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CARBON NEUTRALITY, CARBON FOOTPRINT AND CIRCULAR ECONOMY INDIAN INITIATIVES TO COMBAT CARBON FOOTPRINT

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ABSTRACT

The digital revolution has surpassed the interdependency of business to a greater height. Business organizations are involved in various interactive activities. Transition to digital technology through the extraction of resources has made businesses, widen the scale of operation. With positive developments, the global climatic environment has impacted India, the country is in 3rd place next to China and the USA. The government needs to build better policies for better lives. The man-made industrial revolution has pushed positive productive activities, as well, as caused a negative environment, and imbalance. Activities are measured based on emissions and carbon footprint. Carbon footprint is caused by to overall consumption of materials and energy, flora and fauna confiscation, as well as direct and indirect emissions caused by import and export of trade. World mineral extraction has manifolded 4 times, from 28 Gt to 101 Gt as of 1971 to 2021. This extraction is expected to move 6 times higher, by 2050. Based on this background, the study objectives are, to examine actions taken by India through policy developments to combat the carbon footprint, in aligning the domestic policy to cooperate with global agreements. Secondly, the readiness of Indian business organizations, to develop a systematic sustainable model, to mitigate environmental hazards. Selective case instances are taken from the Indian context to understand green industrialization. Lastly, a study has analyzed using statistical infographics with trend and time series, to understand the cumulative average rise in carbon footprint based on sector-wise variation.

KEYWORDS: *Carbon Footprint, Neutrality, Circular Models, Policy.*

1. INTRODUCTION:

Primitive economy follows a linear model, with waste of resources, but the circular economy model, has its parameters, giving much emphasis on reusing and recycling materials. Right from the 18th century during the Industrial Revolution, industries were practicing the take, make, and dispose of the model, but in a digitized system circular model is the design with a recent version to reduce carbon footprint to achieve sustainability. The goal is to retain the maximum value of resources through effective management of resources and goods, in particular, to lessen waste and maximize the reusing, remanufacturing, and recycling of materials. The circular system has

initiated seven principles that benefit companies in day-to-day operations. Each of these principles is well suited to mitigate carbon footprint.

- Design of the Circular Economy
- Build a circular supply chain
- Reduce environmental impact
- Preserve and extend resources and asset life cycles
- Using regenerative and renewable resources
- Turning waste into resources
- Adapt innovative technologies

1.2 Carbon-negative initiative taken by Indian Organizations via Green Industrialization

Is it time for green industrialization? An accountability matrix for climate action is noted with good transparency, this lies in making every nation accountable, to facilitate smooth interaction, and aligning internal policies, with those of the global attainment of each country's goals.Representatives and decision leaders at the global Conference of Parties (COP) meet, join hands, and commit on behalf of each nation. All signed striking agreements, so promises need not be discontinued. Escalating heat across countries in the globe, transformation serves as a plain reminder that Earth is experiencing thoughtful and probably irreversible changes. So, what is the demand needed for these changes to climatic conditions? Better to shift towards green industrialization, a mindful and sustainable approach for the economy to grow.Green industrialization visualizes the widespread adoption of circular economy principles, encouraging resource efficiency and minimizing environmental impact. This change requires a planned shift from old-style brown assets, which heavily rely on fossil fuels, to innovative green industrial assets. The importance of this idea is the combination of renewable energy sources, such as solar and wind, into industrial processes, to reduce carbon footprints and support non-renewable resources. Green industrialization envisages the basic reshaping of manufacturing developments and economic structures to influence cutting-edge technologies to blend industrial growth with environmental sustainability. This combination of spotless energy sources, such as solar, wind, and green hydrogen becomes the pillar of this change, steering industries away from fossil fuels and diminishing their carbon footprint. With equal access to these advancements, green industrialization can become a shared global endeavor empowering nations to forge a collective path toward a resilient carbon future. Organizations have joined hands with the government to take India towards the path of lower greenhouse gas emissions, almost more than 24 top private companies including Tata, Reliance, Mahindra, ITC, ACC, Adani, and Dalmia Cement signed an agreement on climate change. Each nation voluntarily pledges to, move towards 'carbon neutrality'. To make carbon neutral management of carbon in its form becomes essential. Nature-based solutions such as afforestation or investment in clean energy technologies capture, store, and/or use carbon dioxide (CO_2) emissions to optimize biological and industry processes. One such (Victoria Masterson, April 2022)technology is **Carbon, Capture, Use, and Storage**

(CCUS). To achieve climate goals, however, the CCUS arrangement is to reach 5.6 Gigatonnes (Gt) of CO2, according to the Global CCS Institute (GCSSI), accounting for a fifth of emissions reductions needed by 2050(IEF, 2020). CCUS, the cost of energy sector transitions could increase by more than 70 percent and several countries view CCUS as a "mitigation and adaptation"

