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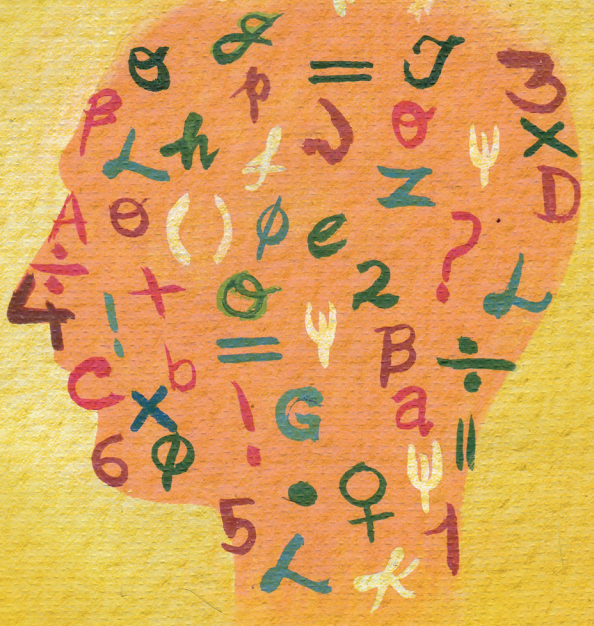

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Impact of Eco-Club Awareness Programme In Present Environment

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FOREWORD

It is indeed a real privilege for me to take foreword The Edited Book, Pragyakosh 2023. At the outset, I congratulate the editorial team of Madhyamgram B.Ed. College for their hard work to bring out this academic piece. I also express my deep gratitude to the esteemed authors who have done serious research with sleepless nights in search of truths and presenting them in this short writings.Writers have presented their thoughts regarding environmental issues in this 1st edition of the edited book PRAGYAKOSH. This is intended to ensure the quality of imparting knowledge to students, as the research done by the teachers directly or indirectly benefits the community in general and students in particular. Also creating such an academic research book by an educational institution is essential to provide a platform for teachers and research scholars to share their writing skills as well as their research findings. I wish the edited book a grand success.

Editorial Notes

Environmental education is an urgent need of the time considering the global degradation of environmental condition that leads to threatening of not only the plants and species in the earth but also the existence of human beings. In this context it is often said in the international circle that one should learn to imbibe the notions of "Thinking Globally and Acting Locally" to address various global as well as regional ecological concerns. Suitable environment is essential for the existence of all the living beings. To educate and protect the environment is a work of virtue by which man can make his present as well as future beautiful and happy. So every citizen of the world has to develop sensitivity towards the environmental issues. Thus various stakeholders— such as students, teachers, teacher educators, researchers, dealing with environmental issues in higher education institutes need to work together to come out from environmental crisis.

All the contents written in this edited book are directed toward the simple and supreme motive that is live in harmony with nature. The content covered by this edited book are highlighted towards the major issues of environment such as global warming, ozone hole, biodegradable plastics, bio significance of plantation, eco-club activities, sustainable development, non-conventional energy sources and promoting environmental values and ethics. Hence in this edited book an attempt has been made to bring awareness among students and teachers about environmental problems along with some suggestions for preventive measures. Thus the aim of the edited book is to make the people in the society to be aware, knowledgeable and inculcate positive attitudes towards protection of environment and make them skilled to solve environmental problems so as to participate in the activities undertaken for the protection of environment.

Thus, this edited book entitled "Pragyakosh" makes a modest attempt to equip the readers with the necessary inputs that can mould them into better and effective leaders of the Environmental education. This edited book contains series of articles presented as chapters by the teachers and students across the state. We extend our thanks to the authors and publishers of books for their valuable contribution. It is an imperative task for us to convey thanks to all who helped us with their immense support to fructify this academic initiative. We also wish to convey our heartfelt thanks and sincere gratitude to Dr. Rupkumar Panda, Principal of Madhyamgram B.Ed College, for his constant support and encouragement. Last but not the least , our thanks and benevolence to the respected members of the managing committee of Madhyamgram B.Ed College, without whose encouragement and valuable inputs the book would not have seen its publication.

While we have tried to make this book the best for readers and suggestions for improvement are therefore cordially invited. We fervently hope that this edited book will be widely read and appreciated by the readers.

Editors: Mr. Sanjoy Dutta, Smt. Keya Samanta & Smt. Rumpa Mukherjee

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Table of Content

Importance of Literature in the Evolution of Environment

Adrija Ghosh, Trainee-teacher, Semester-II, Department of B.Ed.,
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Abstract: In recent time, we came across many environmental awareness campaigns and movements. These campaigns are organized by few groups of people, known as environmentalists who educate the entire human kind about the environmental hazards. He have noticed how Greta Thunberg, a Swedish activist campaigned against the climate change and global warming. We often come across few terms like 'environment', 'climate change', 'melting of glaciers'. Here, we will first talk about the most basic and the most fundamental question, "what is environment"? In simple term, we might say, everything around is environment. It comprises of living and non -living beings which co-exists in the same surrounding. It is said that the pen is the most powerful weapon. We have come across in our past that whenever mankind had to go through any struggle, one of the most important weapons to fight against the struggle was a pen. This pen can create a huge awareness among the mass. Similarly, in this case, we have observed a blend of literature and environment. Ecocriticism is a study of literature which is based on environment. This new theory is the analysis of life and the connection of literature with environment. Most of the authors have beautifully portrayed the strong connection between literature and nature. Globalization has been the most dominant reason behind environmental destruction and so nature has been a real concern for most of the literary person.

Keywords*:* Environment, Literature, Ecocriticism, Environmental Disasters

Introduction: The environment is the cumulative of the biological and the socioeconomic factors that makes up the surroundings of the human. This environment comprises of many living and non- living which sustain in the same surrounding. The environment is a state in which adequate amount of air, water, food and light is present for proper human sustenance. Literature plays a crucial role in representing our environment. Literature is also the reflection of our modern day society. It is because of these literary works we acquire the knowledge which persisted mostly through the pre historic era and events from centuries ago. Previously, the environment was pure and green because of less amount of pollution. There were natural air to breathe, clean water to drink from springs and reservoirs. As a result, not only humans but also birds and animals have enjoyed a long time span. The

pollution has currently reached the maximum level. It has triggered our ecosystem in such a way that now nature has started taking revenge on us. If this continues then, in no time the whole ecosystem will disappear.

Purpose of the Study and Method: This chapter is qualitative in nature, through reading the text, various journals and papers are studied. In this study we will study how nature and literature have blended together to give rise to a newsegment of theoretical study known as the ecocriticism. We will talk about different texts present in literature in which environment is the main concern. This paper will be studied on the theory of ecocriticism.

Analysis and Discussion:

Ecocriticism as a Field of Study: Ecocrticism is a study associated with literature and environment. Basically, it is the analysis of life and its connection between literature and environment. In the year, 1990s, ecology began to strengthen its origin. A minimal line of differentiation exists between ecocriticism and literature. Ecocriticism essentially focuses on the relationship between individual and surrounding environment. Ecocriticism has originated from ecology, which is the analysis of the interaction between various species and their natural environment, while critique is the relationship between literature and the environment. There are many literary works that portrays the nature as a nurturer, who cares about her children. She also punishes her children if they engage in any mischievous act. There are many writers like Ruskin Bon, Robert Frost, Anita Desai, Amitava Ghosh and many more who beautifully painted the picture of nature through their work.

Ecocriticism is an area of literary criticism that has been explored by many writers and researches as an interdisciplinary review of literature and environment. Under the umbrella of ecocriticism, there are many branches of various other studies like science, psychology, political science and history. This can also be described as the humanistic approach theory of nature. Ecocriticism is not just the implementation of concept of ecology and its principles but rather the analysis of literature and conceptual approach to the interrelationship of nature, culture and often even supernatural elements in nature.

Literature and Ecocriticism: In recent times, environmental analysis is becoming a cause of concern for many departments and discipline. For a literary critique, researching on the visions of writers that have explored the special connection between man and nature is a complex study. A huge component in the global destruction of environment is colonialism. The evolution of the world's social and

cultural environment has drastically transformed human's ideology towards nature in the works of literature. Environmental studies have much larger significance in the world literature. Environmental studies have been represented through nature, gender construction, tourism, tradition, etc, across many literary phrases.

Several Indian literary texts have beautifully displayed the theme of crocriticism and environmental concerns. In this paper we shall discuss about few authors like Ruskin Bond, Amitava Ghosh and Anita Desai.

When we visualize the word 'nature', we think of a green meadow where the sun rays are falling on the luscious leaves of the plant. The birds are flying up in the blue sky. This reminds us of Wordsworth's poem, 'Tintern Abbey'. This idea of nature as a nurturer who develops a human personality is evident in the poems of Wordsworth. The urbanization has brought down the destruction of humankind. If we consider nature as a separate entity and mistreat nature for our selfish need; then we will have to face the dangerous consequences of nature.

Ruskin Bond is born on 19th May, 1934. He is an Indian author of British origin. Most of his works manifests his sense of love towards nature and how human development is dependent on nature. We are aware of our dependency on nature, but we tend to ignore it. His novel, *The Room on the Roof* describes how nature fostered an orphan boy. He beautifully paints how the nature changes its weather according to the mood of the boy. 'The afternoon was warm and lazy, usually so for spring; very quiet, as though resting in the interval between spring and the coming summer. There was no sign of the missionary's wife or the sweeper boy when Rusty returned, but Mr. Harrison's car stood in the driveway of the house.' Ruskin wonderfully compared to the season of spring with his new sense of freedom that he witnessed in the past few days.

In *The Book of Nature,* Bond depicted how his childhood days were blissful when he used to live with his grandparents. The garden where he used to spend most of the time was compared with the Garden of Eden, where days were pleasant and nights were glittery. He shifted to Delhi to build up his career. He describes the flora and fauna of the Eastern and the Western Himalayas. The traditional form of life was endangered due to the utilitarian view of urbanization. Nature is said to be a preacher. In different religious book, we come across that nature illuminates us by giving lessons on morals and ethics. Through the novel, the readers are taken to an enlightened journey of Ruskin's life, from his childhood to his adulthood. This journey can be compared to Blake's journey from innocence to experience.

Throughout the novel, the readers observe how nature constructs the personality of a child. Nature taught him various emotions like kindness, compassion and love for one another. This resulted in Ruskin's devotion and gratefulness towards his Mother Nature.

Amitava Ghosh is known for the historical fiction. His book, *The Hungry Tide* narrates the struggle of the people of Sundarban Island. He also depicts the controversial Marichjhapi massacre of 1979. Sundarbans is a biosphere reserve. It has the largest mangrove forest in the world. The government announced 'Project Tiger' to save the tigers from extinction. This project tiger had no regard for the people residing in Sundarbans. The main stram writers failed to showcase the problems faced by the people of Sundarbans. Through the character of Kanai Dutta, a translator, Ghosh could paint the picture of the difficulties that are faced by the people residing there.

> 'Kanai, let me tell you something. Nine years ago, a tiger killed a young girl, right here in Lusibari. They found later that it had swum all the way across the Bidya'smohona and back again. Do you know how far that is?'
>
> 'No.'
>
> 'Six kilometres, each way. And that's not unusual: they've been known to swim as much as thirteen kilometers at a stretch. So don't for a moment imagine that the water will give you any safety. Boats and bhotbhotis are attacked all the time- even out in midstream. It happens several times each year.'(Ghosh)

The human settlement had to adapt to the nature. Sundarbans is a tidal country, so the people have to reconcile to the various natural calamities like flood, cyclone and if nothing then a tiger attack. In an article by *Hindusthan Times* written on 8th May, 2022 proclaimed that the government gives bequest to the person who loses their life due to a tiger attack. The people need to take permission before hand from the government to enter the restricted area. This procedure takes a lot of time. The poor people need to feed their children and so they can't wait for so long to get the permission from the government. The forest officers don't even keep records of the people who died because of illegal entrants. The lives of the people in Sundarbans were difficult. People have to struggle to a great extent just to sustain the basic necessity of their life. There is a constant rift between nature and human civilization, which brings us to the question; ultimately whose land is it? Is it the land of tigers or the land of the people?

In Anita Desai's *Cry, the Peacock* (1963), the relation between nature and man

is vital. In this novel, the undiscovered female psychology is explored by natural imagery. In order to reflect the morale of Maya, the female protagonist of the novel, the author used myriad photographs of botanical, zoological, meteorological and color- representation acts. The symbolism of nature scrutinize Maya's internal mind, inspect her mindset and unfolded her warped world. Unhappy and sorrowful pictures were used. They depicted the fragile temperament of Maya that drove her demented towards the end of the book.

The animal images used in the novel, illustrated the alienation motif that contributed to the motive of death, as the primary signs of the psychic illness of Maya "the body lay rotting in the sun all day." (Desai) It could not be brought back to the deck because the waft of dead flesh was overpowering heat in the month of April. The crows encircled around the corpse and were trying to eat the flesh, entrails and the teeth. Her infertility was one of the main reasons behind her neurotic behavior. Gautama forced Maya to either opt for death or life, which brought an end to her mental instability. She also perceived that the idea of killing her husband, Gautama, who was the primary reason behind her mental illness. The forecast played on her subconscious and finally killed her husband, Gautama. This brings me back to Shakespeare's *Macbeth*, where the witches played with the mind of Macbeth and he stabbed King Duncan with a dagger. The crime changed the destiny of Macbeth forever, leading to his horrifying death by Macduff.(Shakespeare)

Conclusion: Literature has indeed built a bridge between human and the world. Literature analysis gives importance to the research and review of environmental principles. Academic and educated people are forced to ponder it quiet seriously by the existing disparity of the environment and its extreme consequences. Several writers have been conscious about the environment. They now encode a message which delivers to the intellect of the people via their books. The successful and essential tasks of literature are to disseminate the awareness and to concentrate on the practices with the actual and concrete examples.

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Reviving the Nature: India's Leadership Role in Tackling Global Warming

Anik Das, Semester-II, Department of B.Ed., Madhyamgram B.Ed College

Abstract: Burning fossil fuels, cutting down forests and farming livestock are increasingly influencing the climate and the earth›s Global warmingtemperature. This adds enormous amounts of greenhouse gases to those naturally occurring in the atmosphere, increasing the greenhouse effect and global warming. India is the reason for 0.08 degrees Celsius of warming from the 1850s through 2021. India's emissions of carbon dioxide (CO2), methane (CH4) and nitrous oxide (N2O) from 1851-2021 have resulted in 0.04°C, 0.03°C and 0.006°C of global warming over pre-industrial levels, respectively and so as India climbed on 5th position from 10th since 2005. India was the third largest emitter of carbon dioxide by volume in 2020, although its per capita emissions were lower than the world average, according to the UN's Emissions Gap Report (EGR). It becomes important to reduce the carbon footprint as much as possible to reduce global warming. Innovative initiatives are taken in different sectors to get rid from this crisis. The National Action Plan on Climate Change (NAPCC) has released and implemented by India. It has targeted to reach Net zero is where a country is not adding to the overall amount of greenhouse gases in the atmosphere.

Keywords: Global Warming, Emissions Gap Report, Carbon footprint, National Action Plan on Climate Change (NAPCC), Net zero.

Introduction: India has a distinct geographical entity (Indo-Gangetic Plains, Central Highlands and Deccan Plateau, Thar Desert, Himalaya and Northeast Mountain Ranges, East Coast, West Coast, and Bordering seas and islands) with significant variations in climate and regional and local weather conditions across the country. Now India isthe largest populous country in the world and has a unique geo-climatic profile. It is one of the most disaster-prone countries in the world, *"where 59% of the land is vulnerable to earthquakes, 8.5% of the land is vulnerable to cyclonic storms and 5% of the land is susceptible to river basin floods."* Moreover, the majority of the population is dependent on climate-sensitive sectors like agriculture, forestry and coastal ecosystems for livelihoods.Climate-change-induced changes in extreme temperatures, heavy precipitation, cyclonic storms, retreating Himalayan glaciers and sea level rise, exacerbate India's vulnerability to a whole range of hydro meteorological hazards which are rising alarmingly, both in terms of their intensity and frequency, and decreasing in their predictability.

India emits about 3 gigatonnes (Gt) CO2eq of greenhouse gases each year; about two and a half tons per person, which is less than the world average. Temperatures in India have risen by 0.7 °C (1.3 °F) between 1901 and 2018, thereby changing the climate in India.

Currently, the global average temperature has already risen over 1 degree Celsius (°C) since the pre-industrial period, increasing at a rate of about 0.2 degrees Celsius per decade. At the current rate, the global average temperature rise is likely to exceed more than 1.5 °C by 2030, ten years earlier than it was projected by the IPCC (Intergovernmental Panel on Climate Change) AR5 in 2014. The latest IPCC report warned that a threshold of 1.5 °C will lead to serious and irreversible consequences for several centuries. Warming of 1°C is already causing widespread disruptions globally, in various sectors, including agriculture, human health, infrastructure, water management, biodiversity management, etc.International efforts to adequately address the detrimental impacts of climate change and the struggle of the international community to achieve concerted global momentum to address the issue have been ongoing for three decades under the UNFCCC. Since the beginning, the negotiations on climate change have been largely shaped by the divisions between and different perspectives of the Global North and the Global South. It has generally been recognised, based on observed trends, that the industrialised/ developed economies are primarily responsible for most of the accumulated global greenhouse gas emissions in the atmosphere since the industrial revolution, developed countries have significantly higher per capita emissions compared to developing, and that majority of future global carbon emissions are expected to originate from fast-growing developing economies, such as China and India. Given India's high population density, fast growing economy, and that it is the 3rd largest Greenhouse Gas emitter (after China and USA), India's participation in climate change negotiations continues to have far-reaching implications for global cooperation on climate change. Indeed,India recognises that climate change is a significant global problem and an issue of great socio-economic and political importance. India has consistently played an active role in the negotiations and established itself as a coalition-builder and protector of the global south's interests.

Objectives of the Study: Objectives of the study are as follows:

- To reduce the emissions intensity of its GDP by 45 per cent by 2030, from the 2005 level.
- To achieve about 50 per cent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030, with the help of the transfer of technology and low-cost international finance including from the

Green Climate Fund (GCF).

- To create an additional carbon sink of 2.5 to 3 billion tonnes of CO2 equivalent through additional forest and tree cover by 2030.
- To put forward and propagate a healthy and sustainable way of living based on traditions and values of conservation and moderation, including through a mass movement for 'LIFE'– 'Lifestyle for Environment' as a key to combating climate change
- To adopt a climate friendly and a cleaner path than the one followed hitherto by others at corresponding level of economic development.
- To enhance investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management.

Theoretical Framework:

- **Impacts On The Natural Environment:**

Temperature and Weather Change- According to a 2020 report by the Ministry of Earth Sciences (MoES) of the Government of India entitled *"Assessment of Climate Change over the Indian Region"*, summer heat waves are projected to increase by three to four times in frequency and are expected to become longer in duration, by the end of the century compared to the 1976-2005 baseline period. In May 2022 severe heatwave was recorded in Pakistan and India & the temperature reached 51°C.(FIG 2.) Climate change makes such heatwaves 100 times more likely. Without climate change heatwaves, more severe that those who occurred in 2010 are expected to arrive 1 time in 312 years. Now they are expected to occur every 3 years.(FIG1.) The report also noted that India's summer monsoon precipitation from June to September has reduced by 6 per cent as compared to the period 1951 to 2015 and with a marked decline in rainfall over the Indo-Gangetic Plains and the Western Ghats. At the same time, more intense extreme wet spells during the summer monsoon season have been observed over central India. Specifically, the intensity of rainfall beyond 150 mm per day increased by about 75 per cent during 1950-2015 and the frequency of daily precipitation extremes also increased during this period. Overall, studies have shown that the monsoon pattern has become more erratic and extreme in recent years and the trend is expected to continue in the future. Changes in the monsoonal rainfall pattern are causing widespread devastation in India. In April 2022, Assam faced its worst flooding in decades which affected about 2,930 villages and 1.9 million people since the monsoon season began on 06 April 2022. India is also witnessing huge variations in the geographical distribution of monsoon rains. For instance, in 2022, during the first two months of the southwest monsoon

states of Telangana, Tamil Nadu, Gujarat, Dadra and Nagar Haveli, Daman and Diu received excess rainfall, while other states including Uttar Pradesh (58% deficit) Jharkhand (51% deficit), Bihar (45% deficit), West Bengal (29% deficit) and Kerala (19% deficit) received less rain than normal rainfall. Due to these variations of monsoon precipitation over India, the frequency and spatial extent of droughts have also increased significantly from 1951 to 2016. It is projected that many regions in the semi-arid and drought-prone central part of India are likely to experience a simultaneous decline in rainfall of the order of 5-25 per cent. A probable increase in drought intensity over the Indian region will severely affect food security, water security, agriculture production and livelihoods.

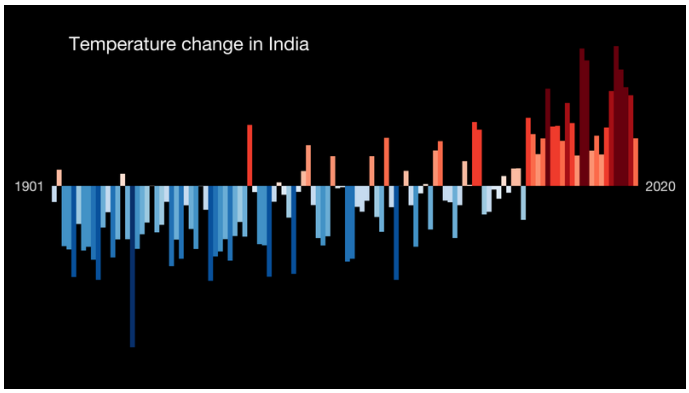


FIG 1.This bar chart is a visual representation of the change in temperature in the past 100+ years. Each stripe represents the temperature averaged over a year. The average temperature in 1971–2000 is set as the boundary between blue and red colors, and the color scale varies from ±2.6 standard deviations of the annual average temperatures between the years mentioned in the file name. Data source: Berkeley Earth.

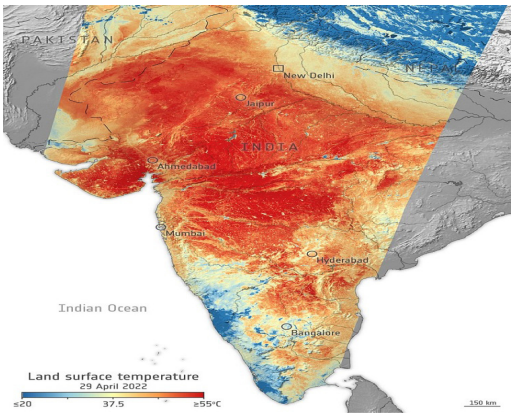


FIG 2. Satellite visualisation of the 2022 Indian heat wave.

Climate change is affecting the Indian Himalayan region as well. The mountain glaciers are melting at alarming rates due to rising temperature and changes in the precipitation pattern over the Hindu Kush Himalayan (HKH) region, threatening water and food security of local communities and the natural biodiversity in the region. Future warming in the HKH region is predicted to be between 2.6 and 4.6 °C by the end of the 21st century. At those levels of warming, we can expect complete collapse of the Himalayan glaciers and associated ecosystems.

Within India's maritime domain, the situation is equally serious. In just the period from 1951 to 2015, the Sea Surface Temperature (SST) of the tropical Indian Ocean has risen by 1°C on average, which is markedly higher than the global average SST warming of 0.7°C, over the same period.The warming of the ocean significantly impacts the entire marine food chain causing migration of hundreds of species - from microscopic phytoplankton to higher tropic species of fish - upon which India's own food security and economic security, as also the food and economic security of nations in India's neighbourhood, are increasingly dependent.

Sea Water Rising- Extreme weather events and sea-level rise are likely to continue to be major risk factors for coastal cities in India, where one-third of the population [which is nearly 170 million people] is located. The Indian coastline hosts several human agglomerations, ranging from fishing hamlets and villages to megacities. The rate of sea-level rise will continue to accelerate further with the rising global average temperature. Climate models based future projections suggest that many low-lying areas along India's densely populated coastline will be inundated by the middle of the 21st century. Even small fractions of sea level rise will aggravate the impacts of extreme weather events such as coastal flooding. In addition to their impacts on coastal human settlements, sea level rise and extreme weather events will also have adverse impacts on coastal ecosystems such as mangrove forests, seagrass, and coral reefs, that provide critical socio-economic services to coastal communities. Projected sea level rise could damage aquaculture industries, and exacerbate already declining fish productivity. Additionally, salt-water intrusion into agricultural lands and underground aquifers due to sea level also pose threats coastal food and water security. Meghalaya and other north eastern states are concerned that rising sea levels will submerge much of Bangladesh and spawn a refugee crisis. If severe climate changes occur, Bangladesh and parts of India that border it may lose vast tracts of coastal land.

Cyclonic Activity-India has been witnessing a sharp surge in extreme cyclonic

activity in recent years. High-intensity cyclones such as *Vayu (*2019), *Nisarga* (2020), *Tauktae* (2021) and Biparjoy (2023) struck western coast,while *Phailin* (2013), *Hudhud* (2014), *Ockhi*(2017), *Titli*(2018), *Matmo* (2019), *Fani*(2019), *Amphan*(2020),*Yaas*(2021),Gulaab(2021),Jawad(2021), Asani(2022), Sitrang(2022) and Mandous(2022), struck eastern coast have wreaked year-on-year havoc in India's coastal areas. These climate-change-induced hazards such as extreme heat, flooding, cyclonic storms and sea level rise are major threats to India's critical maritime infrastructure as well, such as energy infrastructure, transport infrastructure, national security infrastructure, etc. For instance, India has 12 major seaports (managed by the central governments) and over 200 non-major seaports (managed by state governments or private companies, that are critical nodes of India's maritime trade which accounts for nearly 95 per cent, by volume, and 70 per cent, by value, of India's overall trade.

Forest Issue-According to estimates, India roughly has more than 47,000 plant species, including 5,000-plus endemic plants, and 89,000 animal species. However, more than 10% of its flora and fauna are listed as threatened. Climate change has caused a significant loss of forests in India and can become an even bigger problem beating earlier predictions. Annual forest loss increased from 47 sq km to a peak of 2,503 sq km in 2017. However, there was a marginal decline in the year 2018 of around 1,900 sq km. The staggering loss of forest was a total of 20,472 sq km, which accounted for 7.34% of the forest cover. Importantly, the forest loss in the Northeast was four times more compared to other regions.

Forest type	Number of Grids	% Area	Mean Annual Rainfall (mm)	Change in Rainfall (mm)	Mean Temperature (◦C)	Change in Temperature (◦C)
Blue-Pine (Kali)	**311**	**0.88**	**763.0**	**223.5**	**10.5**	**3.0**
Chir Pine	**791**	**2.25**	**1373.4**	**437.4**	**17.1**	**2.8**

Mixed Coni-fers	**1071**	**3.04**	**930.1**	**375.9**	**9.3**	**3.0**
Hard-woods Coni-fers Mix	**296**	**0.84**	**1560.7**	**585.6**	**13.1**	**2.8**
Upland Hard-woods	**881**	**2.50**	**1523.8**	**476.9**	**16.4**	**2.7**
Teak	**3364**	**9.56**	**1314.6**	**353.0**	**26.1**	**2.9**
Sal	**4251**	**12.08**	**1435.2**	**348.3**	**24.6**	**2.7**
Bam-boo Forest	**567**	**1.61**	**2268.3**	**564.9**	**23.8**	**2.7**
Man-grove	**201**	**0.57**	**1734.3**	**280.8**	**26.6**	**2.5**
Miscel-laneous Forest	**22,339**	**63.48**	**1679.8**	**374.5**	**23.0**	**2.7**
West-ern Ghat Ever-green Forest	**163**	**0.46**	**3111.3**	**368.7**	**25.4**	**2.4**

Table 1. Annual Rainfall and Temperature Changes in Different Types of Forests of India Under B2 GHG Scenario for the Year 2085 {Source: FSI (2001)}

Recognising the numerous challenges posed by climate change, India has long expressed its concern over the national and global impacts of accelerating climate change and actively engaged in multilateral negotiations under the United Nations' Framework Convention on Climate Change (UNFCCC) in a positive, constructive, and forward-looking manner. India's positions at the UNFCCC negotiations have been supported by commensurate action at the national level in terms of ambitious climate change policies, a consistent push renewable energy capacity augmentation, preservation of natural ecosystems, and promotion of disaster risk reduction and climate change adaptation measures.

Greenhouse Gas Emissions -India become the world's third-largest emitter of greenhouse gases (GHGs), after China and the U.S.; in 2021, it emitted 3.9 billion metric tons of carbon dioxide equivalent ($GtCO_2e$), India emits about 3 gigatonnes (Gt) CO_2 of greenhouse gases each year; about two tons per person, which is half the world average. The country emits 7% ofglobal emissions. (Fig 3.)

As of 2019 these figures are quite uncertain, but a comprehensive greenhouse gas inventory is within reach. Cutting greenhouse gas emissions, and therefore air pollution in India, would have health benefits worth 4 to 5 times the cost, which would be the most cost-effective in the world.

The Paris Agreement commitments included a reduction of this intensity by 33–35% by 2030. India's annual emissions per person are less than the global average, and the UNEP forecasts that by 2030 they will be between 3 and 4 tonnes.

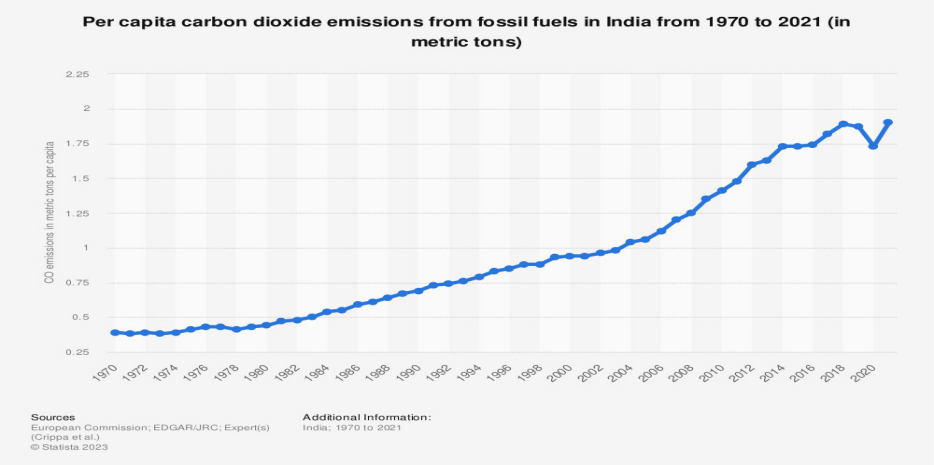


Fig 3. Per capita carbon dioxide (CO_2) emissions in India from 1970 to 2021(Source: European Commission)

❖ Evolution Of India's Position In Global Climate Change Negotiations Of The UNFCCC

The evolution of India's involvement and its position in global climate change negotiations can be seen in the context of three broad phases of the negotiations. The first phase concentrated on the creation of an international regime and climate agenda and to quantify Annex I parties' (developed countries) emission reduction targets from Rio in 1992 to Kyoto in 1997. India played an important role in representing the interests and perspectives of the developing and least developed countries and strongly advocated the principles of equity and 'common but differentiated responsibilities' rooted in the principles of equity and 'common but differentiated responsibilities' rooted in fact that developing countries have relatively negligible contributions to total cumulative emissions and have much lower per-capita emissions. In the second phase extending from 2000 to 2009, in the run-up to the Copenhagen Climate Summit to set a new climate regime post-2012, India pushed for climate finance, technology sharing, and establishment of an adaptation fund to accelerate climate action in developing countries and protect the least developed countries from the worst effects of climate change. The third phase, between Copenhagen in 2009 and Paris in 2015, marked India's transition towards a more flexible, cooperative and holistic approach. At the national level, India formulated its National Action Plan on Climate Change and submitted its Nationally Determined Contributions to the UNFCCC taking into account the principle of common but differentiated responsibilities and respective capabilities (CBDR- RC). At COP21 in Paris, India discussed its voluntary commitments and set its emission reduction targets. Post-2015, India has focussed on adopting measures to achieve its NDCs under the Paris Agreement of the UNFCCC. Each of these periods has been marked by India's strong political leadership in the negotiations.

