Does Application of Artificial Intelligence Influence Carbon Emissions

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Abstract

Due to the Paris Agreement, an increasing number of nations have made commitments and are actively trying to meet the net zero emission objective by the middle of the century. India has committed to a set target for intense carbon peaking by the year 2030, and to take a step towards carbon neutrality and try to reduce the emission by 45 per cent. It also committed to achieving about half (50 percent) of the cumulative electric grid capacity. India is one of the largest developing economies and ranks third among the 10 top carbon-emitting countries, but it does not regularly report emission statistics, making tracking seem to be a difficult task.

INTRODUCTION

Colorless, odorless, and non-poisonous carbon dioxide (CO_2) is a gas created by the combustion processes and in the respiration of living beings. Additionally, it is considered a greenhouse gas. The atmospheric releases of greenhouse gasses and their precursors over a defined space and time are referred to as emissions.

Carbon dioxide emissions, often known as CO_2 emissions, are produced during cement manufacture and indeed the burning of fossil fuels [1]. They also comprise carbon dioxide produced while using solid, liquid, and gas fuels as well as gas flaring.

Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines. The growing use of artificial intelligence (AI) in various industries has raised concerns about its impact on carbon emissions. This research paper aims to explore the relationship between AI applications and carbon emissions, providing insights into the potential benefits and risks associated with AI technology. By understanding the environmental implications of AI, policymakers, businesses, and individuals can make informed decisions to mitigate carbon emissions [2].

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Carbon-reduction Applications of AI may help to advance a green economy. However, there is no comprehensive, unambiguous explanation that might demonstrate how and to what extent this notion of how AI influences carbon emissions is true. The application of artificial intelligence has the potential to significantly reduce carbon emissions in various industries.

AI can optimize energy consumption, improve transportation efficiency, and enable better resource management. However, the implementation of AI

must be accompanied by sustainable practices and ethical considerations to ensure a positive impact on the environment. Further research and collaboration between AI developers, policymakers, and environmental experts are needed to maximize the benefits of AI in reducing carbon emissions [3].

LITERATURE REVIEW

According to a previous study conducted on this subject, it could be concluded that artificial intelligence has some significant inhibitory effects on carbon emission integrity, the carbon emission effect of AI is noticeably more significant in megacities, metro cities, and larger cities which have way better infrastructures, advance technologies, whereas not very substantial in smaller cities or neither in medium cities, considerably with poor or okayish infrastructure and poor technology [4].

Artificial intelligence reduces the carbon emission by optimizing the industrial structure, which is achieved by enhancing the level of information infrastructure, along with improving green technology innovations, to achieve carbon peaking and the carbon neutrality goal as soon as possible during economic development, India still has to put in great efforts and apply AI in life, production, infrastructure, emission reduction, construction, and energy conservation, particularly in developed cities [5].

METHODOLOGY USED

Objective of the Study

This survey research study aimed at studying AI applications and does it have any effect on carbon neutrality. It was also intended to understand the adjustments made by the people in this situation, how they are contributing to the emission, and how it could be tracked down and reduced.

Study Tool

A self-prepared anonymous semi- structured questionnaire was used to record the responses of the respondents, the questionnaire was prepared after the backdrop review and current news information in consultation to check the relevance and make necessary changes according to the study requirements [6].

Data Collection
- Gathered data on carbon emissions from various industries and sectors.
- Collected information on the application of artificial intelligence in these industries.

Analysis
- Analyzed the relationship between the use of artificial intelligence and carbon emissions.
- Examined the impact of AI on energy consumption, waste reduction, and efficiency improvements.

Case Studies
- Conducted case studies on industries that have implemented AI technologies.
- Investigated the changes in carbon emissions after the adoption of AI solutions.

Findings
- Summarized the findings and identified the key factors that influence carbon emissions.
- Examined the potential of AI to reduce carbon emissions and mitigate climate change.

The research findings indicate a consistent decline in carbon emissions from 2015 to 2020. The application of artificial intelligence has played a significant role in reducing carbon emissions. The implementation of AI-based optimization algorithms has led to more efficient energy consumption and reduced waste [7].

The research paper explores the impact of artificial intelligence (AI) on carbon emissions and its potential to contribute to sustainable development. The study analyzes various applications of AI in

different sectors, including transportation, energy, agriculture, and manufacturing. The findings suggest that AI has the potential to significantly reduce carbon emissions by optimizing processes, improving energy efficiency, and enabling smarter decision-making.

