

# The Role of Artificial Intelligence in Achieving the United Nations Sustainable Development Goals

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## Abstract

The United Nations' 2030 Agenda for Sustainable Development aims to tackle poverty, inequality, and environmental degradation and foster economic growth. This study investigates the transformative potential of artificial intelligence (AI) in achieving these Sustainable Development Goals (SDGs). Analyzing data from 44 sources, the research highlights AI's capacity to address critical challenges in healthcare, education, environmental management, economic growth, and gender equality. AI applications in renewable energy, waste management, disease detection, personalized education, and gender equality are examined. The study also emphasizes the ethical issues associated with AI, such as algorithmic bias, data privacy breaches, and job displacement. To fully leverage AI's potential, it is essential to develop intelligent automation governance systems, foster interdisciplinary research combining AI and sustainability, and promote public-private partnerships. Additionally, enhancing public AI literacy and implementing eco-friendly AI policies are crucial. The study advocates for a holistic ethical framework to maximize AI's benefits while mitigating risks, promoting cross-disciplinary collaboration, and establishing ethical AI standards. By doing so, AI can significantly contribute to a more inclusive, equitable, and sustainable future.

**Keywords:** AI, sustainability, SDGs, responsible AI, governance, ethical issues, algorithmic bias, data privacy, social impacts, job displacement

## 1. Introduction

As stated by Carlsen & Bruggemann (2022), if all parties concerned work together with the United Nations' Sustainable Development Goals (SDGs), we would have a better chance of achieving a society where people are treated fairly and where the economy and environment can thrive by 2030. In 2015, all member nations of the United Nations agreed to address interconnected issues such as hunger, poverty, climate change, gender inequality, and inadequate educational opportunities by adopting the seventeen Sustainable Development Goals (SDGs) (Halkos & Gkampoura, 2021). Having creative, efficient methods and solutions for this ambitious goal is crucial. If this works, we can shift gears and progress rapidly. Artificial intelligence (AI) has been the center of attention among other tech solutions due to its extensive incorporation into our work's dimensions (Goralski & Tan, 2020; Truby, 2020). AI has significant applications outside the SDGs, including healthcare, education, pollution management, economic development, pattern identification, and economic growth. However, incorporating AI into these systems should resolve the profound social, environmental, and ethical issues (Von Braunet al., 2021). Though AI systems can be a helpful bridge to reaching the SDGs, there are still downsides to using AI in general (Di Vaio et al., 2020; Palmares et al., 2021). This study examines how advanced AI technology can help achieve the UN's Sustainable Development Goals. This will involve gathering the latest economic/technological and ethical/social research on AI capabilities, applications, and development roadmaps, analyzing how cutting-edge AI technologies could be leveraged and integrated as a cross-cutting approach to cohesively address and make progress on multiple SDGs simultaneously, and discussing an AI-driven framework and strategy to pull together and maximize impacts across various fields.

### 1.1 Background

#### 1.1.1 Overview of Artificial Intelligence

Robotic machines and computers use AI to mimic how the human mind gives machine-human intelligence-like

