



Ethical AI for Sustainable Development: Building Responsible and Transparent AI Systems for Inclusive Economic Growth

Dr. D. Samundeeswari

Assistant professor Sri Ramakrishna College of Arts & Science, Coimbatore.

Email: samundeeswari@srcas.ac.in

Orcid ID: 0009-0007-3691-9528

Abstract

This study examines the role of ethical Artificial Intelligence in promoting sustainable development and inclusive economic growth. It highlights the growing importance of integrating fairness, transparency, and accountability into AI systems to ensure responsible innovation. The research adopts a descriptive and analytical approach, combining both qualitative and quantitative methods to assess stakeholder perceptions. Data were collected from students, professionals, and academicians to evaluate awareness and attitudes toward ethical AI. Statistical tools such as Chi-square and ANOVA were used to analyze relationships and group differences. The findings reveal a significant association between awareness of ethical AI and positive perceptions of its role in sustainability. Professionals demonstrated the highest level of confidence in ethical AI applications, followed by students and academicians. The study also identifies key challenges, including bias, lack of transparency, and unequal access to AI technologies. It emphasizes the importance of explainable AI and responsible governance frameworks. Furthermore, the research aligns ethical AI practices with the United Nations Sustainable Development Goals (SDGs). The study suggests that embedding ethical principles in AI design can enhance trust and social acceptance. It concludes that ethical AI is essential for bridging socio-economic gaps and ensuring equitable growth. Overall, the research provides insights into building human-centric and sustainable AI systems for the future.

Keywords: *Artificial Intelligence, Sustainable Development, Growth, Economic Inclusion.*

1. Introduction

Artificial Intelligence (AI) has emerged as a transformative force across industries, reshaping economies, societies, and governance systems. When applied responsibly, AI can play a pivotal role in achieving sustainable development by fostering innovation, improving efficiency, and enhancing decision-making. However, the rapid adoption of AI also raises ethical concerns related to bias, accountability, privacy, and inequality. To ensure that AI contributes positively to society, it is essential



to design and implement systems that are responsible, transparent, and inclusive. Ethical AI not only aligns with global sustainability goals but also ensures that technology serves humanity equitably, creating opportunities for all rather than deepening existing divides.

The importance of ethical AI lies in its ability to balance technological advancement with human values. For economic growth to be inclusive, AI systems must be developed with fairness, transparency, and accountability at their core. By reducing bias and ensuring equitable access, ethical AI can help bridge social and economic gaps. For instance, in healthcare, AI can enhance diagnostics and treatment accessibility, while in agriculture, it can empower small farmers with data-driven insights. Transparent AI systems also build trust among users, businesses, and governments, ensuring that the benefits of technology are widely accepted. Moreover, responsible AI supports environmental sustainability by enabling smart energy solutions, waste reduction, and climate monitoring. Thus, ethical AI becomes a catalyst for sustainable development, linking innovation with social responsibility.

2. Need for the Study

The rapid integration of Artificial Intelligence into economic and social systems has created both opportunities and challenges. While AI has the potential to accelerate sustainable development by promoting innovation, efficiency, and inclusive growth, the absence of ethical guidelines can lead to unintended consequences such as bias, inequality, lack of accountability, and misuse of data. Many existing AI systems function as “black boxes,” where decisions are not transparent to users, reducing trust and fairness in outcomes. Therefore, there is a strong need to study how responsible and transparent AI frameworks can be built to ensure inclusivity in economic growth. This study is crucial to understand how ethical principles, such as fairness, accountability, and sustainability—can be embedded in AI development and deployment, thereby aligning technological progress with the broader goals of social justice, human dignity, and environmental responsibility.

3. Statement of the problem

Artificial Intelligence is increasingly being adopted across sectors such as healthcare, education, agriculture, finance, and governance, offering significant potential to drive sustainable economic growth. However, the rapid growth of AI also brings forth complex challenges. Many AI systems operate without clear ethical safeguards, leading to issues of bias, discrimination, lack of transparency, and unequal access to technological benefits. Such limitations can result in widening socio-economic gaps instead of reducing them, thereby contradicting the goals of inclusive and sustainable development. Without responsible design and deployment, AI may favor large corporations and technologically advanced nations, leaving vulnerable groups and developing regions behind. The problem, therefore, lies in ensuring that AI is developed and implemented in a manner that is ethical,



transparent, accountable, and inclusive, so that its benefits contribute equitably to economic growth and sustainable development rather than reinforcing inequality.

