Sundara Advanced Research on Artificial Intelligence
Vol. 2, No. 1, April, 2026, pp. 37−47
E-ISSN: xxxx-xxxx | P-ISSN: xxxx-xxxx, DOI:10.34306

Advancements in Artificial Intelligence and Their Contributions to Sustainable Development Goals: A Multidisciplinary Review

Arthur Simanjuntak Anita[1], Taavi Kuusk[2], Gabriela Nicola[3], Marviola Hardini[4*], Untung Rahardja[5]

[1]Department of Accounting, Methodist University of Indonesia, Indonesia
[2]Department of Information Technology, iLearning Incorporation, Estonia
[3]Department of Information System, Pandawan Incorporation, New Zealand
[4, 5]Department of Information Technology, Sundara Group, Indonesia
[1]smjt@rocketmail.com, [2]kuuskvi@ilearning.ee, [3]gabrielanlutfiani@pandawan.ac.nz, [4]marviola@raharja.info, [5]untung@raharja.info
***Corresponding Author**

Article Info

Article history:

Submission February 21, 2026
Revised March 13, 2026
Accepted March 30, 2026
Published April 28, 2026

Keywords:

Artificial Intelligence
Machine Learning
Deep Learning
Sustainable Development Goals
Ethical AI

ABSTRACT

Artificial Intelligence (AI) has positioned itself as a transformative technological force propelling advancements across a multitude of domains, encompassing machine learning, deep learning, natural language processing, robotics, and ethical AI governance; consequently, as a Background, its accelerating evolution continues to engender both substantial opportunities and multifaceted challenges for sustainable and responsible technological development. Grounded in this context, the Objective of this study is to furnish a multidisciplinary review by scrutinizing theoretical advancements, practical applications, and AI's alignment with the United Nations Sustainable Development Goals (SDGs). To accomplish this, the Method employed encompasses a structured literature review spanning key AI domains including Machine Learning, Deep Learning, Natural Language Processing, Robotics, and AI Ethics with the aim of identifying emergent trends, developmental impacts, and prospective research directions. The Results reveal that AI technologies make substantial contributions to global development goals through heightened automation, augmented decision-making capabilities, intelligent perception systems, and the establishment of ethical governance frameworks that underpin sustainable innovation. In Conclusion, AI harbors considerable potential to accelerate the realization of sustainable development objectives; nevertheless, its long-term viability is contingent upon the implementation of responsible governance mechanisms, transparency, and inclusive design principles, so as to ensure equitable and broadly beneficial societal outcomes.

DOI: https://doi.org/10.34306/sundara.v2i1.55

1. INTRODUCTION

AI has evolved into a foundational and pervasive technology that significantly influences a wide range of sectors, fundamentally reshaping how organizations, industries, and societies operate in the digital era [1, 2]. The rapid advancement of computational power, coupled with the exponential growth of data availability and continuous innovation in algorithmic design, has enabled AI systems to achieve unprecedented levels of

performance across complex tasks that were once considered exclusive to human cognitive capabilities, such as pattern recognition, decision-making [3], language understanding, and adaptive learning [4]. As a result, AI is no longer confined to experimental or niche applications but has become deeply embedded in critical societal infrastructures, including healthcare systems [5], financial services [6], transportation networks [7], and public governance [8]. This widespread integration underscores the urgent need to comprehensively understand not only the technological development of AI but also its broader implications for economic sustainability [9], social equity [10], and responsible innovation in an increasingly interconnected world [11].

The scope of AI research continues to expand dynamically, encompassing key domains such as machine learning, deep learning, natural language processing, robotics, and the ethical deployment of intelligent systems [12], each contributing uniquely to the advancement of both theoretical knowledge and practical applications [2]. Machine learning and deep learning techniques, for instance, have driven significant breakthroughs in predictive analytics and autonomous systems [13], while natural language processing has enhanced human–machine interaction through increasingly sophisticated language models and conversational agents [14]. Meanwhile, robotics integrates AI capabilities into physical systems [15], enabling automation in manufacturing, logistics, and service industries [16]. Beyond technical advancements, the ethical dimension of AI has gained critical importance [17], addressing issues such as algorithmic bias, data privacy, accountability, and transparency [18]. Collectively, these domains not only accelerate scientific and technological progress but also facilitate the development of innovative solutions to pressing global challenges [19], including environmental sustainability [20], healthcare accessibility [21], disaster management [22], and the improvement of educational systems [23]. In the context of accelerating global digital transformation [24], AI has emerged as a strategic enabler in supporting the achievement of the SDGs [10], thereby attracting increasing attention from both academic researchers and industry practitioners [25].

In light of these developments, this paper provides a comprehensive and multidisciplinary review of recent advancements in AI [26], focusing on their theoretical foundations, practical implementations, and contributions to global development outcomes [2]. The study systematically examines key trends, identifies emerging research directions, and evaluates the extent to which AI technologies align with and support the SDGs framework [10]. Furthermore, this paper critically discusses the growing importance of ethical considerations in guiding AI innovation [17], emphasizing the need for responsible governance frameworks [27], inclusive design principles [28], and transparent decision-making processes [29]. By integrating technological insights with ethical perspectives, this study aims to contribute to a more holistic understanding of AI as a driver of sustainable development [9], while also highlighting the challenges and opportunities that must be addressed to ensure its long-term societal benefit [30].