Phase I: International Regime Creation and Agenda Setting: Rio to Kyoto Protocol

After the UNFCCC came into force in 1994, it convened the first Conference of the Parties (COP) in 1995 to stabilise GHG emissions to 1990 levels by the year 2000. India, along with other developing countries, voiced concerns about sharing the burden of climate actions by arguing that developed countries (or Annex I countries)

were responsible for the vast majority of the greenhouse gases accumulated in the atmosphere and that per capita emissions in developing countries are still relatively negligible. Scientific evidence unequivocally suggested that climate change is occurring due to the accumulated impact of GHGs in the atmosphere which were emitted by the developed countries during the last 200 years of fossil-fuel powered industrialisation. India took a strong position on the grounds of climate justice and fair responsibility. Consequently, 'the Berlin Mandate' wasadopted at COP 1 by the parties which agreed that developed countries would submit quantified emission reduction targets to strengthen global climate action and it was explicitly noted that developing countries would not introduce any new commitments.

India's position on climate change over time has been largely shaped by how it conceptualised its overall national interest and its contribution to causing climate change. Consequently, India strongly and consistently opposed any ideas of an international agreement that could deprive it of energy use, economic growth, and development, and hinder its core national interest and future development prospects. India emerged as one of the key brokers representing G77 and bringing other groupings of countries together at negotiation forums. India, therefore, in the initial phase, was among the pioneers who formulated important concepts such as "common but differentiated responsibilities" (CBDR) which became one of the core principles of the UNFCCC sought to bring out the diverse national interests and historical responsibilities of developed and developing countries. The differences in capabilities of nations to adapt to climate change impacts, due to differences in economies and different levels of vulnerability to climate change, were also put highlighted by India along with developing countries. This concern was addressed through the phrase 'respective capabilities' (RC) which has underpinned the climate change negotiations.

Phase II: Road to Copenhagen Summit

The Third Assessment Report (AR3) of the IPCC, published in 2001, laid out in detail the growing impacts of climate change and emphasised on the need for adaptation. India recognised that projected climate change would have an adverse impact on food production, water supply, natural ecosystems, coastal settlements, energy security, etc. However, the adaptive capacity of India and other developing countries that are relatively more vulnerable to the impacts of climate change was weak due to limited access to resources and lack of the required technology. India took a strong position and urged for the transfer of technology and financial support from

developed countries to developing countries to be adopted in any formal agreement on climate change. Further, India called for greater attention to adaptation funds at COP 7 in Marrakesh in 2001. 'Climate adaptation' was prioritised in the Marrakesh Accords and provisions were made for funding the implementation of capacity-building in and technology transfer todeveloping countries. It provided additional guidance to the Global Environment Facility.

The release of the IPCC's Fourth Assessment Report (AR4) in 2007 marked a turning point in India's approach to climate change. The report painted a grim picture for India with dire projections for the increase in frequency and intensity of extreme weather events and the adverse impacts of climatic changes on sectors such as agriculture, forestry and ecosystems, water resources, human health and industry, urban settlements and society. In response, at the domestic level, India's approach to national climate policy was debated extensively within its Parliament. There was a growing understanding among Indian policymakers and bureaucrats that the country's vulnerabilities to the impacts of climate change should be a strong motivation to ramp up climate action at the national level and advocate the same at the global level. At the same time, climate change was seen as an investment opportunity for the construction of resilient infrastructure and enhancing the country's energy security by reducing its dependence on coal and oil imports.In 2007, India participated in the G8 summit in Germany where climate change was one of the key agenda points.

Phase III: Building up to the Paris Agreement

At COP 16 in Cancun in 2010, *"***all** *parties recognised that climate change represent an urgent and potentially irreversible threat to human societies and the planet, and thus climate change needs to be urgently addressed by* **all** *Parties"*. Based on this stance, COP 17 at Durban, 2011, was a turning point in the global climate change negotiations. Parties at the COP 17 began negotiations for a post-2020 agreement in the form of a protocol, another legal document, or an agreed outcome with legal force under the Convention by COP 21 in 2015. The agreement would be *"applicable to all Parities"*, essentially eliminating the Kyoto Protocol's clear distinction between developed and developing countries. India's then Environment, Forest, and Climate Change Minister Jayanthi Natarajan in her statement in Durban 2011, stated that climate change is the most pressing and serious challenge for India as well.

India was perceived as one of the pivotal voices at COP 21; its position was in

alignment with its balanced approach to meet its climate change goals while pursuing its national interest i.e., to advance its economy and improve the standard of living of its people. India's commitment to ecologically sustainable economic development is indeed rooted in its age-old civilizational values of respecting nature, incorporating a sense of intergenerational equity and a common humanity. India signed the Paris Agreement in 2015 and ratified the agreement in October 2016 and positioned itself as a responsible global player in the fight against climate change.

Discussion on India's Climate Change Programme

- **India's Net Zero Pledge at Glasgow Climate Summit:** Placing climate change at the centre of its environmental policies, India took bold pledges in 2021 with Prime Minister Narendra Modi asserting at the crucial international climate summit COP 26 that it is the only country delivering in "letter and spirit" the commitments under the Paris Agreement.India led from the front on environmental issues this year, grabbing eyeballs across the world.

- At the 26th Conference of Parties (CoP26), Indian Prime Minister Narendra Modi declared a five-fold strategy — termed as the '*PANCHAMRITA*' — to achieve this feat. These five points include:

1. India will get its non-fossil energy capacity to 500 gigawatt (GW) by 2030
2. India will meet 50 per cent of its energy requirements from renewable energy by 2030
3. India will reduce the total projected carbon emissions by one billion tonnes from now onwards till 2030
4. By 2030, India will reduce the carbon intensity of its economy by less than 45 per cent
5. By the year 2070, India will achieve the target of Net Zero

- India also launched *'One Sun, One World, One Grid' (OSOWOG)* at the conference with an aim to harness solar energy wherever the sun is shining, ensuring that generated electricity flows to areas that need it most.

- **India's Domestic Climate Action Policies:** India has developed its policy response through missions and programmes to reduce its climate vulnerability. On 30th June 2008, the National Action Plan on Climate Change (NAPCC) was released. It is a national strategy of 8 sub-missions to help adapt

and magnify ecological sustainability in India's development path which are as follows;

1. **National Solar Mission:** The NAPCC aims to promote the development and use of solar energy for power generation and other uses, with the ultimate objective of making solar competitive with fossil-based energy options. It also includes the establishment of a solar research center, increased international collaboration on technology development, strengthening of domestic manufacturing capacity, and increased government funding and international support.
2. **National Mission for Enhanced Energy Efficiency:**The NAPCC recommends mandating specific energy consumption decreases in large energy-consuming industries, with a system for companies to trade energy-saving certificates, financing for public–private partnerships to reduce energy consumption through demand-side management programs in the municipal, buildings, and agricultural sectors, and energy incentives, including reduced taxes on energy-efficient appliances.
3. **National Mission on Sustainable Habitat:**The NAPCC also aims at promoting energy efficiency as a core component of urban planning by extending the existing Energy Conservation Building Code, strengthening the enforcement of automotive fuel economy standards, and using pricing measures to encourage the purchase of efficient vehicles and incentives for the use of public transportation. The NAPCC also emphasizes on waste management and recycling.
4. **National Water Mission:** The NAPCC sets a goal of a 20% improvement in water use efficiency through pricing and other measures to deal with water scarcity as a result of climate change.
5. **National Mission for Sustaining the Himalayan Ecosystem:** This particular mission sets the goal to prevent melting of the Himalayan glaciers and to protect biodiversity in the Himalayan region.
6. **Green India Mission:** The NAPCC also aims at afforestation of 6 million hectares of degraded forest lands and expanding forest cover from 23 to 33% of India's territory.

7. **National Mission for Sustainable Agriculture:** The NAPCC aims to support climate adaptation in agriculture through the development of climate-resilient crops, expansion of weather insurance mechanisms, and agricultural practices.
8. **National Mission on Strategic Knowledge for Climate Change:**To gain a better understanding of climate science, impacts, and challenges, the plan envisions a new Climate Science Research Fund, improved climate modelling, and increased international collaboration. It also encourages private sector initiatives to develop adaptation and mitigation technologies through venture capital funds.

The NAPCC also describes other ongoinginitiatives that are as follows:

1. **Power Generation:** The government is mandating the retirement of inefficient coal-fired power plants and supporting the research and development of Integrated Gasification Combined Cycle IGCC and supercritical technologies.

2. **Renewable Energy:** Under the Electricity Act 2003 and the National Tariff Policy 2006, the central and the state electricity regulatory commissions must purchase a certain percentage of grid-based power from renewable sources.

3. **Energy Efficiency:** Under the Energy Conservation Act 2001, large energy-consuming industries are required to undertake energy audits and an energy-labelling program for appliances has been introduced.

4. **Proposals for Health Sector:** The proposed program comprises two main components, namely provision of enhanced public health care services and assessment of increased burden of diseases due to climate change.

5. **Implementation:** Ministries with lead responsibility for each of the missions are directed to develop objectives, implementation strategies, timelines, and monitoring and evaluation criteria to be submitted to the Prime Minister's Council on Climate Change. The Council will also be responsible for periodically reviewing and reporting on each mission's progress. To be able to quantify progress, appropriate indicators and methodologies will be developed to assess

both avoided emissions and adaptation benefits.

India has already submitted its Long-Term Low Emission Development Strategy (LT-LEDS) document at COP 27 which is premised on two major pillars of climate justice and sustainable lifestyles. With this India has joined a list of 58 countries who have submitted their new or updated LT-LEDS.

Implication of the Study:

- Solar and Wind Power Installation- Several schemes have been launched under National Solar Mission to promote solar power installation in the country such as the Solar Park Scheme, VGF Schemes, CPSU Scheme, Defence Scheme, Canal bank & Canal top Scheme, Bundling Scheme, Grid Connected Solar Rooftop Scheme etc. As of June 2022, India's cumulative installed solar capacity was at around 57 GW.(Fig 4)
- ❖ Various policy measures have been undertaken, for e.g., the Solar Energy Corporation of India (SECI) was established as a major procurement agency.
- ❖ A renewable energy corridor was also launched to develop a dedicated transmission grid for areas with an abundance of sunlight or strong wind to create solar and wind energy.
- ❖ National Institute of Wind Energy (NIWE) was established by MNRE at Chennai as an autonomous R&D institution. NIWE has been actively involved in various national initiatives, such as Carbon Neutral Ladakh, Green Energy Islands (Andaman and Nicobar Islands, Lakshadweep), and the Renewable Energy Park in Kutch. NIWE has successfully completed the geo-technical investigations at Gulf Khambhat, off Gujarat coast and Gulf of Mannar, off Tamil Nadu coast, to estimate wind energy capacity. A Wind Turbine Test Station has been established at Kayathar, Tamil Nadu.
- ❖ Guidelines have been developed for creation of smart cities, building bye-laws have been amended for mandatory provision of roof top solar for new construction projects.Solar radiation monitoring stations have been set up across the country.

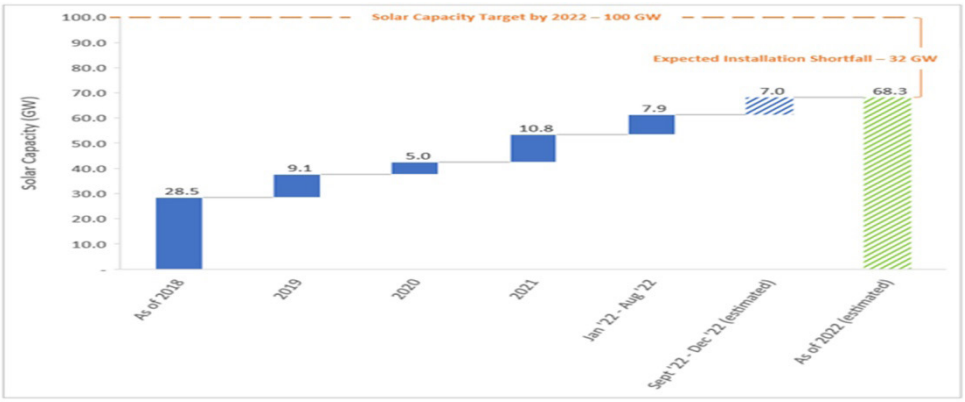
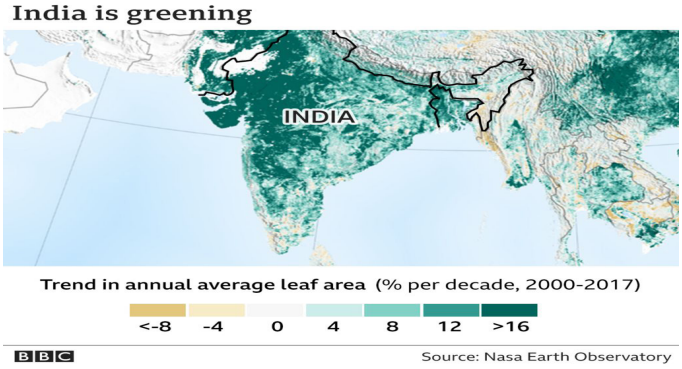


Fig 4. Progress in India's solar power capacity (source Economic Times)

- **Water Projects-** Ensured integrated water resource management to conserve water, minimise wastage, and ensure equitable distribution both across and within states.
  - Large-scale programmes such as the Neeranchal National Watershed Project and National Mission for Clean Ganga, have beenimplemented. A National River Conservation Directorate was established.
  - Pilot climate change risk assessments were conducted for 3 river sub-basins, Sutlej, Chambal, and Cauvery-Delta.
- **HIMALAYAN and COASTAL MONITORING-**Climate Change Cell on Himalayan Ecosystem has been created to regulate natural geological snow and glaciers, forest resources and plant diversity, Himalayan agriculture, micro flora and fauna, wildlife and animal population, and traditional knowledge systems.
  - A comprehensive Climate Vulnerability Assessment was conducted for the Himalayan Region.
  - Vulnerable coastal areas have been identified and demarcated under Coastal Regulation Zones (CRZ) to restrict the expansion of industriesand other disruptive activities. National Centre for Sustainable Coastal Management was established at Chennai, for protection, conservation, rehabilitation and management, and policy design of coastal regions and working in collaboration with 14 identified coastal research institutions.
  - Biodiversity conservation initiatives such as Mangroves for the Future (MFF) were adopted in coordination with the International Union for Conservation of Nature (IUCN) in India.
- **Green Growth-**India assumes the G20 Presidency on the 1st of December 2022 from Indonesia and convened the G20 Leaders' Summit for the first

time in the country in 2023 and this offers India an opportunity to take the lead in climate action and offer a low-carbon growth model that other economies could adopt.

- 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.
- 29 State Forest Department Agency projects totalling INR 38.20 billionhave been operating under the National Afforestation Programme to treat an area of 2.19 million ha. Under the Green India Mission, WorldBank-funded Ecosystems Service Improvement Project (ESIP) is being implemented in two states, namely Chhattisgarh and Madhya Pradesh.



Pic: India is Greening (Source: NASA)

➢ **Plans on Climate Response:** A network of 127 institutions called the Indian Network on Climate Change Assessment (INCCA) and severalClimate Change Centres such as the Indian Climate Research Programme (ICRP) have been created.

- Institutions under the Department of Science and Technology and Ministry of Earth Sciences such as Indian Institute of TropicalMeteorology (IITM), the National Physical Laboratory (NPL), the Indian Meteorological Department (IMD), the National Centre for Medium Range Weather Forecasting (NCMRWF), the National Centre for Antarctica and Ocean Research (NCAOR), the Central Leather ResearchInstitute (CLRI), National Institute of Oceanography (NIO), the National Environmental Engineering Research Institute (NEER), among others,contribute to research on climate change in India and formulate India's "national communications to the UNFCCC".

Several initiatives are also taken for Sustainable Agriculture, Health Improvements

and Waste Management to fulfil India's ambitious targets to combat against Global Warming and Climate Change.

Conclusion: India's approaches to climate mitigation and adaptation measures are often siloed, fragmented and inadequate to address the complex climate crisis which is multifaceted, compounding and systemic in nature. COVID-19 is a stark reminder of the cascading and systemic nature of the risks that are increasing in a society that is ever more interdependent and interconnected. The catastrophic (direct and indirect) impacts of COVID-19 events on the health, social, economic, and financial systems that have cascaded across sectors. The crisis was exacerbated by extreme weather events such as tropical cyclonic storms, heat waves, and heavy precipitation that impacted India. Therefore, integrating climate change policies across all sectors is essential, as is coordination between sectors and ministries rather than operating in silos, to better manage complexity and systemic climate risk more effectively. India's updated NDC represents the framework of the nation's transition from a fossil fuel-based economy to a cleaner energy-based economy. With regard to combating climate change and establishing a clean economy, India must develop trajectories different from those taken by the West in order to strike a balance between aggressive emissions reduction ambitions and economic development. However, given that India is the most populous, largest developing countries, it would be difficult for India to achieve carbon neutrality without help in advanced scientific, technological development, and climate finance from developed countries. India would require a massive amount of investment and access to all forms of capital and technological know-how to achieve climate targets.

Pic: Shining India (credit:NASA)

However, India with her G20 presidency focusing on Global Warming and Climate Change issues and different cities of India are strongly preparing their individual climate action plans to address the climate crisis and come up with appropriate and effective mitigating and adaptive measures and getting ready to achieve the leading place in the World for reaching Net Zero and to show the right path to the whole world with glorious shine.

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Sustainable Development Impact: A Six Dimensional Awareness

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Abstract: Sustainable is able to be maintained at a certain rate or Level and able to be uphold and defended for development or progression. It is a very important process of developing or being developed. On the other hand the sustainable development is based upon the transformation our world is various way properly. We have to determine to mobilize the required agenda to implement. This agenda through revitalize global partnership for sustainable development, based on a spirit of strengthened global solidarity, focused on particular on the needs of the poorest and most vulnerable condition /matter and with the participants of all countries, all stakeholders and all people development with meets the needs of the present without compromising the ability of future generations to meet their own needs. Mainly in 70s and 80 s of last century sustainable development emerged both from science of environmental development of movement of these country. It is a broad term to describe policies projects and investment that provides benefit today without sacrificing environmental, social and personal health in the future. So in this paper I would like to say from the consideration that sustainable development requires that we see our world as a system that connects space and any discussion today must fast consider the enormous impacts that modern globalization trends This are playing in shaping the economic geography of places like micro region. I think this type of region is the best for sustainable development in future. The regional sustainable development concept is come from the place based approach. Sustainable development is also depends on endogenously and spatially.

Keywords: Mobilize, globalization, vulnerable, endogenous, spatial, sustainable

Introduction: Brundtland Commission Report, 1987 introduced the Concept or Sustainable development. From the side of broad aspect it is described investment policies projects and provides today's benefits without sacrificing environmentally, socially personally in the future health it is from the basis of the United Nations Conference. Introduced in 1942 and was well embraced as a vision recognizing the interconnectedness embraced as a vision recognizing the interconnectedness of social, economic and environmental issues.

Theoretical framework:

The first definition of sustainable development is -development that meets current needs without compromising the ability of future generations to meet their needs.

According to board definition of sustainable development report is divided into four groups :

1)economical 2) environmental 3) social 4) technological

In economical aspects it is defined the employment level of the country or living standard of people of the country.in environmental aspects it is defined as protecting natural resources and optimizing the use of agricultural land and matter resources, and finally it means moving society to the age of clear industries that use environmentally clean technology and produce minimal polluting, heat produces minimal pollution, heat- trapping and harmful gases

The social dimensions of sustainable development focus on the fact that human beings are at the center and core both as a means and a goal and therefore concerned with social justice equality of society. The last technological dimension is that effective matter of through world where it is linking, through modern technology towards society's objectives to serve the goals of society by educating the population about the importance of Various technologies in the field of development and how to use them to improve the quality of life.

So we can say that human being are an essential element of sustainable development as they seek to meet their needs and organize their lives, so that they can deal with natural necessary with knowledge and wisdom

Discussion and Analysis:

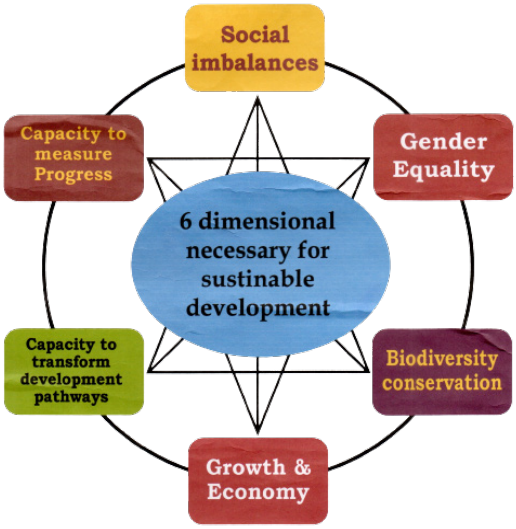
At first I would like to say how do I measure the impact of our sustainable development projects on the community?

Objectives of Sustainable Development:

- The main goals of Sustainable development (SDG) is to transform our would in better achievement and more sustainable future for all.
- Increase global challenges including poverty inequality climate change, environmental degradation, peace and justice.
- Securing economic-environmental development by globalization.
- Need to meet with the existing generation with compromising with the quality of the environment for future generations.
- Implement the agenda through a solid global partnership.
- Fostering peacefulness just for inclusive societies
- Ensure prosperous and fulfilling lives in harmony with nature.
- Develop sustainable economic growth, diversity, innovate and upgrade for economic productivity, promote policies to support job creation and growing entrepreneurship of enterprises.
- It promotes youth employment and education.
- So five pillars of SDG are people, prosperity, planet, peace, and partnership,

those are mostly effective for sustainable development (SDG).

Sustainable development analysis is performed using detailed analysis grids for each of the six dimensions of sustainable development reviewed by bio-diversity, climate, social ties, gender, and governance economy. Thus, main three pillars of sustainability are economic viability, environmental and social equity.



The sustainable development analysis prepared by the project team, best on a qualitative assessment of the scope of the expected impacts.

The stages of sustainability development of development →

Relevance Analysis

Impact Analysis

Comparative Analysis

Associative Analysis

Political Analysis

Capital Analysis

So we know that sustainable development meets the need of the present, without compromising the ability of future generations to meet their own needs and fulfilment of several conditions present preservation the overall balance respect for the environment and preventing the exhaustion off natural. Resources and masks should be follow to. Preserve. Natural resources without damaging the environment.

all through the. Main features of sustainable development are as follows-

1. It improves the quality of human life.
2. It minimizes the depletion of natural resources.
3. It teaches us to respect the chair for all the life forms.
4. Checking the pollution levels.
5. making arrangements for the future generation and they are able to meet their own demands.

So we can say these are the goals of sustainability of development.

The factors are those which are mostly affected in sustainable development. There are 4 factors. Human, Social, economic and environment. Mostly examples of sustainable developments are wind energy, solar energy, crop rotation, sustainable Construction, efficient water fixtures, green space, sustainable forestry. Development and sustainability to grow their goals. These goals include-

1. No poverty development.
2. Zero hunger.
3. Good health and well-being.
4. Quality education.
5. Gender equality.
6. Clean water and sanitization.
7. Affordable and clean energy.
8. Decent work and economic growth.
9. Industry, innovation etc.
10. Reduce inequalities.
11. Stainable cities and communities.
12. Responsible consumption and production.
13. Climate action.
14. Life below water.
15. Life on land.
16. Peace justice and strong instructions.
17. Partnerships for the goals.

According to these goals there are many advantages and disadvantages of sustainable development.

We know every coin has two sides, and so does sustainable development. Some of the Strategies for sustainable development and steel in progress, after applying the existing system the leaders have found same advantages and disadvantages. First, we focus on the benefits. Firstly-> Reduce the impact of technological innovation

on the environment by lowering the rate of air, soil and water pollution.

→→ In ensures a better quality of life for both. present and future generations.

→→ helps in achieving long term economic growth.

On the other hand the disadvantages of sustainable development are →

a) The unemployment rate is rising up

b) Fragile and impractical comments is highlighting

c) One of the major disadvantages of sustainable development is that it can be expensive.so the initial investment required to implement of sustainable practices such as green infrastructure and renewable energy can be high.This can deter some businesses and individuals from adopting sustainable practices.so sustainable development is possible if done strategically.people are adopting to their system gradually. This case is highly effected on pollution factor. Day after day it is increasing and effect the environment which is mostly dangerously blistering all over world environmental infrastructure.So Sustainable development is possible if done strategically. People are adopting to this system gradually.

According to the speech of "**Ramkumar Mishra**":----- smart cities of sustainable development startup are in countries procedure which is needful for finding an attractive way to help this planet sustain itself. Another according to Peterson K.Ojili between sustainability and sustainable development.

Development

Sustainability Framework

SocialEnvironmental Economic Technological

Sustainable Development

Concept sustainable development and sustainability should be defined according to accepted standards of academic rigor.

Implication of the Study: -

Sustainable development globally connected with the aspects of peace partnership, plant, and people prosperity. The most recognized definition of sustainable development originates from **"Our Common Future"**.

So for sustainable development factors such as preserving the environment and natural resources along with maintaining social and economic equality need to be followed. The concept of sustainable development can be also referred to as

environmentally. Sustainable economic growth and it is looks to create a balance between the economical, environmental and social needs. Sustainable development is largely impacted about people belongs with their well -being and equity in their relationship with each other theMost serious issue for sustainable development associated with economical, social, environment and technological changes. This development help country grows in ways that adapt to the challenges mainly effected upon the climate change of daily human life style throughout economically, socially, environmentally and technically. Living within our environmental limits is one of the central principles of sustainable development. One Implication of not doing so is climate change. But the focus of sustainable development is for broader that then just the environment. It's also about ensuring a strong, healthy and just for society. Now we should face the challenges on the implementation of sustainable development.

The Brundtland report concluded that due to continuous growing realization among national governments and multilateral organization or institutions that it is impossible to say. got it economic developmental issues from social and environmental issues. Sustainable development goals are real form of human development goal.

so all over human sustainability Encompasses the development of skills of human capacity to support the functions and sustainability of the organization and to promote the well-being of communities and society. Now a question is what is human sustainability?

Basic answers in such. Inability refers to all.

The activities system and behaviors aimed at preserving natural resources and maintaining. An ecological balance. So human sustainability is a that type of sustainability, which encompasses specific goals, skills, methods and strategies that are undertaken to preserve human life and improve the well-being of the communities. In whole world one of the enabler off human sustainability is cultural sustainability. This is about protecting and sustaining the world's cultural heritage.
Summary table of 6 dimensional sustainable development analysis: -

A. **Sustainable Growth and Resilient Economy through Economical Development:** Microeconomic resistance, traditional development, inclusive trade, local economy, innovation and green production sectors.
B. **Social Well-Being and Reduction of Social Imbalances Through Human Development:** Effective access to services, development of capabilities, improvement of living conditions and environment, decent employment conditions, inclusion or and participation in Community life, lifelong income security, reduction of sensitivity to tensions and conflicts.

C. **Gender Equality through Social Development:** Access to services control over resources and income, access to justice, combating violence against women, participation in economic, social and political decision, just like making bodies project governance considered with regard to gender biodiversity conservation.

D. **Biodiversity Conservation Management of Environment and Natural Resources Through Enological Development:** Functionality of ecosystem of natural resources, inclusion of communities' improvement and sharing of knowledge relevant, technologies,creation of a favorable environment as like as economic incentives, regulation, funding policies of economical growth all are very much information resources to enclose the sustainable development.

E. **Capacity to Develop the Pathway of Transition Through Political Development:** Technical measure/efficiency development is so much monumental for mobilization of financial stack holders,which impacts on public policies consumer interest market demand and devise diverse tactics, budgetary instrument or mechanism.Those are all mostly effective on voluntary Regulatory informational or educational research and development.

F. **Making Sense of Spirituality and Sustainable Development:** Spirituality as being closely associated with human, those which are includes dimensionally involving; they are body, mind, emotions and spirit. In this sense spirituality inhabits and informs the realm of the non- Rational, including the psychological world. holistic spiritual approach to sustainable development that integrates the human Structural organizational development strategy and behavioral development strategy is proposed. So to making the sense of spirituality

Need to inclusion of diverse cultural concept of spirituality in the concept of sustainable development like as Hinduism, Buddhism, Islam etc. After that we can say in the field of educational development religious teachings reveal the natural disasters to minimized the people, those who perform their responsibility with faith in God as the primordial on motivator. Resilience of spirituality can help people develop their inner resilience of mind, which is important in the face of the challenges posed by sustainable development even when faced with many obstacles of everyday life.

G. **Cultural Sustainability as a Part of the Concept of Sustainable Development:** Cultural sustainability is a one of the main part as the fourth sustainability dimension, alternatively, as a totally new way of thinking about sustainability towards our lifestyle. Cultural sustainability maintaining any cultural through time, language, modern method etc. Culture is also an essential component of human development through Representing a source of identity, innovation and creativity which is provides sustainable solutions to local and Global challenges. Culture has a crucial role to play in SDG II. It is called 4 pillar of sustainable development. It also promotes the inclusive sustainability/ integrated sustainability among the Society of the world. NGO would like to say there are so many best practices for building the culture of sustainability in everyone's workplaces such as--Define the sustainability goal

-Run an in depth and survey.
-Bring everyone in one umbrella.
-Update your techniques.
-Incentive the entire people to adapt sustainability at work & outside workplace.

Conclusion: So now it will be very important to conclude these activities that supporting the project owners according to their needs contributing to the implementation of varieties method to develop in whole to do management and regulation update which is based off across to information and justice. Continue keep up the whole consultation and participation in governance projects, improvement of management structures in whole and improving the world economic structure or financing conditions of society through planning, narrating and evaluating etc. So the final conclusion is that have two achieve a more satisfactory relationship between society, environment, economy and technology by any cost. At the core idea of sustainability is the matter of meeting people's needs for home, job, money, good relationship, good health as priority sending their life etc. so if we do not take care of whole environment in which we live now, we wouldn't have anything to leave behind us for future life/generations. s/o two conclude it can be said that sustainable development brings out stability for as per requirements of the environment which makes resources availability for future generation. It's an amazing way to conserve and preserve world resources which is provided by "Nature of World".

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Theoretical Interpretation on the Use of Biodegradable Plastics in Association with Eco-Club Activities Programmes

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Abstract: Eco club is a forum established by the National Green Corps Programme of the Ministry of Environmental Forest of the Government of India that covers around 120000 schools across the country. The aim of this particular study is to present a detailed understanding of the concept of using biodegradable plastic and create awareness of the use of these items with the active incorporation of eco-club activities. The report would focus on three initial objectives of the study which are the evaluation of the concept of biodegradable plastic, the utilisation of bioplastic in waste management and to increase the awareness of using bioplastics through the activities associated with the eco club. The report would contain and understanding with the help of several theoretical framework for create an inside to the context of the utilities of biodegradable plastics for the purpose of replacing the usage of conventional plastic commodities. Besides the implication of the study would focus on the process of understanding both the positive and negative aspects regarding this context and provide a probable solution for them. The report has been written in assistance with the secondary information collected from various books charges and articles from the Google Scholar platform and to maintain the academic integrity and ethical consideration of the report each of the article has effectively been reference and in-texted in APA 7th style who is focuses on maintaining the overall uprightness and cohesion of the information.