capabilities. Machines can accumulate learning skills, solve problems, reasoning, perception, and language comprehension. The most critical AI technologies are machine recognition programming, grammar analysis, and visual recognition. Learning from data is the machine learning way of the world, and it often outperforms explicit programming (Vinuesa et al., 2020). AI based on natural language and computer vision is capable of not only speaking but also understanding and interpreting human language as well. Astronauts use machines and devices in transport, pollution monitoring, health checkups, and education. The United Nations Sustainable Development Goals (SDGs) adopted in 2015 target eradicating extreme Poverty and reducing inequality, ending environmental degradation since this aggravates climate change, increases global temperature, and rehabilitates the environment to its natural status. This endeavor will be done until 2030. AI can execute these things well, as researchers Truby (2020) and Vinuesa et al. (2020) enumerate. There are misgivings to grapple with in economics, the promotion of health, education, ecology, resources, and many others. However, new AI-based solutions can aid in addressing all these problems. Following Holzinger et al. (2021) and Sætra's (2021b) thoughts on the matter, alert attention to the ethical, social, and environmental ramifications that AI might bring as the solution is crucial to be able to use it wisely if it is to be responsible for sustainable development solutions. Critical ethical considerations include algorithmic bias, data privacy, and accountability; besides this, social effects are the opposite. They are changing the economic and power dynamics and creating the potential for job losses. AI technology could generate environmental repercussions comprising resource exhaustion and carbon release (Sætra, 2021b). On one hand, AI can be an effective tool for leading to sustainable development. On the other hand, it can bring discomfort to sustainability, ethical values, or our long-term goals. Hence, the pros and cons of AI usage in sustainable development programs should be evaluated to develop a clear strategy to ensure an AI's positive impact without its negative facets.

#### 1.1.2 United Nations Sustainable Development Goals

The UN created the Sustainable Development Goals in 2015. By 2030, these goals aim to end extreme Poverty and inequality, address climate change and environmental degradation, and slow global economic development. UN member states finalized 17 Sustainable Development Goals (SDGs) to eradicate poverty, protect the environment, and ensure everyone lives in peace and prosperity (Carlsen & Bruggemann, 2022). Good governance, environmental conservation, and social inclusion are among the causes of these three interrelated concerns they address. After adopting the 2030 Agenda, member countries have achieved several goals, but they need to innovate in data gathering, analysis, and decision-making to meet the stated targets (Moyer & Hedden, 2020). Financial help and slum operations include housing, sanitation, and running water (Vinuesa et al., 2020; Truby, 2020). AI can help reduce poverty and improve health care, education, the environment, and economic growth using its pattern-recognizing and information-handling talents. However, Holzinger et al. (2021) and Sætra (2021b) highlight that intelligent AI use and responsible and fair development must address and effectively manage ethical, social, and environmental issues. Ethical challenges include algorithmic discrimination, data privacy, and machine responsibility, while social repercussions include power imbalances and employment losses. In addition, Sætra (2021b) highlights that the production and implementation of artificial intelligence leads to resource depletion and increased greenhouse gas emissions, resulting in environmental effects.

## 2. Literature Review

AI technology advancement will be crucial to meeting the UN's Sustainable Development Goals. The rapid advancement of AI may require updating and revising several SDG goals to stay up with technology. This article examines 44 reliable sources on the issue, and the extensive data shows AI's ability to support and enable global SDG efforts actively. The data shows that intentional AI system integration may generate coordinated success across the SDGs' interrelated economic, social, and environmental dimensions. In general, the SDGs, which are proper for sustainability, are related to sustainable consumption and production, climate change, and biodiversity loss from the point of view of Vinuesa et al. (2020). Along these lines, Truby (2020) perceives that establishing a robust AI governance framework is a critical task that could help realize how AI may propel SDGs. For example, training cutting-edge AI models requires a lot of processing power and energy, which may increase carbon emissions and strain energy resources, worsening climate change (SDG 13). Similarly, without careful design and regulation, AI-driven automation might disrupt labor markets, causing job losses that worsen poverty and economic instability (SDG 1). As Damoah et al. (2021) argue, AI-powered drones in medical supply chains are a prospective solution that will help improve the supply chain's efficiency and contribute to Sustainable Development Goal 3, which encompasses health and wellbeing. As part of the study by Balsalobre-Lorente et al. (2023), telecommunications and information technology, including artificial intelligence, were tested for their contribution to implementing Sustainable Development Goals 11 and 12 (Climate Action and Sustainable Cities and Communities). The industry may need more excellent studies to understand the opportunity that comes with