2. LITERATURE REVIEW

2.1. AI as a Driver of Technological Transformation

AI has become a central component of contemporary technological transformation, driving innovation across various sectors and enabling data-driven solutions to complex global challenges [31]. Recent scholarly discourse has increasingly shifted from a purely technical perspective toward a more comprehensive understanding that encompasses AI's societal, economic, and environmental implications, particularly in relation to the SDGs [10]. This evolution reflects the growing recognition that AI is not merely a computational tool but also a strategic enabler of sustainable and inclusive development [9]. As digital transformation accelerates globally, AI technologies play a critical role in shaping future socio-economic systems and governance structures [27].

2.2. Evolution of AI Technologies

Early research in AI primarily focused on foundational domains such as machine learning, expert systems [32], and pattern recognition. With the rapid advancement of computational capabilities and the availability of large-scale datasets, the field has evolved significantly toward deep learning approaches [33], enabling substantial breakthroughs in computer vision [34], speech recognition, and natural language understanding [35]. More recent developments highlight the emergence of large-scale neural architectures [36] capable of supporting complex reasoning, multimodal learning, and automated decision-making processes [37]. These technological advancements have established a robust foundation for the widespread deployment of AI across multiple industries, facilitating scalable and intelligent solutions to real-world problems [13].

2.3. AI Applications in Supporting Sustainable Development Goals (SDGs)

The incorporation of AI into sustainable development frameworks has been extensively documented within contemporary academic literature [38]. AI technologies have demonstrated considerable potential in optimizing resource utilization [39], refining climate modeling methodologies [20], and advancing renewable energy systems [40], thereby making direct contributions to SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action) [41]. Within the healthcare sector (SDG 3), AI-driven diagnostic instruments and predictive analytics have substantially improved early disease detection capabilities and facilitated more personalized treatment planning [21]. In a comparable manner, within the domain of education (SDG 4), AI-based adaptive learning systems have enabled the delivery of individualized learning experiences that meaningfully enhance student engagement and academic achievement [23, 42]. Moreover, AI contributes to economic growth and industrial innovation (SDG 8 and SDG 9) through the deployment of intelligent automation, robotics [15], and data-driven business models [9], which collectively serve to elevate productivity levels and strengthen operational efficiency [43].

2.4. The Role of NLP and Robotics in Sustainable Systems

Natural Language Processing (NLP) and robotics represent critical subfields of AI that significantly contribute to sustainable development initiatives [44]. NLP technologies facilitate multilingual communication [45], improve accessibility to public services [46], and support policy analysis, thereby promoting inclusive governance and institutional effectiveness (SDG 16) [47]. In parallel, advancements in robotics enable practical applications in areas such as precision agriculture [48], environmental monitoring [20], and disaster response [49], which are essential for enhancing resilience and ensuring sustainable resource management (SDG 2, SDG 11, SDG 15) [50]. These interdisciplinary applications illustrate how AI-driven innovations extend beyond theoretical contributions and generate tangible societal impacts across multiple domains [2].

2.5. Ethical Challenges and Governance of AI

Notwithstanding its transformative potential, the widespread adoption of AI simultaneously engenders significant ethical, social, and governance challenges [51]. The prevailing body of literature draws attention to concerns pertaining to algorithmic bias, insufficient transparency, data privacy vulnerabilities, and inequitable access to AI technologies [6], all of which may substantially impede progress toward inclusive and equitable development outcomes [10]. In response to these concerns, contemporary research has increasingly accentuated the imperative of responsible AI practices [17], encompassing the development of explainable AI (XAI), the formulation of ethical guidelines, and the establishment of comprehensive regulatory frameworks [52, 53]. These concerted efforts are oriented toward ensuring that AI systems operate in consonance with human rights principles and prevailing societal values [18], thereby fostering sustainable and ethically grounded technological advancement [11].

2.6. Research Synthesis and Gap Identification

Overall, the existing body of literature demonstrates that AI advancements hold substantial potential to accelerate the achievement of the Sustainable Development Goals [10]. However, despite the growing number of studies exploring AI applications across sectors, there remains a lack of integrative and multidisciplinary analyses that simultaneously examine technological innovation, ethical considerations, and SDG alignment within a unified framework [38]. This gap highlights the need for comprehensive reviews that not only synthesize existing knowledge but also identify emerging research directions and interdisciplinary opportunities [9]. Therefore, this study aims to address this gap by providing a structured and holistic review of AI advancements and their implications for sustainable development [2].

3. RESEARCH METHODOLOGY

This study adopts a multidisciplinary Systematic Literature Review (SLR) approach to comprehensively examine advancements in AI and their contributions to the United SDGs. The methodology is designed to ensure a rigorous, transparent, and reproducible process by integrating structured procedures for identifying, evaluating, and synthesizing peer-reviewed research across multiple academic disciplines, including computer science, sustainability studies, economics, public policy, and engineering. By employing this approach, the study aims to generate a holistic understanding of how AI technologies contribute to sustainable development from both technical and socio-economic perspectives.