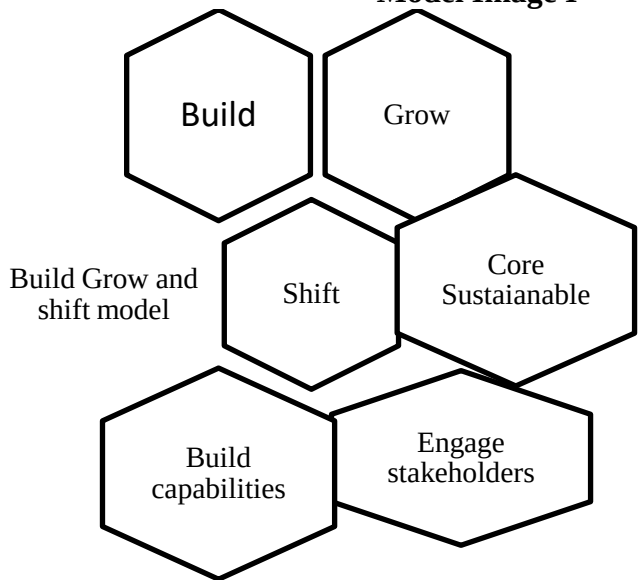
2. Review of Literature

2. Theory and Model

What does the carbon dioxide theory state? As the amount of carbon dioxide rises, the surface becomes muddier over a larger frequency interval. The impacted indicator is that the environment heat rises. So carbon footprint is an ecological indicator that represents the amount of greenhouse gases, that are expressed as CO2 equivalents, that are emitted directly or indirectly as a result of a specific activity.A Planned agenda applied in sustainability changes is through examining various approaches and models. The theory outlines a methodical approach for companies to include sustainability in their core business operations and create a competitive advantage. Organizations need to start by developing a sustainable strategy secure in purpose. Need to take into account material environment, social, and governance areas and identify, where outperformance can contribute significantly to long-term success. Grow captures business value (Murdie, 2013), ***Image 1 Model***, through sustainable practices firms need to explore opportunities. This growth channel could be implemented through cost savings from means competence, new revenue streams from sustainable products or services, or improved brand reputation due to responsible practices. Firms also seek to build new sustainable businesses. Aligning sustainable goals through marginal improvements and innovation totally into new business. As firms work progressively to participate in progressive processes, products, and services, developing capabilities is important. Progressive companies are investing in building skills, knowledge, and infrastructure. Of late companies have made it transparent to engage investors, customers, employers, and stakeholders to advise and guide in positioning sustainability initiatives.A central concept in sustainability is the circular economy. This model supports that products and resources are to be used that minimize the degradation of the environment. The model reinforces closing loops and determines to reduce waste and maximize resource utilization. Does not consider the conservative traditional linear model. The key focus is on the durability of products longevity and reuse, so that the designing of products, is reusable. This could enhance repair, recycling, and redesign that can be used again and again. The circular economy model further stresses its key principle's restorative and regenerative design. Through this principle circular model aims to achieve the highest utility and value in the product lifecycle.

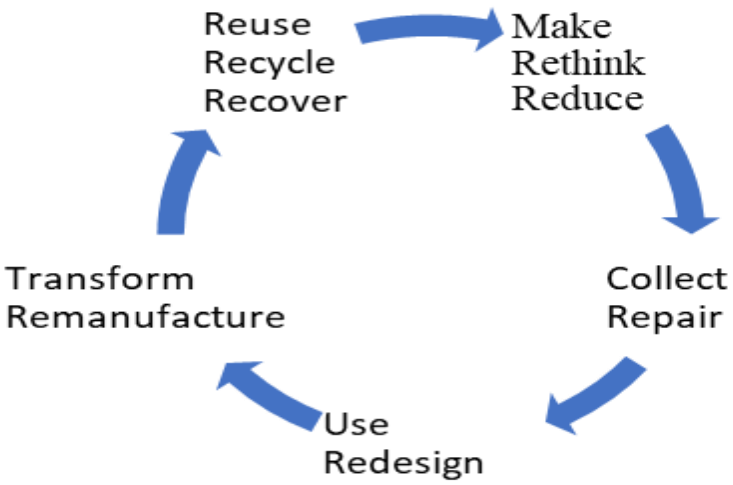
By enhancing the life of products and minimizing waste, the circular model guides to reduction of carbon emissions associated with manufacturing and disposal.

Model Image I



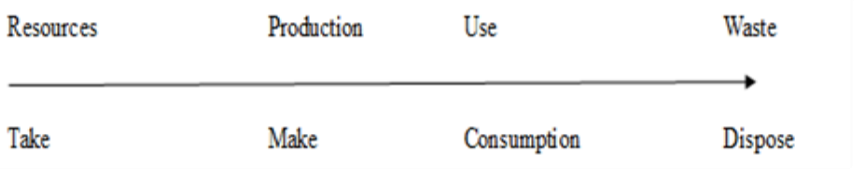
One of the strong reasons to embrace the circular economy model is the linear take-make-use-waste model results in value leakage at every stage of the value chain. The World Economic Forum, moving on to a circular model could foster manufacturing companies to unlock greater opportunity, redefine the design, can operate within the framework, that could position businesses for long-term success. In this way, circular economy model could be made achievable, scalable, and profitable.

The pillars of the Circular Economy are basically to encircle change. This is based on three transformations of technology that redefine product design, materials used, and the way the industries operate. While prioritizing materials to weave and develop through durable, recyclable, and bio-gradable materials.



One of the observations made by the circularity gap report by Circle Economy around 90% of materials are wasted, lost, or unavailable for reuse and recycling. According to (MacArthur)Foundations, the circular system illustrates the continuous flow of materials in a circular economy through two main cycles one, is technical and the second is a biological cycle. In the former cycle, materials are kept in circulation through reuse, repair, remanufacture, and recycling processes. In the latter cycle, biogradable materials are returned to the soil through composting and anaerobic digestion.

Model Image 3



Take-make-dispose model, can be also referred to as the linear economy model, (Lewis, 2022) an old method for resource consumption and production in the economic system. As the resource is extracted from nature, the company designs and processes the needed product. After use consumers discard it as waste. This method does not take into account the long-term impact on the environment. The linear model is unidirectional and accumulates heaps of waste all including metals, plastic, and chemicals. The linear model lacks concerns about the environment.