Keywords: Biodegradable, Plastics, Understanding, Eco club, Impact

Introduction: The National Green Corps (NGC) programme was introduced by the Indian government in 2001 and aims to spread awareness of the environment and ecology among school-going children by engaging them in various activities related to the environment. This particular program associated with the concept of the eco-club is considered for children studying from 9th to 12th grade and around 3.5 million students are participating in this program on an annual basis. There are various recommendations related to eco club participation activities, however, a minimum of 30 minutes within a week is recommended for the schools to conduct these activities (Roberts, 2009). Bioplastics are an important part of the NGC

program initiated by the Indian government which is considered one of the most important alternatives chosen by the government for the reduction of plastic usage which is considered to be the third largest pollutant derived from petroleum-based materials. Bioplastic is considered to be 100% degradable and is obtained from natural polymers like agricultural cellulose and starch wastes. According to the report, the active implementation of biodegradable plastic materials would cover 10% of the Indian plastic markets within the next 10 years (Sharma & Kanauja, 2020).

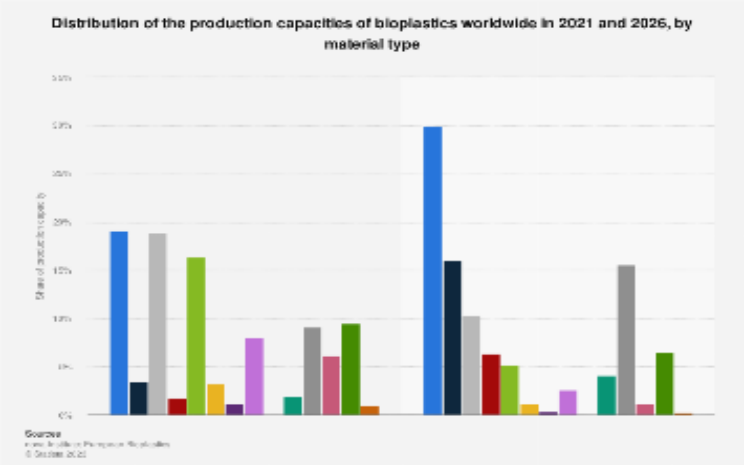

Figure 1: Increased Production of Biodegradable plastics

(Source: Statista, 2021)

Overview of Biodegradable Plastics: Biodegradable plastic is an important part of the bioplastic family that is generated from bio-based materials such as corn sugarcane and cellulose. It is originally made from various mixture of organic materials along with biodegradable synthetic polyesters oils and fossil based extracts (Atiwesh *et al.,* 2021). According to the idea of decomposition there are four types of biodegradable plastics that are available in the industry and the definition of each of the type are as follows.

- Bioplastics are the most common form of biodegradable plastics which are entirely based on the biologically originated polymers. In most cases bioplastics are generally mixed with the synthetic polymers which reduces the overall compostable nature of this kind of plastic (Varghese et al., 2022).
- Oxo degradable plastics are the common form of plastic materials which induces the reduction of the oxygen component from the internal molecular structure of the plastics for the purpose of breaking it down faster than the general plastic which decreases the chances of pollution (Varghese et al., 2022).
- Photo biodegradable plastics are associated with the chemical reaction within the

presence of ultraviolet rays which requires the Oxo degradation and then breaks the overall process of composting much faster than intended (Atiwesh et al., 2021).

- Hydro biodegradable plastic are them last form of bioplastics which is made from basically the plant sources and the overall biodegradation process is initiated by the procedure of hydrolysis (Atiwesh et al., 2021).

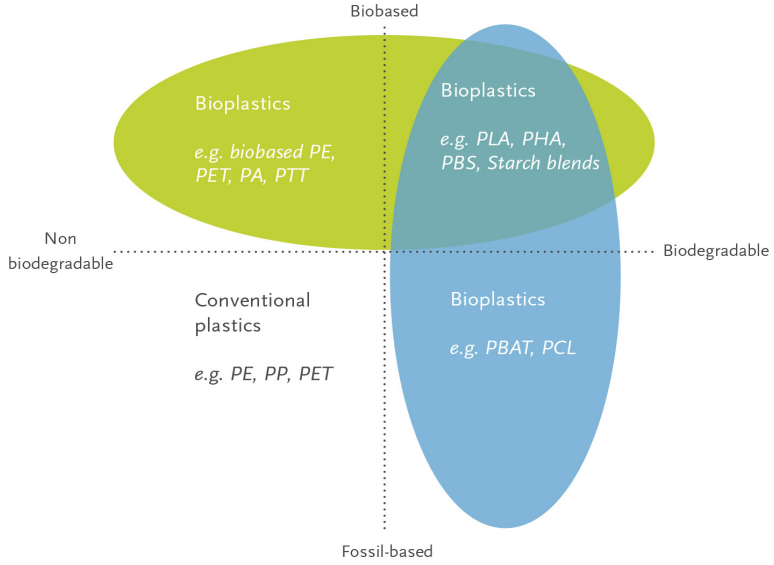

Figure 2: Types of bioplastics

(Source: Roberts, 2009)

Rationale and intended significance of the study: According to the report of the ministry of environmental forest within the Government of India, the increasing use of bioplastics would help in reducing the overall carbon footprint and create options for surplus energy services through the consumption of non-renewable materials. On the other hand, as biodegradable plastic which is known as PHA contains no harmful editing such as phthalates or bisphenol A, it is completely natural for the overall health of the human being (Meereboer, Misra & Mohanty, 2020). Thus, the rationale of the study is to present a detailed discussion on the uses and utilities of bioplastic and their association with eco-club activities. On the other hand, the significance of the current study lies in the fact that it would potentially help in identifying the needs and expectations for using products made of biodegradable plastic materials and the reason for incorporating this particular concept in the eco-club activities driven in various school programs.

Objectives of the study: The objectives of the study would focus on the overall aims and purposes for conducting particular research (African Economic Research Consortium, 2021). The objectives of the current study are as follows.

- To evaluate the concept of biodegradable plastics in the context of Indian society.
- To understand the utilities of bioplastics in waste management practices.
- To create awareness of the use of biodegradable plastics through the incorporation of Eco-club.

Theoretical Framework:

Conceptual understanding

For understanding the overview of The uses of biodegradable plastics the dependent and independent variables could be incorporated. The independent variables are the individualistic or self-sustaining factors that are related to the concept of the overall study. On the other hand, a dependent variable is a factor which is focused on the interpretation and activities of the associated independent variables within the study (Pokhariyal, 2019). In this particular context, three independent variables and one dependent variable are to be introduced.

Independent variables: 1. Responsible behaviour of the individual, 2. Environmental citizenship, 3. Value belief norm within the society.
Dependent variables: 1. Increasing awareness of the uses of biodegradable plastics.

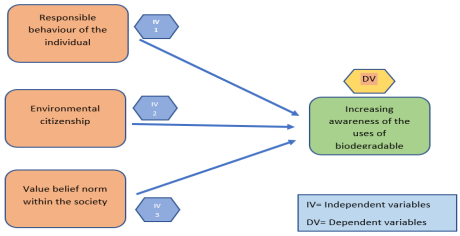

Figure 3: Interaction between independent and dependent variables

(Source: Created by the learner)

Responsible Behaviour Theory: The responsible behaviour theory proposed by Hines, Hingerford and Tomera which environment day responsible behaviour of the individual is determined by several variables such as the intention of the individual to act the local of control the internalised sense of the individual to control over the course of life personal responsibilities and attitude towards other and the overall knowledge management strategies. In the context of using biodegradable plastics there are no current behavioural changes that will address the need of the individual. The knowledge about the issues relating to use of conventional plastics and the utility of biodegradable plastics is insufficient for the overall social and environmental development and the responsible behaviour of the individual and

it should be practised effectively to get the result. The awareness through eco club would be helpful in addressing these issues and draw responsible behaviour from the individual children and adults (Nave & Ferreira, 2019).

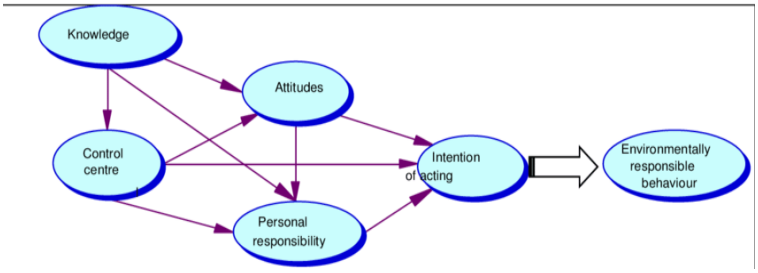

Figure 4: Responsible behaviour theory

(Source: Nave & Ferreira, 2019)

Environmental Citizenship Theory: The theory of environmental citizenship is proposed by Volk and Hungerford which states that the nature of citizenship within the environment is divided into three types of variables that determines the responsibility within the behaviour of the citizen. The entry level behaviour of the individual is determined by the person's knowledge and personality regarding the aspects of environmental sensibility and the existence of biodegradable plastics. The second criteria for the concept of environmental citizenship is determined by the knowledge of the individual regarding the consequences of irresponsible behaviour on the environment and society and their personal investment in the context. Lastly, the variables related to empowerment in the context of badminton citizenship focuses on the use of these skills and knowledge related to the protection of the environment in real life scenarios and try to engage others for supporting and joining this cause (Pateman, Dyke & West, 2021).

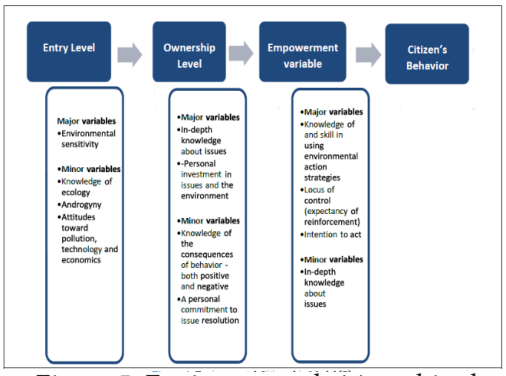

Figure 5: Environmental citizenship theory

(Source: Pateman, Dyke & West, 2021)

The Value Beliefs Norm Theory: The value believes not theory was proposed by Stern which includes the concept of other theories of environmentalism such as Norma activation, new environmental Paradise and ethical theories for value. This particular theory incorporates three types of values of providing ecological worldviews, such as altruistic, biosphere and egoistic point of views that determine the beliefs of the individual. Other hand the beliefs of the individual are associated with the threat of adverse consequences which are related to the ability of the individual to reduce the state according to their own perception. Lastly the norms of the theory focus on the sense of obligations of the individual to take various Pro-environmental activities that leads to various external behaviours such as direct environmental activism, non-activist yet environmentally responsible public sphere behaviours, and the concern related to environmentally responsible behaviour within the private sphere of the individual such as family and workplace (Gazhali et al., 2019).

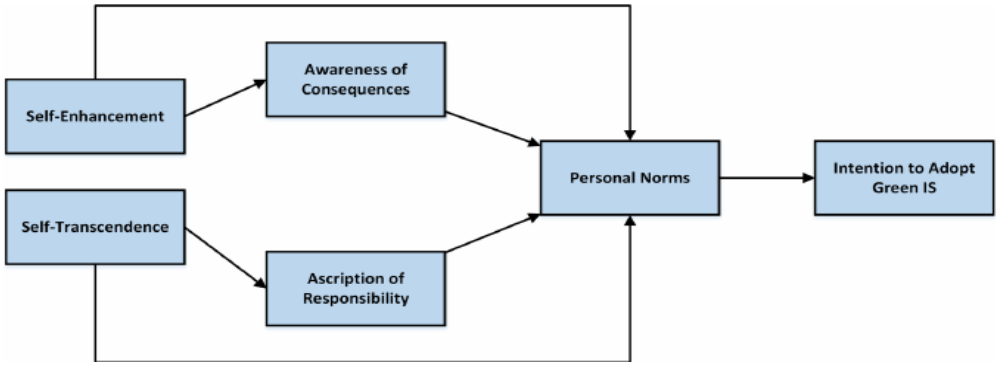

Figure 6:The value beliefs norm theory
(Source: Gazhali *et al.,* 2019)

Discussion and Analysis:

The overview of biodegradable plastic in the context of Indian society: Bioplastics are generally produced from biomass such as polysaccharides proteins and lipids instead of petroleum-based chemicals. The concept of bioplastic can be divided into four categories which are biodegradable plastics that are made from biomass water and carbon dioxide, bio-based plastics which are mainly derived from natural resources such as bio PVC, degraded plastics which are made from antibiotic degradation process through UV light and compostable plastics which needs enzymatic degradation process for considering less toxic materials than the conventional plastics (Moshood, Nawanir & Mahmud, 2022). The market of biodegradable plastics in the context of India is at the infant stage, although there is a huge possibility for the development of the market through increasing environmental awareness programs. For example, the National green tribunal state-level committee put a ban on the usage of conventional plastic usages in 2019 and also created effective support for the commercial producers of bioplastics such as TruGreen, Plastobags, Ecolife, and Envigreen (Gill, 2019).

The utilisation strategies of bioplastic elements in waste management practices: Plastic waste management is a concerning problem in the context of Indian society as around 300 million of plastic waste are produced every year by the human population and a single piece of plastic was initiated around 400 years to composite. Thus, it has been one of the concerning problems related to waste management issues across the globe and choosing the alternative of biodegradable plastic which is made from 60% of synthetic polymers and 40% of biopolymers would not only benefit the overall context of ecological development but it also provides a sustainable solution to the problems related to landfills and the pressure on recycling centres (Gadaleta *et al.,* 2023). In 2018 around 31% of the plastic waste is considered responsible for the increasing criteria of landfills and the ban on plastic use in 2019 has reduced the percentage by 6% approximately. On the other hand, the recycling process of biodegradable plastics has become easier with the help of the existence of natural polymers in the particles of these materials which helps in reducing the mechanical life cycle assessments of the products (Sinan, 2020).

The intended role of eco club activities for creating awareness of the use of bioplastic elements: Biodegradable plastic is often considered a premium alternative solution to fossil fuel-based conventional plastic as it creates a huge impact on the concept of greenhouse gas emissions. According to the report, conventional plastics are responsible for around 15% of the total emissions of greenhouse gases like carbon dioxide. And shifting to biodegradable plastics would help in inducing climate-neutral activities regarding these emissions (Iyer, 2021). Thus, the concept of active uses of biodegradable plastics can efficiently be associated with the eco club activities initiated by the Indian government as it will effectively align with the objectives of the program which is the development of the appropriate attitude and intervention regarding the environmental strategies by the children. With the introduction of the use of biodegradable plastic measures, the children will be able to get first-hand experience through the action-based programs related to the eco club (Sain, 2020).

Implications of the study: On the basis of the overall interpretation of the study, biodegradable plastic uses have several advantages which has made the issue of using biodegradable plastics exam alternative to the conventional plastic production. For example, the use of biodegradable plastics helps in reducing the problems related to recycling and decreases the chances from natural landfills. On the other hand, these plastics while manufactured required minimum energy transitions which also positively affects the overall concept of energy utility and savings. Besides, biodegradable plastics are made by keeping the concern of disposal and as they tend to break down after a few months it reduces the chances of landfills and waste

generation. In contrary to the conventional plastics, biodegradable plastics are made natural resources that helps in dealing with the climate issues and reducing the overall scope of detrimental effects on the ecological equilibrium of the earth (Abe *et al.,* 2021). This, the biodegradable plastics are often associated with the context of sustainable development of the planet.

However, there are some issues within the over usage of biodegradable plastic that can be misleading and critical for the society. For example, not all biodegradable plastics are made of complete ecological substances and have some microorganisms which is generated from the fossil fuel substances that could be critically harmful for the earth. For example, biodegradable plastics are often made up with small organisms which are known as microplastics. The ingestion of microplastics by various animals will disrupt the normal food chain on the earth all though it creates of false sense of sustainability (Shah *et al.,* 2021). On the other hand, according to the report published by United Nations environment program the inclusion of the pro-oxidants such as manganese within the composition of biodegradable plastics can enhance the rate of fragmentation with the help of the UV radiation. Besides the fate of the microplastics in the marine environment is also not clear as it takes around 3 years to melt within water. Thus, although biodegradable plastics are known for their contribution on the enhancement of sustainability they are various independent evidences that suggest it make create and undesirable impact on the hydrosphere of the earth. In addition to that recycling is also not a viable option for the post consumption of biodegradable plastics as it deteriorates the overall life cycles of the materials which actually increases the expensiveness of the remediation and significantly decrease the functionality of the recycled plastics (Muthysamy & Pramasivam, 2019).

Conclusion: In conclusion, this particular article has focused on the context of the utility and validity of including the use of biodegradable plastics which is known as one of the sensations regarding the ongoing sustainability issues around the globe. However on the basis of the overall discussion it can be said that the effective uses of biodegradable plastics can create a positive impact on the overall context of ongoing ecological issues and sustainability concerns. The only problem associated with this particular context is that there are serious uncertainty regarding the utility of biodegradable plastics as they are only recycled and helps the environment if they are decomposed properly. Thus, it is important for the population across the globe to get an effective knowledge about the circumstances related to the usage of biodegradable plastics, otherwise it will only hamper the overall ecosystem of the earth. Incorporation of the eco club activities to derive and generate proper knowledge among the school going students regarding the benefits and detrimental

effects of using commodities made with biodegradable plastics and develop better skills competencies and understanding for the process of delivery better decomposition after the completion of the life cycle of this commodities. The school going children are the future citizen of the society and their learning capabilities are higher than the adults, and the incorporation of knowledge and comprehension on the proper utilitarian behaviour for the commodities made of biodegradable plastic through the eco club activities would be one of the first integral steps to promote sustainability and ecological equilibrium against plastic pollution.

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Review on Impact of Environmental Education and Eco-Club Activities in School Education and Student's Awareness

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Abstract: Considering the activities of humans damaging the environment, it is believed that environment education along with sound legislations and Eco-Clubs can lead to sustainable management of resources and ensure responsible actions by young individuals. Eco-Clubs should be in schools with their primary aim to generate environment consciousness among school students. They work with a belief that learning is more everlasting and enhanced during growing years. Eco-club is a platform on which knowledge about environment is gained early during childhood and they offer programs and activities to encourage others to reduce pollution, plant trees, and more through voluntary group which promotes the participation of students in learning about, and improving their environment. Therefore, this paper reviews the impact of Environmental Education and Eco-club activities in school education and student's awareness. The findings of this review are related to the selected topic and an objective was organized from student and environmental perspectives from different published and unpublished materials found. The review result concluded that it is a wonderful opportunity to create awareness, build attitudes and help students take up activities in real world in which the constraints of the classroom and curriculum will not allow helping to extend boundaries and scope of the formal educational system encouraging creativity, and improving students for constructive action towards the environment.

Keywords: Environmental Education, Eco-Club Activities, School Education, Student's Awareness

Introduction: The diversity in nature allows every element to complement each other. Mother Nature has created enough to provide for every living creature, but there is an important element that humans tend to forget - the balance of nature. It is possible to attain gratification only when one attempts to contribute productively. The history of environmental consciousness and awareness has been viewed over the time shows an ever-increasing gap between man and his environment. The concept of environment is not new; moreover, it is deeply related to each specific

culture and its relationship with nature (Meseret, 2016.).Back as early as the 18th century, Jean-Jacques Rousseau stressed the importance of an education that focuses on the environment in Emile: or, On Education. Environmental education has been considered an additional or elective subject in much of traditional curriculum (Minton, 1980). Conservation Education was a major scientific management and planning tool that helped solve social, economic, and environmental problems during this time period. Environmental education was born of the realization that solving complex local and global problems cannot be accomplished by politicians and experts alone, but requires "the support and active participation of an informed public in their various roles as consumers, voters, employers, and business and community leaders (Saylan, C. and Blumstein, D., 2011). Internationally, environmental education gained recognition when the UN Conference on the Human Environment held in Stockholm, Sweden, in 1972, declared environmental education must be used as a tool to address global environmental problems (Sohn, 1973). To correct and prevent any further environmental degradation the United Nations Conference on the Human Environment held in Stockholm in 1972 urged all countries of the world to incorporate environmental education in their curricula at all levels of education. A followup conference held in Tbilisi in 1977 outlined the objectives and implementation strategies of environmental education (Palmer, 2002 and Toili, 2007).

So to accomplish our work, we can set up an eco club where we can work to contribute in improving environmental conditions by offering programs and activities to encourage everyone to reduce pollution, plant trees, and several other activities. Eco clubs or green clubs is a kind of voluntary group that promotes the participation of individuals from an institution or an organization to learn about, and improve their environment. In such clubs students and youth can organize themselves to learn more on a particular issue, and also take action(s) to improve their environment from the grass root level.

Objectives of the Review: Objectives of the study are as follows:

i. To review the impact of environmental education
ii. To review the importance of eco-clubs on students environmental awareness.
iii. To state the challenges faced while setting up and in progressing the work of an eco-club.

Methodology: Different written, published materials and other reports from local schools in Bale zone woredas were studied and reviewed for organizing this review. Objectives were set from school based eco-club impact on student attitude, knowledge to its implication to the environment.

Analysis and Discussion:

Definition of Environmental Education: Since the early 1970s, similar points to those in the Nevada Conference of the International Union for the Conservation of Nature and National Resources have been emphasized. Accordingly, Environmental education can be defined as the process of recognizing values and clarifying concepts in order to develop skills and attitudes necessary to understand and appreciate the interrelatedness among man, his culture and his biophysical surroundings. Thus in simpler terms, Environmental education, is a process that allows individuals to explore environmental issues, engages in problem solving, and takes action to improve the environment.

Accordingly the expected output of environmental education generally includes-

- Awareness and sensitivity to the environment and environmental challenges,
- Knowledge and understanding of the environment and environmental challenges,
- Attitudes of concern for the environment and motivation to improve or maintain environmental quality,
- Skills to identify and help resolve environmental challenges and
- Participation in activities that lead to the resolution of environmental challenges (Johnson et al., 2000).

Environmental Education Programme: It was developed in 1992 in response to the need to involve young people in environmental projects at the local level as identified at the United Nations Conference on Environment and Development of 1992. Environmental education comprises of education programmes that focuses on creating awareness and modifying learners‟ behavior towards preservation and conservation of the physical environment (Ajiboye and Silo (2008), Gakuo (2010).

UNESCO emphasizes the role of environmental education in safeguarding future

global developments of societal quality of life, through the protection of the environment, eradication of poverty, minimization of inequalities and insurance of sustainable development (Sondakh and Wibowo, 2012 and UNESCO, 2014a).

Objective of Environmental Education –

The key specific objectives are that, EE could-

- Provide individuals and social groups with an opportunity to be actively involved at all levels working towards the resolution of environmental problems (UNESCO, 1980) ;
- Empower the world population to maintain and enhance environmental quality (Toili, 2007 and Gakuo,2010) ;
- Empower students to be the change of our sustainable world needs by engaging them in fun, action-orientated and socially responsible learning through developing environmental knowledge and skills ;
- Promote awareness about the natural resources and their management.

Merits of having Environmental Education in Schools: As the term often implies education within the school system, from primary to post-secondary. But not only school, the term "environmental education" includes all efforts to educate the public and other audiences, including print materials, websites, media campaigns, etc. Environmental education is taught outside the traditional classroom too. Aquariums, zoos, parks, and nature centers all have ways of teaching the public about the environment (MacDonald, 2008). Environmental education goes hand in hand with multiple other disciplines like citizen science, education for Civil and Environmental Research ,sustainable development, climate change education, science education, outdoor education, experiential education, garden based training, inquiry based training. Though each of these educational fields have their own objectives, there are points where they overlap with the intentions and philosophy of environmental education (Ajiboye Silo, 2008 and Francis,et al ,2012).

Demerits of not having Environmental Education in Schools: In several countries the Ministry of Education has realized that the absence environmental education (EE) in the school curriculum have contributed greatly to the improper use of the environment as the field of education (ALJADI, 2020). It has been argued that already several subjects teach about the environment, then why does EE be so significant. As per citations in Nderitu (2011) and Falk (2005) it has been observed

that environment in particular, is a topic not easily confined to school hours and years, because our knowledge and understanding of environmental processes are evolving every day. However, the topics taught in school do not give details on the issues raised (Mbwesa, 1996; Perrot, 1977).

Establishing Eco-clubs in Schools: Although environmental education content is infused in the formal education system through an interdisciplinary approach across the primary and secondary education system and it has not produced an environmentally literate society because most of what is taught in primary school is theoretical. Thus it would be unfeasible to expect learners to become environmentally literate without relevant exposure to environmental knowledge and skills which foster competence to participate in day to day management of their environment.

Eco-clubs are therefore an avenue that completes the formal education offered by the schooling system by involving community activities into the curriculum and thus, the goals of environmental education would be to instill in learners knowledge for the environment, positive attitudes toward the environment, competency in citizen action skills, and a sense of empowerment (Palmer, 2002 and Ruto, 2004).

Purpose of establishing Eco-clubs in Schools: Researchers have felt that eco-clubs could be established to address environmental threats by allocating funds to buy equipment and facilities, money for trips, giving support to the school based clubs, allocating time, integrating Environmental Education (EE) in the school curriculum and involving all teachers, training the patrons on Environmental Education and providing the literature with current information about the environment. Some of the patrons saw the need to use the media to publicize the club activities (Nderitu, 2011).

Goals of Eco- clubs in Schools: The Goal of school environmental club is-

- To help students become environmentally conscious and enable participation in school clubs;

- To develop environment friendly skilled, and attitudes dedicated and responsible citizens who are willing to work, individually and collectively towards achieving high quality of life and environment (Flynn,et al 2002, Neal and Palmer,2003)

Objectives behind organizing eco-clubs in Schools: Eco clubs or green clubs is a kind of voluntary group that promotes the participation of individuals from an institution or an organization to learn about, and improve their environment. In such clubs students and youth can organize themselves to learn more on a particular issue, and also take action(s) to improve their environment from the grass root level.

Eco-clubs come with different objectives like-

1. Motivating the individuals to keep their surroundings green and clean .

2. Promoting ethos of conservation of water by minimizing the use of water.

3. Motivating individuals to imbibe habits and life style for minimum waste generation, source separation of waste and disposing the waste to the nearest storage point.

4. Educating people to create awareness to stop the indiscriminate burning of waste which causes respiratory diseases.

5. Sensitizing people to minimize the use of plastic in every arena possible.

6. Organizing Nature Trail in Wild Life Sanctuaries/Parks/Forest areas to know about the Bio-diversity

Reasons behind opting Educational Institution for Eco-clubs: Environmental issues remain a peripheral issue in the formal schooling system. They continue to be viewed more as an extracurricular activity and less as a subject holding a priority position in the national curriculum. As cited in Meseret (2016) over the past 15 years educational institutions across the world have been encouraged to mobilize students and to take a more active participation in local, national and global processes towards environmental sustainability issues (UNESCO, 2012).

According to United Nations Educational, Scientific and Cultural Organisation (UNESCO) conservation education should be incorporated into primary schools subjects and also in science and geography curricula of secondary schools (UNESCO, 1977). School voluntary Eco-club, which promote the participation of young students in learning about and improving their environment, is best ways of reaching the young about the environment. The educational institutions, where more young generations are more concentrated, have the big responsibility and opportunity to create awareness on young students through both formal and informal educations. The school based Eco-Clubs are one of the good ways through which the students can meet together and deal on environmental protection issues (Meseret, 2016).

It is for this purpose that Schools are the convenient place to teach and equip children and youth students in environmental and climate change issue as they make up a substantial proportion of the children and youth by encouraging them to engage in formal environmental education and school club (GoE, 2017).

Activities of Eco-Club in Schools: The purpose of the club is to create awareness

of environmental issues, such as protection, conservation, preservation, and restoration, with an emphasis on educating and empowering students. Students who are interested in environmental advocacy and awareness are encouraged to join. An environmental organization is an organization coming out of the conservation or an environmental movement that seeks to protect, analyze or monitor the environment against misuse or degradation from anthropogenic activities.

Some of environmental issues that environmental organizations focus on include pollution, plastic pollution, waste, resource depletion, human overpopulation and change (Gakuo, 2010). School based Eco-clubs are volunteers that conduct a range of activities including environmental monitoring, ecological restoration such as re-vegetation and educating others about the natural environment discussed (Gooch, 2005)

Cleanups: The clubs have been undertaking many environmental protection activities including waste management, soil conservation, plantation, and campus landscaping Meseret (2016).Nderitu (2011) added that most club members participated in these activities and several local communities were sensitized on energy saving, deforestation, hygiene and proper waste management through organizing rallies, marches, human chains and street theatre at public places with a view to spread environmental awareness. An environmental organization is an organization coming out of the conservation or an environmental movement that seeks to protect, analyze or monitor the environment against misuse or degradation from anthropogenic activities. Some of environmental issues that environmental organizations focus on include pollution, plastic pollution, waste, resource depletion, human overpopulation and change (Gakuo, 2010). The club members also sensitize other students to minimize the use of plastic bags, not to throw them in public places as they choke drains and sewers, cause water logging and provide breeding ground for mosquitoes.

Awareness Creation: The school based eco-clubs had minimal activities and club activities repeated year after year. The works experienced and frequently carried out were taking positive action in the local environment in collaboration with other organizations to create awareness on the diverse environmental problems (Mutugi, 2010, Gakuo, 2010 and Nderitu 2011). Nderitu (2011) added that most club members participated in these activities and Local communities were sensitized on energy saving, deforestation, hygiene and proper waste management through organizing rallies, marches, human chains and street theatre at public places with a view to spread environmental awareness. In some cases school based Environmental clubs

Organize seminars (rarely), debates, lectures and popular talks on environmental issues in the school and publically to student family through celebration. This implies there is need among the school youth to be aware of environmental problems causes to stop the extensive use of environmental resources, protect our environment and create sustainable future (Meseret, 2016).

Tree Planting: Eco-clubs are volunteers that conduct a range of activities including environmental monitoring, ecological restoration such as re-vegetation and educating others about the natural environment (Gooch, 2005). Eco-clubs therefore provide learners with an opportunity to experience physical environment and act to conserve it. The negative experiences of community members considering tree plantations have to be revised.

Water Storage: Conservation of water by minimizing the use of water through school based water day celebration, installation of a rain harvesting plant where water can be collected, purified and used for various purposes in the school/college (Stohr, 2013).

Impact of Eco-club Activities: Planting trees, cleaning school campus and organizing awareness creation events and the following activity outcomes is expected to be resulted (Roberts, 2009 and Sonowal, 2009).

