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TO STUDY THE ROLE OF AI IN PROMOTING ECO-FRIENDLY TECHNOLOGIES FOR A GREEN ECONOMY

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Abstract:

This study looks at how artificial intelligence (AI) can help advance environmentally friendly technologies and foster the growth of a green economy. It demonstrates how AI-based tools like data analytics, automation, and predictive modeling improve resource management, boost energy efficiency, and lower waste and carbon emissions in a variety of industries, including smart cities, transportation, agriculture, renewable energy, and waste management. AI's role in green innovation, sustainable infrastructure, and environmental monitoring is also covered in the study. It also discusses new issues surrounding the environmental impact of AI, stressing the significance of "Green AI" and responsible governance. According to the research, integrating AI effectively can boost environmental protection and sustainable development while preserving economic growth.

Key words: *Artificial intelligence, sustainable development, Eco-friendly, Green economy*

Introduction:

In order to address global environmental issues and advance sustainable development, artificial intelligence (AI) has become a potent tool. The need for environmentally friendly technologies has grown as problems like pollution, resource depletion, and climate change worsen. Intelligent decision-making, real-time monitoring, and effective resource management are made possible by AI in industries like manufacturing, transportation, agriculture, and renewable energy. AI facilitates the shift to a green economy by decreasing waste, cutting emissions, and increasing energy efficiency. AI-based solutions are being adopted by governments and businesses more frequently in order to maintain economic growth while achieving environmental sustainability.

Review of literature:

1. Eswar prasad (2024),"The green technology and sustainability field is progressing rapidly with innovations such as AI-driven recycling, the Internet of Things, and big data driving sustainability across various sectors. By integrating these technologies, businesses can reduce their environmental impact, improve productivity, and meet regulatory standards, leading to a cleaner and more sustainable future".
2. Zhichun song &yao deng (2025),The impact of artificial intelligence on green economy efficiency under integrated governance. This study analyzes the impact of Artificial Intelligence (AI) on Green Economic Efficiency (GEE) across 30 Chinese

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provinces from 2011 to 2020. The results show that AI significantly improves GEE, especially in economically advanced regions. However, its effectiveness varies with governance: market-based regulations weaken AI's impact, while administrative and informal environmental regulations strengthen it. Overall, the study highlights AI's role in promoting green development under supportive governance frameworks.

3. Naiara Uriarte-Gallastegi 1ORCID, Germán Arana-Landín, ORCID, Beñat Landeta-Manzano ORCID andIker Laskurain-Iturbe (2024), The Role of AI in Improving Environmental Sustainability: A Focus on Energy Management.
4. Xingsi Xue, Himanshu Dhumras, Garima Thakur, Varun Shukla (2025), Integrating artificial intelligence and sustainable materials for smart eco innovation in production. The research investigates the potential of AI optimization in advancing the utilization of sustainable materials to enhance energy efficiency and diminish waste production, operational cost and carbon footprint.

Objective:

1. To accelerate environmental monitoring & climate action.
2. To improve the resource management & its circulation.
3. To enhance green innovation & adoption.
4. To develop sustainable cities & mobility.

Methodology:

The research is entirely based on primary & secondary data, which allows for a comprehensive analysis of importance and the use of AI in the real-world for the sustainable development and the growth of the green economy by promoting eco-friendly technologies. This study adopts a descriptive and analytical research design to examine the role of AI in promoting eco-friendly technologies for the development of the green economy.

Nature and sources of data : Research papers and articles, Websites such as ScienceDirect, MDPI, and other credible sources, Questionnaire.

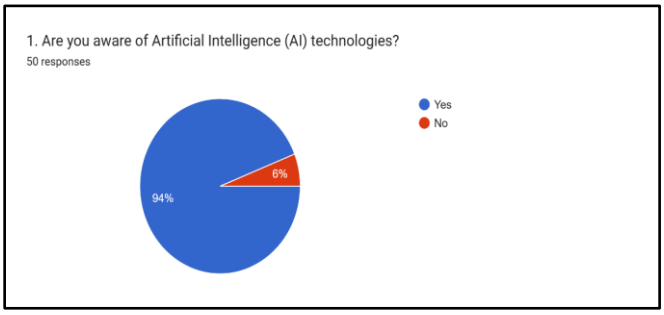
The study considers secondary data published during the period 2015 to 2025, as this period reflects significant advancement in Artificial Intelligence and its increasing role in eco-friendly and green technologies.