Artificial Intelligence as a product and a tool that can offer decent economic employment. The impact of AI adoption on productive work is conceptualized by Braganza et al. (2021) about psychological contracts, job engagement, and employee trust. Nevertheless, the talks above illustrate how AI may help developing nations reach the United Nations' goals, including SDGs 1 and 9, which aim to decrease Poverty and improve innovation and infrastructure. To guarantee that AI development aligns with the SDGs, promoting responsible and ethical AI is crucial, as a literature citation emphasizes. Keep secrecy, security, and safety in mind when considering the long-term viability of technology advancements like AI (Holzinger et al., 2021). In their warning that AI systems employing robotized carers for the aging population could undermine human values and standards, Umbrello et al. (2021) highlight the importance of value-sensitive design. A few publications that conducted bibliometric analyses and systematic literature reviews successfully followed the research trail and identified areas with unanswered questions. The authors of the paper outlining the application of different multi-criterion decision-making procedures to achieve the Sustainable Development Goals (SDGs) are Acquah et al. (2021). Singh et al. (2024) examine bibliometric trends and the concept evolution trajectories of AI research within the framework of the goals of UN agencies, in contrast to the prior study, which focuses on the literature survey about the SDGs related to AI. Digital transformation and data-driven decision-making are two areas where the literature highlights the role of AI. Building a just, peaceful, and institutionally strong world is the focus of SDG Objective 16. Boyd et al. (2020) suggest that digital governance uses an Application Programming Interface (API) framework to help promote inclusive and peaceful societies. An API framework is a set of rules, protocols, and tools for constructing API-based software applications. An API framework in digital governance would enable interoperability, data sharing, and integration between government, agency, and stakeholder digital systems and services. De Villerius et al. (2021) identify blockchain and the Internet of Things (IoT) to investigate their potential role in achieving sustainable business operations that align with the SDGs. This paper recognizes that AI possesses both positive and negative aspects, which is why the possibility of it continues to stimulate appetites. In their 2020 paper, Cernev and Fenner explore the potential for better education and less Poverty to strengthen the artificial intelligence industry, reduce global risks, and advance the SDGs. Saetra (2021a, 2021b) proposed a method for assessing and reporting AI's environmental, social, and governance (ESG) implications, and they incorporated the idea that AI, as a technology, ought to aid in the construction of sustainable sociotechnical systems. In addition, the COVID-19 pandemic provided more proof that AI is the solution to humanity's most significant global problems. Based on AI/ML research, Mhlanga (2022) stresses the importance of applying the lessons learned from the epidemic to using AI and ML to achieve global development goals. A large body of research suggests that AI has the potential to help achieve the SDGs. On the other side, it highlights the importance of designing, deploying, and monitoring AI systems that align with sustainability principles and human values, emphasizing the need for societal and ethical responsibility at their heart. Collaboration among disciplines, involving stakeholders in the process, and testing track records should always be addressed to make an informed judgment on whether AI can improve the situation.

### *2.1 Theoretical Framework*

Challenges and Opportunities of AI in delivering the UN Sustainable Development Goals: An Analysis from Multiple Perspectives There are various theoretical frameworks to consider to determine how the application of AI can help in attaining the UN's SDGs. First, the Technological Determinism Theory postulates that technology, such as AI, implies that technology is the key determinant of change within society. This theory brings credibility to the concept that AI affects sustainable development to varying degrees – economic, environmental, and social (Goralski & Tan, 2020).

Secondly, the Framework adopted for the study is the Sociotechnical Systems Theory which highlights the relations between technology and structures. Specifically, within this framework, the following creates the understanding that improving the implementation of these goals requires a multi-disciplinary view of the technology and its intended application of AI together with appreciating the societal, ethical, and environmental implications of the proposed usage of AI in the achievement of the seven priorities of the SDGs (Holzinger et al., 2021). What this theory shows is that there is a need to develop AI in such a way that the system that results from it will inhibit the right level of efficiency as well as be socially acceptable and ethical.