2.1Carbon Neutrality

(Garima Vats, 2022) have discussed due to heavy freight charges would make decarbonization of the Indian power sector by 2050 a challenge. Residual emissions require carbon sequestration options, that include nature-based solutions as well as technology. To reduce temperature below 2 ^{o} C, India needs to find a path unlike others as well to contain budgets for a sustainable development path. (Saritha S Vishwanathan, 2018) the study has discussed the various opportunities and challenges, and authors have projected endemic transformations, to achieve emissions reduction, and to manage high economic growth. (Gabrial Anandarajah, 2014) their study reveals renewable energy plays a significant role in decarbonizing the Indian economy,

especially the power sector. A greater role for biomass, solar, and wind energy can be deployed through carbon capture storage as well as through appropriate technology. (Palaniappa Krishnan, 2022) have recorded and discussed in their document note, that both the countries India and USA, fill upearly achievements of net zero emissions. Tools have been suggested to achieve a command-based and market-based approach have been decided. Through these tools and approaches, both countries want to achieve equity, efficiency, liberty, and sustainability. (Lin Chen, 2022) have proposed that the best strategy is to move from fossil fuel to renewable, develop low-carbon technology, change dietary habits, and change the value of food and agriculture waste.to develop resilient buildings and cities, decentralized energy systems, and electrification of the transport sector.

2.2Carbon footprint

(Divya Pandey · Madhoolika Agrawal, 2011; Gabrial Anandarajah, 2014) their study concern is to voice on development of standard footprint calculation. Have mentioned that there is no compulsory footprint verification. Carbon footprint is a tool to guide emission cuts and verification. With high intercountry interaction, studies have raised that standardization is the need of the hour. (Tao Gao, 2014)have conducted a study on the assessment standards, their differences, similarities, and deficiencies. Have found that with commercialization of carbon footprint, has made business organizations count down on emissions, to reduce waste, encourage opportunities to improve productive efficiency, promote corporate social responsibility, and achieve sustainability. Have suggested that global cross-border assessments on the standardization of carbon leakages and tax adjustments need to be addressed within the global scope. (Yahaya Hassan Labaran, 2022)has done a thorough analysis of greenhouse emissions from industry, a green building concept a thorough review examined has found that there is inadequate research on interconnectedness. That is the relationship between different drivers that links to low carbon construction and identification of parameters to measure carbon footprint by the international rating system. (Elfriede Penz, 2018) has found ecological sustainability

2.3Circular economy

(Hemant Bherwani, 2022)integrated Resolve strategy framework has focused on reducing carbon footprint and material footprint. The study has predicted to influence policymakers to achieve and practice sustainable development. Policy involvement to solve capital decrease and environment deprivation challenges to produce Gross domestic product. (Poonam Kumari, 2020) study has asserted that the reduction of carbon footprint can enhance financial performance. Policymakers need to standardize carbon emissions and control them to reduce them both in direct as well indirect ways. The study further suggests that technology adoption could lead to an expensive side, instead adoption of green technology with effective cost efficiency would be advised. (A K Kurchania, 2014) have discussed business development and corporate social responsibility. Renewable energy system in urban peri-urban areas. This could be well maintained by residents with appropriate training given. Authors are of the view that businesses will make positive changes to improve the socio-economic lot of the less empowered. Increasing the use of renewable energy sources and conservation would make a sustainable energy supply. (Chakraborty, 2021) has conducted a study on carbon footprint estimation using a life cycle analysis approach. Study analysis reveals that the burning of coal occupies the lion's share in the total carbon footprint of the plant. Studies have recommended green alternatives to achieve sustainability. (Morseletto, 2020) study proposes actions and policy execution based on the

author's investigation of circular economy targets. The study demarcates that recovery and recycling may not promote a circular model, but rather insists on circular strategies. The author emphasizes that new and current targets could reduce waste, increase efficiency, close production loops, and maximize the retention of the economic value of materials and products. (Maria Barreiro Gen, 2020) has analyzed the implementation of the 4Rs in organizations with the help of a survey. The study highlights and reveals that organizations have a low level of use of 4R, more of reduce and recycle but repair and remanufacture is of less use. Results reveal that the practice of circular economy principles is not fully utilized, where there is a gap between practices and implementation.(Haigh, 2022)Preventing and reducing resource use and reusing materials in a global circular economy are key strategies to protect the Earth's environment, as well as its capacity to provide for current and future generations. A variety of metrics are needed to understand progress alongside valuable data, analysis, guidance, and examples. The Circularity Gap Report has provided insights on these topics over the past five years, and it continues to inform progress and the action required to accelerate the circular transition.

3. Methodology Study has referred to multiple sources. Data references were taken from Global Statista and Indstatista. Raw data were categorized and analyzed applying CAGR, graphical presentation were used to capture an immediate birds-eye view. Various models were re-designed based on an original reference made. Statistical tools like percentages and regression to test the relationship between the quantum of emissions and cumulative growth of sectors wereanalyzed.

4. Data Analysis This section will discuss the data analysis based on the framed objectives and supposition underlined. Firstly, global-level emissions are analyzed based on metric tonnes. Secondly, from the nation's perspective emissions are dissected. Over the years sector emissions have been studied to understand the correlation with industry as well increase in emissions. Further study has looked upon the need for extraction and exploitation of resources that leak CO2 emissions. The details have been analyzed in the way emissions are embodied while taking, resource process, producing, and providing. Subsequent sections from 4.6 onwards explain the measures taken to combat emissions, in the last section details of government efforts based on budget allocation and scheme relevance are looked upon.