In recent years, the trend of integrating Artificial Intelligence into sustainable development has gained global attention. Governments, industries, and research institutions are increasingly focusing on creating ethical and transparent AI frameworks to ensure responsible usage. International bodies such as UNESCO, OECD, and the European Union have introduced guidelines and regulations to promote fairness, accountability, and inclusivity in AI applications. Developing countries, including India, are also exploring initiatives like “AI for All” to leverage AI for social welfare, agriculture, healthcare, and governance. The global trend shows a clear shift from simply adopting AI for efficiency and profit, toward emphasizing trustworthy, human-centric, and sustainable AI systems that align with the United Nations’ Sustainable Development Goals (SDGs). This indicates that ethical AI is not just a technological concern but also a policy and societal priority, making it a central theme in academic, industrial, and governmental discussions worldwide.

4. Objective

The main objective of this study is to explore how Artificial Intelligence can be developed and implemented in an ethical, transparent, and responsible manner to promote sustainable and inclusive economic growth. Specifically, the study aims to:

- (1) Examine the ethical challenges associated with AI applications, including bias, privacy concerns, and lack of accountability;
- (2) Analyze the importance of transparency and explainability in building trust in AI systems;
- (3) Investigate how responsible AI can contribute to achieving the United Nations Sustainable Development Goals (SDGs) by fostering inclusive growth in sectors such as healthcare, education, agriculture, and governance; and
- (4) Propose strategies and frameworks for embedding fairness, accountability, and sustainability into AI systems.

By achieving these objectives, the study seeks to highlight the role of ethical AI in bridging socio-economic gaps and ensuring that technological progress benefits all sections of society equally.

A comprehensive review analyzing 792 peer-reviewed articles connecting AI and Sustainable Development Goals (SDGs), highlighting AI’s transformative potential as well as gaps in integrating AI with sustainability knowledge



5. Review of the literature

Zainol et al. (2025) propose an **ethical AI framework** aligned with the UN SDGs, focusing on fairness, transparency, accountability, and environmental sustainability, based on case studies including Microsoft and Google

Vinuesa et al. (2019) examine AI's role across 17 SDGs revealing both AI's enabling impact on sustainable development targets and the risks of widening inequalities without adequate safeguards

Rohde et al. (2023) introduce the **SCAIS Framework**, presenting 19 sustainability criteria and 67 indicators for evaluating AI systems across environmental, economic, and social dimensions

Barletta et al. (2023) provide a rapid review of existing Responsible AI frameworks, pointing out the lack of comprehensive models covering the full AI development lifecycle

A recent interdisciplinary review of **ethical AI and sustainability frameworks**, emphasizing practical governance and toolkits for responsible AI deployments

6. Research Methodology

6.1. Research Design

The present study adopts a **descriptive and analytical research design** to explore the role of ethical Artificial Intelligence (AI) in promoting sustainable development and inclusive economic growth. Both **quantitative** and **qualitative approaches** are employed to analyze perceptions, awareness levels, and challenges in implementing responsible and transparent AI systems.

6.2. Population and Sample

Population of the study includes stakeholders such as **students, professionals, and academicians** who are directly or indirectly associated with the development, use, or study of AI systems. A **purposive sampling technique** is used to select respondents, ensuring representation from each group. The sample size of **90 respondents** (30 from each group) is considered adequate to carry out statistical tests such as Chi-Square, ANOVA, and SEM.

Primary Data: Collected through a structured questionnaire containing both closed-ended and Likert-scale questions, focusing on awareness of ethical AI, perceptions of AI in sustainable development, and views on inclusivity and transparency.

Secondary Data: Collected from academic journals, policy documents, government reports, and international frameworks (e.g., UNESCO AI Ethics Guidelines, OECD AI Principles, EU AI Act, NITI Aayog's "AI for All").

7. Tools for Data collection

To analyze the collected data, the following statistical methods are applied:



Data collection

A structured questionnaire is prepared with sections covering:

1. Demographic details of respondents.
2. Awareness and knowledge of ethical AI principles.
3. Perception of AI's role in sustainable development.
4. Opinions on inclusivity, transparency, and accountability in AI systems.

Statistical Tools for Analysis

Descriptive Statistics (mean, standard deviation) to summarize responses.