- **Care for Environment:** Surveys have found that those engaged in eco-clubs care deeply about the environment and wish to improve the environment in which they live within. The eco-club leader, teachers and school directors agree as the eco-club has a good impact on the students both in and out of school mobilizing replacing each tree cut down by planting at least two to three new seedlings and clean the school yard.
- **Personal Benefits:** There are a few central qualities involved in eco-club that are useful contributions to the individual. These attributes includes:-
- -Enhancing real-world problem solving, -
- -Strengthening physical activity and
- -Improving communication/leadership when working in groups.
- **Student knowledge and Attitude**: Ajiboye and Silo (2008) reported a significant change in the knowledge and attitudes of the pupils after their exposure to the club activities. Additionally Environmental knowledge competences of eco-club members were higher than environmental knowledge competences of non-club members and Environmental attitudes of eco-club members were more positive than environmental attitudes of non-club members (Gakuo (2010).
- **Relation among Students**: The clubs also helped to establish relationships;

learned new information built leadership skills, attitudes, and brought unity in the schools and approaches to environmental problems (Gakuo (2010) and Nderitu (2011). It is Civil and Environmental Research www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.12, No.6, 2020 22 observed that the club members joined from different grades and villages were debate freely on environmental and other issues. The clubs members assume themselves as one body working for common goal and believe in each other. The member themselves evaluate ones work for the club especially issues to be presented on the stage during events. This process helps the students to learn from each other through developing relationship among them.

- **Student Academic Point**: Learners who took part in co-curricular activities during school life were more academically successful than those who did not. Robyn (2008), found learners who participated in peer support programmes developed valuable skills and attributes. Botma (2000), found a relationship between eco-clubs and schools where academically weak learners became more noticeable as they exposed their aptitude.
- **Students built Self-confidence**: In most school based eco-clubs it is the students who share and lead the whole club activities at different level with minimum guidance from the patron. In process of organizing and conducting club activities they develop their self-confidence and leadership ability. The developed self-confidence and leadership ability helps the in their future career life solving the challenge they may face. Svedbom (2000) found eco-clubs develop a sense of resilience and coherence in the face of problems and risks that adolescents face as they prepare for adulthood so that they feel their lives are manageable and meaningful(from Gakuo ,2010).

Challenges faced by Eco-Club: The constraints were more on the conceptual barriers (such as lack of understanding of the scope) and content of the environmental education (Kin, 2004) , logistical barriers (such as time constraint, inadequate teaching materials, inappropriate class size, financial and transportation problems), and issues of security , which can be described as follows-

- **Financial Issues:** The eco-club needs more financial support both from donors and the School to be able to work with full potential. Major challenges to the school based clubs were financial, poor timetabling of the clubs‟ activities, lack of motivation and necessary facilities among others (Nderitu, 2011).
- **School Curriculum:** Environmental education processes is an integral part of both the formal and non-formal curriculum, but little was done at classroom level, beyond a discipline-based approach to the teaching of environmental education processes in many countries (Gakuo, 2010). Eco-clubs are

offered as co-curricular activities in schools to provide an experiential form of learning which supports the formal education practices. According to Nderitu (2011) most of the schools put more emphasis on school curriculum and very little time was given to club acti

- **Time ensured to Club Activities:** As it is reported by Nderitu (2011) most of the schools gives little time for club activities .In most schools even that little time was not as such active and passed by waiting other members to come then finally postponed always. Because of this many members hesitate and leave the club as it consumes their study time. In some cases the school activities often disrupted the club meetings and other teachers felt that the clubs belonged to the particular supporters (Nderitu, 2011).
- **Negative attitude of Parents:** The parents had negative attitudes/fear towards the clubs and frequently discouraged their children from joining them especially female students as club activities are out of education time and students spend may attacked by male students. In most developing countries the school found far from their home and it takes some time to arrive both the school and back to home. The family advises their child to use their time properly both to school and home on time. Additionally in case there is field trip the parent of female student is not willingness to send their children. These problems affect both the knowledge that the students acquire from club activity and successfulness of the club in general.
- **School Land Size**: Most schools had very small pieces of land that had already been filled with trees or have no nursery site area. In certain cases instead of rising seedling in school nursery, the directors prefer getting seedling through purchase. The planted seedlings were also mostly exotic tree species having ornamental value. Most schools dependency on exotic tree species have its own implication on conservation of indigenous tree species through creating less value attitude and attention to indigenous tree species at school student and generally to wider community .
- **Politics:** In some countries the students and patrons feared to carry out demonstrations in case they were mistaken for politicians. The students and patron are not free say or write what they feel about the environmental conservation. These especially common in case students work outshine politician's weakness regarding environmental conservation. Civil and Environmental Research www.iiste.org ISSN 2224-5790 (Paper) ISSN 2225-0514 (Online) Vol.12, No.6, 2020 24 .
- **Lack of Motivation:** The biggest challenge from the member point of view was lack of motivation from school teachers and directors probably because of the very few activities that were being carried out in the clubs. Some of them also believes that no one evaluate their club activity performance except formal subjects given to them.

- **Knowledge of Club Leaders:** It was clear that only a few patrons had attended environmental education courses and even most of them have little knowledge of environmental education. In some of the schools the patrons were appointed as patrons of the clubs and hence they did not have the zeal to improve the clubs or guide the interested students as they had many other responsibilities and received very little material gains from clubs (Nderitu, 2011). In the same way the criteria to become environmental protection club leader is not having knowledge/awareness of environmental education and person with environmental hobbies, rather being relative of school director or gaining high number of vote from group.
- **Lack of Attention:** Most of the schools put more emphasis on school curriculum and very little attention was given to club activities. In most schools Even that little time was not as such active and passed by waiting other members to come then finally postponed always. Because of this many members hesitate and leave the club as it consumes their study time. In some cases the school activities often disrupted the club meetings and other teachers felt that the clubs belonged to the particular supporters (Nderitu, 2011).

Implication of the Review: In spite of the considerable strides made in the area of environmental education, there are still enormous barriers that need to be reoriented to provide formal education on sustainability. They are beyond the reach of individual teachers and schools, no matter how committed they might be so It is possible to overcome such barriers effectively if all the stakeholders in society work collaboratively including schools, families, business, grass-root organizations and Government at district, state and national level to develop processes and policies integrating social, cultural, economic, political and environmental goals together. If we can introduce formal education in schools then it would build a society that helps students determine what is best for environment and to nurture the values of conservation and strategy for sustainability while at the same time contributing to personal and national goals. It calls for a balanced approach that evades undue attention on changes in an individual's lifestyle. It is important to understand that most of the environmental problems are a result of the lifestyle of a common man. The solution to this problem lies in transforming the social condition of human beings as well as changing the existing style of living. It draws attention to the need to educate students to learn problem solving through comprehensive education (UNESCO, 1997).

Conclusion: Our planet is considered to be a large arena where human and their activities are said to be compartmentalized within countries and inside the broad

area of concern – social, political, economic and environmental spheres. However, with global crisis and changing times, these compartments have started to dissolve. They are not separate now, the environmental crisis, developmental crisis, social crisis are all one. The growing concern for natural resources and nature as a whole is not a new concept for a country like India. Our culture has always taught us to respect environment and live in harmony with all natural resources. However, increasing practices of exploiting the nature has let to destruction all around the world.

From this review it could be concluded that, when learners participate in eco- clubs activities their environmental knowledge competences are improved possibly due to exposure gained from interaction with the nature. Positive outcomes in attitudes are experienced when learners participate in eco- clubs than when they do not participate; possibly due to regular voluntary interactions with the environment. Students who were eco- club members were more likely to continue engaging in environmental activities geared towards environmental protection than students who were not eco-club members. Engaging in voluntary environmental groups comprising of learners and teachers (club patrons) in a school can promote participation of pupils in learning about and working towards the conservation and sustainability of the environment. With the support of respective school management and other interested stakeholders, the clubs movement can create awareness about the environmental related issues which threaten the existence of the ecosystems.

Thus, there is a need to pledge and sustain a movement from grass root level to national level with a commitment made towards sustainable Earth. The Eco-Clubs programme initiated by MoEF is one of the most successful programmes running in the county. It is spread across the length and breadth of the nation. However, there is a need to strengthen some of the goals undertaken by Eco-Clubs. Even with such high level of motivation, the actual work undertaken byEco-Clubs is limited. There is a need to incorporate environment management in the educational curriculum and make it mandatory for institutions to imbibe healthy environmental practices in the young generations.

Recommendations: From the review, it can be stated that to make things successful , it is important to increase funding, training on Environmental Education and integration of Environmental Education in all primary and secondary school curriculum. Other recommendations include support from government and school administration, encouraging collaboration and partnership, motivation and positive reinforcement, adherence to time allocated for the clubs, establishment of projects

to raise funds and provision of facilities and equipment such as trips and literature among others.

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Bio Significance of Plantation

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Abstract: Environment is a part of our life. It flourishes our life. It gives us unconditional love. This article represents the bio significance of plantation which gives the environment a green life. An environment is incomplete without plantation. Plantation provides a pollution free life to us. It is as useful for the environment as a human body needs blood. At 21st century the environment is polluted randomly. There are many commercial sectors, building increasing rapidly and it reduces the area of plantation. We cut the trees and build there different institutions, residential places and so on. But we do not think the usefulness of a tree. A tree which takes many years for growing up but we cut the tree within a few hours timings. Tree is not only useful for the environment but also useful for the commercial purpose. The woods of the trees are used for different purposes. A tree helps to build a building by its woods. But sometimes we never judge these things. We never realize a tree's usefulness. And we reduce the area of plantation. So tree plantation is not only useful for the pollution free environment but also it gives cherish and beautiful life to all species. So this article shows the beauty of the plantation, its importance to the human life and its impact on the environment. So we need to do the eco club activities for plantation of the trees in different places so that the environment finds its stability and we understand the bio significance of the plantation. And we can teach our next generation for involving in eco club activities through plantation. This article describes the basic biology of the growth of healthy plantation forests of a single species.

Keywords: Afforestation, Bio significance, Tree plantation.

Introduction: As we need to balance in our lives, the environment needs to balance in itself. And this environmental balance depends on the tree plantation. Trees play a central role in the environment. Without trees the environmental stability hampers.

Biological diversity depends on the tree plantation. The trees give shelter and food to all the species, i.e.; birds, animals, insects, fungi, and also human. Not only shelter and food, the most important thing a tree gives that is Oxygen. Without oxygen no one can stay in this world. So a tree gives us life.

Tree plantation makes the planet greener, livelier and healthier. Without trees the existence of the human beings as well as other species on earth is impossible. So we should plant more and more trees.

Tree plantation program is done by planting the seedlings into the ground. Basically in monsoon season this tree plantation program can be held very well. It is necessary to inform all the people about the necessity of tree plantation program so that they are aware about the environment. They can be known about the vital roles of the trees.

In every home, every educational institution, and other sectors need to take responsibility to plant the seedlings. Plantation of trees gives the fresh air, conserves the water, helps in climate control, preserves soil, and balances the biodiversity and ecological system, thus it benefits the overall environment in different ways.

One of the recognized purposes behind tree plantation is forestry. Forests are quickly diminishing from the earth's surface and make the ecological balance of the environment of the earth. And today more people understand about the advantages of tree plantation. Younger students are planting trees with the assistance of teachers and staffs. So we need to increase the speed of reforestation, which will help the forest to recover from the loss due to deforestation. So through our help, the pace of tree plantation can be increased.

A tree can help to make the ecological balance and this ecological balance makes the balance in species' life (all animals, birds, creatures and as well as human beings). If this balance is unstable then it can cause a huge problem in animal's life as well as human's life. No one can get freedom from this unstable condition. So plantation is a vital part of our life.

Objectives of Tree Plantation: Every good work has some good objectives. Without objectives no good work is held. Same as tree plantation program has its own objectives. So following are the objectives of tree plantation:-

- To give life through providing oxygen and taking the carbon dioxide.
- Trees do the photosynthesis process which helps to transfer the water, sun-light and carbon dioxide into oxygen.
- To provide the shelter for animals tree plantation is necessary.
- To keep the balance in environment we need to plant the trees.
- To improve the water quality everyone needs to plant tree seedlings.
- To make the air free from pollution we should do tree plantation.
- To prevent the soil erosion and floods trees are very necessary.
- To bring the rain on the earth we should plant the trees.
- To make the environment cool trees play important roles.

- ❖ To make healthier ecosystem trees are the central part of environment.
- ❖ To provide the economic growth trees help the nation.
- ❖ To inform the people about the value of environment saplings of the trees must be planted.
- ❖ To beautify the environment trees are the best friend of the environment.
- ❖ To balance the ecological pyramid trees are the main part

The primary concern of this article is to examine the theoretical framework of bio significance of plantation. Tree plantation provides a large scale of green space. We should involve the students in tree plantation program through different activities. The students should involve in forestation, green field, and so many project. It is seen that deforestation can hamper the world. It can cause floods, landslides, soil erosion and pollution. It is also harmful for wildlife animals. Wild animals are facing a scarcity for this deforestation. People cut the forest for building the residents, corporate industries and by this way they take away the shelter of these wild animals. Not only wild animals, but also the rural areas people are facing problems due to deforestation. In rural areas deforestation can cause smog and air pollution. And the urban areas face problems of vehicle exhaust, wood and coal combustion, factories and industries all emit hazardous pollutants and greenhouse gases into atmosphere.

So, all these serious problems have one solution, i.e.; ***"Tree Plantation"***.

Planting trees is a beautiful process, first dig a hole, then put a tree seedling in the ground, fill the hole with soil. It is done during the monsoon season, from July to September in India. And the tree grows up slowly. Tree plantation depends upon the geography and topography region. The trees are encouraged to be grown to maintain the natural heritage. The need for tree plantation has been recognized all over the world. The Indian Government takes plan for this tree plantation program, named "CAMPA" (Compensatory Afforestation Fund Management And Planning Account). Through this plan the government campaigns tree plantation in both urban and rural areas. Not only the government but also NGOs play important roles in plantation program. They inform the schools and other educational institutions to take the active plans for tree plantation and also aware the students about the importance of this plantation program. Tree plantation is not only useful for the environment but also is crucial in growing worries of climate change. Trees can naturally purify the earth. As at present time the human beings cannot walk without networking system, same as trees give the networking system to the earth surface. A tree gives oxygen,

rain, fruits, vegetables, woods, medicines, and does photosynthesis.

As we live in the earth, get the natural benefits from the earth, use the things of the earth, like a same way we should return the good things to the earth by plantation of trees, because; a tree is the best friend of the earth. So we should all remember that plant a tree today for better tomorrow.

Implication of Tree Plantation: *"The Bio Significance Of Plantation"*, this study has implications in different fields. The fields are related with animals, birds, microorganisms, human beings and all over the earth. Trees are very much essential part of our lives. But in today's world there are so many trees are cutting down for building the streets, residents, industries and so on. Unfortunately, deforestation can cause much pollution on the earth, harmful for the wild animals, and other species including human. Also deforestation has resulted in devastating floods and landslides. So tree plantation can save these disasters from occurring. Trees are also known for their ability to hold soil and prevent erosion. During the heavy rain the topsoil of the earth is washed away, trees play important role to prevent erosion of topsoil. Thus the healthy ecosystem is grown by plantation.

Tree plantation is also required for economic growth of a country by providing timber, wood and rubber which help in construction of home, furniture, paper and products sold in the market. Trees also give us different fruits which we use to make juice, jams and other eatables as well. So by these ways trees can help to increase the economic growth of a country. However, the people understand the relevance and importance of planting trees in now days. It is the major duty to all of humanities to plant more trees to save our ailing planet. So the global tree plantation day, which is observed on March 21to make the people aware about the importance of plantation. It should be informed to people that planting saplings to invest in the future is a common practice on tree plantation days.

The implication of this article is to make the environment green and healthier for the living organisms. All the living organisms are incomplete without trees. Trees give us life. Plantation of trees has many implications, these are as follows:-

- **Personal Benefits**- People have an emotional connection with trees. Trees have spiritual and religious significance as they are worshiped as equal to God. Thus trees give personal benefits.
- **Community Contribution**-A community with street side trees, parks with trees, playgrounds with trees is peaceful and relaxable. Trees also can bring people together, through different activities, such as; walking.
- **Health Benefits**- A tree is always beneficial for human health by providing

fresh environment. Also a tree's shade is useful for preventing ultra-violet ray from the sun. So a tree is beneficial for our physical and mental health both.

- **Prevent pollution**- There are many pollutions in the environment which can cause different diseases. Only trees can prevent these pollutions and make the environment healthy.
- **Medicines**- Different types of medicines are produced from the trees, for e.g. Malaria medicine; Quinine is derived from the Cinchona tree.
- **Cooling earth surface**- Trees can keep cool the earth surface, if the trees are cutting down, the earth becomes very warm.
- **Asset**- Trees are the fixed assets for human life as well as the nations.
- **Environment**- Tree plantation absorbs the carbon dioxide, removes and stores carbon and releases oxygen into the air. Thus trees can purify the environment.

In case of bio significance of plantation, we celebrate ***World Environment Day, 5th June***. On this day governments, NGOs, businesses, educational institutions, health centers all of are engaged for celebrating this day.

So, we see that trees have the power to protect the lives of living organisms. A tree saves a million of species lives. Trees are the best friends of human beings as well as animals and other species. The bio significance of the plantation is that to save the trees as they give us a fruitful life. So it is our responsibility to save the lives of the trees.

So, we should plant many trees in city or urban areas to make these areas beautiful as well as beneficial for the people living there. And also nurture the trees of rural areas to keep the rural areas' environment healthy. It is shown that rural areas' environment is more purify than the urban areas, because there are much trees than the urban areas. Rural people get a healthy environment for getting the green environment. But here the urban people face some pollution problems because lack of trees. So we should keep the best friendship of the trees as they are always help us as well as the animals and overall the species on this earth.

Conclusion: So, it is the time to realize that how important trees are for our environment as well as our social and economic wellbeing. Thus we should take the responsibility to plant the trees whenever and wherever we can make our planet a better place to live. So, we can say that trees are important to us as well as other animals a lot of ways and we cannot ignore the importance. The bio significance of plantation stands for the peacefulness of trees, their pleasant creation on the earth.

It is very important to save trees. Planting trees helps in increasing the green cover of the earth and improve the environment. Planting trees gives us enjoyment, makes us joyful with the beauty of the greenery.

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Global Warming: A General Overview with Special Reference to English Literature

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Abstract: The purpose of writing this piece of work is to give a general overview of Global Warming with special reference to English Literature. How the concept of Ecology be associated with the contents of literature down the ages. Poets and advocates of literature have spoken highly of Mother Earth and Nature, but their perspectives have varied from time to time with the change in atmospheric situations. Through this writing the author also discussed about what is Global Warming; stating about its cause and effects in a brief way in order to get an overall idea about the topic in a chronological manner. So, the main focus of writing is to make the readers aware of the alarming environmental situation created by Global Warming and being a student of literature how we perceive this problem.
Key Words: Global Warming, English literature.

Introduction: Global Warming is a phenomenon where the Earth's average temperature rises due to increased amounts of greenhouse gases such as carbon dioxide, methane and ozone trap the radiation from the sun .This creates a natural "blanket" which prevents the heat from escaping back into the atmosphere. This effect is called Greenhouse Effect. The primary effect can be seen on our glaciers, as they are melting and raising the sea level, effecting the human existence.

However Climate themes are topic of discussion in different disciplines. They are not only found in science fiction, dystopian fiction, literary fiction, speculative fiction and fantasy; but also seen in novels dealing with romance, suspense, thriller, adventure and the like. Apart from fiction, good poems remind us of our humanity, Nature and what we have done to nature as human beings. Poems like "I don't know what will kill first us first: The Race War or What we've done to the Earth "by Fatimah Asghar. "Ice Would Suffice" by Risa Denenberg; "Song For Turtles in the Gulf" by Linda Hogan ; "Some effects of Global Warming in Lackawanna county " by Jay Parini – are some of the noteworthy poems which speak about Global Warming and how they have started effecting our Mother Earth and Humanity.

Objectives of the Study:

The objectives of study of this particular extract is:

i. To know about what is Global Warming
ii. To have a general overview about the relationship of Literature and Climate change.

Theoretical Framework

The concept of Global Warming is no longer unfamiliar to the civilization which is surviving on the dungeons of devastation. It is the long term heating of Earth's surface observed since the pre industrial period (between 1850 and 1900) due to human activities primarily Fossil Fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere. Cutting down of the forests to create farms or pastures or for establishment purpose causes emissions because when trees are cut, they release the carbon dioxide they have been storing. Since forests absorb carbon dioxide, destroying them also limits Nature's ability to keep emissions out of the atmosphere. More frequent and intense drought ,storms , heat waves, rising sea levels ,melting glaciers and warming oceans are directly harming animals , destroying their habitats and are wrecking havoc on people's livelihood and communities.

Literature has had a long relationship with Climate as the human species attempts to capture its home environment and convey a sense of it to others, develop an a understanding of why landscapes vary from one place to another , and communicate as well as preserve our environmental knowledge. *Arrhenius* presented a first expression of the theory of Global Warming in 1896 and *Callendar* argued that carbon dioxide (CO2) emissions from industry were responsible for Global Warming. The Climate emergency may be unprecedented, but there are a few key ways in which past literature offers a valuable perspective on the present crisis. New Novels about Climate change – Climate Fiction or Cli-fi are being published all the time. The nature of Climate Crisis is a difficult thing to get across, and so it leaves to imagining the future- as a drowned city; or a world in which water is a precious commodity.

Analysis and Interpretation: When *Byron* and *Shelley* stayed on the shores of Lake Geneva in 1816 the literature that they wrote responded to the "wild weather" of the "year without summer". Literary works such as *Byron's 'Darkness", Percy Shelley's 'Mont Blanc", Mary Shelley's "Frankenstein"* reveal anxieties about human vulnerability to environmental change. M any older texts also bear indirect traces of historical climate change. In *Paradise Lost (1667), John Milton* complains that a "cold climate may damp my intended wing" and prevent him from completing

his masterpiece. Even literature's oldest epic poem "The *Epic of Gilgamesh" (c. 1800 BC)* contains traces of Climate Change. It tells of a huge flood which like the later story of *Noah* in the "*Old Testament"* is probably a cultural memory of the sea level rise following the melting of glaciers at the end of the last Ice Age. Or consider how in 18th and early 19th centuries, the work of nature writers such as *Thomas Bewick , Charlotte Smith* and *Gilbert White* played an important role in promoting natural theology.

Historical Literature can remind us of our own vulnerability to elemental forces. The famous depiction of the storm in" *King Lear",* for example mocks Lear's attempts.

"In his little world of man to out scorn
The to-and-fro conflicting of rain."

Shakespeare might appear to aesthetics dangerous weather, but the play reminds us that the storm is far bigger and messier than any human attempts to represent and interpret it.

Even the period Renaissance during the Restoration Period has also viewed Climate Change as a divine punishment for bad behavior. *John Milton* in his epic poem" *Paradise Lost "*suggest that it was the fall of man that brought in "*pinching cold and scorching heat"* to replace the Eternal Spring of the Garden of Eden. His narrative has clear figurative resonance with our present crisis.

If we speak of Modern Literature, poets like *T.S.Eliot* in his masterpiece "The Waste Land" expresses that "April *is the cruelest month…"* No wonder his perspective coincides with the concept of Global Warming. In the recent years new list of climate poems have been written to offer a cathartic release. *" How to let go of the World" by Fanny Choi; " Particulate Matter" by Molly Fisk ; "Warned" by Sylvia Stults; " Evening" by Dorianne Laux; " Thirteen ways of looking at a glacier (after Wallace Stevens) by Craig Santos Perez* and many more such poems speak about the devastating after effects of Climate Change.

Thus, in the words of literature Global Warming isn't hard to explain. It leaves Mother Earth crying with excruciating pain. This silent pain has been through different forms of expressions – be it poems, or dramas or fictions. It seems that the current predicament was inwardly perceived and felt by them long back and through their creative work they tried to leave a message to humanity about the impending disaster and catastrophe humanity was about to face.

Implication of the Study: The implication of this study is to make humans aware about the deadly clutches of Global Warming and its fatal effects on Earth

and Humanity. It is a result of many serious alterations to the environment and eventually impacting Human health. So being a student of literature, it's a humble effort on my part to portray this burning problem with an overview of literature, as to how this problem has been visualized, predicted and enumerated by the great literarians. As the citizens of this World it is our duty to understand and realize this problem and make efforts to bring back the balance of the Eco- system and make Earth a healthy place to live in.

Conclusion: In conclusion, it can be said Climate Change is the most significant problem the World is facing. Global Warming is increasing day by day by the mindless activities of the humans and other reasons related to environmental changes. So if we do no not take steps to prevent it as soon as possible, our world will face undesirable consequences. So, the need of the hour is to handle this problem seriously and save our Mother Earth from being completely devastated and destructed from its fatal paws of fury.

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A Journey towards Sustainability with Biodegradable Plastics

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Abstract: Today, we utilize plastics extensively. These can be used in anything, including autos and mobile devices. Plastic is a common material used for small items in daily life. Plastic bottles, plastic cutlery, plastic furniture, plastic toys, and even plastic clothing and accessories for interior décor are things we've grown accustomed to using. Although the usage of plastic has significantly enhanced our lives, its negative effects have already reached their limit. Our environment is under jeopardy. Our entire ecology and health are at risk due to the associated carbon emissions from plastics. We must figure out a solution to the problem. Our current goal is to establish an environmentally sustainable planet.

Therefore, it has been taken into account to create plastics that are degradable. For this, certain basic steps have been taken for the sake of a sustainable environment. The major one is creating biodegradable plastic. Biodegradable plastics are mainly made from materials that are easily assimilated by microorganisms and disappear from our environment. We can sort out the problems like climate change by this. Our Earth can be cleaner without plastic. The necessity of Bio degradable plastic materials have grown multi folded in last few years. Despite the fact that their use only partially addresses the issue, we are aware of our obligation to preserve the environment for coming generations. So, using biodegradable plastics is our commitment to future generations that we will move closer to sustainability.

Keywords: biodegradable, plastic, recycling, waste, journey, sustainable environment.

Introduction: Certain innovations in the journey of civilization have created the epitome of success. Plastic may be considered in this context. This is a material that can be used universally for several purposes without any decay or decomposition for several years. This landmark innovation has been working as a blessing as well as a curse for the environment since its introductory years. We benefit from using plastic in numerous ways. But the problem lies with the fate of used plastics. As those are not perishable, a huge mass of used plastics has already crossed the limit of what is safe for the environment. Study shows, the production of plastics dates back to 20th century till date, 6.3 billion tons of plastic waste materials were produced. Since it is a non-biodegradable product, accumulated plastic waste has taken a huge toll on the environment. Scientists, driven by the purpose of saving the environment, have

commenced recycling plastics. But the problem is larger than the solution. Statistics regarding plastic recycling have marked that -

- 9% of waste plastic has been recycled to date.
- 1% has been recycled more than once.
- 12% was incinerated,
- 79% are disposed of in landfills or the environment, including the sea.

Therefore, we need to create biodegradable plastic materials to control the damage done to the environment.

Objectives: The comprehensive approach to creating and using biodegradable plastic materials has covered the necessity of saving Mother Earth in the form of reducing dependence on landfills, conserve resources and protect the environment from plastic pollution and greenhouse gas emissions. The objectives of the study are as follows:

- To provide with a general overview of biodegradable plastics.
- To highlight the significance of using biodegradable plastics with advantages and disadvantages.
- To establish the viewpoints of the sustainability with bio degradable plastics.

Theoretical Framework: Plastics made from organic material that can be decomposed by different organisms like bacteria, fungi, algae to assimilate in water, carbon dioxide and residue biomass in the industrial set up, within 180 days, is considered Bio Degradable Plastic. A favorable environment with a definite temperature, humidity, sunlight, or presence of oxygen is required to perform the action. The major varieties of biodegradable plastic are:

- Oxy-biodegradable and conventional plastics
- Hydro bio degradable which are broken down by hydrolysis
- Photobiodegradable, which reacts with UV rays
- Bioplastics made from biologically sourced polymers

The chemical process for biodegradation starts with the oxidation and hydrolysis of plastic materials. Then a biological process is also carried out. We get carbon dioxide as the end product from these chemical processes. In some cases, methane gas is also emitted. Enzyme assisted mechanism is performed to complete the process. These biodegradable plastics are compostable in nature, too. Manufacture of Bio degradable plastics is done from

- An organic bio-based material (Starch, Cellulose)

- Bio-oils like sugarcane
- Fossil-based synthetic polyester (biodegradable)

They can also be made from soy beans, orange peels, starch, corn oils, and other microorganisms.

Industrially, at the time of manufacturing biodegradable plastic, we get

- Bio plastic which are made from starch mainly, and
- Biodegradable plastic is made from petrochemicals, which break down in industrial settings.

From the point of view of the degradation process, bioplastics can be completely degraded as they are manufactured from renewable sources.

Discussion and Analysis: After procuring detailed research by the scientists on manufacturing biodegradable plastics, we have three types of degradable plastics. Those are:

- Compostable,
- Biodegradable, and
- Oxo-biodegradable

Among these three varieties, compostable plastic breaks down in carbon dioxide, water and biomass without leaving any toxic or harmful material in the environment in an industrial compostable set up. Biodegradable plastics have the chance to leave some toxins after breaking down, and the third variety, which is oxo biodegradable plastics, is not completely environment friendly. It leaves heavy metals and other toxic materials in the soil, and there is a chance they will not get broken down completely.

Therefore, compostable plastic and biodegradable plastic both have the capacity to be broken down into their organic constituents. Composting of plastic requires a specific amount of heat, pressure, and nutrient concentration to maintain a definite chemical ratio. It can be done only in an industrial setting. Aerobic environments are also needed to perform this action. On the other hand, biologically made polymers sourced from non fossil material during bio degrade naturally in the environment.

All organic materials are actually biodegradable, which takes from weeks to millions of years to break down into organic materials. Therefore, the processing needs to be done to reduce pollution of the environment and to achieve the ultimate goal of sustainable development.

- **Advantages of Bio Degradable Plastic:** With the advent of technology and

improved access to materials, we can produce biodegradable plastic on a large scale. More use of biodegradable plastic will help reduce pollution created by conventional plastic materials. We may summarise the benefits as follows:

We use biodegradable plastic in many ways in our lives today.

- As shopping bag
- As compostable wastes collection bag for bins
- For packaging purposes for fruits, meats, and frozen foods
- For use in medical requirements like screws, pins, plates, etc.
- For making disposable catering utensils.
- For making pens, pencils, sharpeners, stationery items, bottles, tea bags, and air pillows.

➢ **Disadvantages of Bio Degradable Plastic:** Despite having a lot of advantages, it does have some drawbacks as well. Let's have a quick note on these.

- These are not completely degradable, which may retain harmful traces in the environment.
- A costly industrial setup with special machinery is needed to process composting plastics.
- The availability of equipment is another factor.
- A specific disposition process needs to be followed to get an accurate result.
- It is an expensive product.
- Single uses are required.
- It requires a lot of water for the process. If there is scarcity of rainfall, the process of decomposition gets hampered.
- The plants that are used as a resource for manufacturing biodegradable plastic are contaminated with agrochemicals during agriculture. Therefore, we cannot avoid the risk of being exposed to those chemicals.

Implication of the Study: Today, the use of biodegradable plastic is gradually becoming more popular. The use of biodegradable plastic bags in supermarkets for packaging products and compostable plastic bags for collecting waste materials in shopping malls, cinema halls, restaurants, hospitals, or any other public places has become a popular choice. These applications are broadening with time.

Biodegradable plastics have the prospect of being used beyond food packaging or manufacturing essential products like toothbrushes, batteries, furniture, diapers, phones, computers, and others. Research is going on to develop its qualities to be

compatible with the environment and eco-friendly. The world awaits the future of biodegradable plastic materials to initiate a revolution.