Another perspective that may be helpful that has been put forward by Amartya Sen and Martha Nussbaum is the Capabilities Approach. It is also centered on improving and expanding people's potential and possibilities and therefore fits well with the human-centered approach promoted by the SDGs. These technologies can be utilized to create positive impacts on fields such as healthcare, education, and the economy to augment the human potential that will be useful for better development without discriminating against people from any background (Vinueza et al., 2020).

Finally, the Theory of Planned Behavior, in this case, helps in analyzing the stakeholders' behavioral intentions

toward the integration of AI in sustainable development projects. According to this theory, attitudes toward the use of AI for sustainable development, perceived behavioral control, and subjective norms have an impact on the intention level. The knowledge of these factors can assist policymakers in formulating implementation frameworks that would facilitate the utilization of AI in a responsible way to help in the fulfillment of SDGs (Truby, 2020). Collected together, these theoretical perspectives offer a concrete, and methodologically discriminant, basis to understand the opportunities and threats that AI might pose for the attainment of the United Nations Sustainable Development Goals.

### 3. Research Methodology

#### 3.1 Research Design

It is a combined method that integrates qualitative and quantitative tools and processes to assess the use of AI in attaining the UN's SDGs.

The phases of the research are a literature review, interviews with selected specialists, and an online questionnaire. This would give an overview of baseline knowledge concerning AI and SDGs and trends, therefore showing areas of uncertainty. Semi-structured interviews with AI professionals, policymakers, and practitioners will target a deep exploration of AI's role in sustainable development in terms of practice and dynamics. Online questionnaire: A final questionnaire will be shared with a broader sample of AI scientists, engineers, practitioners, and stakeholders to quantify sentiment analysis, beliefs, and first-hand experiences on AI's contribution towards attaining the SDGs.

#### 3.2 Participants

This will be done purposively to ensure Varied and expert representation within the scope of the research. The target population will include AI researchers and professionals, SDG policymakers, practitioners who apply AI in executing strategies relevant to sustainable development, and stakeholders from NGOs and international organizations.

These would include about 20-30 interviews, to be conducted to represent all categories of the population, and a target of 200 survey respondents to ensure that this had statistical significance and was generalizable.

##### 3.2.1. Instruments

Data collection instruments will include the following, to be used across the three phases:

**Systematic Literature Review:** In this case, Google Scholar, PubMed, and IEEE XPLORE will be explored for newer publications from 2015 upwards. The review will help map the current knowledge landscape and inherently assess gaps and opportunities.

**Interviews:** This study will use semi-structured interviews with open-ended questions to elicit participants' views on the benefits, challenges, and ethical concerns associated with applying AI to SDGs. These interviews will be recorded and later transcribed for thematic analyses.

**Online Questionnaire:** Administer a structured questionnaire, including open- and closed-ended questions, to gather quantitative data on participants' views and experiences. The questionnaire will be checked for reliability and validity before being used.

The data obtained through the interviews will be subjected to a thematic analysis that delivers themes and patterns relevant to the application of AI in controversial sustainable development aspects.

**Quantitative Data:** The structured data collected through the survey will be subjected to statistical data analysis techniques to gain a holistic understanding of participants' feelings and experiences.

#### 3.3. The Potential of AI in Sustainable Development

##### 3.3.1 AI for Environmental Sustainability

Among the three sustainable development goals (SDGs) on climate action and biodiversity protection, which includes terrestrial and marine lives (SDGs 13, 14, 15), artificial intelligence is the most potent tool of self-processing, which will solve environmental challenges. Research that can help nature has been done in many studies. AI-based models and forecasts catalyze climate change drain mitigation strategies, producing cutting-edge models and simulations. On the same line, Mondejar et al. (2021) and Vinuesa et al. (2020) aspire to achieve a more sophisticated classification process of climate change patterns so assessment and mitigation can conclude. Extensive climate data analysis by machine learning engines allows them to discover patterns and correlations. This can be used to improve policy decisions and adaptation strategies and determine the basic climate action plan. The artificial intelligence that guides data analysis and recommendation could promote more environmentally friendly activities, potentially aiding in preventing adverse phases of climate change. Such intelligent utilization

