:** तेजी से औद्योगीकरण, वाहनों से होने वाले प्रदूषण, परिवहन, ताप विद्युत उत्पादन, और व्यावसायिक-आवासीय कारणों जैसे कारणों से वातावरण में CO₂ और अन्य ग्रीनहाउस गैसों की अत्यधिक रिहाई हुई है। इस तरह फंसी हुई गर्मी के परिणामस्वरूप पृथ्वी के तापमान में अप्राकृतिक वृद्धि होती है।

2. **जीवाश्म ईंधन का जलना:** तेल या कोयले जैसे जीवाश्म ईंधन के जलने से बड़ी मात्रा में ग्रीनहाउस गैस का उत्सर्जन होता है। इसे ग्लोबल वार्मिंग के प्रमुख कारणों में से एक माना जाता है।

3. **भूमि उपयोग में परिवर्तन:** भूमि उपयोग और जलवायु परिवर्तन के बीच एक जटिल संबंध मौजूद है। मनुष्यों ने भूमि वितरण के प्राकृतिक पैटर्न में हस्तक्षेप किया है और भूमि के एक बड़े हिस्से को कृषिउपयोग के लिए बदल दिया है। आज, कृषि उपयोग के तहत कुल भूमि वन के तहत कुल क्षेत्र से अधिक है। पैटर्न में बदलाव प्रत्यक्ष और अप्रत्यक्ष रूप से जलवायु परिवर्तन से जुड़ा हुआ है।

4. **वनों की कटाई:** यह जलवायु परिवर्तन के मुख्य मानव-प्रेरित चालकों में से एक है। मानव बस्ती, कृषि और चराई के उद्देश्यों, इमारती लकड़ी, निर्माण आदि के लिए वन भूमि को स्थायी रूप से साफ कर दिया जाता है। यह न केवल उन वनस्पतियों को हटाता है जो हवा से कार्बन डाइऑक्साइड प्रक्रिया को अवशोषित करती हैं, बल्कि यह हटाने की प्रक्रिया के दौरान ग्रीनहाउस गैसों का उत्सर्जन भी करती हैं।

जलवायु परिवर्तन के प्रभाव

समकालीन जलवायु परिवर्तन पृथ्वी के औसत तापमान में निरंतर वृद्धि का पर्याय है। अगली शताब्दी में पृथ्वी का वैश्विक औसत तापमान 11.5 डिग्री फारेनहाइट बढ़ने की उम्मीद है। तापमान में इतनी तेज वृद्धि के विनाशकारी प्रभाव होंगे। पृथ्वी के बढ़े हुए तापमान के कुछ प्रमुख प्रभावों की चर्चा नीचे की गई है-

1. ग्लेशियरों का पिघलना
2. समुद्र का जलस्तर बढ़ना: 1870 से 2004 के बीच समुद्र के स्तर में कुल 195 मिमी की वृद्धि हुई। दूसरी ओर, 2004 से वर्तमान समय तक इसमें 43 मिमी की खतरनाक वृद्धि हुई।

3. प्राकृतिक आपदाएँ
4. वनस्पति पर प्रभाव
5. डिस्टर्ब फूड-वेब
6. महासागरों का गर्म होना
7. जलवायु परिवर्तन और जंगल की आग
8. खाद्य सुरक्षा मुद्दे
9. स्वास्थ्य जोखिम

जलवायु परिवर्तन का भारतीय जैव विविधता पर प्रभाव

भारत जैसे उष्णकटिबंधीय देश में जलवायु परिवर्तन के निसंदेह गंभीर परिणाम होंगे। देश में जलवायु परिवर्तन के विभिन्न क्षेत्रों पर संभावित दुष्प्रभाव निम्नलिखित हैं-

पारिस्थितिकी एवं पर्यावरण क्षेत्र पर जलवायु परिवर्तन का प्रभाव: जलवायु परिवर्तन के कारण बंगाल की खाड़ी में जलस्तर में वृद्धि होगी जिसके परिणामस्वरूप जैव-विविधता सम्पन्न मैन्ग्रोवपारितन्त्र (मैन्ग्रोवइकोसिस्टम) नष्ट हो जाएंगे। जलस्तर में वृद्धि के कारण अण्डमान तथा निकोबार द्वीप समूह भी जल में डूब जाएंगे परिणामस्वरूप जैव-विविधता की वृहद पैमाने पर क्षति होगी क्योंकि ये द्वीप समूह जैव-विविधता सम्पन्न हैं तथा बहुत से पौधों तथा जन्तुओं की प्रजातियां यहां के लिए स्थानिक (वह प्रजातियां जो देश के किसी अन्य हिस्से में नहीं पायी जाती हैं) हैं। सागर जल की तपन के कारण मूंगे का द्वीप लक्षद्वीप मूंगाविरंजन (कोरलब्लीचिंग) का शिकार होकर नष्ट हो जाएगा। बाद में समुद्री जलस्तर बढ़ने से यह द्वीप पूरी तरह से डूबकर समाप्त हो जाएगा। वैश्विक तपन से हिमालय की वनस्पतियां विशेष रूप से प्रभावित होगी जिससे जैव-विविधता क्षय का खतरा बढ़ेगा।

जलवायु परिवर्तन के कारण कीटों, खरपतवारों तथा रोगाणुओं की जनसंख्या बढ़ेगी: जिनके नियन्त्रण के लिए वृहद पैमाने पर रासायनिक जीवनाशकों (पेस्टिसाइड्स) के प्रयोग के कारण पर्यावरण प्रदूषित होगा। कीटनाशकों तथा शाकनाशकों के अंधाधुंध प्रयोग से गैर-लक्षित उपयोगी कीट, फसलों की जंगली प्रजातियां तथा पौधों की अन्य उपयोगी प्रजातियां भी प्रभावित होंगी, जिससे जैव-विविधता का क्षरण होगा।

जी-20

ग्रुप ऑफ ट्वेंटी (G20) अंतरराष्ट्रीय आर्थिक सहयोग का प्रमुख मंच है। यह सभी प्रमुख अंतरराष्ट्रीय आर्थिक मुद्दों पर वैश्विक संरचना और अधिशासन निर्धारित करने तथा उसे मजबूत करने में महत्वपूर्ण भूमिका निभाता है। ग्रुप ऑफ ट्वेंटी (G20) में 19 देश (अर्जेंटीना, ऑस्ट्रेलिया, ब्राजील,

कनाडा, चीन, फ्रांस, जर्मनी, भारत, इंडोनेशिया, इटली, जापान, कोरिया गणराज्य, मैक्सिको, रूस, सऊदी अरब, दक्षिण अफ्रीका, तुर्किये, यूनाइटेड किंगडम और संयुक्त राज्य अमेरिका) और यूरोपीय संघ शामिल हैं। G20 सदस्य देशों में वैश्विक सकल घरेलू उत्पाद का लगभग 85%, वैश्विक व्यापार का 75% से अधिक और विश्व की लगभग दो-तिहाई आबादी है। जी20 की स्थापना 1999 में एशियाई वित्तीय संकट के बाद वित्त मंत्रियों और केंद्रीय बैंक के गवर्नरों के लिए वैश्विक आर्थिक और वित्तीय मुद्दों पर चर्चा करने के लिए एक मंच के रूप में की गई थी। 2007 के वैश्विक आर्थिक और वित्तीय संकट के मद्देनजर जी20 को राष्ट्राध्यक्षों/शासनाध्यक्षों के स्तर तक उन्नत किया गया था, और 2009 में इसे “अंतर्राष्ट्रीय आर्थिक सहयोग हेतु प्रमुख मंच” के रूप में नामित किया गया था। जी20 शिखर सम्मेलन प्रतिवर्ष एक क्रमिक अध्यक्षता में आयोजित किया जाता है। शुरुआत में G20 व्यापक आर्थिक मुद्दों पर केंद्रित था, परंतु बाद में इसके एजेंडे में विस्तार करते हुए इसमें अन्य बातों के साथ व्यापार, जलवायु परिवर्तन, सतत विकास, स्वास्थ्य, कृषि, ऊर्जा, पर्यावरण, जलवायु परिवर्तन और भ्रष्टाचार-विरोध शामिल किया गया।

जलवायु परिवर्तन पर काबू पाने के सात तरीके

कार्बन फुटप्रिंट के मामले में पेट्रोल डीजल का इस्तेमाल करने वाली दुनिया की कंपनियां आम लोगों से बहुत ऊपर हैं लेकिन इसके बाद भी हम जलवायु संकट से निपटने के लिए बहुत कुछ कर सकते हैं।

1. विमान और पेट्रोल के वाहन छोड़िए और बस, ट्रेन या साइकिल से चलिए

परिवहन से दुनिया का 20 प्रतिशत उत्सर्जन निकलता है। सबसे बुरी स्थिति बनती है सड़क यातायात सेपरिवहन को कार्बनमुक्त करने के लिए उत्सर्जनों में कटौती का एक आसान तरीका है, पेट्रोल से चलने वाली कारों के बदले ट्रेन, साइकिल, ई-वाहन का इस्तेमाल करें और जहां तक संभव हो पैदल चलकर आना जाना करें यानी सबसे शून्य उत्सर्जन वाला ट्रांसपोर्ट शहरों में, ई-स्कूटर से लेकर ई-बसों तक बिजली से चलने वाले परिवहन विकल्प मौजूद हैं और वो एक ठिकाने से दूसरे ठिकाने तक एक कम उत्सर्जन मार्ग बनाते हैं। इलेक्ट्रिक स्कूटर की तुलना में एक पेट्रोल कार दस गुना ज्यादा कार्बन का उत्सर्जन करती है। इसमें उत्पादन से लेकर कबाड़ के निपटारे तक से जुड़ा उत्सर्जन भी शामिल है। विमान से कभी सफर नहीं करने वाली दुनिया की करीब 10 फीसदी आबादी के लिए विमान के बदले ट्रेनों से आवाजाही का भी एक बड़ा असर पड़ सकता है, यूरोपीय शहरों के बीच एक आम रेल सफर उसी दूरी की उड़ान के मुकाबले 90 फीसदी कम सीओ₂ उत्सर्जित करता है।

2. मांस नहीं, फल सब्जी और अनाज खाइये

मीट और डेयरी उत्पाद, 15 फीसदी वैश्विक ग्रीनहाउस गैस (जीएचजी) उत्सर्जन का जिम्मेदार है। जैव विविधता का नुकसान, मिट्टी का दूषित हो जाना और प्रदूषण तो जो है सो अलग है।

इस साल जब जलवायु परिवर्तन पर अंतरराष्ट्रीय पैनल (आईपीसीसी) ने कहा था कि ग्लोबल वॉर्मिंग को कम करने के लिए उत्सर्जनों को 2030 तक आधा करना होगा, तो उसने इस बात पर भी जोर दिया था कि प्लांट प्रोटीन की अधिकता वाले और मीट और डेयरी रहित आहार में, ग्रीनहाउस गैसों की कटौती करने की सबसे ज्यादा क्षमता है। लिहाजा शाकाहारी होना या वीगन आहार लेना, इस जलवायु असर को कम करने का एक तरीका हो सकता है। जलवायु अनुकूल पौधा आधारित मांस की बढ़ती मांग और लोकप्रियता, उपरोक्त विकल्प को और आसान बना देते हैं। हालांकि अभी तक पौधे सिर्फ 2 फीसदी प्रोटीन देते हैं। बोस्टन कन्सल्टिंग ग्रुप के मुताबिक 2035 तक इसके 11 फीसदी तक बढ़ जाने की संभावना है, ये और तेज भी हो सकता है अगर हममें से ज्यादातर लोग मांस और डेयरी उत्पादों की अपनी मांग में कटौती कर दें।

3. सरकारों पर कार्रवाई के लिए दबाव डालिए

फ्राइडेज फॉर फ्यूचर आंदोलन में शामिल स्कूली बच्चों ने दिखाया कि जलवायु के लिए एक सामूहिक कदम उठाना संभव है। राजनीतिज्ञ पर्याप्त काम न कर रहे हों लेकिन उन्हें सुनना तो पड़ेगा ही क्योंकि दुनिया भर में जलवायु चिंताएं भी वोटिंग के इरादों को संचालित कर रही हैं, जैसे कि हाल ही में ऑस्ट्रेलिया में नये नेता जलवायु आकांक्षाओं को उल्लेखनीय स्तर पर बढ़ाने का वादा करते देखे गए। (भले ही कई लोग मानते हैं कि लक्ष्य अभी भी अपर्याप्त है। कभीकभार अदालतें भी सुन लेती हैं। अप्रैल 2021 में फ्राइडेज फॉर फ्यूचर अभियान के युवाओं ने जर्मनी की एक उच्च अदालत में हुई जिरह में कहा कि जलवायु कार्रवाई नहीं होने से उनकी बुनियादी आजादी पर खतरा बन आया है जो असंवैधानिक है। नतीजतन, कोर्ट ने सरकार को उत्सर्जन कटौती के लक्ष्यों को मजबूत करने के लिए बाध्य किया- दो महीने बाद सरकार को अदालती आदेश पर अमल करना पड़ा। मतदाताओं की नयी पीढ़ी में जलवायु का मुद्दा शीर्ष पर आ गया है। लिहाजा कई युवा विरोध प्रदर्शनों, आंदोलनों, सोशल मीडिया अभियानों या स्थानीय प्रतिनिधियों को लिखकर, राजनीतिज्ञों पर दबाव बना रहे हैं। जर्मनी की राजधानी बर्लिन में जलवायु जनादेश को लेकर एक नागरिक अभियान चल रहा है। 2030 तक कार्बन निरपेक्षता की मांग उसकी एक अच्छी शुरुआत है।

4. हरित ऊर्जा और जहां संभव है वहां अक्षय ऊर्जा का इस्तेमाल करिए

ऊर्जा के लिए जीवाश्म ईंधनों को जलाना, ग्लोबल ग्रीन हाउस गैस उत्सर्जनों का सबसे बड़ा स्रोत है। साफ, अक्षय स्रोत जैसे पवन ऊर्जा या सौर ऊर्जा से हरित ऊर्जा हासिल करने का विकल्प बढ़िया है। यह जलवायु तबाह करने वाले कार्बन के मुख्य स्रोत को खत्म कर सकता है। ग्राहक पहले ही अंतर पैदा कर चुके हैं। यूरोपीय संघ में 2019 से, अक्षय ऊर्जा उत्पादन 2005 की तुलना में दोगुना हो चुका है, 34 फीसदी बिजली उसी से आती है। इसका मतलब है कि यूरोपीय संघ की अधिकांश बिजली कोयले से पैदा नहीं की जाती है। कोयला उत्सर्जन के लिए सबसे बड़े जिम्मेदार जीवाश्म ईंधन है। एक घर या मकान या अपार्टमेंट में रहने वाले लोग भी अपनी छतों पर सौर ऊर्जा लगा सकते हैं

या गैस हीटिंग के बदले, जहां संभव है, इलेक्ट्रिक हीट पंप लगा सकते हैं। कुछ समुदाय तो अपने आसपास, विशिष्ट रूप से अक्षय ऊर्जा पर ही निर्भर रहने के लिए एक साथ आ रहे हैं।

5. लाइट बंद और हीटिंग कम कीजिए

हीटिंग को कम करना या बंद करना जैसी सामान्य सी चीज भी बहुत सारी ऊर्जा बचा सकती है। रूसी गैस पर देश की निर्भरता से पैदा हुए ऊर्जा संकट से जूझ रही जर्मन सरकार इसीलिए इन सदियों में सरकारी इमारतों में हीटिंग के तापमान को 19 डिग्री सेल्सियस तक सीमित करेगी। रात में कम्प्यूटर बंद करना और उपयोग में नहीं आ रहे इलेक्ट्रॉनिक उपकरणों को अनप्लग कर जलवायु को सोखने वाली ऊर्जा को हटाना भी जलवायु बदलाव को रोकने वाली एक कार्रवाई है जिसे हम आज के दौर में हासिल कर सकते हैं। इससे भी ज्यादा आसान है कि जब कमरे में ना हों तो लाइट बंद कर दें। ऊर्जा की उच्च बचत वाले उपकरणों का इस्तेमाल, जैसे कि गैस के चूल्हों के बदले इंडक्शन भी आगे की ओर एक कदम है। इससे भी अच्छा है कि आप सरकार से स्मारकों और इमारतों में रात भर जलने वाली लाइटें बंद करने की मांग करें। जर्मन राजधानी बर्लिन में हाल में ये नीति लागू कर दी गई है।