Table 4.1. Largest contributors to Greenhouse gas emissions worldwide in 2022,by country (in billion metric tonnes)

Country	Emission in CtCO2e
China	15.7
USA	6
India	3.9
EU-27	3.6
Russia	2.6
Brazil	1.3
Indonesia	1.2
Japan	1.2
Iran	1
Mexico	0.8

Source: Statista World

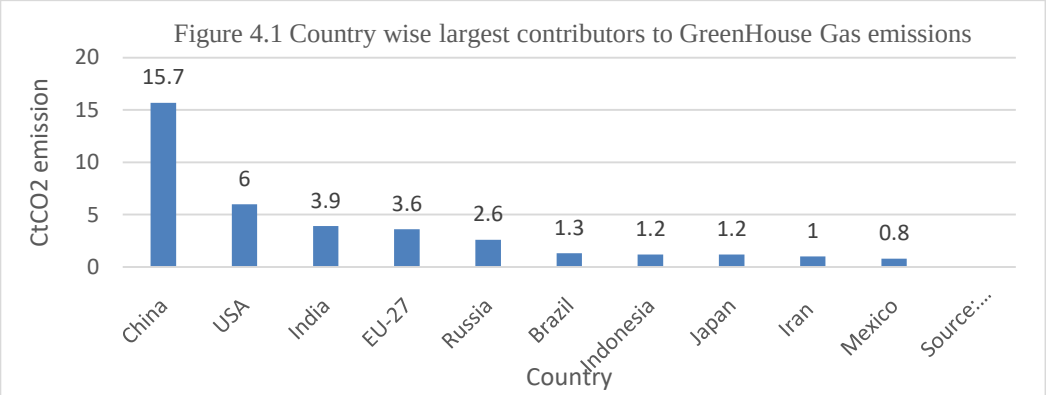
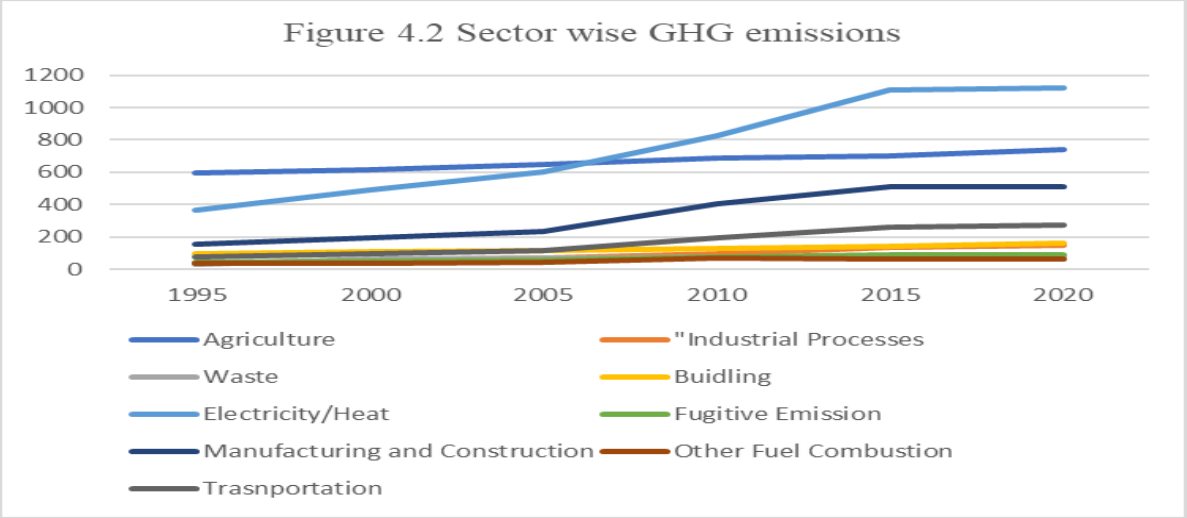


Table 4.1 discusses country-wide impacts due to emissions in million metric tons. India Stands in the third position, while China is impacted with 15.7 billion tons. The reason is due to heavy reliance on coal, coal-fired power stations, coal mining, and blast furnaces producing iron and steel. Other causes for the rise due to increased population, advanced industrial development, urbanization enormous power expansion, and electronics product manufacturing. The same is the situation with the USA, due to the increased use of GHG emissions and the rise in transportation. In India, due to the rise in CO2 are coal, oil, natural gas, and cement. While rest of the regions for low emissions are with the use of renewable and nuclear power energy.

Table 4.2 Green House emissions in India between 1990 and 2020 by sector

Sector	1995	2000	2005	2010	2015	2020
Agriculture	599.03	617.43	647.21	690.93	703.94	741.92
Industrial Processes	37.39	57.48	71.39	100.08	135.89	149.37
Waste	32.9	61.62	67.98	74.34	79.89	85.35
Building	99.4	107.85	115.92	130.48	145.92	162.49
Electricity/Heat	366.55	493.44	602.88	823.81	1108.95	1121.98
Fugitive emissions	48.01	50.32	58.64	78.63	90.21	88.99
Manufacturing/Construction	159.05	195.1	236.27	403.34	509.88	509.45
Other Fuel Combustion	39.54	38.9	47.94	69.6	64.98	64.83
Transportation	80.3	97.52	118.48	197.84	264.4	276.44