3.1. Research Design

The research employs a qualitative, descriptive, and analytical design, aiming to systematically map and analyze the relationships between AI technologies and Sustainable Development Goal (SDG)-related outcomes. This approach enables a comprehensive exploration of how key AI domains (such as Machine Learning, Deep Learning, Natural Language Processing, and Robotics) are applied to address complex global challenges across multiple sectors. By adopting this design, the study not only captures the breadth of AI applications but also provides deeper analytical insights into their role as enablers of sustainable development.

To uphold methodological rigor and transparency, this study embraces the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework as a guiding structural foundation for the literature review process. The PRISMA methodology delineates a standardized and replicable procedural protocol for the selection and appraisal of pertinent studies through four sequential stages: identification, screening, eligibility assessment, and final inclusion. This systematically structured approach strengthens the reliability of the resultant findings by substantially minimizing selection bias and ensuring that exclusively high-quality and contextually relevant literature is incorporated into the analytical process.

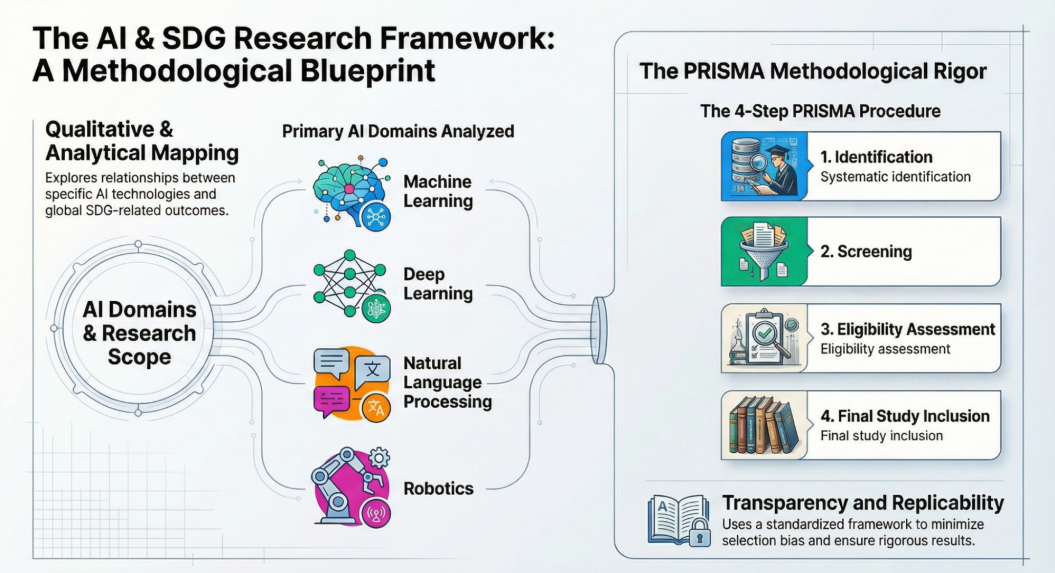

Figure 1. AI and SDG Research Framework and PRISMA Methodological Process

The figure 1 illustrates the conceptual and methodological framework adopted in this study, integrating both the analytical mapping of AI domains and the systematic review process guided by PRISMA. On the left side, the framework presents the primary AI domains analyzed Machine Learning, Deep Learning, Natural Language Processing, and Robotics which serve as the core technological components examined in relation to SDG outcomes. This section emphasizes the qualitative and analytical mapping approach used to explore how these technologies contribute to sustainable development. On the right side, the figure outlines the four-step PRISMA procedure, consisting of identification, screening, eligibility assessment, and final study inclusion, which ensures a transparent, structured, and replicable literature selection process. Overall, the figure highlights the integration of technological analysis and methodological rigor, demonstrating how the study systematically connects AI advancements with sustainability objectives while maintaining high standards of research validity and reliability.

3.2. Data Sources and Search Strategy

The data collection process undertaken in this study was executed through a systematic and rigorously structured literature search, designed to ensure comprehensive, reliable, and high-quality coverage of pertinent academic sources. Several prominent scientific databases were employed, namely Scopus, Web of Science, IEEE Xplore, ScienceDirect, and SpringerLink. The selection of these databases was predicated upon their globally recognized reputation, stringent indexing standards, and extensive coverage of peer-reviewed publications spanning multidisciplinary domains, with particular emphasis on artificial intelligence and sustainability

research. By integrating multiple databases, this study minimizes the risk of publication bias and enhances the inclusiveness of the literature selection process.

Furthermore, a well-defined search strategy was employed to ensure consistency and reproducibility. This strategy includes the formulation of relevant keywords, the application of Boolean operators, and the establishment of clear inclusion and exclusion criteria. Such a structured approach is essential to filter out irrelevant studies while retaining those that are methodologically sound and directly aligned with the research objectives, thereby strengthening the overall validity and reliability of the findings.