Conclusion: We are all well aware of the term "sustainable environment" now. The long-awaited goal of finding a solution for the environment can be well addressed with the use of biodegradable plastics. Compostable plastics do not have any nutritional value, but they have taken on a major role in sustainable biowaste management. Certified compostable plastics should be used in place of conventional plastic. They have a potential environmental benefit in the form of biowaste collection bags. Agricultural mulch film is another example that can be used to prevent long-term plastic accumulation in soil.

With the use of biodegradable and compostable plastics, we can get specific benefits for the environment, but further improvements are required to meet the need. Though the demand for these plastics is increasing significantly, it is still far from being a solution for a green environment.

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Spreading Awareness against Global Warming Through Eco Club

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Abstract: Amidst the escalating climate crisis, eco club awareness programmes have emerged as potent tools in combating global warming and fostering environmental consciousness. Rooted in community-based initiatives, these programmes aim to educate individuals about climate change, biodiversity loss, and sustainable practices, igniting collective action for a more ecologically mindful future. This article presents a comprehensive analysis of the impact of eco club awareness programmes, exploring their implications for environmental education, behaviour change, youth empowerment, and community engagement. The introduction underscores the urgency of addressing global warming and introduces eco clubs as pivotal platforms for driving climate awareness. The objectives section outlines the multifaceted goals of eco club awareness initiatives, encompassing awareness raising, sustainable practice promotion, climate advocacy, collaborative learning, youth empowerment, and lasting impact creation. The theoretical framework section elucidates evidence-based theories like Social Cognitive Theory, Theory of Planned Behaviour, and Diffusion of Innovation, underscoring the effectiveness of eco-clubs in shaping attitudes and behaviours towards sustainability. The discussion and analysis segment offers empirical evidence supporting the impact of eco club awareness programmes. Research indicates that these initiatives enhance climate knowledge, dispel misinformation, and foster informed decision-making. Additionally, eco clubs facilitate behaviour change, with participants adopting eco-friendly practices and reducing their carbon footprints. Evident community engagement and social influence highlight how eco club members inspire positive change within their circles, catalyzing an environmental consciousness ripple effect. Furthermore, eco club awareness programmes empower youth as environmental leaders, endowing them with skills for advocacy and leadership roles. These programmes contribute to climate change mitigation through tangible carbon emissions reductions and resource conservation efforts. The article emphasizes the importance of collaborative partnerships in enhancing eco club impact. In conclusion, eco club awareness programmes illuminate the path towards a sustainable future. By fostering awareness, advocating sustainable practices, empowering youth, and kindling community engagement, these initiatives play a pivotal role in building a

resilient world. Through the collective endeavours of eco clubs and their participants, a greener, more sustainable future is envisioned, safeguarding the planet and its inhabitants.

Keywords: Eco club, Awareness programme, Global warming, Climate change, Environmental education.

Introduction: Global warming is one of the most pressing challenges facing humanity today. The rise in average global temperatures due to greenhouse gas emissions has far-reaching consequences, such as extreme weather events, rising sea levels, and biodiversity loss. Addressing this crisis requires concerted efforts from individuals, communities, governments, and organizations worldwide. In this context, eco club awareness programmes have emerged as a powerful tool in the fight against climate change. Eco clubs are community-based organizations that bring together like-minded individuals passionate about environmental sustainability. These clubs operate in schools, colleges, universities, and local communities, fostering a sense of environmental responsibility and promoting eco-conscious practices. The aim is to empower participants with knowledge about climate change, biodiversity, and sustainable living, thereby inspiring collective action to combat global warming.

The main objective of eco club awareness programmes is to raise awareness about the causes and consequences of global warming. Through interactive workshops, educational sessions, and hands-on activities, these programmes instill a sense of environmental stewardship and encourage individuals to adopt eco-friendly habits in their daily lives. By nurturing a culture of sustainability, eco clubs play a crucial role in shaping the future generation's attitudes towards the environment.

Moreover, eco club awareness programmes extend beyond individual behaviour change; they also foster a sense of community engagement and activism. By organizing tree-planting drives, beach clean-ups, and advocacy campaigns, these clubs become catalysts for broader environmental movements. This collective effort amplifies the impact of their initiatives and drives systemic change in society.

Objectives of the Study: The objectives of the study are as follows:

i. To provide a theoretical framework of eco club awareness programmes in raising awareness against global warming.
ii. To highlight the principal objectives eco club awareness programmes.
iii. To explore the impact of eco club awareness programmes from various perspectives.

Theoretical Framework: The effectiveness of eco club awareness programmes

in raising awareness against global warming can be understood through several relevant theoretical frameworks. These theories provide valuable insights into human behaviour, learning, and the processes by which individuals adopt pro-environmental attitudes and behaviours. The following theoretical frameworks are commonly applied to analyse the impact of eco club awareness programmes:

1. Social Cognitive Theory: Social Cognitive Theory, proposed by Albert Bandura, emphasizes the role of observational learning and social influence in shaping behaviour. According to this theory, individuals learn from observing others and are more likely to adopt behaviours that lead to positive outcomes. In the context of eco clubs, Social Cognitive Theory suggests that when participants witness their peers actively engaging in eco-friendly practices and experiencing positive results, they are more likely to emulate those behaviours. By creating a supportive community that models sustainable actions, eco clubs can effectively influence participants' attitudes and behaviours towards mitigating global warming.

2. Theory of Planned Behaviour: The Theory of Planned Behaviour, developed by Icek Ajzen, focuses on the intention-behaviour relationship. It suggests that an individual's intention to perform a behaviour is influenced by their attitudes, subjective norms, and perceived behavioural control. In the case of eco club awareness programmes, this theory implies that promoting pro-environmental attitudes, social norms around sustainability, and the perception of personal control over sustainable actions can lead to increased intentions to adopt eco-friendly behaviours. By targeting these factors through education and empowerment, eco clubs can foster a greater willingness among participants to take climate-friendly actions.

3. Diffusion of Innovation Theory: The Diffusion of Innovation Theory, introduced by Everett Rogers, explores the process by which new ideas, practices, or technologies spread within a society. In the context of eco club awareness programmes, this theory suggests that eco clubs serve as innovation hubs, where participants are exposed to new and sustainable practices. As eco club members adopt and advocate for these innovations, they influence their social networks, leading to the diffusion of eco-conscious behaviours and attitudes within their communities. By leveraging the power of social networks, eco clubs can facilitate the widespread adoption of sustainable practices and raise awareness about global warming on a broader scale.

4. Experiential Learning Theory: Experiential Learning Theory, developed by David A. Kolb, emphasizes the importance of learning through direct experiences

and reflection. Eco club awareness programmes often incorporate hands-on activities, field trips, and interactive workshops, providing participants with real-life experiences related to environmental issues. According to this theory, these experiences enhance the participants' understanding and retention of information, fostering a deeper connection to environmental concerns. By creating opportunities for experiential learning, eco clubs can effectively engage and inspire participants to become proactive agents of change in the fight against global warming.

The combination of these theoretical frameworks provides a comprehensive understanding of how eco club awareness programmes can influence individuals' attitudes, knowledge, and behaviours regarding climate change. By aligning their strategies with evidence-based theories, eco clubs enhance their potential to raise awareness, foster sustainable practices, and inspire collective action against global warming. In the subsequent sections, we will explore the impact of eco club awareness programmes and their implications for addressing the challenges of climate change.

Discussion and Analysis:

Objectives of Eco-Club Awareness Programmes: The objectives of eco club awareness programmes are multi-faceted and encompass various aspects of environmental education and community engagement. Here, we outline the key objectives that these programmes seek to achieve:

1. Raise Awareness about Global Warming: The primary objective of eco club awareness programmes is to educate participants about the science behind global warming, its causes, and the resulting environmental impacts. By providing accurate and up-to-date information, these programmes aim to dispel misconceptions and foster a deeper understanding of the urgent need for climate action.

2. Promote Sustainable Practices: Eco club awareness programmes strive to inspire participants to adopt sustainable practices in their daily lives. These practices include energy conservation, waste reduction, water efficiency, and the use of eco-friendly products. By empowering individuals to make environmentally conscious choices, these programmes contribute to reducing carbon footprints and resource consumption.

3. Encourage Climate Advocacy: Beyond individual actions, eco clubs aim to nurture a sense of environmental activism and advocacy among their members. By providing a platform for youth to voice their concerns about climate change, these programmes encourage participants to engage with policymakers, businesses, and

their communities to promote climate-friendly policies and initiatives.

4. Facilitate Hands-On Learning: Eco club awareness programmes often involve practical activities like community clean-ups, organic gardening, and tree-planting initiatives. These hands-on experiences allow participants to witness the direct impact of their efforts and develop a deeper connection to the environment.

5. Foster Collaborative Learning: Eco clubs provide a space for collaborative learning and problem-solving. Participants work together to brainstorm innovative solutions to environmental challenges, fostering critical thinking and teamwork skills.

6. Empower Future Leaders: By engaging young people in eco club awareness programmes, these initiatives empower the next generation of environmental leaders. Equipped with knowledge, passion, and a commitment to sustainability, participants are inspired to drive positive change in their schools, families, and broader communities.

7. Create Lasting Impact: Eco club awareness programmes aim to create a lasting impact on participants' attitudes and behaviours. By nurturing a sense of responsibility and stewardship for the environment, these initiatives aim to create a ripple effect, influencing the wider community and future generations.

8. Promote Interdisciplinary Learning: Climate change is a complex issue that requires a multidisciplinary approach. Eco club awareness programmes integrate various subjects like science, social studies, economics, and communication to provide a comprehensive understanding of the interconnectedness of environmental challenges and solutions.

By grounding their approaches in evidence-based theories, these programmes enhance their potential to create a positive impact in the fight against global warming.

Eco club awareness programmes have emerged as powerful platforms for raising awareness against global warming and fostering environmental stewardship. By employing interactive educational methods, promoting hands-on experiences, and leveraging social dynamics, these programmes effectively engage participants and drive meaningful change. In this section, we will explore the impact of eco club awareness programmes from various perspectives, backed by real-world examples and empirical evidence.

1. Knowledge and Awareness Enhancement: Studies have shown that participation in eco club awareness programmes leads to a significant increase in participants' knowledge about climate change, greenhouse gas emissions, and the consequences

of global warming. For instance, research conducted by Herring and Roychoudhury (2019) demonstrated that high school students who engaged in eco club activities exhibited a 30% improvement in their understanding of climate-related concepts compared to their peers who did not participate.

Moreover, eco club awareness programmes play a crucial role in debunking climate change myths and misinformation. By presenting evidence-based information, eco clubs empower participants to make informed decisions and contribute to informed public discourse about climate issues.

2. Behaviour Change and Sustainable Practices: Beyond raising awareness, eco club awareness programmes are successful in promoting tangible behaviour change towards sustainability. Participants often adopt eco-friendly practices in their daily lives, such as reducing plastic waste, conserving energy, and using public transportation. A study conducted by Li et al. (2020) found that university students who actively participated in eco club initiatives were more likely to adopt pro-environmental behaviours and exhibited a significant reduction in their carbon footprints.

The interactive and experiential nature of eco club activities contributes to the effectiveness of behaviour change efforts. By providing hands-on experiences like recycling workshops and organic gardening, these programmes enable participants to witness the immediate impact of their actions, reinforcing their commitment to sustainable practices.

3. Community Engagement and Social Influence: Eco clubs foster a sense of community engagement and social influence, creating a network of environmentally conscious individuals who collectively advocate for climate action. As participants actively engage in eco club initiatives, they inspire their peers, family members, and teachers to adopt eco-friendly behaviours.

The power of social influence within eco clubs is evident in a study by Wang and Chen (2018) that explored the ripple effect of eco club activities. They found that students who participated in eco club events became influential environmental advocates, inspiring positive changes in their social circles and motivating others to join the sustainability movement.

4. Empowerment and Leadership Development: Eco club awareness programmes serve as platforms for empowering future environmental leaders. By encouraging active participation and providing opportunities for leadership roles, these initiatives instil a sense of responsibility and agency among participants. Studies have shown

that students involved in eco clubs develop stronger leadership skills, improved communication abilities, and enhanced problem-solving capabilities (Ramkumar et al., 2021). These skills not only benefit participants within the eco club but also equip them to take on leadership roles in broader environmental movements.

5. Multi-disciplinary Learning and Holistic Approach: Eco club awareness programmes embrace a multi-disciplinary approach to environmental education, bridging science, social studies, economics, and communication. By integrating diverse subjects, these programmes offer a holistic understanding of the interconnectedness of environmental challenges and solutions. This multi-disciplinary learning approach helps participants appreciate the complexity of climate change and the need for collaborative efforts to address it effectively.

Implications of the Study: Eco club awareness programmes play a pivotal role in raising awareness against global warming and nurturing a generation of environmentally conscious individuals. By providing experiential learning opportunities, promoting sustainable practices, and fostering community engagement, these initiatives effectively contribute to the fight against climate change. Moreover, their impact extends beyond the immediate participants, as they inspire a broader cultural shift towards sustainability. As we move towards a more sustainable future, eco club awareness programmes remain invaluable in shaping the mindset of the youth and driving collective action to combat global warming.

The implications of the study on the impact of eco club awareness programmes in raising awareness against global warming are far-reaching and hold significant importance for various stakeholders. These implications shed light on the potential benefits and contributions of eco clubs in the broader context of climate change mitigation and environmental education. Here are some key implications:

1. Strengthening Environmental Education: The study's findings emphasize the vital role of eco club awareness programmes in strengthening environmental education. By providing experiential learning opportunities and fostering multi-disciplinary approaches, eco clubs enhance participants' understanding of complex environmental issues. This, in turn, can lead to more informed and responsible decision-making in individuals' personal and professional lives, contributing to a more sustainable society.

2. Empowering Youth for Climate Action: One of the most significant implications of the study is the empowerment of youth as climate change advocates and leaders. Eco club awareness programmes nurture a generation of environmentally conscious

individuals who are motivated to take proactive action against global warming. As young people develop leadership skills and engage in advocacy efforts, they become powerful agents of change, driving climate action at local, national, and global levels.

3. Amplifying Community Engagement: The study highlights how eco club awareness programmes serve as catalysts for community engagement and social influence. By inspiring participants to adopt sustainable practices and advocate for climate action, eco clubs create a ripple effect within their communities. This amplification of community engagement can lead to collective efforts in tackling environmental challenges, fostering a sense of environmental responsibility among the broader population.

4. Contributing to Climate Change Mitigation: The implications of the study suggest that eco club awareness programmes make tangible contributions to climate change mitigation efforts. Through the adoption of sustainable practices and reduced carbon footprints, participants directly contribute to greenhouse gas emission reductions. Moreover, as eco club initiatives influence social networks and inspire behavioural change in others, the cumulative impact on greenhouse gas reductions can be substantial.

5. Promoting Collaborative Partnerships: Eco club awareness programmes often involve collaboration between educational institutions, non-governmental organizations, local governments, and other stakeholders. The study's implications underscore the importance of fostering collaborative partnerships to maximise the impact of these initiatives. By pooling resources, expertise, and support, these partnerships can enhance the effectiveness and sustainability of eco club awareness programmes.

6. Informing Policy and Curriculum Development: The study's insights can inform policy development and curriculum design related to environmental education. As eco club awareness programmes demonstrate their effectiveness in raising awareness and fostering behaviour change, policymakers and educational institutions may be motivated to integrate similar initiatives into formal education systems. This integration can result in a more comprehensive and effective approach to climate education, equipping students with the knowledge and skills to address global challenges.

7. Inspiring Corporate Social Responsibility (CSR) Initiatives: The positive outcomes of eco club awareness programmes may also inspire businesses and

corporations to incorporate environmental initiatives into their CSR strategies. By supporting and collaborating with eco clubs, corporations can demonstrate their commitment to environmental sustainability and empower youth-led efforts to combat climate change.

The implications of the study emphasize the pivotal role of eco club awareness programmes in raising awareness against global warming, promoting sustainable practices, and empowering youth for climate action. These programmes not only contribute to individual behaviour change but also create a ripple effect of environmental consciousness within communities. As eco clubs continue to play a crucial role in shaping a sustainable future, their impact extends beyond their immediate participants, influencing society, and fostering collective action to address the urgent challenges of climate change.

Conclusion: In conclusion, eco club awareness programmes have emerged as powerful and effective tools in the fight against global warming and the promotion of environmental stewardship. These programmes play a crucial role in raising awareness, fostering behaviour change, empowering youth, and inspiring collective action to address climate change.

Through interactive and experiential learning, eco clubs enhance participants' knowledge and understanding of climate-related issues, debunking myths and misinformation surrounding global warming. This knowledge empowers individuals to make informed decisions and advocate for climate action in their communities. Moreover, eco club awareness programmes go beyond knowledge dissemination; they instil a sense of environmental responsibility and inspire participants to adopt sustainable practices in their daily lives. By promoting energy conservation, waste reduction, and other eco-friendly behaviours, eco clubs contribute to carbon emissions reductions and resource conservation. One of the most significant outcomes of eco club participation is the empowerment of youth as environmental leaders. By providing platforms for leadership development and advocacy, these programmes create a new generation of environmentally conscious individuals who drive climate action at local, national, and global levels. Eco clubs also have a ripple effect within their communities, inspiring positive change through social influence. As participants engage in eco-friendly practices and advocate for sustainability, they influence their peers, families, and social circles to adopt similar behaviours, creating a broader cultural shift towards environmental consciousness.

The implications of the study highlight the importance of eco club awareness

programmes in strengthening environmental education, amplifying community engagement, and contributing to climate change mitigation. Collaborative partnerships among educational institutions, NGOs, governments, and corporations can further enhance the impact of these initiatives. In light of the study's findings, policymakers and educators can integrate similar initiatives into formal education systems, fostering a more comprehensive and effective approach to climate education. Businesses and corporations can also draw inspiration from eco club success stories and incorporate environmental initiatives into their corporate social responsibility strategies. As we move towards a more sustainable future, eco club awareness programmes remain invaluable in shaping the mindset of the youth and driving collective action to combat global warming. These programmes serve as beacons of hope, inspiring positive change and fostering a shared commitment to preserving our planet for future generations. By nurturing environmentally conscious leaders and communities, eco clubs play a crucial role in the global effort to create a more sustainable and resilient world.

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Paving the Way to Recover the Protective Layer: Role of Greenhouse Gas Emission On Creating Ozone Hole And Finding Its Remedy

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Abstract: Emissions of greenhouse gases and ozone depleting substances can create ozone hole through atmospheric interaction. Various amendments taken by the Montreal Protocol to control the consumption and production of anthropogenic ODSs and some HFCs. IPCC is established to keep an eye on climate change and to reach the desired goal. Along with the ODSs, VSLSs also play role in Ozone depletion. Qualitative and quantitative studies are used to evaluate the status of Greenhouse gas emissions. CO2, CFCs, Water vapour, N2O are the major Greenhouse emissions which raise the atmospheric temperature. Here It is shown that how the amount of various ODSs like tropospheric chlorine-bromine, different CFCs, halons, HCFCs, CCl4 etc increasing or decreasing that affects on stratospheric ozone between 2016- 2020 under the control of Montreal protocol. The continued increasement of anthropogenic emissions, Non-ODSs affects on climate leading to greenhouse Effect. Decarbonization of the fossil fuel industry through a transition to molecular hydrogen (H2) could lead to large increases in atmospheric H2 which can play a small role in future global stratospheric ozone. The impacts of rapidly expanding ODS and HFC feedstock use and emissions; increased frequency of civilian rocket launches and the emissions of a proposed new fleet of supersonic commercial aircraft influence on 21st century ozone and the area of heightened concern. Stratospheric aerosol injection is thought to be a new hope to offset the global warming. Among all of these, there is a ray of hope that the ozone hole is healing in a slow manner. Various environmental groups and scientist succeeded to ban various ozone depleting chemicals globally which is one of the most critical environmental achievements to date. It is said the recovery is gradual and will take many years and expected that the Artic region and Antarctica may return to the normal by 2045 & 2066.Keywords: Ozone Depleting Substances, Stratospheric Ozone, Montreal Protocol, Greenhouse gas emissions.

Introduction: Ozone Hole or Depletion is caused by human-related emissions of ozone- depleting substances (ODSs) and the subsequent release of reactive halogen gases, especially chlorine and bromine, in the stratosphere. ODSs include chlorofluorocarbons (CFCs), bromine-containing halons and methyl bromide,

hydrochlorofluorocarbons (HCFCs), carbon tetrachloride (CCl_4), and methyl chloroform. The enhanced greenhouse effect arises from a changing radiation balance in the atmosphere caused by anthropogenic emissions from carbon dioxide (CO_2). methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbons (CFCs). Tropospheric ozone, various types of aerosols, changes in clouds and emissions of minor trace gases also influence the enhanced greenhouse effect. The stratosphere interacts with the greenhouse effect, or climate change processes, in several ways. Some anthropogenic emissions cause chemical changes in both the troposphere and stratosphere, thereby affecting the concentration of greenhouse gases in the troposphere and also influencing the amount of active chlorine and bromine compounds in the stratosphere. The enhanced greenhouse effect causes changes in temperature of both the troposphere and stratosphere, which may affect the chemical composition of the atmosphere as well as its dynamics. It may also influence the exchange processes between the troposphere and stratosphere and thus the chemical composition. Changes in stratospheric ozone also cause changes in the amount of UV radiation reaching the troposphere, which affects the photolysis rates of several chemical reactions and thus changes the chemical composition of the atmosphere. In 1985 the Vienna Convention to protect the ozone layer was signed. This was followed by the Montreal Protocol in 1987 and several amendments and adjustments, i.e. London, Copenhagen and Vienna amendments in 1990, 1992 and 1995, respectively. The 1985 Vienna Convention for the Protection of the Ozone Layer is an international agreement in which United Nations States recognized the fundamental importance of preventing damage to the stratospheric ozone layer. The 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and its succeeding amendments, adjustments, and decisions were subsequently negotiated to control the consumption and production of anthropogenic ODSs and some HFCs. The enhanced greenhouse effect, with its social and economic impacts, are under study in the international framework of the Inter-governmental Panel on Climate Change (IPCC). This panel set up by the United Nations, reports frequently on the current state of the art on climate change (IPCC, 1994; 1995). This forms an important basis for international negotiations on climate change. In the last decade much scientific progress has been made while at the negotiation table the international community signed an agreement in Rio de Janeiro in 1992, the United Nations Framework Convention on Climate Change (UNFCCC), to reduce the adverse effect of climate change. In negotiations a start to formulate and implement policy measures to meet the goals set down in the UNFCCC has been made. In addition to the longer-lived ODSs, there is a broad class of chlorine- and bromine-containing

substances known as very short-lived substances (VSLSs) that are not controlled under the Montreal Protocol and have lifetimes shorter than about 6 months. For example, bromoform ($CHBr_3$) has a lifetime of 24 days, while chloroform ($CHCl_3$) has a lifetime of 149 days. These substances aregenerally destroyed in the lower atmosphere in chemical reactions. In general, only small fractions of VSLS emissions reach the stratosphere where they contribute to chlorine and bromine levels and lead to increased ozone depletion. The Montreal Protocol's control of ODSs stimulated the development of replacement substances, firstly HCFCs and then HFCs, in a number of industrial sectors. While HFCs have only a minor effect on stratospheric ozone, some HFCs are powerful Greenhouse Gases (GHGs).The adoption of the 2016 Kigali Amendment to the Montreal Protocol will phase down the production and consumption of some HFCs and avoid much of the projected global increase and associated climate change. Observations of atmospheric ozone are made by instruments on the ground and on board balloons, aircraft, and satellites. This network of observations documented the decline of ozone around the globe, with extreme depletions occurring over Antarctica in each spring and occasional large depletions in the Arctic region. The chemical and dynamical processes controlling stratospheric ozone are well understood, with ozone depletion being fundamentally driven by the atmospheric abundances of chlorine and bromine.

Objectives:

- To describe the scale of global greenhouse gas emissions.
- To compare the quantity of emissions between individuals, corporations, and nation states.
- To create the model ofthe greenhouse effect with varying levels of greenhouse gases.
- To create data visualizations of quantitative & qualitative data related to greenhouse gas emissions.
- To evaluate strategies for reducing emissions using quantitative tools.

Theoretical Framework:

Emitted Compounds:

CO_2 (carbon dioxide) is a major greenhouse gas causing an increase in the temperature in the troposphere by absorption of infrared (IR) radiation emitted by the surface. Since it is chemically inert it has a long chemical lifetime; its distribution in the atmosphere is homogeneous up to 100 km altitude. In the stratosphere CO_2 emits IR radiation, resulting in a cooling effect. CO has no direct chemical effect

on stratospheric ozone. CO can affect ozone depletion indirectly by changing the temperature in the stratosphere. An increase in CO_2 causes a decrease in stratospheric temperatures. Large temperature decreases might initiate extra formation of Polar Stratospheric Clouds (PSCs) which can cause a large depletion of the ozone layer. If this will happen is speculative, and if so it will probably only occur in winter at high latitudes and in the first half of the next century, when chlorine levels are still high. PSC effect are ignored in this study.

CFCs are greenhouse gases causing an increase in the troposphere temperature. The decrease in temperature in the stratosphere is very small because of its relatively low concentration. Because the lifetimes of CFCs in the atmosphere are long (50-100 yr) CFCs reach the stratosphere and are there the main contributors to active chlorine. The increase in CFC emissions last few decades is the main cause of stratospheric ozone destruction.

H_2O (water vapour) is the most important greenhouse gas. Its abundance in the troposphere is almost completely determined by the temperature structure of the troposphere. The decrease in temperature with increasing altitude in the troposphere causes H_2O vapour to condense and form droplets and rain out of the atmosphere. There is no experimental evidence that the amount of H_2O in the lower troposphere is changing. A warmer climate might result in changes inthe cloud cover and rainfall, which could change the amount of water vapour inthe atmosphere (IPCC, 1995), but this is still speculative and no measurements are available to support this. There is an increase of H_2O in the stratosphere. Oltmans and Hofmann (1995) measured an increase in H_2O in the upper troposphere and lower stratosphere from 1% per year at 10-12 km to 0.34% peryear at 24-26 km over the time period 1981-1994. This increase comes mainly from the oxidation of CH_4 but possibly also from climate-induced temperature changes.

N_2O (nitrous oxide) is a greenhouse gas causing an increase in temperature in the troposphere and a negligible decrease in the stratosphere. Its atmospheric lifetime is 120 yr, so large amounts can reach the stratosphere. In the stratosphere it is broken down mainly by photolysis, forming the major source of NO (= NO + NO_2) which can destroy ozone by catalytic reactions.

ClO, in the stratosphere plays a major role in the destruction of ozone. Its sourceis the emission of CFCs, HCFCs, CCl_4, CH_3CCl_3 from anthropogenic sources and CH_3Cl from natural emissions from the oceans.

BrO, is also important for the destruction of ozone. Approximately 70% comes from natural emissions of CH_3Br from the oceans, the rest from anthropogenic emissions of halons and CH_3Br. Bromine is on a per molecule basis more than 40 times more active in ozone destruction than chlorine but its abundance approximately 150 timesless.

Tropospheric ozone is a greenhouse gas which is not directly emitted but formed in the troposphere by the chemical reaction O + 0_2 The abundance of O atoms in

the troposphere is determined by several compounds; CO, CH_4, NO_X and NMHC. The production and destruction of ozone in the troposphere are large but almost in balance. The influx of ozone from the stratosphere is therefore also important for its tropospheric abundance.

Stratospheric ozone determines the thermal structure of the stratosphere. It is formed from molecular oxygen under influence of UV radiation, and its abundance is strongly affected by catalytic reactions of HO,, NOT lOx and BrO, compounds.

Abundances And Trends In Ozone-Depleting Substances (ODSS)

Ozone-depleting substance (ODS) = An ODS is a chemical that depletes stratospheric ozone. Under the Montreal Protocol, most of the widely used ODSs, except for nitrous oxide (N2O), are controlled. These include, among others, chlorofluorocarbons (CFCs), carbon tetrachloride (CCl4), methyl chloroform (CH3CCl3), halons, methyl bromide (CH3Br) and hydrochlorofluorocarbons (HCFCs). These ODSs typically have sufficiently long atmospheric lifetimes to reach the stratosphere after being emitted at the surface. Methyl bromide is the shortest-lived of the controlled substances and has natural and anthropogenic sources. Other ODSsare not yet controlled under the Montreal Protocol.

Changes in tropospheric chlorine and bromine over 2016–2020

- The atmospheric abundances of both tropospheric chlorine (Cl) and bromine (Br), from long-lived ozone-depleting substances (ODSs) controlled under the Montreal Protocol, continued to decline (**Figure 1**). The observed rate of decline in tropospheric chlorine due to substances controlled under the Montreal Protocol was 15.4 ± 4.1 ppt Cl yr–1 (**Table 1**), which is close to the baseline projection from the 2018 Assessment.
- Tropospheric chlorine from very short-lived gases, whose sources are mainly anthropogenic and which are not controlled under the Montreal Protocol, increased by 2.1 ± 0.6 ppt Cl yr –1. The observedrate of decline in tropospheric bromine due to controlled substances was 0.18 ± 0.05 ppt Br yr –1, which is close to thebaseline projection from the 2018 Assessment. Most of this decrease originated from decreases in halon abundances

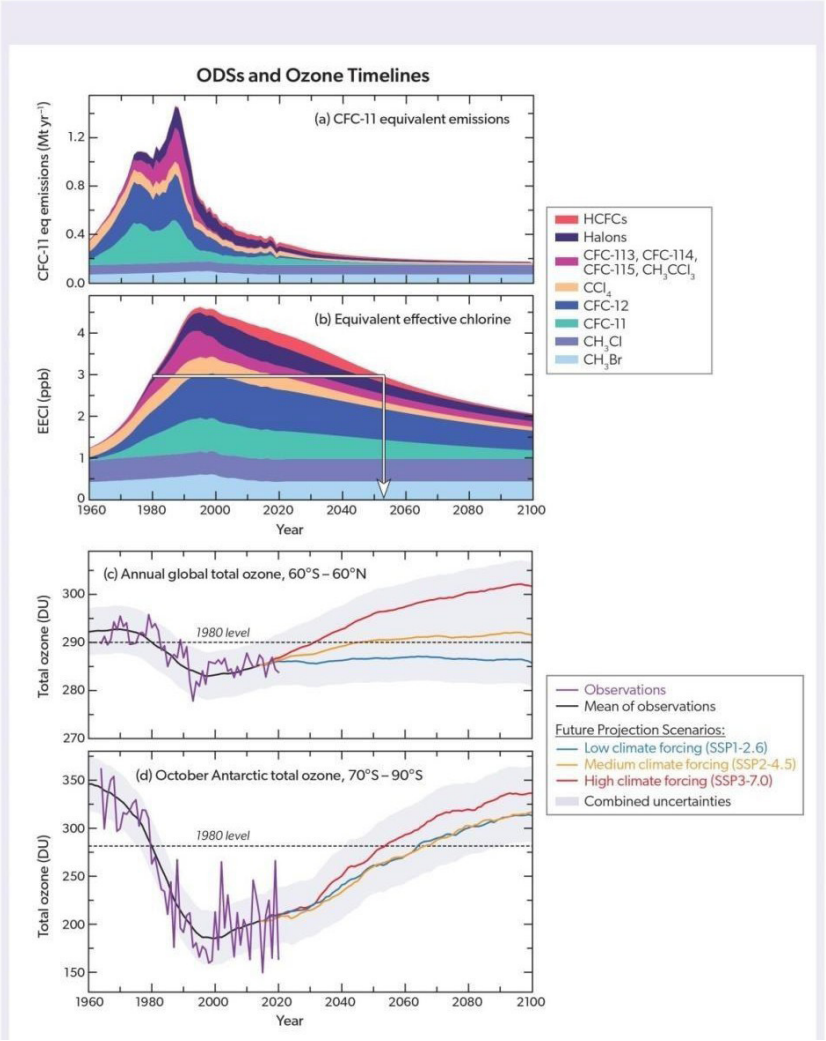


Figure 1. Timeline of: a) CFC-11-equivalent emissions, b) equivalent effective chlorine (EECl), c) global total ozone, and d) October Antarctic total ozone. Annual CFC-11-equivalent emissions are computed for the ODSs shown in the legend by multiplying mass emissions of a substance by its ODP (panel a). Historical emissions are derived from the measured atmospheric abundances of individual ODSs. The future projections of emissions assume full compliance with the Montreal Protocol and use standard methodologies based on reported production, inventory estimates of the banks, and release rates. The annual abundances of EECl, shown for the global surface, are based on surface abundances (measured or derived from projected emissions and lifetimes) of the chlorine- and bromine-containing substances (panel b). The bromine abundances are weighted by a factor of 65 to account for the greater efficiency of bromine in ozone destruction reactions in the atmosphere. Global total column ozone represents an annual average over 60°N to 60°S latitudes (panel c) and Antarctic total column ozone represents an October average over 70°S to 90°S latitudes (panel d). Panels (c) and (d) include a comparison of chemistry-climate model results (black lines with gray shadings indicating uncertainty ranges) and available observations (purple lines). The chemistry-climate model projections assume compliance with the Montreal

Protocol and an increase in greenhouse gases following either the SSP1-2.6 (low climate forcing), SSP2-4.5 (medium climate forcing), or SSP3-7.0 (high climate forcing) scenario, which diverge in 2014. In panel (b), the white line with an arrow mark when EECl returns to its 1980 value. The uncertainty shown in panels (c) and (d) represents the 1-sigma standard deviation about the multi-model mean (MMM), either added to the SSP3-7.0 MMM (upper limit)or subtracted from the SSP1-2.6 MMM (lower limit).