6. खाना बेकार न जाने दीजिए

दुनिया का एक तिहाई भोजन फेंक दिया जाता है। अगर उत्पादन, परिवहन और उपयोग का आकलन किया जाए तो खाने का ये नुकसान और कचरा एक बहुत बड़ा कार्बन उत्सर्जक है। कचरा ठिकानों में फेंका जाने वाला खाना मीथेन पैदा करता है, वो छोटी अवधि में एक बड़े नुकसान वाली ग्रीनहाउस गैस है। अमेरिका में, सालाना भोजन नुकसान और खाद्य कचरे से 17 करोड़ मीट्रिक टन कार्बन डाइऑक्साइड के बराबर ग्रीनहाउस गैस उत्सर्जन होता है और इसमें कचरा ठिकानों के उत्सर्जन शामिल नहीं हैं। कुल मिलाकर ये कोयले से चलने वाले 42 ऊर्जा संयंत्रों के सालाना उत्सर्जनों के बराबर है। इसीलिए फ्रिज में रखी हर चीज हम न खा सकें, तो उसे कम से कम खाद में डाल दीजिए जो बगीचे को उर्वर बनाएगी या बायोगैस में इस्तेमाल कर लीजिए। इस बीच सुपरबाजारों को अतिरिक्त भोजन न फेंकने के लिए दबाव डालें, उसे फूड बैंको या दान संस्थाओं को दे दीजिए। या रेस्तरां को कहिए कि वो नहीं खाये गये भोजन के लिए “डॉगी बैग्स” दें। ये दोनों उपाय हाल में स्पेन में पारित हुए फूड वेस्ट कानून में शामिल हैं।

7. पेड़ लगाइये

पेड़ एक बहुत जरूरी कार्बन सिंक हैं, फिर भी जंगल बड़े पैमाने पर काटे जा रहे हैं। मिसाल के लिए अमेजन जंगल की कटाई में पिछले साल 20 फीसदी की बढ़ोत्तरी हो गई थी।

पहले से कहीं ज्यादा, इस समय पेड़ लगाना मतलब वायुमंडल में सीओ₂ को कम करना है। व्यक्तिगत तौर पर ये सबसे अच्छा उपाय है। पेड़ न सिर्फ हवा को साफ करते हैं, जैवविविधता को बढ़ाते हैं और मिट्टी की उर्वरता बनाए रखते हैं बल्कि वे ऊर्जा भी बचाते हैं। खासकर शहरों में ये देखा जा

सकता है जहां सड़कों पर लगे ज्यादा से ज्यादा पेड़ ठंडक पहुंचाते हैं और एयरकंडिशनिंग की जरूरत में कटौती करते हैं। ये कार्बन मुक्त गैरलाभकारी उपाय है। इसी तरह सदियों में, पेड़ हवा से महफूज रखने वाले शेल्टर होम की तरह काम करते हैं और इस तरह हीटिंग की कीमतों में 25 फीसदी तक की कमी ले आते हैं।

सन्दर्भ

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International Cooperation and Climate Change: the Role of the G20

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The G20 (Group of Twenty) is an international forum consisting of 19 countries and the European Union. The members are Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Mexico, Russia, Saudi Arabia, South Africa, South Korea, Turkey, the United Kingdom, and the United States. The G20 countries represent two-thirds of the world's population and more than 80% of the world's economic output. Around 80% of global GDP, 75% of international trade, and two-thirds of the world's population. The G20 aims to promote international financial stability, sustainable economic growth, and international cooperation on issues of global significance, including climate change. It was established in 1999 in response to the Asian financial crisis. It was initially a meeting of finance ministers and central bank governors from 19 countries and the European Union. Since then, it has expanded to include leaders from member countries, who meet annually to discuss global economic issues and cooperation. The G20's main goal is to promote international financial stability and sustainable economic growth.

The G20 plays a crucial role in promoting international cooperation on a wide range of economic and social issues, including trade, investment, finance, development, and climate change. As an informal grouping of the world's major economies, the G20 provides a forum for dialogue, coordination, and collaboration among its members, as well as with other countries and international organizations. One of the key functions of the G20 is to promote global economic stability and growth through policy coordination and cooperation. The G20's finance ministers and central bank governors regularly meet to discuss global economic issues and to coordinate their policies on issues such as monetary policy, financial regulation, and international taxation. The G20 also plays a critical role in promoting international development and poverty reduction. In 2015, the G20 adopted the 2030 Agenda for Sustainable Development, which sets out a framework for global development priorities over the next 15 years. The G20 has committed to supporting the implementation of this agenda through its work on issues such as infrastructure investment, job creation, and inclusive growth. Moreover, the G20 has been actively involved in responding to global crises, such as the COVID-19 pandemic. The G20 has coordinated its efforts to support the global health response, mitigate the economic

impact of the pandemic, and ensure access to vaccines, especially in developing countries.

In summary, the G20 plays a critical role in promoting international cooperation and collaboration on a wide range of economic and social issues, and its work is essential for addressing global challenges and promoting sustainable development. Climate change is one of the most pressing issues facing the world today, and the G20 has played a critical role in shaping the international response to this challenge. The G20 has recognized the importance of reducing greenhouse gas emissions and has taken steps to promote the transition to a low-carbon economy.

At the G20 Leaders' Summit in 2015, held in Antalya, Turkey, the leaders committed to reducing greenhouse gas emissions, promoting the development of renewable energy, and increasing energy efficiency. The G20 also played a critical role in the adoption of the Paris Agreement on climate change in 2015, which aims to limit global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit it to 1.5°C. In addition, the G20 has established the Green Climate Fund (GCF) to help developing countries finance low-carbon and climate-resilient development. The G20 has also pledged to phase out fossil fuel subsidies and to increase investment in renewable energy and energy efficiency.

Overall, the G20 plays a crucial role in promoting international cooperation and collaboration on climate change, as well as in driving global efforts to transition to a low-carbon economy. However, it is important to note that the G20 is not a legally binding body, and its commitments on climate change are voluntary. It will be up to individual countries to follow through on their commitments and take concrete actions to address climate change. Various issues concerning climate change have been added to the agenda of the G20 over time as the policy makers started to recognize climate's connection to the overall economic performance of the countries and consequently the necessity to act. There was a clear proof for an approach based on cooperation and collaboration and the G20 served as the leading platform. Realizing the heterogeneity of its members, the G20 encouraged country-specific policies, while supporting coordinated action in the fight against climate change. Since their first Summit in 2008 in Washington DC, USA, topics of climate played a significant role in discussions of the G20 leaders. In Washington, the G20 members expressed their concern over climate change for the first time. Following year, the topic got more exposure during the 2009 London, UK Summit, where leaders reaffirmed their commitment to address the threat of irreversible climate change, based on the principle of common but differentiated responsibilities. Leaders committed to make a transition towards clean, innovative, lowcarbon technologies and infrastructure. They also assured to reach agreement at the 15th Conference of the Parties (COP15) of the UNFCCC that took place in December 2009 in Copenhagen. At the COP15 almost 115 world leaders attended the high-level segment and raised climate change policy to the highest political level. The participants agreed

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on the Copenhagen Accord, which expressed in clear terms a political intent to constrain carbon and respond to climate change, in both the short- and long-term. The key element of the Accord was the long-term goal of limiting the maximum global average temperature increase to no more than 2 degrees Celsius above pre-industrial levels, subject to a review in 2015. It also included a reference to consider limiting the temperature increase to below 1.5 degrees Celsius, a key demand made by vulnerable developing countries. However, parties did not specify how to do this in practical terms. In addition, the developed countries promised to fund actions to reduce GHG emissions, to provide US\$30 billion for the period 2010-2012, and to mobilize longterm finance of a further US\$100 billion a year by 2020 from a variety of sources and to help developing countries adapt to the inevitable effects of climate change. The Green Climate Fund was also established at the COP15.

Overarching theme of the Saudi Arabia G20 Presidency is to look for solutions that address present pressing challenges of climate and natural disaster threats that are facing everyone. India has acknowledged the existence and urgency of climate change and has committed to reducing its greenhouse gas emissions. However, it has also emphasized the need for developed countries to take the lead in addressing climate change, given their historical responsibility for the majority of global emissions.

At the 2019 United Nations Climate Action Summit, Indian Prime Minister Narendra Modi announced that India will increase its renewable energy capacity to 175 gigawatts by 2022 and to 450 gigawatts by 2030. He also stated that India will reduce its emissions intensity (the amount of emissions per unit of GDP) by 33-35% below 2005 levels by 2030.

In addition, India has launched several initiatives to promote renewable energy and energy efficiency, such as the International Solar Alliance and the National Mission on Enhanced Energy Efficiency.

Overall, while India recognizes the importance of addressing climate change, it also places emphasis on the need for developed countries to take greater responsibility in this area.

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पर्यावरण परिवर्तन के मनुष्य पर प्रभाव

डॉ० कुसुमलता

एसोसिएट प्रोफेसर, संस्कृत विभाग
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परि और आवरण शब्दों की सन्धि करने पर पर्यावरण शब्द बनता है, जिसका शाब्दिक अर्थ है - जो पारितः (चारो ओर) आवृत (ढके हुये) है। अब प्रश्न उठता है कि कौन किसे आवृत किये हुये है? इसका उत्तर है समस्त जीवधारियों को अजैविक या भौतिक पदार्थ घेरे हुये है अर्थात् हम जीवधारियों तथा वनस्पतियों के चारो ओर जो आवरण है उसे पर्यावरण कहते हैं।

सामान्यतः पर्यावरण एवं प्रकृति को समरूप माना जाता है जिसके अन्तर्गत पृथ्वी के भौतिक घटकों (जल, स्थल, वायु, मृदा) को सम्मिलित किया जाता है जो जीवमण्डल में विभिन्न जीवों को आधार प्रस्तुत करते हैं, उन्हें आश्रय देते हैं, उनके विकास एवं सम्बर्द्धन हेतु आवश्यक दशायें प्रस्तुत करते हैं। वास्तव में विभिन्न जनसमूहों द्वारा पर्यावरण का अर्थ विभिन्न दृष्टिकोणों से विभिन्न रूपों में किया जाता है।

पर्यावरण की संरचना तथा प्रकार

पर्यावरण भौतिक एवं जैविक संकल्पना है अतः इसमें पृथ्वी के जीवित और अजीवित घटकों को सम्मिलित किया गया है-

1. भौतिक पर्यावरण- भौतिक पर्यावरण में वायुमण्डलीय पर्यावरण स्थलमण्डलीय पर्यावरण और जलमण्डलीय पर्यावरण को सम्मिलित किया जाता है।
2. जैविक पर्यावरण- जैविक पर्यावरण की संरचना पौधों तथा मानव सहित जन्तुओं से होती है। इसमें मनुष्य महत्वपूर्ण कारक है।

मानव-पर्यावरण का सम्बंध

मनुष्य की प्राकृतिक पर्यावरण के साथ दो तरफा भूमिका होती है। अर्थात् मनुष्य एक तरफ तो भौतिक पर्यावरण के जैविक संघटक का एक महत्वपूर्ण भाग है तो दूसरी तरफ वह पर्यावरण का एक महत्वपूर्ण कारक भी है। इस प्रकार मनुष्य प्राकृतिक तन्त्र को विभिन्न हैसियत से विभिन्न रूपों में प्रभावित करता है यथा जीवित या भौतिक मनुष्य के रूप में, सामाजिक मनुष्य के रूप में, आर्थिक मनुष्य के रूप में तथा प्रौद्योगिकी मानव के रूप में। मनुष्य के सभी गुण पर्यावरण के उसी प्रकार प्रभावित करते हैं। चूंकि मानव अन्य प्राणियों की तुलना में शारीरिक एवं मानसिक स्तर पर सर्वाधिक विकसित प्राणी है। अतः वह प्राकृतिक पर्यावरण के बड़े स्तर पर परिवर्तित करके अपने अनुकूल बनाने में समर्थ है।

प्रारम्भ में आदिमानव की भौतिक पर्यावरण की कार्योत्पन्नता में भूमिका दो तरह की होती थी- दाता औ पाता की। अर्थात् मनुष्य भौतिक पर्यावरण से अन्य जीवों के समान संसाधन प्राप्त करता और पर्यावरण में अपना योगदान भी करता (फल-फूल आदि के बीजों को अनजाने में बिखेर कर) इस प्रकार मानव संस्कृति के विकास के प्रथम चरण में मनुष्य भौतिक पर्यावरण का अन्य कारकों के समान एक कारक मात्र था जैसे जैसे मानव समाज और संस्कृति विकसित हुई मनुष्य के साथ उसकी भूमिका एवं सम्बंध भी उत्तरोत्तर परिवर्तित होते चले गये। यथा- पर्यावरणीय कारक पर्यावरण का परिवर्तन करता तथा पर्यावरण का विध्वंसकर्ता। जो मानव प्रकृति का अंग था वही आगे चलकर उसका स्वामी बन बैठा।

अतः मानव पर्यावरण के मध्य सहभागिता चरमरा गयी और मानव प्राकृतिक पर्यावरण का कारक एवं पालन न होकर उसका विध्वंसक हो गया। उसने अपने विकास के लिये अपनी पालक प्रवृत्ति को सीढ़ी की तरफ प्रयोग में लाया। प्रकृति का अंधाधुंध दोहन कर धरती को पूरी तरह से खाली और बंजर बना दिया और मानव आज अमीर बन गया वह बहुमंजिला इमारतों में बैठा हवा में उड़ रहा है और इस दोहन के बलबूते स्वयं को ईश्वर सरीखा समझ बैठा है। आज मानव को न गर्मी लगती है न ठंड लगती है न दूरी की चिन्ता है न अपने के दूर जाने का ग़म है क्योंकि मिनटों में फोन द्वारा वीडियो कॉल द्वारा अपने को देख सुन सकता है आज सब सुविधाओं से परिपूर्ण है। मनुष्य ने सब पा लिया, सुखी हो गया परन्तु इस भौतिकता में उसने क्या खोया है किसका विनाश किया है यह नहीं पता। जिस भी दिन प्रकृति रूट होती है बीच-बीच में अपना रौद्र रूप दिखाती है पर मनुष्य सुधरने का नाम नहीं ले रहा। इस पर्यावरण के आधार पर ही मानव ने इतना विकास किया अपना पेट भरा, अपने परिवार का पेट भरा, अपने जानवर पाले और इस आधुनिक मानव ने पर्यावरण के लिये क्या किया।

पर्यावरण का मानव पर प्रभाव

ईश्वर ने ऐसा नियम बनाया है कि जैसा करोगे वैसा भरोगे तो प्रकृति जब अपना इतना नुकसान करवा चुकी है तो वह भी तो बदला लेगी ही न, तो इस प्रभाव को दो रूपों में मुख्यता देखा जा सकता है।

1. प्रत्यक्ष प्रभाव:- यह सुनियोजित है कि किसी भी क्षेत्र में आर्थिक विकास के लिये भौतिक पर्यावरण को रूपान्तरित करने के लिये चलाये जाने वाले किसी भी कार्यक्रम से उत्पन्न परिणामों से मानव पूर्णरूप से अवगत रहता है जैसे- भूमि उपयोग में परिवर्तन- कृषि भूमि में विस्तार तथा फसलों के उत्पादन के लिये वनों को काटकर साफ करना, घाव के क्षेत्रों को जलाना, व्यवसायिक उद्देश्य से वनों को कटान, सिचाई के लिये आधुनिक उपकरणों का प्रयोग करना आदि।

2. निर्माण तथा उत्खनन कार्य- नदी पर बांधों जलभण्डारों तथा सिचाई के लिये नहरों का निर्माण, नदी की जलधाराओं का विपथगमन क्षेत्र विशेष को बाढ़ से बचाने के लिये तटबंधों तथा डाइक का निर्माण, सड़कों तथा पुलों का निर्माण, खनिजों का खनन, खनिज तेल को बेधन आदि।

पेड़ कटान, कृषि में दवाओं का छिड़काव कृषि के लिये ज़मीन को समय न देना और उसमें अंधाधुन्ध खेती करना, एक के बाद एक फसल में निश्चित समय न देना ये सारी बातें यदि हम भूलते जायें तो धीरे-धीरे धरती उर्वरता शक्ति खत्म होती जायेगी, धरती बंजर होती जायेगी। पेड़ों के कटान से वर्षा नहीं होगी, सूखा पड़ जायेगा, बाढ़ आयेगी तो सारी उपजाऊ मिट्टी वह जायेगी जिसे पेड़ अपनी जड़ों से बांध कर रखते हैं। सिचाई के लिये जल का दोहन किसान जिस प्रकार से कर रहा है धीरे-धीरे पानी का स्तर काफी नीचा होता जा रहा है ये ठीक नहीं है।

निष्कर्ष रूप में हम कह सकते हैं कि कृषि के साथ-साथ आधुनिकता की होड़ में मनुष्य भागता ही जा रहा है। खेती और जंगलों को उगाने की जगह वह भवनों की खेती करने लगा है। अन्न उगाने वाले या फल उगाने वाले जंगलों और खेतों को खत्म करते हुये ऊँची-ऊँची अटटारिकार्यें बनाता जा रहा है अरे जब खाने के लिये अन्न ही नहीं उगेगा तो क्या खायेंगे और यदि शुद्ध वायु देने वाले वृक्ष ही न रहेंगे तो मनुष्य सांस कहाँ से लेंगे।

यदि मनुष्य अभी भी नहीं चेता तो वह दिन दूर नहीं जब हमारे पास न खाना होगा न पानी होगा, हमारे पास होंगे भवन। हम उन्हीं को लेकर न जाने कैसे जीवित रह पायेंगे। इसकी कल्पना करना भी मुमकीन नहीं है।

