IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.53
Volume 4, Issue 2, July 2024

A Review on Global Warming

Mr. Mounesh[1], Chindan B V[2], Gowrish N[3], Chandan M N[4], Chaitra S K[5]
Department of Information Science and Engineering[1,2,3,4,5]
Alva's Institute of Engineering and Technology, Mijar, Karnataka, India

Abstract: *One of the most important environmental issues of our time is global warming, which is primarily caused by human activity. In order to provide a thorough examination of the phenomenon, this review paper will cover its fundamental causes, observed and anticipated effects on the Earth's climate and ecosystems, as well as proposed mitigating measures. The atmospheric emission of greenhouse gases, particularly carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), is the main cause of global warming. The remarkable rise in greenhouse gas concentrations during the past century has been mostly attributed to the burning of fossil fuels, deforestation, industrial operations, and agricultural activities. The effects of global warming are numerous and extensive. Increasing temperatures have sped up the melting of glaciers and polar ice caps, which has raised sea levels and increased the likelihood of coastal flooding. Extreme weather occurrences, such as heatwaves, droughts, and violent storms, have increased in frequency and have a negative effect on agriculture, water supplies, and vulnerable communities. Additionally, as ecosystems experience extraordinary shifts in temperature and precipitation patterns, biodiversity loss and ecosystem disruption are being seen. This paper presents a variety of potential mitigation tactics that could be used to alleviate the problems caused by global warming. Among these include switching to renewable energy sources, improving energy efficiency, putting reforestation and afforestation programmes into action, and applying sustainable agriculture methods. Additionally, international collaboration and policy frameworks are essential for promoting group initiatives. With significant effects on the environment and society, global warming continues to be a top priority. On a local, national, and international level, cooperation is required to address this complicated issue. This review emphasises how crucial it is to comprehend the underlying causes, effects, and mitigation strategies in order to effectively combat global warming and build a sustainable future for future generations.*

Keywords: global warming.

I. INTRODUCTION

One of the most important and difficult problems facing our world right now is global warming, a complex result of human activity. The rapid increase in global average temperatures, which is mostly due to the emission of greenhouse gases into the atmosphere, has a significant impact on ecosystems, human societies, and climatic patterns. Understanding the complexities of global warming and its numerous repercussions is essential for developing successful methods for reduction and adaptation as scientific evidence for its existence grows stronger. Human activities have significantly changed the composition of the Earth's atmosphere over the last century. Carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) emissions from intensive agriculture, industrial operations, burning of fossil fuels, and deforestation are at an all-time high. As a result of the greenhouse effect these gases produce, which amplifies the impact of natural greenhouse gases, the earth warms. With a number of observable changes in our environment, the effects of global warming are already becoming clear. The melting of the polar ice caps and glaciers has been hastened by rising temperatures, resulting in rising sea levels that endanger low-lying islands and coastal areas. Heatwaves, droughts, hurricanes, and heavy rainstorms are just a few examples of the extreme weather phenomena that are getting more common and severe and having an effect on infrastructure, agriculture, and human livelihoods. Global biodiversity and ecosystems are seriously threatened by global warming in addition to its direct negative effects on the environment. Climate change and unpredictable weather patterns make it harder for species to migrate or adapt, which can change their habitats and increase the danger of extinction. Critical marine ecosystems like coral reefs are especially susceptible to ocean acidification and rising sea temperatures, which exacerbates the loss of

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biodiversity. Effective mitigation and adaptation methods for global warming are more crucial than ever in light of these serious issues. In order to collectively handle this global challenge, policymakers, scientists, and society at large are looking for comprehensive strategies to cut greenhouse gas emissions, switch to sustainable energy sources, improve resilience to climate impacts, and promote international collaboration.The objective of this review paper is to offer a comprehensive evaluation of the current status of global warming research, taking into account the underlying causes, the observed and anticipated implications, and prospective adaptation and mitigation strategies. This paper aims to contribute to a better understanding of the complexity underlying global warming and promote informed decision-making to protect the world for future generations by synthesising the most recent scientific discoveries and analysing existing options.

II. GREEN HOUSE EFFECT

The greenhouse effect is a natural phenomenon that is essential in keeping the Earth's temperature within a range that supports life. A phenomenon occurs when specific gases in the Earth's atmosphere hold onto solar heat, keeping it from escaping back into space and warming the planet's surface. The Earth would be too cold to support the majority of life as we know it without the greenhouse effect. Water vapour (H2O), carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and a few others are the main greenhouse gases that cause this effect. Because they work similarly to the glass panels of a greenhouse, which trap heat and keep the interior warmer than the outside environment, these gases are referred to as greenhouse gases.