Source: Statista World



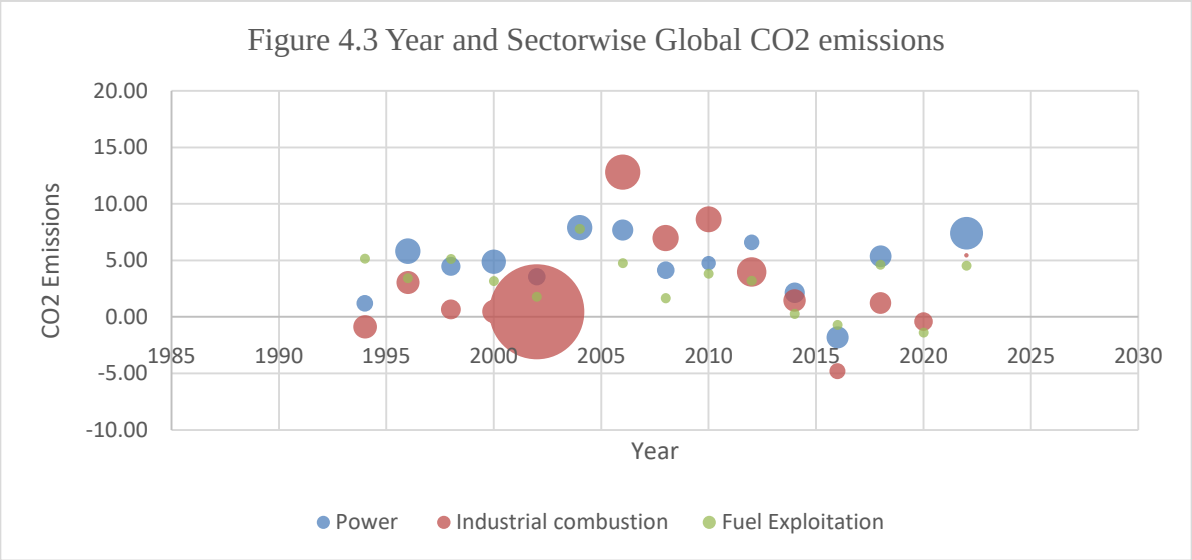
Source: Statista World

Table 4.2 narrates the trend of CHG emissions from the chosen nine sectors. Among all the highest contributors is electricity/heat, while agriculture is the second highest. The sequence of five years of data reveals, that there are mitigation measures adopted for waste, while those fugitive emissions are mostly from factory operations due to gases and vapors that affect the environment in climate changes as well as pollution. Manufacturing and construction are also on the rise, due to an increase in urbanization and city development with high-rise buildings. Industrial processes cause anthropogenic activities, where human involvement affects the environment, like energy combustion of fuels in electric utility and transportation sectors, as well as treatment plants with land use change activities. Buildings cause natural carbon due to the purchase of electricity, and direct consumption of natural gas, and petroleum for heating and cooking.

Table 4.3 Sector-wise global emissions

Year	Power	Transportation	Industrial combustion	Industrial processes	Fuel Exploitation
1994	1.20	2.81	-0.89	5.56	5.16
1996	5.82	6.50	3.04	5.35	3.44
1998	4.47	3.68	0.66	3.89	5.13
2000	4.87	5.90	0.47	5.46	3.17
2002	3.54	3.04	0.44	90.61	1.80
2004	7.89	6.40	13.69	-793.94	7.79
2006	7.68	4.39	12.79	12.48	4.77
2008	4.13	3.07	6.98	6.90	1.67
2010	4.75	2.11	8.63	6.82	3.82
2012	6.58	2.46	3.97	8.69	3.22
2014	2.14	4.13	1.45	5.01	0.28
2016	-1.82	4.85	-4.80	2.55	-0.70
2018	5.36	4.75	1.22	4.70	4.62
2020	-4.56	-16.49	-0.42	3.49	-1.37
2022	7.40	10.88	5.45	0.20	4.53

Source: Statista World



Source: Statista World

Table 4.3 explains sectors-wise global emissions, while power and industrial combustion have been higher in 2000-05,subsequently, mitigation measures have been taken. Active initiatives have been adopted at the global level by organizations, with standardization and adoption. Transportation and industrial processes, industries have already complied with norms and rewards, to ensure policy mandate as well as effective in their developed and mandate structure implementation. Fossil fuel exploitation is on the rise due to man-made human activities, as well as due to burning heavy fossil fuel, deforestation, biomass burning, and heavy combustion release.

Table 4.4 Extraction and Exploitation of Resources Based on Social Needs

Social Needs	GT	End of use	
Mobility	17.1		
Housing	13.5		
Communication	3.5	42.8	CO2
Health care	3		
Services	6.4	11.2	CH4
Consumables	5.6	3.5	N2O
Nutrition	10	1.8	F cases

Source: Statista World

Table 4.4 reflects the social needs and extraction of resources. This exploitation and extraction is based on the take, resources, based on process, produce, and provide. Much of the resources are taken based on the total emissions embodied in each group. The following table will further substantiate the extent of total emissions from natural resource extraction that causes emissions.

Table 4.5 Total Emissions embodied in each group- 59.1Gt				
Take	Resources	Process	Produce	Provide
Petroleum	Fossil Fuels-38.4	Energy use in transport	Transport, fuel production, Transport fuels, vehicles	passenger transport, freight transport
Extraction, Natural Gas	Minerals-1.6	Energy use in buildings	energy use in residential	energy use in residential, energy use in non-residential, material use to residential, material use in non-residential
Coal, sand & clay, stone, metal, wood, animals	Ores-1.2	Energy use in industry and food, cement, iron, steel and non-ferrous metals, chemicals, rubber, plastics, mineral use in buildings, wood products, food products	energy use in non-residential	
Mineral, ores, Forestry	Biomass-16	Material used in buildings, metal ores	construction materials, electronics, machinery, and equipment	

Source: Statista World

Table 4.5 is connected to Table 4.4, which explains the need for analysis and emissions that are caused during the extraction and exploitation of resources. Social needs are growing in day-to-day demands. Table briefs on the total emissions under each group under petroleum, extraction of Natural Gas, Coal, sand & clay, stone, metal, wood, animals, mineral ores, and forestry. The framework of Take-Resource-Process-Produce-Provide, explains highest emissions are caused due to oil, and biomass, next is ores and minerals. The purpose of recurring use narrates the higher need and provision for utilization.

Table 4.6 Cumulative Carbon emissions in India from 1971-2021(in million metric tons)	
1971	4564.7
1981	7076.7
1991	11.62
2001	1913.1
2011	33447
2021	57104.7

Table 4.6 briefs on India's carbon emissions needs actions and policy initiatives is the need of the hour. Numerical metric emissions have thickened the surface. During pre-expansion, CO2 was 155%,while post-open system, carbon emissions have further risen to 170%. This needs attention and initiative from policy to become a mandate. Companies prioritize based on overall policy and commit to zero emissions. Recent actions based on data reveal the initiatives undertaken by the government. From the following table, CO2 can be viewed, from two angles.