पर्यटन उद्योग एवं जी-20 (एक अवसर)

प्रो० दीपा अग्रवाल

अर्थशास्त्र विभाग

रा० रज़ा स्नातकोत्तर महाविद्यालय, रामपुर

पर्यटन दुनिया का एक बड़ा उद्योग है यह न केवल आर्थिक विकास को गति प्रदान करता है वरन् समस्त विश्व की संस्कृति परम्परा, रीति-रिवाजों का आदान-प्रदान कर विश्व के विभिन्न राष्ट्रों को एक सूत्र में बांधने का भी कार्य करता है। भारत में पर्यटन उद्योग के विकास के लिये जी-20 शिखर सम्मेलन 2023 की अध्यक्षता एक स्वर्णिम अवसर है जिससे भारत द्वारा अपनी समृद्ध संस्कृति, सभ्यता, अतिथि देवोः भवः जैसी परम्पराओं एवं विगत वर्षों में तीव्र गति से किये गये आर्थिक विकास को विश्व के समक्ष प्रस्तुत कर बार-बार भारत आने एवं भारत को जानने की उत्सुकता पैदा की सकती है।

इस शोध-पत्र का उद्देश्य उस सम्भावना पर विचार करना है जिससे जी-20 शिखर सम्मेलन आयोजन द्वारा भारत में पर्यटन उद्योग को विस्तार मिल सके।

प्रस्तावना

मानव स्वभाव से ही घुमक्कड़ प्रवृत्ति का प्राणी रहा है और यह मानव का यात्रा प्रिय मन ही था जिसने यात्रायें करते हुये दुनिया के अलग-अलग देशों, द्वीपों, सम्यताओं, को खोज लिया। प्रारंभ में यात्राओं का प्रयोजन व्यापार, तीर्थयात्रा, शिक्षा, प्रवास, राजकीय मामले अथवा खोज हुआ करता था परन्तु सभ्यता के विकास के साथ प्रयोजनों से बंधी यात्राओं के अलावा मानव ने आनन्द एवं मनोरंजन के लिए भी यात्रायें करना प्रारंभ किया और इस तरह घुमक्कड़ी देशाटन, भ्रमण, पर्यटन मानव जीवन का अटूट हिस्सा बनते चले गये।

आज पर्यटन दुनिया का एक बड़ा उद्योग है किसी भी अर्थव्यवस्था का मुख्य सेवा क्षेत्र भी। ऐसी अनेकानेक अर्थव्यवस्थायें हैं जिनकी आय का मुख्य आधार पर्यटन ही है। यूरोपीय देश, तटीय अफ्रीकी देश, पूर्वी एशियाई देश, मलेशिया, सिंगापुर, थाइलैंड, कनाडा, ऑस्ट्रेलिया ऐसे देश हैं जिनकी अर्थव्यवस्था को सुदृढ़ करने में पर्यटन उद्योग की महत्वपूर्ण भूमिका है। पर्यटन उद्योग से न केवल विकास को गति प्राप्त होती है वरन् अलग-अलग देशों, प्रांतों से आये लोगों के द्वारा उनकी संस्कृति, रहन-सहन, रीति-रिवाज का भी आदान-प्रदान होता है। सत्य तो यह है कि पर्यटन उद्योग ही ऐसा क्षेत्र है जो सही मायने में वैश्विक अर्थव्यवस्था की अवधारणा की कसौटी पर खरा उतरता है। यह उद्योग किसी भी राष्ट्र के विकास को गुणक प्रभाव प्रदान करता है क्योंकि पर्यटन को बढ़ावा देने के लिए अधिक से अधिक आधारभूत सुविधाओं की उपलब्धता एक अनिवार्य दशा है और यही आधारभूत

सुविधाओं का विकास अधिकाधिक रोज़गार के अवसर उपलब्ध कराता है जिससे अर्थव्यवस्था में चहुँमुखी विकास का क्रम प्रारंभ हो जाता है। विकास की दृष्टि से सभी राष्ट्रों द्वारा पर्यटन उद्योग को विशेष महत्व दिया जाता है।

भारत में भी पर्यटन की अपार संभावनायें हैं उत्तर में बर्फ से ढके पहाड़ों से लेकर सुदूर दक्षिण तक महासागर में फैले द्वीप, पूरब के मनोरंजक प्राकृतिक दृश्यों से लेकर पश्चिम में फैला सुनहला रेगिस्तान बरबस ही किसी भी सैलानी को अपनी ओर आकर्षित कर सकता है। भारत प्राचीन संस्कृति, समृद्ध विरासत एवं अनगिनत आकर्षणों के साथ पर्यटन के लिये बेहतरीन गंतव्य के रूप में सैलानियों की पहली पसंद बन सकता है। पारम्परिक पर्यटन के साथ-साथ उद्देश्य परक पर्यटन यथा साहसिक, चिकित्सा, योग, ग्रामीण, सांस्कृतिक एवं धार्मिक पर्यटन के भी अपार संभावनाओं के क्षेत्र हैं। कोविड-19 महामारी के काल में भारत की प्राचीन यौगिक, आर्युवेदिक पद्धति ने सभी का ध्यान आकृष्ट किया है एवं बड़ी संख्या में विदेशों से सैलानी इस उद्देश्य से भारत की ओर आकर्षित हो रहे हैं। यद्यपि पर्यटन उद्योग को विकसित करने के लिये बेहतरीन आधारभूत ढांचा एक अनिवार्य दशा है परन्तु किसी राष्ट्र को बेहतरीन पर्यटन गंतव्य स्थल के रूप में विश्व के समक्ष प्रस्तुत किये बिना पर्यटकों को आकृषित करना बेहद कठिन कार्य है। इसी कड़ी में जी-20 शिखर सम्मेलन 2023 की अध्यक्षता भारत के लिये अपनी समृद्ध संस्कृति, सभ्यता एवं विकास के प्रदर्शन का बेहतरीन अवसर है जिससे पर्यटन उद्योग विकास की ऊँची उड़ान भर सकता है।

भारत में पर्यटन का इतिहास

थॉमस कुक को आधुनिक पर्यटन का जनक कहा जाता है जिन्होंने सर्वप्रथम ब्रिटेन में रेल यात्रा का आयोजन किया था। भारत में पर्यटन की विधिवत् शुरुआत हेतु 1945 में सर जॉन सार्जेन्ट समिति की स्थापना की गयी। परन्तु आज़ादी के बाद व्यवस्थित पर्यटन की शुरुआत 1966 में ITDC (Indian Tourism and Development Corporation) भारतीय पर्यटन विकास निगम की स्थापना के साथ हुई। 1980 के दशक तक पर्यटन के क्षेत्र में कोई खास प्रगति नहीं हुई। सर्वप्रथम 1982 में भारत सरकार द्वारा प्रथम पर्यटन नीति बनायी गयी एवं योजना आयोग के द्वारा पर्यटन को एक उद्योग के रूप में मान्यता प्रदान की गयी और इस क्षेत्र को राज्यों की समवर्ती सूची में शामिल किया गया। प्रथम बार 1986 में केन्द्र सरकार द्वारा पर्यटन से होने वाली विदेशी मुद्रा लाभ पर अतिरिक्त कर छूट देकर इस उद्योग को रियायत प्रदान की गयी। तत्पश्चात् 1992-97 में आठवीं पंचवर्षीय योजना में पर्यटन को बढ़ावा देने के लिए निजी क्षेत्र की भागीदारी पर बल दिया गया। वर्ष 2002 में प्रथम बार भारत सरकार द्वारा राष्ट्रीय पर्यटन नीति की घोषणा की गयी एवं पर्यटन को आर्थिक विकास के मुख्य कारक के रूप में स्वीकार करते हुये इस क्षेत्र से संबंधित योजनाओं को तेज़ी से क्रियान्वित करने की दिशा में काम किया गया। विदेशी पर्यटन को बढ़ावा देने के लिए पर्यटक क्षेत्रों का विकास, बुनियादी ढांचे का निर्माण, होटल/रेस्तरां, अतिथ्य उद्योग एवं प्रशिक्षण कार्यक्रमों का विस्तार किया गया। अतुल्य भारत, अतिथि

देवो भवः, जैसे स्लोगनों के साथ भारत को विश्व में बेहतरीन पर्यटक स्थल के रूप में स्थापित करने के प्रयास किये गये।

वर्ष 2017 में भारत में पर्यटन से लगभग 23 अरब डॉलर का राजस्व अर्जित किया जिसे 2023 तक 100 अरब डॉलर करने का लक्ष्य रखा गया था जो फ्रांस एवं स्पेन जैसे राष्ट्रों की राजस्व आय से अधिक था। वर्ष 2019 में WTTC (विश्व यात्रा एवं पर्यटन परिषद) द्वारा 2018 की अपनी रिपोर्ट में भारत को पर्यटन के क्षेत्र में विश्व में तीसरा स्थान मिला। इस रिपोर्ट में विश्व के 185 देशों का आकलन 2011 से 2017 तक पिछले 7 वर्षों में उनके पर्यटन उद्योग का सकल घरेलु उत्पाद में योगदान, अन्तर्राष्ट्रीय पर्यटन एवं घरेलु पर्यटन पर खर्च, पर्यटन क्षेत्र में पूंजी निवेश की मात्रा के आधार पर किया गया था। WTTC द्वारा कहा गया कि आने वाले दशक में विश्व स्तर पर सभी नई यात्रा एवं पर्यटन से जुड़ी नौकरियों में प्रत्येक पाँच में से एक भारत से होगी। परन्तु 2019 में कोविड-19 वैश्विक महामारी के कारण पर्यटन उद्योग बुरी तरह प्रभावित हुआ एवं इस उद्योग से जुड़े सभी क्षेत्र विमानन, होटल उद्योग, परिवहन, टूरिस्ट गाइड सभी बुरी तरह ध्वस्त हो गये एवं लाखों लोग बेरोज़गार हो गये। परन्तु इस महामारी के बीच दुनिया फिर से यात्रा, देशाटन, पर्यटन में रूचि ले रही है और एक बार फिर इस उद्योग की रौनक वापस लौट रही है।

भारत में पर्यटन उद्योग का महत्व

WTTC (विश्व यात्रा एवं पर्यटन परिषद) के अनुसार पर्यटन के क्षेत्र में भारत ने 25 स्थान ऊपर छलांग लगाई है जिसका श्रेय निस्संदेह सरकार द्वारा किये गये उन प्रयासों को जाता है जिनके कारण भारत में विदेशी और घरेलु यात्रियों की संख्या में वृद्धि हुई है। पर्यटन उद्योग को और अधिक विकसित करने के लिए सरकारी प्रयासों में वृद्धि की आवश्यकता है एवं इस उद्योग को अधिकाधिक विकसित करने के लिये आधारभूत सुविधाओं (यातायात, दूरसंचार, स्वच्छ पेयजल आपूर्ति, खानपान एवं रहने की सुविधा, सुरक्षित वातावरण) का विस्तार किया जाना चाहिये।

पर्यटन उद्योग एक साथ कई क्षेत्रों में रोज़गार के अवसर पैदा करता है तथा आर्थिक विकास को गति प्रदान करता है। लगातार बढ़ती हुई पर्यटकों की संख्या प्रत्यक्ष एवं अप्रत्यक्ष दोनों रूपों में लाखों लोगों के लिए रोज़गार के अवसर उपलब्ध कराती है। इसके साथ-साथ अतिथ्य क्षेत्र, एयरलाइंस, होटल/रेस्तरा, टूरिस्ट गाइड, छोटे-छोटे स्टॉल, ऑटो टेक्सी सुविधा के रूप में अनेक छोटे बड़े व्यवसायों का विस्तार होता है। क्षेत्रीय असन्तुलन एवं जनसंख्या पलायन जैसी समस्याओं में कमी आती है, शहरीकरण को बढ़ावा मिलता है, महिलाओं एवं बच्चों के विविध अवसर उपलब्ध होते हैं। पर्यटन से विदेशी मुद्रा भण्डार में वृद्धि, राष्ट्रीय विरासत एवं पर्यावरण संरक्षण के प्रति जागरूकता, अपनी संस्कृति के प्रति गौरव की भावना का विकास होता है। निस्संदेह भारत में पर्यटन उद्योग का तेजी से विकास हो रहा है, परन्तु इस उद्योग को सस्टेनेबल उद्योग में परिवर्तित करने के लिये सरकार द्वारा प्रभावी नीतियों के माध्यम से अधिकाधिक प्रयास किये जाने चाहिये।

प्रयास

भारत जैसे विशाल भौगोलिक संरचना तथा समृद्ध ऐतिहासिक, सांस्कृतिक विरासत के कारण पर्यटन क्षेत्र के विकास में अपार संभावनायें हैं। इन्हीं के दृष्टिगत भारत सरकार द्वारा पर्यटन को बढ़ावा दिये जाने हेतु विस्तृत योजनाओं को लागू किया गया है जैसे-

- “स्वदेश दर्शन योजना, विरासत स्थलों के लिए हृदय योजना” धार्मिक पर्यटन स्थलों के लिए “प्रसाद योजना” बनाई गयी हैं। साथ ही पर्यटन स्थलों पर रोप-वे निर्माण, रेलवे स्टेशनों एवं लॉजिस्टिक पार्कों के निर्माण पर बल दिया गया है।
- विदेशी पर्यटकों के आगमन को सरल बनाने पर बल देते हुए सरकार द्वारा 166 देशों के लिए ई-वीजा को अल्पकालीन एवं दीर्घकालीन वीजा का विकल्प को उपलब्ध कराया गया है।
- सरकार द्वारा विदेशियों को अंडमान निकोबार द्वीप समूह में पहुँचकर 24 घंटे के अंदर विदेशी पंजीकरण कार्यालय में पंजीकरण कराने की बाध्यता को भी समाप्त कर दिया गया है।
- पूर्वोत्तर राज्यों में पर्यटन को बढ़ावा देने के लिए सुगम, सुरक्षित पर्यटन स्थल विकसित करने पर ध्यान केन्द्रित किया गया है।
- मुख्य पर्यटन स्थलों में बुनियादी ढांचों के विकास एवं रख-रखाव पर विशेष ध्यान दिया जा रहा है।
- “धरोहर गोद लो” योजना द्वारा कारपोरेट जगत किसी विरासत को गोद लिया जा रहा है जिसका उद्देश्य अपनी विरासतों की देखभाल के साथ-साथ उनके प्रति अपने उत्तरदायित्व की भावना को भी विकसित करना है।
- पर्यटन को बढ़ावा देने के लिए अधिकाधिक कार्यशालाओं का आयोजन भी किया जा रहा है।
- ‘अतुल्य भारत’, अतिथि देवो भवः, भावना प्रधान प्रचार-प्रसार कार्यक्रमों द्वारा पर्यटन बढ़ाने एवं विदेशी सैलानियों को आकृषित करने के प्रयास किये जा रहे हैं।
- अतुल्य भारत, पर्यटक सुविधा पोर्टल लांच किया गया है जिससे पर्यटन स्थलों की जानकारी आसानी से प्राप्त की जा सकती है।

चुनौतियां

भारत सरकार द्वारा पर्यटन उद्योग को विस्तार दिये जाने के अथक प्रयास किये जा रहे हैं तथापि अनेकों चुनौतियां इस क्षेत्र में बाधक के रूप में विद्यमान हैं जो इस प्रकार हैं-

- बुनियादी ढांचे का अभाव अभी भी भारतीय पर्यटन क्षेत्र के लिए सबसे बड़ी चुनौती है। पर्यटन से जुड़ी अवसंरचना जैसे होटल/रेस्तरां, यातायात सुविधायें, स्वच्छ जल, बिजली, स्वास्थ्य

सुविधायें अभी विकसित होने की अवस्था में हैं जिसे अभी और अधिक विस्तार देने की आवश्यकता है।

- पर्यटन स्थलों पर साफ/सफाई की कमी एक गंभीर समस्या है। बड़ी संख्या में पश्चिमी देशों के पर्यटक इसी कारण भारत की विरासत/धरोहर के प्रति आकर्षित होते हुए भी यहाँ आने की योजना बनाने से पहले कई बार सोचते हैं।
- सुरक्षा विशेष रूप से एक गंभीर मुद्दा है जिस कारण विदेशी पर्यटक भारत को पर्यटन की अपनी पसंद की श्रेणी में प्राथमिकता पर नहीं रखते हैं।
- विदेशी के साथ-साथ घरेलू पर्यटन भी अभी उतना विस्तार नहीं ले पाया है क्योंकि आज भी भारतीय पर्यटन स्थलों तक गरीब, बुजुर्ग, महिलाओं की पहुँच आसान एवं सुरक्षित नहीं है।
- भारत की समृद्ध सांस्कृतिक विरासत को अभी अन्तर्राष्ट्रीय पटल पर उतना उजागर करने में भी सफलता नहीं मिली है जैसी अन्य देशों ने प्राप्त की है।
- चिकित्सा, योग, धार्मिक, शिक्षा, प्राकृतिक, स्वच्छ को पर्यटन में अपार संभावनाओं के बावजूद अभी इन क्षेत्रों पर उतना ध्यान नहीं दिया गया है जिसका दिया जाना चाहिए।