	Contribution to tropospheric chlorine and bromine in 2020[3] (ppt Cl/Br)	Changes in tropospheric chlorine and bromine (ppt Cl or Br per year) from 2016 to 2020
Controlled chlorine substances by group		
Chlorofluorocarbons (CFCs)	1925	−12.9 ± 2.0
Methyl chloroform (CH_3CCl_3)	4.2	−0.90 ± 0.04
Carbon tetrachloride (CCl_4)	308	−3.8 ± 1.0
Hydrochlorofluorocarbons (HCFCs)	319	+2.5 ± 0.4
Halon-1211	3.16	−0.1 ± 0.02
Total chlorine from controlled substances	*2560*	*−15.1 ± 2.4*
Controlled bromine substances by group		
Halons	7.3	−0.11 ± 0.02
Methyl bromide (CH_3Br)[4]	6.6	−0.07 ± 0.02
Total bromine from controlled substances	*13.9*	*−0.18 ± 0.05*

Table1. Contributions of ODSs controlled under the Montreal Protocol to tropospheric chlorineand bromine in 2020, and annual average trends between 2016 and 2020

Total stratospheric chlorine and bromine

- Total chlorine entering the stratosphere from controlled anduncontrolled ODSs declined by 420 ± 20 ppt (11.5%) between the 1993 peak (3660 ppt) and 2020 (3240 ppt) (**Figure2**). This long-term decrease was largely driven by decreasing abundances of CH3CCl3 and CFCs.
- HCl is the major chlorine component in the upper stratosphere. Its abundance in this region decreased on average by 0.5 ± 0.2 % yr –1 during 1997–2020. The long- termdecrease is consistent with the decline in total chlorine entering the stratosphere.
- Total bromine entering the stratosphere from controlled and uncontrolled ODSs declined by 3.2 ± 1.2 ppt (14.5%) between the 1999 peak (22.1 ppt) and 2020 (18.9 ppt). This long-term decrease was largely driven by decreasing abundances of CH3Br and halon-1211.
- Total stratospheric bromine, as derived from bromine monoxide (BrO) observations, has decreased by 0.18 ± 0.04 ppt Br yr –1 (0.8% yr –1) since

2003. This decrease is consistent with the decline in total bromine entering in thestratosphere.

CFC-11

- Global CFC-11 emissions declined after 2018, dropping to 45 ± 10 Gg in both 2019 and 2020. This drop suggests the elimination of most of the unexpected emissions occurring in the years after 2012 (**Figure 2**).
- A large fraction of the unexpected emissions originated from eastern China. This finding is based on available regional observations from multiple sites. The decline of CFC- 11 emissions from eastern China since 2018 explains 60 ± 30% of the observed global emission decrease.

CFC-12

- Global CFC-12 abundances continued to decrease during 2016–2020. Estimates of global CFC-12 emissions were 33 ± 21Gg yr–1 in 2016 and 25 ± 20 Gg yr–1 in 2020.
- CFC-12 emissions from eastern China decreased from 3.3 ±1.4 Gg yr–1 in 2016 to 0.5 ± 0.5 Gg yr–1 in 2019. This decreaseis likely associated with the decline in CFC-11 production.

Other CFCs

- Global abundances of CFC-13, CFC-112a, CFC-113a, CFC-114a, and CFC-115 increased from 16.0 ± 0.3 ppt in 2016 to a total of 17.2 ± 0.3 ppt ppt Cl in 2020. These changes suggest stable or increasing emissions. Atmospheric observations confirm that eastern Asia is a substantialsource region.

Carbon tetrachloride (CCl4)

- The atmospheric abundance of CCl_4 continued to decrease at slower rates than expected, which could be due to underestimated emissionsfrom feedstock production and usage. Global CCl_4 emission estimates based on atmospheric observations are now more accurate due to an improved lifetime estimate, and were on average 44 ± 15 Gg yr –1 inboth 2016 and 2020.
- Emissions of CCl_4 in eastern China over the period 2013–2019 show year-to-year variability likely related to CFC-11 production. Emissions increased after 2013, reaching 11.3 ± 1.9 Gg yr–1 in 2016, and decreased to 6.3 ± 1.1 Gg yr–1 in 2019.

Hydrochlorofluorocarbons (HCFCs)

- Tropospheric chlorine from HCFCs has continued to increase, reaching 320 ± 3ppt in 2020. The annual average growth rate of chlorine from HCFCs decreased from 5.9 ± 1.3 ppt yr–1 reported in the 2018 Assessment to 2.5 ± 1.0ppt yr–1 during 2016–2020.
- Global emission estimates of HCFC-22 show evidence of a decline in 2020 after a period of relatively constant emissions. HCFC-142b emissions continuedto decline, and HCFC-142b abundances have started to decrease. In contrast, HCFC-141b as well as several low-abundance HCFCs (HCFC-31, HCFC-124, HCFC-133a, and the newly detected HCFC-132b) show stable or increasing emissions.

Halons and methyl bromide (CH3Br)

- Bromine from halons has decreased from a peak of 8.5 ± 0.1 ppt in 2006 to7.3 ± 0.1 in 2020. Halon- 1211, halon2402, and halon-1202 abundances continued to decline between 2016 and 2020. The rate of change of halon- 1301 remained indistinguishable from zero. In 2020 it was the most abundant halon in the atmosphere.
- Methyl bromide (CH_3Br) abundances have varied annually between 6.5 ppt and 6.9 ppt during 2016–2020 with no clear overall trend. Most anthropogenically produced CH_3Br has been phased out except for quarantine and pre-shipment (QPS) fumigation, leaving natural emissions as the dominant source. Reported QPS consumption has been relatively stable for more than two decades.

Halogenated very short-lived substances (VSLS)

- Dichloromethane (CH_2Cl_2), the main component of VSLS chlorine, continuedto increase between 2016 and 2020 with a slightly lower growth rate than prior to 2016. This increase primarily results from growing CH_2Cl_2 emissions inAsia.

- Tropospheric chlorine based on measurements of VSLS source gases increased by about 10 ppt between 2016 and 2020. The estimated input of chlorine from VSLSs to the stratosphere also increased by about 10 ppt and amounts to 130 ± 30 ppt in 2020, contributing about 4% of the total chlorineinput (**Figure 2**).
- Chlorinated VSLSs contribute 4% to the total stratospheric chlorine input in 2020 (**Figure 2**). The VSLS chlorine input is estimated as 130 ± 30 ppt in 2020 compared to 120 ± 40 ppt in 2016.
- Brominated VSLSs, with mainly natural sources, contribute 5 ± 2 ppt to

stratospheric bromine and show no long-term changes.

- New evidence suggests that iodine from mostly natural sources is entrainedinto the stratosphere, contributing 0.3–0.9 ppt VSLS iodine in particulate or gas-phase form. No observational trend estimates exist.

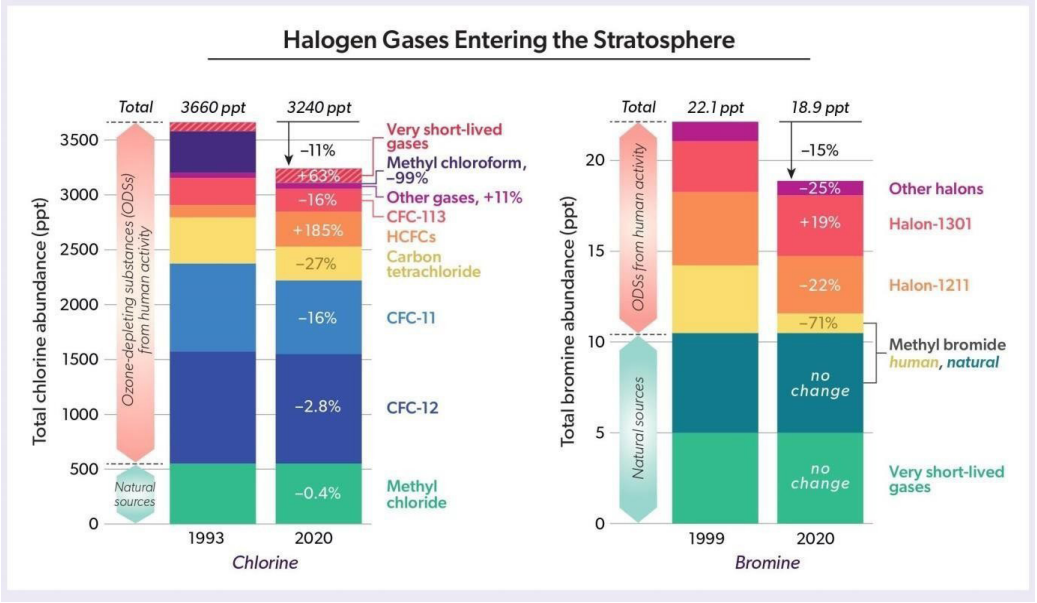


Figure 2. Chlorine and bromine input to the stratosphere for a reference year (1993 for chlorine and 1999 for bromine) and for 2020, for different species and classes of compounds. The reference year is the year of maximum chlorine or bromine loading of the troposphere. Mole fractions of long-lived gases were mostly derived from surface observations from global networks (AGAGE and NOAA), except for CH3Cl before 1995, when observations from both networks were unavailable and values were filled with the simulations from the scenario A1 of the previous Ozone Assessment, which are based on measurements of firn air. The VSLS contributions for bromine are included as a constant 5 ppt, as in previous Assessments. The VSLS chlorine contribution is based on the VSLS input from a model constrained by observed surface boundary conditions. Total VSLS Cl input derived in this way is 80 ppt in 1993 and 130 ppt in 2020. For chlorine, HCFCs include HCFC-22, HCFC-141b, and HCFC-142b; "other" includes contributions from minor CFCs (CFC-13, CFC-112, CFC-113a, CFC-114+CFC-114a, and CFC-115) and halon-1211. For bromine, "other halons" is the sum of bromine contained in halon-1202 and halon-2402. Methyl chloride is counted as having purely natural sources, despite some indications of anthropogenic contributions. The contribution of natural sources

to CH3Br mole fractions was estimated as a constant 5.5 ppt, based on the published firn air and ice core measurements, whereas the anthropogenic contribution was estimated by the global surface mole fractions measured by AGAGE and NOAA minus 5.5 ppt.

Other gases that influence stratospheric ozone and climate

• Three major greenhouse gases—CH_4, N_2O, and CO_2—cause changes in stratospheric chemistry and dynamics that can affect O_3. An increase in N_2O depletes ozone, and increases in CH_4 and CO_2 tend to increase global stratospheric column ozone. These gases have increased over the industrial eraand continue to increase, and are thus additional factors, beyond ODSs, that control stratospheric O_3 trends.

• Anthropogenic N2O emissions in 2020, when expressed as a CFC-11-equivalent, were more than two times the ODP-weighted emissions from all CFCs in that year, and more than 20% of the CFC emissions in 1987, when the latter were at their peak.

- The abundances of many non-ODS, non-HFC, highly fluorinated substances (e.g., SF6, perfluorocarbons, SO2F2, NF3) have continued to increase. While these species do not deplete ozone, they are very strong greenhouse gases with long atmospheric residence times. Total direct radiative forcing due to anthropogenic emissions from these species increased from 0.013 W m–2 in 2016 to 0.014 W m–2 in 2020.
- Decarbonization of the fossil fuel industry through a transition to molecular hydrogen (H_2) could lead to large increases in atmospheric H_2. Estimates from the few existing studies point to relatively small impacts of H_2 on future global stratospheric ozone. Global abundances of H_2 increased by about 70% since preindustrial times and have varied between 530 and 550 ppb since the late 20th century.

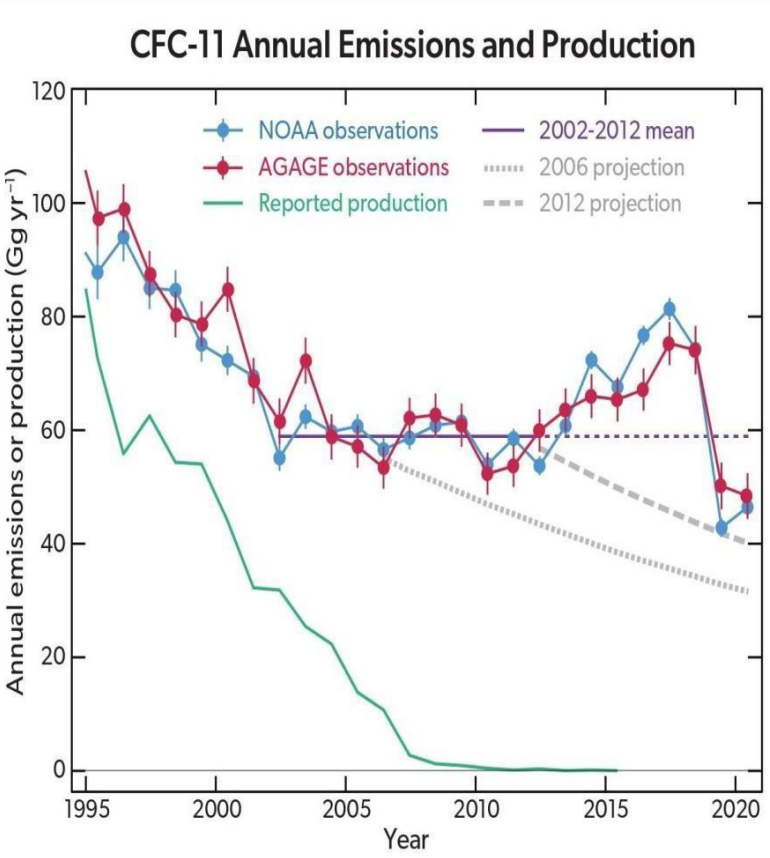


Figure3. CFC-11 global emissions and reported production. Shown are emissions of CFC-11 derived from AGAGE (Advanced Global Atmospheric Gases Experiment; red) and NOAA (National Oceanic and Atmospheric Administration; blue) global network measurements of CFC-11 abundances (see also Figure 1-3 of the Assessment) and a model using a CFC-11 lifetime of 52 years. Also shown is the production history reported to the UN Environment Programme for all uses (green), the average of annual emissions over the 2002–2012 period (horizontal purple line) extended to 2020 (dashed purple line), and scenario projections based on observations through 2006 or through 2012 (grey dotted and dashed lines). These emission projections are calculated using standard methodologies based on reported production, inventory estimates of the bank, and an empirically determined release fraction from the bank over the seven years before 2006 or 2012, which is then applied to subsequent years. Uncertainties in emissions, shown as vertical lines on the data points, include the influence of measurement and model representation uncertainties, and do not include the influence of dynamical variability.

STRATEGIES FOR REDUCING EMISSIONS:

Phaseout of Class I Ozone-Depleting Substances

"Class I" ozone-depleting substances (ODS) were subject to the first round of phaseout targets under the Montreal Protocol on Substances that Deplete the Ozone Layer. Class I ODS have an ozone depletion potential of 0.2 or higher, and include halons, chlorofluorocarbons (CFCs), methyl chloroform, carbon tetrachloride, and methyl bromide. Class II ODS are subject to a different phaseout schedule.

Section 604 of the Clean Air Act (comprehensive federal law that regulates air emissions from stationary and mobile sources)establishes the phaseout targets for Class I ODS. The ban on production and import of halons took effect onJanuary 1, 1994. The ban on production and import of other Class I ODS—excluding methyl bromide—took effect on January 1, 1996.

Phaseout of Class II ozone-depleting substances

These are all hydrochlorofluorocarbons (HCFCs). HCFCs were developed as transitional substitutes for Class I ODS and are subject to a later phaseout schedule than Class I ODS. HCFCs are used in a wide variety of applications. Historically, the most widely used include HCFC-22 (R-22 refrigerant), HCFC-141b (solvent and foam-blowing agent), and HCFC- 142b (foam-blowing agent and component in refrigerant blends). Some HCFCs, like HCFC-22, are also a component in refrigerant blends. They are subject to the same rules because they contain Class II ODS.

Common refrigerants that contain HCFC-22 include R-401A, R-402A, R- 408A, R-409A, R-414B, and R-502A. As a Party to the Montreal Protocol, the United States must incrementally decrease HCFC consumption and production, culminating in a complete HCFC phaseout in 2030. HCFC usage must be reduced to at least 90 percent below baseline levels in2015 and to at least 99.5 percent below baseline levels in 2020.

The U.S. phaseout schedule is summarized in the following table:

U.S. Action to Meet the Montreal Protocol Phaseout Schedule

Year to Be Implemented	Implementation of HCFC Phaseout through Clean Air Act Regulations	Year to Be Implemented	Reduction from Baseline
2003	No production orimport of HCFC- 141b	2004	35.0%

2010	No production or import of HCFC- 142b and HCFC-22, except for use in equipment made before January 1, 2010	2010	75.0%
2015	No production or import of any otherHCFCs, except as refrigerants in equipment made before January 1, 2020	2015	90.0%
2020	No production orimport of HCFC- 142b and HCFC-22	2020	99.5%
2030	No production orimport of any HCFCs	2030	100.0%

Phaseout of hydrofluorocarbons (HFCs)

On 1 January 2019 the Kigali Amendment to the Montreal Protocol came into force. Under the Kigali Amendment countries promised to reduce the use of hydrofluorocarbons (HFCs) by more than 80% over the next 30 years. By 27 December 2018, 65 countries had ratified the Amendment.

Produced mostly in developed countries, hydrofluorocarbons (HFCs) replaced CFCs and HCFCs. HFCs pose no harm to the ozone layer because, unlike CFCs and HCFCs, they do not contain chlorine. They are, however, greenhouse gases, with a high global warming potential (GWP), comparable to that of CFCs and HCFCs. In 2009, a study calculated that a fast phasedown of high-GWP HFCs could potentially prevent the equivalent of up to 8.8 Gt CO2-eq per

> *year in emissions by 2050.A proposed phasedown of HFCs was hence projected to avoid up to 0.5C of warming by 2100 under the high-HFC growthscenario, and up to 0.35C under the low-HFC growth scenario.*

The amendment to the legally-binding Montreal Protocol will ensure that industrialised countries bring down their HFC production and consumption by at least 85 per cent compared to their annual average values in the period 2011–2013. A group of developing countries including China, Brazil and South Africa are mandated to reduce their HFC use by 85 per cent of their average value in 2020-22 by the year 2045. India and some other developing countries

> *– Iran, Iraq, Pakistan, and some oil economies like Saudi Arabia and Kuwait –will cut down their HFCs by 85 per cent of their values in 2024-26 by the year2047.*

Implication Of the Study:

- Actions taken under the Montreal Protocol continue to contribute to ozone recovery. Recovery of ozone in the upper stratosphere is progressing. Total column ozone (TCO) in the Antarctic continues to recover, notwithstanding substantial interannual variability in the size,strength, and longevity of the ozone hole. Outside of the Antarctic region (from 90°N to 60°S), the limited evidence of TCO recovery since1996 has low confidence. TCO is expected to return to 1980 values around 2066 in the Antarctic, around 2045 in the Arctic, and around 2040 for the near-global average (60°N–60°S). The assessment of the depletion of TCO in regions around the globe from 1980–1996 remainsessentially unchanged since the 2018 Assessment.

  The recent identification of unexpected CFC-11 emissions led to scientific investigations and policy responses. Observations and analyses revealed the source region for at least half of these emissions and substantial emissions reductions followed. Regional data suggest some CFC-12 emissions may have been associated with the unreported CFC-11 production. Uncertainties in emissions from banks and gaps in the observing network are too large to determine whether all unexpected emissions have ceased.

  Several space-borne instruments providing vertically resolved, global measurements of ozone-related atmospheric constituents (e.g., reactive chlorine, water vapour, and long-lived transport tracers) are due to be retired within a few years. Without replacements of these instruments, the ability to monitor and explain changes in the stratospheric ozone layer in the future will be impeded.

  The impact on the ozone layer of stratospheric aerosol injection (SAI), which has been proposed as a possible option to offset global warming. Important potential consequences, such as deepening of the Antarctic ozone hole and delay in ozone recovery, were identified. Many knowledge gaps and uncertainties prevent a more robust evaluation currently.

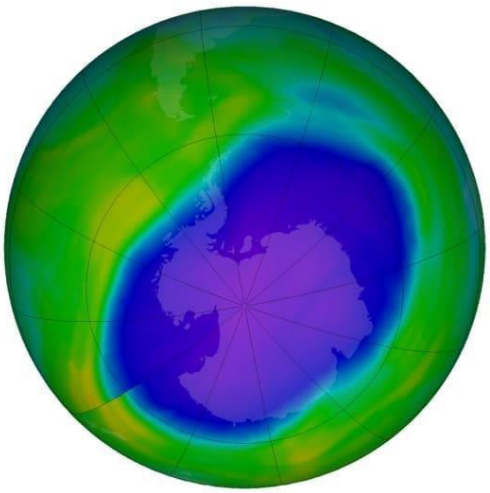
  Heightened concerns about influences on 21st century ozone include impacts of: further increases in nitrous oxide (N2O), methane (CH4), and CO2 concentrations; rapidly expanding ODS and HFC feedstock use and emissions; climate change on Total Column Ozone (TCO) in the tropics; extraordinary wildfires and volcanic eruptions; increased frequency of civilian rocket launches and the emissions of a proposed new fleet of supersonic commercial aircraft.

Conclusion: The Earth's protective ozone layer is on track to recover within four decades,closing an ozone hole that was first noticed in the 1980s. The findings of the scientific assessment, follow the landmark Montreal Protocol in 1987, which banned the production and consumption of chemicals that eat away at the planet's ozone layer which protects the Earth from the sun's ultraviolet radiation,which is linked to skin cancer, eye cataracts, compromised immune systems and agricultural land damage.

In this NASA false-color image, the blue and purple shows the hole in Earth's

protective ozone layer over Antarctica on Oct. 5, 2022. Earth's protective ozone layer is slowly but noticeably healing at a pace that would fully mend the hole over Antarctica in about 43 years, a new United Nations report says.

Scientists said the recovery is gradual and will take many years. If current policies remain in place, the ozone layer is expected to recover to 1980 levels before the appearance of the ozone hole — by 2040, the report said, andwill return to normal in the Arctic by 2045. Additionally, Antarctica could experience normal levels by 2066. Scientists and environmental groups have long lauded the global ban of ozone-depleting chemicals as one of the most critical environmental achievements todate, and it could set a precedent for broader regulation of climate-warming emissions.



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Non-Conventional Energy Sources: A General Overview

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Abstract: 'Energy' is a key factor which plays an important role to drive and improve our life cycle. It is the blessing from the nature in various forms to the mankind for their well-being and progress (Sindhu, N., 2015). The term 'Energy' can be defined as the ability for doing work. According to the principle of conservation of energy, energy cannot be created or destroyed. It can only be transformed from one to another (The Editors of Encyclopedia Britannica, 2023). All energy sources can be divided into two groups. They are Conventional or Non-Renewable energy sources, and Non-Conventional or Renewable energy sources (U.S. Energy Information Administration, 2022). To safeguard our environment the knowledge on non-conventional energy sources and its uses along with its advantages and disadvantages is needed. In this paper, focus has been made to portray the general concept of non-conventional energy sources along with its advantages and disadvantages.

Keywords: Energy, Conventional energy, Non-Renewable energy, Non-Conventional energy, Renewable energy.

Introduction: 'Energy' is a key factor which plays an important role to drive and improve our life cycle. It is the blessing from the nature in various forms to the mankind for their well-being and progress (Sindhu, N., 2015). The term 'Energy' can be defined as the ability for doing work. According to the principle of conservation of energy, energy cannot be created or destroyed. It can only be transformed from one to another (The Editors of Encyclopedia Britannica, 2023). As people have learned to transform energy from one form to another form and have learned to use it for doing work, modern civilization has become possible. Some forms of energies are: heat, light, motion, electrical and chemical etc. An example of the fact of energy transformation from one form to another form can be like, our body stores the chemical energy from the food we eat until we use that chemical energy as kinetic energy during work or play. (U.S. Energy Information Administration, 2022). All energy sources can be divided into two groups. They are Conventional or Non-Renewable energy sources, and Non-Conventional or Renewable energy sources (U.S. Energy Information Administration, 2022). Conventional energy sources are the energy resources which exist in limited quantities. These energy

sources cannot be generated easily. They are formed over thousand years as the decomposed materials to create natural gas, coal etc. (Schiavone, D., 2023). So it is not possible to create these conventional energy sources instantly to fulfill the continuous demand rate of consumption of this energy. Non-Conventional energy sources are the renewable energy sources that are being generated continuously in nature and are in-exhaustible (Menaria, D. S., 2018). Some examples of non-conventional energy are: solar energy, wind energy, hydro energy. In this regard of conventional and non-conventional energy sources, it can be said that conventional energy sources have been used extensively for a long time to meet the demand of energy (Kamran, M. & Fazal, M.R., 2021). "As the rate of consumption is much greater than the rate of formation, these sources of energy have been depleted and do not replenish. Conventional sources of energy emit hazardous emissions that not only damage the earth's atmosphere also deteriorate the health conditions of the livings" (Kamran, M. &Fazal, M.R., 2021). So to safeguard our environment the knowledge on non-conventional energy sources and its uses along with its advantages and disadvantages is needed. In this paper, focus has been made to present the concept of non-conventional energy sources and its present status in India along with the advantages and disadvantages of the use of non-conventional energy sources.

Review of the literatures: A study by Vetrivel, S.C. & Mohanasundari, M. (2011) has focused on the sources and scope of non-conventional energy like solar energy, wind energy, hydro-electric power, tidal energy, energy of waves and biogas. It has focused on the renewable energies in developing countries and future potentials of this energy sources. A study by Sindhu, N. (2015) described the use of non-conventional energy resources and techniques for generating non-conventional energy sources in India for sustainable development of rural areas with a study of villages. A study by Das, S. &Sikdar, S. (2016) was a review based study regarding various non-conventional sources of energy and their status in India at that time. A study by Miyan, M.&Shukla, M.K. (2018) has reviewed numerous renewable energy sources and their status and usage in India on that time. A study by Kumar, J. C. R. &Majid, M. A. (2020) has reviewed the current status, obstacles, future prospects, employment and investment opportunities of non-conventional energies in India for sustainable development. In an article by PTI (2023) in The Economic Times the installed capacity for renewable energy resources in India and related information has been stated.

Energy	**Sources of Energy**
• It is the ability for doing work. • It cannot be generated or destroyed. • It can only be transformed from one form to another form.	• Conventional or Non-Renewable Energy Sources (E.g., Coal, Natural gas). • Non-conventional or Renewable Energy Sources (E.g., Solar energy, Wind energy etc.)

Table 1: Energy and Sources of Energy

Conventional vs. Non-Conventional Energy Sources (Java T Point, n.d.)	
Conventional energy sources	**Non-Conventional energy sources**
• They are called non-renewable sources of energy.	• They are also called renewable sources of energy.
• These sources of energy are not abundant and present in limited quantity. For example, coal, natural gas etc.	• These sources of energy are abundant in nature. For example, solar energy, wind energy etc.
• They have been in use for a long time.	• They are yet in the phase of development over the past few years.
• They are generated over a million years. So, cannot be replenished continuously.	• They are replenished continuously by natural processes.
• They emit harmful gases and pollute the environment.	• They are environment friendly and produce little or no pollution to the environment.
• Using and maintaining these energy sources are more expensive.	• Using these energy sources are comparatively less expensive.
• They are used at a higher rate extensively than the non-conventional energy sources.	• They are not used at a higher rate extensively as compared to conventional energy sources.

Table 2: Conventional vs. Non-Conventional Energy Sources

Objectives: The objectives of this article are:

- To discuss the concept of Non-Conventional energy sources and its present status in India.
- To discuss about the advantages of Non-Conventional energy sources.
- To discuss about thedisadvantages of Non-Conventional energy sources.

Method of Study

The study has been done on the basis of the secondary data including various research journals, articles, news articles, online websites etc.

Discussion and Analysis:

- **Concept of Non-Conventional energy sources and its present status in India:**

Non-Conventional energy is also known as renewable energy. It is created from the natural processes that are replenished or refilled continuously. This energy is constantly renewed (Ciolkosz, D., 2023). Some types of non-conventional energy (U.S. Energy Information Administration, 2022) are:

- **Solar Energy:**In this energy system heat and electricity are produced by using the radiation from the sun. 3 basic types of solar energy systems are: (i) solar thermal systems in which solar radiation is absorbed by using solar collectors to heat water or air for heating water and space. (ii) solar thermal power plants in which sun's rays is focused by using concentrating solar collectors for heating a fluid to a high temperature. To power a turbine and a generator, the fluid generates steam. (iii) Photovoltaic systems in which solar radiation is converted directly into electricity by using solar electric cells.
- **Wind Energy:** The kinetic energy of the wind is collected by using the blades of wind turbines. The blades of the wind turbines are turned by the wind flows over the blades. The electricity is produced as the blades are connected to a drive shaft that turns an electric generator.
- **Hydropower:** In this system of energy electricity is produced from the flowing water. Two general types of hydropower are: (i) Conventional hydropower in which electricity is generated from a spinning turbine by using water in dams or flowing in streams and rivers. (ii) Pumped storage system in which electricity is generated and used by moving water between two

reservoirs at different elevations.

- **Geothermal Energy:** It is the heat energy from the hot interior of earth or near the surface of the earth. It is a reservoir of hot water to rise naturally to the surface at hot springs and geysers. Geothermal heat pumps work by the use of geothermal energy.
- **Biomass Energy:** It is produced by non-fossilized plant materials. The sources of biomass energy include wood, bio-fuels, municipal solid wastes and biogas.