Variables of the study: Independent variable: Artificial Intelligence (AI). Dependent variable: Promotion of eco-friendly technologies and green economy.

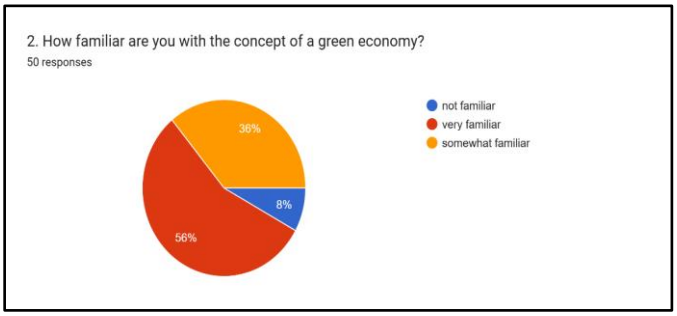
Scope of the methodology: The methodology focuses on understanding AI's contribution across multiple sectors: agriculture, energy, transportation, manufacturing, smart cities and waste management.

It also considers governance, innovation, and sustainability perspectives highlighted in prior research.

Data analysis and interpretation:



A near-total majority (94%) of respondents are aware of AI technologies.



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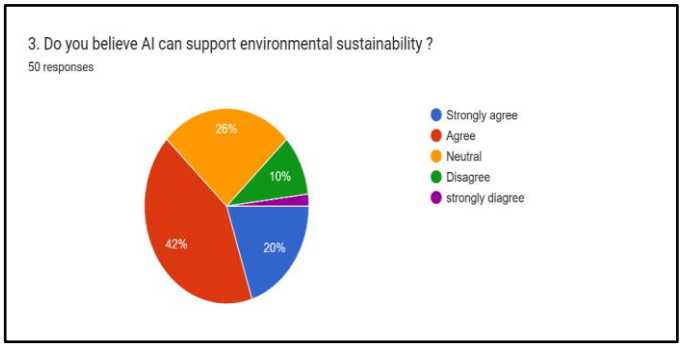
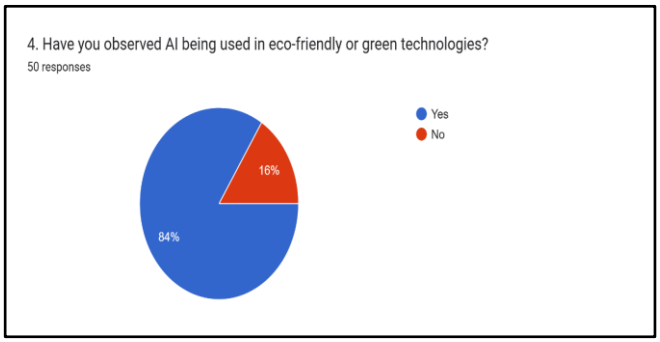
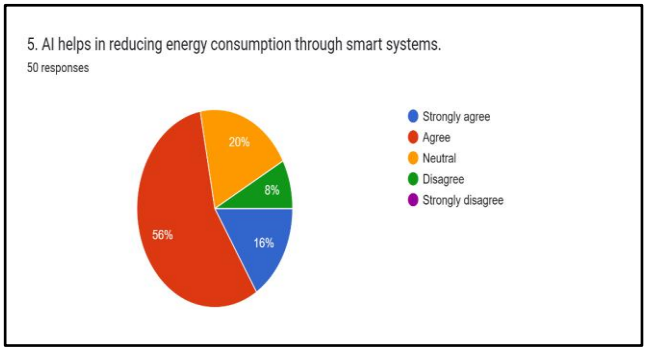
Most participants have some level of understanding, with 56% being "very familiar" and 36% "somewhat familiar" with the concept.