सुझाव

यद्यपि पिछले कुछ वर्षों से पर्यटन उद्योग को विस्तार देने के लिए सरकार द्वारा सराहनीय प्रयास किये जा रहे हैं परन्तु इस क्षेत्र में आने वाली विराट चुनौतियों से निपटने के लिए सरकार को अभी भगीरथ प्रयास करने होंगे। इस संदर्भ में कुछ सुझाव निम्नवत् है:-

- अतुल्य भारत, अतिथि देवो भवः जैसे स्लोगनों के साथ भारतीय संस्कृति एवं पर्यटन स्थलों की व्यापक, प्रचार-प्रसार दिया जाना चाहिए।
- पर्यटकों को आकर्षित करने के लिए बेहतर मूलभूत सुविधायें, सुरक्षा, को युद्ध स्तर पर कार्य करते हुए विकसित करना चाहिए।
- अधिकाधिक पर्यटकों को आकर्षित करने के लिए एडवेंचर टूरिज़्म पर ध्यान दिया जाना चाहिए।
- कोविड-19 के बाद से भारतीय योग में बढ़ती दिलचस्पी के दृष्टिगत योग एवं आयुर्वेद चिकित्सा पर्यटन को भी विकसित किया जाना चाहिये।
- भारत की संस्कृति, प्राकृतिक स्थलों की सुंदरता को वैश्विक पटल पर अधिकाधिक उजागर करना चाहिए।

- पर्यटन स्थलों को अधिकाधिक पर्यटन विभाग की वेबसाइट पर भी अपलोड किया जाना चाहिए।

जी-20 सम्मेलन एक अवसर

जी-20 अन्तर्राष्ट्रीय शासन की अवधारणा और वैश्विक चुनौतियों का समाधान करने हेतु वैश्विक बिरादरी में प्रमुख स्थान रखने वाली विश्व में महत्वपूर्ण एवं प्रभावशाली राष्ट्रों का एक संगठन, एक मंच है जहाँ से वैश्विक आर्थिक चुनौतियों का समाधान ढूँढने एवं आर्थिक उथल-पुथल को समय रहते संभालने की महती ज़िम्मेदारी को निभाने का कार्य करने के लिए इस संगठन के सदस्य देश प्रतिवर्ष बैठकें आयोजित करते हैं एवं वैश्विक स्तर के मुद्दों पर गंभीर चर्चा कर आम सहमति से समन्वय बनाते हुए विकास के एजेंडे पर काम करते हैं।

2023 में भारत को जी-20 की अध्यक्षता प्राप्त हुई है जिसका अभिप्राय है कि भारत द्वारा इस वर्ष में जी-20 के एजेंडे का निर्धारण करने एवं सदस्य देशों के कार्यों के समन्वय में नेतृत्व की भूमिका में रहेगा। जी-20 की अध्यक्षता ने भारत को अपने हितों को ध्यान में रखकर वैश्विक मंच पर अपने देश की छवि को आगे बढ़ाने का एक स्वर्णिम अवसर प्रदान किया है। भारत इस समय विश्व में एकमात्र प्रमुख अर्थव्यवस्था है जिसने कोविड-19 महामारी के दौरान भी अपनी आर्थिक विकास की दर को बनाये रखने का प्रयास किया एवं ब्रिटेन की अर्थव्यवस्था को पीछे छोड़कर जी0डी0पी0 के मामले में विश्व की पाँचवीं बड़ी अर्थव्यवस्था बन गयी है।

वसुधैव कुटुम्बकम् की थीम के साथ भारत वैश्विक चुनौतियों का समाधान करने, बहुपक्षीय सहयोग को बढ़ाने, विभिन्न देशों और क्षेत्रों के बीच पुलों का निर्माण करने/मध्यस्थता करने की अपनी प्रतिबद्धता को मजबूती के साथ रखने में सक्षम है। आज भारत एक आर्थिक एवं सैन्य शक्ति सम्पन्न, परमाणु एवं अंतरिक्ष क्षेत्र में क्षमतावान, वैश्विक मामलों में एक स्पष्ट परिभाषित भूमिका, प्रबंधन, अनुसंधान, विकास, तकनीकी संसाधन सम्पन्न, उच्च प्रभाव वाली विदेश नीति के साथ वैश्विक बिरादरी में एक ऐसे विश्वनेता के रूप में उभर कर आया है जिसकी उपस्थिति को नज़र अंदाज़ करना संभव नहीं है। जी-20 शिखर सम्मेलन 2023 की अध्यक्षता के नाते वैश्विक बिरादरी के मुखियाओं एवं संगठनों के साथ विभिन्न गतिविधियों और कार्यक्रमों की एक लम्बी श्रृंखला वर्ष 2023 में भारत के नेतृत्व में प्रारम्भ हो चुकी है। कार्यक्रमों के सफल संचालन एवं भव्य आयोजन द्वारा भारत अपने आर्थिक, सामाजिक, राजनीतिक, सांस्कृतिक एवं वैचारिक पक्ष को सभी के समक्ष मजबूती से रख सकता है।

भारत में पर्यटन के क्षेत्र में अपनी उपस्थिति विश्व पटल पर बनाने के लिए विगत वर्षों में तेज़ी के साथ प्रयास किये हैं। भारत की पर्यटन नीति, प्रयास, संभावनायें, चुनौतियों इन सभी का मूल्यांकन करने के उपरांत यह स्पष्ट हो जाता है कि पर्यटन उद्योग को आगे बढ़ाने में मूलभूत सुविधाओं के साथ-साथ वैश्विक पटल पर अपनी विरासत, धरोहर, संस्कृति, सभ्यता और पर्यटन स्थलों को प्रचारित, प्रसारित करने की आवश्यकता होती है। जी-20 अध्यक्षता, भारत को अपनी सभ्यता और संस्कृति के

प्रचार-प्रसार का स्वर्णिम अवसर प्रदान कर रही है क्योंकि पूरे वर्ष 50 से अधिक शहरों में 200 से अधिक बैठके भारत के अलग-अलग राज्यों में अलग-अलग स्थानों पर आयोजित की जायेगी जिनमें समस्त सदस्य देशों के प्रमुख एवं अन्य संगठनों से जुड़े प्रभावशाली लोग शामिल होंगे। इन सभी बैठकों के भव्य आयोजन की तैयारी सरकार द्वारा की जा रही है एवं आयोजक राज्यों की संस्कृति, रीति-रिवाज एवं अतिथि देवो भवः की परम्परा अनुसार मेहमानों के शानदार स्वागत के दर्शन अभी तक सम्पन्न बैठकों में दिखाई भी दे रहे हैं फिर वह चाहे गोवा की बैठक हो, खजुराहो (म0प्र0) में आयोजित जी-20 संस्कृति समूह (CWG) की पहली बैठक हो अथवा बेंगालुरु में आयोजित वित्त मंत्रियों की बैठक। इस तरह सभी आयोजनों द्वारा भारत के प्रत्येक राज्य की समृद्ध संस्कृति एवं परम्परा के साथ-साथ विगत वर्षों में किये गये आर्थिक विकास को विश्व के समक्ष प्रस्तुत कर भारत को एक आकर्षक पर्यटक स्थल के रूप में प्रस्तुत करने का एक बेहतरीन अवसर है।

निष्कर्षतः कहा जा सकता है कि जी-20 शिखर सम्मेलन की अध्यक्षता भारत को विश्व विरादरी के समक्ष अतुल्य भारत, स्वर्णिम भारत के उस रूप के दर्शन कराने का स्वर्णिम अवसर है जिससे पश्चिमी जगत अभी भी परिचित नहीं है। यद्यपि भारत की विकास यात्रा से कोई भी राष्ट्र अनजान नहीं है तथापि विश्व की बड़ी अर्थव्यवस्थाओं को यह दिखाया जा सकता है कि भारत आर्थिक, सामाजिक, तकनीकी रूप से एक मज़बूत एवं सुव्यवस्थित अर्थव्यवस्था है। साथ ही भारत अन्य विकासशील अर्थव्यवस्थाओं के लिए मार्गदर्शक की भूमिका के साथ-साथ अपने अनुभवों को साथी राष्ट्रों के साथ साझा कर आर्थिक, सामाजिक, राजनीतिक, मैत्री पूर्ण, संबंधों को नयी दिशा प्रदान कर सकता है। निश्चित रूप से जी-20 शिखर सम्मेलन से भारतीय अर्थव्यवस्था को जहां एक और विकास के नवीन अवसर उपलब्ध होंगे वहीं पर्यटन उद्योग के लिये भी नवीन ऊँचाईयों को छू लेने का मार्ग भी प्रशस्त हो सकता है।

सन्दर्भ सूची

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What to Finance Climate or Life Change: Apprehensions

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This paper in the form of commentary note is written in the light of theme of World Earth Day 2023 “Invest in Our Planet” and forth coming world environment day 2023 for insight the view on the relationship between the quality growth and poverty at global as well as national level.

Today while studying annals of sustainable development, I came across the UN Conference on Human Environment held in Stockholm Sweden in 1972. This was the first global environmental conference. This was the evidence of awakening of global community towards the emerged environmental issues. It was the time of honor for India for its farsightedness. Remember what India’s First Women Honorable Prime Minister, Mrs. Indira Gandhi said, “Are not poverty & need the greatest polluters? How can we speak to those who live in villages & slums about keeping the oceans, the rivers and the air clean when their own lives are contaminated at source?” Ending poverty became the first and foremost priority in the agenda for MDGs and SDGs by 2030. How far we succeeded in eradication of poverty in India as well as at global level is the matter of another concern but we have satisfied ourselves with soothing word by replacing eradication to alleviation. We all are aware of charisma of words.

Coming to the discussion of global issue of climate change which is drawing global attention is also important when recent incidence of heating debate on what constitute climate change finance in which developed countries avoided participating in such debate. This is nothing else but the apprehensions of developing economies in financing climate actions. \$100 Billion goal is worth mentioning here. Actually, climate change caused by anthropogenic as well as non-anthropogenic factors which alters climate measures such as temperatures, wind and precipitation that is prolonged. In the discourse of climate change, the global economies routed the response mechanisms along two prime tracks – Adaptation and Mitigation. “Adaptation is the process of making an adjustment in natural or human systems in response to actual or expected climate stimuli or their effects, which moderate harm or exploit beneficial opportunities while Mitigation is an anthropogenic intervention to reduce the source or enhance the sinks of GHGs. Mitigation’ strategies are important,

'adaptation' strategies are indispensable, because even a drastic & immediate cut in global GHG emissions would not fully prevent climate change impacts. (Murlidharan, K. 2021 Chapter 5 Pg. 165)." These two mechanisms require funding at large scale in order to be operative. Thus, there is need to finance climate change giving rise to the climate change finance. It refers to "local, national transnational financing- drawn from public, private and alternative sources of financing to support the mitigation and adaptation in order to combat the climate change and its impact." As per this meaning, the financing of climate action requires funding support from the public. Public of whom: Developed or Developing or both economies will support? Have we eradicated or alleviated poverty? Have climate change not affected lives of public? Have climate change not costed to public in mitigating and adapting climate change and its impact? Or whether it is stopped to affect? etc. This is the question of poor of 21st century.

To my mind, what our former Prime Minister Mrs. Indira Gandhi said at that time can alternatively be stated as, "Are not poverty & need the greatest polluters? How can we speak to those who live in villages & slums about financing the action of cleaning the oceans, the rivers and the air when their own lives are contaminated at source?" Of course, they have lack of money and they have to feed themselves and they will have to finance their life change first then climate change for subsistence. But again it must be asked, "How can we speak to those who live in villages & slums about financing climate or life change when their own lives are contaminated at source?" when suggestions of such type are made that public-private partnership (PPP) and PPP People (PPPP) can help improving climate change finance. Climate change finance should be equipped with non institutional financial services such as market funds, private etc.

I totally agreed of the report by World Economic Forum (WEF) projected that about \$5.7 trillion would require investing annually in green infrastructure by 2020. But doesn't the annual commitment of \$100 billion appear to be a drop in the ocean before the \$5.7 Trillion puzzle? Who will remind and bind to those who benefitted the opportunities of natural resources in the 18th, 19th and half 20th century? Are the agreed principles of climate change finance kept aside? Combating climate change and its impact does not only depend upon the adaptation and mitigation mechanisms but also financing the mechanisms in order to make them operative. Under the CBDR principle, each nation requires to contribute keeping in mind the need of mechanisms in order to make them operative. This requires that national needs and climate change finance must go in tandem with each other. However, it was observed that there is a huge gap between the two under Nationally Determined Contribution. To fill the void, the additional international financial support is needed. Making arrangement for additional financial support at global level is a major

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challenge of the present time. This will create additional issues in the form of approving fund for developing countries and Least Developed Countries from the multilateral climate funds. “The uncertainties such as, the recent refusal of US to pay \$2 billion of its pledge this has created shortage of funds at available GCF.” Climate Home News dated: 29/03/2022

Gone are the days when the High growth-Low Poverty was fascinating to the Public under the aegis of Trickle down approach. Now climate change policy made a drastic change. Actually climate change policy is not a choice between a “High-growth, High-carbon world’ and a ‘Low-growth, Low-carbon world.” This poses a question of “whether to grow or to preserve the planet.” To response such question, an economic analysis of climate change policy is need of the hour at theoretical level. But where is issue of poverty in the slogan lies. Do we need quality growth? Will high quality growth bring low or high poverty? Needs to be examined with economic data. If it fails bring high quality growth with low poverty? Then it will raise apprehensions: what to Finance Climate Change or Life Change before the poor. Redefining Growth in terms of “Quality of life” and increase in national output in conformity with sustainability is needed. To my mind, it is the need of hour to revert back to our poverty policy and make a concentrated effort in consistent manner to alleviate poverty at mass level by making them capable in terms of quality not quantity. Then it will automatically make them capable of financing both Climate and Life Change.

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The Role of G20 Countries in Promoting Sustainable Energy Transition and the Use of Clean Energy and Green Energy for Climate Conservation.

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Climate change is one of the most important causes of concern of our generations. As we are progressing and making advancements in various fields, climate deterioration is a challenging problem amongst us. All the developed as well as developing countries in the world are of the opinion that some major steps are required to be taken, for which various policies are being proposed but to enforce these policies at grassroot level requires smart delivery and efforts towards these policies. In the present study we discuss different steps to be taken by G20 nations towards sustainable energy goals and how to have there long-lasting effects. These steps should be more environment compatible and many G20 countries are also trying to inculcate the changes by taking various measures, but these measures are not sufficient and these nations have to work collectively to bring in the change which will be beneficial to our future generations.

INTRODUCTION

The G20 countries are playing an important role is focussing towards usage of more environment friendly energy resources which will ultimately help in dealing with the crises of climate destruction. The Bali declaration (2002) and CoP26 at Glasgow were meant for taking certain strong decisions and steps regarding the most important issues of our times, that is what changes the world can bring in by moving towards sustainable energy transition. The aim of G20 countries is to promote various measures which will ultimately lead to the usage of cleaner and greener energy resources. These steps will lead to a more specific measures in generating more resources of renewable energy. But ultimately it depends upon the approach of G20 nations to perform at par towards climate change or to take steps which will lead towards minimising the global climate change.

The steps which will lead to a more positive and environment friendly changes for the future generations. These steps to be followed by these G20 nations

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will lead to a major climatic change which is the need of the hour. The G20 member nations have to work in a more progressive way to reach the sustainable development goals.

The G20 nations are the main contributor in emission of Greenhouse gases and these countries will have to play a lead role to deal with the environment crises. The various G20 summits focusses on steps to be taken to cut down carbon consumption through world-wide cooperation. These nations should work in a more focused way to include innovations and technology such that older energy practices could be replaced with more climate friendly energy generating options like green hydrogen which is very important part of greener energy.

Discussion

Pollution of different kinds has a long-lasting impact on our environment. Environment depletion results in major changes in overall climatic conditions of the world. Minimising pollution is one of the major challenges of today's world. Different sources of pollution should be checked and a greener options need to takeover.

Sustainable energy options should be promoted.

The G20 nations from past many years are working towards more greener options of energy and these nations became united to form various groups so that these groups work collectively to develop different strategies which will ensure that finance is easily available for generating sustainable energy resources and to cut off the use of easily available and widely used carbon energy.

There are various task forces like Energy transition working group (ETWG), Sustainable finance working group (SFWG) and also Think 20(T20) to name some.

The most important problem which all these nations are facing is the cost of sustainable energy resources. So, finance and technology will have to go hand in hand if one has to reach the goal of sustainable energy. When G20 nations will coordinate with each other and work unitedly towards generating more cleaner and greener energy resources, there is certainly a hope that one day these countries will achieve the goal of Climate conservation.