According to one recent update (PTI, The Economic Times, 2023) as said by Union Minister for Power, New and Renewable Energy, R.K. Singh in RajyaSabha, the total installed capacity for renewable energy sources in India has touched 168.96 Giga Watts (GW). Out of 168.96 GW, the installed capacities for solar power, hydro power, wind power and bio power are 64.38 GW, 51.79 GW, 42.02 GW and 10.77 GW respectively. "Another 82.62 GW of green energy capacity is under implementation and 40.89 GW of capacity is under various stages of tendering" (Press Trust of India, 2023). According to R.K. Singh, during the year 2022-2023 (up to January, 2023) a total of electricity generation from non-conventional energy sources is 3,16,754.86 Million Unit (Press Trust of India, 2023). "The Government has set an ambition target of having 500 GW of installed renewable energy by 2030, which includes the installation of 280 GW of solar power and 140 GW of wind power" (Hussain, Z., 2023). Also India aims to be carbon neutral by 2070 as announced by Prime Minister Narendra Damodardas Modi at the 26thsession of the Conference of the Parties (COP26) of the United Nations Framework Convention on Climate Change (UNFCCC) in November 2021 that the target of net zero emissions of carbon will be achieved by India by 2070 (PTI, Energy World, 2023).

- **Advantages of using Non-Conventional sources of energy:**

Some important advantages of using Non-Conventional sources of energy (EDUCBA, 2023) are:

- **Environment friendly:**The sources of non-conventional energy are much cleaner than traditional fossil fuels. The emissions of greenhouse gas, leading cause of global warming is produced less by the use of renewable energies. It makes non-conventional energy a much more viable and sustainable option for the future.
- **Sustainable:** The sources of non-conventional energy are sustainable because they can be replenished infinitely. It can be used repeatedly without

the problem of running out.

- **Cost effective:** These sources of energy are much more cost-effective than the conventional sources, as they require little or no maintenance or fuel costs.
- **Versatile:** These sources are for several applications from powering homes to providing electricity to industrial plants. So it is an excellent choice for a wide range of usage.
- **Renewable jobs:** Use of non-conventional energy sources also opens the opportunities for jobs in the industry of non-conventional energy which helps to improve local economies. It also helps to reduce unemployment in rural areas.

- **Disadvantages of using Non-Conventional sources of energy:**

Some important disadvantages of using Non-Conventional sources of energy (EDUCBA, 2023) are:

- **High initial investment:** The sources of non-conventional energy require a lot of monetary investment to set up initially. Solar, wind and hydroelectric power need large-scale infrastructure to harness the energy from these sources. This infrastructure is expensive to build, maintain and upgrade.
- **Intermittency:** The sources of non-conventional energy are only sometimes available. For example, only during the day solar power is available and wind energy is available only when the wind blows. A large storage of energy is required to ensure the steady energy supply when these sources are not available.
- **Environmental impact:** While the sources of non-conventional energy are much cleaner than convention sources of energy, they can still have impact on the environment. For example, the construction of hydroelectric dams can disrupt ecosystems and the utilization of biofuels can lead to deforestation.
- **Difficult to scale:** The sources of non-conventional energy are sometimes challenging to scale up. For example, solar energy needs large portion of lands to install the solar panels, while large parts of space is needed for wind turbines for producing wind energy.
- **Low efficiency:** Sometimes the sources of non-conventional energy are less efficient than the conventional energy sources. For example, a small portion of sun's energy is transformed into electricity by solar panels.

Implication of the Present Study: The energy consumption is growing day by day and to fulfill the energy demand we depend on traditional or conventional energy sources more than the non-conventional energy sources. However the conventional energy sources cannot be generated easily. They are formed over thousands of years as the decomposed materials to create natural gas, coal etc. (Schiavone, D., 2023). So it is not possible to create these conventional energy sources instantly to meet the continuous requirement. Also it can be mentioned that conventional energy sources create pollution by its harmful emissions. Whereas, non-conventional energy sources are the renewable energy sources that are being generated continuously in nature and are in-exhaustible (Menaria, D. S., 2018). Some examples of non-conventional energy are: solar energy, wind energy, hydro energy. It creates less pollution and helps to create healthy environment. Regarding the use of non-conventional energies it can be stated that India has set a target to reduce the carbon emission and to achieve the net zero emissions by 2070(PTI, Energy World, 2023). So to achieve this goal an awareness in everyone is required on non-conventional energy sources and its uses along with its advantages and disadvantages. As an implication this paper will help to get a general understanding of the concept, present status in India, advantages and disadvantages of using non-conventional energy sources.

Conclusion: In nature energy resources are available in enormous amount in the form of both renewable and non-renewable energy (Vetrivel, S.C. &Mohanasundari, M., 2011). A great emphasis should be given for the development of sectors of renewable energy sources and their proper utilization for the benefit of the mankind and the environment as the sources of conventional or non-renewable energies are limited (Menaria, D. S., 2018). Developing renewable or non-conventional energy will help to safeguard our environment by increasing its energy security, by minimizing the adverse impacts of conventional energy on the environment and by lowering the carbon intensity (Miyan, M. &Shukla, M.K., 2018). So more importance should be given on the use of non-conventional energy for creating sustainable and healthy environment.

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Exploring Environmental Values and Ethics : A Critical Review of Contemporary Perspectives

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Abstract: Environmental ethics and morals play a crucial role in how we interact with the natural environment. These concern our moral duties to preserve and safeguard the environment, as well as its many elements, such as the air, water, land, and living things. Environmental values are the guiding principles, attitudes, and beliefs that affect how we see the environment and behave in relation to it. These values can differ amongst people, communities, and countries and are frequently deeply ingrained in cultural, religious, and philosophical traditions. This article explores the moral principles and values that guide human behaviourtoward the environment. It examines questions such as what obligations we have towards the natural world, what constitutes a morally right or wrong action towards the environment, and what ethical principles should govern our relationship with nature. The recognition of environmental values and ethics is becoming increasingly important in modern society as we face complex environmental challenges such as climate change, pollution, biodiversity loss, and resource depletion. A growing awareness of the interconnectedness between the environment, society, and the economy is driving the need for ethical and value-based approaches to environmental decision-making. Environmental values and ethics play a critical role in shaping our attitudes and actions toward the natural world. They provide a framework for understanding our responsibilities towards the environment and guide our efforts to create a more sustainable and equitable future for all.

Keywords: Environmental Ethics, Value Based Approach, Sustainability.

Introduction: For millennia, people have been interested in and concerned about how humans interact with the environment. The significance of environmental ethics and morals in influencing how people behave toward the natural world has recently come to light. In order to maintain and preserve the environment for future generations, environmental values and ethics relate to a collection of beliefs, principles, and moral standards that govern human interactions with the environment.

Environmental behaviour is governed by a number of moral principles and ideals which includes-1.Stewardship: According to this idea, people have a duty to look

after the environment and preserve it for future generations.

2. Sustainability: This idea highlights how crucial it is to use resources in a way that satisfies existing needs without endangering the capacity of future generations to satisfy their own.

3. Respect for nature: This principle highlights the significance of treating nature with respect and care while recognising the intrinsic value of the natural world.

4. Interconnectedness: All living things are interrelated, and the wellbeing of people is correlated with the state of the environment. This idea is known as interconnectedness.

5. Responsibility: This principle highlights that it is our duty as humans to act in a way that advances the health and welfare of the natural environment.

This critical review paper seeks to explore the historical review of environmental ethics and values, tracking the development of environmental consciousness and the birth of the current environmental movement. The main theoretical foundations for modern environmental ethics and values, such as deep ecology, ecofeminism, and environmental justice, will next be examined.Following that, we'll look at the practical applications of environmental ethics and values, including how they affect activism, policymaking, and community involvement. To demonstrate the difficulties and opportunities of integrating environmental values and ethics into decision-making processes, we will look at case studies and examples from throughout the world.

It will be summarised by the most important conclusions and suggestions for further study and action in the area of environmental ethics and values. I hope to contribute to a deeper understanding of the complex interrelationship between humans and the natural world as well as the pressing need for ethical and responsible behaviortoward the environment by critically analysing and evaluating contemporary perspectives on environmental values and ethics.

Objectives:

This review article has the following primary goals:

1. To present a thorough analysis of the development of environmental ethics throughout history, documenting the change in how people regard the environment and the birth of the current environmental movement.

2.To examine and critically assess the major theoretical pillars that support modern environmental ethics and ideals, such as deep ecology, ecofeminism, and

environmental justice.

3.To study the practical applications of environmental values and ethics, including their role in community participation, and policy-making, as well as to pinpoint successful implementation strategies and obstacles to overcome.

4.To draw attention to important findings and suggestions for further study and action in the area of environmental ethics and values, and to contribute to a better understanding of the complex interaction between humans and nature and the pressing need for ethical and responsible environmental behaviour.

This critical review's overall goals are to give a thorough and critical analysis of current viewpoints on environmental ethics and values and to support the development of a more sustainable and responsible approach to human interaction with the environment.

Theoretical Framework:

It is based on the idea of environmental values and ethics, which is a collection of ideals, tenets, and moral principles that direct how people interact with the environment.

The belief in the divine essence of nature was a common feature of the interaction between people and their environment in ancient civilizations. For instance, many prehistoric societies held that humans had a duty to take care of the planet since it was a living thing. This viewpoint, however, was not shared by all civilizations, and many of them used the environment for personal gain.

The prevalent viewpoint during the mediaeval and Renaissance eras was that the natural world existed to meet human wants. The growth of agriculture and the spread of human settlement into previously uninhabited areas were evidence of this. Francis of Assisi, who asserted that people had a duty to protect the natural environment, was one of the dissenting voices.

Thinking regarding the interaction between people and the environment underwent a change during the Enlightenment. There were some Enlightenment intellectuals who understood the importance of nature for its own sake, but the majority of them thought of nature as a resource to be used for human gain. The development of the scientific method during this time period also made it possible to explore the natural world more methodically.

Due to factory pollution and other industrial activities, the Industrial Revolution had a significant negative influence on the environment. The conservation movement,

which aimed to protect natural regions for future generations, also came into existence at this time.

The modern environmental movement emerged in the 1960s and 1970s in response to growing concerns about pollution, habitat destruction, and other environmental issues. This movement was characterized by a belief in the intrinsic value of nature and a recognition of the interdependence of humans and the environment. This led to the development of new forms of environmental ethics, such as deep ecology, ecofeminism and environment justice.

Deep Ecology: Deep ecology is a way of thinking that highlights the intrinsic worth of life outside of the human species and how intertwined all living things are. For humans to have a sustainable and peaceful relationship with the natural world, it demands a fundamental reform in their ethical and value systems.

Ecofeminism: The relationship between the dominance of women and the dominance of nature is highlighted by this social and political movement. It aims to promote a more comprehensive and just approach to environmental management while also challenging patriarchal and anthropocentric beliefs.

Environmental Justice: The distribution of environmental benefits and responsibilities should take into account social equity and fairness, according to the environmental justice concept. It aims to mitigate the disproportionate effects of environmental degradation on vulnerable and marginalised groups and to support increased community involvement and empowerment in decision-making.

A variety of influences, such as cultural and religious beliefs, scientific advancements, and environmental disasters, have influenced the development of environmental ethics. Environment-related views have changed over time, from seeing it as a resource to be exploited to realizing its fundamental worth and the need to safeguard it. The modern environmental movement is the result of centuries of contemplation on our place in nature and the pressing need to address environmental issues.

Policymakers, businesses, and individuals face a significant problem when it comes to incorporating environmental ethics and values into decision-making procedures. While there are ways to encourage sustainability and safeguard the environment, there are also many obstacles and challenges that must be overcome.

This study attempts to offer a thorough and nuanced understanding of environmental values and ethics and their practical consequences for policy-making and community participation by examining and critically analysing these and other theoretical frameworks.

Discussion and Analysis: The study looks at how environmental values and ethics have evolved historically, the major theoretical frameworks that support modern environmental values and ethics, and the practical ramifications of these values and ethics for advocacy, policymaking, and community involvement.

A complex combination of cultural, social, and economic variables has affected the evolution of environmental ethics throughout history. There have been times when the natural world has been exploited and destroyed, but there have also been dissenting voices and movements for environmental protection. The modern environmental movement reflects a rising understanding of nature's intrinsic worth and the necessity for humanity to coexist peacefully with the environment.

In this article, we will look at several case studies and examples from around the world as well as the benefits and problems of incorporating environmental values and ethics into decision-making processes.

Challenges:

1. **Economic Interests:** Economic interests are one of the major obstacles to incorporating environmental ethics and values into decision-making processes. Many companies put profit before sustainability, which could lead to the deterioration of the environment.
2. **Political Considerations:** Making decisions about the environment can be difficult when politics are involved. Politicians may place a higher priority on immediate objectives and economic expansion than long-term environmental preservation, especially under pressure from influential interest groups.
3. **Lack of Awareness:** Being ignorant about environmental issues presents another difficulty. Many people lack a thorough understanding of how their actions affect the environment, which can result in their making unsustainable judgments.
4. **Implementation:** Implementation can be challenging, even when environmental goals and ethical principles are taken into consideration. There could be opposition from stakeholders, a lack of money or knowledge, or other real-world obstacles.

Opportunities:

1. **Technological Developments:** The incorporation of environmental ethics and values into decision-making processes has become simpler as a result of technological developments. Digital systems, for instance, can assist in tracking and monitoring environmental consequences, making it simpler to pinpoint areas that need repair.

2. **Public Awareness:** Increasing public awareness of environmental issues may put pressure on policymakers to give sustainability top priority. This may result in modifications to laws and regulations as well as a rise in the demand for environmentally friendly goods and services.
3. **Environmental Regulations:** Environmental laws can establish a framework for incorporating environmental ethics and values into decision-making procedures. For instance, restrictions on waste management and emissions requirements may motivate companies to adopt more environmentally friendly procedures.

Examples and Case Studies:

1. **The European Union's Emissions Trading System:** The Emissions Trading System (ETS) of the European Union is a legal framework that charges a fee for carbon emissions. By offering financial rewards to enterprises that pollute less than their allotted allowance, the ETS encourages them to lower their emissions.
2. **The Green Belt Movement:** The Green Belt Movement is an environmental group that strives to advance sustainable development and safeguard Kenya's natural resources. It was founded by the late Nobel Peace Prize laureate Wangari Maathai. The group has supported environmentally protective policies, encouraged sustainable agriculture, and planted millions of trees.
3. **Sustainable Tourism in Costa Rica:** Costa Rica is a leader in sustainable tourism and places a strong emphasis on ecotourism and responsible travel. Protected areas, sustainable agriculture, and renewable energy are just a few examples of the environmental protection policies and practices that the nation has put in place.

Environmental ethics and values have important practical ramifications for community engagement, advocacy, and policy development. Here are some examples of how these principles and ethics can be used in certain contexts:

Adopting Policy:

1. Including sustainability in policy goals: Governments can make environmental protection a priority along with economic and social objectives by incorporating sustainability as a fundamental principle in their decision-making.
2. Promoting sustainable practices: Governments can promote sustainable practices by offering incentives to organizations and people to use eco-friendly methods. For instance, subsidies for companies that place a high priority on sustainability or tax credits for renewable energy.
3. Regulation: Lawmakers can create rules that give environmental protection a top priority. For instance, laws governing waste management, pollution prevention, and emission standards.

Advocacy:

1. Public education: Environmental advocacy organizations can educate the general public on environmental issues and the effects of human activity on the environment. This may result in a rise in the demand for sustainability-focused policies and procedures.
2. Promoting policy change: Environmental advocacy organizations can promote policy change at the local, state, and federal levels. This can entail contacting decision-makers to advocate for causes, planning public events, and using social media to spread awareness of environmental issues.
3. Collaboration with other organizations: To promote sustainable practises and policies, environmental advocacy groups can collaborate with other organizations like companies, religious institutions, and neighborhood associations.

Community Participation:

1. Education and awareness-raising: As part of community participation, local environmental issues may be explained and made more widely known. This may entail setting up public gatherings, workshops, and educational initiatives.
2. Collaboration: In order to create sustainable solutions, community people, corporations, and government organizations may work together as part of community involvement. This can entail collaborating with nearby businesses to implement sustainable practices or participating in community-led initiatives like neighbourhood gardens.
3. Empowerment: Participating in community activities can encourage people and groups to act on environmental challenges. This can entail supporting sustainable behaviours with tools and training and fostering neighbourhood-based conservation efforts.

The study underlines the urgent need for ethical and responsible behaviour towards the environment as well as the significance of environmental values and ethics in influencing human behaviour towards the natural world. The study makes the case that in order to address urgent global concerns like climate change, biodiversity loss, and environmental degradation, a deeper knowledge of the complicated interaction between humans and the natural world is required. This article looks at the application of environmental ethics and values, including how they affect activism, policymaking, and community involvement. In order to show the difficulties and prospects of integrating environmental values and ethics into decision-making processes, the article offers case studies and examples from all over the world. The study, for instance, emphasizes the significance of environmental justice in

addressing the disparate effects of environmental degradation on vulnerable and underprivileged groups.

Implications of the Study: It has numerous significant ramifications for environmental values and ethics research, practice, and policy.The study emphasizes the significance of having a thorough awareness of current opinions on environmental values and ethics. The paper offers a detailed and fair review of the advantages and disadvantages of various approaches to environmental values and ethics by critically analyzing significant theoretical frameworks. This analysis can help guide further study and scholarship in the area and serve as a foundation for more sensible and efficient methods of environmental management. The study also places a strong emphasis on how environmental ethics and values might be applied to community engagement and policy-making. The study emphasizes the benefits and challenges of integrating environmental values and ethics into decision-making processes by offering case studies and examples from throughout the globe. This can assist in fostering a more sustainable and responsible approach to human interaction with the environment by assisting in the development of more fair and effective environmental laws and practices.

The report emphasises the significance of a deeper knowledge of the intricate interaction between humans and the natural world while highlighting the urgent global concerns of climate change, biodiversity loss, and environmental degradation. The findings can help create a more sustainable and fair future for everyone by encouraging moral behaviour towards the environment.

The deep ecology, ecofeminism, and environmental justice, as well as other important ones that support modern environmental values and ethics, are all critically examined in this essay. The paper recognises these frameworks' benefits in fostering a more sustainable and responsible attitude to human interaction with the environment, but it also draws attention to their shortcomings and potential downsides. Deep ecology, for instance, has come under fire for being overly individualistic and undervaluing the significance of social and cultural circumstances, despite the fact that it emphasises the intrinsic value of non-human existence.

There are many opportunities for additional research into modern viewpoints on environmental ethics and values. Here are a few suggestions- Environmental justice and inter-sectionality, Cultural and Indigenous Views on environmental ethics, Technical Developments and Ethics, Business and Environmental Ethics, Environmental ethics and education, Environmental ethics and global governance,

and Environmental ethics and psychological perspectives. The study can influence future research and activity on the subject by offering a critical examination of current viewpoints on environmental values and ethics. This will encourage a more sustainable and responsible approach to human interaction with the environment.

Conclusion: This article offers a thorough and critical examination of current viewpoints on environmental ethics and values. The study underscores the significance of a deeper understanding of the intricate link between human beings and the natural world and the urgent need for ethical and responsible behaviour towards the environment.

The study has significant ramifications for environmental values and ethics research, practice, and policy. The study can influence future scholarship and activity on the subject by encouraging a more thorough and critical awareness of modern viewpoints on environmental values and ethics, helping to advance a more sustainable and responsible approach to human interaction with the environment.

In conclusion, the study underlines the significance of ethical and responsible behaviourtoward the environment and underscores the critical role that environmental values and ethics play in influencing human behaviourtoward the natural world. The study offers a nuanced and thorough analysis that can guide future research and activity on the subject, supporting a more sustainable and equitable future for all. It does this by critically examining present perspectives on environmental values and ethics.

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Biodegradable Plastics: Innovations and Applications for a Greener Future

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Abstract: Plastics have become an integral part of our daily lives, but their persistent presence in the environment and their contribution to pollution and waste accumulation has raised significant concerns. The development and implementation of biodegradable plastics have emerged as a promising solution towards a greener future. This article aims to explore the innovations and applications of biodegradable plastics and put some light on their potential to address environmental challenges and promote sustainability. Here we discuss the materials used in biodegradable plastics, such as biopolymers derived from renewable sources like corn starch, polylactic acid (PLA), and polyhydroxyalkanoates (PHA). These materials offer biodegradability, allowing them to break down naturally into harmless compounds under specific conditions, reducing their impact on ecosystems. This article explores the diverse applications of biodegradable plastics across various industries. It discusses their use in packaging materials, agriculture, consumer products, and medical applications, among others. The potential benefits and challenges associated with the adoption of biodegradable plastics are also addressed, emphasizing the need for widespread awareness, infrastructure development, and regulatory frameworks to ensure their effective implementation. The significance of biodegradable plastics in achieving a greener future by reducing the reliance on conventional plastics derived from fossil fuels, biodegradable plastics offer an opportunity to minimize carbon emissions, decrease waste accumulation, and mitigate environmental damage. By examining the materials, applications, benefits, and challenges associated with biodegradable plastics, it provides a comprehensive understanding of their potential to shape a sustainable and eco-friendly world.

Keywords: bioplastics; biodegradable; environmental; sustainable; innovation.

Introduction:"Plastics" were introduced approximately 100 years ago, and in present days, plastics has become one of the most used and versatile materials. Plastics have undoubtedly revolutionized various industries and transformed the way we live. The demand for plastic is increasing day by day, the production of plastics was between 280-290 million tons in 2012, exceeded 300 million tons in 2014.(Vasava, D.V., & Shah, V.T.,2019.p 385).However, their widespread use and improper disposal

have resulted in severe environmental consequences, including pollution, global warming, ecosystem degradation, and long-lasting waste accumulation. The urgent need to address these challenges has sparked the development of biodegradable plastics, offering a promising solution for a greener future. It emphasizes the need to explore innovative approaches that minimize the ecological footprint of plastic materials without compromising their functionality and versatility. The objective of this article is to delve into the innovations and applications of biodegradable plastics, shedding light on their potential to contribute to a sustainable society. It establishes the significance of this research in addressing the global plastic pollution crisis and fostering a transition towards a more environmentally conscious world. There is an overview of the subsequent parts, briefly describing the key areas of focus. It mentions that the paper will delve into the advancements in biodegradable plastics, including the materials used and their biodegradation mechanisms. It also highlights the diverse applications of biodegradable plastics in various industries, exploring their potential to replace traditional plastics in key sectors. Additionally, It recognizes the need for comprehensive strategies and collaborations among stakeholders, including researchers, industries, policymakers, and consumers, to effectively integrate biodegradable plastics into existing systems and infrastructure. It highlights the potential of these innovative materials to reduce pollution, minimize waste, and contribute to the development of a circular economy.

Objectives: Objectives of the current study are as follows:

1. To investigate and highlight the recent advancements in the development of biodegradable plastics.
2. To explore the diverse range of applications where biodegradable plastics can be utilized as sustainable alternatives to conventional plastics.
3. To analyze the benefits and challenges associated with biodegradable plastics.
4. To evaluate the advantages and drawbacks of biodegradable plastics in terms of their environmental impact, resource efficiency, and economic feasibility.
5. To discuss the significance and importance of awareness, infrastructure, and regulatory frameworks.
6. To emphasize the potential of biodegradable plastics in contributing to a sustainable and eco-friendly future.

Methodology: Researcher has used the secondary information and reviewed a series of research studies and articles on the particular topic.

Theoretical Framework: The study on biodegradable plastics and their role in fostering a greener future can be enriched by adopting a multidimensional theoretical framework. Such a framework allows for a comprehensive analysis of the innovations and applications of biodegradable plastics within the broader context of sustainability. Some theoretical perspectives can be applied to deepen our understanding of the subject matter, including the Circular Economy, Life Cycle Assessment (LCA), Technological Innovation and Diffusion, Sustainable Material Substitution, and Systems Thinking.

- **Circular Economy:** The concept of a circular economy provides a foundation for examining the role of biodegradable plastics and to keep raw materials in a closed loop in achieving sustainability goals. The framework emphasizes the importance of designing products and materials with the intention of minimizing waste, reducing resource consumption, and maximizing resource efficiency. By adopting a circular economy perspective, the study can explore how biodegradable plastics align with circularity principles, such as reducing reliance on finite resources, promoting recycling and reuse, and closing the loop in the product lifecycle. In this way, the circular economy differs from the current economy which is an evaluation of the potential contributions of biodegradable plastics to a regenerative and waste-free economy. (Plaster, J., & Kirschgens, L., 2021)
- **Life Cycle Assessment (LCA):** Life Cycle Assessment is a widely recognized methodology for evaluating the environmental impact of products or materials throughout their entire life cycle. By applying LCA principles to the study of biodegradable plastics, researchers can assess the environmental performance of these materials compared to conventional plastics. Several Factors such as energy consumption, greenhouse gas emissions, water usage, and waste generation can be analyzed at different stages of the life cycle, including raw material production, extraction, manufacturing, distribution, use, and end-of-life disposal. LCA provides a systematic approach to quantify and compare the environmental footprint of different types of plastics, thereby informing decision-making processes and guiding the development of more sustainable materials. ("Current Research in Green and Sustainable Chemistry" 2022)
- **Technological Innovation and Diffusion:** The framework of technological innovation and diffusion focuses on the process of adopting and disseminating new technologies in society. In the context of biodegradable plastics, this framework explores the drivers and barriers to the adoption and widespread use of these materials. It considers technological advancements in the formulation of biodegradable polymers, manufacturing processes, and end-of-life management. Several factors such as market dynamics, regulatory frameworks, and

consumer acceptance play a crucial role in the diffusion of biodegradable plastics. By applying this method, researchers can analyze the interactions between technological developments, market forces, and policy interventions that shape the trajectory of biodegradable plastics in the transition towards a greener future. (Alaswad,O.S.,2022)

- **Sustainable Material Substitution:** The framework of sustainable material substitution examines the process of replacing environmentally harmful materials with more sustainable alternatives. In the context of biodegradable plastics, this framework investigates how these materials can effectively replace conventional plastics in various applications. Considerations such as performance, cost-effectiveness, availability of feedstocks, and end-of-life considerations are crucial factors in determining the feasibility and success of material substitution. This framework allows for an analysis of the potential benefits, challenges, and trade-offs associated with the adoption of biodegradable plastics as a sustainable alternative to conventional plastics.(Yaradoddi, J., 2016, pg.58-61)
- **Systems Thinking:** Systems thinking is an interdisciplinary approach that considers the interconnectedness and interdependencies of various elements within a system. Applying systems thinking to the study of biodegradable plastics enables a holistic understanding of the complex relationships and dynamics involved. This framework recognizes that the adoption and implementation of biodegradable plastics are influenced by a multitude of factors, including economic, social, and environmental dimensions. It allows researchers to examine potential unintended consequences, feedback loops, and trade-offs that may arise from the adoption of biodegradable plastics. By considering the broader system and its inherent complexities, this framework helps identify opportunities and challenges in integrating biodegradable plastics into existing socio-technical systems.

By adopting a multidimensional theoretical framework that incorporates the Circular Economy, Life Cycle Assessment, Technological Innovation and Diffusion, Sustainable Material Substitution, and Systems Thinking, the study on biodegradable plastics can offer a comprehensive analysis of their innovations and applications for a greener future. These frameworks provide a solid basis for understanding the environmental, economic, and social dimensions of biodegradable plastics, enabling researchers to assess their potential benefits, limitations, and implications. By employing this interdisciplinary approach, the study can contribute to the broader understanding of the role of biodegradable plastics in promoting sustainability and guide decision-making processes towards a more sustainable and environmentally friendly future.

Discussion and Analysis: The current study revolves around the key findings and their implications for a sustainable future. It involves a critical analysis of the innovations, applications, benefits, challenges, and potential environmental impacts of biodegradable plastics.

- **Innovations in Biodegradable Plastics:** The discussion begins by highlighting the significant innovations in biodegradable plastics, such as the development of new materials and manufacturing processes. It explores how researchers and industry have focused on finding sustainable alternatives derived from renewable resources, including bio-based polymers and biodegradable additives. The analysis emphasizes the importance of optimizing the properties and performance of biodegradable plastics to ensure they meet the requirements of various applications. .(Yaradoddi, J., 2016)
  - **Applications and Environmental Benefits:** The analysis shifts to the applications of biodegradable plastics and their potential environmental benefits. It explores how these materials can be used as alternatives to conventional plastics in packaging, agriculture, consumer products, and medical applications. The discussion highlights the potential for reducing plastic waste and environmental pollution, particularly in areas where conventional plastics have a significant environmental impact. The analysis also examines how biodegradable plastics can contribute to the conservation of natural resources and the mitigation of climate change.
  - **Challenges and Trade-offs:** The discussion acknowledges the challenges and potential trade-offs associated with biodegradable plastics. It examines the complexities of biodegradation, including the importance of specific environmental conditions and the need for appropriate disposal methods. The analysis considers the potential release of micro plastics during biodegradation and the need for further research to assess their environmental impact. The discussion also addresses the trade-offs between the environmental benefits of biodegradable plastics and potential issues such as increased energy consumption during production or conflicts with food production for bio-based feedstock's.(Muscat, A.,2020)
  - **Transition and Infrastructure:** The analysis delves into the implications of transitioning to a biodegradable plastics-based system and the required infrastructure. It discusses the need for investment in recycling and composting facilities to ensure the proper management of biodegradable plastics at their end of life. The discussion emphasizes the importance of creating an enabling environment through policies, regulations, and incentives that promote the adoption and market demand for biodegradable plastics. It also highlights the need for collaboration among stakeholders,

including governments, industries, researchers, and consumers, to drive the transition towards a greener future. (Moshood,D.T.,2022)

- **Future Perspectives:** This discussion concludes by outlining future perspectives and areas for further research. It suggests the importance of continued innovation to enhance the performance and versatility of biodegradable plastics, as well as to develop sustainable end-of-life solutions. The analysis emphasizes the need for comprehensive life cycle assessments, including a holistic evaluation of environmental, economic, and social aspects. It also highlights the significance of consumer education and awareness to drive the demand for biodegradable plastics and promote responsible consumption and disposal practices.

This discussion provides a comprehensive analysis of the innovations, applications, benefits, challenges, and implications of biodegradable plastics for a greener future. It offers critical insights into the potential environmental benefits, trade-offs, and necessary infrastructure and policies to support the transition towards sustainable plastic alternatives. The discussion also identifies future research directions to address existing challenges and optimize the use of biodegradable plastics for a more sustainable society.

Biodegradable plastics have gained significant attention as a potential solution to the environmental challenges posed by conventional plastics. This analysis focuses on examining the key findings and implications of biodegradable plastics for a greener future, considering their innovations, applications, benefits, challenges, and environmental impacts.