of renewable resources can be accomplished by integrating AI in the design, construction, and administration of renewable plants. AI is effective in making solar and wind farms eco-friendly. By examining weather data, energy loads, and system performance information, AI possesses an exceptional potential to raise the efficiency and productivity of renewable energy sources to the highest level. Artificial intelligence (AI) technologies can make resource efficiency and implementation of waste management and circular economy easier, as Gupta et al. (2021) described. The increasing efficiency of AI technologies in improving environmental sustainability is evident due to the growing interest of researchers in investigating solar PV monitoring systems. Solar PV monitoring systems alleviate the detrimental effects on the environment to ensure the conservation of natural resources. The figure illustrates a growing adoption of solar energy systems to replace non-renewable energy sources. Solar panels on residential roofs support environmental sustainability and the UN's SDGs. This solar-powered household decreases its carbon footprint and fights climate change, promoting numerous SDGs. First, it promotes Affordable and Clean Energy (SDG 7) since it reduces non-renewable resource use and provides energy security. The action also supports SDG 13 on Climate Action by generating power and solar panels, cutting greenhouse gas emissions, and fighting climate change. Urban residential solar panels minimize building emissions and create sustainable and resilient communities, promoting SDG 11.



Figure 1. A home with rooftop solar in Los Angeles, California (divanov/Shutterstock.com)

### 3.3.2 AI in Economic Growth and Decent Work

Innovation and economic progress are possible with AI. AI can help achieve the Sustainable Development Goals (SDGs) for decent employment and economic growth (SDG 8) and industry, innovation, and infrastructure development (SDG 9) by boosting labor productivity and working conditions. These goals stress inclusive economic growth through productive employment, technical advancement, and sustainable industrialization. The capability of AI to spur technological development and innovation can boost innovation in a wide range of areas faster than ever before, which, in turn, means higher efficiency and sustainable economic growth (Mhlanga, 2021). Machine intelligence and artificial intelligence technologies can substitute functions such as automated manufacturing, predictive analytics decision support systems, increasing manufacturing process efficiency, developing responsive supply chains, and tightening product development cycles. This improves efficiency and decreases and leads to creative innovations within industries. This also means that the economy will grow sustainably. Promoting good work conditions and labor productivity via AI yields benefits such as producing new occupations and improving the occupational environment through robotics substituting dangerous, dull, or routine tasks (Braganza et al., 2021). Regarding the Sustainable Development Goals, code scanning procedures at one of

Suntory's plants (Figure 2) show how AI boosts economic growth and decent labor. Specifically, AI-powered automated code scanning can increase manufacturing productivity and efficiency, supporting SDG 8's economic growth goals. AI-driven automation that reduces manual labor and dangers promotes SDG 8's on decent work goals. Therefore, AI-powered advanced manufacturing can boost innovation and growth of technologically advanced industries, supporting economic development (Modgil et al., 2020).



Figure 2. Scanning for code labels in one of Suntory's factories. From AI in Manufacturing: 4 Real-World Examples by Kavita Ganesan 2024