However, steps for climate conservation should be taken rapidly as we have lost considerable time to take actions towards climate conservation and it's time to speed up our efforts, which will result in more favourable progress in usage of green energy options and will result in finding the replacement of pollution causing energies like fossil fuels which have resulted in changing our climatic conditions and have negatively affected our environment.

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More responsibility lies on the developed nations as they are powerful economies of the world and they can contribute more than the developing nations in developing more environment favouring and energy yielding technologies through which whole world will get benefitted. The developing countries can also contribute by decreasing their use of fossil fuels and adapting towards more greener options of energy resources.

There can be various measures but these steps can only be followed if all the countries coordinate with each other which is of utmost importance not only for us, but for our future generations to come.

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Role of India as a Member of G20 in Energy Transition and Promoting Clean Energy.

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1.NEED OF SUSTAINABEL ENERGY TRNSITION

“It’s time to stop burning our planet, and start investing in the abundant renewable energy all around us.” – António guterres, *United Nations Secretary-General*

IPCC sixth assessment report (2023) clearly states, “*Human activities, principally through emissions of greenhouse gases, have unequivocally caused global warming, with global surface temperature reaching 1.1°C above 1850–1900 in 2011–2020. Global greenhouse gas emissions have continued to increase, with unequal historical and ongoing contributions arising from unsustainable energy use, land use and land-use change, lifestyles and patterns of consumption and production across regions, between and within countries, and among individuals.*” Report highlights the risk of climate change due to emission of green house gases. It further states that global warming, climate change risks will become increasingly complex and more difficult to manage. Multiple climatic and non-climatic risk drivers will interact, resulting in compounding overall risk and risks cascading across sectors and regions. Climate-driven food insecurity and supply instability, for example, are projected to increase with increasing global warming, interacting with non-climatic risk drivers such as competition for land between urban expansion and food production, pandemics and conflict.

A large share of the greenhouse gases that surrounds the Earth and trap the sun’s heat are generated through energy production, by burning fossil fuels to generate electricity and heat. Fossil fuels, such as petroleum, coal and gas, are by far the biggest contributor to global climate change on account of global warming. It accounts for over 75 percent of global greenhouse gas emissions and nearly 90 percent of all carbon dioxide emissions. There is an urgent need to arrest the worst impacts of

climate change, greenhouse gases emissions need to be curtailed by almost half by 2030 and reach net-zero by 2050. **IRENA's World Energy Transitions Outlook (2022)** sees half of the energy consumed in 2050 coming from electricity. 90 per cent of all decarbonisation will involve renewable energy through direct supply of low-cost power, efficiency, electrification, sustainable bio energy and green hydrogen. Switching energy systems from fossil fuels to renewable like solar or wind will reduce the emissions driving climate change.

While a growing number of countries are committing to net zero emissions by 2050, emissions must be cut in half by 2030 to keep warming below 1.5°C. Achieving this means huge declines in the use of coal, oil and gas: over two-thirds of today's proven reserves of fossil fuels need to be kept in the ground by 2050 in order to prevent catastrophic levels of climate change.

Energy transition refers to the global energy sector's shift from fossil-based systems of energy production and consumption — including oil, natural gas and coal — to renewable energy sources like wind, solar, biomass, geothermal, hydroelectricity as well as lithium-ion batteries. The increasing penetration of renewable energy into the energy supply mix, the onset of electrification and improvements in energy storage are all key drivers of the energy transition.

Regulation and commitment to decarbonisation has been mixed, but the energy transition will continue to increase in importance as investors prioritize environmental, social and governance factors.

2. G20: ROLE IN ENERGY TRANSITION

The G20 was founded in 1999 after the Asian financial crisis as a forum for the Finance Ministers and Central Bank Governors to discuss global economic and financial issues. Thereafter, the G20 was upgraded to the level of Heads of State/Government as a consequence of the global economic and financial crisis of 2007, and, in 2009, was designated the “premier forum for international economic cooperation”. The Group of Twenty (G20) includes 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 United States and European Union). The G20 member countries represent around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population.

Initially, the focus of G20 was largely on broad macroeconomic issues. Later on, it expanded its agenda to inter-alia include trade, health, sustainable development, agriculture, energy, environment, climate change, and anti-corruption.

G20 member countries account for 85% of the global economy, 75% of world trade and two-thirds of the global population. While the energy mix in G20 economies differs considerably, majority of countries currently depends on a high share of fossil fuels in their total energy supply. In fact, G20 economies account for 82% of global energy-related carbon dioxide (CO₂) emissions and almost 80% of global energy consumption. Notwithstanding, G20 economies have become leaders in promoting cleaner energy systems, holding a cumulative 81% share of global renewable power capacity. Energy transitions in G20 economies will shape global energy markets and determine GHG emissions and sustainable development roadmap worldwide.

3. ROLE OF INDIA IN ENERGY TRANSITION AND CLEAN ENERGY

It was decided in The Bali Declaration (2022) that G20 members will use all options for generating clean energy including renewable energy while accelerating efforts for reducing coal use. India, with a second largest population on earth and growing economy is the fifth most polluted country in the world. Fossil fuels and traditional power generation account for a large chunk in this pollution. India primarily relies on fossil-fuel-based power generation, and more than 59% of its total installed capacity comes from coal, lignite, gas and diesel sources. India's energy transition started with the set up of a dedicated ministry to deal with climate change, called Ministry of Non-Conventional Energy Sources in 1992 renamed as Ministry of New and Renewable Energy (MNRE) in 2006. India's commitment to a healthy planet and its Nationally Determined Contributions as per the Paris Accord on Climate Change, it made a pledge that by 2030, 40% of installed power generation capacity shall be based on clean sources; it was committed that 175 GW of renewable energy capacity will be installed by 2022. This includes 100 GW from solar, 60 GW from wind, 10 GW from bio-power and 5 GW from small hydro power. In line with Prime Minister's announcement at COP26, Ministry of New and Renewable Energy is working towards achieving 500 GW of installed electricity capacity from non-fossil sources by 2030. So far, a total of 172.72 GW of capacity from non-fossil fuel sources has been installed in the country as on 31.10.2022. It includes 119.09 GW RE, 46.85 GW Large Hydro and 6.78 GW Nuclear Power capacities. This has a share of 42.26% of total installed generation capacity in the country i.e. 408.71 GW as on 31.10.2022.

The substantial higher capacity target will ensure greater energy security, improved energy access and enhanced employment opportunities. With the accomplishment of this ambitious target, India will become one of the largest Green Energy producers in the world, even surpassing several developed countries. India stands 4th globally in Renewable Energy Installed Capacity (including Large Hydro), 4th in Wind Power capacity & 4th in Solar Power capacity (as per REN21 Renewables 2022 Global Status Report). A total of 14.21 GW of Renewable Energy (RE) capacities were added, during the period Jan to Oct. 2022 as compared to capacity of

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11.9 GW added during the period Jan to Oct. 2021. A total of 151.94 BU have been generated from RE sources during the period Jan to Sept. 2022 as compared to the 128.95 BU during the period Jan to Sept. 2021.

To tap the potential of solar energy in sunshine countries, which lie either completely or partly between the Tropic of Cancer and the Tropic of Capricorn, The International Solar Alliance (ISA) , a treaty-based intergovernmental organisation was launched by Prime Minister Narendra Modi of India and Former President François Hollande of France. ISA's goal is to provide a dedicated organisation for cooperation and collaboration among solar resource rich countries and the wider global community - including bilateral and multilateral organisations (IMF, WTO, WORLD BANK etc.), industry and other stakeholders – to promote and support the increasing use of solar energy. India, in alliance with France, has invited nations to develop infrastructure for implementation of solar projects. The international solar alliance has committed one trillion dollars as investment. It has committed to making the costs of solar power more affordable and accessible for remote and inaccessible communities. The alliance will endorse India in achieving its goal of generating 100 GW of solar energy and 175 GW of renewable energy by 2022. The countries shall support each other in research and development as well as other high level activities.

India as a responsible nation of G20 in tackling the challenge of climate change has taken numerable measures to reduce fossil fuel consumption. It has a sound and well planned roadmap for energy transition from fossil fuel to renewable and clean energy. It is also a leader and founder of international solar alliance dedicated for promoting solar energy.

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Expedient for Climate Manoevure In G20 Countries

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India must put vitality security and climate finance at the heart of it G20 President of by forcing on helping countries adopt critical and appropriate governance strategy and risk management structure to deal with climate risks. This will ensure the flow of capital required to take vital and ambitious climate action to reduce emission and adapt to climate change impact.

The number and coverage of climate change mitigation policies have increased in the past twenty years. Approximately half of the policy options are not widely adopted. Adoption is particularly low for policies that aim to phase out coal and oil and mandate energy reductions is electricity and heat supply reduce industrial process emission and incentivize fuel switch in industry design urban planning strategies for retrofits . However many policy adoption gaps exist at the coverage of at least one policy option could be improved in each sector. Policy adoption gaps leave at least one- tenth of G20es emission.

INTRODUCTION

Multilateral forums like the group twenty [G20] play a critical role in bolstering global collective action against climate change the G20 was formed in 1999 in the backdrop of the financial crisis of the late 1990's that hit east Asia and south earth Asia in particular.

It aims to secure global financial stability by involving middle- income countries together; the G20 countries include 60% of the world's population, 80% of global GDP and 75% of global trade.

LEADERS IN CLIMATE PERFORMANCE

India ranks first among all G20 members in terms of overall climate performance owing to its significantly low per crepitate contributions to carbon and GHG emissions.

EMERGING ECONOMIES

On average the emerging economies within the G20 perform slightly better than the advanced economies. Difference between the two clusters is not statically significant.

ADVANCED ECONOMIES

Among the advanced economies the overall climate performance of the european countries including Italy, France, United Kingdom, Germany and the members of EV is considerably better than the North American countries.

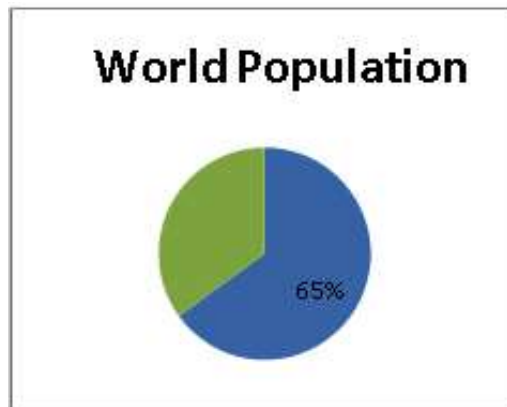
The commitments adopted by the G20 members in the domain of climate change revolve around the following issues energy security and markets energy efficiency and renewable rationalizing and phasing out of fossil for subsidies adophen of advance and clean technologies resilient infrastructure.

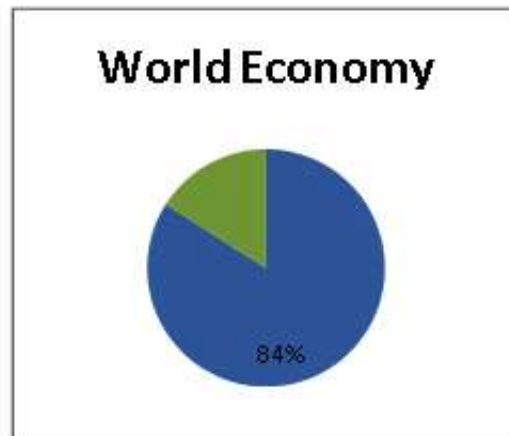
DISCUSSION SECTION

The G20 recognizes the importance of collection action in tackling environmental challenges and climate change while performing transitions.

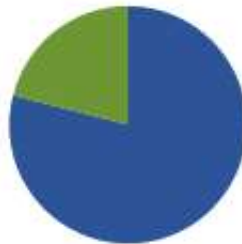
Today we know the G20 submit is held annually under the leadership of a rotation presidency. The G20 initially focused on broad macroeconomics issues, but it has since expanded its agenda to interlay include the presence of trade, traditional view, health, agriculture etc.

According to me it also enhances green development, climate finance and life increasing progress on SDG's and also increases the multilateral institutions for the 21st century.





World Climate



CONCLUSION

The G20 summit is relevant because it provides the together leadership of the worlds largest economies to address critical global issues and work towards finding solutions.

It also provides a valuable platform for India to showcase it economic achievements and to engage with other countries on key table global issues. The G20 is an important international forum that plays a critical role in promoting economic co-operation and stability. In last I would like say that:

ONE EARTH ONE FAMILY ONE FUTURE

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Climate Change Finance in Global Economies: Retrospection

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The paper entitled, “Climate Change Finance in Global Economies: Retrospection”, discusses the key term climate change finance along with the various tool which comes under it with a view to make a brief review of its evolution over the period of time and how it is labeled as climate change finance while tracing its root from the collective effort commenced at global level in 1948. The paper also discusses to the challenges of climate change finance and makes suggestions in the form of possible ways with special reference to global economies. The paper also seeks to answer whether the fund under this climate change finance is sufficient or not to combat climate change and its impact at global level. The paper suggests what should be done in the form of possible ways in the climate change policy with special reference to global economies.

INTRODUCTION

Aftermath of the Second World War, there was following themes towards which the world turned their attention and required the collective effort to achieve—

1. Peace
2. Freedom
3. Development
4. Environment

Environment is where we live, and development is what we do to improve our human environment. These two are inseparable. In order to improve our lot within that abode, the more and more economic activities are carried out while exploiting the natural and physical resources. In the process of carrying out economic activities while exploiting the natural resources, there are some byproducts as a result of these economic activities in the form of waste. It is not only anthropogenic activities but also non-anthropogenic activities responsible for waste generations. However, these wastes are given back to the Nature. Nature has the assimilative

capacity of waste. It is easy for the Nature to assimilate the biodegradable wastes and tough for the Nature to assimilate the non-biodegradable waste. While giving wastes back to the Nature, we forget that the Nature also has a limit in assimilating capacity of waste. Yes, there is cap on the assimilative capacity of waste of the Nature. It is in respect of both time taken to assimilate the waste as well as quality and quantum of wastes. Not only this, but also this assimilative capacity of waste degrades with the passage of time. But why? Actually, in the race of becoming the developed economies, the rate of exploitation of natural resources exceeded the rate of replenishment capacity of the Nature and the rate of giving wastes back to the Nature exceeded the rate of assimilative capacity of wastes of the Nature. This overheats the environment. When the environment overheats, several issues come out at local, national and global level. These problems are transboundaries in nature, which does not confine to the particular boundaries of the nations. Few issues are listed below:

1. Local environment issues: Air pollution, Depletion and pollution of water resources, Water Footprints, Solid waste problem, Land degradation, Degradation Ecosystem (forest, fresh water, marine etc.) Pesticide, heavy metal & other toxic chemical like DDT poisoning the web of life Carbon Footprints.
2. Global environment issues: Climate Change, Ozone depletion, Global Warming, Trade and environment.

These issues are of such in nature that if we did not make effort then it is to remember that Nature always has also the limit to bear the brunt of extreme circumstances thereafter it tries to regain its status quo. In our economics terminology, the Nature balances itself. In this regard, the Malthusian population theory is worth mentioning here. Thomas Robert Malthus in his book, “An Essay on the Principles of Population (1803)” wrote how the Nature balanced the population when it exceeded the Nature productive capacity to feed, that is, imbalances between food and population chain. Alternatively, he suggested adopting positive checks in order to avoid natural checks which are pathetic, i.e. natural calamities. From his theory, it concludes that we have only two choices.

1. Let the Nature itself balances the imbalances between human environment and natural environment.
2. Let us make the collective effort to balance the imbalances between human environment and natural environment.

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To my mind, the third choice is the mixture of these two choices. In present, it is easily observed that despite our collective efforts to maintain the sanctity of Nature, we are not in a position to mitigate the effects on the environment. This raises question on the collective efforts which are being put at local, national and international level. There is a need to retrospect the problem afresh and investigate the degree of effective collective efforts to maintain the sanctity of Nature. This means that if the collective efforts to maintain the sanctity of Nature are not much sufficient or not so effective that Nature could regain itself upto sufficient level while keeping its replenishment capacity and assimilative capacity intact with the pace of rate of exploitation of the Nature then the Nature will balance itself despite the collective efforts put by the human. Now the choice is our's "*What the Future We Want.*" This is the question of 21st century.

Before answer to this question, "*What the Future We Want*", the present generation seeks to answer of its own question put before the previous generations: when the Malthus had made us aware of problem then why it was not taken up seriously from that time, whether it was not considered a problem and when you have benefitted the beneficial opportunities of the environment then why you are posing restriction on us and why we should care of the problems and so on. These are nothing else but the apprehensions of the developing economies before the developed economies. They need answers of such apprehensions but also compel to think.

"If not now, then when?; If not we, then who? ; If not here, then where?"

Now the Problems are low level of awareness, lack of civic sense, lack of coordination among various government departments, reluctances in submitting environmental audit report by industry, lack of focus on preventive measures, illegal mining & deforestation and no central authority at World level.

RETROSPECTION: WHAT HAS BEEN IN THE PAST!