- **Innovations in Biodegradable Plastics:** The analysis begins by highlighting the innovations in biodegradable plastics, including the development of bio-based polymers and additives derived from renewable resources. These innovations have led to improved properties, such as increased biodegradability, mechanical strength, and barrier properties, making biodegradable plastics more viable for various applications. The analysis emphasizes the importance of ongoing research and development to enhance the performance and versatility of biodegradable plastics. . ("Current Research in Green and Sustainable Chemistry" 2022)
- **Applications and Environmental Benefits:** The analysis delves into the applications of biodegradable plastics and their potential environmental benefits. Biodegradable plastics find application in sectors such as packaging, agriculture, consumer products, and medical devices. The discussion highlights how their use can help reduce plastic waste and environmental pollution, mitigating the harmful effects on ecosystems and wildlife. Biode-

gradable plastics also have the potential to contribute to resource conservation by reducing dependence on fossil fuels. (Stevens, E.S.,2020)

- **Challenges and Considerations:** The analysis acknowledges the challenges and considerations associated with biodegradable plastics. It explores factors such as the specific environmental conditions required for efficient biodegradation, as well as the potential release of micro plastics during the degradation process. The discussion emphasizes the need for standardized testing methods and certification systems to ensure the reliability and effectiveness of biodegradable plastics. It also recognizes the trade-offs between the environmental benefits of biodegradable plastics and other considerations, such as energy consumption during production and potential conflicts with food production.
- **Environmental Impacts:** The analysis critically evaluates the potential environmental impacts of biodegradable plastics. While these materials offer the promise of reduced plastic waste, it is important to assess their overall environmental footprint. Factors such as the carbon footprint of production, the energy required for manufacturing, and the emissions associated with degradation and disposal need to be considered. Life cycle assessments can provide a comprehensive understanding of the environmental impacts of biodegradable plastics and guide their sustainable use. (Stevens, E.S.,2020)
- **Transition and Policy Considerations:** The analysis addresses the transition to a greener future through the adoption of biodegradable plastics. It emphasizes the importance of establishing the necessary infrastructure, including recycling and composting facilities, to manage biodegradable plastics effectively at their end of life. The discussion also highlights the significance of supportive policies and regulations that promote the adoption and proper use of biodegradable plastics. Additionally, public awareness and education are crucial to drive consumer demand and responsible consumption practices.

The analysis of biodegradable plastics for a greener future underscores their potential as a sustainable alternative to conventional plastics. It highlights the innovations, applications, benefits, challenges, and environmental considerations associated with biodegradable plastics. By carefully addressing the challenges and optimizing their use, biodegradable plastics can contribute to a more sustainable and environmentally friendly future. However, ongoing research, collaboration among stakeholders, and well-designed policies are essential to ensure the effective integration of biodegradable plastics into our society and mitigate potential unintended consequences.

Implications: The adoption and widespread use of biodegradable plastics have significant implications for achieving a greener and more sustainable future. Here are some key implications:

- **Depletion of Plastic Waste:** Biodegradable plastics offer the potential to reduce the accumulation of plastic waste in landfills and the environment. Unlike conventional plastics that can persist for hundreds of years, biodegradable plastics can break down into natural elements through biological processes. This can help mitigate the negative impacts of plastic waste on ecosystems, wildlife, and human health.
- **Preservation of Natural Resources:** Biodegradable plastics derived from renewable resources contribute to the conservation of finite natural resources. By using bio-based polymers or additives, we can reduce our reliance on fossil fuels, which are the primary feedstocks for conventional plastics. This promotes the sustainable use of resources and helps to mitigate climate change by reducing greenhouse gas emissions associated with fossil fuel extraction and production. (Moshood,D.T.,2022)
- **Advancement of the Circular Economy:** Biodegradable plastics align with the principles of the circular economy, which aims to minimize waste and maximize resource efficiency. These plastics can be integrated into a closed-loop system where they are recycled or composted after use. Through proper waste management infrastructure and practices, biodegradable plastics can be diverted from landfill disposal and effectively processed to create new products or return valuable nutrients to the soil.
- **Moderation of Environmental Pollution:** Biodegradable plastics have the potential to mitigate environmental pollution associated with conventional plastics. By degrading into natural elements, they reduce the risk of long-term pollution in ecosystems, particularly in marine environments. This can help preserve biodiversity, protect water quality, and maintain the health of ecosystems.
- **Shift in Consumer Behavior and Industry Practices:** The adoption of biodegradable plastics can drive a shift in consumer behavior towards more sustainable choices. Increased awareness and education about the benefits of biodegradable plastics can influence consumer preferences and purchasing decisions, encouraging the demand for environmentally friendly products. Moreover, industries may transition to manufacturing practices that prioritize the use of biodegradable plastics, leading to more sustainable and eco-conscious production processes. (Moshood,D.T.,2022).
- **Policy and Regulatory Inference:** The rise of biodegradable plastics necessitates the development and implementation of appropriate policies and

regulations. Governments and regulatory bodies can play a crucial role in promoting the adoption of biodegradable plastics, setting standards for biodegradability and compost ability, and incentivizing the development and use of sustainable materials. These policies can create a supportive environment for the growth of the biodegradable plastics industry and facilitate the transition to a greener future.

The implications of biodegradable plastics for a greener future are far-reaching. They offer the potential to reduce plastic waste, conserve natural resources, promote the circular economy, mitigate environmental pollution, influence consumer behavior, and drive policy and regulatory changes. By embracing biodegradable plastics, we can take significant steps towards achieving a more sustainable and environmentally friendly society. However, it is crucial to address challenges such as standardization, infrastructure development, and comprehensive life cycle assessments to ensure the optimal integration and realization of these implications.

Conclusion: Biodegradable plastics hold great promise for a greener future. The development and widespread adoption of these materials offer several significant benefits and opportunities for addressing the environmental challenges posed by conventional plastics. The implications of biodegradable plastics include the reduction of plastic waste, conservation of natural resources, promotion of the circular economy, mitigation of environmental pollution, shifts in consumer behavior and industry practices, and the need for supportive policies and regulations. By reducing plastic waste through biodegradation, we can minimize the harmful impact of plastics on ecosystems and wildlife, contributing to a cleaner and healthier environment. The use of renewable resources in biodegradable plastics supports the sustainable use of natural resources and helps mitigate climate change by reducing greenhouse gas emissions. Biodegradable plastics also align with the principles of the circular economy, promoting the recycling and composting of materials to create a closed-loop system. Moreover, the adoption of biodegradable plastics can drive a shift in consumer behavior towards more sustainable choices, leading to increased demand for eco-friendly products. Industries can embrace these materials, fostering more sustainable production practices. However, addressing challenges such as standardization, infrastructure development, and comprehensive life cycle assessments is crucial for the successful integration of biodegradable plastics into our society. To fully realize the potential of biodegradable plastics for a greener future, supportive policies and regulations are necessary. Governments and regulatory bodies play a vital role in setting standards, incentivizing the use

of biodegradable plastics, and creating an enabling environment for their growth. Collaboration among stakeholders, including researchers, industries, consumers, and policymakers, is essential for driving the transition towards a more sustainable and environmentally friendly society. Biodegradable plastics offer a pathway towards a greener future by reducing plastic waste, conserving resources, mitigating pollution, and promoting sustainable practices. Embracing biodegradable plastics and addressing associated challenges can pave the way for a more sustainable and resilient world, where the negative environmental impacts of plastics are minimized, and a circular and sustainable economy are fostered.

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A Study on Relationship between Environment and Creativity

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Abstract: The study on the effect of environment on creativity of an individual indicates that environment stimulates curiosity. It is a perennial source of knowledge and research as its workings are mysterious and uncontrollable. This fosters flexibility and imagination and leads to beneficial distraction from obsession and preoccupation to maintain mental peace and evokes a spirit of freedom from worldly bondage. It is study to explore two-way interactive effects of humans and environment on each other. The study finds a positive as well as a negative human effect on environment but a significant positive effect of environment on humans. The methods adopted for the study is literature survey, comparative statistical method and study of correlation by collecting data from 40 subjects in urban and rural areas to see the difference in creativity under environmental exposure and a correlation between environment and creativity. The survey result and collected data are interpreted by following mixed method to conclude the positive effect of natural environment on human creativity and a strong correlation between environmental stimulus and human creativity.

Key words: Environment, Creativity, P-type, H-type, Cloud seeding, effect modifier, biodiversity

Introduction: Nature is the source of knowledge, nature is the source of power; nature is the source of all creation and existence of all the species on the earth. It is the source of beauty, power, miracles, birth, generation and regeneration. It is a superpower in the world of existence. An aesthetic impulse is created under the influence of environment on an individual. Wild beauty of nature is also a source of awe, admiration and inspiration for a creative personality. Exposure to the natural environment works as an attention restoration therapy for every depressed individual. Environment provides us with different subject-matters so that we can treat those in our own way and generate information based on these. In arts, there is scope for natural duplication, animated duplication and cartoonist duplication. All of these have a single natural source. On the other hand, natural is a rich source of scientific exploration and related information. Nature is a treasure trove for us that

opens up scope for new information as well as new discovery. It is an everlasting source of wonder, awe and inspiration. Science bears the responsibility to discover the secrets of this wonder and awe. But it never ends. Right from the fossil fuel to discovery of chemicals, nature has an undeniable contribution.

Objective of the Study:

i. To find how human activities contribute to environment
ii. To find negative human effect on environment
iii. To find how environment contributes to human creativity
iv. To find correlation between environmental stimulus and creativity

Hypotheses:

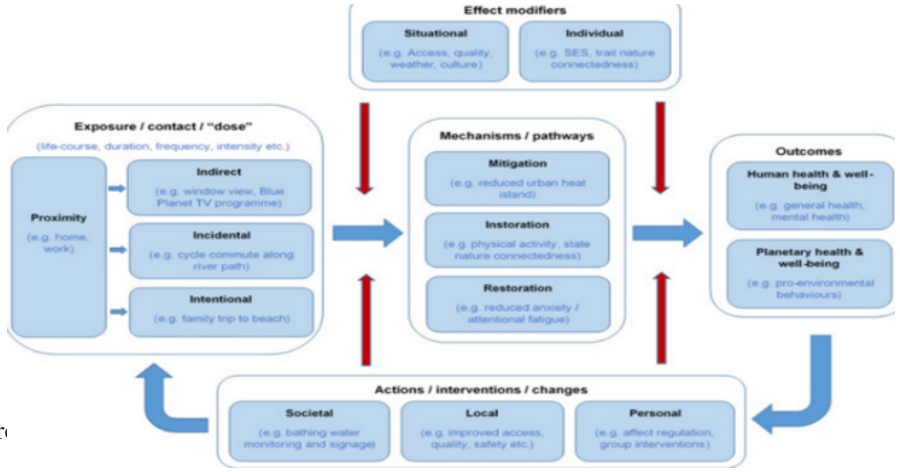
i. There is no environmental effect on human creativity
ii. There is no correlation between environmental exposure and human creativity

Theoretical Background:

Defining Natural Environment: Nature as an inseparable entity of environment: Flora ns fauna are essential entities of nature around us. Nature is always alive with them. Flora consists of all the plants in nature and its different varieties. On the other hand, fauna consists of different types of animal in it. All these together create a unique combination and this combination form a hierarchy from herbivores to carnivores. The cycle of eco-system is complete with the existence of nature and surrounding flora and fauna. Man is the central to all. The existence and welfare of human species depends on how well we manage our environment and how well we can protect the species all around us.

Nature of Natural Environment: The term "natural environment" or "natural world" refers to all naturally occurring, that is, not manmade, living and non-living phenomena. This environment includes how all living things interact with one another as well as the climate, weather, and natural resources that have an impact on human survival and economic activities.(Wikipaedia). Lithosphere, hydrosphere, atmosphere, and biosphere are the four main elements of the environment, which are represented by rocks, water, life, and the atmosphere, respectively. Along with this, five fundamental elements are ether, earth, water, fire, and air. Natural environment is regenerative, characteristically non-manmade open-air and an under-sky entity.

Effect of Environment on Human Existence: Interaction among nature, flora and fauna has a positive effect on the survival and sustenance of human species in general. According to Bennett & Jones (2018), 'greenspace exposure' has a positive effect on human health as per 143 studies related to it. They also find a positive neurological effect of environment on human brain that leads to mental composure and this results in an inspiration for being engaged in innovative activities if the fields of art, science and technology. White et. al. (2020), has shown "potential health and well-being benefits from exposure to green spaces such as parks and woodlands". This is an important interdependence of health benefits and exposure to green spaces around us. Hartig et al. (2014) has discussed two sets of environmental effect modifiers: first one being situational modifier and the second one being individual modifier. Thus, effect of environment varies with situational factors, such as, 'access, quality, weather, culture, etc.' and individual factors, such as, personal characteristics such as age, gender, SES, etc. This makes it clear that our environment has a variable effect of humans based on where one lives or his location and demographic status of the individual. The diagram below shows an interaction between environment and individuals under situational and individual modifier.



Sour

Humans are exposed to environment indirectly, intentionally and incidentally. As an effect, their respective health issues are either mitigated or good health is restored eventually. So far as locative modifier in this case is concerned, the responsive area indicators may be a locality, society as a whole and personal habitat where people have different outlook towards environment that may either be indifferent, or destructive or regenerative.

Creativity: According to 'Psychology Today', the capacity to come up with novel,

creative connections and solutions to issues is what is meant by creativity. Fostering resilience, igniting joy, and offering chances for self-actualization are all aspects of what drives us as people. In the Encyclopedia of Creativity, creativity is defined as Invention, Innovation and Entrepreneurship by Carayannis (2013) as "the ability to respond adaptively to the needs for newapproaches and new products, or as the ability to bring something new and valuable into existence purposefully." As Maheshwari (2016) states, "creative individuals are the resources ofany team." She provides a wholesome definition of creativity propounded by Plucker, Beghettoand Dow (2004), "Creativity is the interaction among aptitude, process and environment bywhich an individual or group produces a perceptible product that is both novel and useful…"Here, the focus is on the novelty of the outcome. In the Oxford Dictionary of Psychology, "theproduction of ideas and objects that are both novel or original and worthwhile or appropriate,that is, useful, attractive, meaningful or correct. The twenty-first century generation should worktogether with a proactive idealism to 'perform or perish' and also with acontemporaneousversion of the motto - 'innovate or perish'. She has mentioned two special types of creativity: P-type creativity and H-type creativity. **P-type** creativity is psychological creativity also known asexpressive creativity that may occur to an individual at a specific moment of imagination. **H-type** creativity is scientific creativity that leads to a scientific invention. Creativity is the only survivalstrategy for the upcoming generation.

Nature of Creativity: Creativity is naturally unique and original. According to Mangal (2014), "creativity is a uniqueand novel personal experience" and he mentions the following characteristics:

i. Creativity is universal: According to him, creativity is not limited to the barrier, caste andlanguage. It is a spontaneous expression and anyone can possess it.
ii. Creativity is innate as well as acquired: it is often believed that creativity is God-gifted.This belief implies that it is natural and it is a special bent of thought and ideas. Creativitycan also be developed by creating an environment with relevant cultural background, experience, education and training.
iii. Creativity produces something new and novel: Creativity denotes the ability of a personto produce something new that never existed before or some altered and modified formthat has some new application.

iv. Creativity is adventurous and open-thinking: Creativity does not mean developingsomething the same as before but it is an adventurous task of making a new model thatcan replace that old one or an old product can be used for a new purpose.

Effect of Human Activity on Environment: The effect of human existence on environment has a two-way interpretation: first, it can be shown in a positive way and then, it can be interpreted in a negative way. The positive effect is that human skill can make our environment even better, attractive and interesting by making it more productive and regenerative. The art of paining, writing, restructuring and redesigning our natural environment into a digital animated viewcan convert our surroundings into an attractive way to feel our environment in a better and aesthetic way. It shows a creative and recreative human endeavor. These creative approaches are shown below:

Human Skill of Improving the Environment Naturally:

i. **Japanese Bon Sai:** "Bon-sai" is a term with Japanese origins which translates to "Planted in a container." "Bon" denotes a deeper-cut modified vessel. And "sai" refers to the process of growing a planted tree or plant. Consequently, the term "Bonsai" refers to a tree that has been planted in a container. China owns the ancient living art. It was originally a Chinese horticulture technique. Later, the art was created again by the Japanese. They were ultimately influenced by Japanese Zen Buddhism during its development. Typically, people think of bonsai trees as dwarf plants. The creation of a miniature version of nature is the ultimate goal of bonsai cultivation. So, in the primary the form of a little tree, bonsai is a genuine reflection of nature.

ii. **Aquatica:** This is an artificial water-pool that can be used as a favourite tourist spot. Usually, ponds and lakes are less visited by people but this artificially created water-pools can attract a large number of people and this artificially created natural environment can save our environment from being damaged and thus, it can add attraction to out nature in a better way.

iii. **Nature Park:** This is another way to make our environment beautiful and feel the grace of nature in an enjoyable way. There are many examples of

this sort of part like, Ecological Garden, Botanical Garden, Eco Nature Preserve Place, Central Park etc. These places are characterized by lush green plants all around and shady spots to take a day's rest under trees and enjoy fresh air and a clear view of trees and plants around us.

iv. **National Parks:** National parks are the unique places where we can experience both the view of natural green plants and trees and at the same time the view of wild animals moving all around. Here, Jungal Safari has an important attraction that makes us closer to the animals and the heavenly blessings of natural surroundings can be perceived within our reach. The following are the spots where unique moments can be enjoyed in the lap of nature.

Jim Corbett National Park: It is situated is the district of Nainital in Uttarakhand. This is full of trees and plants and this spot is exclusively for enjoying the view of nature and feel the abundance of tigers in Corbett's majestic scenery.

Kaziranga National Park, Assam: This is an excellent natural surrounding that is famous for rhinos for a close view in proximity with nature. This is a restricted place for any disastrous activity. This spot is purely foe enjoyment of nature's blessing.

Sundarbon National Park: In West Bengal, India, there is a national park, tiger reserve, and biosphere reserve called the Sundarbans National Park. It is a piece of the Sundarbans on the Ganges Delta and is close to Bangladesh's Sundarban Reserve Forest. To the southwest of Bangladesh is where it is situated. The delta is one of the biggest habitats for Bengal tigers and is heavily covered with mangrove woods. Numerous birds, reptile, and invertebrate species live there as well, including crocodiles, living in saltwater.

Gir National Park: Nature has been beautifully and constructively regenerated as a prominent shelter of different species of plants and animals in Gir Forest. This is a natural spot dedicated to the trees and animals and a view of this forest can make one feel for natural environment and get a perception that man cannot live without nature and nature is an inseparable entity to the human world. The only location outside of Africa where lions can be viewed in their natural habitat is Gir National Park. More than 425 different bird species find refuge in Gir National Park's diverse flora, and the sanctuary has also been designated an important bird location by the Indian Bird Conservation Network. Visitors get a fantastic chance to appreciate the rustic beauty and wilderness of the area in the Sanctuary's enclosed area.

These national parks are examples of environmental recreation that creates in us a feeling of vastness and grandeur of lush green beauty and the presence of different natural animals inside.

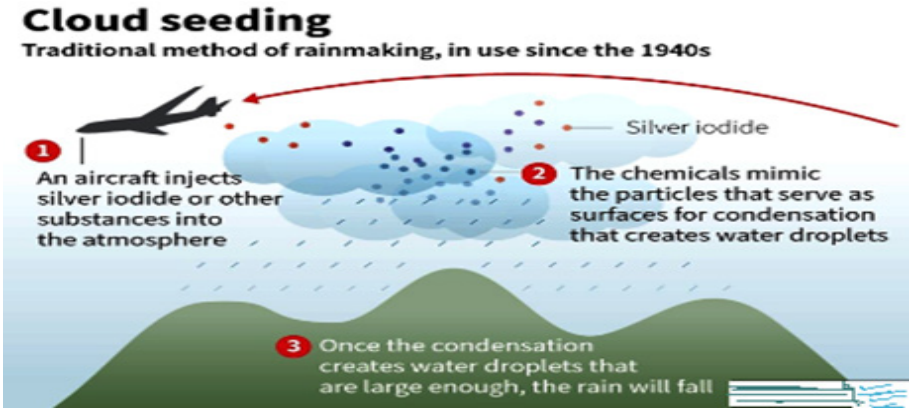
Creative Effect of Human Intellectual Work on Beautifying Environment: Creative art is centrally related to natural elements in form of writing and painting. From time immemorial, artists are representing the natural forms in their arts. They are expressing their creative talents in this way and also developing a sense of love and respect for natural environment. If we look at the artworks of French impressionist artist Claude Monet, we can rediscover the form and colour of nature around us. This will create not only a realistic impression of nature but also gives an everlasting effect of the grace of nature and its pervasive beauty around us. Other than this, the works of Mika Ninagawa, Vanessa Hogge, Andrew Cooper, Kuanth, Arko, Javiera Estrada present Nature in their most graceful forms and these are mostly a discovery of the secrets of nature. These are recreation of nature and making them alive by adding sensibility of natural organisms as if they can perceive the world around them.

Literary Creation Involving Natural Environment: Literature is the mirror of human existence. It reflects human life in its multidimensional perspectives. Nature is an inseparable entity of literary creation. Human creativity has augmented the status of environment and heightened it to the level of pure and sublime beauty. When we read the poems of William Wordsworth, the beauty and legendary reflection of natural surroundings of the Lake District becomes alive to the readers. John Keats' perception of active nature with the sound of wind and call of birds instills in the readers a sense of concrete presence of natural environment all around us. At the time of reading 'Shasti' by Rabindranath Tagore, the readers can perceive an intrinsic relation between effect of change in season on nature and the effect of it in the life of the characters. The fate of Chandara in the story is determined by her hungry husband as he was racked between his hunger, extreme tiredness due to heat and sultry weather along with unquenchable poverty. This short story is the reflection of external environmental roughness and inner disturbance in the family of Chandara. The complexity of environmental metaphor is an important tonal feature of this story. Along with this metaphorical and symbolical representation of nature, direct reference to nature and its workingsare also evident in his poetry. When we read 'Jhar' by R. Tagore, the angry rudeness of nature becomes alive to the readers. The impact of storm and rain in nature gives a make-believe feeling of comfort even

when there is no apparent rainfall in reality. The creation of a storm-ridden rainy moment bears an everlasting feeling of peace and comfort when people are in dire need of rain in reality. This literary creation with an environmental impetus has an indelible and everlasting aesthetic and psychological effect on the readers.

Scientific Recreation of Environment: Nature is a source of infinite power and potentials. The world is active with the energy extracted from nature. Nature of the source of our physical comfort with hot and cold air; it is also a source of satisfying our hunger and thirst. But sometimes nature is rude to us. The farmers suffer due to lack of rainfall, extreme heat and cold make us upset. Extreme rainfall or lack of it leads to flood and famine. To save us from these untoward positions, scientists have extracted power to run electrical equipment; they have made use of thermal power, wind power, solar energy and hydroelectricity.

Cloud Seeding: Rainfall is an important prerequisite to temperature balance and climate stability. As an effect of it, it brings solace to plant and animal community. Lack of rainfall results in an embarrassing climatic condition that is unproductive and works as a major obstacle to agriculture. Natural water-cycle is not always a successful mode of heavy precipitation as other factors may stop rainfall from happening. The scientists have developed an alternative to natural rainfall that is known as 'cloud seeding'. 'Cloud seeding' is a method of weather modification that increases a cloud's capacity to produce snow or rain by inserting minute ice nuclei into specific kinds of subfreezing clouds.



Source: Biodiversity & Environment, Cloud Seeding

On tropical cumulonimbus clouds, seeding works. The most often used substances for cloud seeding are dry ice, potassium iodide, and silver iodide. In the United Arab Emirates, a novel technique has been in use since 2021. Drones with a payload

of electric-charge emission instruments and tailored sensors fly at low altitudes, delivering an electric charge to air molecules that promotes condensation and results in rainfall. This is an example of how human uses creative measure to reinvent natural phenomenon. This implies an interaction between natural determinants and human intervention. This is the process of facilitating a natural activityfor the purpose of favourable environmental condition and human welfare as the ultimate purpose.

Negative Effect of Human Activity on Environment: The details above show positive human activities to innovate restore and recreate environment. On the other hand, there are negative human activities too which are destructive or degenerative in nature.

No one waits and think of the negative human activities that causes major harm to environment. The responses are instant as everyone is aware of the harm caused to environment yet everyone is a silent offender or tolerant of this. First, we have ample evidence of deforestation and filling waterbodies for building apartments; agricultural lands are at the mercy of predatory promoters; low agricultural production and disturbed irrigation system diminishes supply of vegetables and seafoods, yet we are silent spectators. Water depletion is a graver concern than a criminal offence now and air-pollution is a significant cause of depletion of ozone layer and consequent global warming that is gradually changing our climatic stability and creating environmental issues. Reddy & Appannagari expresses their concern by saying, "The destruction of ozone layer and the further warming of the earth surface threaten catastrophic consequences such as eruption of cancerous and tropical diseases, disruption of oceans food chain, rising of sea levels, submersion of many islands, melting of small land-based glaciers, flooding in many low lying coastal areas and harvest loss etc." According to Manisalidis et.al. (2020), "the only way to tackle this problem is through public awareness coupled with a multidisciplinary approach by scientific experts;" But our education has not provedto be strong enough to protect ourselves from the clutches of those environmental goons.

Effect of Environment on Humans: Effect of human community on environment is seen to have both positive and negative impacts. As humans shows constant effort to recreate environment and tries to improve its effect in a facilitating way; at the same time some destructive agents are equally active to destroy the purity of environment and making life hard to live under their commercial activities that result in dire imbalance in eco-system causing a threat to our environment with climatic extremities. But, environment always sheds her blessing on humansin spite

of growing human apathyat a large scale. A traditionalist interpretation of the effect of environment can be done in the following way:

i. Natural environment is the primary source of food for everyday living.
ii. Natural environment of the source of oxygen that we breathe in everyday to live.
iii. It is the source of natural resources including water that we use everyday for facilitating our lifestyle and extending our longevity.

Other than these typical environmental supports, some atypical psychological support of environment is also worth mentioning:

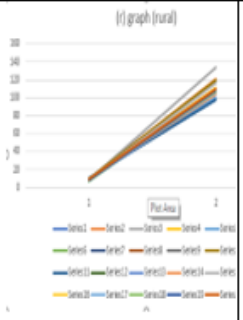
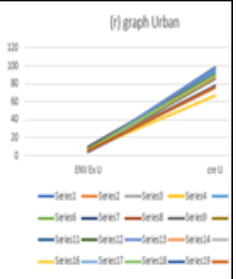
a) Natural environment boosts healthy mindset: A close proximity of nature regularize secretion of serotonin in brain that keeps us jolly and maintains a happy mood. A study conducted at the University of Derby revealed that "subjective feelings of happiness and wellbeing were positively correlated with natural activities such as gardening, animal feeding, bird watching, and bushwalking." (Richardson, Cormack, McRobert, & Underhill, 2016). According to "exposure to sunlight in nature activates our neurotransmitters in brain and causes secretion of serotonin and endorphin improving our mood and helping us relax". (National Institutes of Health; University of Minnesota, 2018)
b) The serenity and calmness of nature maintains a peaceful and stress-free mind and refreshes us and boosts productivity. As the English poet of high repute, William Wordsworth states, "Poetry is the spontaneous expression of powerful feelings and it takes its origin from emotion recollected in tranquility." Here, the poet stresses on the need for a calm and serene natural environment for literary creation.
c) Environmental psychology research has discovered that exposure to nature has psychological advantages that significantly improve vital aspects of human health, including the attention restoration and stress reduction. A previous study discovered that a forest scene encourages people to give more in-depth responses than an urban street landscape. The majority of research has, however, concentrated on the psychological advantages of natural settings for self-actualization and creativity. Exposure to natural environment

works as a therapy for attention restoration and stress reduction (Trammell & Aguilar, 2021). Restoring attention from severe unrest and bringing equanimity or calmness to mind has a productive effect on human mind. Productivity has a direct link with Creativity that is an advanced cognitive process that is more divergent than convergent. This is a faculty that needs more liberty and openness than restrictions and limitations. A natural setup can work here as favourable stimulus for creative activities.

Statistical Correlation between Environmental Stimulus and Creativity: A creativity test was conducted by selecting samples of students from class XI in urban and rural areas in the districts of Hooghly. Author made questionnaire was used to collect their response on respective creativity. The questionnaire contained 10 subjective questions of 20 marks each. Total marks were 200. Reliability score of the questionnaire was 8.1 and piloted with 10 students each in rural and urban area. The number of subjects for the study was 20 from urban area and 20 from rural area. The objective was to compare creativity between urban and rural students with an implication of active presence of environmental stimulus on their creativity and also to find correlation between environment and creativity. The test result is as follows:

Creativity Scores (Rural)	Creativity Scores (Urban)	Mean (rural) $\bar{x}_1$	Mean (urban) $\bar{x}_2$	sd (Rural)	sd(Urban)	t-value	p 0.01
104	76	111.1	85.1	8.571065	8.380899	9.50	2.58
121	96						
134	78						
111	89						
100	94						
107	87						
117	86						
118	87						
119	90						
120	89						
98	98						
109	86						
104	97						
104	87						
116	75						
106	67						
107	78						
108	89						
109	78						
110	76						

To compare creativity of rural and urban students under the effect of environmental exposure, two sample t-test was applied and the result shows t-value 9.50 > p-critical value 2.58 at 0.01 level of significance; **therefore, the hypothesis of no difference in creativity between rural and urban students under environmental exposure is rejected and a significant difference in creativity between rural and urban students is found**. The result also implies that students who are exposed environment have a higher level of creativity than their counterparts in urban area. Moreover, responses were collected to an author-made questionnaire of 10 marks in total with a reliability coefficient of 0.7 on Environment exposure of the subjects. The following matrix shows that **a positive correlation exists between Environmental Exposure and Creativity**:

Env.ex. R	Creativity R	ρ	Correlation graph (Rural)	Env.ex. U	Creativity U	ρ	Correlation graph (Urban)
8	104	1		6	76	1	
9	121			7	96		
8	134			8	78		
9	111			9	89		
9	100			7	94		
7	107			6	87		
8	117			5	86		
8	118			9	87		
9	119			10	90		
9	120			6	89		
10	98			5	98		
9	109			5	86		
8	104			5	97		
9	104			6	87		
9	116			5	75		
9	106			7	67		
9	107			6	78		
9	108			7	89		
9	109			4	78		
9	110			5	76		

Conclusion: Thus, the effect of environment on creativity and their correlation shows that natural environment is an effective creativity booster. On one hand, humans are creative in making our environment enjoyable and comfortable by inventing innovative ways to attract people; on the other hand, the destructive attitude of people is equally harmful to human survival. But, environment itself has overall positive effect on human existence and it has worked as a potential stimulus to boost creativity since long past and even nowenvironmental proximity proves to be strong attention restorative agent and it has a positive correlation with creativity.

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Appendix

Questionnaire to assess effect of natural environmental on creativity

(Subjective short response type within 100 words each– An author-made power test) 10X20 = 200

1. If you see a flower bloom what is the first thing you do?
2. When you read a poem on nature, what do you do immediately?
3. When you look at starry sky, what you intend to do?
4. When you visit a garden, what usually do you want to see?
5. Do you like to read a nature poem in nature or in your room and why?
6. Write four sentences on the beauty of the setting sun?
7. If you see someone cutting a tree, what would you tell him and why?
8. If you see people practicing water-skimming in the sea, what you plan to do something new?
9. Read any nature poem and find out a suitable computer game related to it and explain your choice.
10. On a stormy night with constant rainfall, dark all around, no one nearby, what is the best thing you can do?

Bipolar questionnaire (Yes/No type) on environmental exposure (Author-made): 10x1 = 10

1. Do you see flowers around your house?
2. Can you feel rainwater by stretching your hand out of window?
3. Do you see pond or river where you live?
4. Can you see a vast stretch of greenery from your roof?
5. Do you see around trees shedding fruit?
6. Do you see two animals or birds playing together?
7. Is it usual to see a farmer preparing the soil for seeds?
8. Can you see dark cloud in the sky before rain?
9. Is it a usual sight to see a flesh-eating animal enjoy chewing grass?
10. Can you see an owl during day and a crow at night usually?

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