Table 1. Search Strategy and Criteria

Component	Description
Keywords	"Artificial Intelligence", "Sustainable Development Goals", "AI for sustainability", "machine learning applications", "ethical AI"
Boolean Operators	AND, OR combinations to refine and expand search results
Databases	Scopus, Web of Science, IEEE Xplore, ScienceDirect, SpringerLink
Publication Period	2016–2024
Document Types	Peer-reviewed journal articles, conference papers, high-quality reports
Inclusion Criteria	Studies focusing on AI applications related to SDGs, sustainability, or ethical AI
Exclusion Criteria	Non-peer-reviewed sources, outdated studies (pre-2016), irrelevant domains

Table 1 presents a comprehensive overview of the search strategy and selection criteria applied in this study. It outlines the specific keywords used to capture relevant literature, the Boolean operators employed to refine search results, and the range of databases accessed. Additionally, the table specifies the publication period considered, the types of documents included, as well as the inclusion and exclusion criteria used to systematically screen and select the most relevant studies. This detailed framework ensures transparency in the literature review process and allows for the replication of the study in future research.

3.3. Data Analysis and Synthesis Technique

To analyze the selected literature, this study adopts a thematic analysis approach, enabling the systematic identification, organization, and interpretation of recurring patterns across the reviewed studies. This method is particularly suitable for synthesizing heterogeneous research findings from multidisciplinary domains such as Artificial Intelligence and sustainable development. Each selected article was subjected to an in-depth review process and subsequently coded based on its primary focus, methodological approach, and specific contribution to the advancement of Sustainable Development Goals (SDGs). The coding process was conducted iteratively to ensure consistency and to capture nuanced insights emerging from the literature. The identified patterns were then consolidated into broader thematic categories that represent the dominant areas in which AI contributes to sustainability.

Table 2. Thematic Categories of Analysis

Theme	Description
Resource Optimization	AI applications in energy efficiency, smart resource allocation, and sustainable consumption
Climate & Environmental Modeling	Use of AI for climate prediction, environmental monitoring, and sustainability analytics
Healthcare Innovation	AI-driven diagnostics, predictive analytics, and personalized medicine
Inclusive Education	Adaptive learning systems and AI-based educational technologies
Sustainable Industrial Transformation	Automation, robotics, and AI-driven productivity in industry

Ethical & Governance Frameworks	Issues related to fairness, transparency, accountability, and AI regulation

Table 2 presents the main thematic categories derived from the analysis along with their corresponding descriptions. These themes reflect key domains of AI application, ranging from technical implementations such as resource optimization and climate modeling to socio-technical considerations including education, industrial transformation, and ethical governance. The categorization provides a structured overview of how AI technologies are being leveraged to address diverse sustainability challenges across multiple sectors.

In addition to thematic categorization, a cross-domain comparative analysis was conducted to explore similarities, differences, and interconnections among the identified themes. This analysis facilitates the identification of overlapping contributions, emerging trends, and potential research gaps in the application of AI for SDGs. By examining how different domains intersect and complement each other, this approach provides a more holistic understanding of the role of AI in driving sustainable development, while also highlighting opportunities for future interdisciplinary research and innovation.

4. RESULTS AND DISCUSSION

The findings of this multidisciplinary review affirm that AI has rendered significant, measurable, and cross-sectoral contributions to the attainment of the Sustainable Development Goals (SDGs). The synthesis of selected studies discloses consistent and converging patterns, indicating that AI technologies are fundamentally reshaping critical sectors, encompassing healthcare, education, energy, industry, urban sustainability, and environmental management. These findings illuminate AI's role not merely as a technological innovation, but more profoundly as a strategic enabler of sustainable development. Within the context of SDG 3 (Good Health and Well-being), robust empirical evidence substantiates that AI significantly strengthens healthcare systems through enhanced diagnostic accuracy, early disease detection capabilities, and individualized treatment planning. Deep learning models, in particular, exhibit high-level performance in identifying complex pathological conditions such as cancer, diabetes, cardiovascular disorders, and infectious disease outbreaks. Furthermore, AI-driven predictive analytics facilitates proactive healthcare interventions, thereby contributing to the reduction of mortality rates and the overall improvement of healthcare delivery efficiency.

With respect to SDG 4 (Quality Education), the findings indicate that AI catalyzes the development of adaptive learning environments through personalized content dissemination, intelligent tutoring systems, and automated assessment mechanisms. Natural Language Processing (NLP)-based platforms augment interactivity and accessibility, thereby fostering more inclusive educational ecosystems capable of accommodating diverse learner populations, including individuals with disabilities. These technological advancements contribute substantively to the mitigation of educational inequalities and the enhancement of learning outcomes at a broader scale. In addition, AI assumes a pivotal role in propelling progress toward SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). Machine learning algorithms are extensively deployed in renewable energy forecasting, smart grid optimization, and climate modeling applications. These implementations serve to improve energy efficiency, facilitate the seamless integration of renewable energy sources into existing infrastructures, and support data-informed decision-making in the realm of environmental policy formulation. Consequently, AI makes substantial contributions to the reduction of carbon emissions and the advancement of sustainable energy systems on a global scale.