Table 4.7 CO2 emission in million tonnes

Year	Baseline emission	Post-implementation of CO2
2019-20	23	23
2021-22	25	24
2022-23	25	24
2023-24	26	21
2024-25	30	19
2025-26	36	14
2026-27	42	11
2027-28	49	11
2028-29	55	6
2029-30	60	6

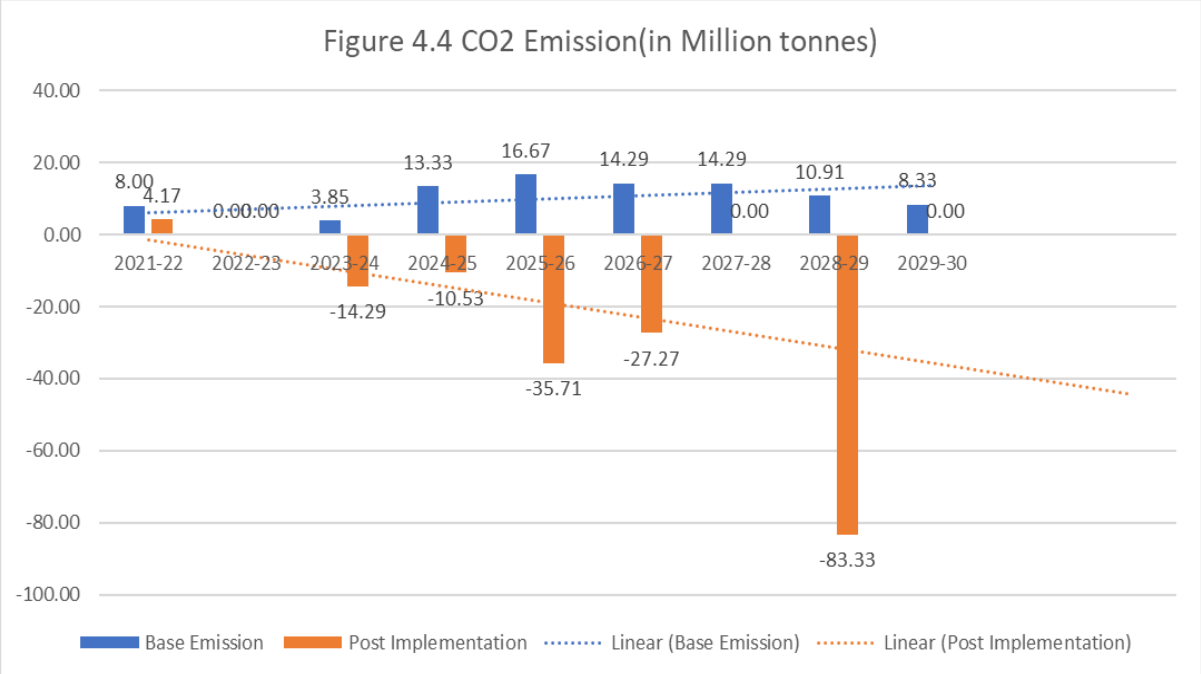


Table 4.7 explains before strategy and policy frame, it is essential to know the past emissions due to GHG. Baseline emissions in India occurred in the past, as of 2021-22 percentage rise is almost 8%, and planned to reduce to zero CO2. Effective strategies become essential to combat the environmental problem. Appropriate mitigation measures taken can reduce CO2, however

alarming baseline emissions between 2025 and 2029 reflect that initiatives taken to control still need substantial effort. Post-control of CO2 compared to baseline illustration reveals a discrepancy in size, however, mitigation efforts have to continue concomitantly. India's efforts to combat emissions could be possible with active citizens-industry participation as well as stringent policy measures.

Year	Table 4.8 Material extraction (in billion tonnes in Gt)
1972	28.6
2000	54.9
2016	89.9
2021	101.4
2050	170

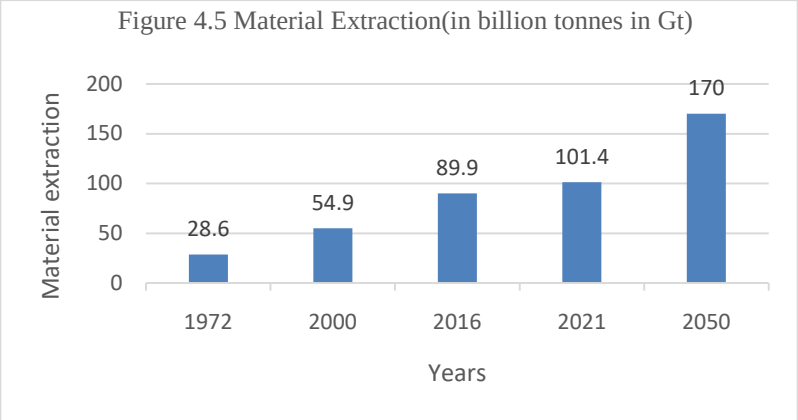
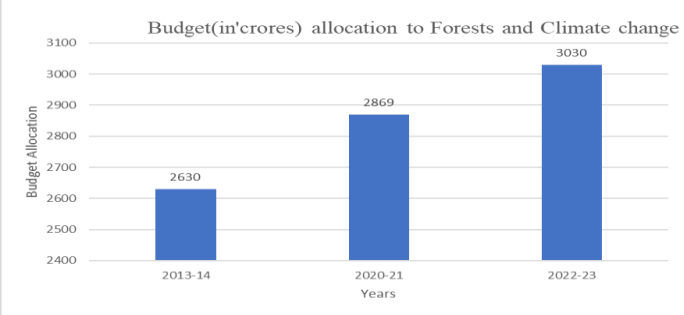


Figure 4.5 Material Extraction(in billion tonnes in Gt)

Source: India Budget Series, Research unit 2022-23

Table 4.8 explains over the years material extraction in billion tonnes. This could be a concern and an appropriate model adapted during policy structures and development could align 2030 commitment. The higher the extraction lower the need for the waste,these reverse thoughts,with focused financial plans can be one of the ways to combat the emissions. Through the 3Rs as well protective measures need to be made during the annual business plan. This could facilitate to meet the zero target by 2030.