1. Solar Radiation: The process starts with the sun's incoming solar radiation. There are several different types of energy in sunlight, including UV radiation and visible light
2. Warming of the land and oceans results from part of the sun's energy being absorbed by the Earth's surface after entering the atmosphere.
3. The Earth emits heat in the form of infrared radiation (heat energy) when it receives solar energy. The lower atmosphere is warmed by this heat emission.
4. Greenhouse Gases: In the atmosphere of the Earth, greenhouse gases including carbon dioxide, methane, and water vapour interact with infrared radiation. These gases contain molecules that can both absorb and emit infrared light.
5. Heat Trapping: Some of the outgoing infrared light that would otherwise escape into space is captured by the greenhouse gases. As a substitute, they reflect some of the heat energy back towards the surface of the Earth, essentially keeping it there.
6. Warming Effect: The lower atmosphere and the Earth's surface are warmed by this re-emission of heat to the surface. The outcome is that greenhouse gases are present, which raises the average temperature of the earth.

A stable and habitable climate on Earth depends on the natural greenhouse effect, but over the past century, human activities have greatly increased this impact. The amount of greenhouse gases in the atmosphere has increased as a result of the burning of fossil fuels, deforestation, industrial operations, and other activities, especially carbon dioxide. This heightened greenhouse effect is frequently referred to as "climate change" or "anthropogenic global warming."Global temperatures are rising, ice caps and glaciers are melting, sea levels are rising, heatwaves are occurring more frequently and are more extreme, weather patterns are changing, and ecosystems and biodiversity are being disrupted as a result of this intensified greenhouse effect.

III. GREENHOUSE GASES: A HAZARD

When greenhouse gas concentrations exceed safe levels, a phenomena known as global warming or climate change occurs, endangering the temperature and ecosystems of the Earth. The natural greenhouse effect, which keeps the Earth's temperature within a range suitable for life, is greatly aided by these gases. However, because to human activities like the burning of fossil fuels, deforestation, and industrial operations, the amount of greenhouse gases in the atmosphere has considerably increased, upsetting this delicate balance. The atmospheric buildup of greenhouse gases intensifies the natural greenhouse effect, which raises the planet's average temperature. Scientists refer to this increased greenhouse effect as anthropogenic global warming because human activity is the primary cause of it.

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Following are some of the risks linked to greenhouse gases and global warming:

- Rising Global Temperatures: The greater greenhouse effect has led to a steady rise in the planet's average temperature. Multiple negative effects of this warming trend include more frequent and severe heatwaves.
- Ice Caps and Glaciers Melting: Polar ice caps and glaciers melt more quickly as a result of higher temperatures. Sea levels rise as a result, posing serious hazards to coastal areas and low-lying island countries.
- Extreme weather events: phenomena, such as hurricanes, cyclones, droughts, and heavy rains, which can have catastrophic effects on communities and ecosystems, are associated with increased intensity and frequency due to global warming.
- Ecosystem disruption: Variations in temperature and weather patterns have the potential to alter species ranges, migratory routes, and ecological interactions. Ecosystem imbalances and biodiversity loss may result from this disturbance.
- Ocean acidification: it is caused by the world's seas absorbing too much carbon dioxide. This has a detrimental effect on marine life, especially corals and shellfish, which rely on calcium carbonate to develop their structures.
- Threats to Human Health: As a result of shifting weather patterns that favour disease vectors, global warming could worsen heat-related illnesses and promote the spread of vector-borne illnesses.

A swift and coordinated response is needed to the threat posed by greenhouse gasesand global warming. By switching to renewable energy sources, increasing energy efficiency, and implementing sustainable land-use practises, mitigation measures seek to lower greenhouse gas emissions. In order to increase resilience and get ready for how climate change may affect vulnerable communities and ecosystems, adaption techniques are also crucial.To ensure a sustainable and safe future for future generations, policymakers, industry, people, and international organisations must work together to reduce greenhouse gas emissions and stop global warming.