In the domains of SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation, and Infrastructure), AI-driven automation, robotics, and intelligent manufacturing systems have been shown to increase productivity, optimize supply chains, and reduce operational inefficiencies. Predictive maintenance systems minimize downtime, while data-driven industrial processes enhance resource utilization and economic competitiveness. These advancements reinforce AI's role in fostering sustainable industrial growth and innovation. Additionally, notable contributions are observed in SDG 11 (Sustainable Cities and Communities) and SDG 15 (Life on Land). AI-powered smart city solutions improve urban management through real-time traffic optimization, air quality monitoring, waste management, and disaster risk prediction. In environmental sustainability, AI supports biodiversity conservation, land-use analysis, and precision agriculture, enabling more efficient and sustainable use of natural resources. To provide a clearer overview of these findings, the key contributions of AI across SDGs are summarized in Table 3.

Table 3. Summary of AI Contributions to SDGs

SDG	Sector	AI Contribution	Key Impact
SDG 3	Healthcare	Diagnostic systems, predictive analytics, personalized medicine	Improved accuracy, early detection, reduced mortality
SDG 4	Education	Adaptive learning, NLP platforms, automated assessment	Enhanced learning outcomes, reduced inequality
SDG 7	Energy	Renewable energy forecasting, smart grids	Increased efficiency, better energy distribution
SDG 13	Climate	Climate modeling, environmental analytics	Reduced emissions, improved climate resilience
SDG 8	Economy	Automation, AI-driven business models	Increased productivity, economic growth
SDG 9	Industry	Robotics, predictive maintenance	Operational efficiency, innovation acceleration
SDG 11	Urban	Smart city systems, traffic and waste optimization	Improved urban sustainability
SDG 15	Environment	Biodiversity monitoring, precision agriculture	Resource efficiency, environmental protection

Overall, the results indicate that AI serves as a critical technological driver in accelerating progress toward the SDGs. The convergence of AI capabilities across multiple sectors underscores its transformative potential in addressing complex global challenges, while also emphasizing the importance of continued innovation and responsible implementation.

5. MANAGERIAL IMPLICATIONS

The findings of this study underscore that managers, organizational leaders, and policymakers must embrace a more strategic and integrative approach in harnessing AI as a pivotal enabler of sustainable development, wherein the implementation of AI ought not to be perceived merely as a technological upgrade, but rather as a fundamental transformation of organizational processes, decision-making architectures, and value creation mechanisms. This transformative endeavor necessitates substantial investments in digital infrastructure, data management systems, and human capital development, while concurrently cultivating a data-driven organizational culture that empowers institutions to leverage predictive analytics, automation, and intelligent systems to elevate operational efficiency, augment the precision of decision-making processes, and sustain competitiveness within an increasingly intricate and dynamic global landscape. Moreover, managers are expected to harmonize AI adoption strategies with overarching sustainability objectivesmost notably the Sustainable Development Goals (SDGs)by systematically identifying and prioritizing use cases wherein AI can simultaneously generate tangible economic value and meaningful social impact, such as in the domains of healthcare optimization, energy efficiency enhancement, intelligent educational systems, and sustainable industrial practices, thereby ensuring that technological innovation contributes not exclusively to organizational performance, but extends its benefits to encompass broader societal well-being.

At the same time, the implementation of AI requires careful consideration of ethical, governance, and regulatory dimensions, as managers must ensure that AI systems are developed and deployed in a manner that upholds transparency, fairness, accountability, and data privacy, which are essential for building stakeholder trust and minimizing risks associated with algorithmic bias and unequal access to technology, while also encouraging the adoption of responsible AI frameworks, including explainable AI (XAI) and compliance with emerging regulatory standards; in addition, managers should actively promote cross-sector collaboration involving industry, government, academia, and civil society to address complex global challenges more effectively, as well as continuously enhance organizational adaptability through ongoing learning, workforce reskilling, and strategic flexibility, enabling organizations to respond proactively to rapid technological changes

and to fully capitalize on the transformative potential of AI in achieving long-term sustainable development.

6. CONCLUSION

AI has progressively cemented its position as a transformative and pervasive force spanning multiple domains, encompassing machine learning, deep learning, natural language processing, robotics, and ethical AI governance, fundamentally reconstituting the manner in which technological systems are conceived and deployed within contemporary society. The findings of this study affirm that AI not only propels scientific and technological innovation but also assumes a critical role in confronting complex global challenges through its application across pivotal sectors such as healthcare, education, energy, industry, and environmental sustainability. Consequently, AI emerges as a strategic enabler with the capacity to accelerate progress toward the attainment of the SDGs by furnishing scalable, efficient, and data-driven solutions to pressing developmental imperatives.

Notwithstanding its considerable potential, the study further accentuates that the pervasive adoption of AI introduces a constellation of ethical, social, and governance challenges that necessitate careful and deliberate management to ensure sustainable and equitable developmental outcomes. Concerns pertaining to algorithmic bias, insufficient transparency, data privacy vulnerabilities, and inequitable access to AI technologies may substantially obstruct the inclusive benefits of AI if left inadequately addressed. Accordingly, the long-term viability of AI in underpinning sustainable development is contingent upon the establishment of responsible governance frameworks, the seamless integration of ethical principles into system architecture and design, and the active promotion of transparency and accountability within AI-driven decision-making processes.