Table 4.9 Ministry of Environment, Forests, and Climate Change	
Year	Budget(₹.crores)
2013-14	2630
2020-21	2869
2022-23	3030



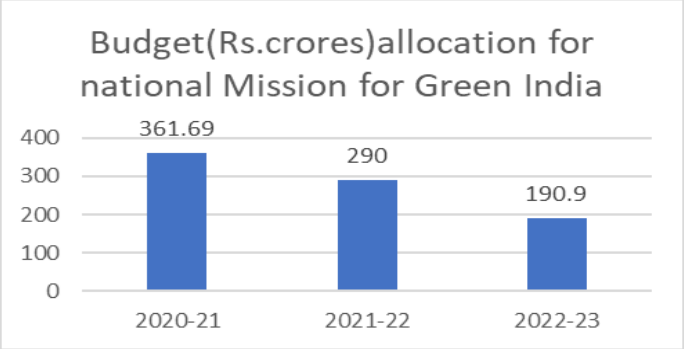
Source: India Budget Series, Research unit 2022-23

Table 4.9 briefs India’s breakthrough of net-zero commitment by 2070, is to enable through five new climate change targets announced by the Prime Minister of India, Mr. Narendra Modi. In the discussion consensus taken is that removing as many emissions of carbon dioxide from the environment as is emitted. India's four other commitments are by 2030, increasing non-fossil energy capacity to 500 gigawatts. Meeting 50% of energy needs from renewable sources. Reducing the carbon intensity of an economy by 45% and reducing total projected carbon emissions by One billion tonnes. Efforts here the Indian government has taken are based on India being the tenth largest country by forest area in the world, and gaining third rank globally, in average net gain in forest area between 2010-2020. India's forest with 7,13,789 sq km in 2021 an

increase of 3.14% over 2011. Improvement in forest canopy density would improve conservation measures, afforestation measures, and protection activities. The budgetary allocation has a gap of 6 years.

Table 4.10 Budgetary Allocation for National Mission for Green India

Year	Budget(Rs. Crores)
2020-21	361.69
2021-22	290
2022-23	190.9



Source: India Budget Series, Research unit 2022-23

Table 4.10 explains the budgetary allocation for the National Mission for Green India. Over the years there has been a rise in allocation at a decreasing rate. The main objective is to protect, enhance, and restore India's falling foreign coverage. This mission under the umbrella of the national action plan on climate change has been launched to reduce the deleterious effect of climate change.

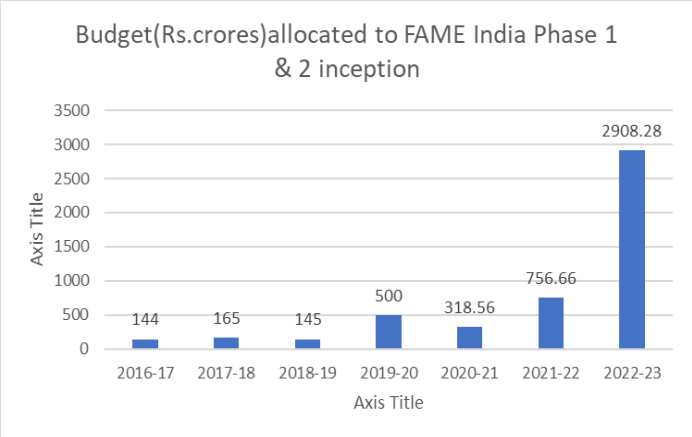


Table 4.11 Funds allocated to FAME India in Phase 1 & 2 inception

Year	Budget(Rs.crores)
2016-17	144
2017-18	165
2018-19	145
2019-20	500
2020-21	318.56
2021-22	756.66
2022-23	2908.28

Source: India Budget Series, Research unit 2022-23

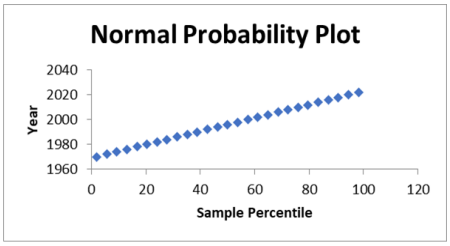
Table 4.11 explains the budgetary allocation for Faster adoption and manufacturing of hybrid and electric vehicles in India. To propel green India production link incentives for manufacturing high-efficiency modules prioritizing a shift from polysilicon to solar modules. Energy efficiency and saving for large commercial buildings through energy service company models and energy audits have been promoted. A sovereign green bond has been initiated to enhance government market borrowings. This would increase the potential and mobilization of resources.