It was the time when most of the economies were freed from the colonial rule and the world had faced the Second World War which caused heavy destruction in the developed economies. Now these two economies had their own economic interest lies the development goals. Developed economies, which borne the brunt of the Second World War, wanted to regain their development path while the developing economies wanted to follow the development path of the developed economies. In the 18th and 19th centuries along with the half of 20th century, there were less number of countries who gained freedom and most of the colonial economies. So there was less awareness regarding the development and environment trade off. However, some

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efforts were put in this direction from the foundation of International Union for Protection of Nature, Fontainebleau, near Paris in 5 October 1948 and later on it was renamed as International Union for Conservation of Nature and Natural Resources (IUCN) in 1956. Presently, it is known as International Union of Conservation of Nature. It is a unique partnership of governments & NGOs. A book written by Rachel Carson “Silent Spring” published in 1962 drew the attention towards the relationship between development and environmental degradation. In this book, Carson, R. (1962) glimpsed of Nature compromised by the use of synthetic pesticides, especially DDT (Dichlorodiphenyltrichloroethane) in Agriculture and argued “once these pesticides entered the biosphere; not only killed bugs but also made their way up the food chain to threaten birds and fish populations and eventually sicken human beings.” This raises the concern towards the existence and survival of human beings on the earth. Another eminent work was published by Club of Rome founded in 1968 entitled “Limits to Growth: a study about the future of planet” prepared by D. H. Meadows, D. L. Meadows, J. Randers and W. W. Behrens. In this report, it was argued “if present population, food, pollution and resource trends continue the limits to growth on the planet will be reached within the next 100 years.” It added on concern towards future of planet besides the existence and survival of human beings. Now exploring the development and environment relationship became imperative and global cause of concern. An International Seminar was held in Founex, Switzerland in 1972 and the Founex Report prepared by a panel of experts led by Maurice strong and three consultants – Mahbub-ul-Haq, Gamani Corea and Barbara Ward- was published. The report was first in its nature to identify key objectives and relationships between environment and development, and helped to locate and bridge the policy gap and also cleared conceptual differences separating developing and developed economies. The Report pointed out that environmental problems are trans-boundaries in nature and all countries are affected by it while presenting a list of issues and goals that developing countries had and should not avoid environmental problems because it is eventually different because there is poverty trap and lack of development. The problems of developing economies can be resolved through development process by widening of development concept while incorporating urgent social and human problems besides the concern for environment problem. But the problem is that limited resources in developing countries are constraint to achieving this integration. Another UN Conference on the Human Environment was held in Stockholm, Sweden in 1972. The conference called upon Governments and peoples “to exert common efforts for the preservation and improvement of the human environment, for the benefit of all the people and for their prosperity.” In 1972, “Only One Earth: the Care and Maintenance of a Small Planet” written by Barbara Ward & Rene Dubos

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was published. The book highlighted world's biggest problems – poverty, hunger and the destruction of natural resources. United Nations Environment Programme (UNEP) was founded at Nairobi, Kenya on June 05, 1972. “UNEP is an agency of the UN that coordinates its environmental activities, assisting developing countries in implementing environmentally sound policies and practices.” UN’s World Commission on Environment and Development (WCED) began its work in 1983. “A Global Agenda for Change” was what the WCED was asked to formulate “to propose a long-term environmental strategy for achieving sustainable development by the year 2000 and beyond.” WCED’s Report “Our Common Future” was published in 1987. It defined sustainable development as the “*ability to make development sustainable – to ensure meeting the needs of present generation without compromising the ability of future generations to meet their own needs.*”

The World Meteorological Organization (WMO) and UNEP established the Intergovernmental Panel on Climate Change (IPCC) in 1988. UN Conference on Environment and Development (Earth Summit) was held in Rio de Janeiro (Brazil) in 1992. Agenda 21 addresses the pressing problems of today & also aims at preparing the world for challenges of the next century. United Nations Framework Convention on Climate Change (UNFCCC) is an International environmental treaty produced at the Earth Summit 1992 with the objective “to stabilize greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” In 1997, the Kyoto Protocol concluded and established legally binding obligation for developed economies to reduce their greenhouse gas emissions. Kyoto Protocol Framework Convention on Climate Change was adopted in 1997. UN Millennium Summit (2000) declared 8 Millennium Development Goals and 18 Targets to be achieved by 2015. (Rio+20) UN Conference on Sustainable Development (2012) was held in Rio de Janeiro (Brazil). The document “The Future We Want” released putting sustainable development as a top priority on the agenda of UN & the international community. Most significant outcomes of Rio Summit was the restoration of the “Principle of equity & of Common but Differential Responsibilities (CBDR)” in the global environmental discourse & placing poverty eradication at the top of agenda. The conference decided to launch 4 mechanisms: “1- Developing Sustainable Development Goals 2- Technology Transfer 3- Financing Strategy 4- Defining the Format and Organizational aspects of the high level political forum to follow up on the implementation of Sustainable Development.” Sustainable Development Goals have “17 Goals and 169 Targets to be achieved by 2030.” Among 17 goals, the goal number 13 is to take urgent action to combat climate change and its impacts.

Climate change caused by anthropogenic as well as non-anthropogenic factors which alters climate measures such as temperatures, wind and precipitation that is prolonged. In the wake of climate change, the global economies routed the response mechanisms along two prime tracks – Adaptation (adjustments in natural or human systems in response to actual or expected climate stimuli or their effects, which moderate harm or exploit beneficial opportunities), and Mitigation (anthropogenic intervention to reduce the source or enhance the sinks of GHGs). While ‘mitigation’ strategies are important, ‘adaptation’ strategies are indispensable, because even a drastic & immediate cut in global GHG emissions would not fully prevent climate change impacts. These two mechanisms require funding at large scale in order to be operative. Thus, climate change finance refers to “local, national transnational financing- drawn from public, private and alternative sources of financing” to support the mitigation and adaptation in order to combat the climate change and its impact.

Now again, it raises the apprehensions in the mind of developing economies before the developed economies regarding financing the mechanisms (adaptation and mitigation) to combat the climate change and its impact. UNFCCC, Kyoto Protocol and Paris Agreement had already made a call for financial support from the more endowed countries to the less endowed and vulnerable to climate risks. In Cancun Agreements (2010), developed economies made a commitment to “a goal of mobilizing jointly USD 100 billion per year by 2020 to address the needs of developing countries in respect of adaptation and mitigation activities to combat climate change and its impacts.” In Paris Agreement (2015), developed economies re-confirmed the \$ 100 billion goals and agreed to set a new collective quantified goal not less than of USD 100 billion per year prior to 2025. Before United Nations Conference of Parties (COP24) in 2018, the BASIC (Brazil, South Africa, China and India) countries said “they would push developed countries on their commitment to providing \$100 billion annually from 2020.” Alok Sharma, president of COP 26, reiterated “a mechanism was being put in place to achieve the **target of climate financing USD 100 billion by 2023.**” At COP21 in Paris, Parties extended the \$100 billion goals through 2025. After COP26, there was a consensus “developed nations will double their collective provision of adaptation finance from 2019 levels by 2025, in order to achieve this balance between adaptation and mitigation.”

NEED FOR CLIMATE CHANGE FINANCE AT GLOBAL LEVEL AND TOOLS

The report by World Economic Forum (WEF) projected that about \$5.7 trillion would require investing annually in green infrastructure by 2020. The annual commitment of \$100 billion appears to be a drop in the ocean before the \$5.7 Trillion puzzle. This is why there is a need for large scale investment in 2020 and beyond for

the effective implementation of Mitigation and Adaptation Mechanisms to tackle climate change and its impact. The fact behind is this that both mechanisms require a large scale investments so a significant level of financial resources are needed. In order to tackle the problem of fund deficiency at global level, few initiatives have been taken in the form of Global Climate Financing Tools.

Green Climate Fund (GCF) was established after Cancun Agreement to reduce greenhouse gas emissions in developing countries. It is designated as an operating entity of the financial mechanism. Adaptation Fund (AF) was established after Kyoto Protocol in 2001 and has committed US\$ 532 million to adaptation and resilience activities. Global Environment Fund (GEF) served as an operating entity of the financial mechanism since the Convention came into force in 1994. It is a private equity fund focused on seeking long term financial returns by investments in clean energy under climate change. In addition to providing guidance to the GEF and the GCF, parties have established two special funds: The Special Climate Change Fund (SCCF) and the Least Developed Countries Fund (LDCF). Both funds are managed by the GEF.

CHALLENGES TO CLIMATE CHANGE FINANCE AT GLOBAL LEVEL

There is a gap between national needs and climate finance under Nationally Determined Contribution. There is need for additional international financial support. Least Developed Countries receive much less approved funding in per-capita terms from the multilateral climate funds. The rate of approvals is time taking, due to which the drawee nation has insufficient funds to complete its target and leads to stalling of projects. The uncertainties such as, the recent refusal of US to pay \$2 billion of its pledge this has created shortage of funds at available GCF.

CONCLUSIONS & SUGGESTIONS

Climate Change Policy is not a choice between a “High-growth, High-carbon world’ and a ‘Low-growth, Low-carbon world.” This poses a question of “whether to grow or to preserve the planet.” To response such question, an economic analysis of climate change policy is need of the hour at theoretical level. While at practical level, there must be an attempt to limit human activities to level that is within the carrying capacity of the environment like a “Plimsoll line” of the ship. Fundamental Change in Attitude of stakeholders to use Natural recourses wisely is also needed. Redefining Growth in terms of “Quality of life” and increase in national output in conformity with sustainability is needed. Redefining costs and benefits to reflect externalities and to promote investment decisions compatible with sustainability criteria is also needed. Diversionary principles to be followed – money should be

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diverted from activities that are environmentally damaging to those which are environmentally friendly (e.g. diversion of money from waste disposal to waste reduction). Thus three main building blocks of climate smart policies are:

1. Acting now: time is most scarce element.
2. Acting together: global partnership from technology transfer and funding mechanism.
3. Acting differently: resource use efficiency

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Effect of Climate Change on Livestock Production

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One of the major problems facing the world in this century is climate change. Huge numbers of climate-related events are occurring more frequently. The livestock industry has also been impacted by the changing environment, which has led to an increase in the loss of animal assets as well as numerous other indirect losses. Thermal and cold stresses are two effects of climate change on animals. Animal output and productivity are reduced as a result of rising disease occurrences, decreased feed, fodder, and water availability. The research primarily examines how climate change will affect livestock production.

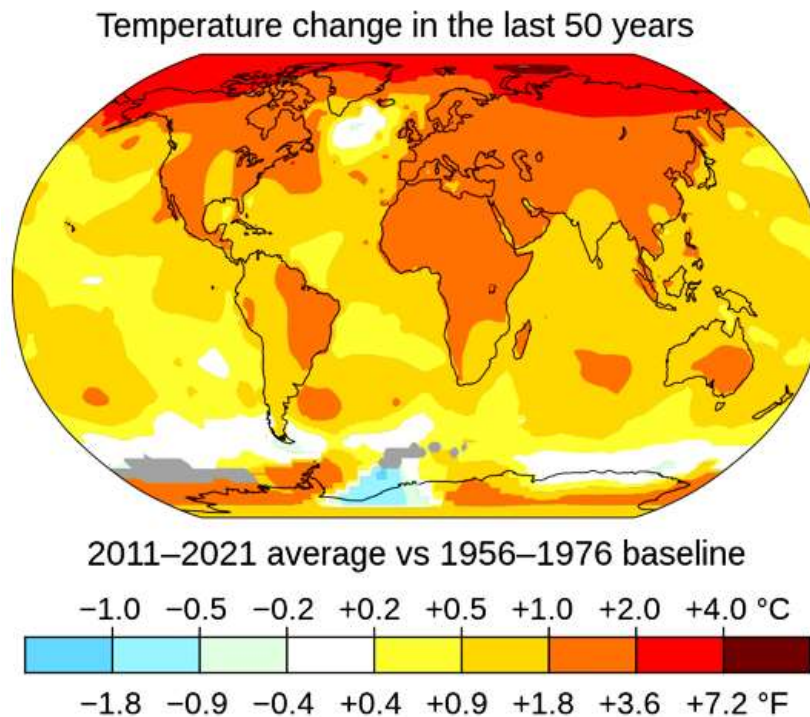
INTRODUCTION

The cattle industry is a cornerstone of the world food system and makes contributions to agricultural growth, food security, and poverty eradication. The FAO estimates that livestock sustain about 1.3 billion people's livelihoods, as well as their ability to eat and be well nourished. Livestock contributes 40% of the value of the world's agricultural output. Nevertheless, there is a lot that can be done to make the practises in the livestock sector more egalitarian, sustainable, and low-risk to both animal and human health (The World Bank, 2021). Global demand for foods of animals origin is growing and its apparent that the livestock sector will need to expand. Livestock are adversely affected by the detrimental effects of extreme weather. Climatic extremes and seasonal fluctuations in herbage quantity and quality will affect the well being of livestock, and will lead to declines in production and reproduction efficiency (FAO, 2006).

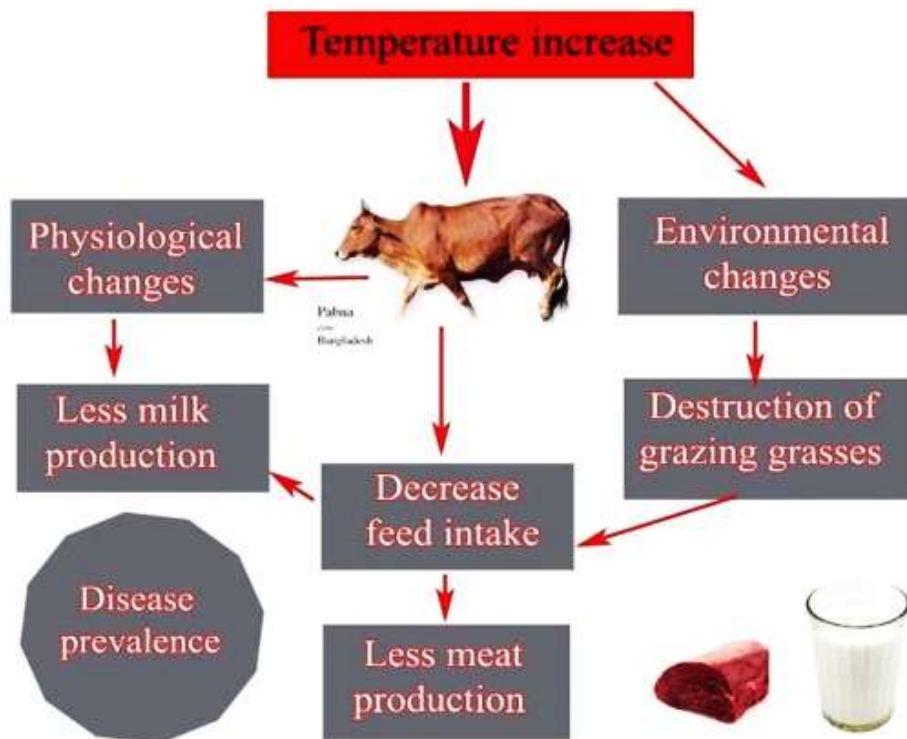
Climate change is a major threat to sustainability of live stocks system globally. Consequently, the adaptation, to, and mitigation of the detrimental effects of extreme climates has played a major role in combating the climatic impact on livestock. There is a little doubt that climatic change will have an impact on livestock performance in many regions and as per most predictive models the impact will be detrimental. Climatic change may manifest itself as rapid changes in climate in short term (a couple of years) or more subtle changes over decades. Generally climate change is associated with an increasing global temperature (Sirohi and Michaelowa 2007).

SENSITIVITY TO CLIMATE CHANGE

Climate change is a phenomenon due to emissions of greenhouse gases from fuel combustion, deforestation, urbanization and industrialization resulting variations in solar energy, temperature and precipitation. It is a real threat to the lives in the world that largely affects water resources, agriculture, livestock, coastal regions, freshwater habitats, vegetation, forests, melting of snow covered mountains and increase in climatic events such as landslides, desertification and flood. around the world the three major components of climatic change already evident and escalating in magnitude and significance are: warming, altered patterns of precipitation and increased incidence of extreme climatic events (FAO, 2006). Because livestock are homeotherms, animals must control their body temperature within a relatively small range in order to stay healthy and productive. Animals experience stress due to environmental temperatures that are either below or over the thermoneutral range. Adult cattle are said to operate best in a range of temperatures between 5 and 15 degrees Celsius (Hahn 1999). However, within the range of 5 to 25°C, major alterations in feed intake or in a number of physiological processes won't happen (McDowell 1972). Dairy cattle have a lower upper critical temperature than other livestock species (Wathes et al. 1983).