Future research should focus on advancing the development of responsible and human-centered AI systems by emphasizing interdisciplinary collaboration across technological, social, and policy domains, as well as strengthening global regulatory frameworks that ensure ethical compliance and equitable access to AI technologies. In addition, further studies are needed to explore the long-term societal and environmental impacts of AI deployment, particularly in underrepresented regions and sectors, while also investigating innovative approaches that enhance the alignment between AI advancements and sustainable development objectives, thereby maximizing the overall technological, social, and environmental benefits of AI.

7. DECLARATIONS

7.1. About Authors

Arthur Simanjuntak Anita (AS) https://orcid.org/0000-0003-2881-1158
Taavi Kuusk (TK) -
Gabriel Nicola (GN) -
Marviola Hardini (MH) https://orcid.org/0000-0003-3336-2131
Untung Rahardja (UR) https://orcid.org/0000-0002-2166-2412

7.2. Author Contributions

Conceptualization: AS; Methodology: TK; Software: GN; Validation: MH and UR; Formal Analysis: AS and MH; Investigation: MH; Resources: TK; Data Curation: MH; Writing – Original Draft Preparation: AS and MH; Writing – Review and Editing: AS and MH; Visualization: MH; All authors, AS, TK, GN, MH, and UR, have read and agreed to the published version of the manuscript.

7.3. Data Availability Statement

The data presented in this study are available on request from the corresponding author.

7.4. Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

7.5. Declaration of Conflicting Interest

The authors declare that they have no conflicts of interest, known competing financial interests, or personal relationships that could have influenced the work reported in this paper.

REFERENCES

[1] A. Singh, A. Kanaujia, V. K. Singh, and R. Vinuesa, "Artificial intelligence for sustainable development goals: Bibliometric patterns and concept evolution trajectories," *Sustainable Development*, vol. 32, no. 1, pp. 724–754, 2024.

[2] S. Kosasi, C. Lukita, M. H. R. Chakim, A. Faturahman, and D. A. R. Kusumawardhani, "The influence of digital artificial intelligence technology on quality of life with a global perspective," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 3, pp. 240–250, 2023.

[3] A. Erica, L. Gantari, O. Qurotulain, A. Nuche, and O. Sy, "Optimizing decision-making: Data analytics applications in management information systems," *APTISI Transactions on Management*, vol. 8, no. 2, pp. 115–122, 2024.

[4] G. Lampropoulos, J. Garzón, S. Misra, and K. Siakas, "The role of artificial intelligence of things in achieving sustainable development goals: State of the art," *Sensors*, vol. 24, no. 4, p. 1091, 2024.

[5] E. W. Ziemba, C. D. Duong, J. Ejdys, M. A. Gonzalez-Perez, R. Kazlauskaitė, P. Korzynski, G. Mazurek, J. Paliszkiewicz, J. Stankevičienė, and K. Wach, "Leveraging artificial intelligence to meet the sustainable development goals," *Journal of Economics and Management*, vol. 46, pp. 508–583, 2024.

[6] L. Limajatini, S. Suhendra, G. A. Pangilinan, and M. G. Ilham, "Integration of artificial intelligence in the financial sector innovation, risks and opportunities," *International Journal of Cyber and IT Service Management*, vol. 5, no. 1, pp. 58–70, 2025.

[7] M. Miftah, D. I. Desrianti, N. Septiani, A. Y. Fauzi, and C. Williams, "Big data analytics for smart cities: Optimizing urban traffic management using real-time data processing," *Journal of computer science and technology application*, vol. 2, no. 1, pp. 14–23, 2025.

[8] T. Hariguna, U. Rahardja, and Sarmini, "The role of e-government ambidexterity as the impact of current technology and public value: an empirical study," in *Informatics*, vol. 9, no. 3. MDPI, 2022, p. 67.

[9] W. Usino, M. M. Sari, F. P. Oganda, O. P. M. Daeli, and E. Smith, "Artificial intelligence integration for sustainable business model innovation insights from global startups," *Sundara Advanced Research on Artificial Intelligence*, vol. 1, no. 2, pp. 82–89, 2025.

[10] C. Lukita, A. W. A. Rahman, I. N. Hikam, and U. Rahardja, "Integrating strategic management with sdg 10 for sustainable development and equity," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 2, pp. 638–649, 2025.

[11] A. Pambudi, N. Lutfiani, M. Hardini, A. R. A. Zahra, and U. Rahardja, "The digital revolution of startup matchmaking: Ai and computer science synergies," in *2023 Eighth International Conference on Informatics and Computing (ICIC)*. IEEE, 2023, pp. 1–6.

[12] D. Mhlanga, "Fintech and artificial intelligence for sustainable development: The role of smart technologies in achieving development goals," in *FinTech and artificial intelligence for sustainable development: The role of smart technologies in achieving development goals*. Springer, 2023, pp. 3–13.

[13] M. Hatta, W. N. Wahid, F. Yusuf, F. Hidayat, N. A. Santoso, and Q. Aini, "Enhancing predictive models in system development using machine learning algorithms," *International Journal of Cyber and IT Service Management*, vol. 4, no. 2, pp. 80–87, 2024.

[14] W. Abdullah, "Artificial intelligence for achieving sustainable development goals: Applications, techniques and progress," *International Journal of Computers and Informatics (Zagazig University)*, vol. 5, pp. 117–128, 2024.