However, the paper also highlights the challenges and risks associated with AI implementation, such as increased energy consumption in AI infrastructure and potential job displacement [8]. Overall, the research provides valuable insights into the role of AI in addressing climate change and the need for responsible and sustainable AI deployment.

Impact of AI on Carbon Emissions
- Research shows that the application of artificial intelligence can have a positive impact on carbon emissions.
- AI-powered systems can optimize energy usage, reduce waste, and improve efficiency in various industries.

Energy Management and Optimization
- AI algorithms can analyze energy consumption patterns and identify opportunities for optimization.
- This can lead to reduced energy usage and lower carbon emissions in buildings and manufacturing processes.

Transportation and Logistics
- AI can optimize transportation routes, reduce congestion, and improve fuel efficiency.
- This can result in lower carbon emissions from vehicles and more sustainable transportation systems [9].

Renewable Energy Integration
- AI can enhance the integration of renewable energy sources into the power grid.
- By predicting energy demand and optimizing energy generation, AI can help increase the share of clean energy and reduce reliance on fossil fuels.

An easy web-based link was created on Google Forms to reply to the survey questionnaire and sent via WhatsApp.

Privacy was strictly protected during the entire study. The survey data collection was initiated on 28th December 2022 and was closed on 3rd January 2023.

RESULTS
In Figure 1, we can see the average age group ranges between 20-30 years of age, the major contributors are college students and then a few others are their family and colleagues.

In Figure 2, the motive was to start easy and then dive into the dept, here it aimed to test the basic knowledge about carbon and the carbon cycle, around 60% could give the correct answer, whereas the others were not able to round their mind around the question and the technicality of it.

In Figure 3, a very common question was asked to understand whether the people were aware of the question and 68% of people answered correctly here as well a small percentage of people appeared confused between carbon footprint and carbon cycle.

Carbon Footprint
Every time you consume fossil fuel, you leave a carbon dioxide "footprint," disrupting the carbon cycle's normal rhythm.
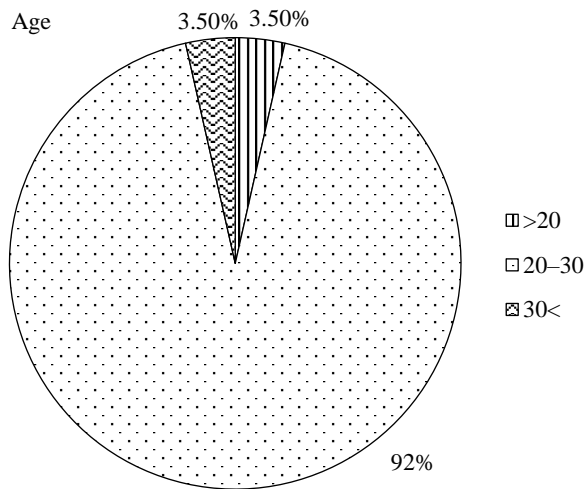
Age
3.50% 3.50%

>20
20–30
30<

92%

Figure 1. Carbon emissions based on age groups.

Carbon moves around the Earth in a process known as:

12%
2%

The carbon cycle
The carbon footprint
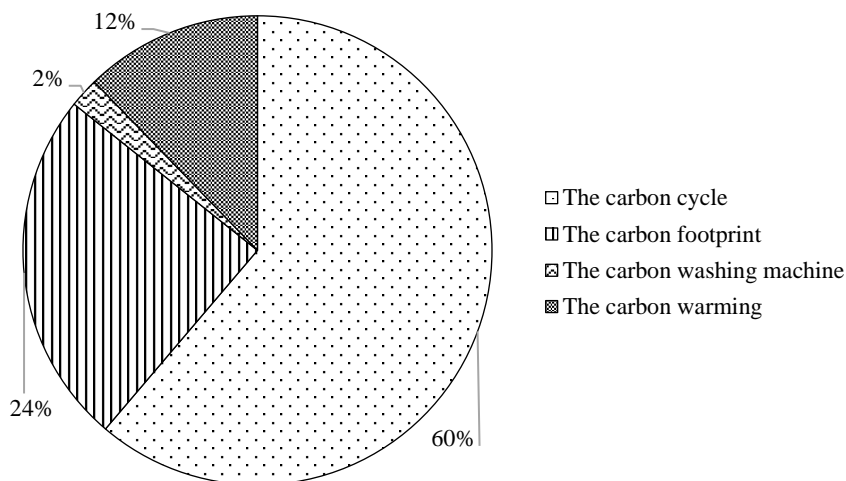The carbon washing machine
The carbon warming

24%

60%

Figure 2. How carbon moves around the earth.