### 3.3.3 AI in Health and Wellbeing

AI technology holds enormous power and can positively influence global health parameters and the establishment of SDGs. The ability of AI in health care comes in many ways, such as disease diagnosis, treatment planning, prescription, drug discovery, and epidemiology (Damoah et al., 2021; Umbrello et al., 2021). A wide range of healthcare applications, such as ML algorithms, may be used in image analysis of the patient's data and information from electronic health records, as a tool to assist in the detection of diseases in their early stages, formulation of personalized treatment, and identification of possible adverse side effects medication. Furthermore, it can translate to better health outcomes, lower healthcare costs, and more rational resource distribution. Peyton's primary goal is to integrate sustainable principles into every company's operations, from production to product and packaging design. AI in the field of public health can help developers simulate the spread of infections in the population, distribute resources effectively for pandemics or any other outbreak, and identify risk groupings for precise treatments. Building a framework with AI-enabled telemedicine and remote monitoring systems will provide an avenue for equity in healthcare access where less resourceful and remote communities get equal opportunity to access high-quality medical services (Mhlanga, 2022). Virtual patient consultations, artificial intelligence-enabled diagnosis, and remote patient monitoring can make healthcare access possible even in distant locations, which is one of the requirements of universal health coverage. AI and technology improve healthcare efficiency, as shown in Figure 3, through telehealth technologies. The person in Figure 3 is filling in prescriptions. The graphic relates to AI in healthcare and SDGs for different reasons. First, AI can evaluate drug interactions, patient dosages, and dispensing accuracy to help pharmacists fill prescriptions faster. Medication safety and mistake reduction improve SDG 3.

AI might scan enormous prescription records and patient data to identify over-prescribing and misuse, supporting responsible drug use (SDG 3.5). The growing adoption of AI technologies in healthcare facilities significantly improves patient outcomes. AI-enabled remote monitoring, virtual consultations, and data analysis can streamline operations, enhance access to care, and improve patient outcomes through informed decision-making. Furthermore,

an AI can ensure that medical supply chain management runs smoothly through the timely delivery of essential medications and medical equipment during shortages.



Figure 3. Pharmacy technician Keenan Becker fills prescriptions at a CVS. David Wallace—the Republic/Image Content Services/USA Today Network by David Joyner (2024)

### 3.3.4 AI in Education and Gender Equality

AI can be involved in several ways to achieve SDG4 (Quality Education) and SDG5 (Gender Equality) by making resources accessible to all individuals and genders. Using AI-based adaptive learning platforms and intelligent tutoring systems to facilitate access to education could create an interactive experience where educational resources and instruction are customizable for each person's learning needs and nature (De Villiers et al., 2021). Infrastructure constraints may need help accessing qualified education, especially in areas with limited traditional educational institutions. AI can also translate language, giving a broader range of students with various ethnic backgrounds access to learning materials. Implementing gender equality using AI can be utilized to find and close gender gaps in classroom learning materials, curricula, and career guidance (Zengin et al., 2021). AI supports such a process by analyzing textbooks, teaching approaches, and professional guidance resources to spot and remove gender stereotypes or imbalances between masculine and feminine (if any) sides, thus promoting more inclusive and fair educational practices. Similarly, AI skills training and employment matching programs will be essential for women's growth. Figure 4. Shows a discussion between instructors about the integration of AI in the classrooms. The graphic relates directly to SDGs in that the computer workstations and screen software facilitate AI integration into education, which ultimately addresses SDG 4, which aims to achieve quality education. In this context, the image highlights how AI in the classroom may promote the SDG of inclusive and equitable quality education and lifelong learning. This indicates that AI-powered education may increase gender and socioeconomic diversity in access to quality education materials, enabling more equitable learning. AI could also help personalize learning, provide customized support, and identify gender biases in educational content and delivery. They can ensure that they receive the proper knowledge and skills for particular jobs and harness the opportunities in the labor market, thus promoting gender equality and women empowerment.