[15] N. Hussain and G. A. Pangilinan, "Robotics and automation with artificial intelligence: improving efficiency and quality," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 2, pp. 176–189, 2023.

[16] P. Costa, J. Ferdiansyah, and H. D. Ariessanti, "Integrating artificial intelligence for autonomous navigation in robotics," *International Transactions on Artificial Intelligence*, vol. 3, no. 1, pp. 64–75, 2024.

[17] R. Widayanti and T. Mariyanti, "Ai dialog: Utilization, challenges, and ethics in the age of artificial intelligence," *International Transactions on Artificial Intelligence*, vol. 2, no. 1, pp. 40–48, 2023.

[18] M. O. Syaidina, R. Fahrudin, and I. A. Mutiara, "Implementation of ethics of using artificial intelligence in the education system in indonesia," *Blockchain Frontier Technology*, vol. 4, no. 1, pp. 63–71, 2024.

[19] P. Tripathi and P. Saxena, "An assessment of the role of artificial intelligence on sustainable development goals," in *Digital Technologies and Distributed Registries for Sustainable Development: Legal Challenges*. Springer, 2024, pp. 3–23.

[20] O. Bianchi and H. P. Putro, "Artificial intelligence in environmental monitoring: Predicting and managing climate change impacts," *International Transactions on Artificial Intelligence*, vol. 3, no. 1, pp. 85–96,

2024.
[21] R. Royani, S. D. Maulina, S. Sugiyono, R. W. Anugrah, and B. Callula, "Recent developments in healthcare through machine learning and artificial intelligence," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 6, no. 1, pp. 86–94, 2024.
[22] S. Wang and H. Zhang, "Promoting sustainable development goals through generative artificial intelligence in the digital supply chain: Insights from chinese tourism smes," *Sustainable Development*, vol. 33, no. 1, pp. 1231–1248, 2025.
[23] C. Davis, T. Bush, and S. Wood, "Artificial intelligence in education: Enhancing learning experiences through personalized adaptation," *International Journal of Cyber and IT Service Management*, vol. 4, no. 1, pp. 26–32, 2024.
[24] M. M. Siahaan, A. Sijabat, H. Samosir, R. Purba, and R. F. Terizla, "Enhancing hots and entrepreneurial competencies through avnet academic applications in english learning," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 7, no. 1, pp. 206–216, 2025.
[25] R. Raman, V. K. Nair, P. Nedungadi, A. K. Sahu, R. Kowalski, S. Ramanathan, and K. Achuthan, "Fake news research trends, linkages to generative artificial intelligence and sustainable development goals," *Heliyon*, vol. 10, no. 3, 2024.
[26] I. Kulkov, J. Kulkova, R. Rohrbeck, L. Menvielle, V. Kaartemo, and H. Makkonen, "Artificial intelligence-driven sustainable development: Examining organizational, technical, and processing approaches to achieving global goals," *Sustainable Development*, vol. 32, no. 3, pp. 2253–2267, 2024.
[27] Q. Aini, P. Purwanti, R. N. Muti, E. Fletcher *et al.*, "Developing sustainable technology through ethical ai governance models in business environments," *ADI Journal on Recent Innovation*, vol. 6, no. 2, pp. 145–156, 2025.
[28] Z. Zainol, G. Brotosaputro, S. C. Chen, and E. A. Natasya, "Designing ethical ai systems for sustainable technology development," *ADI Journal on Recent Innovation*, vol. 6, no. 2, pp. 201–211, 2025.
[29] A. Sánchez-Roncero, Ò. Garibo-i Orts, J. A. Conejero, H. Eivazi, F. Mallor, E. Rosenberg, F. Fuso-Nerini, J. García-Martínez, R. Vinuesa, and S. Hoyas, "The sustainable development goals and aerospace engineering: a critical note through artificial intelligence," *Results in Engineering*, vol. 17, p. 100940, 2023.
[30] H. F. Abdel-Elaah and A. H. Abed, "The contribution of artificial intelligence to addressing the global goals for sustainable development," *Journal of computers and digital business*, vol. 4, no. 1, pp. 45–55, 2025.
[31] M. A. Hussein and H. M. S. Ahmed, "The role of artificial intelligence in achieving the sustainable development goals: Literature review," *International Journal of Innovation and Knowledge Management in the Middle East and North Africa*, vol. 10, no. 1/2, p. 23, 2025.
[32] W. Leal Filho, P. Yang, J. H. P. P. Eustachio, A. M. Azul, J. C. Gellers, A. Gielczyk, M. A. P. Dinis, and V. Kozlova, "Deploying digitalisation and artificial intelligence in sustainable development research," *Environment, development and sustainability*, vol. 25, no. 6, pp. 4957–4988, 2023.
[33] V. Agarwal, M. Lohani, and A. S. Bist, "A novel deep learning technique for medical image analysis using improved optimizer," *Health Informatics Journal*, vol. 30, no. 2, p. 14604582241255584, 2024.
[34] T. R. V Jericho, "Implementation of cnn and mediapipe in increasing the effectiveness of stretching in futsal sports," *Technomedia Journal*, vol. 9, no. 3, pp. 386–397, 2025.
[35] B. Rawat, A. S. Bist, U. Rahardja, Q. Aini, and Y. P. A. Sanjaya, "Recent deep learning based nlp techniques for chatbot development: An exhaustive survey," in *2022 10th International Conference on Cyber and IT Service Management (CITSM)*. IEEE, 2022, pp. 1–4.
[36] J. Siswanto, Hendry, U. Rahardja, I. Sembiring, E. Sediyono, K. D. Hartomo, and B. Istiyanto, "Deep learning-based lstm model for number of road accidents prediction," in *AIP Conference Proceedings*, vol. 3234, no. 1. AIP Publishing LLC, 2025, p. 050004.
[37] M. Choiri, E. S. Pramudito, F. Sutisna, and R. S. Sean, "Business artificial intelligence for enhancing sustainable decision intelligence," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 7, no. 1, pp. 106–116, 2025.
[38] A. Pambudi, O. Wilson, and J. Zanubiya, "Exploring the synergy of global markets and digital innovation in business growth using smartpls," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 6, no. 1, pp. 106–113, 2024.
[39] M. D. T. P. Nasution, Y. Rossanty, R. Harahap, A. R. Tanjung, and T. A. M. Nasution, "Technology-driven