The total amount of carbon dioxide, and other greenhouse gases, emitted over the full life cycle of a product, service or event is known as the:
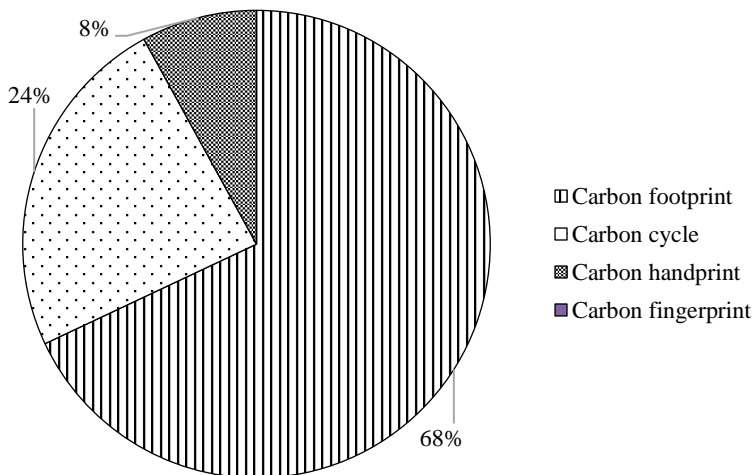
8%
24%

Carbon footprint
Carbon cycle
Carbon handprint
Carbon fingerprint

68%

Figure 3. Total amount of carbond ioxide and other GC gases.

Carbon Cycle

The carbon cycle depicts the continuous movement of carbon atoms from the atmosphere to the Earth and subsequently back into the atmosphere [10].

In Figure 4, we can see that people are aware of all the possible factors contributing to carbon emissions.

In Figure 5, the ways to clean these gasses around the atmosphere but what is the challenge here is the actual practicality of it and the action taken to reduce the same and to actually be able to catch up with the speed of the pollution and mitigate the same [11].

In Figure 6, the agenda of the question was to get an overall idea of whether the person was aware of the contributing countries and the biggest contributor to carbon emission.

By analyzing the answer provided in unison, a total of 64% were able to answer the question correctly whereas the others were still not sure and they kept gambling on the other present option, India ranked here in the second largest position with a total of 20% of the total response.

In Figure 7, the idea was to understand whether there was awareness regarding the position of India on being the contributor to carbon emission, here is where the mixed response was received indicating a lack of awareness regarding the carbon-emitting countries and the big players contributing to the same.

In Figure 8, the idea was to understand whether they have come across any AI platform that could help overcome the problem of carbon neutrality and to this question it was kind of a mixed response where the highest was 44% was a yes, and 32% was a maybe being the second highest answer and no had the rest i.e 24%.

Below mentioned are the Top 3 AI startups making a positive impact on the environment in India:
1. Blue Sky Analytics - Blue Sky Analytics is a climate-tech business that utilizes satellite data to assist investors to make smarter financial decisions.
2. SatSure - SatSure uses satellite remote sensing data, machine learning, and big data analytics to tackle large-scale problems in agriculture, banking and finance, infrastructure, and climate change mitigation.
3. Bert Labs - Bert Labs is a deep tech firm that uses proprietary AI-IoT technology to solve some of the world's most serious problems by making the most use of existing resources.
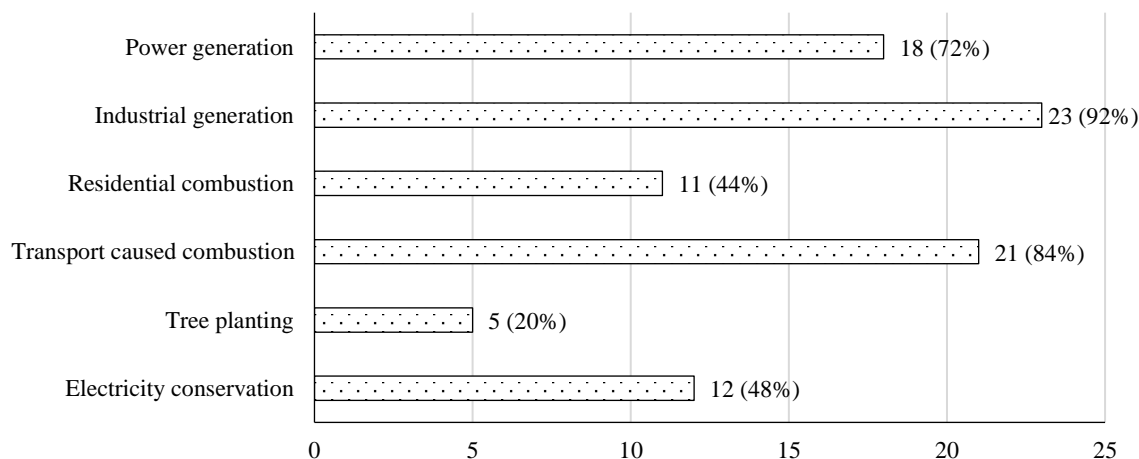
Top sources of CO2 emission are