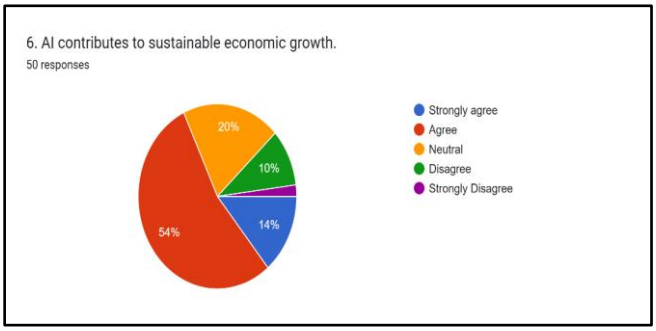
Public sentiment is positive, as 67% (combined "Agree" and "Strongly Agree") believe AI can support environmental sustainability



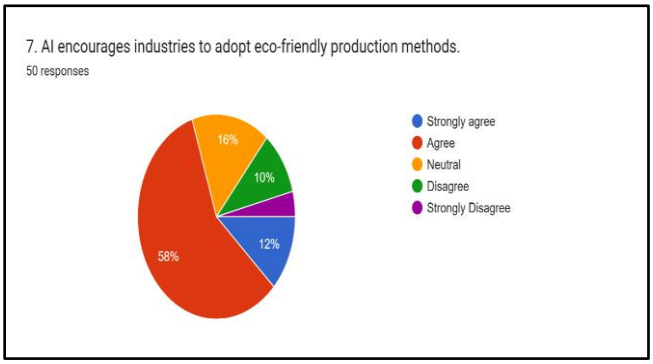
A high percentage (84%) have already observed AI being used in green or eco-friendly technologies.



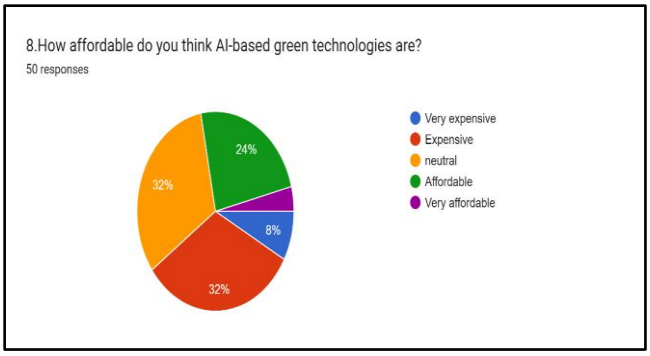
Exactly half of the respondents (50%) "Agree" that AI helps reduce energy consumption through smart systems.



Majority support continues here, with 54% agreeing that AI contributes to sustainable economic growth.



Half of the surveyed group (50%) "Agree" that AI encourages industries to adopt greener production methods.



Perceptions are split; 32% find AI green tech "expensive" and 32% find it "neutral," while only 8% view it as "affordable".

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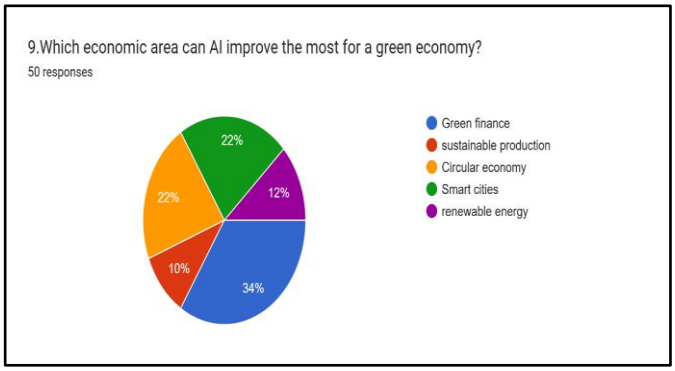
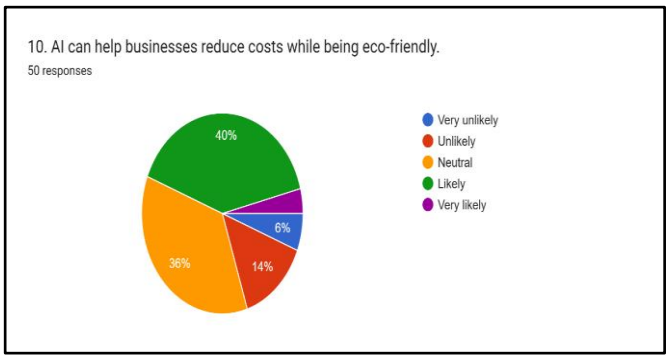
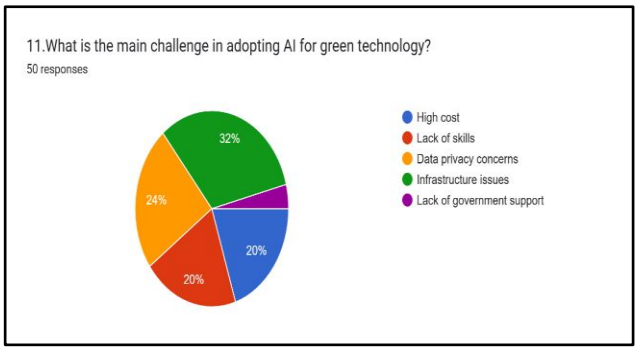