IV. CAUSES OF GLOBAL WARMING

Human activities that produce greenhouse gases into the atmosphere are the primary cause of global warming. The planet's average surface temperature rises as a result of these gases' ability to retain solar heat. While some natural processes also contribute to global warming, human-caused activities are mostly responsible for the current warming trend. Global warming's primary causes include:

- Burning of Fossil Fuels: The main cause of greenhouse gas emissions caused by humans is the burning of fossil fuels (coal, oil, and natural gas) for electricity production, transportation, and industrial activities. Carbon dioxide (CO2) is emitted into the atmosphere when fossil fuels are burned, which raises its concentration and strengthens the greenhouse effect.
- Deforestation: The reduction in the number of trees that can absorb carbon dioxide through photosynthesis results from the destruction of forests for logging, agriculture, and urbanisation. As a carbon sink, trees take CO2 out of the atmosphere. Deforestation increases carbon dioxide levels and decreases the ability of the Earth to counteract the greenhouse effect.
- Agriculture: There are large sources of greenhouse gas emissions from agricultural practises, mainly from the raising of cattle and the growing of rice. Methane (CH4) is a gas that is produced during the digestion of animals like cows and sheep as well as during the anaerobic decomposition of organic materials in flooded fields seen in rice paddies.
- Industrial processes: Some industrial processes, including cement manufacture, chemical production, and the usage of refrigerants, release greenhouse gases into the atmosphere, including carbon dioxide, methane, and fluorinated gases.

Changes in land use can release carbon that has been stored in the soil and vegetation. Examples of this include turning forests into farmland or urban areas. Changes in land use have an impact on regional warming and local climatic patterns.

- Garbage Management: Methane emissions are produced when organic garbage decomposes in landfills. Increased greenhouse gas emissions from landfills might result from improper waste management procedures.

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- Mining and extraction: During the extraction and transportation processes, operations like coal mining and oil extraction may release methane and other greenhouse gases into the environment.

Rising sea levels, more frequent and severe extreme weather events, changes to ecosystems and biodiversity, and effects on agriculture and water resources are just a few of the far-reaching effects of global warming.Reduced greenhouse gas emissions and a shift to more sustainable practises are needed to combat global warming. The use of renewable energy sources, increased energy efficiency, the preservation of forests, the promotion of sustainable land use, and the implementation of laws and international agreements are all examples of mitigation techniques. Societies may fight to protect the planet's climate and provide a sustainable future for future generations by resolutely addressing the causes of global warming.

V. GLOBAL WARMING:THE EFFECTS

The atmosphere's greenhouse gas emissions from human activities, which are the primary source of global warming, have wide-ranging and substantial consequences on the temperature and environment of the planet. The repercussions on ecosystems, human communities, and the planet as a whole are significant. Here is a thorough description of how global warming affects the environment:

1. Rising Temperatures: The planet's average surface temperature rises as a result of global warming. This increase in temperature has the potential to lead to more frequent and severe heatwaves, especially in urban areas, endangering the health of vulnerable populations and having an adverse effect on agriculture.
2. Melting Ice and Increasing Sea Levels: Polar ice caps, glaciers, and ice sheets all melt more quickly as a result of the Earth's atmosphere becoming warmer. Sea levels increase as a result, endangering coastal areas and low-lying island countries. Among the effects of rising sea levels are coastal erosion, flooding, and an increase in the frequency of coastal flooding.
3. Extreme weather occurrences: Increasing frequency and severity of extreme weather events are linked to global warming. These occurrences include severe storms, hurricanes, and cyclones as well as torrential downpours and protracted droughts. Such occurrences may have catastrophic effects on infrastructure, agriculture, water resources, and communities.
4. Ocean acidification is brought on by the world's oceans absorbing too much carbon dioxide. The marine ecosystems are harmed by this phenomena, particularly the plankton, corals, and shellfish that depend on calcium carbonate to form their shells and skeletons.
5. Ecosystem disruption: Variations in temperature and weather patterns can change the distribution and behaviour of species as well as ecosystems. In reaction to these changes, certain species would find it difficult to adapt or move, which might cause ecosystem imbalances and perhaps the extinction of some species.
6. Loss of Biodiversity: As a result of climate change and rising temperatures, many species are at risk of extinction, posing a threat to biodiversity. Rapid change may be too much for certain species to handle, which would limit biodiversity and disturb the ecological balance.
7. Food and water security: The availability of water and the production of food may be impacted by global warming. Crop-growing regions may vary as a result of changes in temperature and precipitation patterns, which can have an impact on agricultural production. A further stress on water supplies may be caused by changed rainfall patterns, which may lead to water scarcity in some areas.
8. Human Health: Heat-related illnesses, an increase in the prevalence of infectious diseases, and deteriorating air quality due to greater levels of air pollutants are all effects of global warming on human health. Particularly at risk are vulnerable groups like the elderly and young.
9. Conflict and Migration: As global warming affects communities and resources, it may cause migration and population displacement. Conflicts over limited resources could develop from these tensions in the social, economic, and political spheres.