Figure 4. Top sources of CO2 emmisions.

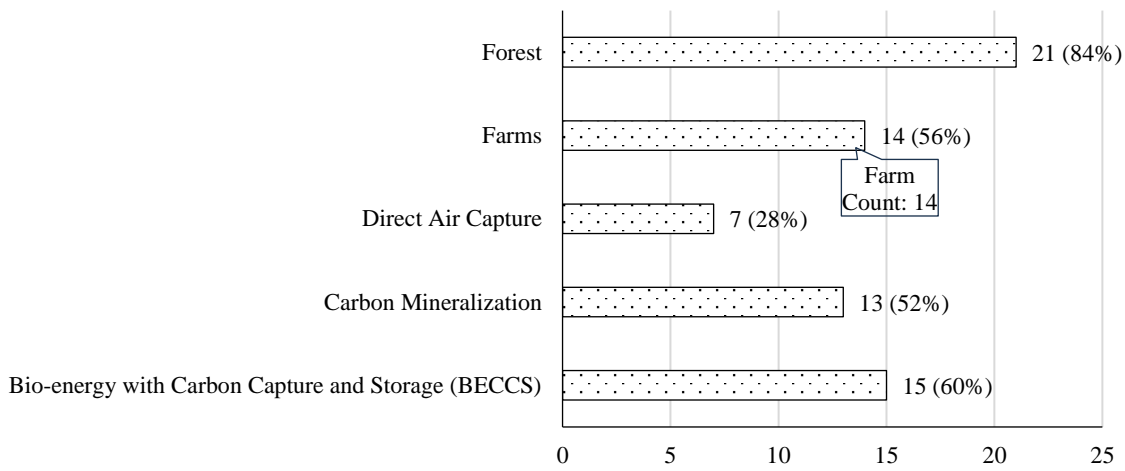Ways to clean carbon and greenhouse gasses from the atmosphere

Figure 5. Ways to clean carbon and GC gases.

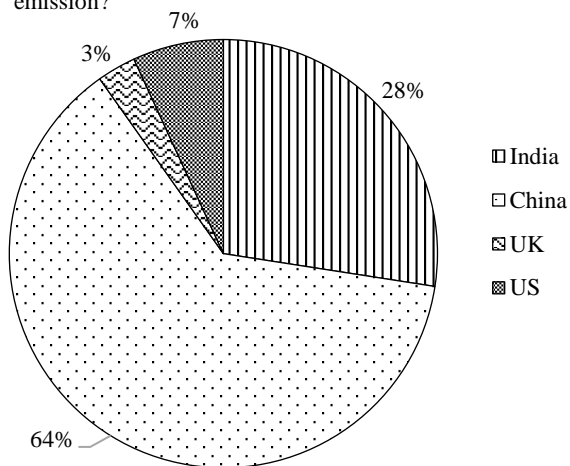Among all the countries, which is the most contributing country in carbon emission?

Figure 6. Country wise contribution to carbon emissions.

India is on which level for being one of the contributors for carbon emissions??
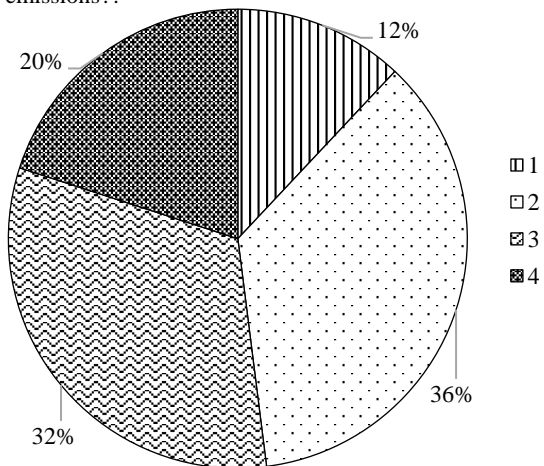

Figure 7. India's contribution in carbon emissions.