The impact of climate change is confirmed to be true and is having a significant impact on livestock populations in a variety of ways. Extreme weather events including droughts, heat waves, storms, desertification, and increases in pest infestations are all predicted to become more frequent as a result of climate change. All animals, including those in oceans, on farms, in wilderness areas, and in our homes, will be impacted by long-term climate changes. (khanal, 2010). warmer and weather (particularly warmer winters due to climate change) will increase the risk and occurrence of animal diseases, as certain species who serve as disease vectors, such as biting flies and ticks, are more likely to survive year-round. At higher temperature, numerous diseases display greater virulence. As a result of climate change the environment become favourable for the disease agent (bacteria, viruses, e.t.c)and the host will become susceptible easily. the epidemiologically triad between agent, host and environment become imbalance and different disease may also become more prevalent, or their geographical range may spread , it rainfall increase. Increase temperature may cause thermal stress in terrestrial and aquatic animals, leading to reduce growth, sub optimal behaviour, decrease productivity and reduces immune competence of animas (Sirohi and Michaelowa, 2007; Koirala and Bhandari,2019).



Milk production

Heat stress has a significant impact on high-production animals (Martello et al., 2010). In tropical and subtropical climates, the temperature humidity index (THI) threshold level for the high milk-yielding cow is around 72. The THI lower than 68 is suitable for cattle performance, according to current studies on THI in temperate climates (Gauly et al., 2013). Dairy cows exhibit early indicators of heat stress such as panting, sweating, and prolonged standing. Cows don't eat as much as they usually do as a result of these circumstances.

Growth of livestock

Animals under heat or cold stress grow slower and consume their food less efficiently. Winter's cold weather causes metabolic acclimation, which lowers animal performance and production effectiveness. Plasma corticosterone levels and the amount of circulating non-esterified fatty acids (NEFA) were also elevated by cold stress. The performance of growth appears to be unaffected by temperatures between 15 and 29 degrees C. Low anabolic activity and increased tissue catabolism are caused by high ambient temperature. Growth performance is negatively impacted by decreased anabolism activity, which lowers voluntary feed intake, and increased catabolism, which results in fat depots (Koirala and Bhandari, 2019).

Effect on reproduction

Livestock reproductive efficiency is susceptible to climate change. Both the male and female reproductive systems are negatively impacted by it. Heat stress shortens and weakens the oestrous cycle in animals and also increases an oestrous and silent heat.

CONCLUSION

With a growing worldwide population comes a growing demand for animals and animal products. Climate change, however, is having a severe impact on productivity and livestock production. A decline in the availability of feed, fodder, and water for the animals as well as a rise in diseases brought on by thermal and cold stress are all contributing to a decrease in animal productivity. Climate extreme dangers are also increasing, inflicting enormous losses in livestock assets. Finding the right breeding techniques can help animals survive and develop a tolerance for heat and cold. One strategy to reduce the harmful impacts of climate change on cattle is to identify and strengthen indigenous breeds that are adapted to the local environmental stress and feed supplies. The development of forecasting and early warning systems for cattle diseases is also necessary.

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An Overview of how our Country India is Gearing for Energy Transition and Climate Change Keeping G20 in Present Scenario

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India has on numerous occasions shown its obligation to natural stewardship, environment activity and spotlight on renewables to decarbonize the manner in which the nation works. In the national statement he gave at the 26th Conference of the Parties (COP 26) in Glasgow in November 2021, Prime Minister Narendra Modi set five daring and ambitious goals for further emission reduction. The milestone net-zero responsibility by 2070 was among the five new environmental change targets reported by the Head of the state. Net-zero refers to eliminating as many carbon dioxide emissions from the atmosphere as are produced.

The following are India's four additional commitments, all of which must be met by 2030:

- bringing the capacity of non-fossil energy up to 500 gigawatts (GWs),
- supplying renewable energy for half of the country's energy needs,
- lowering the economy's carbon intensity by 45%, and
- lowering the estimated total amount of carbon emissions by one billion tonnes.

Several times, the need to initiate the one-word movement "LIFE," which stands for "Lifestyle For Environment," has also been emphasized. This movement promotes mindful and deliberate consumption rather than mindless and destructive consumption.

India's commitment to reaching the goal of net-zero carbon emissions by 2070 is reflected in the climate provisions in the Union Budget 2022-23.

INTRODUCTION

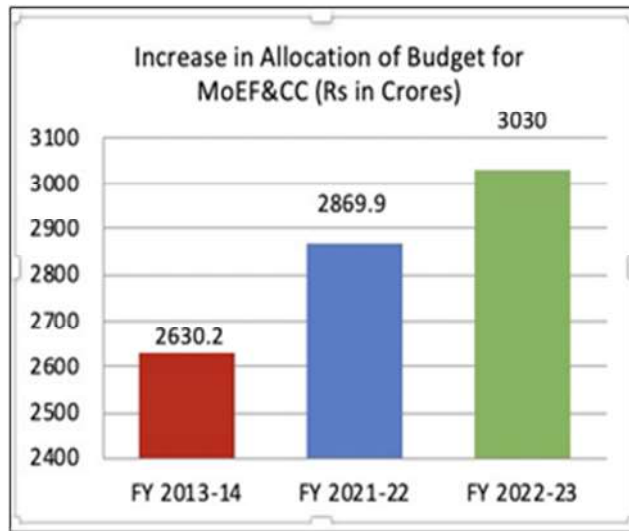
Holistic approach cutting across Ministries:

The Environment, Forest, and Climate Change (MoEFCC), Ministry of New and Renewable Energy (MNRE), and Ministry of Heavy Industries (which

implements the Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME INDIA) scheme to promote electric vehicles) have largely been the driving force behind India's effort in this direction because no single ministry is responsible for moving the country toward net zero.

Allocations for green, renewable energy, and electric-mobility projects in the budget for 2022:

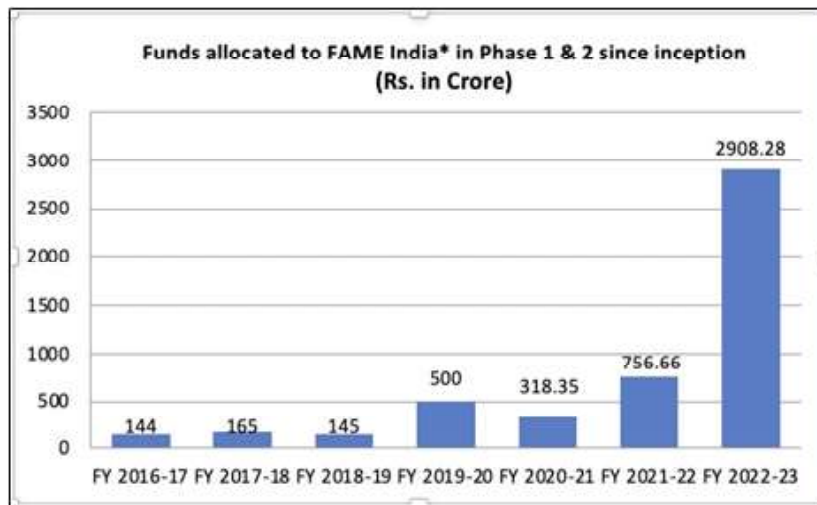
- The Ministry of Environment, Forests, and Climate Change received Rs 3030 crore, up from Rs 2869.93 crore the year before.



Climate Change and the G-20: Opportunities and Challenges - ISBN: 978-93-93248-56-5

- This year, the National Mission for Green India has received Rs 361.69 crore, an increase of 24.72 percent from the previous fiscal year's allocation of Rs 290 crore.
- The amount of money given to the National Afforestation Program has increased by 27.65 percent, from 235 crores last year to 300 crores this year.
- Climate Change Activity Plan has been dispensed Rs 30 crores, same as a year ago.
- Of the Rs 3030 crores given to the MoEFCC, Rs 460 crores have been set aside for pollution control, which is a significant sum.
- Significant Increase to the Ministry of Heavy Industries' FAME-India (Faster Adoption and Trade of (Hybrid and) Electric Vehicle in India) Electric vehicle program The program saw a major increase from Rs 800 crores the previous year to Rs 2,908 crores this year.

Phase II of the FAME Scheme was approved by the government, and it will cost INR 10,000 billion over five years, beginning on April 1, 2019. This phase will support 7,090 electric buses, 55,000 electric three-wheelers, 55,000 electric four-wheeler passenger cars (including strong hybrids), and 10 lakh electric two-wheelers to increase demand. The requirement for a permit for electric vehicles has also been eliminated. There will be 966,363 electric vehicles on the road nationwide as of February 11, 2022. Electric vehicle GST has also been reduced from 12 percent to 5 percent; GST on chargers/charging stations for electric vehicles additionally decreased from 18% to 5%.



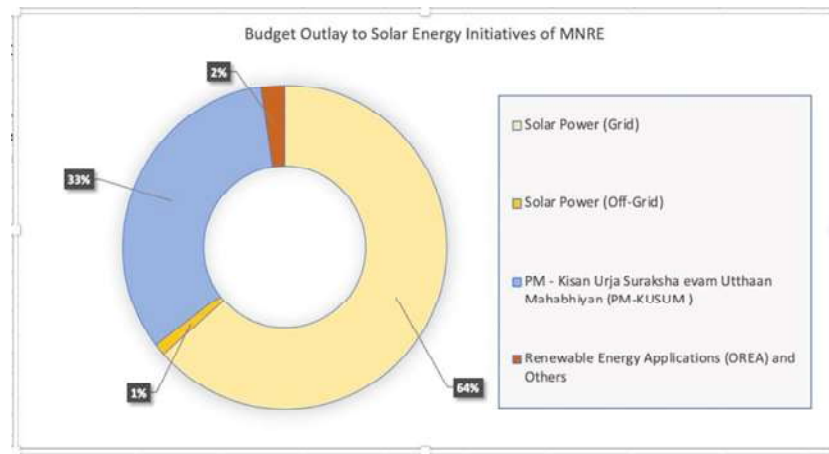
*There was no such scheme for electric vehicles prior to April 2015

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- Rs 6,900.68 crores were allocated to the Ministry of New and Renewable Energy (MNRE), which is in charge of overseeing India's ambitious renewable energy goals.

The solar energy sector, which includes both grid-interactive and off-grid projects, received the highest allocation in the MNRE in order to accomplish the objective of producing 280 GW of installed solar capacity by the year 2030. Rs. 3365 crores have been given to it in comparison to the Rs. 2606 crores, an increase of 29%.

- Grid-based solar power – Rs. 3304.03 crores in Off-Grid Solar Power – Rs. 61.50 crore from PM-KUSUM 1715.90 crores of Other Applications of Renewable Energy – Rs. Rs. 10 crores for Other 124.36 billion



Propelling Green India-announcements in Union Budget 2022:

- An additional allocation of Rs. 280 GW of installed solar capacity must be manufactured domestically by 2030. Production Linked Incentives (PLI) worth 19,500 crores have been proposed for the production of high-efficiency modules, with the goal of fully integrating polysilicon and solar PV module manufacturing units first.
- The proposal to co-fire biomass pellets containing 5-7 percent biomass in thermal power plants will help to prevent stubble burning in agricultural fields, provide farmers with an additional source of income, and reduce annual CO₂ emissions by 38 million tons.
- The energy service company model, capacity building, and awareness of energy audits are used to promote energy efficiency and savings for large commercial buildings.

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- Four proposed pilot projects for the gasification of coal and chemical production from coal
- Concentrate on private forestry and agroforestry; assistance for farmers from Scheduled Tribes and Scheduled Castes who want to start agroforestry.
- In 2022 and 2023, the government will issue sovereign Green Bonds as part of its overall market borrowings to raise funds for green infrastructurevi. The funds will be put toward public sector initiatives that aid in lowering the economy’s carbon intensity.
- Promoting climate action, agriculture, and other clean technologies through blended finance, with a 20% government share cap; Private fund managers will be in charge of this.
- The inclusion of energy storage on the standardized infrastructure list.
- Advancing travel situated advancement for urban communities.
- Utilization of public vehicle in metropolitan regions will be advanced.
- Interoperability standards and a policy that allows for the swapping of batteries were said as part of an effort to encourage the use of electric vehicles (EVs) in the ecosystem. As a faster alternative to charging stations, drivers will be able to swap out aged battery blocks at swap stations thanks to this. It likewise boosts the confidential area to foster feasible and creative plans of action for ‘Battery or Energy as a Help.’
- Furthermore, the Financial plan Meeting was supposed to examine another bill — The Energy Preservation (Change) Bill, 2022vii — which points “to give administrative structure to:
 - India’s carbon trading,
 - The Energy Conservation Act of 2001’s effective implementation and enforcement,
 - Encouraging the use of renewable energy sources in the energy mix.

Recent Developments- India’s commitment to Green Energy Future

India is reducing its reliance on fossil fuels and steadily increasing its capacity to produce green energy through hydro, wind, and solar projects. Indian Railways has set a goal of pretty a net zero-carbon emitter by 2030, so work on stirring the railways to 100 percent is also moving quickly. The nation is likewise featuring on Mission Roundabout Economy and India’s Vehicle Scrap Strategy is a valid example. The rule’s resolve to assist local controls in doing the country’s 450 GW renewable energy targets is verified by the recent equity injection of Rs 1,500 crore into IREDA by the Union Cabinet to rise the agency’s lending capacity.

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The area covered by trees and forests in India increased by 2261 sq. km over the past two years, which demonstrates India's emphasis on environmental preservation. Some of the most recent government initiatives and developments are listed below. of India to make a smooth energy transition and positive climate action possible:

- The Global Solar Alliance (ISA), Coalition for Disaster Resilient Infrastructure (CDRI), and Leadership Group for Industry Transition (LeadIT Group)viii are global climate change initiatives led by India. LeadIT Gathering is one of the nine activity tracks recognized by the UN Secretary-General to support milieu ends and activities to carry out the Paris Arrangement.



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- PM Modi introduced the ICRISAT's Environmental Change Exploration Office on Plant Assurance and Quick Age Progression Office on February 5, 2022ix.
- On India's 75th Independence Day, August 15, 2021, the Hon'ble Prime Minister launched the National Hydrogen Mission. The Mission aims to help the government meet its climate goals and turn India into a hub for green hydrogen. This will help in gathering the objective of creation of 5 million tons of green hydrogen by 2030 and the connected improvement of environmentally friendly power limit. It is anticipated that hydrogen and ammonia will eventually replace fossil fuels as fuels. One of the most important requirements for the nation's environmentally sustainable energy security is the production of these fuels, which are referred to as green hydrogen and green ammonia, using power generated by renewable sources.

“The field of green hydrogen is the one that is going to assist India in making a quantum leap in terms of climate change out of all the efforts that are currently being made by India. I am announcing the National Hydrogen Mission today with this tricolor as a witness in order to accomplish the objective of Green Hydrogen. In his speech on Independence Day, the Prime Minister stated, “We have to make India a global hub for Green Hydrogen production and export in the AmritKaal.” The Indian government is taking a number of steps to make it easier to switch from fossil fuels and feed stocks based on fossil fuels to green hydrogen and ammonia. One of the most important steps in this endeavor is to notify people about this policy.



PM announced the goal of blending 20% ethanol into gasoline by 2025 on June 5, 2021. The ambitious goal, which moves the goal of blending from 2030 to

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2025, is an important part of the energy transformation that will affect the entire economy. As of September 2021, the nation has proactively reached 8.5 percent ethanol mixing and is on target to accomplish the 20% objective by 2025 according to Financial Overview 2021. Ethanol blending has the potential to provide the nation with a number of advantages, including the reduction of carbon emissions, the improvement of air quality, the promotion of the productive use of ruined food grains and waste, the increase in farmers' incomes, the creation of employment and investment opportunities, and the saving of USD 4 billion annually from imports.

FOCUS ON RENEWABLE ENERGY

- The Indian Renewable Energy Growth Agency (IREDA)^x, which provides project financing to the Renewable Energy (RE) sector, received approval from the control in January 2022 for an asset of Rs. 1,500 crores. The rule also approved the Intra-State Show System – Green Energy Corridor Phase-II, which will lay the infrastructure for connecting electricity generated by renewable sources with the power grid in seven states^{xi}. This equity infusion will contribute to the creation of about 10200 jobs per year and the reduction of almost 7.49 million tons of CO₂ equivalent emissions per year.
- The corridor plan, which is estimated to cost Rs 12,031 crores, would receive 33%, or Rs 3,970 crores, in central funding. The plan will help in accomplishing the objective of 450 GW introduced RE limit by 2030.
- According to the Economic Survey 2021^{xii}, as of December 31, 2021, the nation had installed 49.35 GWs of solar power capacity, 36 GWs of solar power capacity was under construction, and 19 GWs of solar power capacity had been offered through the following initiatives:



➤ PradhanMantriKisanUrjaSurakshaevamUtthaanMahabhiyan (PM-KUSUM) Plan sent off in 2019 to give energy and water security, de-dieselise the ranch area and create extra pay for ranchers by carrying sun based power. With a cash boost from the rule of more than Rs., the plan aims to add 30.8 GW of solar capacity. \$34,000 million. There are three parts to it:

1. Devolved, grid-connected solar power plants with a combined capacity of 10,000 MW and a
2. Installation of 20,000 individual solar-powered agriculture pumps and
3. Solarisation of 15 Lakh existing network associated farming siphons.