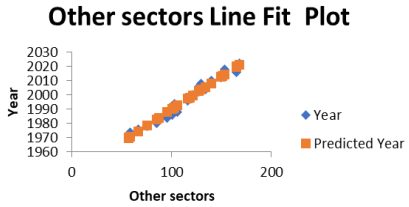
4.2 Analysis of Significance Relationship

Regression Statistics	
Multiple R	0.98762
R Square	0.975392
Adjusted R Square	0.974408
Standard Error	2.539517
Observations	27

ANOVA

	df	SS	MS	F	Significance F
Regression	1	6390.771	6390.771	990.9487	1.23591E-21
Residual	25	161.2286	6.449145		
Total	26	6552			





The study has examined the sectoral emissions by applying statistical techniques based on regression. The influence of sectors listed in the study emphasizes that there is a 0.98 level of dependence year-wise and an R2 0.97 percentage of relationship that influences explanatory variables like usage, extraction, and exploitation of resources for various needs and purposes. The normality plot and scatter plot reveal that emissions based on year are exponential and there is linear growth in the sector-wise carbon emissions.

5 Organization's compliance and commitments towards zero carbon footprint.

Dalmia is the early cement company in the world to commit to a net zero and carbon-negative roadmap in 2018, Dalmia Bharat has boarded an innovative decarbonization growth curve. The firm has applied the circular economy model as a pedal to solve their product value. Delmia Bharat has already planned and able to avoid 8.6 million tonnes of carbon dioxide (CO2) emissions annually and desires to bring down CO2 emissions further to 15 million tonnes per annum by the financial year 2027. Their commitment goes beyond the conservative "take, make, dispose" approach. It has instead, included a sustainable model that comprises recycling and reusing materials and energy resources within its production cycle. Substitutes for raw materials and fuels and waste heat are the three prongs of the company's circular economy model. Dalmia Cement has been able to achieve lower carbon emissions per unit of cement produced, which is a significant contribution to combatting climate change.

Mahindra Arise's action against carbon footprint has committed to carbon neutral by 2040, through energy efficiency and technology solutions. Mahindra Group continues to move towards a low carbon economy and is poised to deliver on its goals and targets that will help in achieving the landmark Paris Agreement. Key initiatives undertaken by Mahindra are ep100, carbon neutrality, and carbon pricing. Mahindra & Mahindra became the first Indian company to sign the EP100 program - a commitment to double the energy productivity by 2030, on a baseline of 2005 - and hope to make a strong contribution towards achieving the climate goals agreed upon at COP21. Mahindra has saved 58 million kWh of energy from more than 700 energy efficiency

projects implemented in the past five years and Mahindra's carbon pricing leadership story was featured in the World Bank report.

6. Policy Initiatives taken for Indian attention

India's commitment by 2030 are

- Increasing non-fossil energy capacity to 500 Gigawatts (GWs),
- Fulfilling 50 percent of energy requirements from renewable sources,
- Reducing the carbon intensity of an economy by 45 percent, and
- Reducing total projected carbon emissions by One billion tonnes.

Environment sustainability can be achieved only through climatic change and India's energy requirement doubles in the next 20 years. In the focus of global brainstorming on climate change, on behalf of India, the Prime Minister presented the five nectar elements, Panchamrits, to deal with this challenge. One of them is for India to reach its non-fossil energy capacity of 500 GW by 2030. Secondly, India is to meet 50 percent of its energy requirements from renewable energy by 2030. Thirdly, India is to reduce the total projected carbon emissions by one billion tonnes from now onwards till 2030. Fourthly by 2030, India to reduce the carbon intensity of its economy by less than 45 percent. Lastly, by the year 2070, India will achieve the target of Net Zero. These panchamrits will be an unprecedented contribution of India to climate action. He also added that the Indian railway system has set itself a target of making itself 'Net Zero' by 2030. This initiative alone will lead to a reduction of 60 million tonnes of emissions annually. A massive LED bulb campaign is reducing emissions by 40 million tonnes annually.

India has a revolutionary step in solar power, and the country has initiated the International Solar Alliance. This is a sensitive and vital initiative to save crores of lives. During the COP26 Summit in 2021, India's PM proposed the One Word movement, which is the need of the hour, for all citizens to come together, with collective participation, to take Lifestyle For Environment (LIFE) forward as a campaign. This campaign is to become a mass movement in the country, to be mindful and deliberate mobilization, instead of mindless and destructive consumption. A significant image of the Government of India's strong commitment towards sustainable development is no single ministry is responsible for moving India towards net zero, the Environment, Forest and Climate Change (MoEFCC), Ministry of New and Renewable Energy (MNRE), and Ministry of Heavy Industries (which implements the Faster Adoption and Manufacturing of Hybrid & Electric Vehicles in India (FAME INDIA) scheme to promote electric vehicles), have largely been the driving force behind India's effort in this direction

7. Findings and discussion indicate there is a correlation between growth in GHG emissions with industrial progress. Efforts being taken by Indian organizations are commendable, as the national policy pressures on the environment concern as well global participation in congress parties. India has certainly put their effort into making it conducive, to ensure that environmental degradation is taken care of. Sector-wise concentration on sustainable issues has been executed to ensure zero emissions by 2030-70.

8. CONCLUSION

The study concludes that Indian government initiatives to combat CO2 emissions are of recent attempt. Every budget emphasizes the mitigation measures, that are discussed in budget allocation and schemes in action. Observation goes a long way to examine whether India's efforts to mitigate harmful emissions by 2030-70. Figure 4.4 explains the policy effort put from base emission to post-linear implementation in zero-emission as a long-term goal.

9. Practical/ Research/Industrial Implications: Industrial undertakings have involved themselves with policy changes. Business organizations have embedded in their organization goals, policy development, and strategy to combat and adapt to sustainable measures. The circular system and circular economy have given clarity to move towards a green industrialization nation. Indian businesses could come up with a standardized proposal that carbon footprint can be mitigated.

10. **Limitations:** The study was undertaken based on secondary data. First-hand opinions from industrial undertaking could differ in their opinion and tasks involved. Business efforts in experiencing various hurdles while implementing the circular economy model. Details relating to costs, and department policy could be biased. While other functional operations would be a difficult task and a challenge. These could be some of the constraints that the study might not reflect the realistic facts.

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