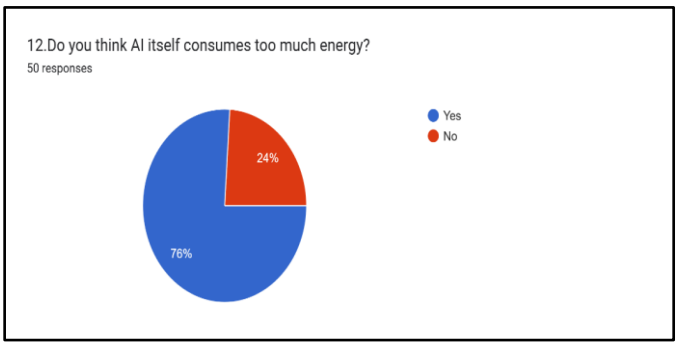
Green finance is seen as the area AI can improve the most (34%), followed by circular economy and smart cities (both at 22%).



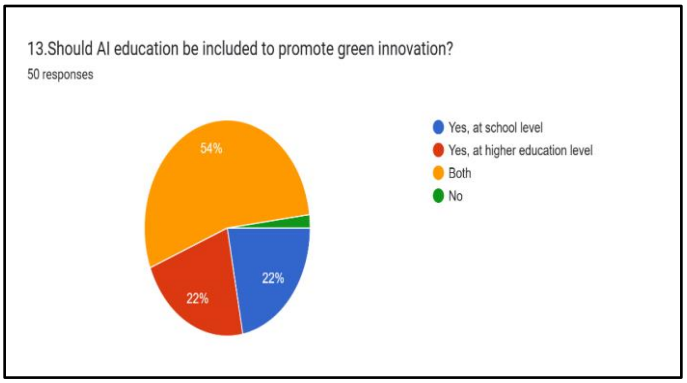
Respondents are optimistic about business benefits, with 40% saying it is "Likely" and 38% feeling "Neutral" about AI's ability to reduce costs while being eco-friendly.



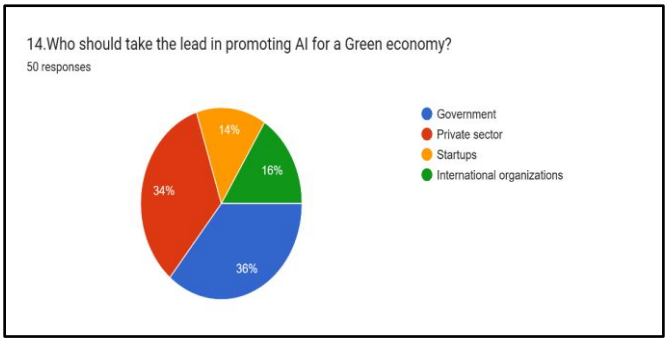
Infrastructure issues (32%) are cited as the top challenge for adoption, followed by data privacy concerns (24%) and high costs or lack of skills (both at 20%).



A significant concern exists, as 76% of people believe that AI itself consumes too much energy.