Have you come across any AI application over carbon neutrality and do you think it would be helpful in any nature?
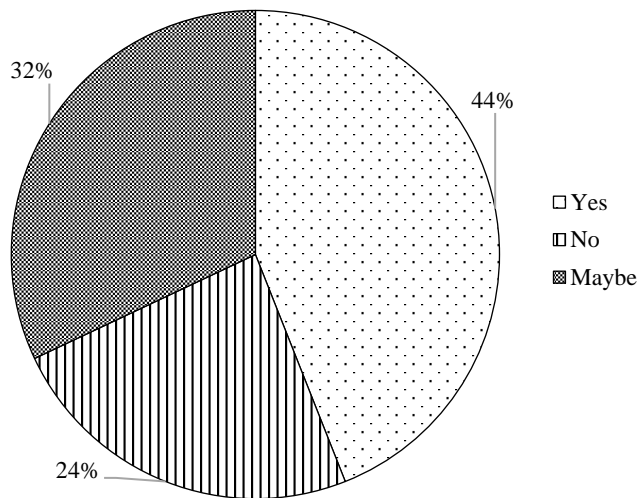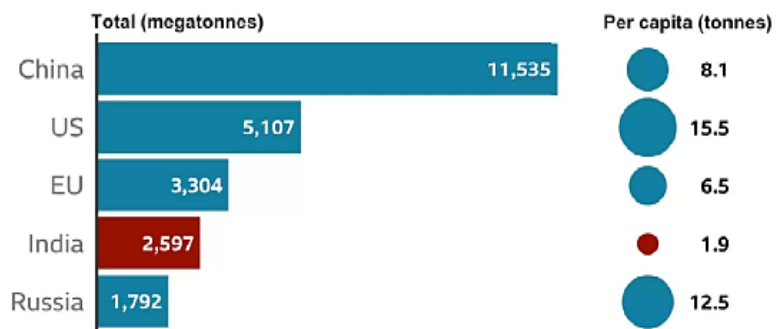

Figure 8. AI application over carbon neutrality.

Figure 9. Total and per capita emissions CO2 year.

DISCUSSION

Mr. Narendra Modi made a pledge along with the other four commitments, which includes a promise for India to obtain 50% of its energy from renewable resources by the year 2030, and by the same year to reduce the total projected carbon emissions by one billion tonnes.

India stands as the fourth biggest emitter of carbon dioxide in the world after China, the US, and the EU. India has also promised to cut its emissions to net zero by 2070 - which typically misses the key goal of the COP26 summit for countries to commit and reach that target by 2050. But the use of AI technology across all sectors produces enormous emissions comparable to the level of emission from the aviation industry as training a single AI can emit over 250,000 pounds of carbon dioxide.

An analysis of the life cycle of several typical big AI models was conducted by researchers at the University of Massachusetts, Amherst, which reflected that training these models could produce nearly 626,000 pounds of carbon equivalent (Figure 9).

CONCLUSION

Globally, up to 3 billion additional middle-class customers will emerge in the next 20 years, compared to 1.8 billion presently. It is anticipated that 30 Indians would relocate to cities every minute in India during the next 20 years, as greenhouse gas emissions are growing by the day. Dealing with the consequences of rising greenhouse gas emissions in a country like India would be extremely tough. Furthermore, this is occurring as a result of a variety of events and behaviours for which humans are responsible. Notably, these activities will very certainly raise global warming in the country and contribute to climate change, therefore destroying the ozone layer.

Environment protection is a collective responsibility not only for the government, and industries but is the responsibility of every individual and by using artificial intelligence, they can contribute to some extent in reducing carbon emissions.

However, there had been no credible carbon footprint calculator tailored to Indian conditions to involve people and make them part of the solution. As a result, inhabitants in India may be unable to identify their CO2 footprint or decrease its environmental impact in a systematic manner. Because only informed communities in multiple cities can work with one another. Based on current social media trends throughout the world, such groups are likely to actively participate in partnerships to tackle their common concerns.

To involve the general public and all other stakeholders in addressing energy and climate challenges, a systematic, coordinated, and dedicated approach that goes much beyond a carbon footprint calculator is necessary.

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