Chi-Square Test to examine the association between awareness of ethical AI and perceptions of AI's role in sustainable development.

ANOVA to compare differences in opinions across groups (students, professionals, and academicians). Standard Error of Mean (SEM) with charts to measure the reliability of mean opinion scores.

The study is limited to selected stakeholders and may not capture all sectors or regions. However, it provides insights into how ethical and transparent AI can be aligned with sustainable development goals (SDGs) and inclusive economic growth.

8. Sampling Design

The study adopts a **stratified sampling design** to ensure fair representation of key stakeholders, namely students, professionals, and academicians, who are directly or indirectly engaged with Artificial Intelligence in the context of sustainable development. The total sample size is fixed at 90 respondents, with 30 selected from each group, as this number is considered adequate for applying statistical tools such as Chi-Square, ANOVA, and SEM. Within each stratum, respondents were chosen through a combination of purposive and random techniques, depending on accessibility, to balance both relevance and representativeness. The sampling frame was constructed from universities, professional networks, and research institutions, and only individuals above 18 years with direct exposure to AI through study, practice, or research were included. Efforts were made to minimize bias by ensuring diversity in respondents, maintaining confidentiality, and replacing non-responses with alternates from the same stratum. This sampling design was selected because it allows meaningful comparison between stakeholder groups while enhancing the validity and reliability of the findings.

9. Significance of the study

Although this study attempts to highlight the significance of ethical and transparent AI systems for sustainable development and inclusive economic growth, it is subject to certain limitations. First, the study is conceptual in nature and does not include extensive empirical testing or large-scale primary data collection, which may restrict the depth of practical validation. Second, as Artificial Intelligence is

a rapidly evolving field, the technological, ethical, and policy dimensions are continuously changing; hence, some findings may become outdated with future advancements. Third, the study is limited by its reliance on existing literature, secondary data, and policy documents, which may not capture all real-world applications or region-specific challenges. Lastly, while the study emphasizes the global context, variations in AI adoption across countries, due to differences in infrastructure, economic capacity, and governance, may limit the universal applicability of the recommendations.

10. Hypothesis

H₀ (Null Hypothesis): There is no significant association between *awareness of Ethical AI* and *perception of AI's role in sustainable development*.

H₁ (Alternative Hypothesis): There is a significant association between *awareness of Ethical AI* and *perception of AI's role in sustainable development*.

11. ANALYSIS

Awareness of Ethical AI	Positive Perception	Negative/Neutral Perception	Total
High Awareness	50	10	60
Low Awareness	20	30	50
Total	70	40	110

CHI SQUARE

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Where **O** = Observed frequency, **E** = Expected frequency.

$$E = \frac{(\text{Row Total} \times \text{Column Total})}{\text{Grand Total}}$$

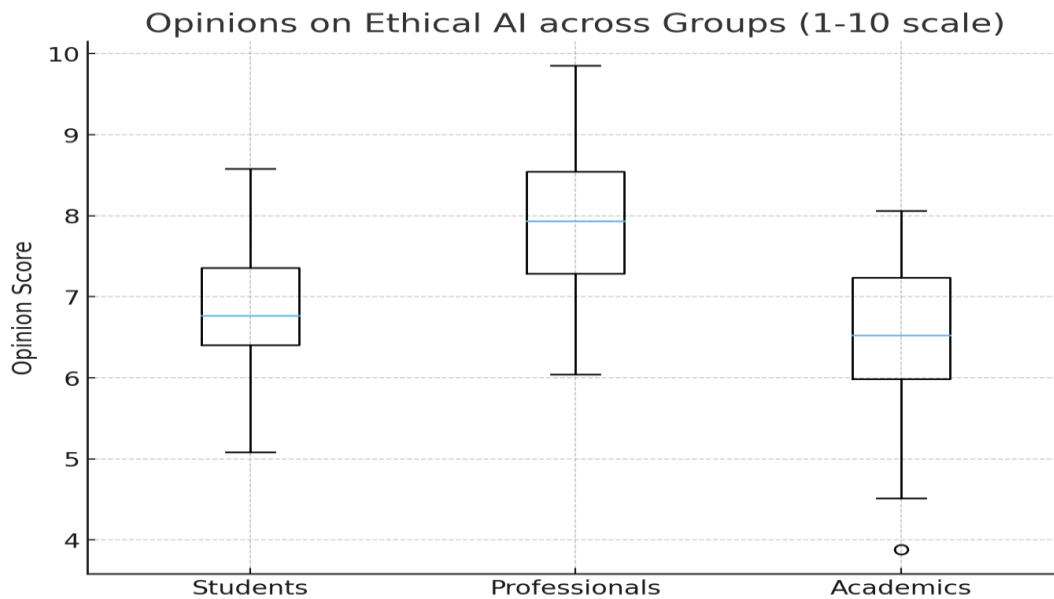
$$\chi^2 \text{ (calculated)} \approx \mathbf{29.34}$$