There is strong support for education; 54% believe AI education should be included at "Both" school and higher education levels.



Responsibility is seen as shared, with 36% looking to the Government and 34% to the Private Sector to lead AI for a green economy.

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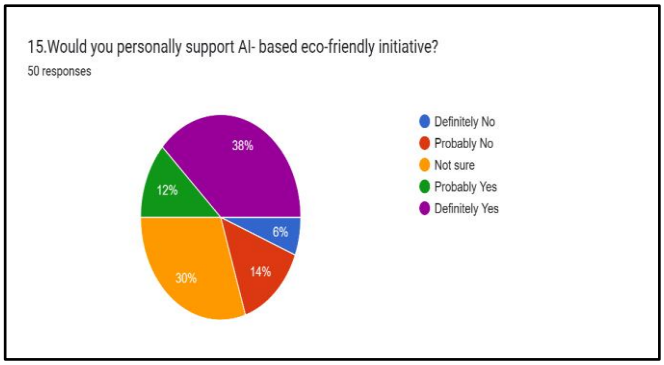

Personal commitment is high, with 50% (combined "Probably Yes" and "Definitely Yes") willing to support AI-based eco-friendly initiatives.

Findings:

- Optimizing energy efficiency.
- Enhancing renewable energy.
- Improving waste management& recycling.
- Enhancing environmental monitoring and conservation.
- Accelerate sustainable innovation.
- Develop smart & sustainable infrastructure.
- Foster green economic models & policy.
- Address AI's own footprint.

Scope :

Studying the role of AI in promoting eco-friendly technologies presents vast scopes for sustainable development across various sectors like agriculture sector, IT sector, transportation, smart cities, water management, waste management and resource management too.

It also provides a vast scope for research' innovation, and it also has vast career opportunities like climate data scientist, AI solutions architect for sustainability, sustainable supply chain manager and many more job opportunities.

Significance :

The study of AI in promoting eco-friendly technologies for a green economy is significant because it helps to understand how the advance technologies can address environmental challenges such as climate change, pollution and resource depletion.

It provides insights into the effective use of AI for sustainable development, energy efficiency and waste reduction.

The study also supports decision-making by governments and organizations in adopting green technologies.

It will provide new career pathways for students in green AI, sustainable engineering, climate tech and data science for sustainability. It will help in developing new skills among students and future generations.

It is significant for society too:

- AI helps in optimized resource management.
- AI helps in designing eco-friendly products, supply chain transparency and also monitors deforestation.
- AI enables smart traffic, efficient public transport and better waste management.

Suggestions:

- Governments and institutions should invest more in AI research focused on sustainability, such as energy- efficient algorithms and low-carbon computing.
- Develop and use energy-saving data centers, green cloud computing, and optimized AI models to reduce the carbon footprint of AI itself.
- Improve access to high-quality environmental data (water, agriculture, climate) to make AI solutions more accurate and impactful.
- Promote partnerships between Governments, startups, industries, and research institutions to scale AI- based green technologies.
- Promote transparent, fair, and accountable AI systems to ensure long-term trust and sustainability

Conclusion:

A key factor in advancing a green economy is artificial intelligence, which has emerged as a potent enabler of

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environmentally friendly technologies. This study demonstrates how AI supports effective resource management, energy optimization, waste reduction, and environmental monitoring in a number of industries, including manufacturing, transportation, smart cities, and agriculture. AI helps lower carbon emissions while preserving economic growth by promoting sustainable innovation and the integration of renewable energy.

The results show that AI promotes the creation of intelligent and sustainable infrastructure in addition to improving green economic efficiency. But issues like excessive energy usage and e-waste produced by AI systems cannot be disregarded. To reduce AI's environmental impact, ethical use, responsible governance, and the implementation of "Green AI" techniques are crucial.

All things considered, AI can greatly quicken the shift to a sustainable and ecologically friendly economy with the right regulation, creativity, and cooperation between governments, businesses, and researchers. The study comes to the conclusion that artificial intelligence (AI) is not only a technological breakthrough but also a major force behind long-term sustainable development and environmental preservation.

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