RBI has incorporated these parts under Need Area Loaning Rules for facilitating openness of money. As of December 31, 2021, the individual pump solarization variant had solarized over 77000 stand-alone solar pumps, 25.25 MW solar power plants, and over 1026 pumps.

- A plan called “Development of Solar Parks and Ultra Mega Solar Power Projects” is being implemented with a target capacity of 40 GW by March 2024 to make it easier for large-scale grid-connected solar power projects. In 14 states, 50 solar parks with a combined capacity of 33.82 GW have been approved thus far. In these parks, solar power projects with a combined capacity of approximately 9.2 GW have already been put into operation.
- Phase II of the Roof Top Solar program, which aims to accelerate the deployment of solar roof top systems and have 40 GW of installed capacity by December 2022, is also in the process of being implemented. The country has seen the installation of 5.87 GW worth of solar roof top projects thus far.
- A plan for setting up 12 GW Matrix Allied Sun oriented PV Power Tasks by rulematters (with Focal Public Area Events) is under execution. This plan provides support for funding the capability gap. The direction has approved about 8.2 GW of projects so far under this plan.

The Off-Grid Solar PV Applications Programme’s Phase III for Solar Street Lights, Solar Study Lamps, and Solar Power Packs was open until March 31, 2021. As reported by State Nodal agencies, over 1.45 lakh solar street lights, 9.14 lakh solar study lamps, and about 2.5 MW solar power packs were installed until December 2021.

- In order to take advantage of the potential of offshore wind energy along India’s coastline, the Indian government issued the offshore Wind Energy

Policy in October 2015. Offshore wind projects off the coasts of Gujarat and Tamil Nadu are being planned for installation by the Ministry of New and Renewable Energy. The Service has told the breeze sun based half and half strategy, giving a system to progress of enormous matrix associated breeze sun oriented PV mixture projects for ideal and proficient use of show foundation and land, decreasing the variableness in sustainable power age and doing better network security.

INDIAN RAILWAYS GOES GREEN

- The use of three-phase technology for regenerative braking, “head on generation” technology, which eliminates the need for separate diesel-fueled power cars, and the use of renewable energy sources (133.26 MW solar and 103 MW wind installed capacity) are major initiatives taken to reduce carbon emissions.
- The network will be 100% electrified by December 2023.
- Provisioning of Driven lights at all rail line creations, and creation of extra carbon sink by afforestation.

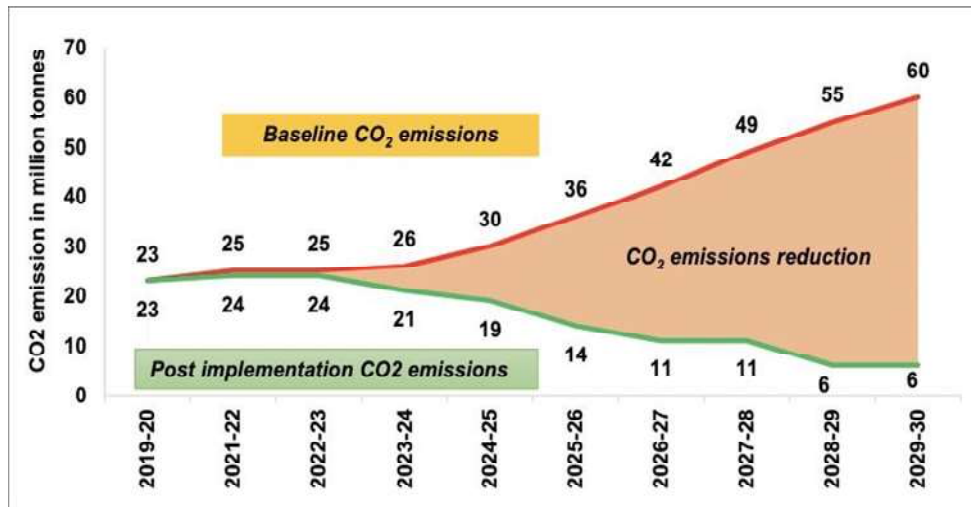
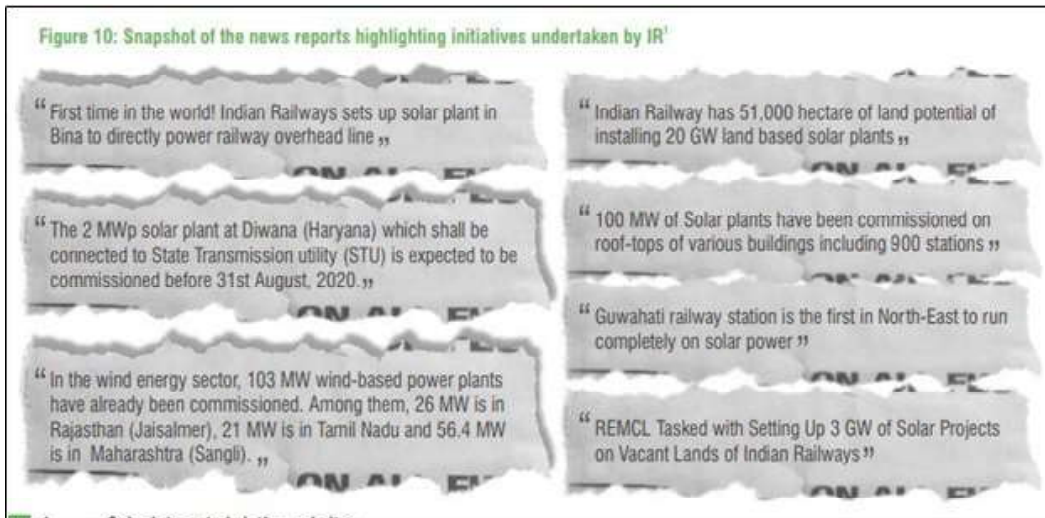


Figure shows the expected CO₂ emission reduction by Indian Railways through use of renewable energy.

- Indian Railways (IR) is moving toward becoming a “net zero carbon emitter” before 2030 and is working in mission mode to become the largest Green Railways in the world.

Mission MODE: By 2030, Indian Railways wants to be net-zero in carbon emissions, primarily by getting its energy from renewable sources. Its strategy to achieve net zero carbon emissions includes railway electrification, increasing the energy efficiency of locomotives, trains, and fixed installations, obtaining green certification for installations and stations, installing bio toilets in coaches, and switching to renewable energy sources.

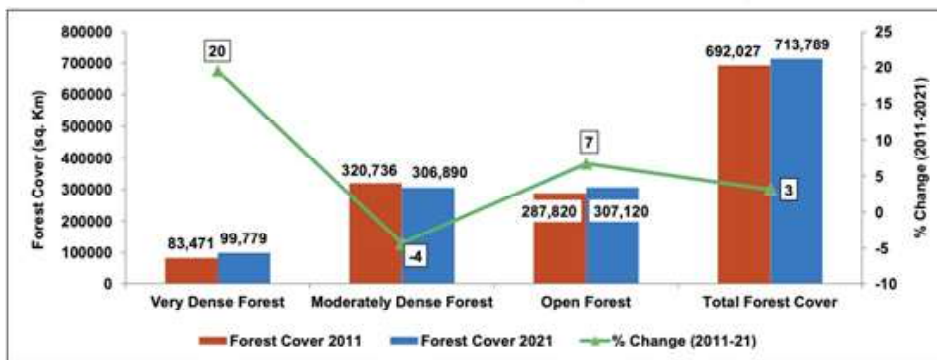
- As part of Mission Mode, Indian Railways is utilizing rooftop solar panels (Developer model) to maximize the potential of 500 MW of energy. 100 Megawatt (MW) of solar power had been installed on the roofs of various buildings, including 900 stations, as of July 2020. At various stages of operation, solar plants with a combined capacity of 400 MW are being constructed. Tenders have proactively granted for 245 MW and focus for fruition of these plants is December 2022.
- In collaboration with Bharat Heavy Electricals Limited (BHEL), one project of 1.7 MW at Bina (Madhya Pradesh) has already been installed and is currently undergoing extensive testing. This is the world's first solar project of its kind.
- There had been the hiring of 103 MW of wind-based power plants in the wind energy sector. Giving to Sangli, there are 26 MW in Rajasthan (Jaisalmer), 21 MW in Tamil Nadu, and 56.4 MW in Maharashtra. In addition, Indian Railways intends to construct 200 MW wind energy plants in Tamil Nadu, Gujarat, Rajasthan, and Karnataka over the next two years.



IMPROVEMENT IN FOREST COVER OF INDIA

By forest area, India is the tenth largest country in the world. It positions third universally in yearly normal net addition in backwoods region between 2010 to 2020. The total forest cover of India was 7,13,789 square kilometers, giving to the India State of Forest Report 2020–21. km in 2021, a 3.14 percent increase from 2011. Better upkeep measures, guard, afforestation efforts, tree farm drives, and agro-forestry may be liable for the rise in forest cover or density.

Forest Cover of India (2011 and 2021)

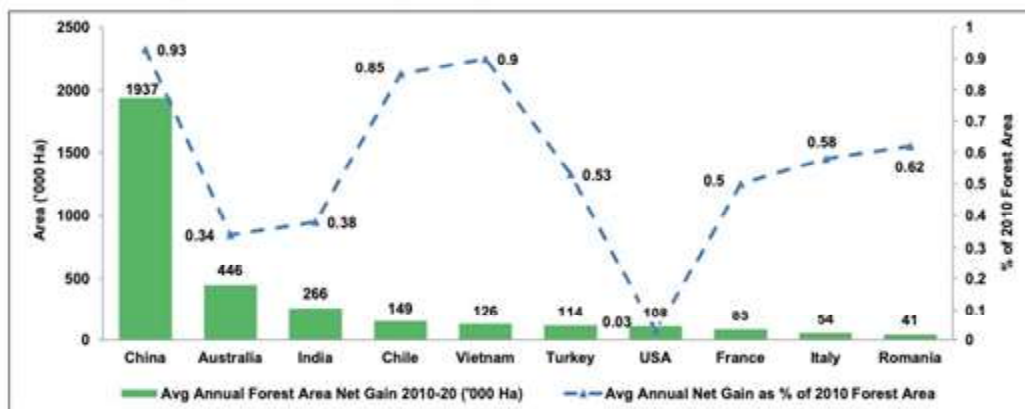


Source: India State of Forest Report 2021 and 2011

Note: Very dense forest: All lands with tree canopy density of 70 per cent and above); Moderately dense forest: All lands with tree canopy density between 40-70 per cent; and Open forest: All lands with tree canopy density between 10-40 per cent

- According to the India State of Forest Report 2021, India also ranked among the top ten nations in terms of the average annual net gain in forest area between 2010 and 2020.

Top Ten Countries by Average Annual Net Gain in Forest Area (2010-20)

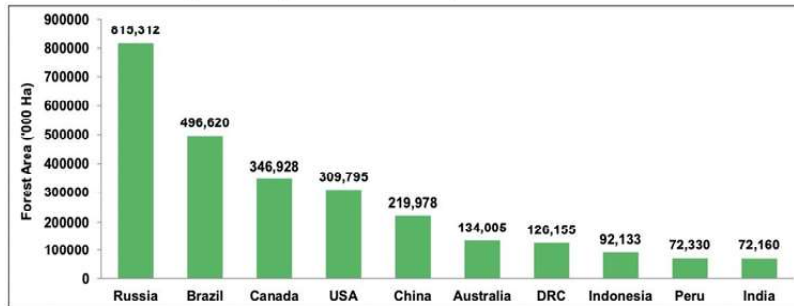


Source: India State of Forest Report 2021

STEPSTAKENFORPLASTICWASTEMANAGEMENT

➤ The Plastic Waste Running Change Rules, 2021 were issued by the Ministry of Setting, Forest, and Climate Change in August 2021. These rules forbid identified single-use plastic items that have low utility and high littering potential by 2022. Beginning on July 1, 2022, it will be illegal to produce, import, stock, distribute, sell, or use any identified single-use plastic, including expanded polystyrene and polystyrene. The regulation aims to boost the circular economy of plastic packaging waste, encourage the creation of new plastic-free alternatives, and encourage globally friendly plastic packaging.

Figure 6: Top Ten Countries by Forest Area in 2020



Source: India State of Forest Report 2021

Note: DRC: Democratic Republic of the Congo

INITIATIVES TO CONTROL AIR POLLUTION

➤ The National Clean Air Programme (NCAP)^{xv}, which was launched in 2019 by the MoEFCC, is currently being implemented in 132 cities to reduce particulate matter (PM) concentrations by up to 30% by 2024 across the nation. When compared to 2019-20, the concentration of PM₁₀ in 96 cities decreased in 2020-21. From 18 in 2019-20 to 27 in 2020-21, the number of cities that meet the required National Ambient Air Quality Standard (PM₁₀ less than 60 g/m) also increased.



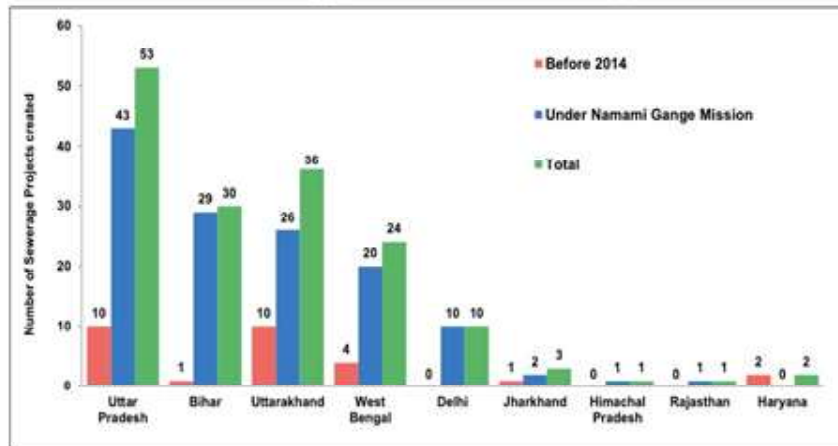
➤ Steps to Reduce Vehicle Emissions India has moved from BS-IV to BS-VI fuel and vehicle emission standards as of April 2020. Metro rail networks for public vehicle have been upgraded and more urban areas have been covered. CNG, LPG, and ethanol blending in gasoline are examples of cleaner/alternative fuels that have been introduced.

CONSERVATION OF WATER –NAMAMI GANGE MISSION

The Ganga River Basin is the focus of the Namami Gange Mission, which aims to preserve, restore, and protect it. The Mission was approved by the Cabinet in 2015 for a five-year period (2015-2020) with a budget of Rs. 20,000 billion. The National Mission for Clean Ganga (NMCG) was subsequently notified as an authority under the Environment Protection Act on October 7, 2016, making it the nodal agency in charge of monitoring and implementing the Namami Gange Mission. The four pillars of the Mission—Nirmal Ganga (Unpolluted Flow), Aviral Flow (Continuous Flow), Jan Ganga (People-River Connect), and Gyan Ganga (Research and Knowledge Management)—underpin the mission-related activities. As of December 2021, the mission had approved 363 projects totaling Rs. 30,841.53 crores.

- The state-by-state distribution of the Namami Gange Mission’s sewerage infrastructure projects since its inception is shown below. Uttar Pradesh has completed the most projects (43), followed by Bihar (29), and Uttarakhand (26).

Sewerage Infrastructure Projects created under the Namami Gange Mission as of December 31, 2021



Source: National Mission for Clean Ganga (NMCG)

PARIVESH PORTAL

The acronym “Parivesh” refers to “Pro-Active and Responsive Facilitation by an Interactive, Virtuous, and Environmental Single-window Hub.” It is a portal for green clearances that PM Modi established in 2018. It is a role-based, web-based workflow application designed for online proposal submission and monitoring in order to obtain CRZ, Environment, and Wildlife Clearances from Central, State, and District level authorities. It robotizes the whole following of proposition which incorporates online room of another proposition, altering/refreshing the subtleties of recommendations and presentations status of the recommendations at each phase of the work process. The potential for this portal’s expansion via a Centralised Processing Centre-Green (CPC-Green) was also emphasized in the Union Budget 2022.

SUSTAINABLE DEVELOPMENT GOAL INDIA INDEX

According to the SDG India Index released by NITI Aayog in June 2021, India’s score increased from 60 in 2019-20 to 66 in 2020-21. Kerala came out on top in the index’s act ranking of states.

- The Keezhattur village in Kerala’s Malappuram district boasts door-to-door collection of both dry and wet waste in its entirety. At the GramaPanchayat (GP) level, there is a Material Collection Facility (MCF), and at the block level, a Resource Recovery Facility (RRF) has established forward links.
- In addition, the effective implementation of the Green Protocol in all government offices, institutions, and events organized under the GP has successfully reduced the volume of dry discards or non-biodegradable waste.
- There are restrooms in every school, Anganwadi Center, and public office.
- [Click here](#) to view the Economic Survey 2021’s mention of India’s progress on climate change and sustainable development.

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