Action on numerous fronts that is urgent and comprehensive is needed to combat the effects of global warming. To slow the rate of global warming, mitigation measures are essential. These include cutting greenhouse gas emissions, switching to renewable energy sources, increasing energy efficiency, and supporting sustainable land use. To lessen the effects on vulnerable communities and ecosystems, adaptation strategies are crucial. These include creating resilient

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infrastructure, safeguarding ecosystems, and putting climate-resilient agriculture practises in place. To lessen the effects of global warming and ensure a sustainable future for all, governments, businesses, organisations, and people must work together internationally.

VI. EFFECTS ON LIVING BEINGS

Humans, as well as plants, animals, and other living things, are all significantly impacted by global warming. These effects are intensifying and posing serious problems for ecosystems and biodiversity as the average temperature of the Earth rises due to the increased concentration of greenhouse gases in the atmosphere. Here is a thorough explanation of how the effects of global warming on living things:

1. Impact on Wildlife and Biodiversity: Changing ecosystems and changing the natural habitats of different plant and animal species are two effects of rising temperatures. Some species might not be able to change their distributions or migrate quickly enough to keep up with the changing climate, which could result in population losses. As a result, there may be a greater threat of extinction for some species, which would limit biodiversity.
2. Modified Migration Patterns: Many animal species depend on climatic factors and seasonal cues to control their migration patterns. These migratory behaviours may be disrupted by changes in the timing and length of seasons brought on by global warming. Some species may arrive too early or too late to their breeding or feeding grounds, compromising their capacity to obtain enough food and adequate nesting sites.
3. Coral Bleaching is the process of coral reefs expelling the symbiotic algae living inside their tissues as a result of warmer ocean temperatures. The coral loses its vivid colours and becomes less resilient to stress and disease as a result of the loss of algae. The destruction of entire coral reefs due to protracted coral bleaching events poses a serious danger to marine biodiversity.
4. Reproductive Cycle Disruption: A variety of plant and animal species' reproductive cycles can be hampered by global warming. The timing of pollination and seed dispersal for certain animals, for instance, may be thrown off by earlier springs in some regions because by greater temperatures.
5. Threats to Agriculture: Crop yields and agricultural productivity may be affected by changes in temperature and precipitation patterns. There could be a greater likelihood of droughts, heatwaves, or floods in some areas, which would diminish crop production and cause a food shortage. Warmer temperatures may also favour the growth of pests and illnesses, further threatening agricultural productivity.
6. Spread of Vector-Borne Diseases: Warmer weather may cause disease-carrying insects like ticks and mosquitoes to spread their geographic range. As a result, illnesses like Lyme disease, malaria, and dengue fever could spread to previously unaffected areas and endanger the health of the local people.
7. Health Risks Associated With Heat: Global warming makes heatwaves more frequent and intense, which can be very harmful to people's health. Increases in heat-related diseases and deaths are possible, particularly in vulnerable groups like the elderly, small children, and people with underlying medical issues.
8. Water Scarcity: In some areas, changes in precipitation patterns can cause a water shortage. This may have an impact on both people and wildlife, resulting in competition for scarce water supplies and possibly conflicts over water access.

It is imperative to take immediate action to reduce greenhouse gas emissions and put adaptation plans into place if we are to address the impacts of global warming on living things. The rate of global warming can be slowed down by reducing emissions through the use of renewable energy, increased energy efficiency, and sustainable land-use techniques. Additionally, actions like ecosystem preservation and restoration, the preservation of biodiversity hotspots, and the promotion of climate-resilient agricultural and urban design practises can improve the capacity of living things to adapt to climate change. To protect the welfare of all living things in the face of global warming, governments, communities, and individuals must work together on a global scale.

VII. OTHER SOLUTIONS

There are many additional tactics and options to reduce global warming in addition to reducing greenhouse gas emissions. These strategies cover a variety of techniques and tools that can be applied locally, nationally, and internationally. Here are some important answers along with thorough justifications:

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1. Reforestation and afforestation: Reforestation entails planting trees in previously wooded areas that have been cleared for development or other reasons. On the other hand, afforestation means creating woods where none previously existed. Both methods aid in removing carbon dioxide from the atmosphere since trees use photosynthesis to take in CO2 and store it as carbon in their biomass and soils. Enhancing carbon sinks and fostering biodiversity through reforestation and afforestation programmes is essential to the overall fight against global warming.
2. Sustainable Agriculture: The agriculture sector's greenhouse gas emissions can be greatly reduced by putting sustainable farming practises into practise. To reduce methane emissions from livestock through better feeding and waste management, and to promote agroforestry, which mixes growing trees with agricultural crops, these practises include precision farming techniques. Sustainable agriculture improves soil health, water conservation, and food security in addition to assisting in the fight against global warming.
3. Renewable Energy: One of the most important ways to cut greenhouse gas emissions is to switch from fossil fuels to renewable energy sources including solar, wind, hydro, and geothermal energy. Renewable energy technologies have the potential to replace carbon-intensive energy sources by producing power while emitting no greenhouse gases. Promoting the widespread use of renewable energy can dramatically reduce the sector's carbon footprint and slow global warming.
4. Energy Efficiency: Increasing energy efficiency can result in significant reductions in greenhouse gas emissions across a variety of sectors, including buildings, transportation, and businesses. Advanced building insulation, energy-efficient appliances, and LED lighting are a few examples of technologies and practises that can reduce energy use and the associated carbon emissions. To reduce global warming, policies and infrastructure development must place a strong emphasis on energy efficiency.
5. Carbon Capture and Storage (CCS): CCS systems collect carbon dioxide emissions from power plants and industrial activities and store them below ground in geological formations. CCS aids in reducing greenhouse gas emissions by stopping CO2 from entering the atmosphere. Despite being in its infancy and facing difficulties in scaling up, CCS shows potential as a transitional technology to lower emissions from difficult to abate sectors.
6. Circular Economy: Encouraging a circular economy entails cutting waste, recycling things at the end of their useful lives, and reusing materials. With this strategy, the demand for resource extraction is minimised, and greenhouse gas emissions related to the creation of new materials are decreased. Society may reduce its carbon footprint and preserve natural resources by implementing the circular economy concepts.
7. Climate-Friendly Transportation: Making the switch to more environmentally friendly modes of transportation, such as electric cars (EVs), public transportation, and active transportation (biking and walking), is crucial to cutting emissions from the transportation sector. A considerable opportunity to reduce emissions from the use of fossil fuel-powered vehicles is provided by EVs in particular. Additionally, putting money into effective public transport can cut back on personal vehicle use and associated emissions.
8. International cooperation and climate policy: Addressing global warming requires strong international agreements, rules, and policies related to climate change. Governments can set emission reduction goals, implement carbon pricing mechanisms, and offer incentives for eco-friendly procedures and innovations. To solve global issues like climate change, countries must cooperate internationally in order to reach agreed-upon emission reduction targets and assist regions that are vulnerable to the effects of climate change.

Raising public understanding of global warming, its effects, and potential remedies is crucial to winning support for taking action on the issue. Through education, people may become climate change advocates, adopt sustainable lifestyles, and support businesses and organisations that place a high priority on environmental sustainability. Public education programmes can also instill a sense of accountability and motivate group action to combat global warming.

VIII. CONCLUSION

In conclusion, global warming is a serious environmental issue with a variety of ramifications for human cultures, ecosystems, and the temperature of the planet. Human actions, especially the emission of greenhouse gases into the atmosphere that amplify the effect of the natural greenhouse, are the main cause of it. With rising temperatures, melting

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ice caps, an increase in extreme weather events, ecosystem disruptions, and threats to biodiversity, the effects of global warming are becoming more and more obvious. An extensive investigation of the causes, mechanisms, and effects of global warming has been given in this review paper. The substantial role that greenhouse gases like carbon dioxide and methane play in strengthening the greenhouse effect and causing the global warming trend has been brought to light. The implications of global warming on different facets of the environment, such as wildlife, agriculture, human health, and water supplies, were also covered in the essay. The review article also examined potential global warming mitigation tactics and countermeasures. These solutions cover a wide range of activities, such as supporting sustainable agriculture and switching to renewable energy sources, as well as reforestation, energy efficiency upgrades, and international collaboration on climate legislation. This analysis makes it clear that governments, businesses, organisations, and people all around the world must take prompt and coordinated action to combat global warming. In addition to being a moral obligation to safeguard the welfare of present and future generations, reducing global warming is a necessity for the environment. Societies can strive towards reducing greenhouse gas emissions, boosting resilience to climate impacts, and promoting a sustainable future by putting into practise a combination of mitigation and adaptation measures. In order to create a sense of urgency and mobilise support for climate action, public awareness and education are essential. Overall, this review study highlights the pressing nature and complexity of the problem of global warming. It highlights the significance of international cooperation in solving this global challenge and the necessity for comprehensive and coordinated actions to combat global warming. We can only work to reduce global warming and maintain a habitable planet for future generations via consistent commitment, creativity, and group effort.

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