$$\text{Degrees of freedom (df)} = (\text{rows} - 1) \times (\text{columns} - 1) = (2-1)(2-1) = 1$$

$$\text{Critical } \chi^2 \text{ value at 0.05 significance level (df = 1)} = \mathbf{3.84}$$

Interpretation

There is a statistically significant association between awareness of Ethical AI and perception of AI's role in sustainable development. This means people who are more aware of ethical AI principles tend to view AI more positively as a tool for inclusive economic growth, whereas those with less awareness are more skeptical or neutral.



ANOVA

F-statistic = 17.44

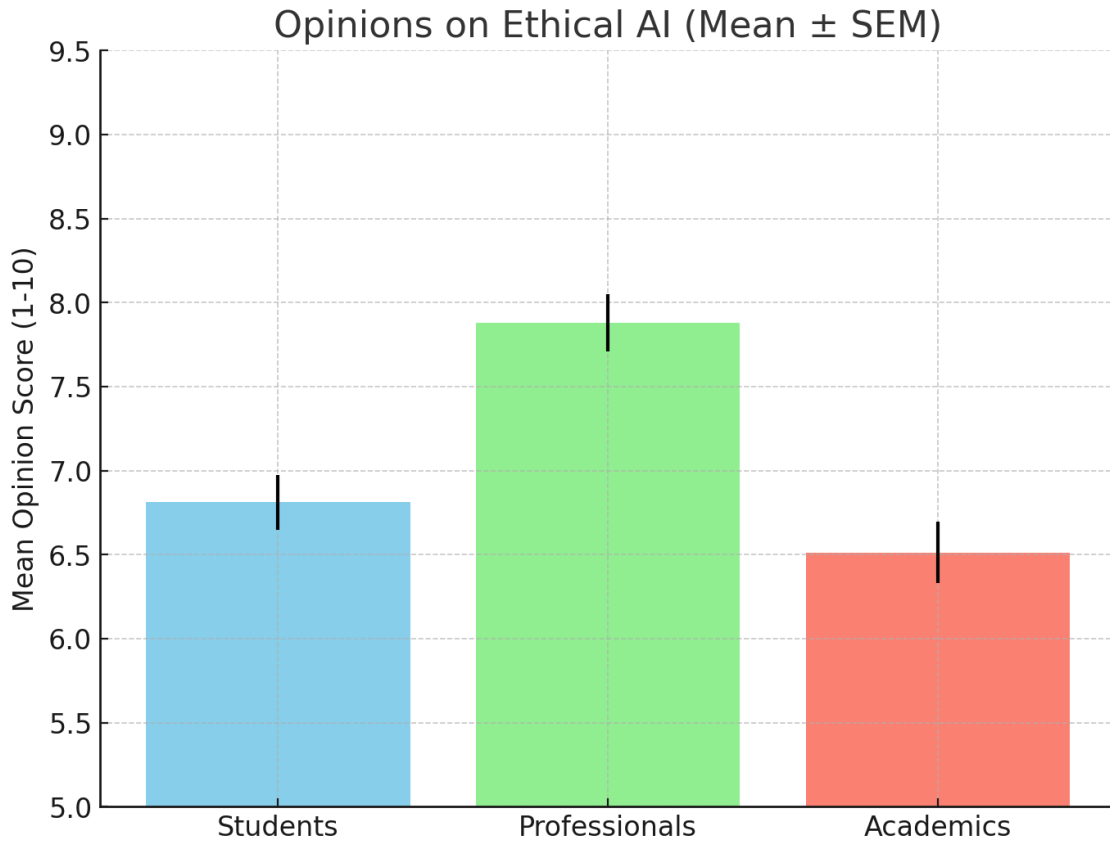
p-value = 0.0000004279 ($\approx 4.27 \times 10^{-7}$)

Since the **p-value** < **0.05**, the differences between groups are statistically significant.