Figure 4. University of Carolina (UNC) Asheville has begun implementing AI in a Mass Communication course. From *AI in the classroom: UNC Asheville explores technology's opportunities and challenges* by Ed DiOrio (2024)

### 3.4 Findings, Challenges, and Considerations

#### 3.4.1 Ethical and Social Implications

AI promises to be the most potent collaborator in the sustainable development process. However, we should be prudent in its application and use to avoid ethical and other social effects. Considering the possibility of AI in SDGs, this article is expounding major ethical questions demanding the production, utilization, and deployment of AI. Di Vaio et al., 2020 (Truby, 2020; Holzinger et al., 2021) advise about the right to privacy, ethics, and responsibility in case of the AI systems algorithm bias. Incomplete, abnormality, or imbalanced data input into ML models may make the system promoting inequality more unbalanced rather than help reduce inequality. Such datasets may miss out on the aspects of society that are screaming for equality, which will enhance inequality problems. The eligible goals of the SDG that aim to circumnavigate inequality and establish an inclusive culture are becoming more challenging due to the second. Large-scale AI training and operating on personal datasets puts privacy into a big question. Therefore, data governance and the implementation of privacy-enhancing mechanisms are required. For example, academics like Umbrello and others (2021) have raised doubts about the relevance of developers' ethics and values in their system development process due to the sensitive nature of development. When addressing social impacts, the threats of resistance of job categories in different fields through the employment of AI could worsen economic inequalities and the SDGs, as the targets for inclusive and sustainable economic growth concerning decent work might be hindered (Braganza et al., 2021). Moreover, under such circumstances, it is possible to see the high concentration of AI capabilities in the hands of few organizations leading to handling with power imbalances and misuse of vast technological capabilities that will eventually give birth to more conflicts and hinder progress towards goals that are targeting the inequalities and that focus on creating a peaceful, inclusive world. Sustainable governance mechanisms, generalized participation of all stakeholders, and measures of reskilling and upskilling the workers, which will limit the social risks created by AI, are crucial to ensure that the fruits of AI are fair to all.

#### 3.4.2 Sustainability of AI Solutions

Even though AI can generate many environmental benefits and play a proactive role in achieving our sustainability goals across various issues, AI technologies are also capable of high energy usage and excessive CO<sub>2</sub> emissions, which must be respected. They can have a profound environmental impact that needs proper attention. As an illustration, the emission of greenhouse gases, the spurt in demand for energy, and the deterioration of the



environment occur at an appreciable level due to the development of models of extensive AI and the activity of AI systems (Sætra, 2021b). Cerner and Fenner (2020) point out that not skillfully controlling the ecological tolls of AI technology may stop or even backslide the progress made towards attaining the goals 13, 12, and 15, respectively, better life below water, responsible consumption and production, and sustainable use of resources. To solve energy efficiency and sustainability challenges, AI implementers must consider using energy-efficient AI models based on renewable energy sources. Besides, it is also essential to reduce the computational needs of AI programs during this procedure (Vinuesa & Sirmacek, 2021).

Moreover, sourcing raw materials, reducing and minimizing electronic waste, and promoting circular economy schemes are the keys to lessening the environmental burden of AI technologies during the entire lifecycle. The literature cements the need for a more holistic and responsible approach to AI development and deployment that aligns with ethics, socioeconomic equity, and environmental sustainability goals. AI researchers, policymakers, private sector stakeholders, and civil society organizations should work in an interdisciplinary manner. They can capitalize on the exciting aspects of AI to proactively mitigate its likely risks and unforeseen downs. Persistent monitoring, assessment, and alteration mechanisms are still significant in having AI technologies follow the big picture of sustainable development goals where the objectives are constantly held.

#### 3.4.3 Recommendations for Policymakers and Stakeholders

Various measures, including those consistent with humanizing AI, are required to achieve long-term sustainable development without underestimating the fair risks AI technologies allow. Firstly, a framework and guidelines for AI governance must be designed that prioritize ethical and fair use of AI development, and this would raise questions of accountability, transparency, and fairness as most, if not all, concerns are related to AI systems. Secondly, organizing and conducting training courses and skills enrichment programs is a principal step towards providing workers with AI and data literacy that would allow these employees to use AI to realize sustainable projects effectively. The third to be mentioned is the cooperation of the public-private sector, as in the case of multi-stakeholder dialogue being used in the SDG to serve the SDG with diverse perspectives, resources, and knowledge. The next element is coming up with, setting up, and popularizing inclusive and suited to less mainstream groups and susceptible people AI technologies that guarantee a fair distribution and sharing of the rewards that come with AI technology by society.