resource utilization and integration to enhance firm performance," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 8, no. 1, pp. 268–283, 2026.

[40] R. Sivaraman, M.-H. Lin, M. I. C. Vargas, S. I. S. Al-Hawary, U. Rahardja, F. A. H. Al-Khafaji, E. V. Golubtsova, and L. Li, "Multi-objective hybrid system development: To increase the performance of diesel/photovoltaic/wind/battery system." *Mathematical Modelling of Engineering Problems*, vol. 11, no. 3, 2024.

[41] H. Henry, K. Lutfiyah, H. Agustian, and N. Lachlan, "Assessing the environmental and economic impact of smart grid integration in renewable energy management," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 7, no. 1, pp. 38–50, 2025.

[42] Q. Aini, M. Hardini, A. Faturahman, D. Apriliasari, and A. C. Kiboy, "Analyzing user acceptance of ai based water quality monitoring through the utaut2 framework," *Sundara Advanced Research on Artificial Intelligence*, vol. 1, no. 2, pp. 65–73, 2025.

[43] R. E. Indrajit, M. V. A. Sin, E. A. Nabila, W. N. Wahid, and N. Septiani, "Optimizing business process efficiency through artificial intelligence integration in industry 4.0," *Sundara Advanced Research on Artificial Intelligence*, vol. 1, no. 2, pp. 47–55, 2025.

[44] K. Arora, A. S. Bist, U. Rahardja, and A. Singh, *Artificial Intelligence: How Computers Think*. Walnut Publication, 2020.

[45] B. Rawat, A. S. Bist, N. Mehra, M. F. Fazri, and Y. A. Terah, "Study of kumaon language for natural language processing in end-to-end conversation scenario," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 3, no. 2, pp. 143–149, 2022.

[46] G. Brotosaputro, A. Supriyadi, and M. Jones, "Ai-powered assistive technologies for improved accessibility," *International Transactions on Artificial Intelligence*, vol. 3, no. 1, pp. 76–84, 2024.

[47] I. B. M. P. Dharmika and I. N. Subanda, "The effectiveness of public services in realizing good governance," *Aptisi Transactions on Technopreneurship (ATT)*, vol. 5, no. 1Sp, pp. 77–83, 2023.

[48] S. Purnama and W. Sejati, "Internet of things, big data, and artificial intelligence in the food and agriculture sector," *International Transactions on Artificial Intelligence*, vol. 1, no. 2, pp. 156–174, 2023.

[49] R. Nanda, S. A. Pratama, M. Y. Pusadan, and Y. Anshori, "Design thinking for kami peduli website to mobilize community disaster response," *IAIC Transactions on Sustainable Digital Innovation (ITSDI)*, vol. 6, no. 1, pp. 51–64, 2024.

[50] S. C. Azhari, C. Saepulmilah, and A. H. Juhaeni, "Pelatihan pembuatan pupuk organik hasil fermentasi (porasi) untuk mempromosikan sdgs dalam model pertanian berkelanjutan," *ADI Pengabdian Kepada Masyarakat*, vol. 4, no. 1, pp. 27–32, 2023.

[51] M. Manu, F. Makhija, A. S. Bist, P. S. Kharayat, A. Singh, and S. Goyal, "Unraveling the consequences of unethical act of use of artificial intelligence: A systematic review and meta-analysis," in *2024 4th International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)*. IEEE, 2024, pp. 1890–1894.

[52] T. Mariyanti, I. Wijaya, C. Lukita, S. Setiawan, and E. Fletcher, "Ethical framework for artificial intelligence and urban sustainability," *Blockchain Frontier Technology*, vol. 4, no. 2, pp. 98–108, 2025.

[53] T. Bustomi, C. Aurora, S. Millah, F. A. Ramahdan, and F. Kruger, "Integrating artificial intelligence and smartpls for data driven educational innovation," *Sundara Advanced Research on Artificial Intelligence*, vol. 1, no. 2, pp. 74–81, 2025.