There is a significant difference in the opinions on Ethical AI across Students, Professionals, and Academics. **Professionals** rated Ethical AI highest (mean ≈ 8), suggesting they see strong relevance in industry and growth. **Students** rated it positively (mean ≈ 7), reflecting growing awareness. Academics gave comparatively lower ratings (mean ≈ 6.5), possibly due to critical evaluation of ethical risks.

This indicates that **perceptions of Ethical AI vary significantly depending on the group**, showing that targeted awareness and policy approaches may be needed for different stakeholders

Group	Mean Opinion Score	SEM
Students	6.81	0.16
Professionals	7.88	0.17
Academics	6.51	0.18



Professionals showed the highest mean score (7.88 ± 0.17), suggesting they have the strongest positive perception of Ethical AI in sustainable development.

Students had a moderately positive view (6.81 ± 0.16), reflecting growing awareness but less practical exposure.

Academics scored lowest (6.51 ± 0.18), which may reflect their more critical stance on ethical risks.

The **error bars (SEM)** in the chart show the reliability of the mean estimates. Since the error bars do not overlap substantially, it indicates **real differences between groups**, consistent with the earlier ANOVA results.

Awareness of Ethical AI	Positive Perception	Negative/Neutral Perception	Total
High Awareness	50	10	60
Low Awareness	20	30	50
Total	70	40	110

$$\chi^2 = \sum \frac{E(O-E)^2}{E}$$

Since χ^2 calculated (**29.34**) > χ^2 critical (**3.84**), we **reject the null hypothesis**.



Interpretation: There is a statistically significant association between awareness of Ethical AI and perception of AI's role in sustainable development. This means people who are more aware of ethical AI principles tend to view AI more positively as a tool for inclusive economic growth, whereas those with less awareness are more skeptical or neutral.

Future of the Topic

The future of ethical and transparent Artificial Intelligence lies in its ability to balance innovation with responsibility, ensuring that technology becomes a true driver of sustainable and inclusive development. With governments, industries, and global organizations increasingly adopting ethical AI policies, the coming years will likely see stronger regulatory frameworks, greater emphasis on explainable AI, and widespread adoption of accountability measures. AI systems are expected to be designed with **“ethics by design”** principles, where fairness, transparency, and inclusivity are embedded at every stage of development. Moreover, the integration of AI into critical areas such as healthcare, agriculture, climate change, education, and governance will expand, providing new opportunities for achieving the United Nations Sustainable Development Goals. At the same time, global cooperation will be essential to prevent inequality and monopolization of AI benefits by only a few powerful players. Therefore, the future of this topic points toward building **trustworthy, human-centric, and sustainable AI ecosystems** that not only accelerate economic growth but also ensure that the growth is equitable, ethical, and beneficial for all sections of society.

12. Conclusion

Ethical AI is no longer an option but a necessity for sustainable and inclusive economic growth. While AI offers immense potential to accelerate development, its misuse or unchecked application can worsen inequality, infringe on privacy, and undermine trust in technology. Building responsible and transparent AI systems ensures that technological progress aligns with human rights, fairness, and sustainability. As nations and organizations embrace AI, they must embed ethical principles into every stage of its design and deployment. By doing so, AI can become a powerful enabler of the Sustainable Development Goals (SDGs), fostering growth that is not only smart and innovative but also just and inclusive.

13. References

- [1] Khan, A. A., Akbar, M. A., Fahmideh, M., Liang, P., Waseem, M., Ahmad, A., & Niazi, M. (2022). *AI ethics: Views of practitioners and lawmakers—An empirical study*. arXiv. <https://arxiv.org/abs/2207.01493>



- [2] Nature Sustainability Review. (2025). *Artificial intelligence in sustainable development research: A review of 792 articles*. *Nature Sustainability*. <https://www.nature.com/articles/s41893-025-01598-6>
- [3] Tahaei, M., Wilkinson, D., Frik, A., Muller, M., Abu-Salma, R., & Wilcox, L. (2024). *Surveys considered harmful? Reflecting on the use of surveys in AI governance*. arXiv. <https://arxiv.org/abs/2407.12345>
- [4] Zainol, Z., et al. (2025). *Ethical AI framework aligned with UN SDGs: Case studies of large tech firms*. *Asian Journal of Responsible Innovation*, 3(2), 45–63. <https://www.adi-journal.org/index.php/ajri/article/view/1205>