#### 4. Conclusion

The growing application of AI technologies is crucial for increasing impetus for realizing the UN Sustainable Development Goals. AI can both be a problem solver in the dynamics of environmental issues and economic and social development and may also serve as a potential tool to deal with the challenges of accessibility and health indirectly. Nevertheless, all ethical and social issues must be regarded highly to enable AI systems to develop more sanely. For AI to meaningfully contribute to the fight against societal inequalities and promote a more sustainable future, topics such as algorithmic bias, data privacy, and the environmental impact of AI systems should not be disregarded. It is crucial to remember that harnessing AI's power will depend on joint actions and the participation of many different parties. Swapping ideas and knowledge between countries, organizations, and communities in society propels the spread of implemented, tested, and learned best practices. However, conservation can successfully lead AI research - the space where interdisciplinary researches are prioritized- bearing in mind the concerns on sustainability and ethical issues that entail continued investment. An approach like that leads to capacity-building programs promoting AI and digital literacy, cutting across all sectors, thus allowing stakeholders to participate in AI-based solutions for the 17 SDGs. Moreover, complete governance systems and legislations guided by values of transparency, accountability, and fairness are necessary to maintain AI systems effectively. Summarizing, careful and strategic artificial intelligence (AI) incorporation will be the solution to reach the UNDs with an end view to building an environmentally friendly, socially just, and economically alluring world for all. Notably, AI will be helpful if it is applied in such a way as to avoid harm and unintended consequences. At the same time, the ethical rules and environmental and social objectives will be adhered to. Therefore, such a future is one where technology and social phenomena agree and can go well.

This research has explored the potential of enhancing the probability of achieving the UN's SDGs through the advancement of artificial intelligence. Thus, applying qualitative and quantitative approaches in the research framework, it pinpointed opportunities and threats stemming from AI's dynamics for sustainable development. Accordingly, despite offering idealistic ways of enhancing healthcare solutions, education, economic development, and environmental conservation, it is factual that AI's implementation needs to address the ethical social, and environmental barriers as depicted in this paper. Therefore, effort should be made to present a fair compromise that would unlock the potential of Artificial Intelligence while, at the same time, helping to mitigate the ill

consequences of the change in technologies on the global society.

#### Recommendations

- Develop Comprehensive AI Governance Frameworks: Policymakers need to introduce sound governance measures to enhance the regulation of AI technologies and their application to serve society's interests.
- Promote Interdisciplinary Collaboration: Organize teamwork among the leading AIs, authorities, and businessmen to establish an effective model of sustainable development using modern technologies.
- Enhance Public Awareness and Education: AI literacy and its potential for the SDGs' future can be increased through learning material and various targeted efforts.
- Invest in Responsible AI Research: Allocate funding for creating new algorithms and applying AI that will conform to ethical standards and be more efficient and balanced in the future.
- Monitor and Evaluate AI Impact: Solution, monitoring, and assessment should be integrated into tracking the impact of applying AI to meet the targets of the SDGs to allow adjustments of the strategies and policies as required.

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**Informed consent**

Obtained.

**Ethics approval**

To conduct this study, necessary approval from the institutional research committee was sought for inclusion in the World Medical Association Declaration of Helsinki—Ethical Principles for Medical Research Involving Human Subjects, 1964, and its revisions were followed. Assent was obtained from all individual participants enlisted in the study before the experiment was conducted.

The Publication Ethics Committee of the Canadian Center of Science and Education.

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**Data availability statement**

As per the current study, the datasets used and analyzed during the research are available to the corresponding author upon request. Data sharing is precluded by ethical considerations, which require the participants' consent and, hence, privacy.

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data sharing statement**

No additional data are available.

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